# Analysis of faunal remains at HbRf-39

Jonathan Driver

Department of Archaeology, Simon Fraser University

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The most common objects recovered from excavations were animal bones. These derive from human hunting and fishing activities, from predators bringing prey to the site to be consumed, and from animals that died a natural death at the site. Animal remains from Tse'K'wa consist mainly of bones and teeth from vertebrates, and occasional gastropod shells. Most faunal remains were recovered during excavation when deposits were screened through 3mm hardware cloth. A small number of specimens were obtained when finer screening was used. This was not done systematically, and usually occurred when an excavator noticed concentrations of very small bones and removed a block of sediment and bones for later processing.

Most of the analyses conducted on the fauna have used traditional methods of zooarchaeology and paleontology, where the analyst tries to identify the part of the skeleton (e.g. humerus; cervical vertebra) and assign it to some kind of taxonomic designation. For some specimens the analysts could be quite specific, for example when identifying *Castor canadensis* (beaver) or *Vulpes vulpes* (red fox). For other specimens the designation might be less specific, such a Mustelidae (weasel family) or *Podiceps* sp. (undesignated grebe). Unidentifiable specimens were defined as being those specimens for which the analyst could not identify which part of the skeleton was present.

A smaller number of analyses have used more recently developed techniques for identification, including ancient DNA (aDNA) analysis or zooarchaeology through mass spectroscopy (ZooMS). Those analyses are described later.

Faunal remains were recovered during excavations in 1974, 1983, 1990 and 1991. The 1974 assemblage has not been analyzed. It is quite small, and a quick inspection suggests that it is consistent with the fauna from Zone IV recovered in later seasons. The entire faunal assemblage excavated in 1983, except for fish specimens, was analyzed by Driver and undergraduate student assistants, supported by a SSHRC grant. Fish bones were counted by Driver and a sample was later sent to Gay Frederick for analysis (funded by an internal SFU SSHRC grant). Driver's assistants in the 1980's also completed a study of all the unidentifiable specimens and took measurements on selected snowshoe hare specimens to see if changes in size of this common species could be detected (results suggested no change in size through time).

Driver's analysis of identifiable vertebrates (excluding fish) was based on standardized codes for taxon, element, part of element, state of fusion of epiphyses, and modification (e.g. burning, cut marks etc). Identifications were made in the zooarchaeology lab at SFU, and specimens

requiring further identification were taken to the Royal Ontario Museum and University of Toronto. The data on identified specimens were recorded by hand on standardized sheets and then entered (by a clerical worker) on SFU's mainframe computer using an Oracle database. Data summaries were run on the computer but quite a lot of subsequent analysis was done by hand. When SFU's mainframe was decommissioned, the data were provided to Driver on a floppy disc (likely as ASCII files) and subsequently transferred to an Excel spreadsheet.

The analysis of the 1983 faunal remains was presented at a number of conferences and published as a paper in *Canadian Journal of Earth Sciences* in 1988. A few years later Driver and Keith Hobson published a separate paper in *Arctic* on the birds from the site. (Hobson was the radiocarbon technician in Archaeology at the time, but subsequently completed a PhD in zoology and had a distinguished career as an ornithologist).

The 1991 excavations included Randall Preston as a crew member, and he entered the MA program to undertake a taphonomic study of the fauna. (Taphonomy is essentially the study of how bones ended up on the site). Although he decided to leave archaeology to pursue other interests (and did not complete his thesis) he undertook a very thorough analysis of a sample of fauna from 1990 and 1991 excavations. When he left the graduate program at SFU he provided Driver with a hard copy of his data, but Driver did little with this until about 2018 when the 120 pages were optically scanned in the SFU Library and provided as 120 separate Excel sheets. These were combined by a research assistant into a single spreadsheet, and many scanning errors were corrected. Preston's analysis included a very large number of descriptive variables, and only the more fundamental information (taxon, element, part of element) was used. (Preston's full data sheets and coding system are in the physical archive). One of Preston's more interesting identifications was collared lemming (*Dicrostonyx* sp.) and a short description was published by Driver in *J. of Vertebrate Paleontology*.

In the early 2000's Claudine Vallières studied all of the bison and large artiodactyl specimens from Zone II (basically late Pleistocene, about 12,500 to 11,000 years ago). This was written up as her M.A. thesis and a summary was published by Driver and Vallières in *Canadian Journal of Archaeology* in 2008 Vallières analyzed about 100 specimens and the data were presented in her thesis as a table. This thesis is not available online, but a hard copy is included in the physical archive.

At about the same time Alan Cooper (then at Oxford) sampled some of the bison for aDNA analysis being conducted by his PhD student Beth Shapiro. These data were subsequently published in Shapiro's paper in *Science*.

Driver was in senior administrative positions (Dean of Graduate Studies; Vice-President Academic) at SFU from 2000 to 2016, and again from 2019 to 2020 (Vice-President Academic). His research activity declined somewhat, but more importantly he was focused on continuing work in the American Southwest, and that took most of his available research time. Two M.A. students based their theses on Tse'K'wa post-2010. Roxanne Pendleton wrote her M.A. on the

Zone II and subzone IIIa fauna (excluding bison, which had already been studied by Vallières). Pendleton's data were recorded on Excel, using similar codes to those used by Driver on the 1983 faunas. Alessandria Testani completed an M.A. thesis on the Holocene fauna a few years later. She studied all the fauna that had not been studied by previous analysts. She created a coding system that was based on a coding system that Driver had developed in the early 1990's for his work in the American Southwest. Testani's coding system has been adopted for the amalgamation of all the data into a master catalogue.

Catalogue numbers have been assigned to all identifiable specimens, except for fish. Pendleton catalogued almost all specimens, so there are some specimens from her analysis that have catalogue numbers and aren't identified. There are also some catalogued specimens that were thought to be identifiable and have been subsequently classed as "unidentifiable".

Starting in about 2018 Driver initiated a project to combine all the faunal data. (This project was interrupted when he was unexpectedly asked to come back to the VP Academic position at SFU from September 2019 to November 2020). The following actions were taken:

Driver checked specimens from 1983 against the catalogue, and bagged all specimens in standard plastic bags with standard labels made on archival paper. A research assistant (Rory Doucette) converted all codes to conform to the codes used by Testani.

A research assistant (RD) checked all of the specimens analyzed by Preston against his catalogue, and relabeled and rebagged everything. RD then converted Preston's data (taxon and element) to Testani's codes. Driver then went through Preston's data and made changes to conform with other analytical protocols. Notably, Driver did the following:

(a) Used a single entry for mandibles and maxillae with teeth (Preston had given a separate catalogue number to each tooth, even if it was still present in the mandible or maxilla)

(b) Used a single entry for specimens that consisted of conjoinable pieces (Preston had given each piece a separate catalogue number and data entry)

(c) Assigned new catalogue numbers to specimens found as articulated skeletons (Preston had given each skeletal element the same catalogue number, and used a second numbering system to keep the various elements separate)

Driver also changed all the "element part" codes in Preston's data to conform with Testani's codes.

Driver checked all of Pendleton's identifications because he had noted some errors in her data spreadsheet. It is not clear how these errors arose, but some seem to result from the right identification being associated with the wrong catalogue number, and others may come from the "autoentry" feature of Excel. Driver then converted all Pendleton's data to conform to Testani's codes.

Driver then combined all the spreadsheets into a single master spreadsheet. That should be taken as the definitive catalogue of fauna from the site, incorporating all of the work done by Driver and his students up to 2022.

The final project on Tse'K'wa faunal remains was initiated by Driver when he obtained a SSHRC Insight grant (2019 to 2023). Driver hired Dr. Thomas Royle as a post-doctoral fellow, with responsibilities for conducting further aDNA research. Driver and Royle (and Royle's PhD supervisor Dongya Yang) analyzed ground squirrel specimens, demonstrating that they were Richardson's Ground Squirrel – well outside their modern range at Tse'K'wa. Royle had earlier undertaken aDNA analysis of fish remains from the site, and prepared that for publication while a post-doc. He then moved on to a study of very rare large hare specimens from the earliest layers at the site. These were too large to be snowshoe hare, and the analysis confirmed that they were white-tailed jackrabbits – also well outside their modern range. At the time of writing (2022) Royle's work is ongoing, with an analysis of snowshoe hares underway. Driver also contributed some bird specimens to an SFU student (Luke Jackman) studying waders for his M.A. thesis in archaeology.

Fish remains

Driver's work on the 1983 fauna separated out fish remains, and Driver subsequently obtained a small grant to support Gay Frederick's analysis of a sample that spanned the various time periods. Frederick's report (available in the physical archive) noted that all identified specimens were suckers (*Catostomus* sp.), and that most specimens seemed to come from a single species. (Royle's aDNA analysis later confirmed this). Analyses by Preston and Pendleton also separated out fish remains. In contrast, Testani kept quite detailed records of fish remains, providing counts of elements, rather than simply totals of fish specimens. In 2021 Driver compiled all the records and identified excavation units for which fish had not been identified, and did basic counts of fish bones.

Driver compiled all the available data on fish into a spreadsheet that is separate from the master faunal catalogue.

Future work

There is a huge opportunity for more work on aDNA.

There are numerous potential projects on the assemblages using more traditional zooarchaeological approaches. Some examples of potential projects include the following.

(a) The later periods at the site produced large quantities of heavily broken up large mammal bones – how does this relate to past subsistence practices?

(b) A wide range of fur-bearing animals are present at the site; were ancestral Dene people participating in a pre-colonial fur trade or do these represent animals trapped for local use?

(c) Most of the smaller birds have not been identified to a more detailed taxonomic designation. Further work on small birds would further increase the number of different species recorded from the site.

(d) No one who has worked on the faunal material (including Driver) had sufficient expertise in analysis of small rodents, especially the microtines. Teeth are well preserved, and should be re-studied.

Note re unit 6, HbRf-39

Unit 6 was excavated in 1983, on top of the test units excavated in 1974.

Column samples were taken from unit 6, and fauna was recovered from some of these.

Specimens were identified by J. Driver and added to the master faunal catalogue in 2021.

Specimens are bagged by "level" which refers to the number of the column sample, not the excavation level.

Using data on depth below surface, Driver assigned these column sample specimens to the equivalent layer/level designations from the unit, as follows:

| Sample number | Depth below surface | Likely equivalent layer and level | Subzone | Specimens |
|---|---|---|---|---|
| 21 | 232-242 | 2-6 | IIIb | 6377,40011, 40012 |
| 23 | 252-262 | 3-1 | IIIa | 5927, 5928, 40009, 40010 |
| 25 | 270-280 | 4-1 | IIc | 6378, 40013 to 40032 |
| 27 | 290-300 | 4-3 | IIc | 5929 to 5933, 40000 to 40003 |
| 28 | 200-310 | 4-4 | IIc | 5934 to 5948, 6379 to 6392, 40004 to 40008 |

In the master faunal catalogue the specimens are assigned a layer and level, not the column sample number