


# Ancient Herring DNA from the Burton Acres Shell Midden (45KI437) and Pacific Herring Population Dynamics in the South Salish Sea



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# Pacific Herring (*Clupea harengus pallasii*) – Traditional Subsistence and Ecological Keystone Species



Ocean Modeling Forum, Margaret Siple, University of Washington

[www.pacificherring.org](http://www.pacificherring.org)



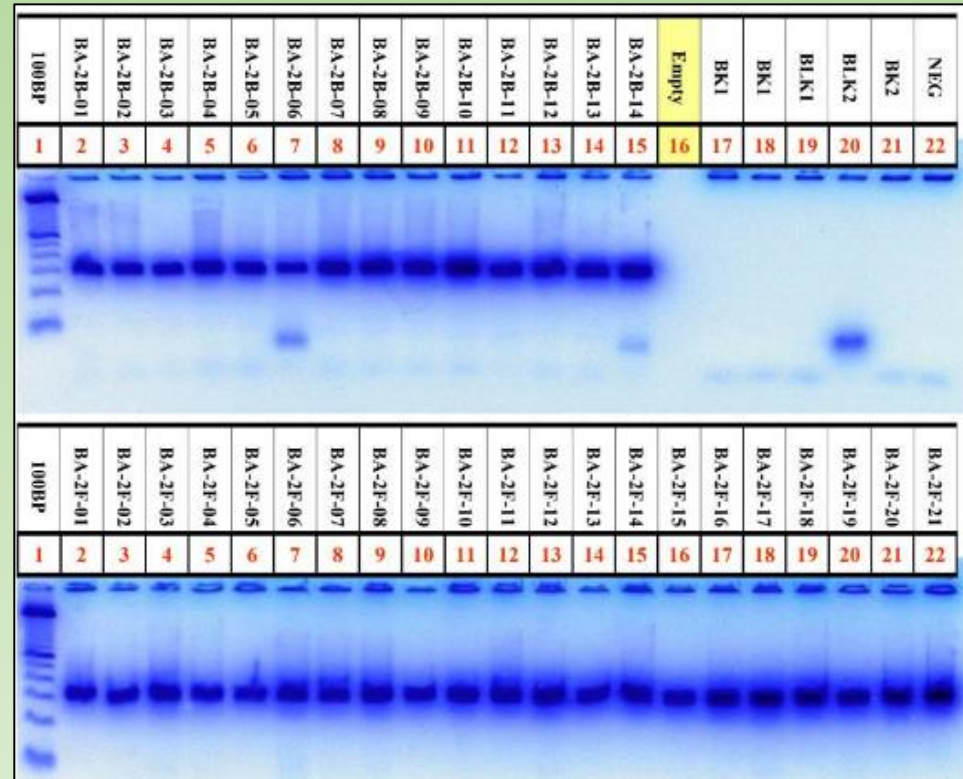
Digester/Powell River Museum ND000241 1938



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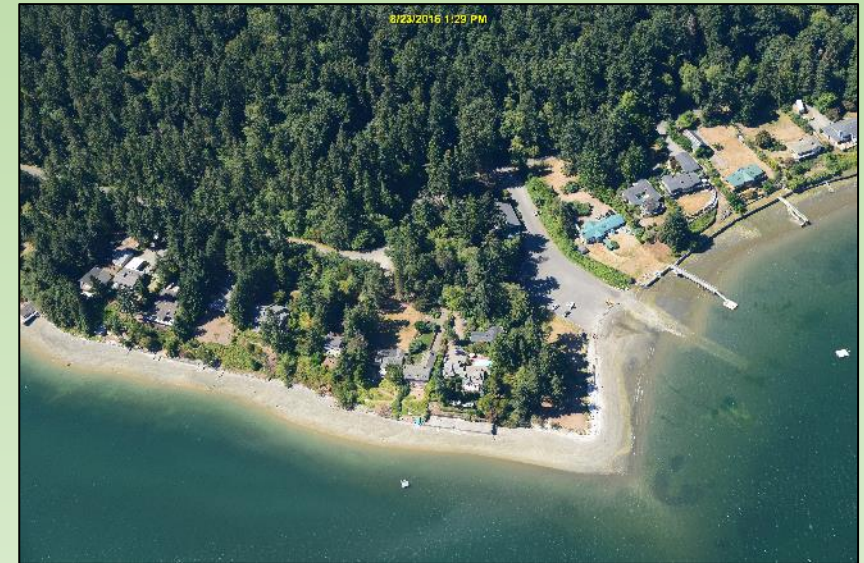
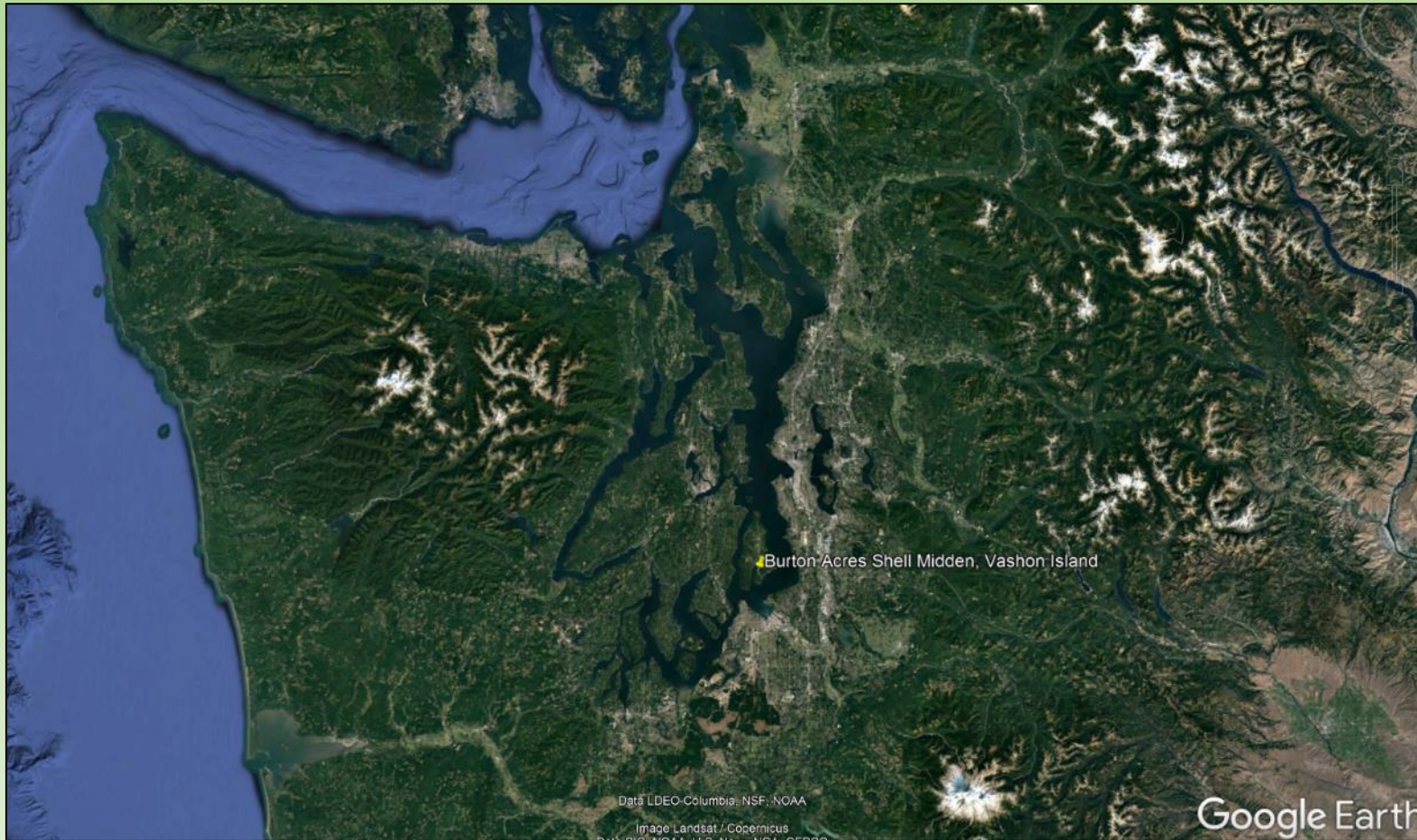
# The Burton Acres Shell Midden (45KI437) - Herring Galore



# The Burton Acres Shell Midden (45KI437) - Julie Stein, P.I. Extraordinaire



# The Burton Acres Shell Midden (45KI437)



WA Dept of Ecology

# The Burton Acres Shell Midden (45KI437)





# The Burton Acres Shell Midden (45KI437)

## 1996 Excavation

- Burke Museum, Puyallup Tribe, McMurray Middle School.
- Almost 400 Volunteers over the course of ~2 weeks, each excavating one liter of midden matrix and taking it through the process of excavation, screening, and sorting.
- 4 One-Square Meter Units, About 2 m<sup>3</sup> volume excavated.
- Few lithic artifacts, some bone fishing-related tools.
- Mammal, bird, and shellfish remains typical of western Washington shell middens.
- Abundant, taxonomically diverse fish remains.



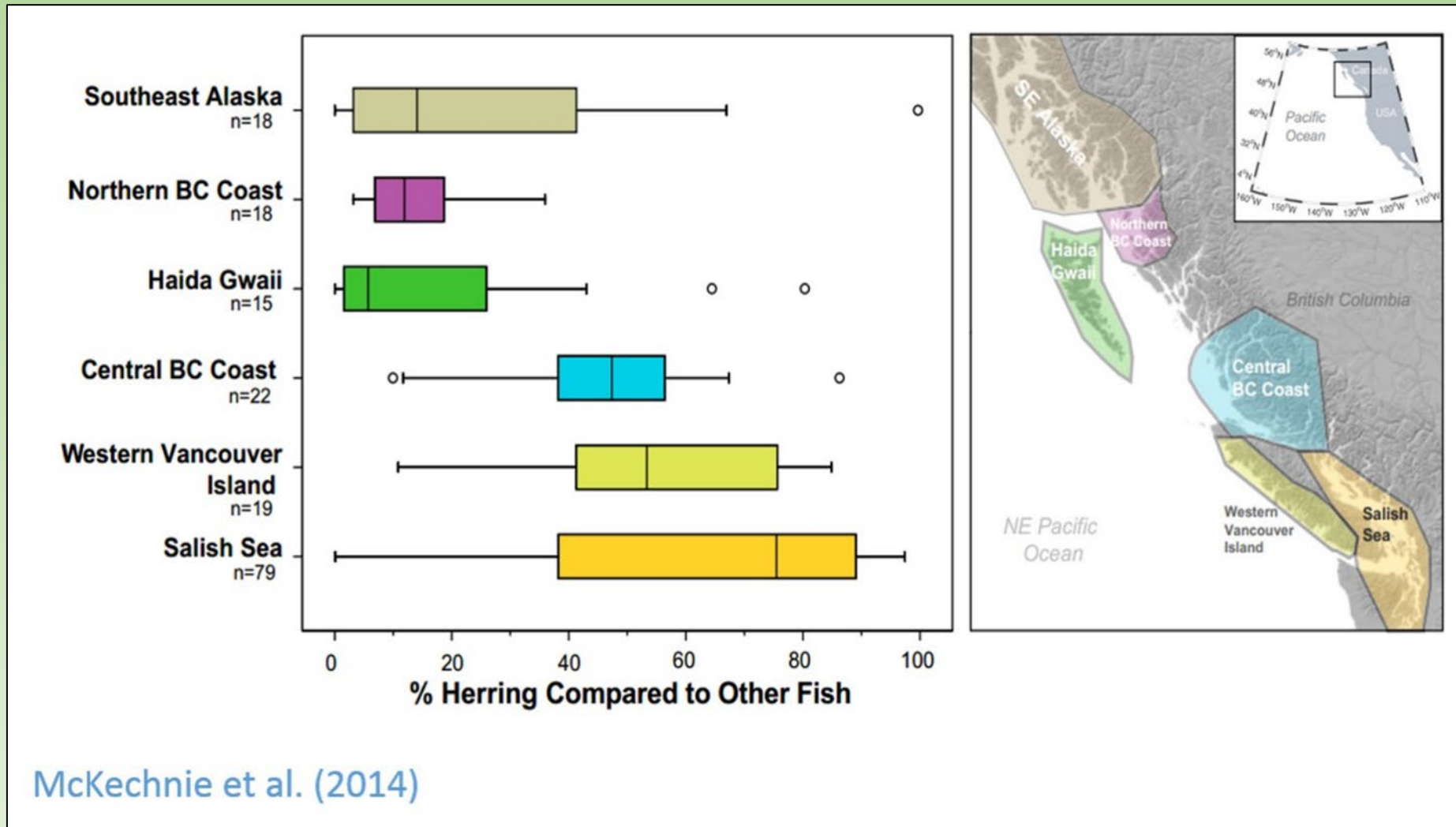
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(Boy Meets Fishbones)

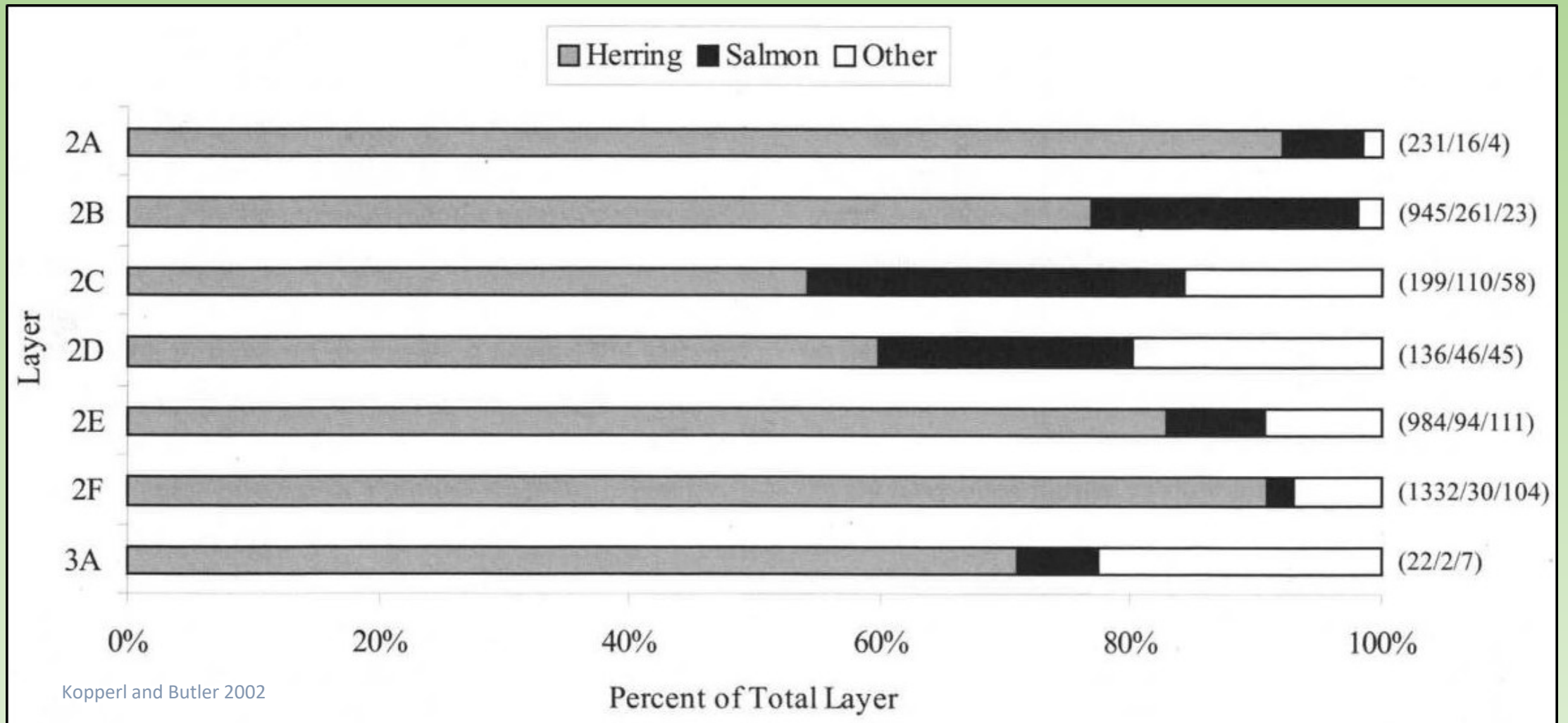


# Herring in the Salish Sea Archaeological Record

Herring are ubiquitous, and quite often abundant, in shell middens throughout the Salish Sea

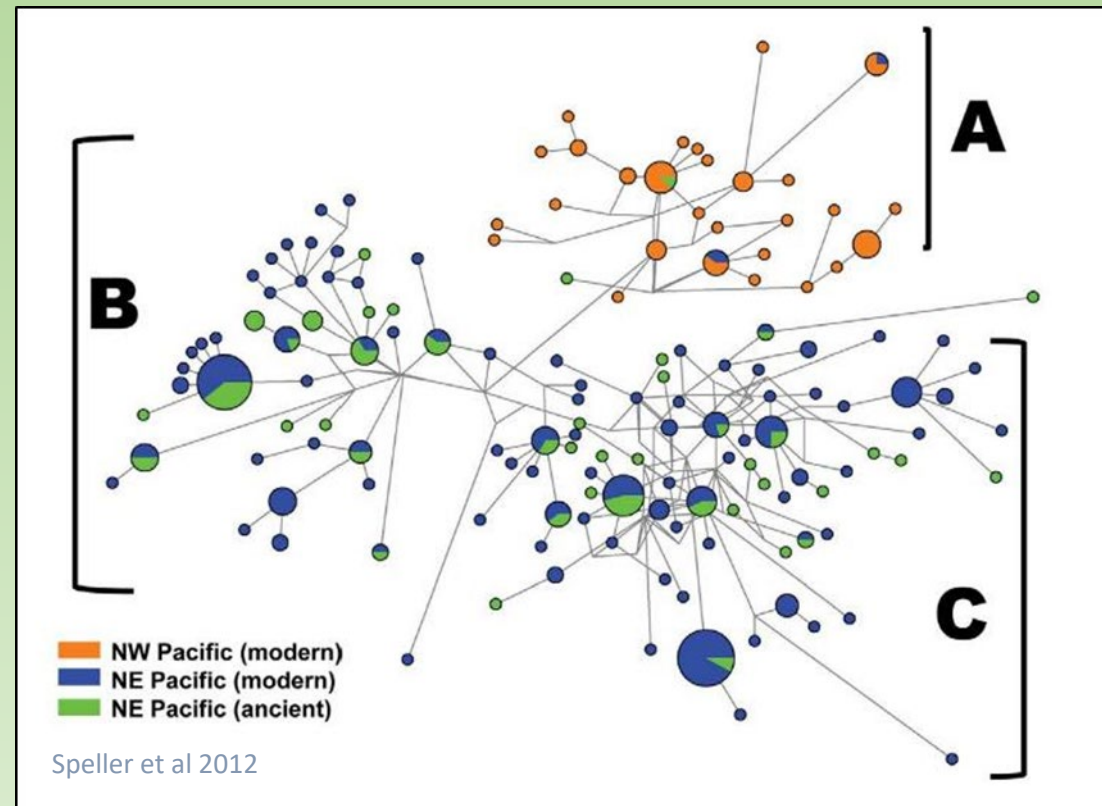


# Herring in the Salish Sea Archaeological Record



# Herring in the Salish Sea Archaeological Record

Although not nearly as established as with salmonids, herring aDNA research is coming into its own, esp. BC and AK



# Shifting baselines in Puget Sound: population diversity of Pacific herring and its use by Native Americans over the millennia

**Collaborators**



**CCIRA**

**POLICY & ECOSYSTEM RESTORATION IN FISHERIES**  
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**Hakai**  
A Tula Foundation Program  
Willamette Cultural Resources Associates, Ltd.  
Archaeology • History • Ethnography

**Fisheries and Oceans Canada**

**PUYALLUP TRIBE OF INDIANS**

**The Suquamish Tribe**  
Port Madison Indian Reservation

**Upland Resources Society**

**Coastal Marine Ecology & Conservation Lab**  
CMEC

**WASHINGTON DEPARTMENT OF FISH AND WILDLIFE**

**Funding Sources**



**Sea Grant**  
Washington

**NSERC**  
**CRNSG**

**iPOC** IGERT PROGRAM ON OCEAN CHANGE

**NSF**

# Shifting baselines in Puget Sound: population diversity of Pacific herring and its use by Native Americans over the millennia

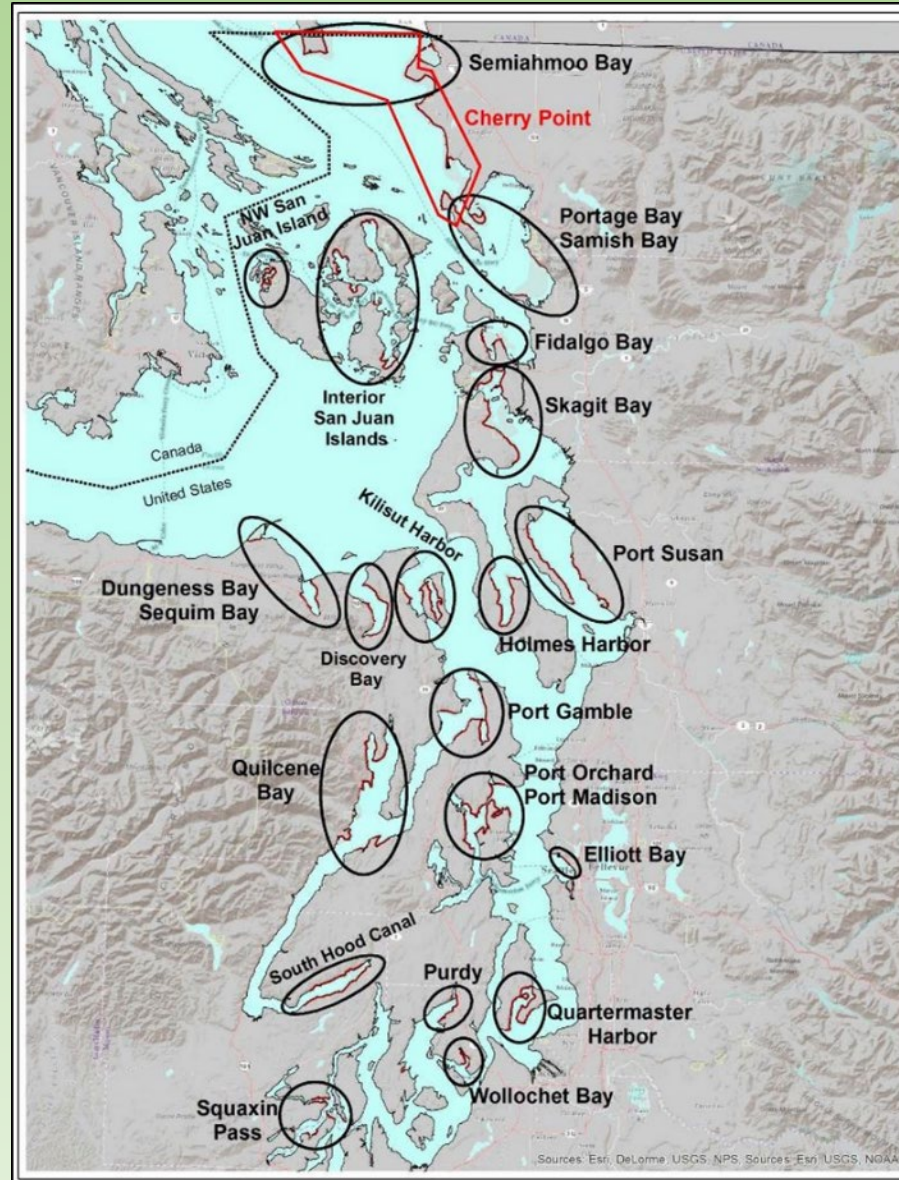
## Questions:

- 1) Can aDNA be extracted from archaeological herring remains that inform us of their genetic diversity in the south Salish Sea?
- 2) Which herring stocks were fished by Coast Salish people in the south Salish Sea?
- 3) Does the relative abundance of these stocks vary through time in the archaeological record?

## Approach Components:

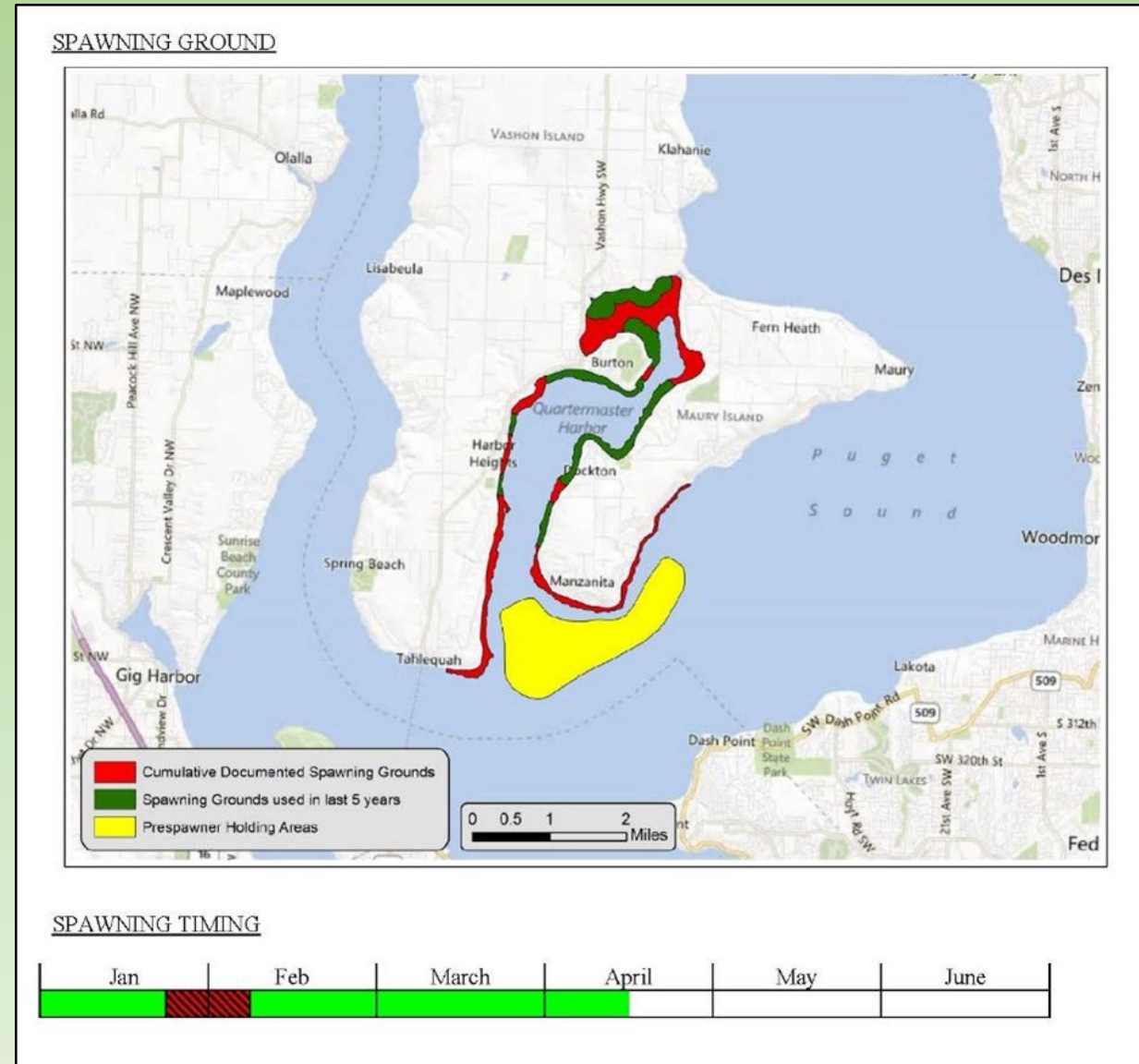
- 1) Zooarchaeological Synthesis
- 2) Genetic profiling of modern south Salish Sea Pacific herring stocks
- 3) Genetic reconstruction of ancient south Salish Sea Pacific herring stocks
- 4) Oral history of traditional and commercial Native herring fisheries

# Shifting baselines in Puget Sound: population diversity of Pacific herring and its use by Native Americans over the millennia





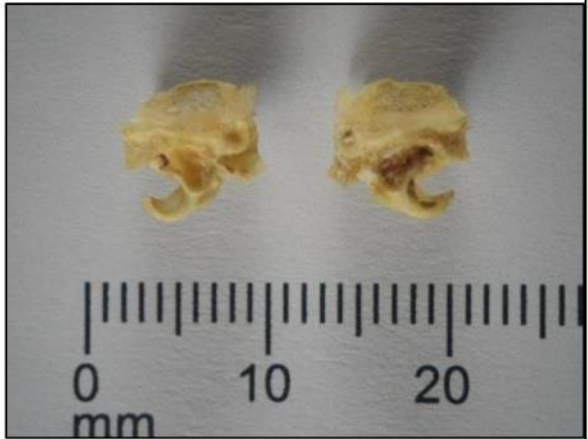
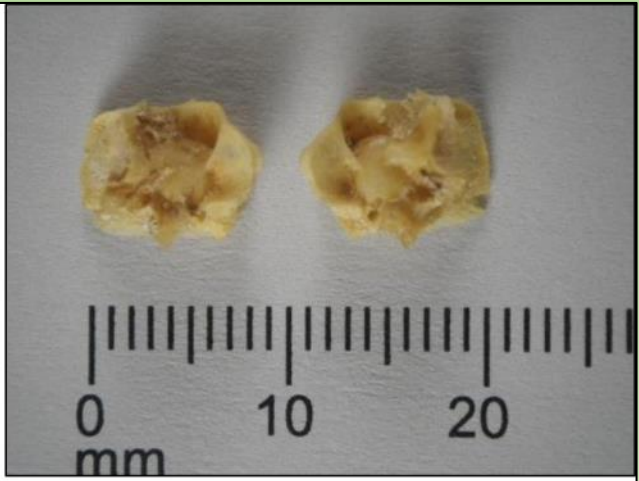
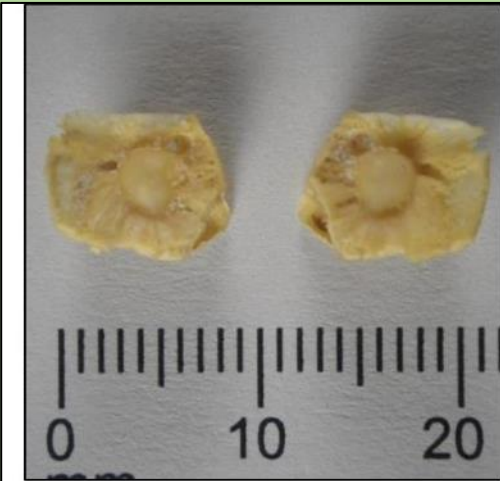
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# Sampling, Analyzing, and Interpreting aDNA from Burton Acres Herring Bones



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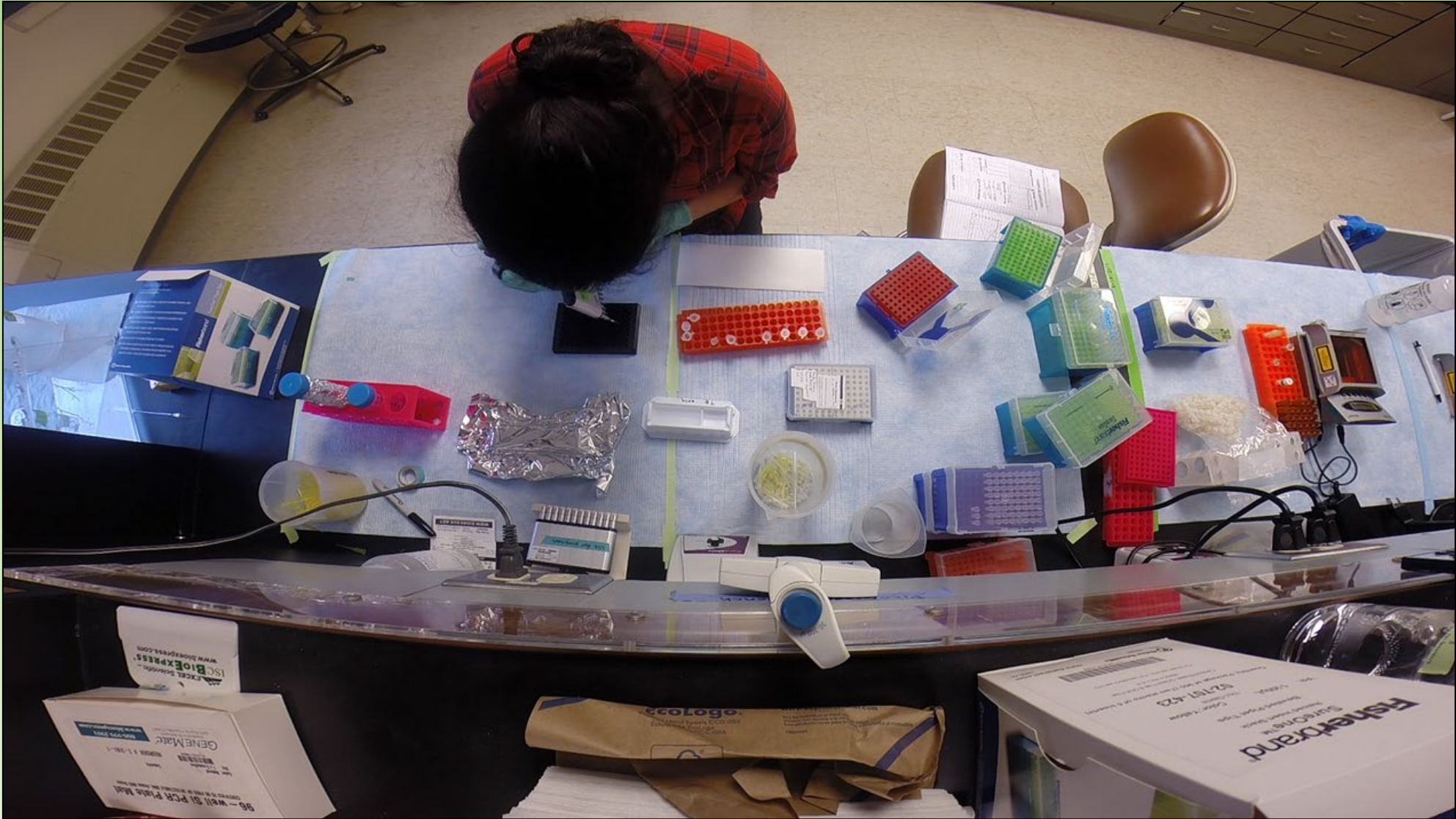
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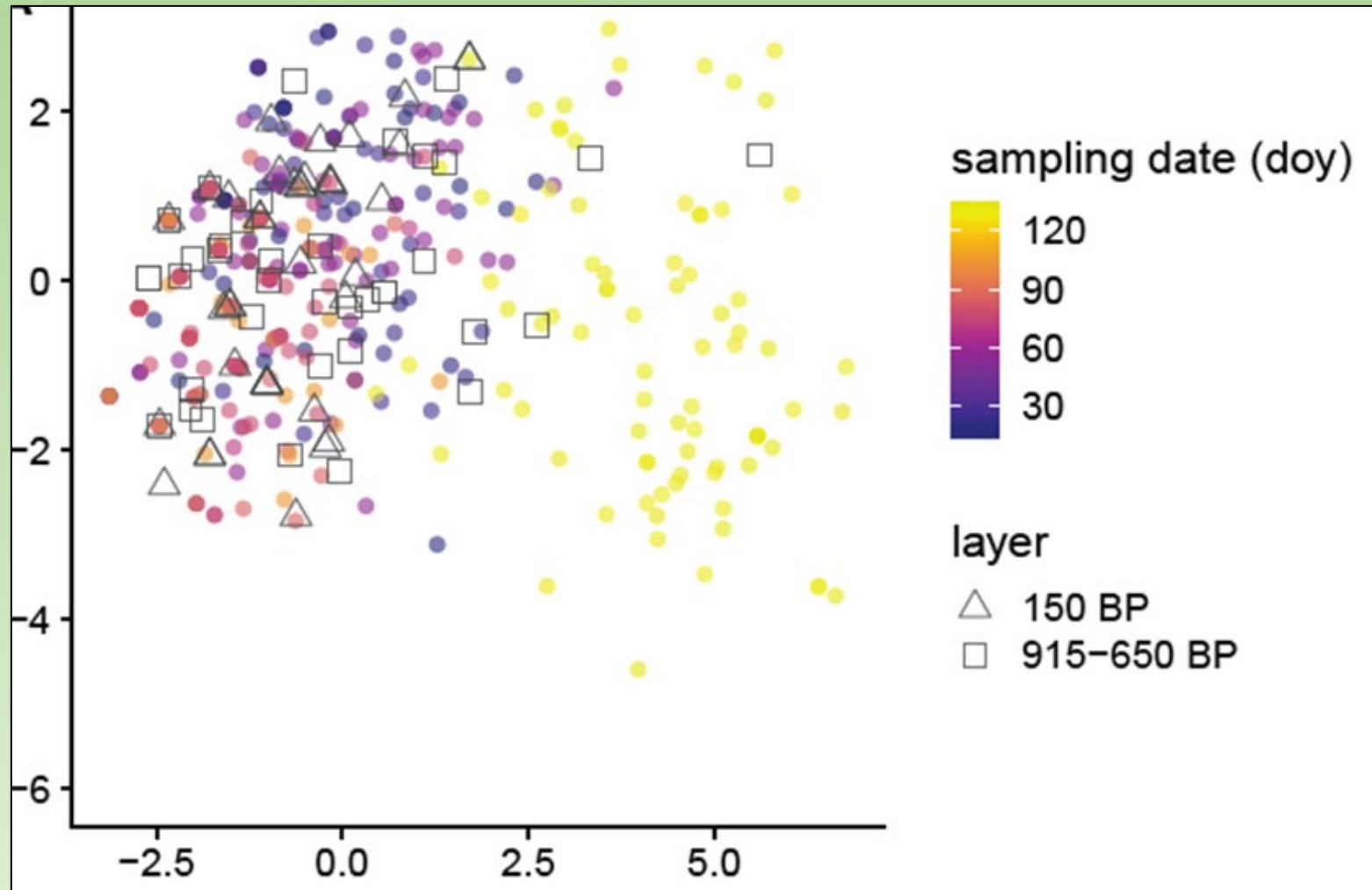
# Sampling, Analyzing, and Interpreting aDNA from Burton Acres Herring Bones

mtDNA Analysis						
SFU ID	Sequencing	D-Loop haplotype	Region	GenBank Accession Number	Reference	Additional Comment
LHH1	2 directions F6/R425	SP13	Simpson Sound, Alaska	JF507018	Liu et al. 2011	
LHH2	2 directions F6/R425	YB23	Yakutat Bay, Alaska	JF506886	Liu et al. 2011	
LHH3	1 direction F6	SS66	South Sitka, Alaska	JF506976	Liu et al. 2011	Needs 2nd direction
LHH4	2 directions F130/R425	Various	Alaska and BC		Liu et al. 2011, Lakkonen et al. 2013, Grant et al. 2012	
LHH5	Failed					
LHH6	2 directions F130/R425	Inconclusive	Alaska, Washington, and BC		Liu et al. 2011, Lakkonen et al. 2013, Grant et al. 2012	Needs re-sequencing
LHH7	2 directions F130/R425	NO61	Nootka Sound, BC	JF507286	Liu et al. 2011	
LHH8	2 directions F130/R425	NO61	Nootka Sound, BC	JF507286	Liu et al. 2011	
LHH9	2 directions F130/R425	Various	Alaska, Washington, and BC		Liu et al. 2011, Lakkonen et al. 2013, Grant et al. 2012	
LHH10	Failed					

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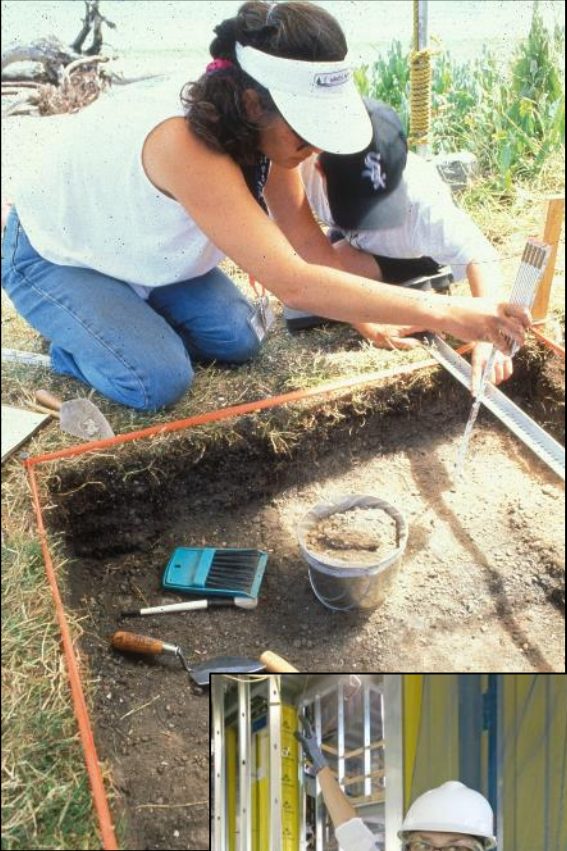
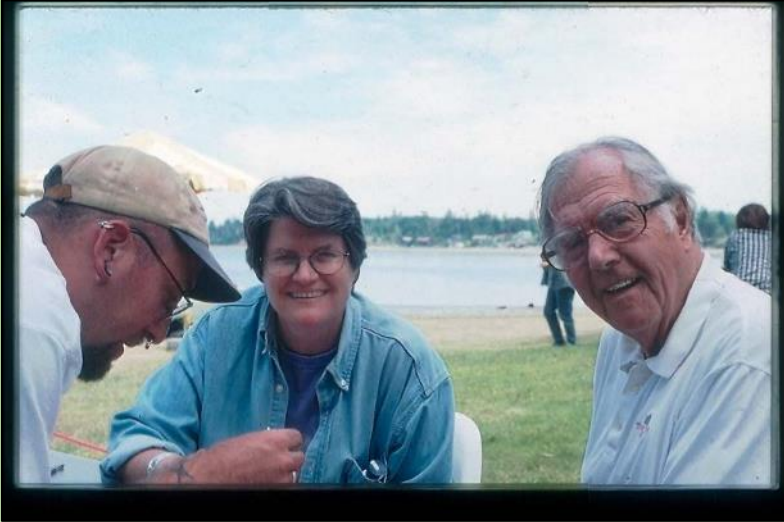


# Herring Beyond Burton Acres





# Acknowledgements



Seattle Times



Burke Museum of Natural History and Culture

# Acknowledgements

The Herring Team – Eleni Petrou, Lorenz Hauser, Dana Lepofsky, Dongya Yang, Antonia Rodriguez, Camilla Speller

Our Herring Colleagues – Madonna Moss, Ian McKechnie

Our Tribal Partners – Dennis Lewarch (Suquamish), Brandon Reynon (Puyallup), Josh Wisniewski (Port Gamble S’Klallam)

Access to faunal collections and awesome photos of the Burton Acres Dig – Laura Phillips & Burke Museum Staff

