Using Mini-Barcodes to Investigate the Species Composition of the Late Holocene (3,500 to 200 years BP) Fishery at EeRb-144, British Columbia, Canada

Thomas C.A. Royle1, George P. Nicholas2, and Dongya Y. Yang1

1 Ancient DNA Laboratory, Department of Archaeology, Simon Fraser University, Burnaby, B.C., Canada 2 Department of Archaeology, Simon Fraser University, Burnaby, B.C., Canada

Introduction

EeRb-144 is a seasonal prehistoric (~7000 to 200 cal. years BP) composite located in the Interior Plateau region of southern British Columbia, Canada (Fig. 1).1,3 Excavations of the site have recovered numerous Late Holocene (3500 to 200 cal. years BP) materials associated with fishing, including fish remains and fishing spears points. The majority of fish remains recovered from EeRb-144 are fragmented. This fragmentation has generally precluded the identification of these remains through morphological analysis to the species level. Consequently, little is known about the species composition of EeRb-144’s Late Holocene fishery.

To shed light on the species composition of the Late Holocene fishery at EeRb-144, we used ancient DNA (aDNA) analysis to identify a sample of Late Holocene fish remains from the site.

Ancient DNA Analysis

64 Late Holocene fish remains from EeRb-144 were selected for aDNA analysis. The remains were taken from a variety of contexts in order to increase the likelihood that they represent multiple individuals.

A modified silica-spin column method was used to extract DNA.2 A 166 bp COI mini-barcode was amplified with universal primers and sequenced. The sequences were compared to reference sequences and a taxonomic identification was assigned to the remains using a threshold approach.

COI-based identifications were confirmed or refined through the analysis of a CytB mini-barcode. CytB mini-barcodes were amplified with family- or genus-specific primers.

Pre-PCR lab work was conducted in a dedicated aDNA laboratory and used strict contamination controls.3

Results

COI mini-barcodes were amplified from 33 of the 64 analyzed fish remains. CytB mini-barcodes were amplified from 31 of these 33 remains.

All of the remains that yielded DNA could be identified to the species level.

A species accumulation curve4 indicates the sample’s richness largely stabilized after 13 fish remains had been identified (Fig. 3). Another species was only identified after the number of identified remains had been nearly doubled (Fig. 3). This suggests the sample’s taxonomic composition approximates the composition of the entire assemblage of Late Holocene fish remains from EeRb-144.4

Seasonality of Fishery

Historically, Plateau peoples caught suckers (Catostomus spp.) during their spring spawning runs.1 If EeRb-144’s inhabitants had similar subsistence scheduling, its Late Holocene fishery’s focus on largescale sucker, which spawns in May and June (Fig. 4), would suggest this fishery occurred during the spring to early summer. The other three resident species harvested by the fishery can also be readily caught at this time as they also congregate to spawn during this period (Fig. 4).

Since Chinook salmon runs in the nearby Thompson River system from August to October (Fig. 4), its presence at EeRb-144 suggests the fishery continued into at least the mid-summer.

A spring to mid-summer time frame for EeRb-144’s Late Holocene fishery concords well with other seasonal indicators from the site that suggest it was occupied during the spring and summer.4

Implications

Studies of Late Holocene subsistence patterns in the Interior Plateau have tended to emphasize the importance of anadromous salmon (Oncorhyncus spp.) and minimize the importance of resident fish. However, our results indicate that during the spring and early summer when salmon were not running, resident fish—especially largescale suckers—were an important food source for Late Holocene Plateau peoples. Moreover, this study demonstrates that the analysis of mini-barcodes from archaeological remains can provide a more nuanced understanding of ancient fisheries by enabling the identification of otherwise unidentified fish remains.

Acknowledgments

The authors would like to thank the UVic University of Victoria, the staff and students of the Secwépemc Cultural Education Society, Secwépemc University, and the Interior First Nations for their support during fieldwork. We would also like to thank the staff of the British Columbia Ministry of Forests, Lands and Natural Resource Operations for their assistance in obtaining permits for fieldwork. We thank the University of Victoria, Simon Fraser University, and the University of Alberta for providing laboratory and field equipment.


References:


Figure 1. Map of EeRb-144 and its environs. The location of EeRb-144 within British Columbia, Canada, is indicated in the inset map.

Figure 2. Relative abundance of the fish species identified in the sample of Late Holocene fish remains from EeRb-144.

Figure 3. Species accumulation curve for the sample of identified Late Holocene fish remains from EeRb-144.

Figure 4. Spawning seasons of the fish species identified at EeRb-144.4,7,9

Studying the Late Holocene subsistence patterns in the Interior Plateau have tended to emphasize the importance of anadromous salmon (Oncorhynhus spp.) and minimize the importance of resident fish. However, our results indicate that during the spring and early summer when salmon were not running, resident fish—especially largescale suckers—were an important food source for Late Holocene Plateau peoples. Moreover, this study demonstrates that the analysis of mini-barcodes from archaeological remains can provide a more nuanced understanding of ancient fisheries by enabling the identification of otherwise unidentified fish remains.

Acknowledgments

The authors would like to thank the UVic University of Victoria, the staff and students of the Secwépemc Cultural Education Society, Secwépemc University, and the Interior First Nations for their support during fieldwork. We would also like to thank the staff of the British Columbia Ministry of Forests, Lands and Natural Resource Operations for their assistance in obtaining permits for fieldwork. We thank the University of Victoria, Simon Fraser University, and the University of Alberta for providing laboratory and field equipment.