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The Social Fabric: Deep Local to Pan Global

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Threads, twist and fibre: Looking at Coast Salish Textiles:

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Abstract

Coast Salish textiles are remarkable for their quality, unusual in the fibres used, notable in their designs, and singular in the innovative processes used to create them. Salish textiles were determined by geography, shaped by trade, and influenced by colonization. That the textile tradition has survived reflects the prestige they hold and the importance of the textiles in the Coast Salish culture.

Relatively unknown and underappreciated, the older textiles deserve to be looked at with fresh eyes, employing modern methods that can reveal with new clarity the outstanding abilities of the Coast Salish women in the creation of these important textiles.

This paper looks at older blankets and robes in museum collections in Europe and North America and reviews the problems experienced in identifying the fibres used. In the last ten years or so, newer techniques such as scanning electron microscopes and proteomics have been utilized; these help identify the fibres used and allow us to look more closely at how the threads were created. The results have been surprising. They include verification of oral histories about using wool from the Coast Salish woolly dog, deeper understanding of the importance of resource exploitation, textile technology, social networks and trade; demonstrations of changing techniques over time; and greater appreciation of the cultural importance of spinning, and how spinners and weavers instilled spiritual protection into the textiles.

A select number of textiles will be reviewed to demonstrate the types of textiles and their cultural importance. Their fibres include cedar, stinging nettles, the Coast Salish woolly dog wool, down feathers, cattail and fireweed fluff and mountain goat wool. Also examined in this paper are different techniques and tools used to create the threads, and the cultural stories of the fibres used.

The Coast Salish

The Coast Salish First Nations are spread along the inner coast of British Columbia and Washington State, along the Pacific North West coast of North America.

Figure 1 Map of Coast Salish territories

Figure 2 Map showing Coast Salish territories from the MoA exhibit 'Fabric of our Land'

The map on the left is a typical Euro-centric map showing Coast Salish territories. The map on the right was on display at the Museum of Anthropology at UBC at the entrance to the 2018 exhibit 'Fabric of our Land'. It upends our north-at-the-top perspective and overlays a Coast Salish blanket design onto the land. This illustration helps to turn our thinking around, introducing a different perspective on Coast Salish territories and textiles.

The Coast Salish are many nations sharing a common ancestral language. Broadly speaking, this Language, like Salish blankets, links the nations together, but each nation has its unique origin stories, songs, dances, protocol. Often some of these cultural elements belong not just to a particular Nation but to a particular family or person. Such elements can be physical items, customary practises, or deep cultural knowledge: songs, spinning expertise, weaving patterns, spiritual ceremonies—all these are closely guarded; they are private and must be honoured and protected. One needs to keep this in mind when viewing or learning about Coast Salish textiles—only those who inherit that deep knowledge can understand more fully the Salish textile complex.

To view these textiles with any degree of understanding, and to appreciate their importance, we need to acquire an informed perspective, one that places them in context, within their culture.

This paper starts by examining the fundamental component—the fibre, moving on to consider how it is processed and structured into yarn, woven into blankets and finally how the blankets

are worn. It also looks at some of the issues of fibre identification and our expanding knowledge about what we are seeing when looking at a blanket.

Fibres

The Pacific Northwest has few fur bearing animals with fibre suitable for spinning. Animals such as sea otter, river otter, deer and mink have wonderfully warm fur, but with short slippery fibres. Their pelts are best used in strips or sections, sewn together, rather than attempting to cut and spin the fibres from their pelts. The most common fibres traditionally found in Coast Salish textiles are from the mountain goat, the Salish woolly dog, plant fibres, cedar, Indian hemp, and nettle. Not as common are fibres from plant cottons/fluff feathers and down and sinew from deer and elk. In more recent times sheep wool has become the most commonly used fibre.

Mountain goat (*Oreamnos americanus*)

The most suitable animal fibre for spinning is the mountain goat (*Oreamnos americanus*), found in the Coastal Mountain Range and along the major river valleys like the Fraser River. However, these animals are not found on Vancouver Island, nor on the Olympic Peninsula. This made the wool a valuable trade item between those who had access and those who did not.

The mountain goat is the most revered fibre for Coast Salish textiles; its white wool bears powerful spiritual significance. As Dr Ellen Kwulasulwut White OBE, a Snuneymuxw elder, explains “The mountain goat is the most pure of all the animals because it lives in remote areas, near the sky. Nothing can reach it there.”¹

Figure 3 Mountain goat shedding its coat in late June. Photo by Mark Kaarremaa

The wool is collected either in the spring when the goats shed their wool, or by hunting. Hunting provides meat and hides which are soaked for a few days to release the fibres from the pelt.

The wool has three main fibre types: coarse guard hairs which are prickly and hard and must be removed, softer long hairs, and very soft down wool that provides warmth.

Salish woolly dog

Coast Salish oral history tells of a treasured dog specifically bred for the undercoat of its fur, a warm and spinnable wool prized for its use in blankets and robes. Captain Vancouver, in 1792, recorded a sighting of a special breed of dogs in his ship's log soon after he entered Juan de Fuca Strait, near Port Orchard:

¹ Leslie H. Tepper, Janice George, and Willard Joseph, *Salish Blankets: Robes of Protection and Transformation, Symbols of Wealth* (Lincoln, Nebraska, USA: University of Nebraska Press 2017), 151.

“The dogs belonging to this tribe of Indians were numerous, and much resembled those of Pomerania, though in general somewhat larger. They were all shorn as close to the skin as sheep are in England; and so compact were their fleeces, that large portions could be lifted up by a corner without causing any separation. They were composed of a mixture of a coarse kind of wool, with very fine long hair, capable of being spun into yarn”²

Vancouver was not the first European to mention the wool dog but his description it is the most quoted, being so clear and detailed.

The wool dog was kept separate from the more common village/hunting dog to keep its wool traits pure. This intentional breeding of a dog for its wool is unique in North America, and highly unusual; this is probably why its credibility has been widely questioned despite oral history, explorers’ journals, museum collectors’ observations and notes gathered from First Nation informers, all of which agree that dog wool was indeed used in blankets.

A critical question is highlighted by Paula Gustafson in her well-researched 1980 book on Coast Salish weaving.³ Gustafson did an extensive and thorough survey of the majority of known Salish blankets in the world and posed the question that has plagued those interested in Salish weaving ever since:

‘I examined almost all of the historical Northwest Coast textiles in museums in North America and Europe. I am still looking forward to examining a Salish dog hair blanket.’ and she went on to say “...the spinning of pure dog hair by the traditional Salish method would be difficult to the point of frustration...” and “Were dog hair blankets actually made by the Salish? And if they were, how can we reconcile the apparent lack of existing blankets with the specific descriptions of wool dogs by Vancouver and other explorers?”⁴

Gustafson’s observations cast considerable doubt on the use of dog wool. She also questioned the suitability of dog hair for spinning a yarn: “*Canine hair, no matter what breed, is not a good spinning fibre, and it is particularly difficult to work with using the suspension-spindle method of spinning employed by the Salish.*”⁵ She suggested that the dog hair would have to be mixed with goat wool or “*mixed with longer and more tenacious fibres.*” This cast even further doubt on the use of dog wool, for if it was used at all it was apparently unsuitable as a primary fibre, so its use and its importance could be argued to be minimal.

² George Vancouver and John Vancouver, *A Voyage of Discovery to the North Pacific Ocean, and Round the World: In Which the Coast of North-West America Has Been Carefully Examined and Accurately Surveyed : Undertaken by His Majesty's Command, Principally with a View to Ascertain the Existence of Any Navigable Communication between the North Pacific and North Atlantic Oceans; and Performed in the Years 1790, 1791, 1792, 1793, 1794 and 1795, in the Discovery Sloop of War, and Armed Tender Chatham, under the Command of Captain George Vancouver*, vol. no. 42059 (London: Printed for John Stockdale, 1801), 131.

³ Paula Gustafson, *Salish Weaving* (Seattle: Douglas & McIntyre, 1980).

⁴ Ibid., 79.

⁵ Ibid., 83.

Yet oral history and collectors' notes from the 1800s are unequivocal about blankets and robes containing dog wool, even giving dog hair blankets a special name. In his notes on the Nisqually language, Dr. George Gibbs, recorded the name of the dog wool blankets as Ko-matl'-ked.⁶

The wool dog was virtually extinct by 1870. However, sometime before 1858, George Gibbs was given a dog, whom he named 'Mutton' because the dog loved chasing sheep. Mutton is said to be one of the last of the Salish wool dogs. Gibbs led an adventurous life, working for the US Government and the Smithsonian on a variety of projects in the Pacific Northwest. He was an ethnographer, a naturalist and a geographer, best known for his knowledge of Pacific Northwest customs and languages.

Dr. Gibbs eventually shipped Mutton's pelt, along with a village dog pelt, to the Smithsonian. Somehow the pelt was separated from its paperwork, and Mutton lay in a dark drawer until his rediscovery in the early 2000s. His supple hide and soft fur has been perfectly preserved for hundred and fifty years. He is not exactly as described by Captain Vancouver, being more tan than white, and his wool doesn't seem as thick as a sheep's fleece but nonetheless his wool is long and spinnable.

Having dog wool to trade provided the Puget Sound and Vancouver Island nations a valuable resource. James Teit, an ethnographer living in Spences Bridge along the Fraser River in the late 1800s, explained that at Spuzzum dog hair used in blanket-weaving was *"....generally mixed with the wool of the goat. People who did not have any of these dogs used only goat's wool. The using of dog's hair it is said made the blankets of a softer texture and furthermore they supplied a source of wool right at hand, whereas the goats had to be hunted and their wool thus cost -considerable labor"*.⁷ It is not clear if dog wool was held in as high esteem as the mountain goat, although Salish stories exist about dogs holding special powers.

Given that mountain goats do not live on Vancouver Island or on the Olympic Peninsula, the wool was traded from the mainland. In the early 1900s a Snuneymuxw man witnessed trade between mainland Salish and Island Salish over bales of mountain goat and dog wool. He described the traders taking a little wool away or adding some to a bale until both were happy that it was a fair exchange.⁸ This implies that both fibres were equally valued.

⁶ William Healey Dall and George Gibbs, "Tribes of the Extreme Northwest by W.H. Dall. Tribes of Western Washington and Northwestern Oregon by Geo. Gibbs," ed. Gibbs George (Washington: G.P.O., 1877), 293.

⁷ Grant Keddie, "Prehistoric Dogs of Bc: Wolves in Sheep Clothing," *The Midden* 25(1993): 4.

⁸ Ed Barraclough, "Dogs That Were Indigenous to the Northwest Coast," *BC Historical News* 2 no. 3 (May) (1969): 11.

Plant fibres

Red cedar (*Thuja plicata*) was commonly used for capes and robes. The inner bark of the cedar was collected in late spring, dried, and pounded (sometimes soaked in fresh water first, and sometimes oil was added for extra softness) to create soft shredded long fibres which were then twined into capes and skirts.⁹ Cedar warp was used when using strips of fur or bird skin for plain weave blankets. Sometimes bird feathers and down would be spun along with cedar to create a soft warm weft which was then woven onto a cedar warp.

Figure 4. Shredded cedar cape. Perth Museum and Art Gallery, Perth, Scotland Catalogue #1978.520. Photo: Mark Kaarremaa

On the Pacific NorthWest Coast, stinging nettle (*Urtica dioica*) was plentiful and the stems were collected in early fall and processed to release the inner bark fibres. Long fibres would be joined with others, and twisted together to give the desired thickness of thread or yarn. Nettle was often used for warp and, being long, was useful as a fibre for holding shorter fibres together. It would be mixed with down or other blends and mixtures.

Indian hemp, also called dogbane (*Apocynum cannabinum*) is very easy to process and spin and commonly used in warps. It is not found on the coast, but it grows away from the coast, further inland in Interior Salish territory so nettle and hemp were often traded.

While warm wool, either woolly dog or mountain goat, was preferred, many other soft fibres could be blended together to provide warmth, and mixtures of fireweed fluff, cattail fluff, down feathers, and other soft materials were spun together using longer fibres (e.g. dog, mountain goat nettle, hemp) to help hold the mixture together until it was spun into stable yarns.

Spinning and Yarn Characteristics

This author's research goal here is to share a wide range of knowledge and experience about producing traditional Coast Salish yarns with First Nation spinners and weavers, so they understand, and can replicate, if they wish, the many varieties of traditional yarns in making their own Salish blankets. The first necessary step is to understand some of the technical elements of both spinning and weaving, in order to analyze the spinning characteristics of fibres used in older textiles. From this, it is important to know about twists per inch, diameter, angle of spin and how many single yarns are twisted together to make a plied yarn. These characteristics are like markers indicating the tools and techniques originally used in creating the yarns. Once known, it then becomes easier to replicate the yarn with either traditional tools or modern fibres and tools. The historical yarns just need to be "read" to reveal their stories.

Looking for twist

The first characteristic is the amount of twist in a spun yarn. Fibres need twist to stay together. Too little twist and a yarn comes apart. Too much twist and a yarn becomes brittle and more subject to breaking. Some fibres need only a little twist while others need a lot. Some fibres, like

⁹ Hilary Stewart, *Cedar: Tree of Life to the Northwest Coast Indians* (Douglas & McIntyre, 2009), 124-25.

most sheep wool, can create different types of yarn depending on the amount of twist it has been spun with. Looking at the twist can reveal a great deal of information.

The direction in which a yarn is spun and/or twisted is often used to describe the construction of a yarn. Spun to the **right**, the fibres will show a slant pointing up to the **right**. This is commonly

Figure 5 Showing the direction of plied yarns.

referred to as z-spun, as a “Z” is typically written starting at the top and going to the **right**, then slanting down to the bottom left before ending with a horizontal line to the **right**. The slanting vertical line of the “Z” shows a similar slant (up to the **right**) to a fibre spun to the **right** as shown in the diagram. Likewise, a fibre spun to the **left** is

said to be s-spun. A handwritten “S” starts with the upper curve of the S to the **left**, then a downward slant starting on the **left** and going to the bottom right before finishing with a curve to the **left**. Whether you hold the yarn upside down or right side up, back or front, the direction of spin remains the same.

Figure 6 s-twist, z-twist and ply. Illustration by Julia Meyerson.

<https://khipukamayug.fas.harvard.edu/KhipuConstructCords.html>

Ply

Twist is energy. When you twist fibres into a yarn you are storing twist energy. If you let go of a freshly twisted piece of yarn it will want to let that energy out and it will untwist, so you must

Figure 7 Cedar twisted zzS

hold the ends to keep that energy stored into the yarn. Rolling it around a stick will help hold the twist in. Another way to hold the twist is to let it twist or ply back onto itself. Two freshly spun singles laid side-by-side will twist around each other (in the opposite direction from that in which they were spun) trying to let the twist escape only to be caught by the opposing single. This produces a plied yarn.

Two, three, four or more singles can be plied together. The typical traditional Coast Salish yarn is left ‘s-spun’ and then two s-spun singles are joined and plied up the thigh producing a Z-2ply (described as you would in replicating it: ssZ). Plying holds the twist and needs to be the opposite direction from the original spinning, in which case the plying is done to the right or Z as in the middle yarn in the first picture. Sometimes a yarn is found twisted or plied in the opposite direction from the majority of yarns, but not often. The yarn on the far left, made of what looks to be mountain goat, in Figure 6 is most

unusual in a Coast Salish textile and is a cabled yarn (ssZssZ). This could have been created to give a stronger yarn, used for tying the blanket close around the body.

The direction of the spin matters because it reveals something more than just the look of a yarn. The direction of the twist hints at what tools and techniques were used. For example, a typical hand-spun yarn was created on the thigh by rolling a rough roving (length of unspun fibre) of fibre from the top of the thigh down towards the knee or, by using a spindle attached to fibre and rolling it down the thigh, producing yarns ssZ. Figure 7 shows cedar cordage used as a warp. A typical cedar yarn is spun zzS, the opposite of a typical wool yarn which is ssZ. This tells us that the cedar cordage was made using a different tool and technique than the typical yarn in a Coast Salish textile.

Both the direction of the spinning/twist and the number of plies can also be useful to help identify a commercial yarn from a hand spun yarn. Hand spun Coast Salish yarns are 2-ply spun to the left and plied to the right, ssZ. Commercial yarns found in Coast Salish blankets are typically 4 or 5-ply and have the opposite spin (to the right) and then plied to the left e.g. zzzzS. Seeing 3, 4 or 5-ply yarns in a textile can also indicate colours that are difficult to achieve with natural dyes, so these may well indicate both commercial dyes and wool, pointing to trading practices.

Wraps per inch

Wraps per Inch (WPI), or how many times a yarn can be wrapped around a one-inch mark on a ruler, is a spinner's term for measuring the diameter of the yarn. The WPI is a higher number (i.e. more wraps per inch) for older Coast Salish blankets, meaning the yarns were thinner or more tightly spun. Newer blankets have less WPI, requiring less time spinning the yarns to produce the same size of blanket. A higher WPI would indicate a textile more impervious to wind or rain, while a low WPI would indicate a fluffier yarn, most likely encasing more air, which acts as insulation for warmth.

Knowing all these characteristics not only helps in re-creating traditional or in creating new yarns, but also gives an insight into how the yarns were made and why—the technical aspect of spinning. What they do not provide is the spiritual aspect. Only those with knowledge of the culture will be able to spin the yarns with the full knowledge of what goes into the spinning process.

Spinning Yarns

Figure 8 Mrs. Selisya Charlie, a Musqueam weaver spinning in 1915. Photo by Dr. Newcombe. RBCM #11165

Figure 9 Mrs. George (Harriott) Johnnie of Skwxwu7mesh (Squamish) demonstrating beating diatomaceous earth (a white clay-like material) into mountain goat wool, spinning and weaving with it. Photo from a 1928 film by Harlan I. Smith #16-0400-0008

The two photos above provide some interesting aspects on spinning mountain goat yarn. On the left is Mrs Selisya Charlie, sitting on a large mountain goat blanket with balls of mountain goat yarn near her feet, one of which looks to be over a foot high and a foot across. In her hands she holds a large Coast Salish spindle with spun mountain goat yarn disappearing out of the picture. She is creating a Z-twist, but we can't tell from the picture if she is spinning a single yarn or plying two singles together. From the research into spin and twist, mountain goat twill blankets are almost always ssZ, so there is a good chance that she is plying two singles together.

In the photo on the right, Mrs George Johnnie sits in front of a Salish loom with a twill-style blanket being made. A pile of mountain goat wool is lying on a cedar mat. This picture comes from a film recorded in 1928. In the film she takes a weaving sword and is either mixing two fibres together or pounding diatomaceous earth into mountain goat fibres before spinning.¹⁰ She first spins by rolling wool down her legs, making a roving, then she plies using a large Salish whorl, twirling it and spins it to the right Z to ply.

The Coast Salish large spindle is unique—it has a yard-long shaft and a large 6-12" whorl. Its design makes it efficient in spinning the thick yarns used in mountain goat twill blankets. Often the large whorls have carvings facing the spinner. Some seemed to be animated when twirled—an animal chasing its tail for example. Some of these are thought to hold spiritual significance, which is spun into the yarn. Smaller spindles were used to create thinner yarns typical of the finer blankets.

These pictures above are important not only because they show the process of preparing, spinning and weaving mountain goat wool in the past, but also because of what they cannot show: the picture's influence on the future.

¹⁰ Liz Hammond-Kaarremaa, "A Curious Clay: The Use of a Powdered White Substance in Coast Salish Spinning and Woven Blankets," *BC Studies*, no. 189 (2016).

Both Mrs. Johnnie and Mrs. Charlie were weaving at a time when very few Coast Salish were still weaving. Much of the weaving knowledge was lost in many communities between 1900 and 1960. Yet Mrs. Selisya Charlie's descendants, especially Debra and Robyn Sparrow and their cousins, were instrumental in reviving the Musqueam weaving. Debra and Robyn's work is in collections around the world and some of their weavings can be seen welcoming visitors at the Vancouver International Airport.

At least one of Mrs. George Johnnie's descendants, Buddy Joseph, along with his partner Chief Janice George of Squamish, have played significant roles in reviving Coast Salish weaving. They have now taught more than 2,400 people the art of Coast Salish weaving.

Coast Salish Blankets

There are very few Coast Salish textiles dating back before 1900, but those that survive reveal an astonishing knowledge of local fibres, how to process them, how they should be spun, and a variety of weaving techniques. These textiles are comprised of a wide range of fibres, making efficient use of plants, animals and birds. Those that survive include capes, hats, tumplines, etc. but for the purposes of this paper, the focus is on blankets. Many blankets, which early Europeans greatly admired, survive in a few museums in North America and Europe. Examples in museums include blankets comprised of strips of fur as weft and cedar cordage warps, woven strips of bird skin feathers and down, pounded cedar and fibres spun from plants and animals.

Blankets had a variety of uses in Coast Salish culture bedding, robes, wall separations, etc. but their greatest importance lies in their connection to ceremony.¹¹ Blankets play a central role in life event ceremonies, traditionally representing spiritual protection. If you are 'blanketed' you are protected. Marriages are performed on a blanket (often four blankets) to protect the couple, while another blanket wraps around the couple. Naming ceremonies, puberty rites, funerals and memorials are all ceremonies in which blankets play a protective role.

With this in mind, the processes of collecting, preparing, spinning the yarn and weaving the blanket all contribute to the spiritual significance of blankets, and each step is taken seriously. Modern Salish weavers carry on the tradition of purifying their heart and mind from bad thoughts before spinning and weaving. Chief Janice George (Chepximiya Siyam) explains:

Because the weavings are alive, they radiate the feelings of the weaver. Some people teach that you should not weave when you were angry or sad. The weaver should feel confident she is doing the right thing on all levels, that she is following the teachings. Then the weaving will contain good feelings, love, prayers, and protection.

Chief Janice George, Squamish.¹²

¹¹ The term 'blanket' is used in this paper as an overall term covering the multiple uses of these textiles.

¹² Tepper, George, and Joseph, *Salish Blankets: Robes of Protection and Transformation, Symbols of Wealth*, 153.

Blanket styles

Paula Gustafson, author of the first in-depth review of Coast Salish blankets, categorized Coast Salish blankets into two broad descriptions: Plain (twill weave) and Organized (twined technique) and she named three subcategories under the Organized category.¹³ These subcategories are based on a time line and on her interpretation of influences in the design of the blankets. The subcategories reflect the impact of colonization and the eroding of traditional weaving values. They are: Classic, approximately 1778 to 1850; Colonial, 1850 to around 1900; and Hybrid, post 1850.

This categorization is useful for grouping similar blankets. It does make some broad assumptions regarding when the designs were first developed, their inspiration and geographic origins; these may be problematic given the scarcity of Salish blankets still in existence.

Tepper et al use a typology based on function and size, examples from smallest to largest: Sitting Blanket 2'x3', Puberty or Naming Robe 4' x 4' and Memorial Blanket 8' x 8'.¹⁴ This is useful for modern weavers, providing them with measurements to follow.

This paper uses a simplified typology based on weaving technique rather than era, design, size or function: Plain weave; Twined weave; Twill weave and Hybrid (see the accompanying photographs below). This weaving-based typology by nature reflects spinning techniques: together, these two techniques are useful for analyzing the construction and along with the Tepper typology, for replicating a blanket.

Plain weave blankets are not often found in collections and plain weave is usually found only along an edge or as in the case of the Ozette blanket, only where the black/blue stripes are. This one was entirely plain (tabby) weave.

Figure 10 Plain weave blanket (below) of dog wool Burke Museum #2.5e1965

¹³ Gustafson, *Salish Weaving*, 37.

¹⁴ Tepper, George, and Joseph, *Salish Blankets: Robes of Protection and Transformation, Symbols of Wealth*, 74-75.

Twined weave is common in blankets, from loosely compacted twined strips of fur or bird feather skin to the more closely compacted twined elaborate geometric blankets made with many combinations of natural dyed colours along with commercial aniline-dyed wool yarns.

Twined weaves like this one have higher TPI and WPI than the twill weaves. Many of the bright colours indicate commercial 3 or 4+ply sheep wool.

Figure 11 Twined geometric blanket National Museum of Finland VK1.

Twill blankets makeup the majority of blankets in collections. Made from white mountain goat wool in twill-weave. Some have red (most common) or black fabric stripes woven in to add a few stripes of colour.

Older twill blankets have more TPI and WPI than newer twill blankets indicating a change in the spinning processes over time.

Figure 12 Twill mountain goat wool blanket with stripes of red fabric. Pitt Rivers Museum, University of Oxford #1898.53.1 Photo Mark Kaarremaa

Hybrid blankets have a combination of techniques, usually a colourful twined border around a plain white blanket, or, a border of blocks of twined alternated with twill surrounding the twill blanket.

Figure 13 Hybrid blanket. Made by Sp!aq!elthinoh of Sto:lo, Museum of Anthropology, UBC. Object # A17200

Unsurprisingly some blankets defy categorization, or simply stand in a class of their own. One such example is one of the best-known blankets in the history of the Pacific Northwest, the oldest surviving blanket from this area. This is a Makah blanket that was buried in a mudslide at Ozette on the west coast of the Olympic Peninsula, over 500 years ago. This is known as the Ozette blanket. Although not a Coast Salish blanket it demonstrates skills that were likely shared by neighbouring peoples. It is interesting for a variety of reasons including the weaving techniques—both plain weave and a twill weave. It has a plaid design and the blue/black stripes of the plaid are woven plain while the white body is woven in twill.¹⁵ Some of the plied yarn is twisted Z and some twisted S, which is most unusual in Pacific Northwest weavings.

Analyzing and identification of fibres

While my research looks at the structure of the yarns, I also look at the fibres. It is important to know the difference between a locally spun plant or animal fibre, and commercial yarn for example. As indicated above, commercial yarn, almost always sheep wool, is distinguished by the 3 or 4-ply structure, while locally spun yarns are almost always 2-ply. Unless you have permission to deconstruct the yarn, even the number of plies can be deceiving without a microscope. The other distinguishing feature is the direction of the ply, commercial being zzzS, entirely opposite of the final twist in local hand spun ssZ.

Commercial yarn from the 1800s – 1950s is mostly wool: rayon not being available until after 1910 and nylon during WWII. The classic blankets that do exist in museums are post 1800 and most contain sheep wool as well as traditional fibres discussed above. Sheep were first brought into Puget Sound area in 1838-1840, but a trade in commercial wool in the Pacific Northwest

¹⁵ Gustafson, *Salish Weaving*, 16.

pre-dates that. The Coast Salish are also known for (un)ravelling yarn and re-spinning it, so the number of plies and the spin direction are important to distinguish sheep wool.

Certain fibres can be difficult to identify with confidence. Nettle, dogbane and very soft pounded cedar all resemble each other. Often a plant fibre is difficult to tell from an animal fibre just using your naked eye. This difficulty has troubled First Nation weavers, curators and scholars, and has cast doubt on some of the oral history about textiles that has passed on through the generations. The advancement of technology has assisted in settling some of the challenging questions that have been raised.

Examination of blankets in museums shows that mountain goat wool appears in all four blanket styles: plain weave, twined, twill and hybrid. Mountain goat wool has the advantage of guard hairs to distinguish it, and so is easily spotted. The twill blankets are typically made from mountain goat; we can tell that from the guard hairs (dog wool, by contrast, has no thick prickly guard hairs).

The analysis of blankets has also revealed that older blankets, dating back to 1800s, contain less guard hair. This could be due to commercial blankets becoming more easily available by the mid 19th century. Fewer people may then have wished to engage in the time-consuming “dehairing” of the wool. Perhaps, as trading patterns changed, the increasing difficulty of obtaining mountain goat wool, drove spinners to try to extend supplies by including more guard hair to bulk up the supply. This could also indicate a change in processing the wool. If the mountain goat wool is very carefully processed to get rid of the guard hairs, then it can be difficult to discern if a fibre is mountain goat rather than dog or sheep wool. An additional confusion arises in distinguishing fibres because some sheep breeds have a lot of guard hairs (kemp), easily confused with mountain goat.

Some of the technologies that have assisted in identifying fibres are carbon isotope analysis and microscopy. Hair analysis, in particular carbon isotope analysis, is a useful tool that can determine from one hair the source of the food eaten by the animal, based on the type of carbon embedded in the hair. It can reveal if the fibres in a blanket come from a herbivore or an animal with a marine-based diet. This technique was useful in helping to identify fibres in a child's burial blanket found near Yale, along the Fraser River where Simon Fraser recorded his sighting of wool dogs.¹⁶ Rick Schulting, a researcher at SFU, showed that the fibre was almost 100% from the same species, that the fibre was not a mixture, and that it came from a species with a marine-based diet.¹⁷

Although this does not prove the fibre is from dog, it does tell us two important facts. First, given where mountain goat are found, it is unlikely that mountain goat fed on salmon, or on any other marine source of carbon in this area, ruling out mountain goat as the fibre in the child's blanket. Secondly, the fibre could be spun by itself as a single fibre yarn. If, and this is still the big

¹⁶ Simon Fraser and W. Kaye Lamb, "The Letters and Journals of Simon Fraser, 1806-1808," in *Voyageur classics* (Toronto Ont.: Dundurn Press, 2007), 119-20.

¹⁷ Rick Schulting, "The Hair of the Dog: The Identification of a Coast Salish Dog-Hair Blanket from Yale, British Columbia," *Canadian Journal of Archaeology* 18(1994).

question, this proves to be dog hair, then this finding will indicate that dog hair was valuable by itself, used as a single fibre source rather than as a filler to mix with other fibres.

Looking at the medulla (inner core) of a hair turns out to be useful in distinguishing dog hair from mountain goat, and regular light microscopy can be used to do that. The woolly dog Mutton's hairs, once he was rediscovered, were useful as a comparison.

In 2011 Caroline Solazzo used proteomics to study the fibres in nine blankets in the Smithsonian, working on a total of eleven tiny samples of fibre. Protein mass spectrometry (Proteomics) is a useful tool in analyzing textiles and other objects composed of proteins. This technique is especially useful because only very small samples are required. Signature proteins vary from species to species, and using this technique to look for dog, mountain goat and sheep proteins, Carolyn Solazzo was able to positively identify dog hair in ten of the eleven textiles. One of the earliest blankets dated 1803, has a blend of mountain goat and dog in the warp and in the weft while three other blankets also contained a blend.^{18 19} Pure dog hair was found in two samples, in the warp of one²⁰ and the fringe of another²¹ while pure mountain goat was found in six wefts and five fringes. An unexpected result was finding a blend of sheep wool with mountain goat in two blankets, one of which was collected just prior to sheep being introduced in the Pacific Northwest. Based on this small sample size it can be inferred that blankets made prior to 1850 are more likely to contain some dog hair than blankets made post-1850. This date aligns with the gradual extinction of the Salish woolly dog, thought to be in the 1860's.

A hand-held microscope was used to look closely at two other blankets, based on the author's suspicion that they contained dog hair. One, a small blanket still on a small loom, at the Pitt Rivers Museum has a halo much like that of an angora sweater.²² Looking closely at the fibres, they are evidently white but many have dark brown/black tips, indicating a fibre other than mountain goat, although mountain goat could still be present. This blanket is still to be tested by the proteomics method.

The second blanket, a plain weave one (see Figure 10) at the Burke Museum at the University of Washington in Seattle, has a small tear in which the warp is visible. The microscope showed the warp is likely made primarily from sinew.²³ The main fibre for the weft does not look like mountain goat or sheep; it resembles Mutton's fur. Further analysis showed that the majority of fibres were indeed dog.²⁴

In the last forty years, we have gone from a belief that Coast Salish blankets were unlikely to contain dog wool, to the understanding that perhaps dog wool was added, but only as a filler fibre, to our current position of now knowing that dog wool is the sole fibre in some blankets.

¹⁸ Smithsonian National Museum of Natural History catalogue #NMNH 177710

¹⁹ Smithsonian National Museum of Natural History catalogue # NMNH1891, NMNH 2120 and NMNH 221408

²⁰ Smithsonian National Museum of Natural History catalogue #NMNH 2124

²¹ Smithsonian National Museum of Natural History catalogue #NMNH 1894

²² Pitt Rivers Museum at Oxford University, England, accession #1884.46.23.1

²³ Burke Museum #2.5e1965. Elk sinew was used in warps.

²⁴ Analysis was performed by Elaine Humphrey, project manager at the University of Victoria's Advanced Microscopy Facility

This more than justifies the Coast Salish having a name for dog wool blankets— Ko-matl'-ked (in the Nisqually language).

Newer technologies have changed and enhanced our perspectives on the fibres used in Coast Salish blankets, lending support to fleeting observations made by early European observers, and, more significantly, upholding older beliefs and knowledge, passed down through generations of oral tradition. We would do well to bear in mind that we often may need to adjust our assumptions and pay much closer attention to the the cultural foundations from which these remarkable textiles have emerged.

Hich'ceq Musqueam, Squmaish i tslay'wa'tuth shqualuwun utl' Musqueam, Squmaish i tslay'wa'tuth tumuxw kweyul u tuna kweyul.

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