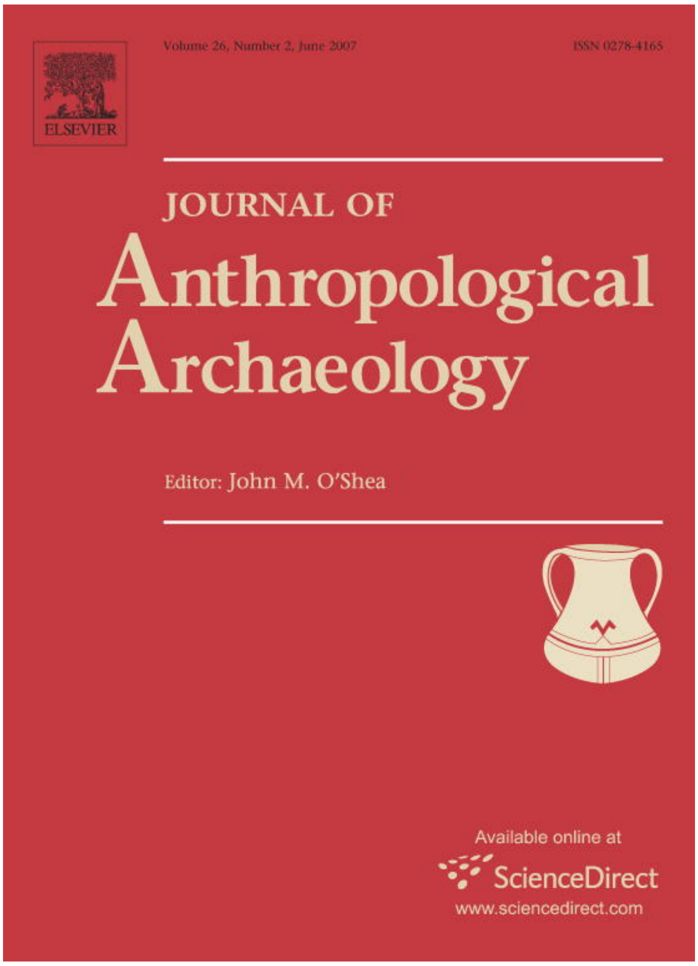
Volume 26, Number 2, June 2007
ISSN 0278-4165
ELSEVIER
JOURNAL OF
Anthropological
Archaeology
Editor: John M. O'Shea
Available online at
ScienceDirect
www.sciencedirect.com

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ScienceDirect
Journal of Anthropological Archaeology 26 (2007) 299–327
JOURNAL OF
Anthropological
Archaeology
www.elsevier.com/locate/jaa

The emergence of status inequality in intermediate scale societies: A demographic and socio-economic history of the Keatley Creek site, British Columbia

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Received 25 May 2006; revision received 26 October 2006
Available online 9 February 2007

Abstract

Explaining the emergence of status inequality in human societies is an important priority for many anthropological archaeologists, particularly those whose research includes intermediate scale societies (complex hunter–gatherers and early agriculturalists). Yet, fine grained records of emergent inequality are still exceedingly rare. This paper outlines a fine-grained record of cultural change from the Keatley Creek site, a complex hunter–gatherer village in British Columbia, in which it is possible to recognize the emergence of inequality and its demographic and economic correlates. Results of the study suggest that status inequality emerged abruptly after an extended period of socio-economic stability in the village under conditions of adversely altered resource conditions, demographic packing, and subsistence resource diversification and extensification.

Keywords: Plateau; Archaeology; Complex hunter–gatherers; Keatley Creek site; Status inequality

"Perhaps the dimmest areas that remain in studies of political "evolution" are the initial stages in which inequalities beyond those of age, ability, and gender, emerged, grew, and became institutionalized. Engendered in a climate in which social and material discretion was the rule, the onset and dynamics of institutionalized inequality remain concealed by sparse archaeological evidence" (Wiessner, 2002, 233).

The evolution and organization of intermediate scale societies is an important archaeological topic in many regions of North America,

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0278-4165/$ - see front matter © 2006 Elsevier Inc. All rights reserved.
doi:10.1016/j.jaa.2006.11.006

particularly the Pacific Rim (Arnold, 2001; Fitzhugh, 2003; Matson et al., 2003; Prentiss and Kuijt, 2004a). This research, especially in its complex hunter–gatherer manifestation (Arnold, 1996a; Sassaman, 2004), is of critical importance, since in many areas of the world these were the first groups to transition from mobile egalitarian bands to more densely aggregated and sedentary communities often featuring social inequality. It is not surprising that Pacific Rim researchers have posited a variety of models seeking to explain processes behind the emergence of inequality (e.g., Matson and Coupland, 1995). Yet, as so eloquently pointed out by Wiessner, fine grained records that reveal actually how inequality emerged are rare. Consequently, we are often left looking for ethnohistorical accounts to test the models and to ultimately understand the details of this process (e.g., Wiessner, 2002).

As suggested by various researchers, details of the major organizational changes inherent in emergent complex societies are often best seen in household contexts (Ames, 1995; Blanton, 1995; Lesure and Blake, 2002). Unfortunately, it is rare to be able to reconstruct the vital transition within a single household where we can explore changes in the demography, subsistence economy, technology and social organization. Many Northwest Coast villages contain house-associated middens that do span the transition. While this is an extremely valuable resource to archaeologists, it rarely (if ever?) permits the study of changing dynamics within specific house-groups. Either, specific houses were too ephemeral in construction (and impermanent) and consequent archaeological record to have enough of a history to document the full transition (e.g., Matson, 1992), household stratigraphy becomes too mixed via successive reoccupations to permit analyses of the details of temporal change (e.g., Lepofsky et al., 2000), or it is impossible to link specific middens to specific houses. Even when the record is adequate to explore changes in households across the transition, archaeologists often face interpretive problems with ambiguous material remains (Lesure and Blake, 2002).

In this study we explore a fine-grained record of occupation at one household in one village in order to gain insight into the processes by which institutionalized inequality emerged in an intermediate scale society.[1] Our study context is the Middle (or "Mid") Fraser Canyon of south-central British Columbia where archaeologists have documented evidence for large complex villages that existed between about 2000 and 200 years ago. We know from an excellent ethnographic record (Hayden, 1992; Teit, 1900, 1906, 1909) that at the time of European contact, the Mid-Fraser villages were occupied by Salish-speaking societies inhabiting villages marked by hereditary inequality manifested in corporate groups occupying ranked households. Individuals in households also maintained memberships in broader social constructs (Teit (1906) calls them clans) in the Mid-Fraser villages. The Mid-Fraser villages were generally larger and more densely occupied that those of other drainages on the interior Plateau of North America, with the possible exception of the Protohistoric Chinookans of the Lower Columbia. They were economically supported by intensive harvest of massive numbers of spawning salmon, geophytes or roots, deer, and to a lesser degree, other fish, plant, and mammal species. Foods were harvested most intensely in the warm season with substantial amounts placed in dry storage for winter survival (Alexander, 1992). Household corporate groups presumably used the surplus of salmon in particular to acquire other goods from adjacent regions including ornaments and some foods from the coast and various food and nonfood goods from elsewhere on the interior. A prestige goods trade network likely connected elites of the Mid-Fraser villages with those of

[1] The term institutionalized inequality is used to describe the cultural contexts whereby inequalities that were previously manifested only at perhaps age and gender levels in otherwise egalitarian contexts give way to new social forms whereby hierarchical and ascribed ranking between individuals and/or larger social groups (e.g., Northwest Coast house groups) emerged and is marked by measurable material manifestations in form of variability in house architecture and size, differential access to key foods, and variable rates of accumulations of prestige goods (e.g., Brumfiel, 1992; Hayden, 1995, 1998; Paynter, 1989). As pointed out by Wiessner (2002, p. 233), these are typically "systems with hierarchical organization, hereditary position, and control by the elite over institutions that extend beyond the boundaries of the local group." By intermediate scale society, we refer to cultural groups organized in ways that are socio-economically and politically more complex (e.g., more social units [e.g., Bamforth, 1988]) than band scale hunter–gatherers, yet not as socially complex as states. Our definition, is thus, substantially in line with Clark and Blake (1989); and also Hayden's (1994) concept of "transegalitarian" societies.

the Lower Columbia at least in the final centuries of the late prehistoric period (Hayden and Schulting, 1997).

From an archaeological standpoint, the Mid-Fraser villages offer a particular advantage over most other complex hunter–gatherer sites. Due to a particularly good combination of sedimentary contexts, ancient cultural practices, and general lack of disturbance by modern activities, the sites preserve a spectacularly detailed record of socio-economic changes across the transition from egalitarian to nonegalitarian society. As described by Hayden (1997a,b), the Mid-Fraser villages are made up of semi-subterranean houses or housepits that were occupied for long periods by multi-family households or corporate groups (e.g., Hayden and Cannon, 1982). Repeated re-roofing and re-flooring of houses led to the formation of extensive middens surrounding individual houses containing a year by year record of changes in the dynamics of life within each household. Some houses retain only their final floors (e.g., Keatley Creek), while in other contexts (Bridge River) floors accumulated like layers of old rugs. The most intensive excavations have been conducted at the Keatley Creek site and therefore it provides the best data for this study. We benefit from the relatively fine grained record of Housepit 7, in particular, as a window into processes that gave rise to inequality at this village.

In this paper we analyze variation in dates, artifacts and floral/faunal remains recovered during recent excavations of the Housepit 7 Rim (see also Burns (2003), Godin (2004), Harris (2004), and Lyons (2003)). Data from this sequence are compared to that from other dated contexts in the village to improve our overall understanding of the evolution of this important community. Ultimately, this paper examines indicators of variation in predation behavior, demography, and status differentiation that documents the changes in subsistence economy and social organization between ca. 1600 and 750 cal. B.P. During this time, Housepit 7 inhabitants appear to have shifted from a salmon dominated economy with a somewhat more egalitarian social organization to one featuring intensification of mammals, participation in prestige exchange networks, and socio-economic status inequality. In presenting this history, we seek to shed light on the processes by which social complexity emerged in intermediate scale societies.

Explaining inequality

Status inequality has been subject of a growing literature that has sought to define variation and evolutionary origins of this phenomenon around the world (Arnold, 1993, 1995, 1996a,b; Earl, 1997; Feinman, 1995; Fitzhugh, 2003; Kirch, 1991; Hayden, 1995; Wiessner, 2002). As noted by Wiessner (2002), arguments seeking to explain emergent inequality in intermediate scale societies generally fall into two groups: managerial and agency. We suggest that Darwinian evolutionary theory provides an even more powerful model and substantially integrates both the managerial and agent-based approaches.

Managerial models vary widely and include population pressure (Cohen, 1981; Croes and Hackenberger, 1988), scalar stress (Ames, 1985; Johnson, 1982), warfare (Carneiro, 1970), and ecological patchiness and population packing (Binford, 2001; Fitzhugh, 2003). As a group, they argue that cultural practices, sometimes described in aggregate as systems of behavior, adjust to new conditions in adaptive ways sometimes leading to the need for more complex social relations in order to efficiently harvest, process, protect, and distribute resources. Many of these models (pressure, packing, scalar stress, resource stress) assume adverse conditions revolving around imbalances between available food resources and human populations that require change in order to restore balance.

In contrast, agency approaches look to the processes of the social field as primary to the development of inequality. Marxian scholars describe this process obliquely as generative, deriving from the dialectic of practice and structure in its particularistic socio-historical context. We agree that one cannot understand the emergence of new social structures without looking at the human social interactions behind its development. However, as is clear from the literature of the complex societies of North and Central America's western coasts, an understanding of ecological contexts also plays a critical role.

Arnold (1993, 1996a), Clark and Blake (1994), Hayden (1994, 1995), Lepofsky et al. (2005), and Maschner and Patton (1996) offer a variety of hypotheses concerning the emergence of hereditary inequality that recognize not only the importance of historically situated agency and structure but also basic ecological principles Major differences, measurable in the archaeological record, within this group revolve around ecological conditions that favor emergent wealth building strategies within rapidly changing social environments.

Hayden (1994,1995; see also Clark and Blake 1994) argues that optimal resource conditions are necessary for people to tolerate new forms of resource ownership and control associated with proto-elite wealth building schemes that might eventually give rise to hereditary inequality. In a similar model, Maschner and Patton (1996) suggest that under good resource conditions, village growth, fissioning and threats of raids (to small new villages) will provide conditions in which aspiring elites in larger core villages can gain control by extending their kin group to cross-cut and thereby influence or even control the smaller village groups. In contrast, Arnold (1993, 1996a,b) argues that aspiring elites will not gain opportunity to exert control over new groups until those groups become stressed enough to be willing to submit to these actions. Consequently she looks to altered resource conditions or population-resource imbalances as the background to successful machinations of elites. At the most basic level, we would expect this process to be marked archaeologically by correlations between periods of subsistence stress and jumps in degrees of social complexity.

We argue that it is not necessary to dichotomize the managerial and agent based approaches when a comprehensive theory exists that is capable of incorporating both. Darwinian evolutionism is the most powerful explanatory model in science and has been demonstrated to be very effective in explaining the emergence of cultural phenomena on many scales (Chatters and Prentiss, 2005; Spencer, 1997). In order to address inequality it is necessary to recognize an appropriate scale of evolution and a target of the evolutionary process. Obviously we are not discussing evolution purely at the scale of artifact as promoted by O'Brien and colleagues (e.g. O'Brien and Lyman, 2000, 2003). Rather, we are discussing the emergence of cultural structures existing above the level of artifact and only visible within the actions of groups or populations.

The concept of emergence is of particular importance within an evolutionary framework for understanding the development of inequality. Some agency scholars might be troubled by this term, taking it to mean the inevitable "flowering" of some more ancient seed as might be implied by most neo-evolutionary models (e.g., band-chiefdom-state). We do not define it this way, preferring instead the more sophisticated usage of paleobiology where emergence refers to the appearance of a *new* population scale character (Vrba and Eldredge, 1984). Cultural structures, patterns, and organizations are characters undeniably expressed not by individual persons but by groups or populations. Consequently, when their expression becomes recognizable for the first time in the historical record, we call them emergent (Prentiss, 2006; Rosenberg, 2006).

From an evolutionary standpoint, the triggers for emergence of new population scale characters, such as social structures featuring hereditary inequality, are historically contingent in nature, the often unintended by-product of action by individuals and groups of various sizes within their socio-natural contexts (Braun, 1990). The results of these actions are constrained by preexisting social structures (e.g., Gould and Lewontin, 1979) and are also conditioned over the longer term by basic evolutionary processes like natural selection (Spencer, 1997). Spencer (1997, 2006) and Spencer and Redmond's (2001) account of the evolution of Monte Alban provides a particularly good example of this process.

Prior to its emergence as a state, Monte Alban was one of several competing chiefdoms within the Valley of Oaxaca. In order to avoid extinction at the hands of the neighbors, elite members of Monte Alban developed a growth strategy that had dramatic success. They invaded a weaker and more distant polity, established a puppet ruler, and rearranged the resource production and distribution system to benefit themselves and their polity. Their growing economy was used to further expand their military might, which permitted the successful invasion of the more local polities resulting in complete control of the region. By the time the process was through, Monte Alban had developed a government bureaucracy to maintain law, collect tribute, and other matters, a formalized writing system to keep track of records, to signify its presence and to exalt its history, and an enhanced research and development program for improving its economy and military power. It had evolved into a state (Spencer, 2006; Spencer and Redmond, 2001).

The emergence of the Monte Alban state was, like all cases of evolution, the result of a combination of historically unique events, structural constraints, and general evolutionary process. History determined its context and affected the decisions of its elites (agency). Once set in motion, changes in leadership and labor needs resulted in the rearrangement of existing structures into the more complex entities of the Classic Zapotec state (structural constraints). Multi-scalar selection favored the progressive development of more complex social structures over the older small scaled institutions (general evolutionary process). The Monte Alban case provides a very dramatic example of processes that could also be enacted on smaller scales in different regions with different histories. The large villages of the Mid-Fraser Canyon provide an ideal context to explore these ideas in reference to the emergence of institutionalized inequality in a complex hunter–gatherer context.

The Keatley Creek site

The Keatley Creek site (Fig. 1) has been at the center of many discussions regarding the emergence of complex hunter–gatherers featuring socio-economic status inequality (Hayden, 1997a). The site offers one of North America's best examples of a complex hunter–gatherer community (Cannon, 1999) as it is large (over 115 house depressions), there is a long occupation span, and preservation conditions for organic artifacts are extremely good (Hayden, 1997b; Prentiss et al., 2003). Hayden's extensive excavations at the site (and other tangential studies [e.g., Schulting, 1995]) have suggested that the large aggregate winter village was probably occupied by ranked corporate groups that controlled access to a variety of resources possibly including fishing places and quarries. Hayden (2000a, 2005) contends that the same corporate groups controlled the village from as early as 2600 cal. B.P. until around 800–900 cal. B.P. If correct, this indicates that the village developed during a time of cooler/wetter conditions favoring high levels of salmon production. If ranked houses emerged very early in the history of the village, it could also mean that aggrandizing behavior of household leaders could have played a substantial role in the establishment of the village (Hayden, 1994, 1995, 1997b, 1998, 2000b). Given the evident importance of salmon as the subsistence mainstay, Hayden and Ryder (1991) (but see, Kuijt, 2001) argue that only a major interruption in access to this critical resource could have caused the demise of such a long-lived prosperous village.

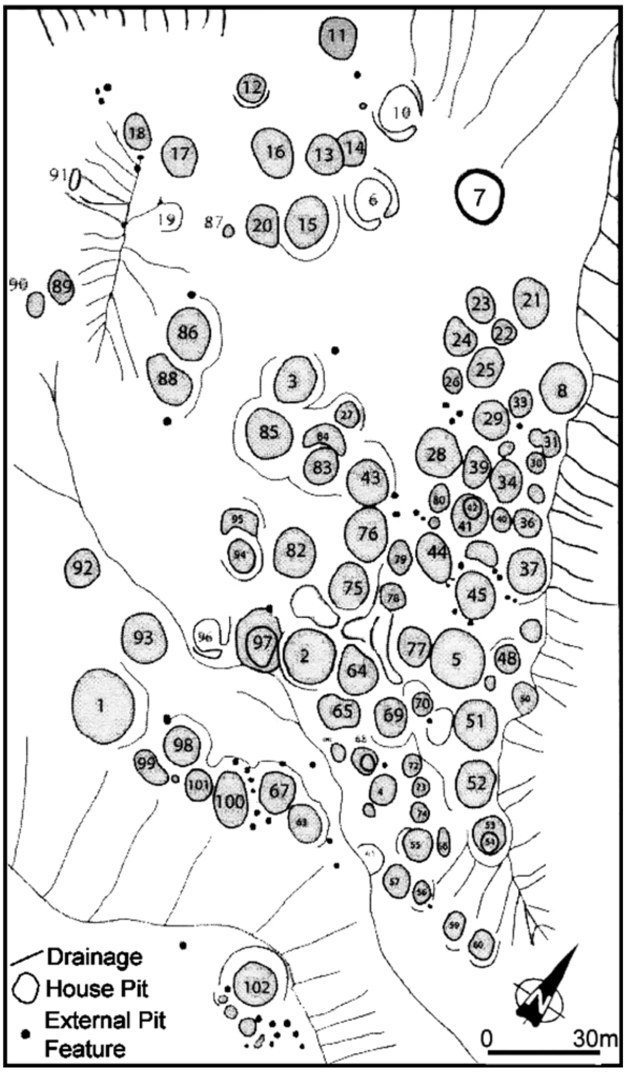

Fig. 1. Map of the Keatley Creek site (adapted from Hayden, 1997a).

Recent research by Prentiss et al. (2003, 2005a) has offered an alternative dating sequence for the rim midden deposits of Housepit 7 and the Keatley Creek village. New dating of early features suggests that Housepit 7 and likely the entire aggregated village existed between 1614 and 747 cal. B.P. (Figs. 2 and 3). Within this time frame there appear to have been four phases to the history of Housepit 7 (Table 1). The excavations conducted in 1999, 2001, and 2002 revealed that following the abandonment of a very small housepit that may have been occupied during or immediately prior to the initial construction period of the first large houses at Keatley Creek (Stratum I/Sub-housepit 3 [Harris, 2004]), rim sediments accumulated in finely stratified sealed layers of redeposited floor and roof materials (Prentiss et al., 2003). Early Housepit 7 (Stratum IIa) and Rim 1 (Stratum IIb) sediments buried Subhousepit 3 at 1614–1241 cal. B.P.[2] Next, a small Housepit

[2] Dates are calibrated means (actual 2σ ranges are wider). See Prentiss et al. (2003) for full data.

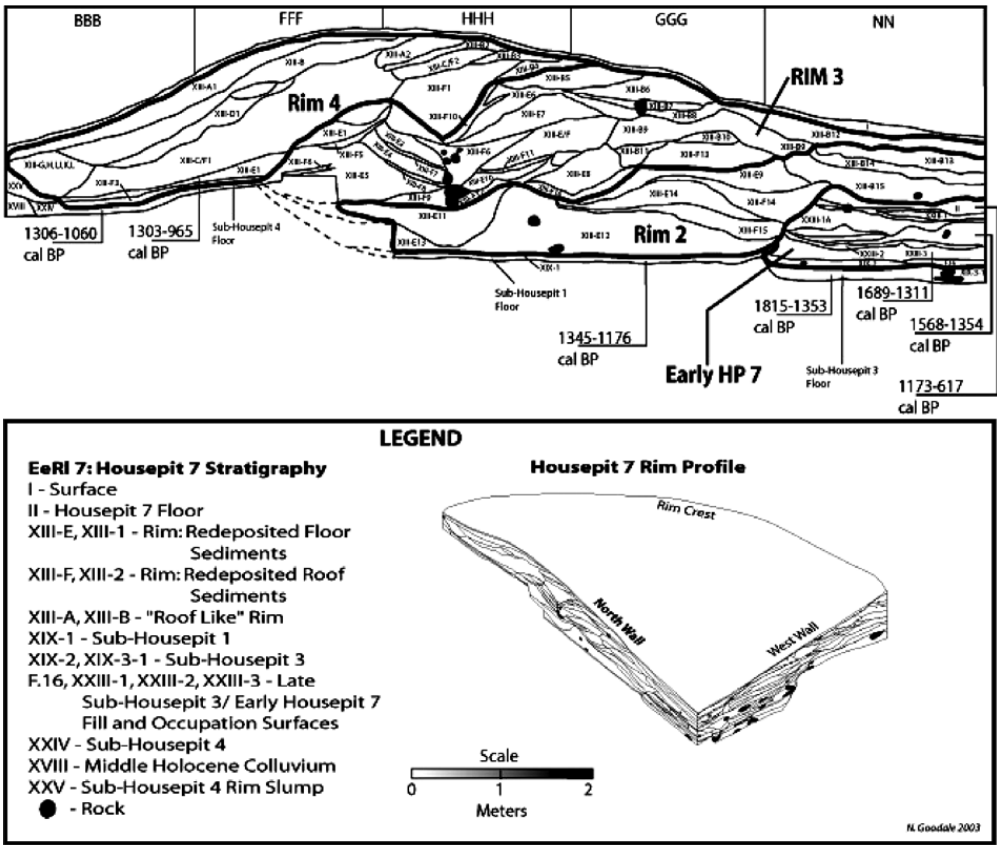

Fig. 2. Stratigraphy and dating of Housepit 7 based upon University of Montana excavations in 1999 and 2001 (north wall map from Prentiss et al., 2003).

floor (termed Subhousepit 1) was excavated, occupied, abandoned and filled by Rim 2 (Stratum IIc [includes SHP 1]) and 3 (Stratum III) deposits at 1241–1134 cal. B.P. Near the final phase of deposition of Rim 3 (still Stratum III), an additional small housepit floor (Subhousepit 4) was excavated on the northwestern edge of the rim and quickly abandoned and filled with final rim sediments. The final rim (Rim 4) accumulated as a consequence of the final occupations leading up to the final roof and floor, which complete the Housepit 7 stratigraphic sequence (Stratum IVa–c). The latter sediments date to 1134–747 cal. B.P. A limited number of housepit floors are dated to the time frame of the Housepit 7 sequence. Housepits 12 and 90 fall in the range of Early Housepit 7 to Rim 1. The floor of Housepit 3 dates to almost exactly the same time as the Housepit 7 final floor. Although many other housepits have been tested at the site, no other floors have been reliably dated to times within the main history of the core village (Hayden, 1997a,b).

Housepit 7 is obviously not the only large house in the Keatley Creek village. As shown in Fig. 1, other large houses include housepits 1, 2, and 5. While Housepit 7 does appear to be somewhat more isolated than the others, Harris (2006) argues that all of the large housepits are associated with groups of smaller houses, with clusters often visible as linear strings (e.g., Housepits 1, 99, 98, 101, 100, 67; or 96, 97, 2, 64, 65, 96). From this stand point, Housepit 7 is associated with the group that includes 20, 15, 6, 10, 14, 13, 16, and possibly 11 and 12. Ideally, it would have been useful to compare the chronologies of several large households to truly appreciate village wide processes. Unfortunately, none of the other large houses have been adequately excavated or radiocarbon dated (Hayden, 2000c), preventing their incorporation into this research.

As suggested by Harris (2006), for much of its history, the aggregated village at Keatley Creek may have been organized around larger multi-household groups such as the Lillooet "clans" described by Teit (1906) or "social groups" of Hill-Tout (1905) occupying the clusters of housepits still visible. Similar patterns have been found at the nearby Bridge River site (Prentiss et al., 2006). If this is the case then the deep middens associated with the largest houses will hold the best record of

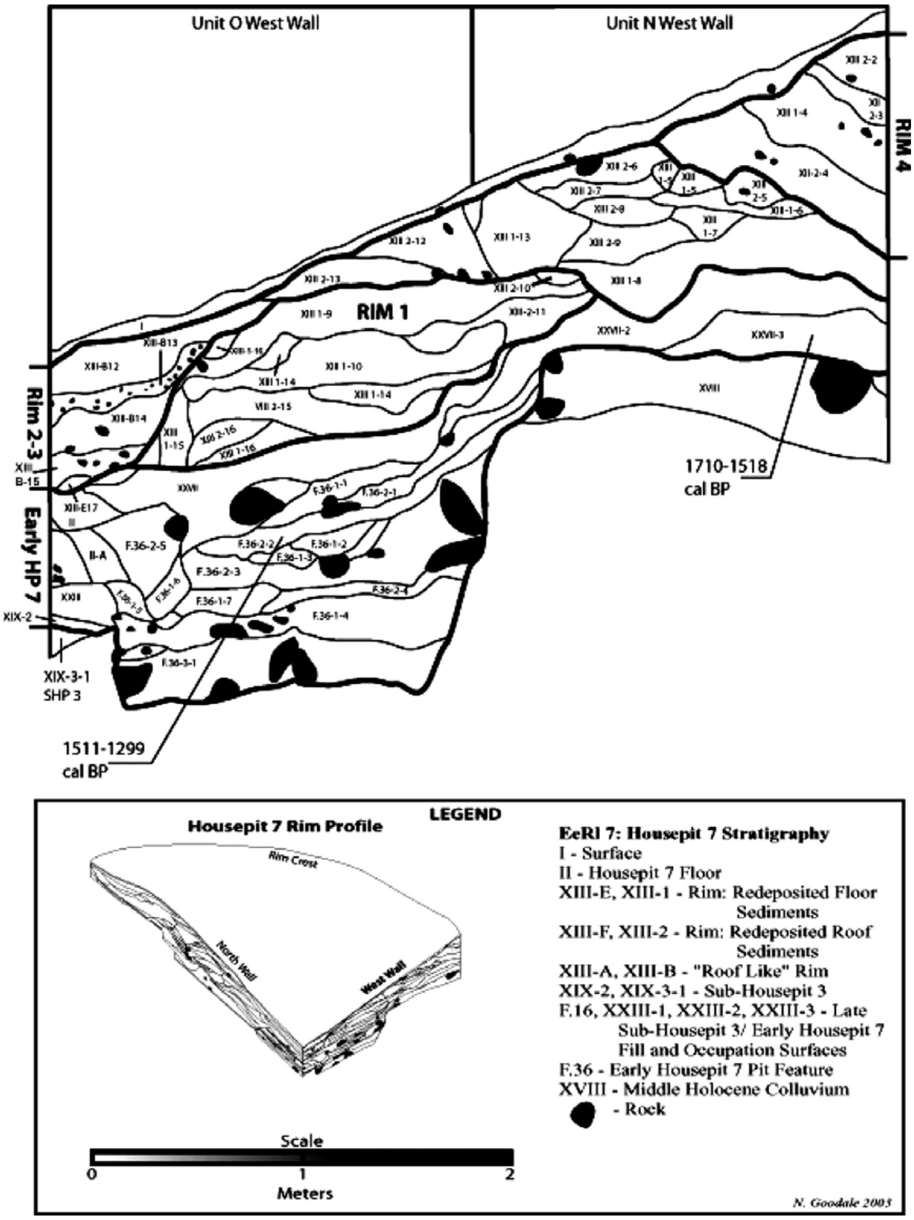

Fig. 3. Stratigraphy and dating of Housepit 7 based upon University of Montana Excavations in 1999 and 2001 (west wall map from Prentiss et al., 2003).

Table 1
Keatley Creek, Housepit 7 calibrated radiocarbon chronology (see Prentiss et al., 2003 for additional details)

Stratum/context	2σ B.P. calibrated range	Mean calibrated range	Inferred occupation range
I/Sub-housepit 3	1815–1353	1677–1528	1700–1614
IIa–IIb/early HP 7-Rim 1	1710–1176	1614–1241	1614–1241
IIc–III/Rims 2–3	1306–1060	1241–1176	1241–1134
IVa/Rim 4	1303–1173	1134–984	1134–984
IVb/final roof	1173–695	984–812	984–812
IVc/final floor	1173–617	984–747	984–747

Final roof dates are from wooden beams found in roof matrices. Final floor dates derive from wood fragments, a wooden wall brace, and charcoal found on the final floor.

changes within the larger social units. Consequently, we argue that it is entirely appropriate to use the fine grained record of Housepit 7 as a proxy for larger processes within its local housepit group and likely, across the village. Clearly, however, further testing at other large housepits, similar to that described by Prentiss et al. (2003) would be useful to more fully explicate cultural patterns at Keatley Creek. But, for the time being, we must be content with "knowledge of the moment" (Binford, 1984) as primarily derived from Housepit 7 but also Housepits 3, 12, and 90.

The Keatley Creek village: exploring demographics and socio-economic variation through time

The relatively fine-grained chronology at the Keatley Creek village permits us to reconstruct a socio-economic and demographic history in order to gain a better understanding of factors causally associated with the emergence of status inequality in this context. In order to accomplish this we examine a wide range of data using a variety of methods (Table 2). Where data from the Keatley Creek site are inadequate (rates of village growth and regional population dynamics) we rely on measurements from nearby sites as proxy measures of likely processes at Keatley Creek. First, we define a chronology of social changes at the village. Second, we look for indicators of demographic changes in the region and at the specific site. Finally, we examine changes in subsistence strategies throughout the life of the village, focusing in particular on Housepit 7. Here we seek to determine if subsistence varied over time and if so, whether it took the form of intensification or disintensification/extensification (Morrison, 1994). To accomplish this we examine data sets derived from studies of fauna, flora, and lithic artifacts recovered in excavations at Housepit 7, compared, where possible, to other similarly dated contexts elsewhere in the village.

Inequality at Keatley Creek

Building on the innovative studies of intra- and inter-household variation in material culture at Ozette (e.g., Samuels, 1991), Hayden (1997a; Lepofsky et al. 1996) uses a variety of data sets to build an argument that the Keatley Creek village featured inter-household ranking and individual status differentiation within houses much like the complex societies of the central and northern Northwest Coast. Hayden shows that larger houses contained larger groups, highest storage capacity (accounting for size variation in floors), higher frequencies of prestige foods (Chinook salmon, etc.), and highest frequencies and variety of prestige artifacts and raw materials (see also Hayden, 1998). Hayden (1997a) makes the entirely logical assumption that since the patterns visible in the record at Keatley Creek (especially the final floors of Housepits 3 and 7) match archaeological expectations for institutionalized hereditary inequality, derived from the Lillooet ethnographies (Teit, 1906) and archaeological and

Table 2
Measuring variation in Keatley Creek demography, economy, and social organization

Topic	Subtopic	Measurement
Social	1. House group size	1. Housepit size and floor configuration
	2. Use of food	1. Spatial positioning of activity areas
		2. Inter-household variation in food
	3. Wealth	1. Frequencies and variety of lithic prestige items
		2. Frequencies and variety of prestige lithic raw materials
Demography	1. Change in regional population size	1. Dated site frequencies
	2. Change in village size	1. Dated housepit frequencies
	3. Variation and change in household population size and density	1. Housepit size variation
		2. Botanical analysis—variation in charcoal and seed density
		3. FCR frequency
Subsistence	1. Predation spectrum	1. Faunal/floral measures: mammal index, richness
		2. Faunal processing tool index
	2. Predation mode	1. Faunal/floral measures: evenness
	3. Butchery/transport strategy	1. Faunal measures: element frequency analysis
		2. Botanical sources: geophyte processing sites; dry-soil plant index
		3. Artifact raw material evenness

ethnographic studies from the Northwest Coast (e.g., Matson and Coupland, 1995), this pattern was likely also present on the Interior Plateau at this village. However, he also makes the assumption that this basic pattern persisted throughout most of the life of the village. We test this latter idea primarily by looking for indicators in the stratigraphic record of major jumps in the ability of households to acquire and process prestige food and nonfood resources. We assume that under conditions of hereditary inequality, household control of key subsistence resource localities would translate into significantly enhanced opportunities and abilities to acquire wealth items for those larger households (Hayden, 1994, 1995). We look for the onset of that pattern as indicated by changes in food type, preparation context, and in particular, frequencies and types of prestige items. We define prestige items following Hayden (1998, 2000d) as typically derived from non-local context, having obvious visibility compared to more local materials (e.g., obsidian or nephrite), and/or often requiring excess labor (and sometimes specialized knowledge) for manufacture (e.g., nephrite adzes and stone ornaments).

In an examination of radiocarbon dating at Keatley Creek, Prentiss et al. (2003) showed that the wide variation in house size, documented by Hayden, existed nearly throughout the life of the village. The only significant change came during the Housepit 7, Rim 4 period (Stratum IV/post 1134 cal. B.P.) when the smallest housepits ceased to be occupied. Unfortunately, it is not currently possible to examine variation in the layout of floor features and artifact distributions as markers of social group size and organization as has been so effectively done by Hayden for the final floors. Based upon recent work at the similarly dated, nearby Bridge River village, it does appear that there was only limited change through time in the organization of family groups on housepit floors (Prentiss et al., 2005c). Some preliminary data do suggest that the number of hearth groups on house floors may have increased through time. Regardless, variation in house size probably does reflect some differences in ability to produce surplus food and goods.

As discussed below, we find little variation in general classes of food consumed between houses. Another possible indicator of this could be associated with contexts of food preparation. Hayden and Cousins (2004) report on a series of outside roasting pits, located on the margins of the village core, dated to early in the life of the aggregated village (equivalent to Early Housepit 7). All other roasting pits fall much later after the abandonment of the aggregated village. Prentiss et al. (2002, 2003) document a likely outdoor food processing activity area at Housepit 7 during its earliest occupation phase (Early Housepit 7). After this time, food preparation appears to have moved into less visible locations (e.g., inside houses). Outside roasting pits persist in the nearby Bridge River site through ca. 1200 cal. B.P. While Hayden and Cousins (2004) view the presence of these features as markers of feasting and social complexity, we argue that they may just as likely reflect more mundane concerns. Following Flannery (2002), they could reflect a change in the role of food preparation in social dynamics in the village. Public food preparation generally requires sharing in intermediate scale societies. When people seek to avoid sharing of food or knowledge of household activities then they move these activities into more hidden locations (e.g., inside). Frequent public sharing of foods may be more reflective of greater degrees of egalitarianism than inequality.

A stronger marker of differences in status comes with inter-household differences in goods accumulated. We start with the record of prestige raw material accumulation at Housepit 7 (Table 3). We defined three potential prestige-associated raw materials: obsidian, nephrite, and steatite (following Hayden, 2000d). Numbers of prestige-associated lithic raw materials increase in total numbers and richness (number of sources) through time peaking in the final stages of occupation at Housepit 7[3] (Table 3, Fig. 4). Of particular interest is the pronounced increase in obsidian between Rim 3 and Rim 4. Studies show that obsidian was imported from elsewhere in the Pacific Northwest, especially Anahim Lake, located roughly 300 kilometers northwest of the Keatley Creek site (Hayden, 2000c; Rousseau, 2000).

[3] Accounting of total excavated volumes of the Housepit 7 final roof and floor sediments have not been published. Therefore in order to compare some roof and floor materials to those from the rim we had to estimate volume for each. This was accomplished with the formula $v = \Pi r^2 d$ where d = depth of sediments and r = housepit floor/roof radius. To calculate these, we assumed the floor and roof was a maximum of 10.5 m in diameter (radius 5.25 m) and an average of 10 cm depth based in part upon figures provided in Hayden (1997a). Recognizing that roof sediments are highly variable in thickness but typically at least three times the floor thickness, we assumed roof sediment depth to average 30 cm.

Table 3
Counts of lithic raw materials from the deposits at Housepit 7

	I/SHP3	IIa/EHP7	IIb–c/R1/2	III/R3	IVa/R4	IVb/RF	IVc/FL
Utilitarian raw materials							
Jasperoid	52	96	190	194	256	20	1
Pisolite	20	42	84	110	152	6	1
Vitric Tuff	2	9	11	19	19	2	1
Chalcedony	6	17	38	39	42	1	
Quartzite	2	7	47	69	52	3	1
Prestige raw materials							
Nephrite	1		2	1			1
Steatite				1	6	5	
Obsidian				1	14	9	26
Total	1		2	3	20	14	27

Roof and floor data are derived from Hayden et al. (1996b) and Hayden (2000d). SHP3, Subhousepit 3; EHP7, Early Housepit 7; R1/2 & SHP1, Rims 1 and 2 and Subhousepit 1; R3 & SHP4, Rim 3 and Subhousepit 3; R4, Rim 4; RF, final roof; and FL, final floor).

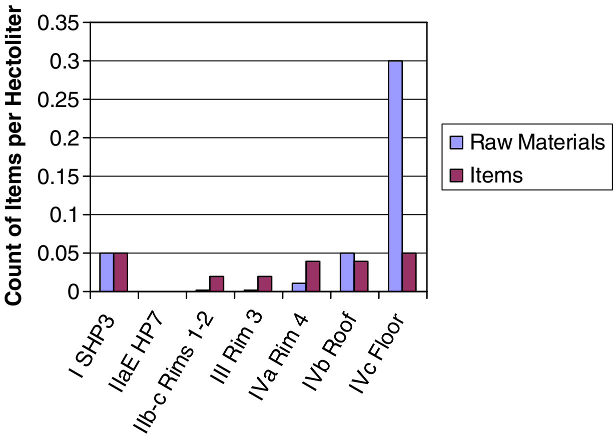

Fig. 4. Frequencies of prestige raw materials and objects from the Housepit 7 rim and final roof and floor deposits (SHP3, subhousepit 3; EHP7, Early housepit 7; Roof, final roof; Floor, final floor).

Formed or worked lithic prestige items are another marker of potential changes in household wealth and potential status (Hayden, 1998, 2000d). Items in this analysis include stone beads, stone pendants, ornaments, pipe fragments or bowls, ground stone mauls, celts or adzes, ornamental ground nephrite, paint cups, and a single piece of miscellaneous ground stone. Housepit 7 deposits produced 67 individual prestige items (Table 4). The increase in number of prestige items over time is clear, and terminates with a peak in the final roof deposits of Housepit 7 (Fig. 4). It is curious that numbers decline on the final floor. One possibility is that this could reflect a more substantial clean-up or at least greater care with these items immediately prior to the abandonment of the village.

Lithic prestige items showed the same pattern as prestige-associated raw materials. The steady rise in numbers of artifacts through time indicates the possibility that prestige items played their maximum socio-cultural role during the last two occupation phases of Housepit 7. No such increase can be seen when comparing earlier and later dating floors (e.g., Housepits 3, 12, and 90) from elsewhere in the vil-

Table 4
Counts of lithic prestige items from Housepit 7

	I/SHP3	IIa/EHP7	IIb–c/R1/2	III/R3	IVa/R4	IVb/RF	IVc/FL
Bead					3		1
Ornament					1	4	1
Pipe				1	2	5	
Maul				1		1	1
Adze				1			
Other							
Nephrite	1						1
Other GS			1				
Total	1		1	3	6	10	4

Roof and floor data are derived from Hayden (2000c) (SHP3, Subhousepit 3; EHP7, Early Housepit 7; R1/2 & SHP1, Rims 1 and 2 and Subhousepit 1; R3 & SHP4, Rim 3 and Subhousepit 3; R4, Rim 4; RF, final roof; and FL, final floor).

lage. Houses 12 and 90 contain prestige items at early dates when none are known for Housepit 7. Archaeological signatures from the earlier phases at Keatley Creek parallel in some ways those observed by Lesure and Blake (2002) at the Formative period transegalitarian village of Paso de la Amada in southern Mexico. Here they recognized major architectural differences between houses with the presumed most powerful featuring elaborate constructions built on platforms. Yet, there was little difference between low and higher energy construction households in practically all artifact classes with the exception of some ritual items. We are in a similar bind at Keatley Creek, though there are some differences. The Keatley Creek households varied in size but probably not in many architectural details and there is no evidence for differences in food or accumulation of goods in the earlier village. There are no specific ritual items that can be identified with certainty for this period (Early Housepit 7 to Rim 3). Thus, when combined with the food preparation contextual data, this suggests to us that Housepit 7 began as one of many houses in a village that routinely shared resources and did not permit overt accumulator/aggrandizer (e.g., Hayden, 1995) behavior. However, it appears to have evolved in this direction by the final occupation phase. We conclude, therefore, that while some (perhaps achievement based) status differences may have existed in the early phases at Keatley Creek, the pattern of institutionalized inequality described by Hayden (1997a) that permitted secretive uses of food and unequal accumulations of prestige display items did not come until the Housepit 7 Rim 4 period.

Demographic changes at Keatley Creek and the surrounding region

In order to address the models that assume an explanatory premium on population growth and/or packing (e.g., Binford, 2001; Cohen, 1981), we had to gain some understanding of the population history within the greater region and more specifically at Keatley Creek. Following Chatters (1995), Lenert (2001), and Lepofsky et al. (2005), we used frequencies of calibrated radiocarbon dated sites as a coarse indicator of regional population dynamics. In order to accomplish this, we accumulated radiocarbon data from sites in the Middle-Fraser Canyon. Then we plotted the number of sites falling in each 20 year period back to 4000 B.P., bracketing the earliest possible point when collector-like strategies entered the Mid-Fraser area (Chatters and Prentiss, 2005). No site was counted more than once per 20 year interval. Means were calculated in situations where multiple dates from the same site fell within a single 20 year interval. The resulting plot (Fig. 5) reveals a pattern of rising and falling numbers of sites in the Mid-Fraser (Lillooet) area with six peaks: ca. 2000, 1500, 1200, 850, 500 and 300 cal. B.P. The large Mid-Fraser villages like Keatley Creek and Bridge River were established between ca. 1900 and 1600 cal. B.P. (Prentiss et al., 2003, 2005a,b,c), at a regional population low. Indications of institutionalized inequality do not appear at Keatley Creek until after the 1200 cal. B.P. peak. Indeed it may have occurred during a regional population trough. Among the very large villages, Bridge River was abandoned just after the 1200 peak, while Keatley Creek and Bell persisted until just after the 850 peak.

The Keatley Creek site has had substantial excavations at a limited number of houses but little effort placed towards dating enough to recognize village-scale patterns of occupation throughout its history. In contrast, the Bridge River site, a nearby and similarly densely occupied village, has been extensively dated (90 dates on 55 houses) (Prentiss et al., 2005c). We therefore use the Bridge River chronology as a possible proxy for the history of Keatley Creek. Prentiss et al. (2005c) defined several periods of occupation at Bridge River (BR1–3) based upon patterning in the radiocarbon record from which we can extrapolate a model of village growth for Keatley Creek (Fig. 6). The Bridge River data form a trend from 7 occupied house floors shortly after 1900 cal. B.P. to nearly 30 floors prior to site abandonment shortly after ca. 1200 cal B.P. Since Keatley Creek is larger (44% more housepits than Bridge River), more densely packed, but occupied for a similar length of time, we expect that the Bridge River chronology may be predictive of growth trends at Keatley Creek. It is hard say how many houses were simultaneously occupied, but the number could range from 10 to over 40 (e.g., Hayden, 1997a).

It is possible that by Rim 3 and 4 times (Strata III and IV) at Keatley Creek smaller houses were being abandoned in favor of life in larger households (Prentiss et al., 2003). This could mean that numbers of peoples in the larger houses were on the rise. While this is very difficult to measure, we can make a preliminary test of this hypothesis by examining

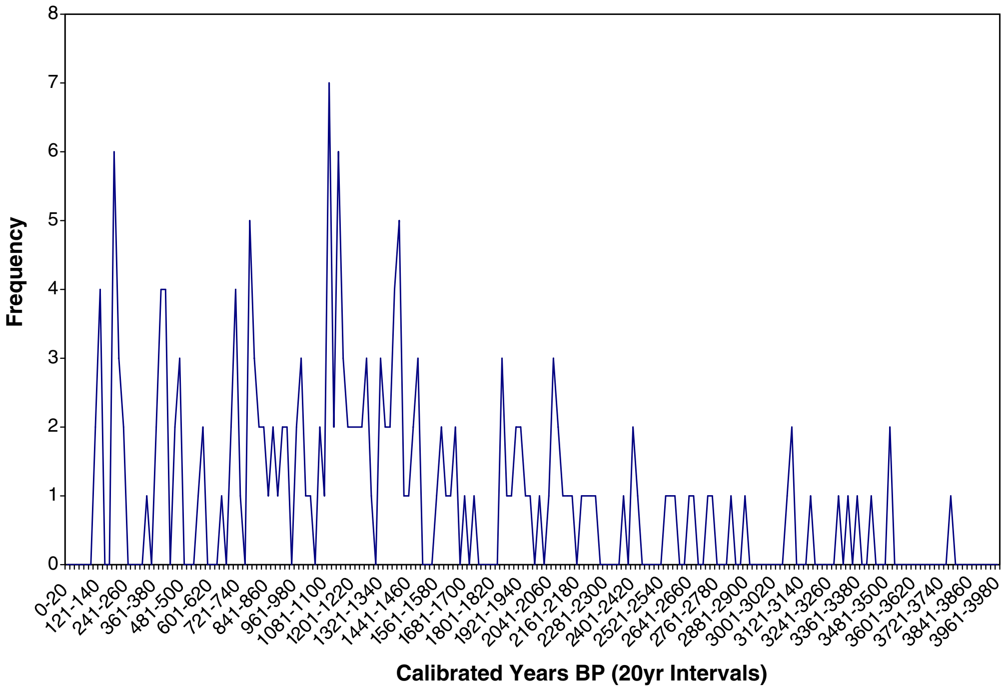

Fig. 5. Frequencies of calibrated radiocarbon dated sites in Mid-Fraser and South Thompson regions.

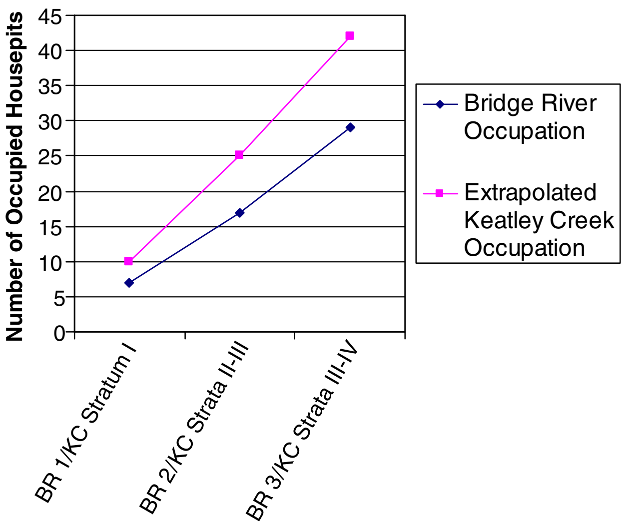

Fig. 6. Frequencies of radiocarbon dated housepit floors at the Bridge River site and extrapolated frequencies from the Keatley Creek site (BR1, Bridge River Period 1; BR2, Bridge River Period 2; BR3, Bridge River Period 3; KC, Keatley Creek).

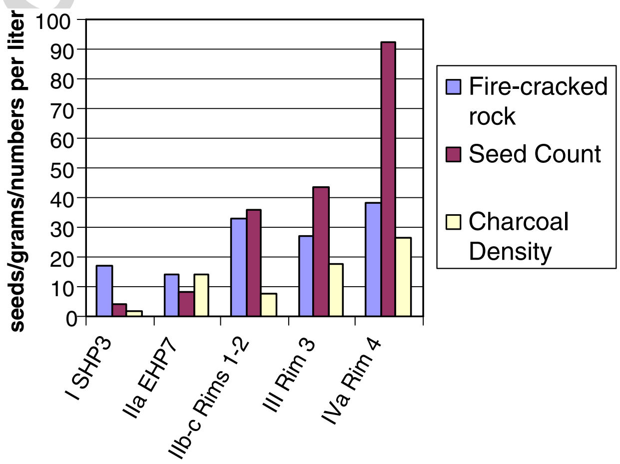

Fig. 7. Variation in FCR, seed, and charcoal density in the rim deposits of Housepit 7 (SHP3, Subhousepit 3; EHP7, Early Housepit 7).

botanical evidence for changes in the frequency of cooking as indicated by density of discarded charcoal and berry seeds in the rim middens. Highest densities of botanical materials are expected in contexts formed by accretional events that were not subject to cleaning such as rim middens.

With relatively robust sample sizes (Lyons, 2003), seed and charcoal density in Housepit 7 show parallel increases from the first through the final occupation (Fig. 7). The strength of the patterns shown in Fig. 7 suggests to us that substantive changes in rates of food processing and hearth use occurred at Housepit 7. If numbers of occupants was increasing, but cooking rates per person did not change, then we would expect a parallel increase through time in quantities of hearth debris generated and discarded on the rim middens. This conclusion is tentatively supported by Fire-Cracked Rock (FCR) data. Here, we calculated a ratio of the number of FCR (pebble or larger on the Wentworth Scale) to liters excavated for each rim deposit

Table 5
Fire-cracked rock and excavated liters of sediment data (EHP7, Early Housepit 7; R1, Rim 1; R2, Rim 2; R3, Rim 3; R4, Rim 4)

	I/SHP3	IIa/EHP7	IIb/R1	IIc/R2	III/R3	IVa/R4
Liters	1259	5077	1170	9612	15,026	14,023
Number of FCR (*n*)	88	727	210	3393	4071	5308
Ratio *n*/L	.07	.14	.18	.35	.27	.38

(Table 5). The result (Fig. 7) illustrates a major rise in quantity of FCR (over 100%) between the Early Housepit 7 (Stratum IIa) and Rim 4 (Stratum IVa) deposits. However, change in fire-cracked rock frequency could also indicate changes in cooking strategies (e.g., more stone-boiling late in the life of Housepit 7).

The combined radiocarbon, botanical, and FCR data suggest that Housepit 7 may have grown in number of residents between its earliest and latest occupations. We suggest that it could be the result of internal successes and consequent growth and possibly acceptance of new household members from other contexts within and outside the Keatley Creek village. A possible source could be the Bridge River village, which may have held as many as 800–1000 persons at ca. 1200 cal. B.P. but was suddenly abandoned within a few decades of this point (Prentiss et al., 2006). Inequality did not result from steady regional population rise, but it could be associated with packing at select villages like Keatley Creek in the wake of abandonments elsewhere.

Subsistence change at Keatley Creek

The success or failure of communities in intermediate scale societies is intimately tied to the long term viability of subsistence strategies (Redman, 1999). We cannot begin to understand the history of a complex community like Keatley Creek without a close look at changes over time in subsistence. Further, most explanatory models of emergent inequality embed assumptions about the role of food resources in ancient economies. Some expect persistent intensification of a narrower range of high density resources to be a key driving force (Binford, 2001; Hayden, 1994, 1995, 1997a; Lepofsky et al., 2005) while others expect signs of resource depression from overexploitation (e.g., Broughton, 1994, 1997) or environmental interruptions causing temporary resource extensification or diversification of the subsistence base (Arnold, 1993). We examine variation in subsistence economies at Keatley Creek through analyses of fauna, flora, and lithic tools. We use these data to assess prey choice (predation spectrum), strategy (predation mode), and food processing and transport issues.

Predation spectrum: fauna

Our study of change in predation spectrum has several parts. First we examine data to assess change in frequencies of the major classes of fauna at Keatley Creek through the use of a mammal index (total identifiable mammalian elements/total identifiable elements) designed after Broughton (1994) (Table 6).

Table 6
Basic faunal data (identifiable elements)

Context	Bi	Dg	B	M	De	Sa	She	M	G	Shp	F	Be	El	Ra	Total	R	J
I/SHP3						1451									1451	1	
IIa/EHP7	4	5	2	1	14	766									793	6	.11
IIc/Rim 2	2	2	24	8		478	1								513	5	.2
III/Rim 3	3	1	42	8	3	192	1	1	1						249	8	.25
IVa/Rim 4	4	1	8	8	29	122	3		3	4					178	8	.51
IVb/RF	18		8		75	319	25			3	1			3	452	8	.48
IVc/FL	4	1	16		42	1344	8			1	1	1	1	19	1438	11	.19
HP3T	4	41	8		7	328	8							1	397	7	.44

Housepit 7 roof and floor data are derived from Kusmer (2000a).
SHP3, Subhousepit 3; EHP7, Early housepit 7; RF, final roof; and FL, final floor; HP3T, housepit 3 total final roof and floor).
Notes: R, Richness; J, Pielou's J (evenness index); HP3T, total housepit 3; Bi, bird (aves); Dg, dog (*Canis familiaris*); B, beaver (*Castor canadensis*); M, marmot (*Marmota* sp.); De, deer (*Odocoileus* sp.); Sa, salmon (*Onchorhyncus* sp.). She, shellfish (various including *Margaritifera falcata*); M, moose (*Alces alces*); G, mountain goat (*Oreamnos americanus*); Shp, big horn sheep (*Ovis canadensis*); F, fox (*Vulpes vulpes*); Be, bear (*Ursus arctos*); El, elk (*Cervus canadensis*); Ra, rabbit (*Lepus americanus*).

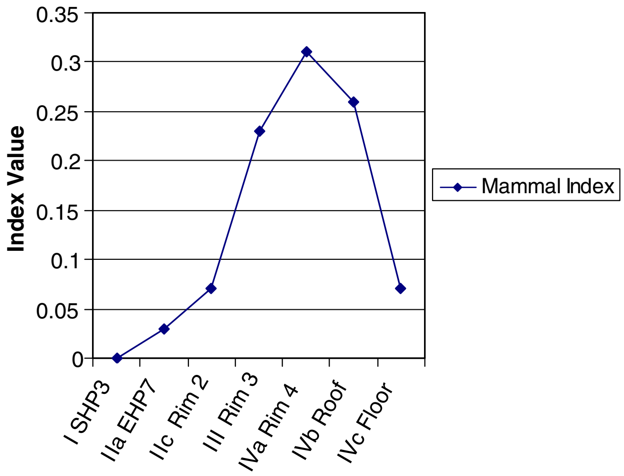

Fig. 8. Plot of mammal index across Housepit 7 rim and final roof and floor strata (SHP3, Subhousepit 3; EHP7, Early Housepit 7).

From the standpoint of the index, the earliest rim and pre-rim [Subhousepit 3] sediments from Early Housepit 7 (Stratum IIa), Rim 1, and Rim 2 (Strata IIb–c) display a subsistence pattern weakly associated with the consumption of mammals (Fig. 8). The later deposits from Rims 3 and 4 (Strata III–IVa) show a marked trend of increasing reliance on mammalian resources and a likely broadening of the diet. Interestingly, dog remains (many with cut-marks) are the dominant mammals of Rim 3 (Stratum III) and deer are by far the most common in Rim 4 (Stratum IVa) (Burns, 2003). While the final roof contains high numbers of mammals, the final floor reverses the trend with a low mammal index value. We do not think this is due to differential formation processes as salmon are common in the earlier rim deposits and sample size does not seem to play a role (Burns, 2003). Thus, we conclude that salmon numbers probably did rise on the final floor, suggesting the possibility of several very productive fishing years just before site abandonment.

An assessment of numbers of mammals and fish from other fully excavated housepit floors and roofs indicates the presence of faunas with large numbers of mammals in primarily later contexts (Housepit 3 final floor) (Kusmer, 2000a,b). Interestingly, the faunal data from roof, floor, and pit at Housepit 12 (dating to Early Housepit 7 times) appears to support a mammal orientation. It is likely, however, that more fish could be present here than actually reported, as a cache pit with multiple articulated salmon vertebrae was exposed but not excavated during the 1989 field season (Handley, 2000). Housepit 90, however, did produce a very high mammal to fish bone ratio (28.6).

Salmon, viewed as large aggregate prey, could be considered the calorically highest ranking food resource in the Mid-Fraser area (e.g., Madsen and Schmitt, 1998). If access to salmon declined it would make sense to expect increases in mammalian prey (e.g., Broughton, 1994). Decline in preferred prey could reflect a natural decline in salmon due to broader environmental changes or it could reflect resource depression due to intensive predation by the growing population in the Mid-Fraser area (Broughton, 1994, 1997; Butler, 2000). The latter seems unlikely given the technology available and the size of the salmon spawning runs in the Fraser River (Kew, 1992). Thus, it is more likely that salmon, as the top ranked resource, may have declined in accessibility due to natural fluctuations causing Keatley Creek foragers to more frequently harvest species lower in economic rank. This conclusion is buttressed by richness statistics suggesting a small but steady rise in numbers of species used between Early Housepit 7 and that house's final floor (Table 7; Fig. 9). The richness pattern is not significantly influenced by sample size correlations (Burns, 2003).

Predation spectrum: flora

Botanical data provide a direct look at the other primary facet of subsistence—predation upon plants. As this portion of the study focuses on spectrum we review richness data. Richness measures the diversity of plant taxa in a given assemblage and can inform about the relative use of economic species. Richness, for the archaeobotanical data, is measured in this study as number of identified taxa (NIT). A substantial portion of the seed assemblages from Housepit 7 deposits could not be identified and are thus not included in these calculations. However, seed sample size is still adequate for inter-deposit comparisons (Lyons, 2003). In general, seed richness remains relatively stable throughout the sequence of Housepit 7 occupations (Table 7; Fig. 10). The majority of identified taxa, that are considered to be culturally deposited, are food seeds (particularly berries), followed by non-food seeds, which include those used in technology and a possible medicinal seed (e.g., *Phacelia* in subhousepit 3), in addition to other seeds likely introduced naturally into deposits.

Clusters of seeds were also found in various deposits, including blue elderberries (*Sambucus*

Table 7
Archaeobotanical assemblage from Housepit 7 including food seeds, non-food seeds, and charcoal, by frequency[a] (unburned food seeds)

	I/SHP 3	IIa/Early HP 7	IIb–c/Rims 1,2	III/Rim 3	IVa/Rim 4	IVc/final floor
Volume analysed (litres)	33.4	18.9	16.4	9.9	6.5	
Contexts represented[b]	F, H, M, O	F, H, M	F, H, R	F, H, R, O	R	F, H
Food seeds						
Amelanchier alnifolia (saskatoon)	4	13	6.5 (4)	11 (12)	22 (61)[d]	40
Arctostaphylos uvaursi (kinnikinnick)	4.5	1.5	3	6.5	2.5 (2)	9
Crataegus sp. (hawthorn)		1	1	1		
Ericaceae (heather family)	5.5	42 (2)	6.5	4	2.5	62
Opuntia sp. (prickly pear)		19 (1)	2.5	2	2 (72)	2
Pinus cf. *ponderosa* (Ponderosa pine)		1.5			1(96)	
Opuntia/Pinus fragments					(181)	
cf. *Prunus* sp. (cherry)	1	4	0.5	2	1	4
Rosa sp. (wild rose)	0.5	2.5	1		1	9
Rosaceae (rose family)	4					
Rubus sp. (raspberry)	6	1		2	1	
Sambucus cf. *cerulea* (blue elderberry)	2	75.5		2		
Sorbus cf. *sitchensis* (mountain ash)				2	1	
Vaccinium sp. (blue/huckleberry)		31		33	25	
Non-food seeds						
Caryophyllaceae (pink family)				1		
Chenopodium sp. (chenopod)	19	79.5	545.5	318.5	122	
Cyperaceae (sedge family)				1		
*Phacelia*sp. (phacelia)	1					
Poaceae (grass family)	1	11	6.5	9		
Unidentified whole seeds	6	12	9	19	4	
Total seeds	54.5	296	586	457	597	124
Charcoal[c]						
Acer sp. (maple)				1		
Alnus cf. *crispa* (Sitka alder)				6		
Betula sp. (paper birch)					7	
Juniperus sp. (juniper)					2	
Pinus cf. *ponderosa* (Ponderosa pine)				3	15	
Populus sp. (cottonwood)				8	20	
Pseudotsuga menziesii (Douglas fir)				3	30	
Unidentified charcoal				4	3	
Total charcoal				25	77	
Richness	8	11	7	10	10	7
Evenness	.52	.33	.5	.31	.31	.45

[a] For a complete account of the archaeobotanical rim assemblage from Housepit 7, including plant parts not discussed here, such as buds, bulbs, and unidentified seeds, see Lyons, 2003. Final floor data are from Lepofsky (2000).
[b] F, floor; H, hearth, M, midden; R, rim; O, other features.
[c] Charcoal analyses were limited to rims 3 and 4, largely because results were redundant to Lepofsky's previous analyses.
[d] () are unburned seeds not possible to definitively link to cultural behavior.

cerulea) in Early Housepit 7 and unburned pine nuts (*Pinus ponderosa*) and prickly pear (*Opuntia* sp.) in Rim 4. Although, the clusters of pine nuts and prickly pear seeds could reflect rodent caches, their sudden appearance in Rim 4 (Stratum IVa) could suggest that these rodents were deriving their food from new cultural sources. Burned prickly pear seeds do occur in the rim suggesting human involvement. If at least partially the result of human behavior, these seeds may represent high carbohydrate plant foods collected for processing and consumption during the final phase of occupation. While seeds generally offer high caloric values compared to many other plant foods, their cost/benefit ratio

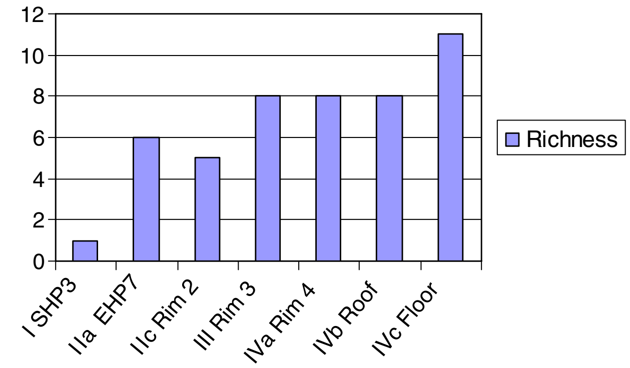

Fig. 9. Richness of fauna from Housepit 7 rim and final roof and floor deposits deposits (SHP3, Subhousepit 3; EHP7, Early Housepit 7; RF, final roof; FL, final floor).

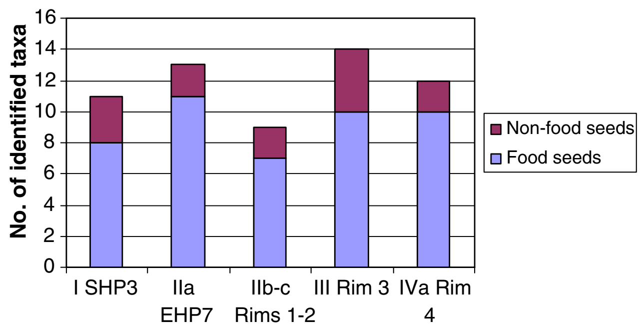

Fig. 10. Variation in seed and nonseed botanical taxa in the Housepit 7 rim deposits (SHP3, Subhousepit 3).

compared to larger mammals and aggregate harvested oily fish (salmon) is relatively low (Simms, 1987). Although relative caloric returns of seeds are higher per unit than that of other higher carbohydrate species such as geophytes, other factors such as processing requirements, abundance, and availability will increase search and handling times and thus decrease the relative value of these resources (Lepofsky and Peacock, 2004). Consequently, we would expect them to more frequently have been added into diets as search costs for more calorically rich foods rose (e.g., Simms, 1987) (Table 8).

Predation spectrum: lithic indicators

We conducted analysis of lithic tools (Table 9) as an independent test of conclusions drawn from the faunal and floral studies. Theoretically, if mammals were being eventually harvested in larger masses than salmon we would expect to see a similar pattern of increasing frequencies of hunting, butchering, and hide-working gear and decreasing numbers of tools used to prepare fishing gear such as nets, traps, and harpoons. The lithic tools of Housepit 7 can be divided into three functional groups: (1) hunting and butchering tools, (2) hide-working and other lighter duty tools, and (3) wood-working (heavy duty) tools. These morpho-functional tool groups were developed in part from the design strategy work of Hayden et al. (1996a; see also Spafford 1992) and Rousseau (1992), but also from summaries of ethnographic tool use (Alexander, 2000) and direct ethnographic accounts (Teit, 1900, 1906). These issues were outlined in more detail in Godin (2004). Change in tool frequencies is measured through the use of a faunal processing tool index (total hunting and butchering and light duty tools/total tools) similar to our mammal index.

Increasing frequencies of hunting and butchering and light duty tools supports the possibility of an increased focus on the procurement of terrestrial resources through time (Fig. 11). Terrestrial foods could have included plant resources, which were likely harvested through the use of baskets (Prentiss et al., 2005b). Admittedly, however, basketry was probably equally important in transporting dried fish to the village from fishing sites deeper in the canyon. Nonetheless, rates of basket manufacture appear to significantly increase by Rim 3 (Stratum III) times (Fig. 12), which may at least in part help to explain the rising frequencies of light duty lithic tools. Increased numbers of light duty scrapers could also reflect more frequent preparation of hides as would be expect with an increased focus

Table 8
Counts of lithic tools under the functional classification

	I/SHP3	IIa/EHP7	IIb–c/R1/2	III/R3	IVa/R4	IVb/RF	IVc/FL
Hunting/butchering	3	12	31	45	92	157	180
Hide/basketry/light duty work	2	8	23	42	51	97	285
Subtotal	5	20	54	87	143	254	465
Woodworking	12	16	42	41	70	78	218

Roof data derived from two sectors (Spafford, 2000b).
Floor data are derived from Spafford (1991, 2000a) (SHP3, Subhousepit 3; EHP7, Early Housepit 7; R1/2, Rims 1 and 2 and Subhousepit 1; R3, Rim 3; R4, Rim 4; RF, final roof; and FL, final floor).

Table 9
Deer element frequency data (excluding skulls, teeth, and antler; MAU, minimal animal unit [MAU]; % = percentage MAU)

Element	II– IVa/Rim			IVb/Roof			IVc/Floor		
	N	MAU	%	*N*	MAU	%	*N*	MAU	%
Vertebra	9	.33	17	9	.33	4			
Ribs	3	.12	6	4	.15	2	1	.04	1
Sternum							2	2	73
Scapula	4	2	100	8	4	55	2	1	36
Humerus				2	1	14	4	2	73
Radius				3	1.5	21			
Ulna	1	.5	25	2	1	14			
Pelvis				2	1	14			
Femur	2	1	.5				1	.5	18
Tibia	2	1	.5	2	1	14			
Carpal/tarsal	6	.23	12	14	.54	7	12	.46	17
Metapodial				29	7.25	100	11	2.75	100
Phalanx	1	.25	13	35	4.4	61	21	2.63	.96
Noviculo-cuboid	1	.25	13						

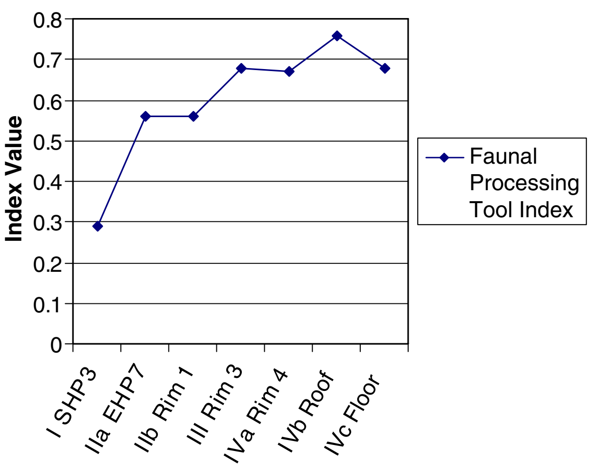

Fig. 11. Plot of the faunal processing tool index across Housepit 7 strata (SHP3, Subhousepit 3; EHP7, Early Housepit 7; Roof, final roof; Floor, final floor).

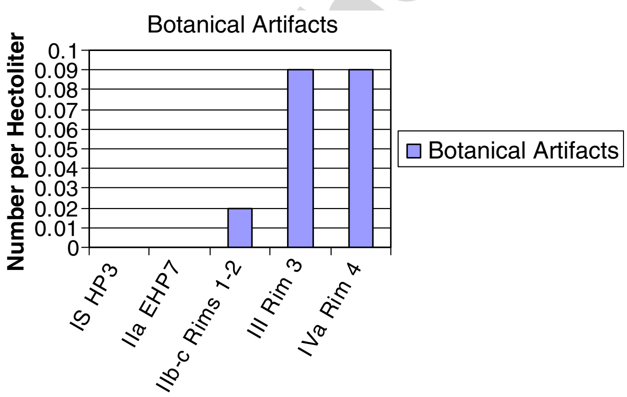

Fig. 12. Frequencies of botanical artifacts in the rim deposits of Housepit 7 (SHP3, Subhousepit 3; EHP7, Early Housepit 7).

on mammals. Changes in subsistence are also suggested by progressively diminishing frequencies of woodworking or heavy-duty tools. Many of these tools are specialized and conducive to working the hard materials used in the production of such things as fishing tools. These patterns lend support to an argument that early occupants of Keatley Creek were most heavily focused on salmon while hunting of mammals became increasingly critical to later groups.

Similar patterns are found in the lithic tool data from small earlier dating floors elsewhere in the village. The mammal dominated Housepit 90 has a lithic assemblage with numbers of hunting/butchering tools (Heffner, 2000) that are slightly higher than those of Rim 4 (Stratum IVa) at Housepit 7. In contrast, the lithic tools from the likely more salmon dominated Housepit 12 contain few hunting/butchering tools, comparable to Early Housepit 7 (Stratum IIa). Stone tool signatures also match fauna from the final floor/roof at Housepit 3 (dated to the same period as the Housepit 7 final roof and floor) where hunting and butchery tools dominate the lithic assemblage from the mammal-dominated roof deposits while woodworking tools narrowly dominate the slightly more salmon oriented final floor (Spafford, 1991, 2000b).

Predation mode: fauna and flora

Chatters (1987, 1995) notes that predation mode is the strategy used to acquire prey. This can come in two forms: pursuit and search. Pursuit strategies require targeting of specific game and ignoring all others. In contrast, search strategies require foraging for a broader range of prey. When archaeo-faunas are assessed with evenness statistics, pursuit strategies are very uneven, whereas search strategies produce the opposite. When key prey resources are clumped in annually predictable, large numbers, pursuit makes greater economic sense. In contrast, a dispersed and unpredictable prey base will more often result in the use of a search strategy. Change within a region from pursuit to search could occur under conditions of local resource depression as foragers are forced to search in wider ranges while becoming less exclusive about prey to be taken.

We measured predation mode using Pielou's evenness statistic (Pielou, 1966) using only taxonomically identifiable bones from known food species at Housepit 7 (Table 6). Sample sizes were too small to compare to other housepits. Results (Fig. 13) do not significantly correlate with sample size ($r = -.588$, $p = .165$) and indicate a trend towards increasing evenness through the Housepit 7 final roof (Stratum IVb). The pattern reverses with the final floor (Stratum IVc) data in which large numbers of salmon send the index lower (Table 6). This could reflect short-term success at salmon harvest during the final years of occupation of Housepit 7, compared to the years of decline in this resource leading up to this point. However, a relatively high evenness score was derived for the fauna from similarly dated final floor/roof at Housepit 3. With a 400% increase in evenness scores between Early Housepit 7 and most of the late occupation strata,

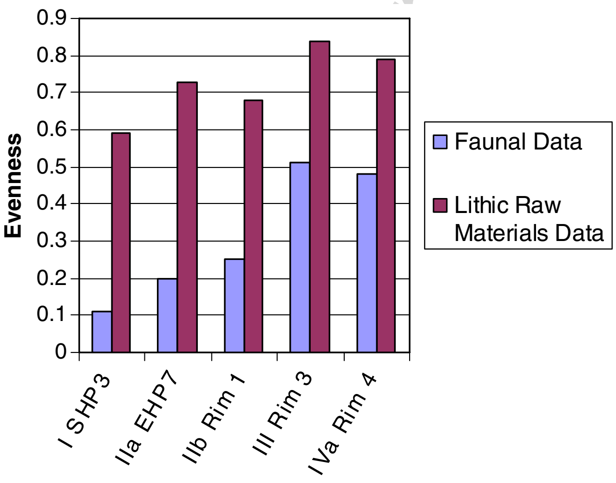

Fig. 13. Evenness of faunal remains and lithic raw materials from the Housepit 7 rim and final roof and floor (SHP3, Subhousepit 3; EHP7, Early Housepit 7).

it appears that an intensely pursuit oriented strategy may have gradually shifted to one with a higher search orientation. At a minimum, distances traveled in food collection forays must have grown.

Evenness indices for botanical remains change little across the life of Housepit 7 (Table 7). However, we consider this inconsequential for understanding the subsistence history of Housepit 7 since it is clear that the underlying structure of the botanical assemblages changed substantially through time possibly towards increases in numbers of prickly pear seeds and pine nuts reflecting a subsistence strategy that incorporated increasingly higher numbers of lower ranked resources. As we outline below, there were also changes in preferred berry species, possibly tied to shifts in mobility and collection of other resources.

Processing and transport: fauna, flora, and lithics

Analyses so far suggest that diets at Housepit 7 may have increased in the range and evenness of animal species used. One implication is that foragers may have had to travel increasingly long distances to acquire prey. We can test this hypothesis with an analysis of deer element representation under the assumption that animals harvested within short distances of the village would be more frequently introduced whole while those at greater distances would be returned in segments, most often higher utility elements (Binford, 1978; Broughton, 1994). To accomplish this we had to rely on analysis of simple element frequencies since published data are not adequate for calculation of minimum number of elements (MNE). Following Lyman (1984), we determined that element frequencies (excluding teeth and skull parts) for rim (Strata II–IVa), roof and final floor (Strata IVb–c) deposits (Table 9) are not significantly correlated with bone density (rim: $r = -.231$, $p = .581$; final roof: $r = .235$, $p = .514$; final floor: $r = .288$, $p = .489$). We then divided deer elements from the rim, roof and final floor stratigraphic contexts at Housepit 7 into utility based classes using criteria derived from Madrigal and Holt (2002). This resulted in three groupings: high utility (upper limbs), moderate utility (axial parts), and low utility (lower limbs) (Table 10). While sample sizes are low, we consider the results to be provocative in light of other subsistence data and thus, worthy of further discussion. A plot of the results (Fig. 14) indicates a consistent signature of low representation of high utility parts. This is

Table 10
Variation in deer element frequencies (ratio scores) organized into utility based groups (utility designations derived from Madrigal and Holt, 2002)

	High utility (upper limbs)		Moderate utility (axial, ribs, scapulae)		Low utility (heads)		Low utility (limbs)	
II–IVa/Rim	2	(13)	16	(100)	4	(25)	12	(75)
IVb/RF	2	(2)	23	(27)	6	(7)	85	(100)
IVc/FL	5	(11)	5	(11)	4	(9)	44	(100)

Housepit 7 roof and floor data are derived from Kusmer (2000b).
EHP7, Early housepit 7; RF, final roof; FL, final floor).

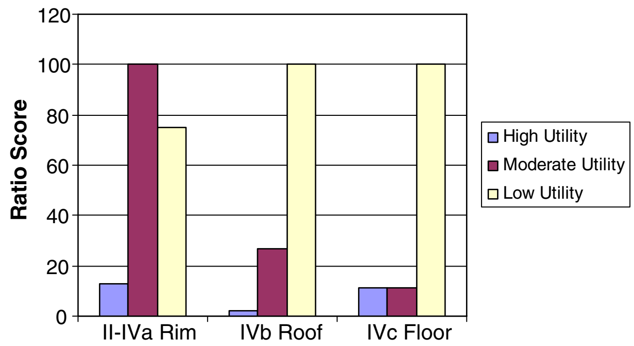

Fig. 14. Percentage variation in representation of deer bones organized by utility class from the Housepit 7 rim and final roof and floor.

likely due to excessive bone processing. However, moderate utility (axial) parts steadily decline towards the final roof and floor of Housepit 7. In contrast, low utility limb parts rise, peaking in the final roof and floor (Strata IVb–c). We interpret this to mean that heavy elements with lower rankings were being discarded in the field while limbs with lighter lower elements attached were being more frequently transported back to the village or that lower limbs were returned attached to hides used to transport dried meat, assuming that most processing took place in upland field camps (e.g., Alexander, 1992; see also Kuijt and Prentiss, 2004).

More detailed insight into these patterns can be derived from an examination of variation in Minimal Animal Units (MAU).[4] Percentage MAU distributions (Table 9 and Fig. 15) also indicate a shift between rim (Strata II–IVa) and final roof and floor (Strata IVb–c) in element transport from rim deposits dominated by rear limbs, scapulae, and to a lesser degree, ribs and vertebrae to roof and final floor strata strongly dominated by lower limb parts. The final floor does have a somewhat higher frequency of relatively high utility parts from front quarters (humerus, scapula, and sternum). The reader should be cautious of over-interpretation since we were not able to calculate true MNE scores from which to derive the MAUs. However, we still suggest that by final roof and floor times, deer hunting may have required longer distance travel than in earlier times. Indeed, similar to patterns recognized by Broughton (1994) and Janetski (1997), it could reflect local resource depression in ungulates (Fig. 16).

If local groups were foraging more widely for deer, we would also expect them to be collecting other food sources while away from home (Alexander, 1992). Plants are often very sensitive to microenvironmental context and can potentially provide indicators of human land use patterns. While we cannot exactly source plant remains from the archaeological record, we can determine whether the plants were typical of more xeric or moist environments. On the British Columbia Plateau, plants such saskatoon and blue elderberries derive from drier soils while those such as blue huckleberries and heather prefer wetter contexts. Since, most of the Mid-Fraser context is semi-arid in climate, featuring steppe, grasslands, and open pine forests, the most frequent and extensive patches of moist-soil berries are at higher elevation at greater distances from Keatley Creek (Turner, 1992). In order to explore variability in plant resources from this standpoint we developed a xeric plants index (total xeric plant seeds/total seeds) similar to our mammal index and plotted the results by Housepit 7 occupation phase (Fig. 15). Despite some variability in sample sizes and the possibility of sampling error, results are provocative. Early occupations appear to have progressively accumulated more xeric soil

[4] MNE scores are normally required to calculate Minimal Animal Units. As this was not possible from published faunal data at Housepit 7, we assumed for heuristic purposes that element frequencies actually represent MNEs. We also excluded skulls and teeth from these studies as descriptions of these items do not provide enough detail for this level of analysis. Consequently, these results should be viewed with some degree of caution. However, patterns are generally similar to that produced by the utility index based distribution (Fig. 14).

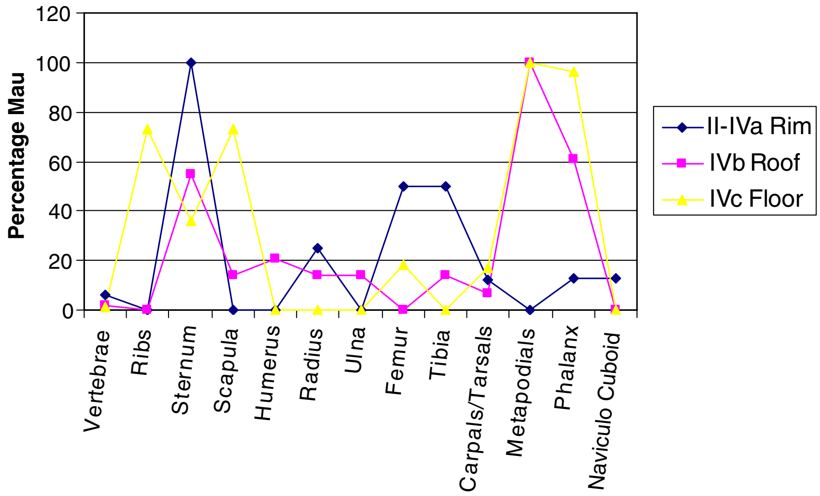

Fig. 15. Distribution of percentage MAU scores for deer between rim, roof, and floor contexts.

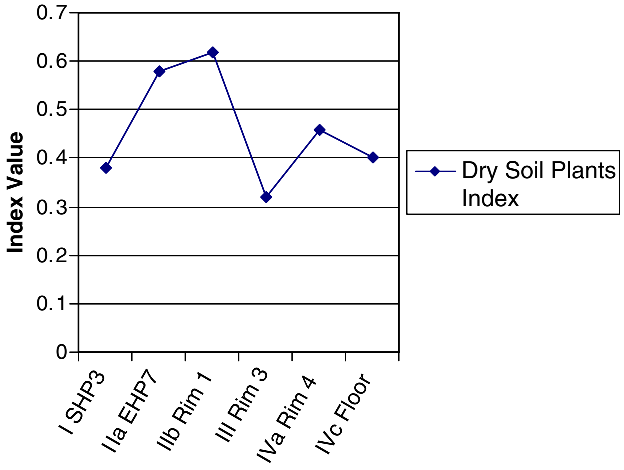

Fig. 16. Plot of the Dry-soils plant index across Housepit 7 strata (SHP3, Subhousepit 3; EHP7, Early Housepit 7).

plants. By Rim 3 (Stratum III) times, the pattern becomes reversed with a pattern of more frequent moist-soil plants. This could indicate that groups traveling more widely in search of deer were more often also in contexts of moist-soil berry resources, in contrast to earlier times when foraging was predominately closer to the winter village, resulting in most frequent use of xeric-soil berries.

Changes in geophyte harvest, processing and transport could also help to mark variation in foraging ranges. However, it is currently impossible to recognize plant taxons from tissue data at Plateau villages, which makes it very difficult to assess the role of geophytes in human diets (Lepofsky, 2004; Lepofsky and Peacock, 2004). Consequently, we consider frequencies and sizes of root roasting pits as proxies for intensity of geophyte use (Hayden and Cousins, 2004; Lepofsky and Peacock, 2004; Thoms, 1989). Lepofsky and Peacock (2004) document continuous use of geophyte resources in upland valleys east of the Mid-Fraser canyon throughout the occupation span of Keatley Creek. However, Hayden and Cousins (2004) document roasting ovens only during the early portions of the Keatley Creek chronology. If local geophyte resources (that could be cooked in the village) were reduced due to over-predation perhaps in the range of Housepit 7 Rims 2–3 (Strata IIc–III) (e.g., Kuijt and Prentiss, 2004), then we would expect longer trips requiring in-field processing to reduce weight for transport back to the village and thus a dramatic reduction in the frequency of in-village root roasting. As we noted earlier in this paper, it is possible that the seeming decline in public root roasting at Keatley Creek could also be linked to social factors.

Data on lithic raw material variation provide limited support for this conclusion. Logically, wider ranging logistical mobility associated with hunters and other foragers could also be reflected by increased frequencies of a range of non-local raw materials procured during subsistence oriented trips. To assess this possibility, we tabulated numbers of utilitarian raw materials (e.g., jasperoid, pisolite, vitric tuff, chalcedony, and quartzite) from each stratigraphic context at Housepit 7. Notably, the most common non-local raw material is jasperoid, which is typically quarried in the same contexts where root roasting ovens are found. Following Hayden et al. (1996b) we excluded dacite as it is widely available and ubiquitous in all assemblages. We also excluded data from the final roof and floor contexts due to comparatively very low sample sizes. While there is no change at all in richness (frequencies of raw material types), evenness indices (again using Pielou's *J*; no correlation with sample size [$r = .037$, $p = .945$]), support a change in lithic procurement modes toward a slightly more extensified pattern during and after Rim 3 (Stratum III) times (Table 3; Fig. 13). These data also suggest that resource collecting groups may have spent somewhat more time in a wider range of more distant contexts by Rim 4 (Stratum IVa) times.

Ecological contexts of change at Keatley Creek

Data are not available to write an ecological history of microenvironmental change specifically at Keatley Creek. However, enough regional scale research has been conducted to gain some idea of broad patterns of change relevant to subsistence resource parameters. As much of this material has been summarized elsewhere (e.g., Chatters, 1998; Lepofsky et al., 2005; Prentiss et al., 2003, 2005a), we keep our review brief.

It is clear that the forests of the central Northwest Coast were beset with repeated warm summer and fall temperatures and droughts between 2400 and 1200 cal. B.P. resulting in frequent intense fires peaking at ca. 2100 and 1600 cal. B.P. with a less intense fire period between 1000 and 1500 cal. B.P. (Hallett et al., 2003; Gavin et al., 2003; Lepofsky et al., 2005). Various studies from the interior Plateau and western Rocky Mountains suggest warm and dry conditions prior to ca. 1600 cal. B.P. and in the range of 1000–600 cal. B.P. Chatters (1996) and Chatters and Leavell (1995a,b) documents moderately high fire frequencies prior to 1600 cal. B.P. and intense fires at ca. 700–800 cal. B.P. Hallett and Walker (2000) recognize high fire frequencies at Kootenai Lake at ca. 1200–900 cal. B.P.

Fire frequency data are backed by pollen studies supporting non-climax vegetation during peak fire periods as would be expected if fires were preventing complete succession (Chatters and Leavell, 1995b; Hallett and Walker, 2000). Coarser sediments are also found in contexts associated with frequent and intense fires indicating more intensive erosion from dry conditions (Chatters and Leavell, 1995a,b). Finally, climatic instability during the period of 1000 to 600 cal. B.P. is supported by evidence for more frequent and intense floods on the Columbia River (Chatters and Hoover, 1986).

Reyes and Clague (2004) document a history of expansion and contraction in the Lillooet Glacier, located west of the Mid-Fraser Canyon area. They demonstrate that the glacier advanced between ca. 1700 and 1400 B.P. and again after 500 B.P. These results correspond with research elsewhere in the Coast Range and Rocky Mountains supporting advances at ca. 2500–2300 B.P. ca. 1500–1600 B.P. and after 500 B.P. (Clague and Mathewes, 1992; Luckman et al., 1993; Wood and Smith, 2004). At a minimum, these data imply increased winter moisture in the range of 1600–1400 cal. B.P. and relatively drier winter conditions ca. 2200–1600 cal. B.P. and 1300–600 cal. B.P.

Limited studies of eastern Pacific fisheries productivity have indicated a period of higher productivity occurring between ca. 1200 and 2000 cal. B.P. reversing to sub-average productivity between 1000 and 500 cal. B.P. (Tunnicliffe et al., 2001). The pattern is inverse to that of the Gulf of Alaska where peak productivity appears to occur after 1000 cal. B.P. (Finney et al., 2002). Various studies indicate that high sea surface temperatures correlate with higher air temperatures (Mote et al., 2003) and that has an effect on overall productivity levels (Chavez et al., 2003). Consequently, it is not surprising that we see weakness in the eastern Pacific precisely when warmth and droughts are recognized on adjacent landforms (e.g., Kennett and Kennett, 2000). Lepofsky et al. (2005) have reviewed potential impacts of warm and dry conditions on various salmon species suggesting that pink, sockeye, and coho populations would be most adversely affected by warm conditions while chum and Chinook salmon might not be impacted. Chatters et al. (1995) provide independent data generally backing this conclusion suggesting a decline in salmon numbers at ca. 500–1000 cal. B.P. in the Columbia River system. Unfortunately, they are unable to control for variation in salmon species.

These studies point to potentially significant problems for spawning salmon during periods of high temperature and droughts. Warm sea surface temperatures (SST) adversely affect survival of juveniles among pink, sockeye, and coho populations in marine contexts. Dry landscapes lead to warmer stream temperatures and higher sediment bedloads, which in turn delay freshets and adversely affect spawning rates and survival of fry in interior streams (Chatters et al., 1995; Heard, 1991; Lepofsky et al., 2005). Studies of marine and riverine fisheries and terrestrial paleoecology suggest that salmon numbers were undoubtedly high and likely rising on the coast and interior between ca. 1600 and 1200 cal. B.P. The Mid-Fraser probably became an optimal patch for salmon fishing during this time. Historic salmon population estimates in the Fraser system suggest that in poorest spawning years the total numbers of fish running can be over 400% higher in the Mid-Fraser context than all other major northern interior drainages (Kew, 1992). It is therefore not surprising that salmon would dominate faunas at Mid-Fraser villages such as Keatley Creek and Bridge River at dates of ca. 1200–1700 cal. B.P. (Prentiss et al., 2005c). However, after 1200 cal. B.P., declines in marine productivity coupled with adverse conditions for spawning fish, may have caused reductions in salmon numbers, but also probably increased the degree of inter-annual uncertainty of access to large numbers of fish. Kew (1992) documents that in poor spawning years, numbers of sockeye salmon can be as low as 20% of peak year numbers. The drop in salmon after 1200 cal. B.P. may have been even more extreme in the poor spawning years during that era.

In addition to salmon, several key terrestrial resources may have been affected by climatic changes. Most edible geophytes critical for their carbohydrates (Kuijt and Prentiss, 2004; Lepofsky and Peacock, 2004) on the Northern Plateau require dry meadows for optimal growth (Turner, 1992). Consequently, wet conditions should curtail production of these resources. The best evidence for later Holocene intensive harvest and processing of these resources in the Mid-Fraser area is dated to the dry periods of 2300–1500 and 1000–500 cal. B.P. (Lepofsky and Peacock, 2004).

Warm and dry conditions probably favorably affected berry production in a positive way by providing more opportunities for invasive berry species to proliferate in regenerating woodland contexts (Lepofsky et al., 2005). Likewise, numbers of deer and elk may have been positively affected by dry conditions in the mountainous areas where more open conditions would have favored easier access to forage, particularly associated with margins between more mature and regenerating forests (e.g., Mackie et al., 1982; Shackleton, 1999). In contrast, dry conditions might lead to reductions in ungulate populations in more arid areas (e.g., canyon terraces and bottoms, intermediate grasslands) due to declining forage (Byers and Broughton, 2004). This could have the effect of seasonally concentrating deer and elk populations in transition zones within montane contexts, thereby increasing accessibility to human hunters. If this did occur, it was likely at 1000–600 cal. B.P., coincident with the period of peak mammal predation at Keatley Creek.

Discussion

The aggregated village at Keatley Creek emerged abruptly at ca. 1600–1650 cal. B.P. within a landscape previously peopled by small bands of egalitarian hunter/gatherer/fishers, with simultaneously occupied houses of a wide range of sizes. If its history was anything like that of the Bridge River site, Keatley Creek became a very large community of perhaps 40–60 households by ca. 1200 cal. B.P. Current data suggest that smaller houses were abandoned at this point while larger households probably increased in numbers of residents. It is impossible to say if there was any net increase (or decrease) in total village occupants, however. The pattern of rising numbers followed by individual household abandonments is duplicated in the regional data where it would appear that the Mid-Fraser received rapid population growth followed by a decline at ca. 1200 cal. B.P. A subsequent brief population plateau was eclipsed by what appear to be large scale regional abandonments after ca. 800 cal. B.P.

The Keatley Creek village was initially supported by a relatively narrow diet that was dominated by salmon and probably included large quantities of geophytes. Fish and roots were supplemented by berries and to a much lesser degree, deer and some other mammals. This basic dietary pattern was apparently stable through ca. 1200 cal. B.P. when salmon declined and mammals began to take on an increasingly critical role in the diet. During the final occupation phase between about 1150 and 750 cal. B.P., diets became broader to the point of possibly adding low ranking foods such as seeds. Dogs were apparently eaten frequently for a short time during Rim 3 times perhaps shortly after 1200 cal. B.P. (at least at Housepit 7 [Burns, 2003]). But this rapidly shifted to deer. Deer procurement and transport appears to have been relatively local earlier in the village history, but by the final occupations it would appear that hunters were traveling long distances to find game. Subsistence changes tie closely to predictions from paleoenvironmental research. High salmon numbers at Keatley Creek correlate with high eastern Pacific productivity and indicators of cooler and wetter climatic conditions. Extensification of subsistence after 1241 cal. B.P. coincides with climatic warming, droughts, and declines in fisheries productivity in the eastern Pacific. The latter conditions probably did increase the numbers and accessibility of many terrestrial resources including geophytes, berries, and deer (all in the higher elevations). This probably offered a critical alternative when salmon access declined.

With large and small houses occupied simultaneously in the early village, it is tempting to assert, following Hayden (1997a), that some forms of inequality must have existed. This seems to be a logical argument as some households were simply larger and probably at a gross level, more productive. However, frequent public food preparation and a lack of differential accumulation of prestige goods or manufacture debris suggests that archaeologically measurable aggrandizing behavior did not exist. This implies the more obvious possibility the interpersonal relations were more of an egalitarian nature and that large households may have been more important for maintaining the economic health of all households. This changed however by ca. 1200 cal. B.P. when small houses were abandoned, signs of outdoor food preparation disappeared, and large houses began to accumulate comparatively large numbers of prestige goods. We assert that it is at this point that the kind of institutionalized inequality described by Hayden (1997a) emerged. Prior to this time differential ability worked to serve all. By final occupations, house groups served themselves to a greater degree.

Keatley Creek and several other large villages in the Mid-Fraser Canyon emerged abruptly at the end of a dry period with the beginnings of a major upswing in salmon. While salmon access remained high, all of the villages grew and prospered. Although house group size was highly variable, social relations were likely still largely egalitarian. When salmon declined, some villages were outright abandoned (e.g., Bridge River), while others such as Keatley Creek and Bell survived for some time longer. Under drier conditions the Mid-Fraser had probably become patchier with a new high premium on maintaining access to key fishing places in the Fraser River canyon and select terrestrial resource collecting locales. For Housepit 7 occupants, the most critical patches probably included nearby portions of the Hat Creek Valley and adjacent terrain where deer, geophytes, and lithic raw materials sources were relatively abundant (see also Hayden et al., 1996b). The last villages may have grown by accepting new members possible originating in the abandoned villages. It is also likely that by this time small houses had been abandoned, with their groups also moving into the larger houses. Household abandonments may have been economically stimulated by the promise of better access to food (via membership in a larger house) in an increasingly stressed environment and they could also reflect a need for protection from raids (e.g., Cannon, 1992).

With many people becoming dependent upon others and substantial payoffs for control of key patches, the environment was right for inequality to surface and become institutionalized in the Mid-Fraser villages. However, we suggest that this process was not driven by aggrandizers waiting for the opportunity to strike. Prior to ca. 1200 cal. B.P., household and village leadership had probably been in the hands of household heads (middle-aged adults and elders with demonstrated ability) who had worked to maintain peaceful and cooperative communities, but now faced troubles associated with a new environment in which food resources had grown more tenuous and the population of disenfranchised people in the general Mid-Fraser area had risen. In order to protect their own subsistence options and to ensure safety from attack, household heads now sought to expand their households by attaching new non-kin members, drawing from the newly disenfranchised groups. The biggest payoffs went to those with the largest and best organized groups since they could produce more products for internal use and for exchange, more effectively protect themselves and their resource collection locales, and simultaneously forage over a wider landscape. Mid-Fraser villages now hosted a growing class of "poor" people, willing to subjugate themselves to the most powerful of these households in exchange for protection, shelter and food (e.g., Rosenberg, 2006). Inequality became institutionalized as elders from "old money" families sought to protect their original social positions by passing on rights of property, resource, and ritual to their children. Because status and position were now inherited, children of the now "working poor" were locked into the lower class. As ecological and social pressures mounted, prominent groups within the upper class now "fought" to maintain their status through prominent displays of household success such as competitive feasting, potlatches, display of prestige objects, and control of ritual activities (e.g., Hayden, 1997a).

Processes like this have been documented elsewhere, but typically associated with some sort of organized external pressure as in another similarly organized ethnic entity moving into a group's original territory (Wiessner, 2002) or in more extreme cases, a far more complex cultural entity pressuring the original group as happened so often in the Colonial period in North America (e.g., Crowell, 1997). There is no evidence that any single external entity was creating troubles in the Mid-Fraser. Rather, we suggest that the patchy environment and unpredictable nature of salmon access probably gave rise to economic troubles and more frequent raiding and small scale warfare throughout the Plateau region after 1200 cal. B.P. This hypothesis is supported by Chatters (2004), who demonstrates a major jump in the frequencies of large village settlements, occupation of fortified mesas, and projectile wounds during this time. In the Mid-Fraser context, it paid to be a member of a larger village, with its guarantees of enhanced access to economic resources and better protections from raids.

The final Mid-Fraser villages were abandoned by ca. 750–800 cal. B.P. While Hayden and Ryder (1991) argue for a salmon catastrophe associated with land slides into the Fraser River, Kuijt (2001) points out that the slides are not adequately dated. We also know now that not all Mid-Fraser villages were simultaneously abandoned. Keatley Creek and Bell were just the last ones. Further, unusually high numbers of large villages were being abandoned throughout the greater Pacific Northwest region between 1200 and 700 cal. B.P. This suggests that broader ecological issues may have played a role in the abandonments. Two factors may have been critical at Keatley Creek. First, natural fluctuations in salmon populations undoubtedly affected human subsistence. Second, with continuously high numbers of consumers and a likely expanded emphasis on harvest of surplus for feasting and exchange purposes (at least within some houses), pressure would have undoubtedly been placed on local resources. Faunal data support local resource depression in deer populations requiring long distance travel by hunters. Kuijt and Prentiss (2004) raise the possibility of similar impacts on geophytes, though this is not fully demonstrated. However, botanical data suggest a possible pattern of foraging for berries more commonly from montane environments (not the Mid-Fraser terraces or canyon bottoms) and possible collection of seeds ranking well below geophytes. As argued by Kuijt and Prentiss (2004), by 800–1000 cal. B.P. the village was probably on "the edge." It would have taken only took one additional downturn in one sector of the subsistence economy (fish, roots, or mammals) to cause enough economic strife for house groups to cease their investment in social complexity at Keatley Creek (e.g., Tainter, 1988). While we have no direct evidence of how the final abandonment process proceeded, we can imagine that perhaps families chose to move in with other groups outside the Mid-Fraser area who offered greater security (Hayden and Ryder, 2003).

Conclusions

The history of Keatley Creek and the Mid-Fraser villages does offer theoretical implications for how we understand and explain emergent inequality. Simple population pressure (e.g., Cohen, 1981) appears to have little role in the process. There appears to have been little social change despite rising populations prior to 1200 cal. B.P. However, demographics were undoubtedly important. As anticipated by Binford (2001) and Lepofsky et al. (2005), a patchy environment does appear to have attracted clusters of human settlement. It is also possible that while some villages were abandoned ca. 1100–1200 cal. B.P. others were subjected to increased population packing after this time. Keatley Creek may have crossed Binford's (2001) "packing threshold" at this point, perhaps economically justifying the rise of social complexity and inequality.

However, understanding the process requires more than a consideration of demographic conditions and economic justification. History and human agency play key roles in the evolutionary process and were undoubtedly important at Keatley Creek. Given the late pattern of emergent inequality under increasingly adverse resource conditions, Arnold's (1993) suggestion that resource adversity provided conditions whereby weaker human groups might be willing to work for others despite loss of social status does appear to be relevant. Thus, we suggest that it was not simple resource abundance that broke the binds of egalitarianism. Rather, it was the need to feed and/or protect ones family that caused people to join and support a cultural system that at some point began to permit elite wealth building strategies resulting in resource control, ownership, hoarding, and use of surplus to create long term debt (e.g., Dyson-Hudson and Smith, 1978; Kelly, 1995; Wiessner, 2002).

It is possible that increasingly unpredictable resource conditions, demographic changes, and socially altered households initiated a competitive process for acquisition of goods and new productive household members. This selectively "driven" (e.g., Spencer and Redmond, 2001) process may have had the effect of temporarily rewarding the most successful households with large self sustaining groups, better defense, resource access via control of sources, and community respect. But, as argued by Kuijt and Prentiss (2004) it may also have brought a down side in the form of over-harvest and resource depression. Food resources became increasingly tenuous, labor requirements for maintaining subsistence parity rose, as (probably) did the aggravation factor for living in packed conditions (e.g., Chatters, 2004). Consequently, the famous house groups of Keatley Creek disintegrated. The Mid-Fraser was once again populated by small, more egalitarian bands until the cycle began again shortly before the Protohistoric period.

Acknowledgments

This research was conducted under permits from the Provincial Government of British Columbia, permission from the Ts'kway'laxw (Pavillion) Band, and encouragement from Brian Hayden. We especially thank Desmond Peters Jr. and Sr. for their support, hospitality, friendship, and insights into traditional life in the Mid-Fraser Canyon. Excavations at Keatley Creek in 1999, 2001, and 2002 were funded by grants from The University of Montana, the National Science Foundation (BCS-0108795), and the Wenner-Gren Foundation for Anthropological Research (Gr. 6754). Laboratory facilities were provided by the Department of Archaeology, Simon Fraser University. We especially thank Andrew Barton, David Burley, Jon Driver, Brian Hayden, Philip Hobler, Dana Lepofsky, and Shannon Wood. Finally, we thank all of the students (Simon Fraser University, The University of Montana, Notre Dame University) and volunteers who worked on the project. This paper has strongly benefited from comments by Jeanne Arnold, Kelly Dixon, Brian Hayden, Ian Kuijt, Michael Lenert, Dana Lepofsky, and one anonymous reviewer. We thank John O'Shea for his editorial guidance. Fig. 1 was drafted by David Clarke. Figs. 2 and 3 were drafted by Nathan Goodale and Fig. 5 was compiled and produced by Michael Lenert.

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