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Metric Analysis of Chipped Cobble Net Weights on the Lower Spokane River (Spokane Arm of Lake Roosevelt)

Christopher M. Casserino

Abstract *Indigenous people of the Inland Northwest subsisted for millennia on protein sources extracted from the Spokane River (now the Spokane Arm of Lake Roosevelt) and other inland waterways. The cobble net/line weight is one of the few pieces of indigenous fishing technology that is preserved in the archaeological record. Net weights from seven archaeological sites on the lower Spokane River were measured to determine if any of the three dimensions was more influential in raw material selection. It is demonstrated that oblong cobbles dominated the sample, that thickness was the most influential factor in material selection, and that there was no significant difference between sites.*

Introduction

The indigenous people of the Spokane area in eastern Washington State relied heavily on protein sources extracted from the area's rivers, most notably migrating salmon during the Middle Archaic (approximately 5,000 years BP to 2,000 years BP) onward (Ames et al. 1998). In addition, other riverine sources such as trout (*Oncorhynchus* spp.), freshwater mussel (*Margaritifera falcata*), and crayfish (*Pacifastacus leniusculus*) were exploited. A sophisticated toolkit was developed for harvesting riverine resources, enabling the people to enjoy a rich and diverse diet (Ross 2011:376–400).

According to Ross (2011), the ancestors of the Spokane Tribe constructed fishing traps and weirs in moving bodies of water as a means of harvesting fish in great numbers. These structures were held in place by large anchor stones that could weigh up to 30 kg (Ross 2011:226). Seine nets were weighted with groups of much smaller stones, which were expediently modified, used, and left behind for future re-use (Ross 2011:226). Chipped cobble line/net weights are one of the few pieces of fishing tackle that preserve well archaeologically. These artifacts, also known as line or net sinkers, are commonly found on the shores of the lower Spokane River and other inland waterways, especially on rocky floodplains and terraces bordering rivers (Casserino 2015). All cobble weights are referred to here as “net weights” for the sake of simplicity. Net weights mark areas of fishing activity and their presence and abundance can inform about the intensity of fishing activity. These artifacts survive better in the archaeological record than organic components such as fish remains, cordage, or nets. Their discovery in conjunction with dateable organic material can indicate the time period that aquatic resources were exploited.

Cobble net weights are produced by making notches, grooves, or holes in stones so another object such as a line, net, or basket may be attached (Figure 1). These



Figure 1. Side-notched quartzite (L) and four-notched quartzite net weight (R).

modifications are accomplished through percussion flaking or pecking to produce notches, or by drilling, grinding, or rubbing to perforate or groove (Nadel and Zaidner 2002:51; Stewart 1982:30). Notching is found predominantly along the lengths of oblong net sinkers, although end notching or multiple notching patterns are found on rare occasion (Prowse 2010:78).

After years of casually observing these artifacts in the field, the author noted a trend toward oblong-shaped net weights and was curious as to whether a preference had developed for size, shape, and material type. A search of the literature turned up no studies concerning systematic measurement of these artifacts in the study area. This is in stark contrast to the volumes of work that describe the size, shape, weight, and flaking patterns of projectile points. The purpose of this study is to characterize by size, notch characteristics, and material types, chipped cobble net weights found on the lower Spokane River/Spokane Arm of Lake Roosevelt in eastern Washington State. Study of these characteristics will aid in identification of these artifacts, and may provide insight into the selection criteria of size, shape, and raw material type when producing these implements. It is hoped that the increased collection of metric and qualitative data from net weights will stimulate future researchers to answer a greater number of questions related to aquatic resource utilization.

History and Previous Research

Cobble net weights appear in the archaeological record at Kettle Falls, Washington before 6,800 years BP (Carlson 2011:225) and are documented in the southern Columbia Plateau before 5,000 years BP (Ames 1985:172–173). Their presence is firmly established in the Middle Archaic (Andrefsky 2004:30–31), a time of increased sedentism and reliance on salmon in many of the region's rivers (Ames et al. 1998:112; Chatters and Pokotylo 1998:76). They are widespread by the time

of European contact (Ames et al. 1998:111). Despite their ubiquity, little in-depth analysis has been published about these artifacts; typically, only a notation of their presence and sometimes material type are recorded.

Three sites located on the middle section of the Spokane River (45SP214, 45SP215, and 45SP238), and one (45SA11) located on the Columbia River above Bonneville Dam (Draper and Olson 1991; Minor et al. 1989) serve as background examples of the underutilization of net weight data. Four net weights were recovered from 45SP214, one from 45SP215, and sixteen from 45SP238 (Draper and Olson 1991). All three sites appeared to be short-term campsites that had fire-modified rock, lithic debitage, mammalian and fish bone, and some freshwater mussel shell associated with the net weights. Neither metrics nor notch location of the net weights was recorded, but material type was noted for those recovered at 45SP215 and 45SP238. The lone net weight at 45SP215 was made of quartzite, whereas the collection from 45SP238 consisted of nine made of mudstone, six of quartzite, and one of an unidentified material type. This suggests that mudstone was a common material that occurred in the area of 45SP238 and was likely chosen for its softer nature, which made for easier modification.

Site 45SA11 in the Columbia River gorge, which dates to the fifteenth through early nineteenth centuries A.D., produced 303 net weights (Minor et al. 1989). These were found in association with 1390 fish remains, which constituted 5.3% of the total faunal assemblage (Minor et al. 1989:188). Again, the artifacts were not measured, but they were characterized by material type and alteration. Basalt accounted for 96% of the material represented, with minor amounts of quartzite (1%); other materials (3%) were of miscellaneous/unknown material (Minor et al. 1989:129). About 65% of the net weights were either fully or partially grooved, 33% were perforated, and 1% was notched (Minor et al. 1989:129). In all of these reports, aside from listing of material type and occasional mention of type of modification and notch placement, no mention was made as to size, shape, and thickness of these artifacts.

Methods

The study area encompassed the Spokane Arm of Lake Roosevelt, which stretches from Two Rivers to Little Falls Dam (Figure 2). Specific site locations and trinomials are not used due to tribal privacy requests. The seven sites of interest in this study are streamside campsites or villages, some of which were repeatedly occupied since the Early Archaic, while all were occupied since at least the Middle Archaic based on radiocarbon dates and projectile points recovered during past excavations. All of the sites contain fire modified rock features and/or freshwater shell middens. The majority of the artifacts were recovered from the surface, so their temporal context is unknown.

The artifacts included in this study originated from seven sites located along the lower Spokane River: four on the Lincoln County side, coded as Sites 1, 2, 4, 6, and three on the Stevens County side (Spokane Indian Reservation), coded as sites 3, 5, 7. The study included artifacts stored in the Spokane Tribe of Indians Collections Facility and artifacts located in the field. Collections facility artifacts were previously collected from the surface. The majority of field artifacts were located on the surface by pedestrian survey at previously recorded site locations, whereas a small minority were collected during controlled excavation. One artifact from Site 1 was excavated in



Figure 2. Map of study area (shaded).

association with charred organic material that returned a conventional radiocarbon date of $3,320 \pm 30$ years BP (two-sigma calibrated date range of 3635–3470 years BP [Beta#440718]). The metrics of maximum length, width, and thickness of 154 artifacts were measured using a sliding caliper and rounded to the nearest millimeter. The length-to-width (L:W) ratio was calculated to characterize the shape of the artifacts. Number and location of notches, as well as material type, were recorded. All objects measured in the field were replaced in their original location immediately after measurement.

Descriptive statistics were calculated for each site and for the pooled site samples. Inter-site comparisons then were made to determine if preferences for net weight size existed at different sites, which may have been a result of river current swiftness at different locations (Table 1). A one-way ANOVA test was performed to determine inter-site differences in the L:W ratio and thickness of objects. The comparisons of L:W were made between sites (Table 2). A chi-square test was used to investigate whether there was a significant difference between the observed and expected frequencies of material types at the different sites. The chi-square table included the categories “basalt” and “quartzite;” the remaining material types were pooled into a category called “other” due to the high number of cells containing no observed artifacts (Table 3).

Table 1. Summary Statistics of Three Attributes Measured

Attribute	n	Mean	Std. Dev.	Variance
Length	154	74.5 mm	10.7	114.9
Width	154	54.0 mm	7.1	50.5
Thickness	154	16.1 mm	4.6	20.7

Table 2. Summary Statistics of Length-to-Width Ratio

Site	n	Mean	Std. Dev.
1	23	1.44	0.23
2	24	1.33	0.17
3	19	1.38	0.23
4	13	1.3	0.18
5	10	1.4	0.27
6	27	1.37	0.14
7	38	1.46	0.24

Table 3. Chi-Square Analysis^a

Site	Quartzite	Basalt	Other
1	13 (12.8)	13 (11)	0 (2.19)
2	13 (11.8)	8 (10.1)	3 (2.03)
3	7 (7.9)	9 (6.75)	0 (1.35)
4	4 (6.42)	8 (5.49)	1 (1.1)
5	6 (4.94)	4 (4.22)	0 (.84)
6	13 (13.3)	11 (11.4)	3 (2.28)
7	20 (18.8)	12 (16)	6 (3.21)

^aobserved, (expected) frequencies

Results

Net weights were fashioned predominantly from quartzite (49%) and basalt (42%). The remaining material types included rhyolite, tuff, andesite, granite, and metasediment. Chi-square analysis showed a significant difference between observed and expected frequencies of material type occurrence at the sites at the 95% confidence level ($\chi^2=12.7$; $df=12$; $p=.389$) (Table 3). Notch placement overwhelmingly favored side notched to all other types. Side notching was found on 138 artifacts (90%), end notching occurred on one artifact, four artifacts possessed four opposing notches, nine had three notches, and two had a single side notch opposite a concave side.

The average net weight length was 74.5 mm, average width was 54 mm, and average thickness was 16.1 mm (Table 1). Length varied the most of the three attributes, followed by width, and finally thickness (Table 1). Figure 3 illustrates this in graphic form. Though all three attributes can affect the mass of the object, thickness was the least flexible raw material selection factor. The average L:W ratio for all sites was 1.39, which translates to an average net weight shape that is approximately 40% longer than its width (Table 2).

One-way ANOVA tests found no significant difference in the thickness attribute means among all sites, and the L:W ratio (thickness $F=1.83$, $p=.097$, $d.f.=6$; L:W $F=1.69$, $p=.13$, $d.f.=6$). Thickness varied the most at Site 1 and least at Site 2 (standard deviations of 8.7 and 2.5, respectively).

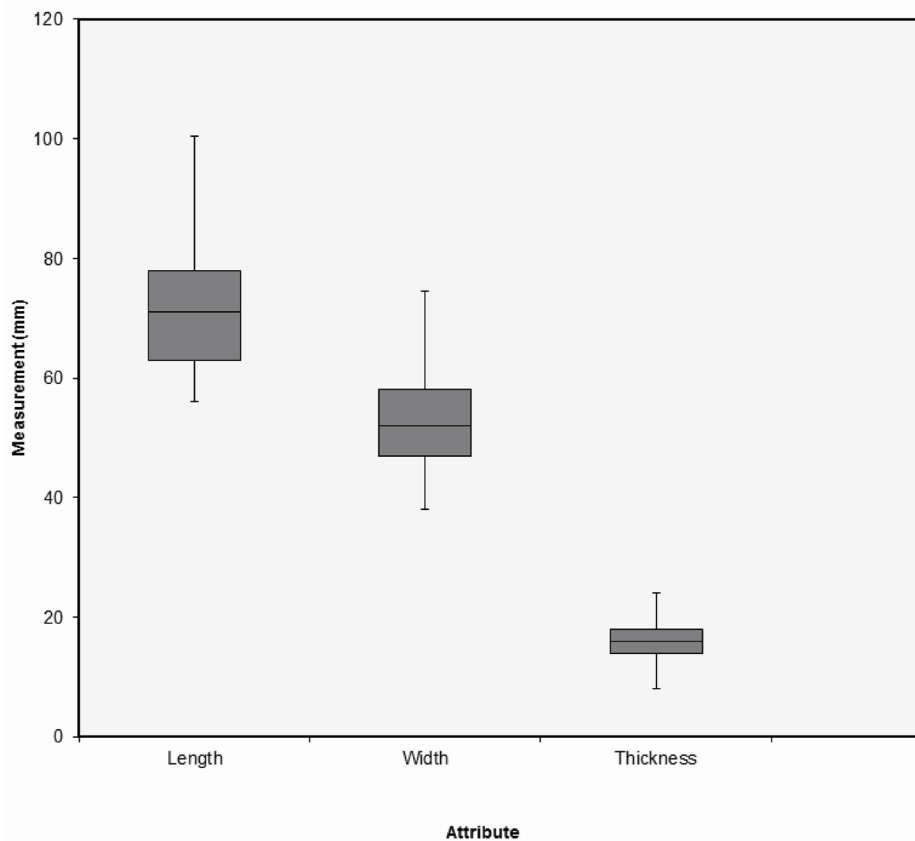


Figure 3. Box plot showing variation in attribute measurement.

Discussion

The assessment of cobble net weights has shed some light on raw material selection and modification. Quartzite and basalt were the most common materials used to make these objects, likely owed to their relative abundance along the Spokane Arm of Lake Roosevelt. Length and width were the most variable metrics, which implies that they were less important factors in raw material selection. However, the average thickness of the objects was 16.1 mm, which varied little and is likely correlated with the difficulty of modifying such durable materials as quartzite and basalt. Both of these materials are more difficult to modify than sedimentary materials used for net sinkers found at sites elsewhere (Draper and Olson 1991; Nadel and Zaidner 2002; Prowse 2010). Hence, the edges of thinner quartzite and basalt cobbles are more easily flaked. L:W ratio also varied considerably, suggesting that shape was not a significant factor in cobble selection, although there was a tendency toward stones with straight or concave sides.

Side notching was the most common notch placement pattern. This agrees with the assessment of Prowse (2010:78). This may be due to the long sides having a straight or even concave outline, which requires smaller notches and less effort to modify them, as opposed to the convex outline of the ends of the cobbles. Those cobbles with more than two notches may have had a more specialized function or were used for more than one purpose.

Indigenous Spokane people from the Middle Archaic through the historic period relied heavily on riverine resources during the winter. Dams installed in the twentieth century blocked the passage of migratory salmonids, halting fishing activities that had sustained native people for millenia. Chipped cobble net weights, though seemingly unimportant and simple to produce, played a key role in the acquisition of resources along the lower Spokane River through the ethnographic period. Their deposition in groups in middens suggests they served their purpose for fishing, then were removed from nets and left behind. Based on this study, cobbles used for this pursuit were chosen primarily for their thickness, which likely facilitated easy modification. Length and width were lesser factors in material selection, though a tendency toward an oblong shape is evident.

Future data collection should go beyond simply recording the presence of these artifacts. Spatial information and metrics should be included to build a database that could be used to make inferences about material selection (type, size, shape), time investment, net or trap size, and current swiftness of the water body in which they were utilized. Furthermore, variability in size, shape, notching patterns, and material type can be compared throughout the region to provide insight into the challenges that material availability and type of marine environment may have imposed on the production of these tools. Net weights recovered in association with dateable materials could help uncover diachronic patterns in distribution and manufacture between individual sites and across the region.

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