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# EXPLORING ANCIENT WOOD AND FIBER TECHNOLOGIES ALONG THE NORTHWEST COAST OF NORTH AMERICA

**Dale R. Croes and Kathleen L. Hawes**

**Abstract**

Well-preserved waterlogged/wet archaeological site explorations have revealed a focused use of wood and fiber technologies spanning more than 10,500 years along the Northwest Coast of North America. Major artifact categories represented include those for subsistence (e.g., wooden shank fishhooks and nets), manufacture (e.g., wooden wedges, wood chip debitage, and basketry element debitage), containers (e.g., basketry and wooden boxes/bowls), and tying elements (e.g., cordage and binding elements). The kinds of plants used for tools at different sites are explored. Also, technologies and styles used often reflect long-term cultural continuities in different regions—with focus here on wet sites in the recently renamed Salish Sea shared between British Columbia and Washington state.

## Introduction

Aquifer wet sites are commonly found along the entire Northwest Coast of North America, from southeast Alaska to southwest Oregon, with dates ranging from 10,700 cal C14 years B.P. through contact periods (Fig. 1). Aquifer wet sites are characterized by waters actively running through the archaeological deposits. This process results in a loss of oxygen content, creating an environment that preserves wood and fiber (but rarely leather, hide, hair or softer animal matter).

Several factors have combined to produce a large number of wet sites along approximately 10,000 miles (16,000 kilometers) of shoreline from all time periods of human occupation. The region is marked by abundant precipitation, caused by the North Pacific Drift, prevailing westerly winds, and the steep topography of the mountain barriers; these conditions have led to saturated landforms along the coastal waterways, where Northwest Coast peoples have subsisted throughout their past. Probably every sizable shell-midden site along the Northwest Coast, if explored with the intent to find a waterlogged area, would exhibit a wet site area with preserved wood and fiber artifacts. Unfortunately, wet site techniques and procedures have not been fully integrated into the learning traditions of archaeology programs in our region, so wet sites are rarely sought out by practicing archaeologists. This methodological weakness, however, is changing, as the potential of Northwest Coast wet sites to contain wood and fiber artifacts has caught the attention of native peoples of the region. Increasingly, native groups are working with archaeologists to explore wet sites to recover the wood and fiber materials that once made up over 90% of the Native material culture of the Northwest Coast (Croes 2012b).

The best known wet site is the Ozette Village wet site, located near Cape Alava in northwestern Washington state, where an entire section of an occupied Indian village was covered and encased by a successive series of massive clay mudslides. This situation provided a Pompeii-like complete artifact assemblage. Most Northwest Coast wet sites, however, are the result of various other environmental contexts and typically contain perishable artifacts that were broken and discarded at these locations. These sites, for the most part, have been discovered as a result of naturally occurring erosion (often a critical problem in itself). Other sites have been found below the water table level during the course of non-wet shell-midden excavations (Croes 2012b).

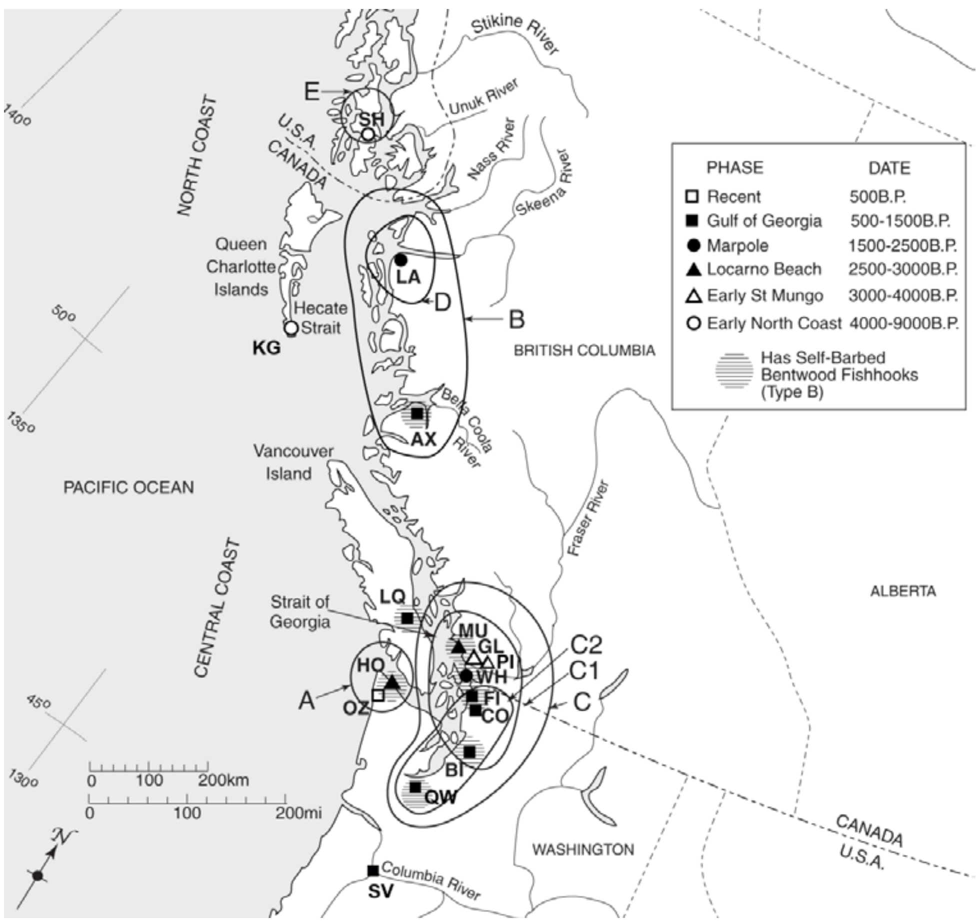



Fig. 1. Locations and general phases/time periods of major explored wet sites on the Northwest Coast of North America. This map denotes regions of ancient basketry style continuity on the Northwest Coast and locations where self-barbed bentwood fishhooks have been reported (see Croes 2001). Site abbreviations: SH: Silver Hole, KG: Kilgii Gwaay, LA: Lachane, AX: Axeti, LQ: Little Qualicum River, MU: Musqueam NE, GL: Glenrose, PI: Pitt Polder, WH: Water Hazard, FI: Fishtown, CO: Conway, BI: Biederbost, Qw: Qwu?gwes, HO: Hoko River, OZ: Ozette; SV: Sunken Village (Matson, Coupland and Mackie 2003).

The purpose of this article is to first review the methods used to identify the types of materials often recovered at wet sites, and describe the plant preferences that native peoples had for making various items such as wedges, fishooks, basketry, cordage, and nets. Second we use wet sites from the recently named Salish Sea region to explore a different pattern for distribution of wet site basketry artifacts when compared to stone, bone-antler, and shell artifacts. Our hope is that our work will stimulate more native peoples and archaeologists to work together to recover and understand the rich assemblages of wood and fiber materials recovered from coastal wet sites.

## Identification of Ancient Wood/Fiber Artifacts used at Northwest Coast Wet Sites

For over 10,500 years, we see similar plants used in making wood and fiber artifacts on the Northwest Coast. Native experts have developed a complex understanding of the plant properties and how different parts of the same plant (limbs/boughs, heartwood, inner bark, roots, etc.) can best be used to construct native material culture. Often, we find a specific plant was used widely, such as *Thuja plicata* (western red cedar), though different parts of the plant may have been emphasized in different regions at different times in making their basketry and/or cordage. For example, the ancient outside West Coast peoples emphasized inner cedar bark basketry construction, whereas the ancient inside Gulf of Georgia/Puget Sound peoples emphasize splint cedar bough basketry construction—a cultural preference for using different parts of the same plant through time.

To identify the ancient plant species and part of the plant that was used to fashion the items found archaeologically in a wet site, a cellular analysis is conducted. The cellular identification of ancient wood and fiber artifacts was pioneered in the 1970s by Janet Friedman at the Ozette Village wet site (Friedman 1975, 1978, 2005). Expansion of this work continues, as shown by a case study from the Qwu?gwes wet site. This case study, described below, illustrates the basic importance of distinguishing the use of hardwoods and softwoods, especially for the construction of fiber basketry and cordage artifact; hardwood barks appear to be have been used at Qwu?gwes more than at any other Northwest Coast wet site to date. Results revealed an emphasis on big leaf maple bark (*Acer macrophyllum*) for woven basketry, cordage (especially braids) and nets.

Cellular analysis of archaeological wood involves taking samples with a sharp razor blade from three sections of a piece of wood: tangential, radial and cross-section (Fig. 2). Samples are then placed onto glass slides, and viewed with a compound microscope. Differences between deciduous hardwoods and coniferous softwoods can be quickly identified by this method, and unique characteristics between softwoods can be observed in the rays, tracheids, and pit features.

### *Softwoods*

Softwoods (gymnosperms), also called conifers, when microscopically viewed, have tracheids, which are long thin cells that conduct water vertically along the length of the tree. In cross-section, the tracheids appear as small holes (Fig. 3, left). The long thin tracheids can be seen running vertically in the tangential section view, the area of wood that begins just under the bark (Fig. 3, center).

Ray cells, composed of parenchyma and tracheid tissue, also appear in the cross-section view similar to spokes of a wheel radiating out from the center of the stem. The ray cells can be a few or many cells in height but in softwoods is generally only one cell in width (uniseriate); the ends of several rays are visible in the tangential section view. Fig. 4 illustrates the various cell elements described above in a modern sample of western red cedar (*Thuja plicata*).

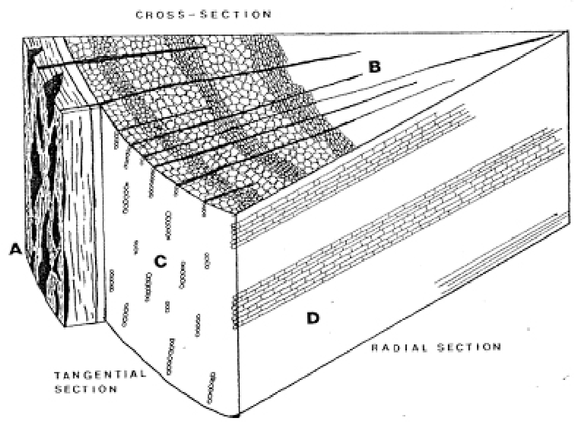



Fig. 2. Stylized piece of wood, with the orientations used for sampling and identification labeled. Samples are taken from these orientations with a sharp razor blade, and then viewed microscopically (Friedman 1978:3).

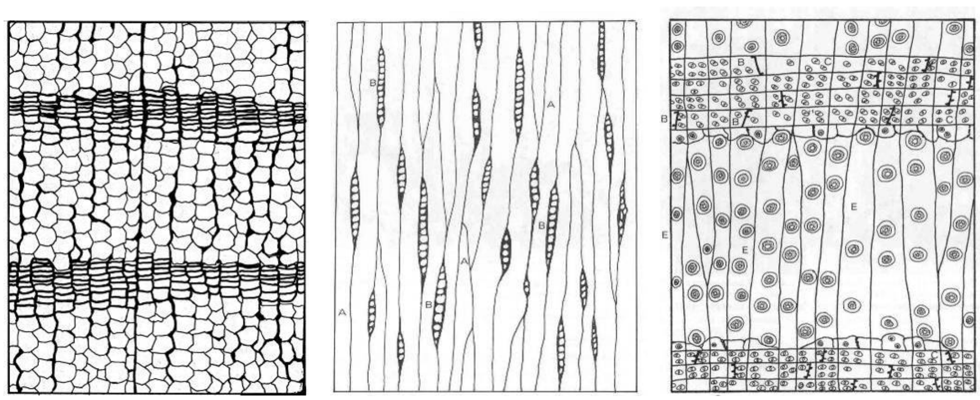


Fig. 3. Stylized drawings of (from left) cross-section, tangential section, and radial section views of a typical softwood (Friedman 1978).

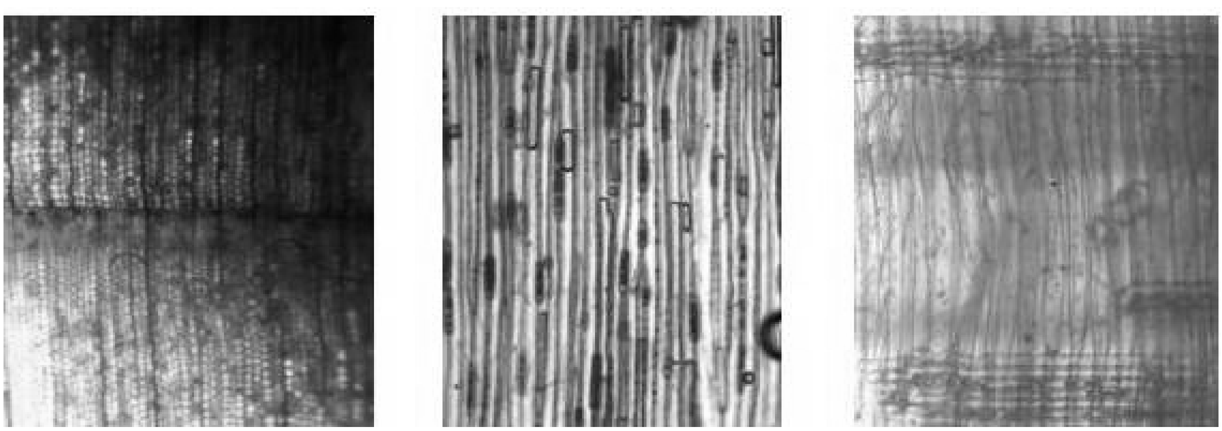


Fig. 4. Samples of western red cedar (Thuja plicata) wood (left to right): cross-section, tangential section, and radial section views (100x magnification).

*Hardwoods*

Hardwoods (angiosperms) are flowering plants and trees that have broad leaves that usually change color and die every autumn. Bigleaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), and bitter cherry (*Prunus emarginata*) are examples. The most reliable way to distinguish between a softwood and hardwood microscopically is to examine the cross-section view. Hardwoods, in addition to tracheids, contain thick-walled fibers and large vessel elements. Vessels are specialized cells in hardwood for conducting water and dissolved salts (Pearsall 1989:157). In the cross-section view, vessels are seen as large pores contrasting with the smaller fibers (Fig. 5, left).

The arrangement of the pores in cross-section can be used to identify different hardwoods, as each genus, and frequently species, has unique patterns of these pores, as seen in Fig. 6. Red alder is a diffuse-porous hardwood, with medium-sized pores distributed fairly evenly across both early and latewood. Bitter cherry is also a diffuse-porous hardwood but has a row of pores following the growth ring. Garry oak (also known as Oregon white oak) is a ring-porous hardwood, with a larger row of pores in the earlywood along the edge of the growth ring and smaller pores in the latewood. The vessels in Garry oak also have spidery inclusions called tyloses (Pearsall 1989:158).

Hardwood rays as seen in cross-section can be uniseriate or two or more cells in width (multiseriate), and some species such as Garry oak (*Quercus garryana*) have very wide rays that are diagnostically important in identification (Fig. 6, right).

In the tangential section view, the ends of the rays are visible, as well as the vessels seen running vertically (Fig. 5, center). The individual vessel elements are arranged end to end and are connected by perforation plates; these can be simple holes as in bitter cherry and Garry oak or scalariform, appearing as a ladder-like pattern across the end of the vessel element, as found in red alder. Several hardwood species include spiral thickening in tracheids and vessels, aiding in identification.

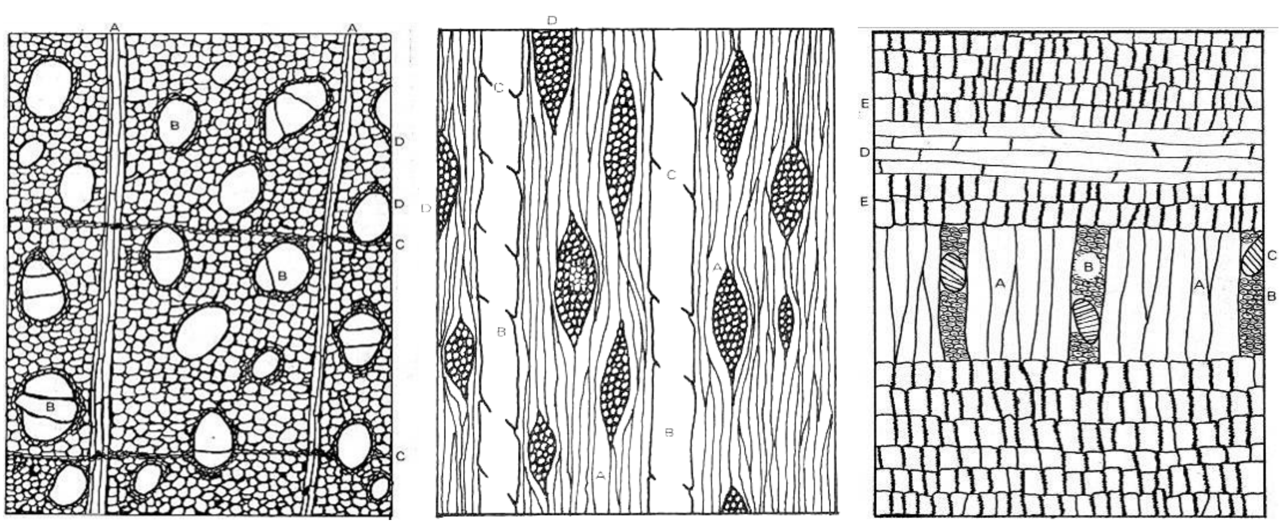


Fig. 5. Stylized drawings of (from left) cross-section, tangential section, and radial section views of a typical hardwood (Friedman 1978).

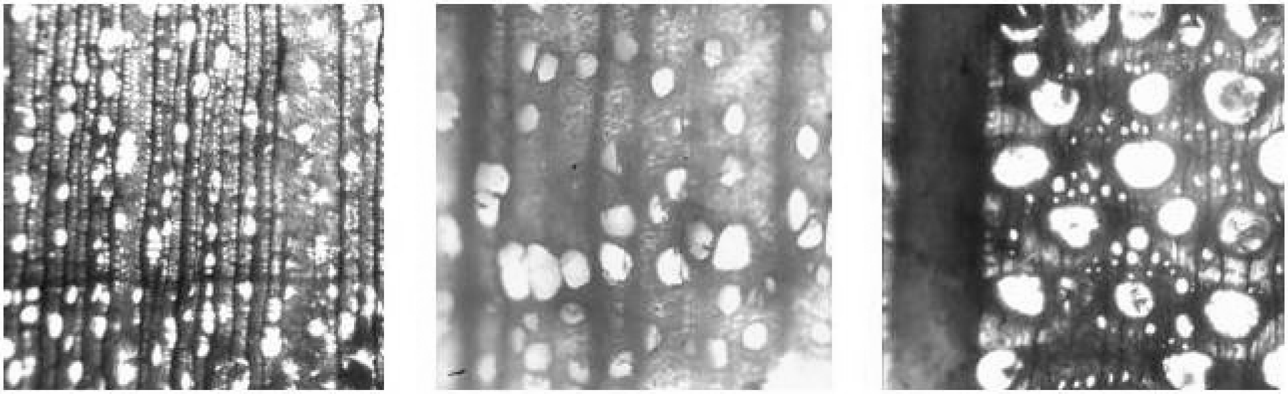


Fig. 6. (From left to right) Cross section views of red alder (Alnus rubra), bitter cherry (Prunus emarginata), and Garry oak (Quercus garryana) showing differing pore arrangements (100x magnification).

*Characteristics of Softwood Bough and Root Fibers*

The process of identifying plant materials and fibers used in basketry and cordage is similar to that of wood; however, not all orientations may be visible. Materials used in basketry such as western red cedar roots and boughs, usually have the cross-section and radial section views available, and occasionally the tangential section can be obtained. In these woody elements, tracheids and rays can be viewed for identification. Differences between bough and root are identifiable microscopically; the wood of boughs has central pith, and the growth rings are similar to trunk wood, with thicker-walled tracheids several cells wide forming the latewood. In root material, the cells are larger and more thin-walled compared with bough material, with a vascular stele in the center, and although growth rings can be found, they consist of fewer cells (Fig. 7).

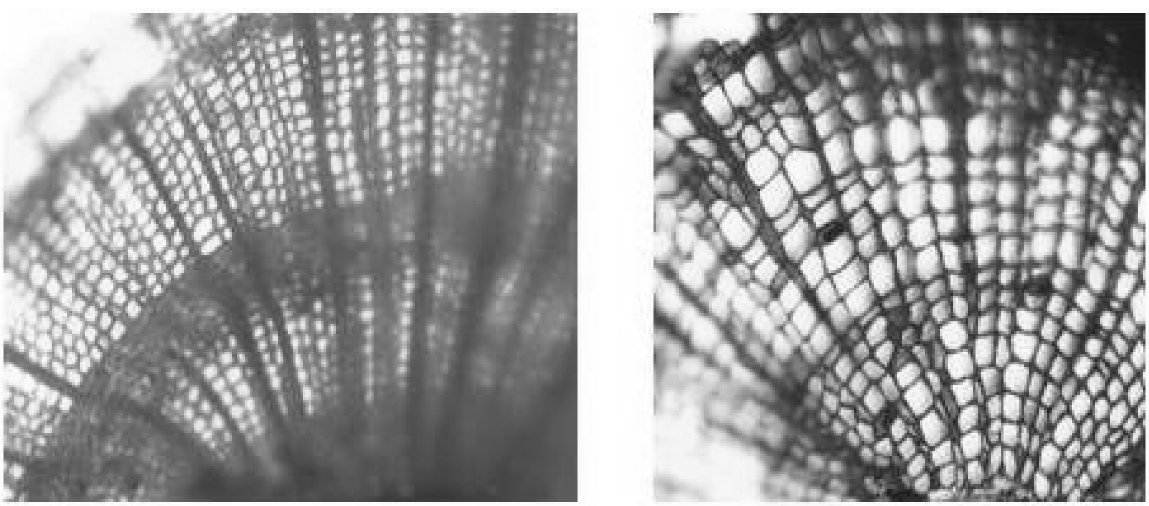


Fig. 7. Cross-section views of western red cedar bough (left) and root (right). Photos courtesy of Vernon Veysey and Daniel Rowley, 2009.

*Flat Inner Bark Elements*

For flat inner bark elements found in checker and twill weaves and braids, the cross-section and/or radial views may not be obtainable. In this case, identification is based primarily upon the tangential section view. Tangential section views can also be obtained from twisted cordage and knots. The secondary phloem tissue of western red cedar (commonly referred to as “bark,” although not a true outer bark) is commonly used for these artifacts and often can be identified visually by a characteristic appearance with “fraying” of the fibers, especially after use. This characteristic can also be seen microscopically (Fig. 8).

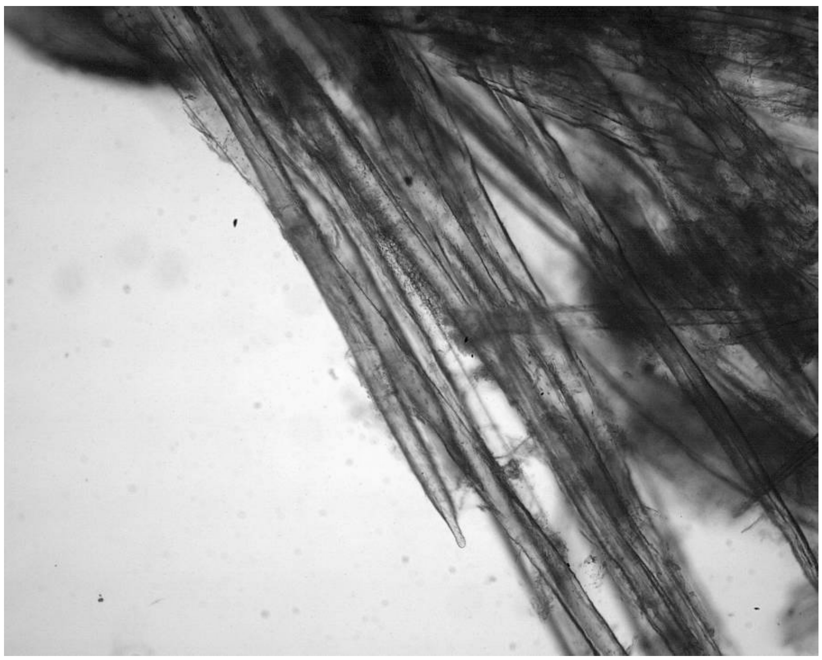


Fig. 8. Western red cedar bark showing “frayed” qualities.

The use of cedar bark for basketry, cordage and clothing has been well-documented among tribes along the Northwest Coast (Stewart 1984:113–153). This indispensable fiber, the inner phloem tissue below the outer layer of western red cedar bark, was traditionally gathered in spring when the sap began to run and the inner bark separated more easily from the tree wood. It was dried in large bundles, to be later softened by soaking in water when needed. Strips of varying widths were split and thinned from the lengths of bark and woven into mats and baskets of various sizes. Cedar bark was also shredded for use in clothing, twisted into string and cordage and pounded into a soft fiber used in infants’ bedding and diapers. Yellow cedar (*Chaemocyparis nootkensis)*, less commonly found growing in lowland areas than western red cedar (Pojar & McKinnon 2004:43), was also used in similar ways.

An example of a case study of plant material identification at the Qwu?gwes wet site provides an examples of basketry originally thought to be western red cedar bark, but had a thinner, layered single-element bark-like appearance and lacked the characteristic frayed attribute of cedar bark (Fig. 9). The construction materials of these artifacts, often tumpline straps, strongly resembled the inner phloem fibers of big leaf maple bark (*Acer macrophyllum*), which separates easily into thin sheets when deteriorated or dry (Florian 2002:70; Fig. 10). Microscopically, the fibers also lacked softwood tracheids and included characteristic hardwood multiseriate rays (Fig. 11). Among the basketry identified as woven from big leaf maple bark is a checker weave folded bag/mat. This distinct basketry piece revealed an overlay grass-like white element that presented a pattern across the surface (Fig. 12).


Fig. 9. Twill-on-bias tumpline fragment with layered single- element appearance (N16E14, 45-50, 2006).

Fig. 10. (Left) Modern big leaf maple (Acer macrophyllum) bark from a mature downed log; (Right) close-up of maple secondary phloem fiber—note the characteristic separation into numerous thin sheets.

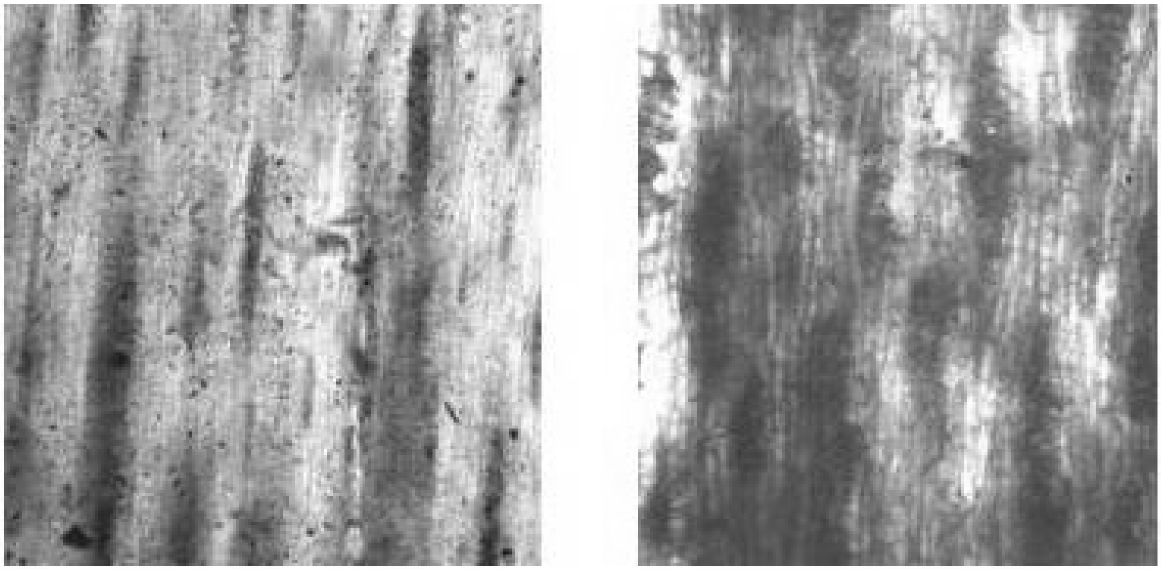


Fig. 11. (Left) microscopic image of sample from ancient tumpline or braid; (Right) microscopic image of modern secondary phloem fibers of big leaf maple (100x magnification).

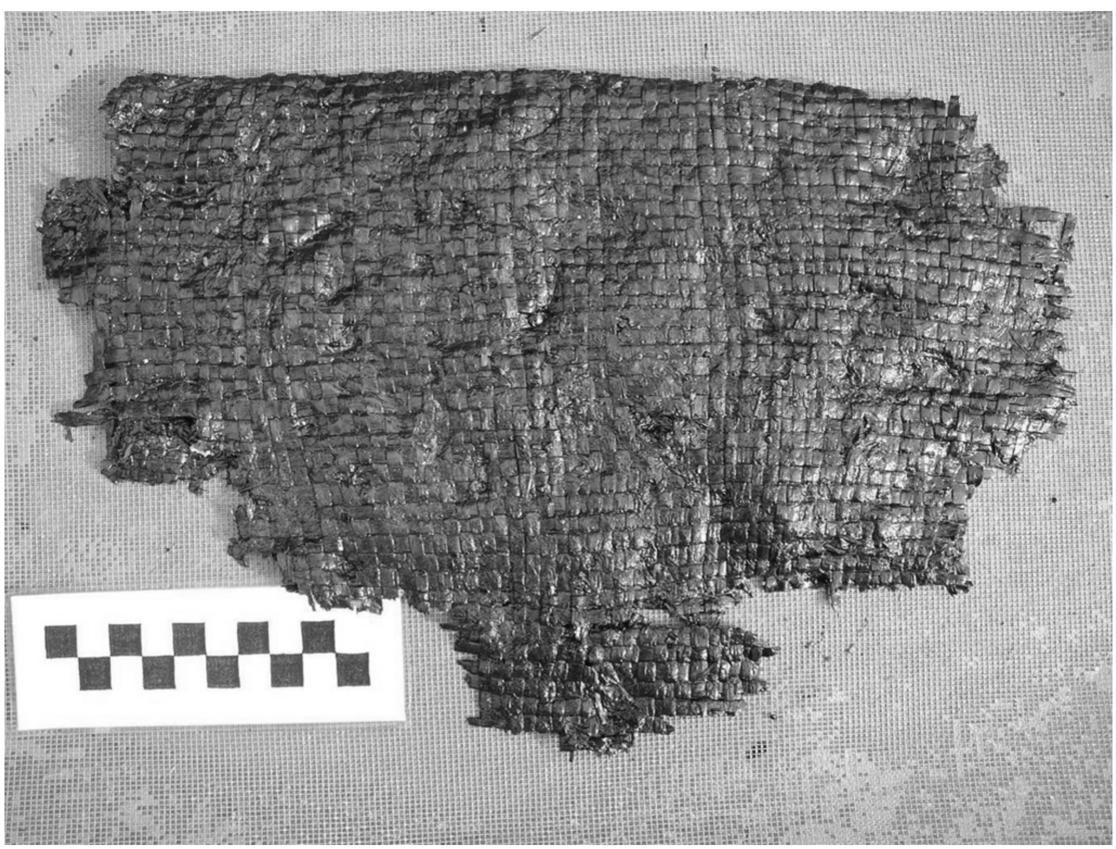


Fig. 12. Example of fine gauge checker weave "matting" identified as big leaf maple (Acer macrophyllum) (N21E14, 55–60, 2004).

Following this discovery, it became clear that the majority of the Qwu?gwes twisted two-strand and braid cordage also was big leaf maple bark (Fig. 13). In the first year of excavation at Qwu?gwes in 1999, a net was recovered from the waterlogged shell midden area, and fragments of net were also discovered in all future years. Although the net fragments appeared to be cedar bark, cellular analysis identified the net and net fragments to be maple bark. This difference is an unusual find, as no recorded ethnographic or archaeological evidence has been found for the use of big leaf maple bark in construction of nets.

Fig. 13. Braid fragment (N19E12, 50–55, 2007) used to confirm cellular identification of material as big leaf maple bark by Mary-Lou Florian, Research Associate, Royal British Columbia Museum, Victoria, B.C., Canada.

Recent examination and cellular analysis of a braid fragment recovered from the Sunken Village wet site (35-MU-4) in 2007 from Transect III Pit E revealed that the material used in this artifact was also a hardwood, and comparisons with the braid and cordage artifacts from the Qwu?gwes wet site and modern samples of big leaf maple bark identify this braid fragment as woven from big leaf maple. All other cordage and checker weave artifacts examined from Sunken Village were constructed from western red cedar bark. It is possible that the use of this material is more widespread than previously thought and further examination of archaeological cordage and basketry from this area, as well as from other sites in the Northwest, may reveal more examples of the use of big leaf maple's inner phloem fibers.

There is also ethnographic documentation of the use of maple bark on the Northwest Coast. Erna Gunther mentions the use of maple bark for rope and tumplines (1973:39); and carrying straps braided of maple bark and overlaid with beargrass by Puget Sound Tribes (Haeberlin and Gunther 1975 [1930]:33). Maple bark was interwoven with cedar bark strips for use as bowls by the Cowlitz (Gunther 1973:20), and baskets were made from young maple bark for storing acorns in mud by the Chehalis (Gunther 1973:28). The Burke Museum at the University of Washington in Seattle houses baskets in their collections that have maple bark used in their construction, including a vertically twined soft bag with attached tumpline of maple bark and beargrass (Catalog ID:118) collected from Skokomish by Myron Eells around 1892–1893.

An image taken in 1910 shows a young Muckleshoot girl wearing a skirt and cape of shredded cedar bark, with a tumpline woven of maple bark overlaid with beargrass and attached to a basket on her back (Fig. 14; Suttles and Lane 1990: 494).

The use of maple bark has also been documented in other areas of the Northwest Coast. In the north, the Nisga'a of the Nass River and the Gitxsan of the Skeena River in northwestern British Columbia traditionally use both cedar and maple bark in basketry (Laforet 1993:218–231). To the south, the Siletz of the central Oregon Coast traditionally use maple bark for skirts (Robert Kentta, personal communication, 2008); and, at a traditional Renewal Ceremony in 2008, Hawes observed dancers wearing maple bark skirts.

Other archaeological evidence for the ancient use of maple bark by native people is also recorded. At the Glenrose Cannery Archaeological Site (DgRr-6) wet component in British Columbia, which dates to between approximately 4590 and 3970 years B.P., six open wrapped basketry fragments were recovered; four were constructed of true fir (*Abies sp*) with maple bark wrapping and two were entirely constructed from maple bark (Eldridge 1991:30, 37).

Fig. 14. 'Muckleshoot girl, granddaughter of Anne Jack, wearing skirt and cape of cedar bark, which were effective in shedding rain. The tumpline is made of maple bark imbricated with bear grass' (Suttles and Lane 1990:494).

## Wood/Fiber Preferences for Key Ancient Artifact Categories from Northwest Coast Wet Sites

With a growing understanding of plant cellular identification, we can begin looking at the plants and plant parts (wood, bark, boughs and roots) that were preferred for over 10,500 years along the Northwest Coast. Ancient ethnobotanical cultural knowledge transmission often reflects a preference for certain plant or plant parts in making artifacts. As mentioned, some Northwest Coast peoples used the inner bark of the western red cedar (*Thuja plicata*) for basketry and cordage, while others emphasized the use of cedar boughs (splint or twisted).

To illustrate further, we summarize current knowledge of ancient flora construction materials and plant preferences for making ancient (1) wooden wedges, (2) wooden fishhooks, (3) basketry, (4) cordage (including binding straps) and (5) nets.

### *Wooden Splitting Wedges*

The use of wood-splitting wedges, often with a cordage collar on the poll or proximal end, is recorded along the entire Northwest Coast for over 10,500 years, showing the incredible success of this wood splitting technology for at least that period (Table 1). These tools are used to split planks and split out dugout canoes, and also as a primary tool in splitting firewood. The wood used in the production of wedges tended to differ among sites and possibly through time (Table 1). Salish Sea sites of Hoko River, Little Qualicum River, Water Hazard and Musqueam Northeast mostly had wedges made with Pacific yew (*Taxus brevifolia*), while Ozette wedges generally are Sitka spruce (*Picea sitchensis*). Ethnographically, yew wood has been cited as the preferred wood for wedges because of its structural (compression) strength (J. Friedman 1975:115–121). Although Lachane and Ozette wedges were most often made of western fir (*Abies grandis*) and Sitka spruce (*Picea sitchensis*), in both cases the wood used exhibits a condition called compression—or reaction wood (Inglis 1976:166, J. Friedman 1975:121). This kind of wood typically is found on the underside of leaning coniferous trees and is noted for its structural strength (J. Friedman 1975:122). Even though Lachane and Ozette wedge makers did not use yew as the main wedge material, they demonstrated knowledge of wood properties by using the strongest portion of the wood types chosen for the purpose.

### *Wooden Fishhooks*

Over 1,300 wooden shanked fishhooks of three types have been recovered from Northwest Coast wet sites, of which 240 are the self-barbed bentwood fishhooks (called Type B; Fig. 15; Croes 1997, 2001, 2003). The Type B fishhook has the widest distribution in wet sites on the Northwest Coast (see distribution in map, Fig. 1) with at least seven sites recording them, and dating from 500–3000 years ago (Croes 1997, 2001, 2003).

The c. 3,000–2,600 B.P. Hoko River wet site (45-CA-213) has the most Type B hooks recorded (n = 109, with 35 preforms). The fishhooks are believed, through experimental archaeology, to have been used for cod in the off-shore fishing grounds (Croes 1995). Hoko bentwood hooks were shaped from Sitka spruce (*Picea sitchensis*) and true fir (*Abies* sp) (n = 109, Croes 1995:84). The Water Hazard DgRs 30 site in British Columbia yielded seven bentwood hooks, dating to c. 1,980–1,580 B.P. and made from Douglas-fir (*Pseudotsuga menziesii*, Bernick 1989:37). One bentwood hook recovered from the Little Qualicum River Site DiSc 1, British Columbia (Fig. 1), was constructed of fir wood (*Abies spp*) and dated between c. 1,030 and 730 B.P. (Bernick 1983:325). A possible Type B hook was found at the Qwu?gwes wet site (45-TN-240), southern Puget Sound, and is made of western hemlock (*Tsuga heterophylla*) (Hawes 2013).

This type of fishhook does not appear to have been used any longer at contact on the Central Northwest Coast; however, it continued to be used at contact by the Haida and other North Coast groups, who continued using it into the historic period (Croes 1995:104; 1997:607; 2003:54) and typically were used for cod fishing.

TABLE 1. WOODEN WEDGES FROM NORTHWEST COAST WET SITES

| Site | Time Period | No. of Wooden Wedges | Dominant Material Type | Reference |
|---|---|---|---|---|
| **Ozette Village (House 1)** | 300 BP | over 1,000 | Sitka spruce | J. Friedman 1975, 1978; Gleeson 1980, 2005 |
| **Conway** | 500-1000 BP | none recorded | | Munsell 1976:106 |
| **Fishtown** | 500-1000 BP | 5 | ? | Onat 1976:131 |
| **Qwu?gwes** | 500-1000 BP | possibly 1 | western hemlock (Tsuga heterophylla) | Hawes 2013 |
| **Little Qualicum River** | 500-1500 BP | 4 | yew | Simonsen 1976:71; Bernick 1983:326-328 |
| **Axeti** | 500-1500 BP | 21 | ? | Hobler 1970:91 |
| **Lachane** | 1500-2000 BP | 75 | western fir | Inglis 1976:170 |
| **Biederbost** | 1500-2000 BP | present | ? | Croes 1980 |
| **Water Hazard** | 1500-2000 BP | 44 | yew (4) | Bernick 1989:32-37 |
| **Hoko River** | 2500-3000 BP | 47 | yew | Croes 1976:213–214, 1980:268–273, 1995:156–161 |
| **Musqueam Northeast** | 2500-3000 BP | 18 | yew | J. Friedman 1975; Archer and Bernick 1990:27 |
| **Glenross Cannery** | 3500-4500 BP | possibly 1 | ? | Eldridge 1991:51 |
| **Kilgii Gwaay** | 9500-10,500 BP | 5 | western hemlock (Tsuga heterophylla) (1), Sitka spruce (1) | Fedje, A. Mackie, Wigen, Q. Mackie and Lake 2005:187-203; A. Mackie personal communications 2012 |

*Basketry*

Ozette basketry materials are defined in Table 2 and shows how an example of different parts of the same plant (e.g., western red cedar *Thuja plicata*) is used. Under the category “modification,” an idealized cross-section through the designated plant part is drawn to illustrate the general method of splitting, thinning, or sectioning. Of the major Northwest Coast wet sites, Ozette has the largest basketry sample (446 examples, not including basketry fragments, from House I alone; Croes 1977). Basketry from other sites varied from 12 to 130 specimens.

Sample size is carefully noted in the comparisons. It should be pointed out that the Ozette Village basketry sample consisted of relatively complete specimens, rather than the generally fragmentary specimens found at most other wet sites. Controlled excavations and labeling techniques at most of the sites being compared indicate which fragments belong to a single specimen.

Most Northwest Coast wet sites have basketry artifacts constructed from similar materials as used at the Ozette Village site. However, the frequency of these basketry materials varies markedly among the different sites. If one compares the frequency graph (Fig. 16) some important patterns can be observed. The two northernmost sites, Lachane and Axeti, have a strong stress on the use of cedar bark basketry materials (100% and 96% respectively) (Fig. 16). The Puget Sound/Gulf of Georgia sites have a 3,000 year duration with a strong stress on cedar splints basketry materials (from 60–98%; Fig. 16). The three earlier sites (2000–3000 years ago: Musqueam NE, Water Hazard, and Biederbost) show the strongest emphasis on splints (90–98%) while the later sites (within the last 1,000 years: Fishtown, Conway and Qwu?gwes) continue to show a strong use of cedar bough splints for approximately 60% of their basketry) (Fig. 16). The Hoko River site on the other hand has a strong emphasis on cedar bark followed by cedar splints, splints/cedar bark, and root basketry materials (Fig. 16). Thus, of the Puget Sound/Gulf of Georgia sites show a positive correlation, whereas the Hoko River site is most similar to the Ozette Village site to which it is spatially very close (Map, Fig. 1), but temporally separated by about 2,500 years. The Little Qualicum River wet site is more diverse in its material selections, and possibly can be considered transitional between major cultural area. These trends were recognized in earlier studies of basketry and statistically correlated (Croes 1977:25–31).

*Cordage*

Northwest Coast wet site cordage is made from different plant parts that are often twisted, braided, or used as flat strip elements (Table 3).

In comparing Northwest Coast wet sites with over 500 examples of cordage (Fig. 17), Hoko River is distinctive because it has revealed such a high percentage of string-gauge, Sitka spruce-rootlet cordage (Croes 1980; Bernick 1983, 1989). The high frequency of spruce-root strings probably reflects, in part, their use as the sewing element in tule mats (HO-M1, Croes 1995:136–138), which were common at Hoko River. Most likely, the mats were used as wall coverings for temporary fishing camp shelters. Thus, the high occurrence of spruce-root strings in the archaeological record appears to be due to the fact that worn-out and fragmented mats were discarded in the offbank area (Croes 1995:136–138, 144).

At Ozette, on the other hand, the most emphasis was given to the use of cedar-bough cordage. This, in part, may reflect the fact that large numbers of single-strand cords were used to hold, in a sling-fashion, the wall boards tied between the double house wall poles (Croes 1980:71–75; Mauger 1978:96–101, 1991:103–107).

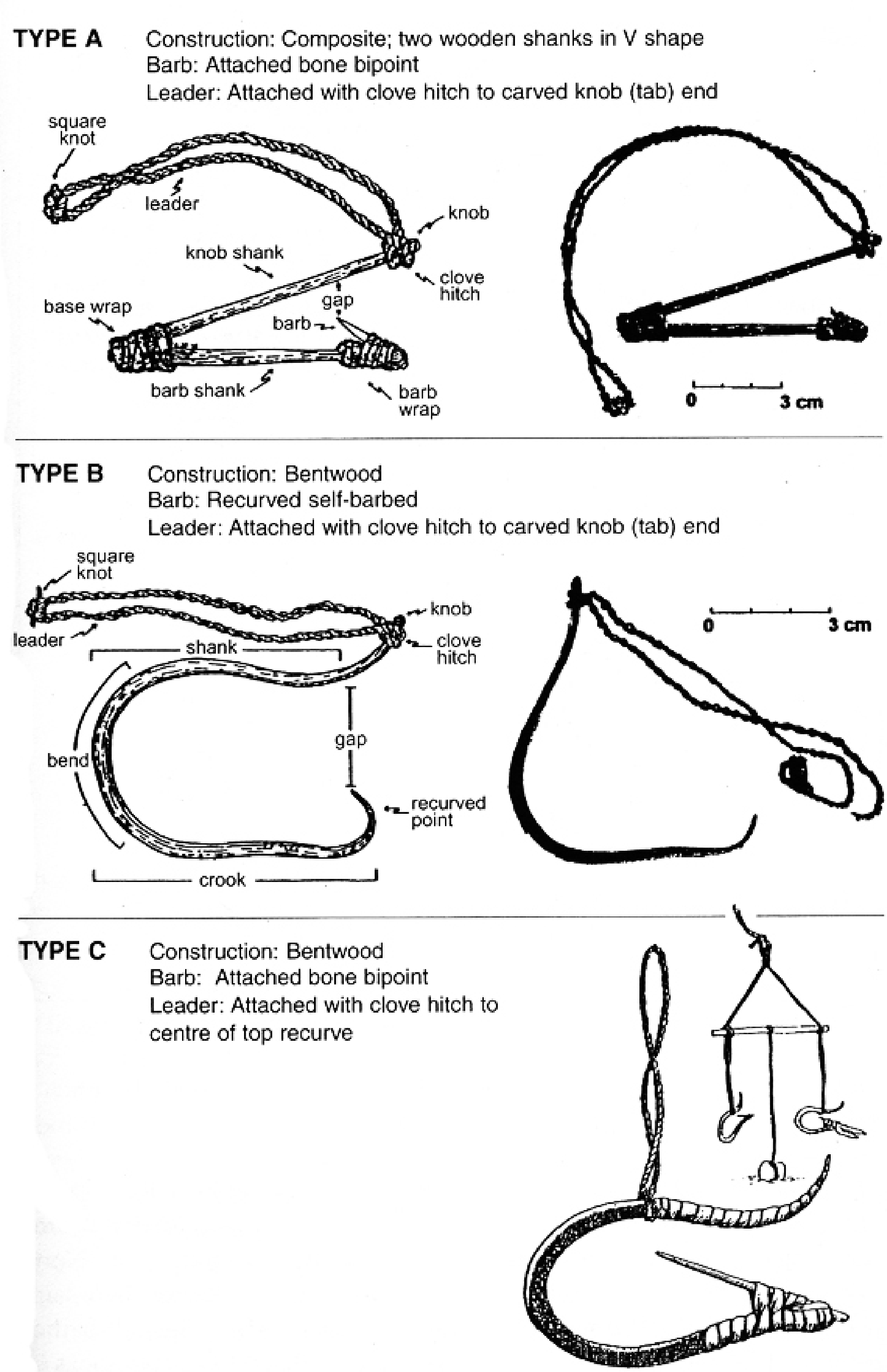
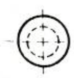
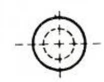
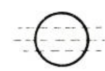
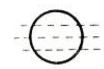
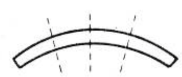
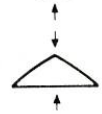



Fig. 15. Definition and illustrations of the three major Northwest Coast wet site fishhook types recovered to date. Type A and B illustrated by Ricky Hoff (1980:163, 166); Type C, Hillary Stewart (1987:89). Photo profiles are examples from the Hoko River site (Croes 1995).

TABLE 2. BASKETRY MATERIALS DEFINED

| | Plant | Plant Part | Modification; X-Sec. | | Name |
|---|---|---|---|---|---|
| 1. | *Thuja plicata* | + root | + curvilinear split splints |  | Cedar Root Splints |
| 2. | *Picea sitchensis* | + root | + curvilinear split splints |  | Spruce Root Splints |
| 3. | *Thuja plicata* | + boughs (limbs) | + flat split splints |  | Cedar Bough Splints |
| 4. | *Acer circinatum* | + boughs (limbs) | + flat split splints |  | Vine Maple Bough Splints |
| 5. | *Thuja plicata* | + inner cortex of bark | + split ribbon strips |  | Cedar bark Strips |
| 6. | *Prunus emarginata* | + bark *(?)* | + cut ribbon strips |  | Cherry Bark Strips |
| 7. | *Xerophyllum tenax* | + leaves | + edges scraped |  | Bear Grass |
| 8. | *Carex sitchensis* | + leaves (blades) | + split sedge blades |  | Split Beach Grass |
| 9. | *Scirpus acutus* | + stems | + flattened |  | Tule (Bulrush) Stems |
| 10. | *Typha latifolia* | + leaves | + flattened |  | Cattail Leaves |

At Axeti, the most emphasis was placed on the use of cedar-bark multi-strand cordage of several types (Croes 1980). Water Hazard and Musqueam Northeast appear to have had similar ratios of emphasis on cedar bark and cedar bough cordage (see Fig. 17). However, considerable caution must be taken regarding this pattern, because (1) the Water Hazard artifacts were affected by a dredging operation; therefore, it is difficult to say how fragmented the cordage became when redeposited (Bernick 1989), and (2) the Musqueam Northeast cedar-bark cordage statistics are the result of a high count of net fragments, which actually appears to represent four clusters, or possibly four nets (Archer and Bernick 1990:164). Therefore, these statistics should only be considered a reflection of general trends.

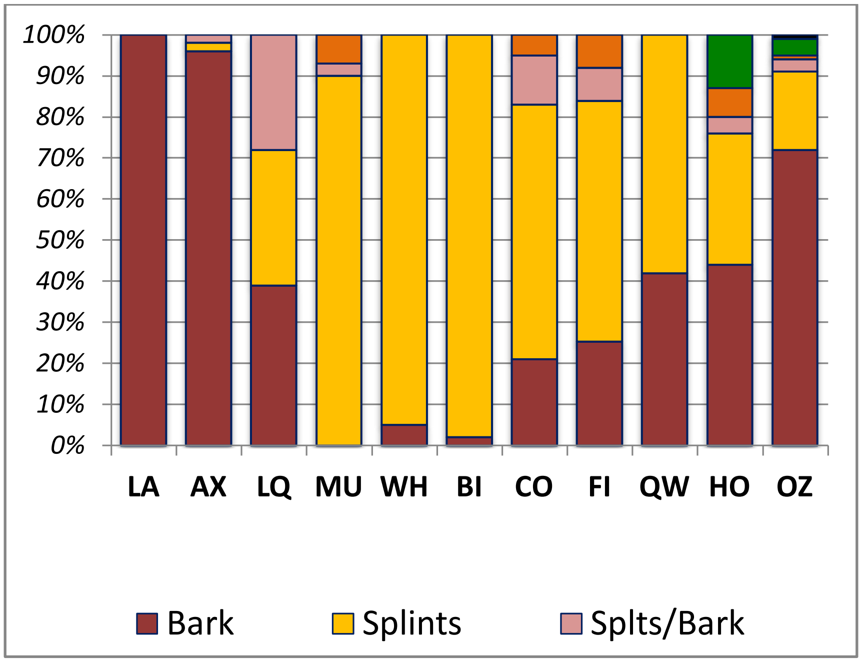



Fig. 16. Northwest Coast wet site basketry construction material emphases: LA=Lachane (N=27), AX=Aexti (N=46), LQ=Little Qualicum River (N=18), MU=Musqueam NE (N=130), WH=Water Hazard (N=102), BI=Biederbost (N=41), CO=Conway (N=42), FI=Fishtown (N=12), QW=Qwu?gwes (N=26), HO=Hoko River (N=202), and OZ=Ozette Village (N=446) (see map, Fig. 1, above).

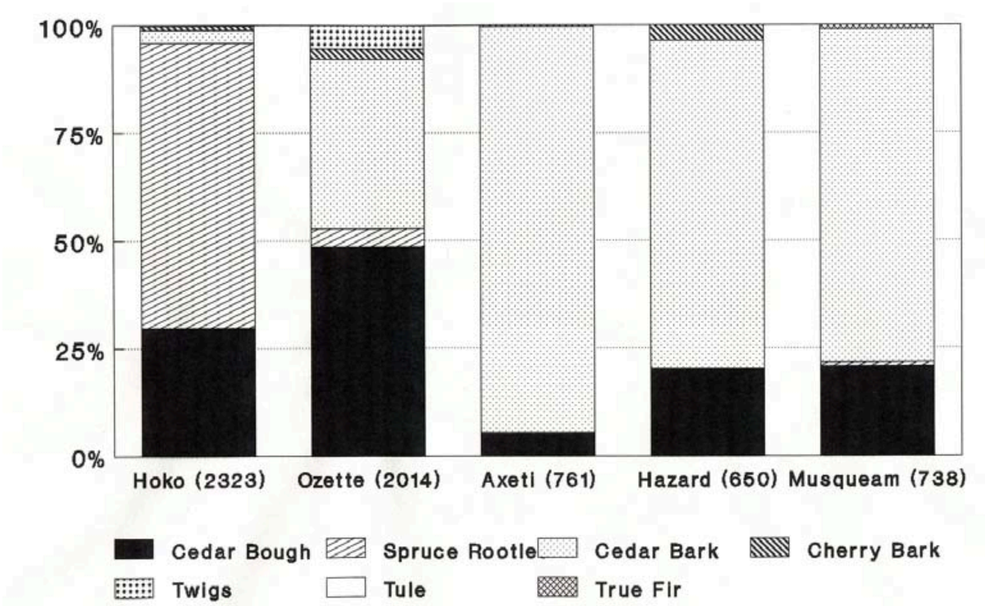



Fig. 17. Percentages of cordage construction material identified at five Northwest Coast wet sites. Based on over 500 examples.

TABLE 3. COMMON NORTHWEST COAST WET SITE CORDAGE MATERIALS

| Plant | Plant Part | Modification; X-Sec. | | Name |
|---|---|---|---|---|
| 1. *Thuja plicata* | + Bough | Twisted |  | Cedar bough withe |
| 2. *Thuja plicata* | + Inner cortex of bark | + Split ribbon strips |  | Cedar bark strips |
| 3. *Picea sitchensis* | + Root | + Twisted |  | Spruce root withe |
| 4. *Thuja plicata* | + Twigs | + Split in half |  | Cedar twigs |
| 5. *Prunus emarginata* | + Bark | + Cut ribbon strips |  | Cherry bark strips |
| 6. *Thuja plicata* | + Bark | + Shredded and twisted fibers |  | Twisted cedar bark fibers |
| 7. *Thuja plicata* | + Root (?) | + Split through center |  | Splint strip |
| 8. ***Acer macrophyllum*** | + Inner cortex of bark | + Split ribbon strips |  | Maple bark strips |

As a form of cordage, coiled strips of cherry bark binding have been found in all extensively excavated Northwest Coast wet sites (Fig. 18). At Qwu?gwes, and other Northwest Coast wet sites, these curls often occur independently, probably examples of discarded surplus from the ends of strips, unwound from artifacts, or stored for later use. Qwu?gwes has more cherry bark curls than all other Northwest coast wet sites combined, even the extensively excavated Ozette Village Wet Site (Fig. 18). However, few cherry bark curls were used to bind the artifacts found at Qwu?gwes. Therefore, it is believed that this site may have been a source for this raw material, similar to a quarry, where it was harvested for later use or traded elsewhere (Croes et al. 2013).

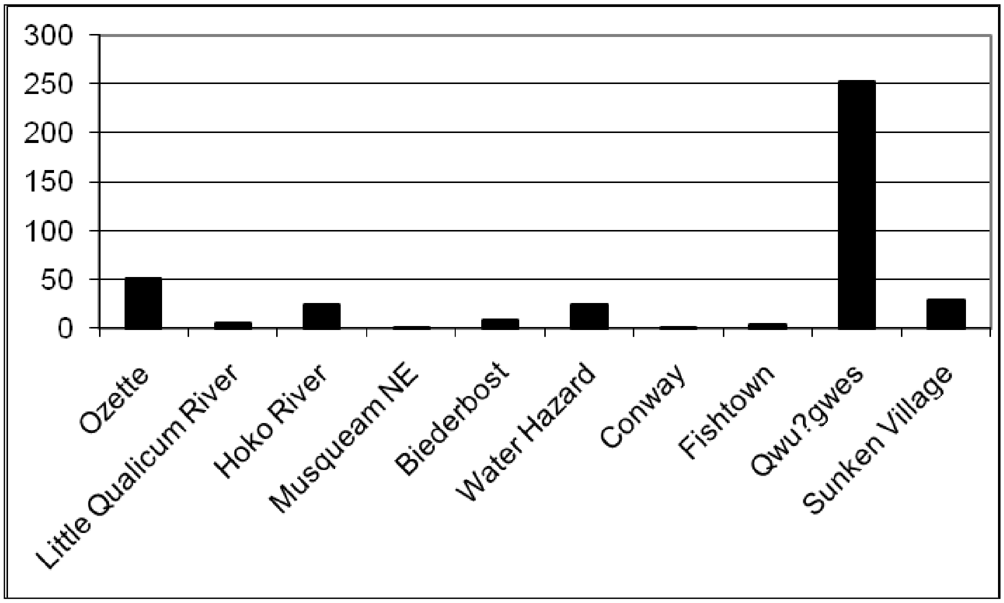



Fig. 18. Number of examples of *Prunus emarginata* strips from reported Northwest Coast wet sites. Qwu?gwes has a noticeable large occurrence – possibly collected for later use or trade.

Biederbost, Conway, Hoko River, Ozette Village, and Qwu?gwes wet sites have examples of cherry bark in a functional context. Therefore, a description of their uses at those sites may help suggest other uses at sites such as Qwu?gwes. Ancient cherry bark strips have been found binding fishhook shanks at Hoko River (Croes 1995:88) and otherwise unmodified anchor stones at Conway (Munsell 1976:121), Hoko River (Croes 1995:177–180) and Biederbost (Nordquist 1961:3–4, 1976:200). The most common use at Ozette Village was in the construction of the whale harpoon equipment (Croes 1980:149).

Other uses observed at Ozette Village include bindings for projectile or spear points, bindings for anchor stones, wrappings in lattice work, imbrications on coil basketry, and weft wrappings in open wrapped west coast burden baskets (Croes 1980:147–150).

A small toy war club, less than 5 cm long was found at Qwu?gwes. The club was constructed using a pebble wrapped onto the end of a cedar stick using cherry bark for binding (Fig. 19). If this artifact were not in a wet site, the pebble would be all that is preserved, and would never be recognized as an artifact (Croes et al. 2013).

The importance of cherry bark as a raw fiber material has not been adequately recognized in Northwest Coast archaeology. Hopefully this overview of cherry bark sheds some light on the importance of this raw material through, no doubt, a vast time period.

*Nets*

This important fishing equipment has been found from many Northwest Coast wet sites. The oldest net so far dates to approximately 5,000 years old (C14 dating) from the Lanaak wet site (49-XPA-78) on southern Baranof Island, southeastern Alaska (Table 4, Bernick 1999) supporting the fact that netting is a very ancient technology along the Northwest Coast. The uses also vary from smaller mesh dip nets to larger web gill nets (Table 4). Qwu?gwes is the only site where big leaf maple bark is extensively used to make nets (Hawes 2013).

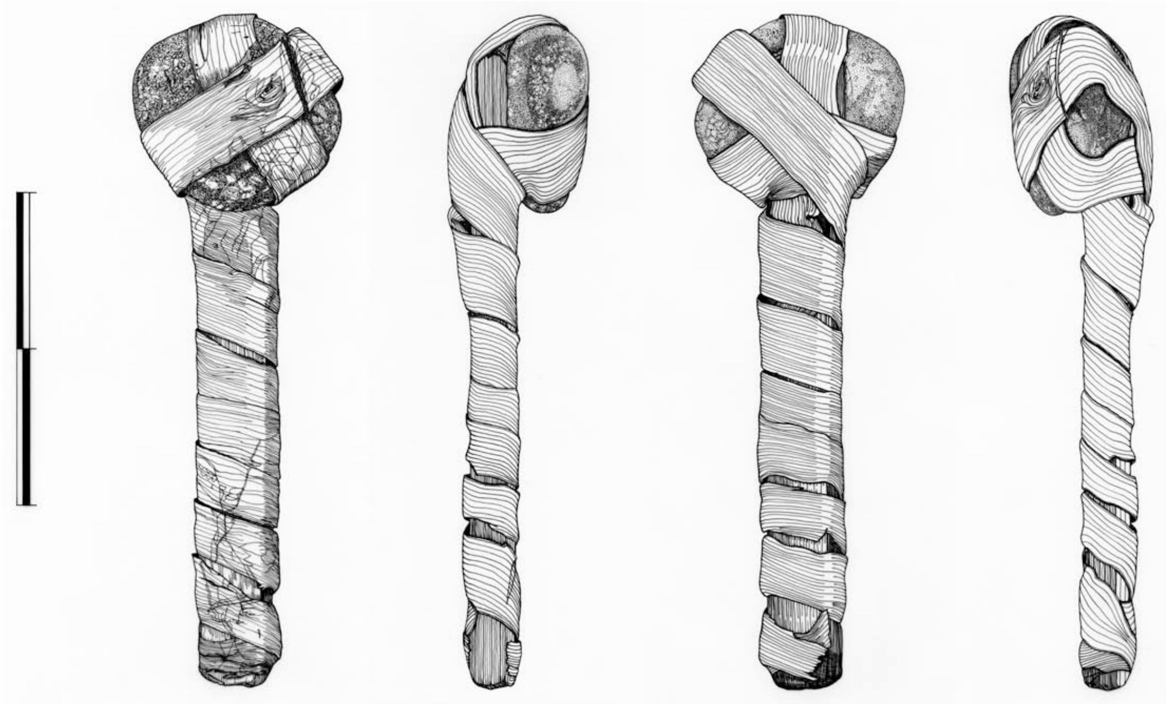


Fig.19. Example of a miniature toy war club from Qwu?gwes wet site (scale=cm; N19E12, 40-45, 2007); the handle is split cedar wood, the wrapping is a cherry bark strip and the head is a green sedimentary pebble (Illustration by Candra Zhang, 2009).

TABLE 4. CURRENTLY RECORDED NORTHWEST COAST WET SITE NET SUMMARY, OLDEST TO YOUNGEST

| ***Wet Site*** | **Date** | **Construction Material** | **Ply Direction** | **Mesh Size** | **Proposed Use** |
|---|---|---|---|---|---|
| Lanaak, Baranof Island, SE Alaska (49XPA78) | 5,000 B.P. | *Picea sitchensis:* Sitka Spruce Root | None-Single Filament | 3.5-5.0 cm | Dip Net |
| Hoko River (45CA213) NW Olympic Peninsula | 3,000 B.P. | *Picea sitchensis:* Sitka Spruce Splint Limbs | None- Single Filament | 10 cm | Gill Net |
| Musqueam Northeast (DhRt4) Fraser Delta | 3,000 B.P. | *Thuja plicata:* Western Red Cedar Inner Bark | Z-ply | 15 cm | Gill Net |
| Water Hazard (DgRs30) Fraser Delta | 2,000 B.P. | *Thuja plicata:* Western Red Cedar Inner Bark | S-ply | 8.9 cm | Gill Net |
| Qwu?gwes (45TN240) Southern Puget Sound | 500 B.P. | *Acer macrophyllum:* Bigleaf (or Broadleaf) Maple Inner Bark | S & Z-ply | 8.4 cm | Gill Net and Dip Net |
| Ozette Village (45CA24) NW Olympic Peninsula | 300 B.P. | *Picea sitchensis:* Sitka Spruce Root | Z-ply | 3.8 cm | Dip Net |

## Northwest Coast Archaeological Plant Technology—Case Study of Salish Sea Wet Site Perishable Artifact Comparisons

In 2009, the name ***Salish Sea*** for the inland marine waters of British Columbia, Canada and Washington state, USA was officially adopted. The Salish Sea forms a *single functioning estuarine ecosystem* (previously referred to as the *Georgia Basin–Puget Sound* watershed; Fig. 20). The northern Salish Sea has been the region for developing this region's archaeological phases, largely through the stone, bone-antler, and shell (SB-AS) artifacts from common shell midden sites (Table 5). We have chosen this region for a case study comparing wood and fiber artifacts from wet sites in this overall region to show how these abundant perishable artifacts have shifted perspectives on cultural evolution in this region.

With the expanding excavation of Northwest Coast wet sites, we can now examine the technically most sensitive artifact of all—ancient basketry. In contrast to stone, bone-antler and shell (SB-AS) artifacts, basketry construction involves fundamental technical complexities that "objectify themselves in the product and are not lost in the process of making" (Weltfish 1932:108); basketry is an additive technology not unlike ancient pottery in other parts of the world. As Adovasio in his North America-wide examinations of ancient basketry, mostly from dry cave sites, points out:

> . . . few classes of artifacts available to the archaeologist for analysis possess more culturally determined and still visible attributes than basketry. . . . It appears to be an established fact that no two populations ever manufactured their basketry in precisely the same fashion. Not only is this ethnographically demonstrable, it also seems to be archaeologically valid as well (Adovasio 1974:102).

In a study of over 2,800 Northwest Coast ethnographic museum baskets, Joan Megan Jones statistically verified the correlation of basketry types and "tribal" groupings (1976:173). As with these museum and contemporary Northwest Coast basketry traditions, these cultural distinctive techniques and styles no doubt have considerable time depth and can be used to identify the distinctive cultural styles of ancient Northwest Coast groups. For the Salish Sea itself, the data reflects an outside Wakashan style versus an inside (inland sea) Coast Salish styles through at least 3,000 years of time.

Ancient basketry in the Salish Sea and surrounding areas have revealed a pattern that regionally cross-cuts the Phases or Culture Types established well by SB-AS artifacts: Locarno Beach, Marpole and Gulf/Late Phases (Fig. 21; Table 5). Possibly this is the result of different kinds of cultural transmission, affecting different categories of artifacts differently. We argue that SB-AS artifacts tend to be *subsistence* and *manufacturing* related artifacts, as are those made of wood and fiber, as discussed above, including fishhooks and nets (*subsistence*) and wooden splitting wedges (*manufacturing*). These categories of subsistence/manufacturing artifacts are probably rapidly dispersed through diffusion, or a process called blending/ethnogenesis (Croes 2005:231–232).

A good example of a wooden *subsistence* artifact is the self-barbed bentwood fishhooks with a knob leader attachment (Type B; Fig. 15). This artifact appears to cross-cut basketry style areas (C and A in Fig. 1) as do the SB-AS artifacts that define phase designations (see map of Type B bentwood fishhook distribution in Fig. 1, above; Croes 1997). Therefore, not unlike SB-AS subsistence artifacts, this Type B wooden fishhook blends through diffusion across the region and through time. In fact, this fishhook type, no longer seen into the historic period in the Salish Sea region, appears to continue in use on the historic North Coast Tlingit-Haida areas as the main cod-fishing hook (Stewart 1982; Croes 1997).

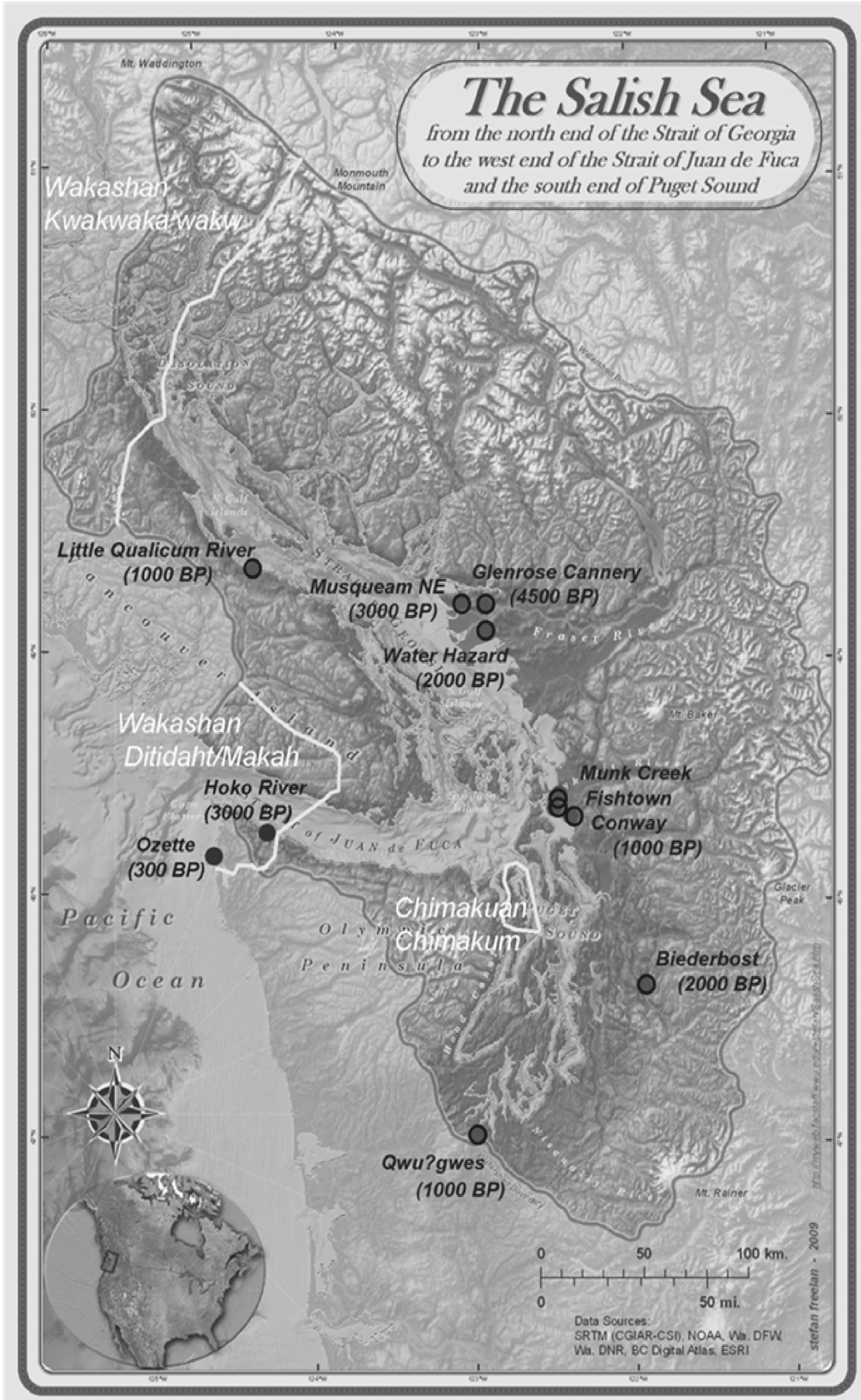



Fig. 20. Map of the Salish Sea, showing locations of different contact-period ethnographic groups in this largely Coast Salish region (outlined in white), and the locations of wet/waterlogged sites artifacts (base map courtesy Stefan Freelan, 2009).

TABLE 5. EXAMPLES OF PROPOSED SUBSISTENCE, MANUFACTURE, AND CONTAINER/ LINES ARTIFACTS FOUND IN ASSOCIATION WITH SALISH SEA PHASES DEFINED MOSTLY IN THE GULF OF GEORGIA REGION[1]

| Phase/Culture Type | Artifacts Represented |
|---|---|
| **Locarno Beach** | |
| *Subsistence* | medium-sized flaked points; quartz crystal microblades & microcores; flaked slate/schist; microflakes made with bipolar flaking technique **[Wet (H): hafted in split cedar handles as fish fillet knives]**; large faceted ground slate points; ground slate knives; many quartz crystal microblades **[Wet (H): end hafted on split cedar handle];** grooved and notched sinkers; **[Wet (H,M): cherry bark wrapped stone sinkers]**; handstone and grinding slabs; unilaterally and bilaterally barbed antler antler points; **[Wet (H): unilaterally barbed wooden points with line guards]**; antler toggling harpoon heads; antler harpoon foreshafts; **[Wet (H, M): Fiber gill nets], [Wet (H): wooden shanked fishhooks, Types A and B, Fig. 15]** |
| *Manufacturing* | small, well-made ground stone celts; **[Wet (H, M): wooden splitting wedges]**; heavy bone wedges; antler wedges; mussel celts; sandstone abraders; **[Wet (H): wooden tule mat creaser]** |
| *Fiber Containers/Lines* | **[Wet (H, M): baskets (numerous types), cedar and tule mats, tumpline straps, hats; ropes, cords and strings]** |
| *Other* | ground stone and coal labrets; **[Wet (H): decorated wooden blanket or hair pin]** |
| **Marpole** | |
| *Subsistence* | flaked stone points in a number of forms; microblades and microcores; large leaf-shapped and smaller triangular ground slate points; thin ground slate knives; handstones and grinding slabs; barbed, nontoggling antler harpoon points with a tang, lineguard or line hole, most unilaterally barbed; **[Wet (W, B): wooden shanked fishhooks, Type B, Fig. 15] [Wet (B): cherry bark wrapped stone sinkers]; [Wet (W): Fiber gill nets]** |
| *Manufacturing* | ground stone celts; **[Wet (W, B): wooden splitting wedges]**; antler wedges; antler sleeve hafts; stone hand mauls, with nipple or decorated top; sandstone abraders; sectioned and split bone awls |
| *Fiber Containers/Lines* | **[Wet (W, B): baskets (numerous types), cedar mats, tumpline straps; ropes, cords and strings]** |
| *Other* | disk beads of shale or clamshell; ground stone labrets; stone sculptures, including decorated bowls, seated human figures |
| **Gulf/Late Phase** | |
| *Subsistence* | small, triangular flaked basalt points; thin triangular ground slate points; thin ground slate knives; unilaterally barbed bone points; bone single-points and bipoints; **[Wet (O): bone bipoints in wood shanked fishhooks]**; antler composite toggling harpoon valves; ground sea mussel shell points; **[Wet (O, Q): Fiber dip and gill nets], [Wet (O, Q): wooden shanked fishhooks]; [Wet (C, O): cherry bark wrapped stone sinkers]** |
| *Manufacturing* | large ground stone celts, sandstone abraders; flat-topped stone hand mauls; split and sectioned bone awls; **[Wet (O, C, F, Q): wooden splitting wedges];** antler wedges |
| *Fiber Containers/Lines* | **[Wet (O, C, F, Q): baskets (numerous types), cradles, cedar and tule mats, tumpline straps, hats; ropes, cords and strings],** |
| *Other* | decorated antler combs; decorated bone blanket or hair pins |

[1] Source for stone, bone-antler, shell (sb-as) artifact types: Mitchell (1990:340-348). Wet site abbreviations: h: Hoko; m: Musqueam ne; w: Water hazard; b: Biederbost; c: Conway; f: Fishtown; q: Qwu?gwes; o: Ozette.

A second example of broad diffusion/blending distribution is the wooden splitting wedge with rope collar, a *manufacturing* artifact. This type of collared wooden splitting wedge tool is found in all Northwest Coast wet sites for at least 10,700 years, as seen at the oldest known aquifer wet site, Kilgii Gwaay on southern Queen Charlotte Island, B.C. (Fedje and Mathewes 2005:198–203). This manufacturing artifact certainly demonstrates the success and longevity of this woodworking technology and how it was shared through time and space on the ancient Northwest Coast.

Basketry is often considered a *container* category of artifact, and, as with ceramics in the Southwest, can be made with a wide variety of techniques that can reflect emblemic styles—reflecting culturally who the makers represent (Wiessner 1983). Technically basketry is so diverse, through both weaving and sewing techniques, that in manufacturing techniques can be used for family and community cultural identity. The methods are often guarded in ther cultural transmission through a process called branching/phylogenesis (Croes 2005:232–233). In this branching/phylogenesis process:

> the similarities and differences among cultures are the result of a combination of predominately within-group information transmission and population fissioning. The strong version of the hypothesis suggests that 'Transmission Isolating Mechanisms' (TRIMS) (Durham 1992) impedes the transmission of cultural elements [considered basketry elements/styles here] among contemporaneous communities. (Collard, Shennan and Tehrani 2006)

A graphical representation of the way we perceive the processes of blending/ethnogensis and branching/phylogenesis is provided in Fig. 21. The newly analyzed ancient basketry tends to be guarded by communities/families and branches between regions through time as a form of emblemic styles or identity (Croes 2012a). Blending/ethnogenesis processes are proposed to define ancient Salish Sea Phases—Locarno Beach, Marpole, Gulf/Late—through rapid diffusion of good ideas for *subsistence* and *manufacturing* artifacts, whether wood/fiber or SB-AS varieties. Also these Salish Sea archaeological phases have been characterized as economic stages and/or plateaus that all Salish Sea area groups went through, reflected in the subsistence and manufacturing artifacts shared across the region (Croes and Hackenberger 1988).

To demonstrate statistically how these ancient Northwest Coast basketry technologies have shown these branching patterns in the Salish Sea region, we have carefully defined and compared their (a) modes or attributes, (b) types or classes, and (c) functional categories to show how they reflect potential emblemic sensitivity (Croes 1975, 1977, 1989, 1992a, 1992b, 1995, 2005). Eighty four distinct basketry modes or attributes systematically derived from the character dimensions of *basketry construction materials, shapes, construction techniques, selvages, gauge of weave, size and surface ornamentation* were compared individually among the twelve major Northwest Coast wet sites, nine or 75% of which are within the core Salish Sea region (Figs. 1 and 20).

Initial studies focused on using cluster analyses to measure degrees of similarity. Recent studies have used cladistic analyses, which more specifically define phylogenetic relationship in terms of relative recency of common ancestry. Ultimately, cladistic analysis seeks to find a special similarity rather than overall similarities.

The earlier resulting site average linkage clusters are regional, even though spatial and/or temporal considerations are not introduced as factors in the testing (Croes 2005; Fig. 22). The similarity coefficient between the regionally close Hoko River and Ozette (A cluster) is not as strong as between the temporally closer Musqueam Northeast, Water Hazard and Biederbost (3–2000 B.P., C1 cluster), or Qwu?gwes, Conway, and Fishtown (1000 B.P., C2 cluster) sites, but the A cluster similarity distance can be explained by (a) 2,500-year temporal distance and (b) the fact that the Ozette collection represents a *primary deposition*, containing an entire winter village house assemblage preserved under a massive mudslide, whereas the Hoko deposits are secondary, being discarded, typically broken examples from along a fishing camp beach. Therefore, as expected, Ozette has a much wider variety of available "household" basketry, making this clustering worthy of note.

The same presence/absence data was used to conduct the cladistic statistical analyses. However, these tests explore exclusive common ancestry as indicated by evolutionarily novel or derived character states. The resulting unrooted cladogram shows a similar and complimentary pattern to the average linkage cluster analyses, additionally supporting the cultural connections of basketry styles through time and space of these Northwest Coast sites (Fig. 23).

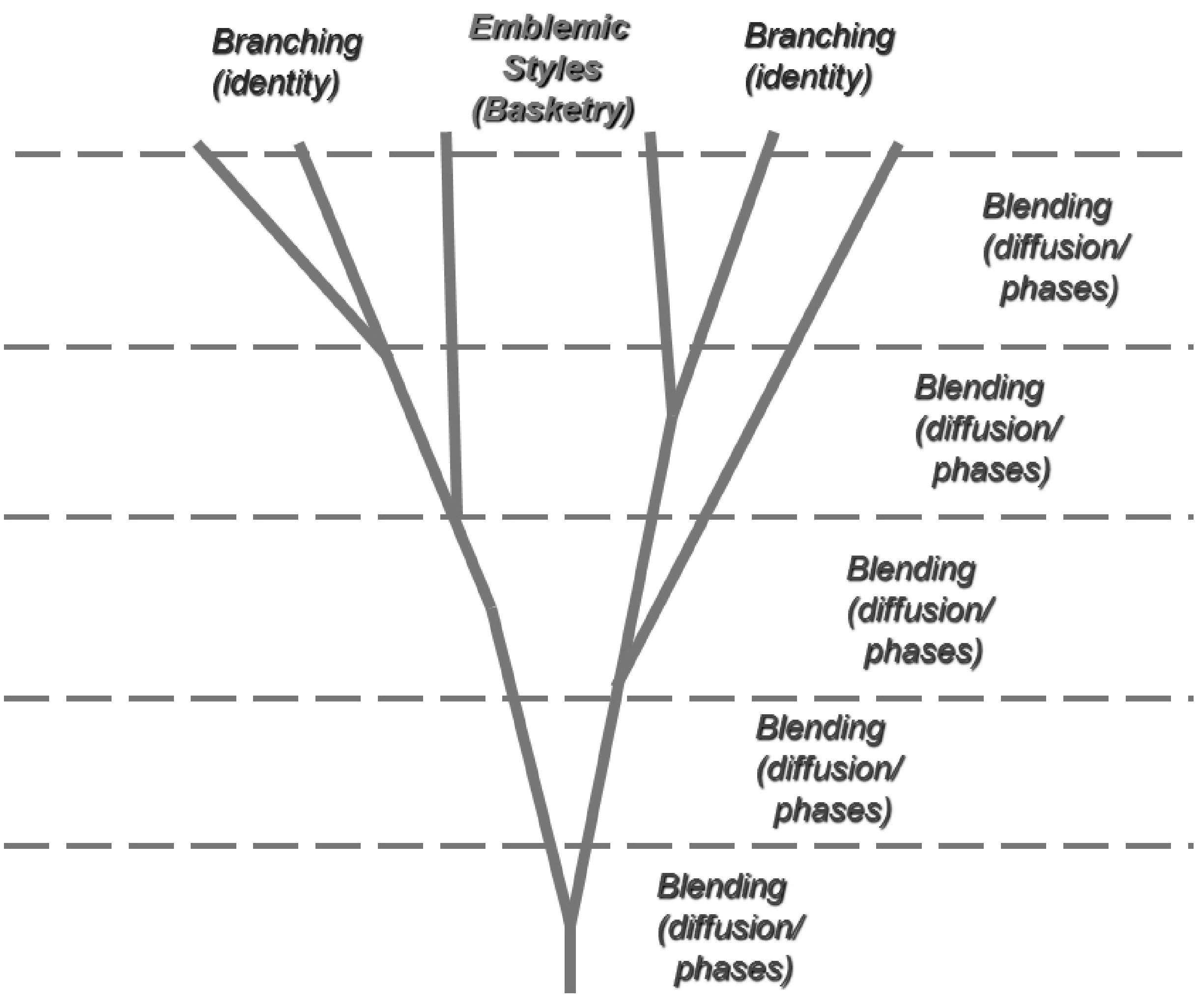



Fig. 21. Idealized example of how artifact categories (especially subsistence and manufacturing) may be shared across the region through blending/ethnogenesis, largely through rapid diffusion during economic shifts (or stages; also see Croes and Hackenberger 1988), and how proposed emblemic basketry artifacts branch through the region through guarding of techniques that reflect cultural identity through branching/phylogenesis.

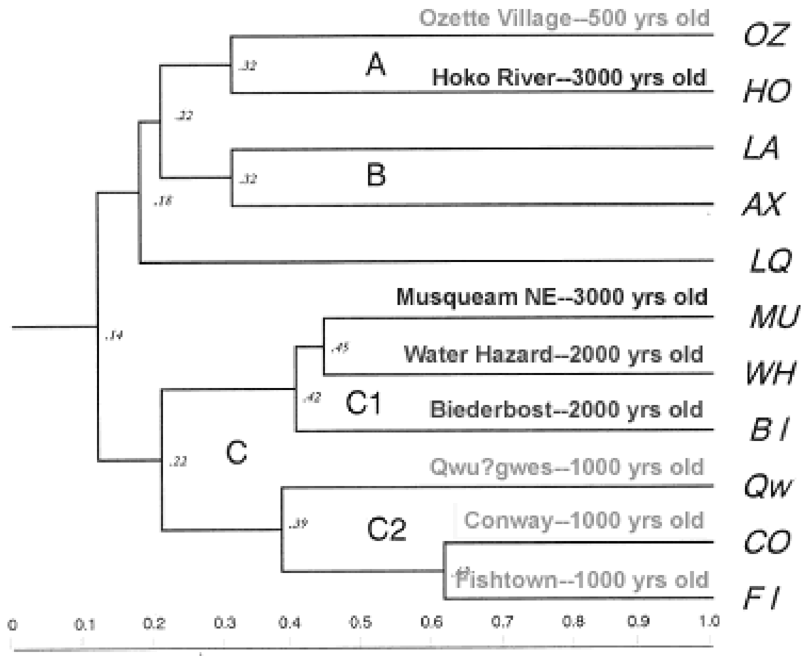



Fig. 22. Dendrogram representing an average linkage cluster analysis of Northwest Coast wet site basketry attributes (modes) on a matrix of Jaccard's Coefficient (degrees of similarity: 1=complete similarity, 0=no similarity). Data as of 2012, using current Hoko River and Qwu?gwes data and Bernick (1983, 1989); see Fig. 1 for site locations.

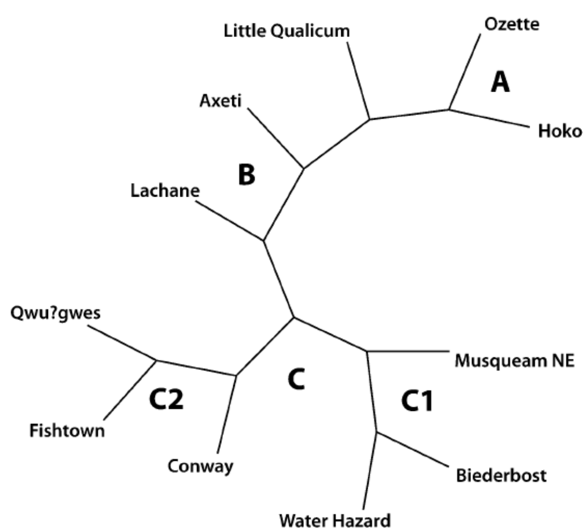



Fig. 23. Unrooted tree diagram based on PAUP software—Phylogenetic Analysis Using Parsimony—statistical test of Northwest Coast wet site basketry attributes (modes). Data as of 2012 using current Hoko River and Qwu?gwes data and Bernick 1983, 1989; see Fig. 1 for site locations). From this data and results we would propose that ancient Coast Salish basketry is represented for 3,000 years from sites in Area C (C1 sites: 2000–3000 years ago, C2 sites: 500–1000 years ago) and propose the top end branch is representing Wakashan basketry sites for 3,000 years in Area A. For additional details and discussion of all the sites and analysis, see Croes, Kelly, and Collard (2005:137–149).

The association of sites in both statistical tests of Musqueam Northeast—Water Hazard—Biederbost (C1 cluster; a spatial spread of 125 miles as the crow flies, and further spatial spread than between Musqueam and Hoko (about 100 miles)), and the Conway—Fishtown—Qwu?gwes (C2 cluster; with a 125 mile spread) basketry modes is particularly tight and is proposed to represent a Gulf of Georgia/Puget Sound (main reach of Salish Sea) inland sea Coast Salishan stylistic region (Fig. 24, cluster C,) ( Croes 1977:195–199).

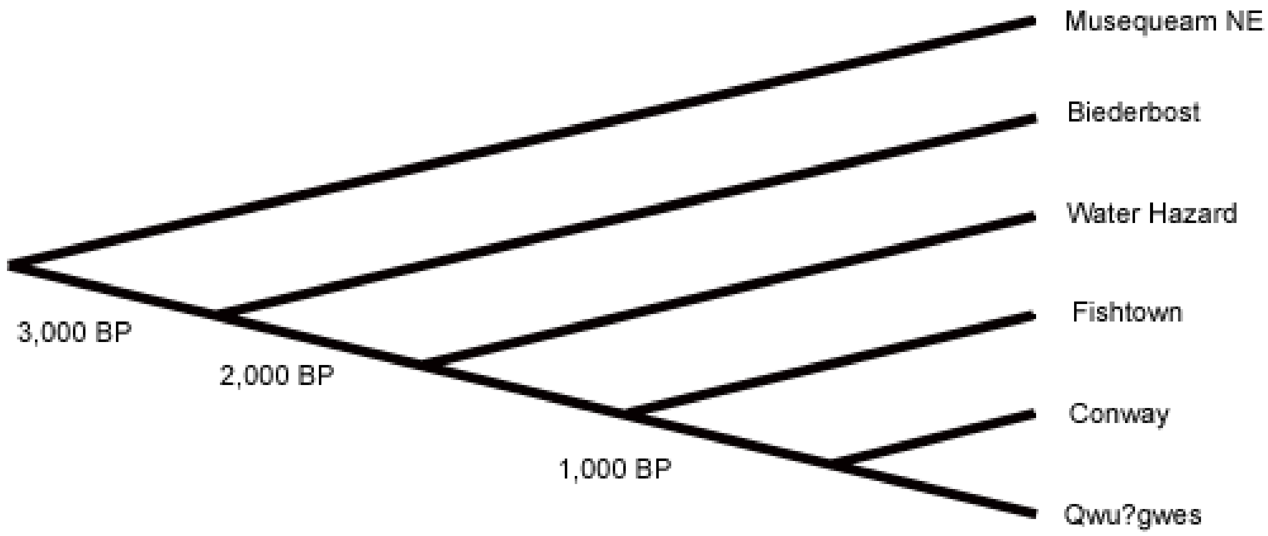



Fig. 24. Slanted cladistic analysis cladogram derived from Gulf of Georgia-Puget Sound wet site basketry attributes (modes) creating a phylogenesis tree of Coast Salish basketry style and proposed ethnic linguistic inter-connections in the heart of the inside Salish Sea for 3,000 years (based on PAUP software). See this as Area C in Fig. 23.

The pattern of branching basketry style continuity on the Northwest Coast, and especially the Salish Sea case study, can be graphically depicted through time and space and reflects how these artifact styles cross-cut through for at least 3,000 years the phases defined by SB-AS artifact types, mostly associated with *subsistence* and *manufacturing* tasks (Fig. 25).

A good example of likely embleic style differences at contemporary, 3,000 year B.P., Musqueam Northeast and Hoko River wet sites are the common pack baskets at each fishing camp. The carrying or burden basket comprise of over 50% of all baskets at each site (Croes 2005:239); however, the weave on the bottom and body, and the handle and tumpline attachments on these baskets were distinctly different at each site (Fig. 26). Although the burden basket is quite common at each of the 3,000 year old wet sites, they are very different in technology and style—but no doubt equally efficient as carrying or burden baskets. At this 3,000 year old time period we would suggest that someone seeing one of these baskets, and possibly a person carrying one, would identify the basket and carrier as an outside West Coast or inside Salish Sea person. Alternatively, if one saw a basket load of some product in one of these baskets, they would know its origin. Because of the continuity of styles through time on the outside West Coast and inside Salish Sea, one potentially may also be able to recognize that the person was ancestral Makah or Coast Salish too.

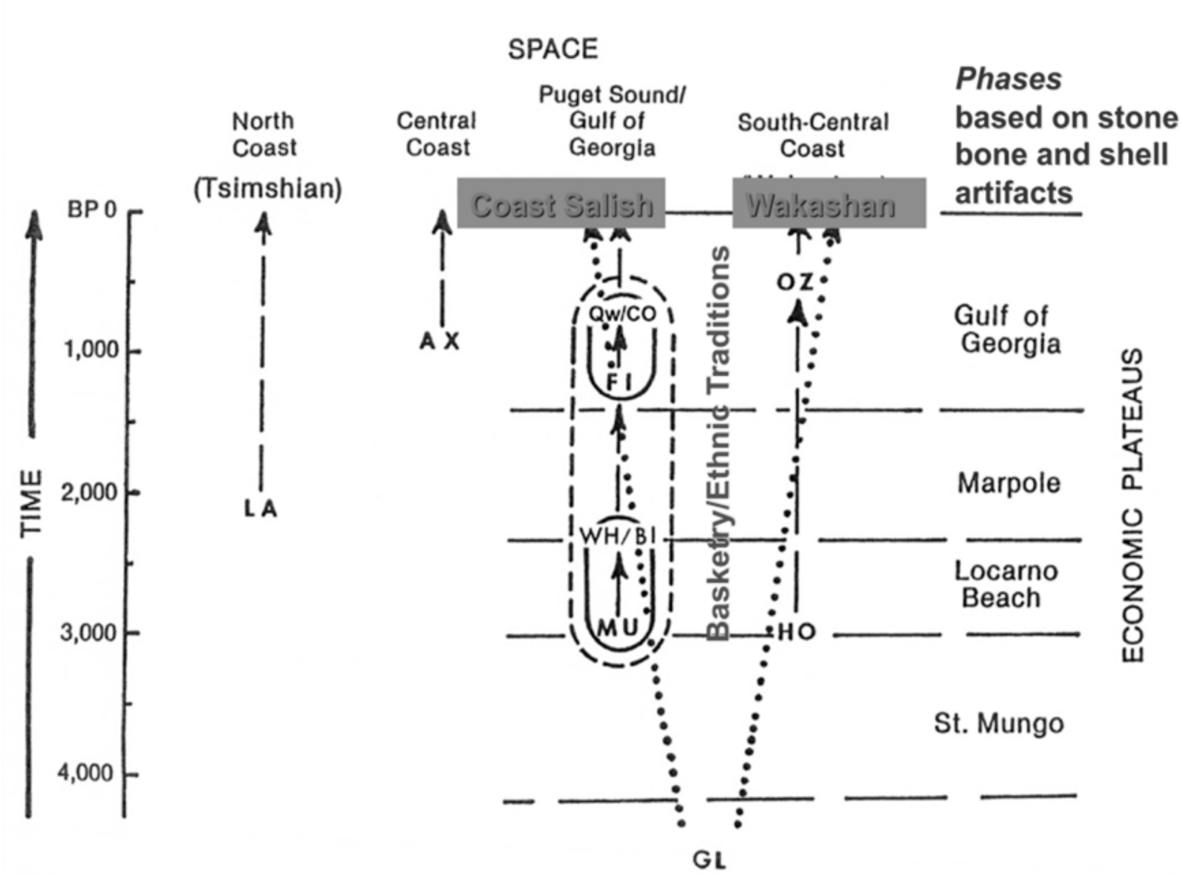



Fig. 25. Hypothetical branching stylistic/ethnic phylogenetic continuity patterns, based on basketry artifact analyses which cross-cut ethnogenetic phase designations based on Central Coast SB-AS artifacts (for site abbreviations, see Fig. 1; also, for a different rendition of the Coast Salish continuity see Fig. 24). Note: when looking at only SB-AS artifacts from Ozette, it reflects the Gulf of Georgia Phase, though clearly Makah in perishable artifacts from the wet site (see Croes, Kelly and Collard 2005:141–154).

## Conclusion

Wet site paleoethnobotanical research has broad potential for learning about the wood and fiber technologies used by ancient- and contact-period people on the Northwest Coast. Using preliminary case studies that focused on micro- and macro-floral identifications and technological comparisons through time and space, a framework has been developed for use of these materials throughout the Salish Sea. Major artifact categories used to develop this framework include subsistence (e.g., wooden shank fishhooks and nets), manufacture (e.g., wooden wedges, wood chip debitage and basketry element debitage), containers (e.g., basketry and wooden boxes/bowls), and tying (e.g., cordage and binding elements). Given that wood and fiber materials comprised perhaps as much as 90% of the material culture in a pre-contact community, evidence from wet sites reveals technological complexity that can be used to better explain defined archaeological phases as economic stages that are cross-cut through time by the branching basketry styles that better reflect cultural identity. Together non-perishable and wet site perishable artifacts have great potential for developing holistic views of the overall ancient cultural dynamics from this distinct Northwest Coast region.

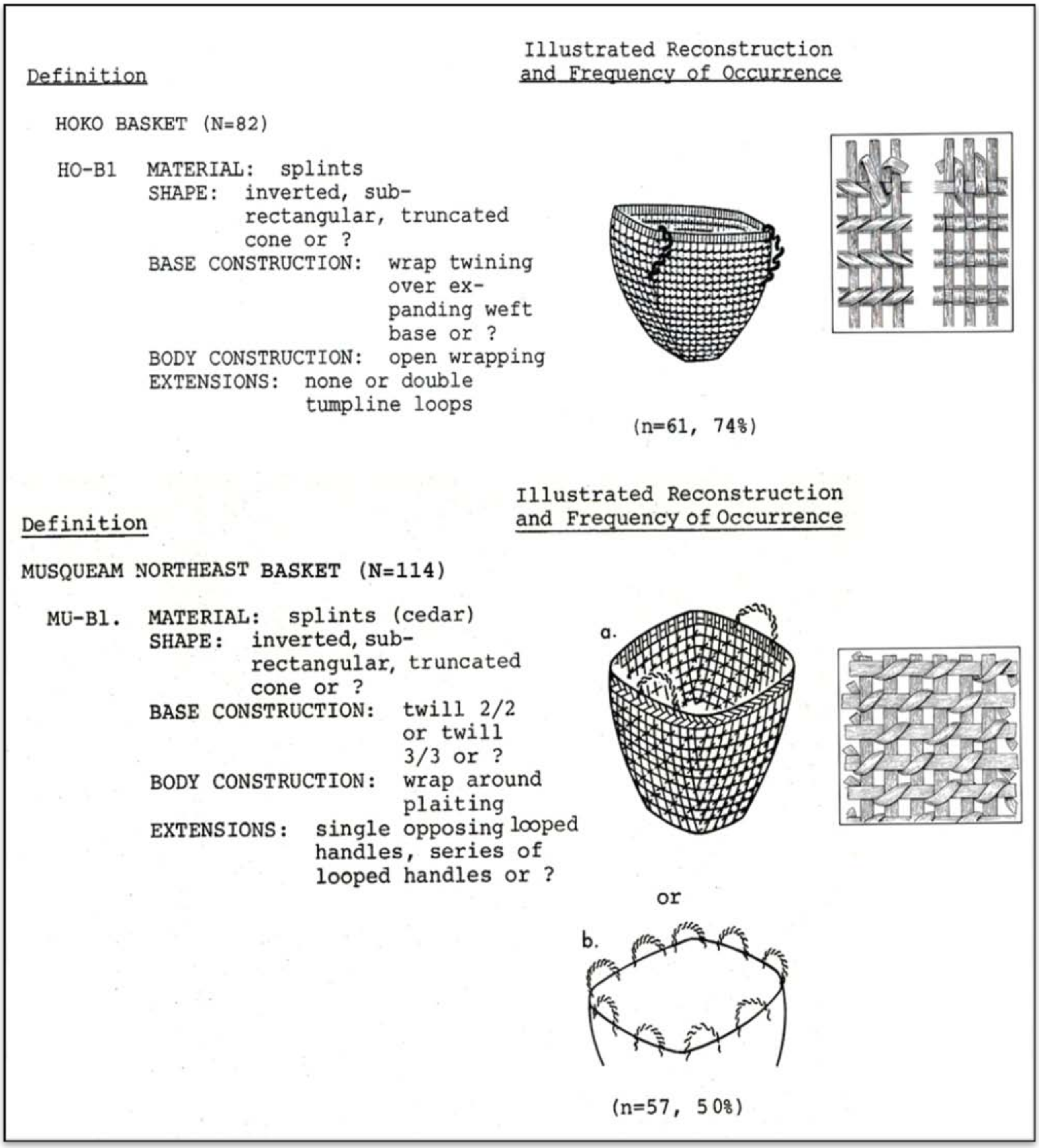



Fig. 26. Definitions of the common pack basket types from the contemporary 3,000 year old Hoko River and Musqueam Northeast sites (Croes 1977, 1995).

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Dales Croes, Adjunct Faculty, Anthropology,
Washington State University and Director,
Pacific Northwest Archaeological Services
Tumwater, WA

dcroes444@gmail.com

Kathleen L. Hawes
Assistant Director,
Pacific Northwest Archaeological Services
Tumwater, WA

aragalen@gmail.com

Dale R. Croes received his B.A. in anthropology from the University of Washington and his M.A. and Ph.D. in anthropology at Washington State University (WSU). He did his Ph.D. dissertation research on basketry and cordage artifacts from the Ozette Village wet site, conducted post-doctoral research with the Makah Tribal Nation at the 3,000 year old Hoko River wet site, directed first-ever archaeological excavations at the National Historic Landmark wet site of Sunken Village with the Confederated Tribes of Siletz Indians, Confederated Tribes of Grand Ronde and the Conferated Tribes of the Warm Springs Indians, and recently co-directed excavations of the Qwu?gwes wet site with the Squaxin Island Tribe. He is semi-retired from teaching, adjunct faculty with WSU, and president of a contracting company, Pacific Northwest Archaeological Services that specializes in wet site excavation and wood/fiber conservation and cellular ID.

Kathleen Hawes is currently the Assistant Director of Pacific Northwest Archaeological Services (PNWAS), and has seven years of archaeological experience, receiving her Bachelor's Degree in Archaeology and Paleoethnbotany from the Evergreen State College and Cultural Resource Certifications in Archaeology and Museum Studies from South Puget Sound Community College (SPSCC) in 2009. She has participated in several projects and surveys in the region in consultation with Tribes of the Quileute, Lower Elwha, Quinault, Skokomish, Chehalis and Nisqually. Her specialties include wet-site archaeology, conservation of wooden artifacts, and microscopic identification of wood/fiber and charcoal from archaeological sites.