

APPENDIX B: The Cultural Importance of Kelp for Pacific Northwest Tribes

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B.1 A Link between Worlds

With its holdfast clinging firmly to the seafloor and a long stipe reaching up to bulb and blades in the waves, bull kelp provides a physical link between the surface and undersea worlds. But kelp is also a link between continents, a link between land and sea, and a link between the human and supernatural worlds (Turner 2005a; Pringle 2017). Many of these links between realms are formed — materially and/or symbolically — by bull kelp (*Nereocystis luetkeana*). For example, the Haida people, whose homelands include the coastal islands of southeastern Alaska and northwest British Columbia, tell the story of Sounding-Gambling-Sticks, who lost his father’s town in a gambling game. He floated in his canoe for many nights, trying to think of how to regain what he had lost, when he came upon a two-headed kelp (Figure B-1). He followed the kelp down to the bottom of the sea and realized that it was a housepole leading to the home of his supernatural grandfather. His grandfather gave him the power to regain all that he had lost (Turner 2005b).



Figure B-1. A couple of examples of two-headed bull kelp, provided by Tom Mumford (left) and Helen Berry (right).

The close relationship between kelp-based coastal ecosystems and Pacific Northwest indigenous cultural systems is reflected in a wide range of evidence, including prehistoric artifacts, historical sources, and contemporary practices. The first human inhabitants of the Pacific Northwest likely followed “the kelp highway” that extends along the Pacific Rim from Asia to South America. Kelp forests provide habitat and primary production, supporting diverse marine resources that have sustained and inspired traditional indigenous lifeways across continents and over generations. Within the Pacific Northwest, bull kelp played a particularly prominent role in traditional subsistence knowledge and technology and was used in fishing, hunting, and food preparation and

storage. It was also put to more playful uses by both children and adults, who used kelp for toys, target practice, and musical instruments.

Kelp also plays an important role in symbolic and spiritual aspects of traditional Northwest Coast cultures. Some groups used kelp for cranial modification, an important sign of status and nobility throughout the Pacific Northwest. Kelp also appears in various Coast Salish myths and stories, where it represents the interdependence between indigenous people and the sea, the reciprocal ties of kinship between humans and supernatural beings, and the potential perils of marine livelihoods.

B.2 An Ecological and Cultural Foundation Species

B.2.1 “May Contain Traces of Kelp”

Healthy kelp forests provide habitat and primary production that support diverse marine food webs (Klinger 2015), as well as economically and culturally important protected resources. In his satirical Breakfast Series, Kwakwaka'wakw artist Sonny Assu (Gwa'gwa'da'ka) mentions that the Salmon Loops and Salmon Crisps “may contain traces of kelp” (Assu 2006), a fact confirmed by isotopic analyses of salmon species (Johnson and Schindler 2009). Kelp has relatively more carbon-13, while phytoplankton has relatively more carbon-14. Therefore, scientists can estimate how much of an organism's diet comes from nearshore (kelp-based) versus pelagic (phytoplankton-based) food chains. Kelp accounts for 36-89 percent of the carbon in kelp greenlings and 32-65 percent of the carbon in black rockfish along the Pacific Coast (von Biela et al. 2016). However, kelp signatures in rockfish samples have declined since European contact (Szpak et al. 2013), likely in tandem with local declines in kelp forest cover. Given the importance of kelp to Puget Sound's nearshore food webs, these declines may be cause for alarm.

B.2.2 The Kelp Highway

Archaeological evidence suggests that the Americas may have first been settled by maritime peoples following the rich assemblage of marine resources found in the kelp forests that extend along the Pacific Rim from Japan all the way down to Chile (Erlandson et al. 2007; Erlandson et al. 2015). The “Kelp Highway Hypothesis” suggests that ancient Americans may have arrived and dispersed far earlier by sea rather than by land. By fishing, hunting, and sheltering among the kelp forests, the first peoples may have followed kelp like a road map to find new land and resources. The close relationship between kelp-based coastal ecosystems and Pacific Northwest indigenous cultural systems is conveyed by the Coast Salish through stories of a girl who married a man of the sea. In the Samish version of the story (Figure B-2), Ko-kwahl-alwoot's marriage ensures that her people have access to the sea's bounty. Her own gradual transformation into a sea-being prevents Ko-kwahl-alwoot from visiting her family, but when the Samish see her hair — blades of bull kelp — moving with the tides near Rosario Beach, they know she still provides for them (Rector and Karsen 2015; Samish Indian Nation Elders, pers. comm., June 5, 2017). The maiden in the Chimakum/Klallam/Skokomish version of the story is Kaka'ntu' or Kekanetu, and her hair

forms the kelp beds near Port Townsend and Port Crescent, Washington (Gunther 1925; Elmendorf 1961).



Figure B-2. The story of Ko-kwahl-alwoot, the Maiden of Deception Pass, is commemorated in a story pole carved by Tracy Powell on behalf of the Samish people. Powell's rendering clearly depicts the large bulbs characteristic of bull kelp (*Nereocystis luetkeana*). The story pole was raised near Rosario Beach at Deception Pass State Park in 1983. Photo by Cameron Lothrop Johnson.

B.2.3 The Role of Kelp in Traditional Ecological Knowledge

Traditional ecological knowledge (TEK) is knowledge about living organisms and their interactions with each other and their environment gained through generations of experience, adaptation, and cultural transmission (Berkes 1999). We know based on European explorer travelogues, early ethnography, myths, and contemporary subsistence activities that kelp was and continues to be an important part of Pacific Northwest indigenous TEK.¹ Declining kelp beds are, therefore, a sign of ecological disruption as well as an impending cultural loss since the two are so intricately intertwined in indigenous lifeways.

Much of kelp-related TEK highlights its role as a foundational habitat-forming species while also revealing sophisticated traditional ethological knowledge. Nuu-chah-nulth hunters knew that sea otters often rested on kelp beds and that females left their pups floating atop kelp beds while they foraged (Drucker 1965). Kwakwaka'wakw hunters tried to keep harpooned seals from swimming into patches of kelp, where they had a better chance of breaking the kelp harpoon line or dislodging the harpoon point (Boas and Hunt 1921). One Samish elder described how her family would search for crabs in kelp beds during low tide, when the crabs would hide underneath the kelp to stay cool and moist (Leslie Eastwood, Samish Indian Nation Elder, pers. comm., June 5, 2017). Once it washed ashore, salt-laden kelp attracted browsing deer that could easily be taken by Lummi hunters (Tacoma News Tribune 1972). Links between kelp and the harvesting of important traditional foods are also expressed in Pacific Northwest mythology. In various Tlingit myths, for example, Raven instructs the people to harvest particular species, such as halibut and sea urchins, in or near kelp forests (Swanton 1909).

Finally, persistent kelp forests were also part of the navigational knowledge of coastal groups. For example, names of marine landmarks reference the presence of kelp beds in various Tlingit legends (Swanton 1909). The Makah people sometimes used kelp beds as overnight anchorage when venturing far from home. Nuu-chah-nulth warriors famously did this in 1852 when they intimidated the U.S. Pacific Survey at Cape Flattery (Reid 2015).

B.3 The Role of Kelp in Traditional Subsistence Practices

B.3.1 Reef Net Fishing

Reef net fishing was practiced by the Lummi, Samish, and other Straits Salish groups to harvest salmon. This ingenious method took advantage of the tides and kelp-covered rocky reefs and was one of the few traditional fishing techniques that persisted many years after Euro-American settler colonialism (Lane 1973). The Samish, for example, continued reef net fishing for subsistence until

¹ A brief, but necessary note about sources: Many archival sources, including explorer travelogues and early ethnographies, offer a very colonialist and Eurocentric perspective on Pacific Northwest indigenous cultures. As part of the colonialist “exploration” and salvage ethnography eras, these descriptions and depictions often simultaneously reinforced Euro-American notions of “primitive Indians” and fueled false narratives about “vanishing” peoples and cultures. I urge readers to keep this important limitation in mind, and to critically evaluate their own assumptions. I also welcome any feedback from Tribal and First Nations communities on the accuracy and appropriateness of the information from these sources.

around 1875 and resumed the practice in the 1890s to sell salmon to local canneries (Lane 1975). Reef net fishing has persisted up to the present, and the practice has been observed as recently as 2014 near Shaw Island, and 2018 near Lummi Island (Thom Mumford, pers. comm., September 29, 2019).

Reef net fishing requires two canoes and six to twelve crewmen (Figure B-3). Preferably, reef nets are placed above natural kelp-covered reefs. In their absence, lead lines covered in strands of eelgrass can be added to the reef net anchor lines to mimic the appearance of kelp (Easton 1990). In either case, the large rocks anchoring reef nets often provide substrate for the formation of future kelp-covered rocky reefs. Nets are placed perpendicular in the path of migrating salmon during the tidal ebb or flow, where the kelp (real or fake) forces the salmon to rise closer to the surface and into the net. To facilitate this, a channel is cut through the kelp to funnel the salmon toward the reef net. Once the salmon are visible directly above the net, the slack in the anchor line is released to allow the net to be lifted and the canoes to come together, thereby trapping the salmon (Stewart 1977).



Figure B-3. Lummi Native American reef netters (ca. 1930), photographed by Eugene H. Field. Six to twelve fishermen and two canoes were needed for reef net fishing. Source: Item waRN0084, Lummi Island Heritage, Reef Net Fishing Collection, held at Island Library (Whatcom County Library System) and published by the Washington State Library.

B.3.2 Herring Spawn on Kelp

Many groups, including the Nuxalk, Haida, Heiltsuk, Nuu-chah-nulth, Tsimshian, and Kwakwaka'wakw, also used kelp to harvest herring roe. Pacific herring deposit their eggs on seaweeds and seagrasses during spawning, and some groups augmented this process by setting up stalks of giant kelp (*Macrocystis pyrifera*) or cedar boughs in spawning areas near river mouths. After spawning, the kelp was gathered by boat and then left to dry in the sun (Stewart 1977). When prepared, the kelp pieces were soaked overnight then broken into small pieces and eaten with eulachon oil (Turner 1995; Turner 2001). Pacific herring roe remains an important traditional food for Salish Sea First Nations, and they continue harvesting herring spawn using kelp (Pawsey 2015).

However, according to Chris Morganroth III of the Quileute Tribe, increased sedimentation from logging has led to the loss of giant kelp beds where Pacific herring spawned on the Olympic Coast (Wunsch and Lepofsky 2014-2015). To maintain the traditional herring roe on kelp fishery despite declining kelp beds, in the 1990s the Makah Tribe harvested large quantities of *Macrocystis* and transported it by truck to the Lummi Reservation (Tom Mumford, pers. comm., September 29, 2019). For more information about the ecological and cultural importance of Pacific herring, including interviews with elders and videos of the spawn on kelp harvest, visit the Herring School's website: www.pacificherring.org.

B.3.3 Traditional Subsistence Technology

“Without doubt, the most valued marine plant material in traditional Northwest Coast technology is bull kelp” (Turner 2001). In particular, bull kelp figured prominently in traditional fishing and hunting technology. The Coast Salish made halibut and cod bentwood fishing hooks by placing fir and hemlock knots inside of bull kelp bulbs (Turner and Bell 1971). Branches were cut to size and shaved to the right thickness and shape before being placed inside of a kelp stipe. The stipe was then filled with water, plugged up at the end. The kelp stipes and bulbs were buried in hot ashes and left to steam overnight. By morning, the wood was supple and flexible and could be bent into shape or placed into wooden molds and left to harden and cool (Stewart 1977; Turner 2001; Turner 2005). A similar method was used to soften the ends of hardwoods and bend them into bows (Turner 1979; Turner 2001; Turner 2005a), and to straighten harpoon shafts (Waterman 1920). The Makah and Quileute tribes also steamed cedar bark in bull kelp stipes to soften it before making rope and baskets (Kirk 2015).

Bull kelp was also frequently used by the Quileute, Quinault, Makah, and other tribes to create fishing, anchor, and harpoon lines (Waterman 1920; Turner and Bell 1971; Gunther 1973). To make these lines, the stipe was tightly twisted and cured by alternatingly soaking it in freshwater and oil. The resulting line was brittle when dry, but strong and flexible once wet (Stewart 1977; Turner 2001; Turner 2005a).

B.3.4 Household Uses of Kelp

The technological uses of bull kelp also extended into many aspects of household daily life. Kelp bulbs and stipes facilitated the long-term storage and long-distance trade of eulachon, seal, dogfish, and whale oils (Boas and Hunt 1921; Turner 2001), and later molasses and spirits (Wood 1882; Gunther 1973). Bulbs were cut to make a convenient funnel, and liquids were poured into stipes and coiled up for storage in bentwood boxes (Stewart 1977). The Nuu-chah-nulth used bull kelp bulbs to store deer suet and healing skin salves. The liquid fat would harden inside the bulb, which could be pulled off after the fat solidified (Turner 2001).

In other household contexts, bull kelp also served as a garden hose, refrigerator, steamer, fuel, and even fertilizer. The Nuxalk often used the stipes as water conduits, and their modern word for hose literally means kelp (Turner 2001). Harvested fish were kept fresh and cool in canoes and on land with a protective layer of kelp (Turner 1979). To prepare fish and other foods, steam pits were lined with kelp and other seaweeds to add moisture and flavor (Boas and Hunt 1921; Stewart 1977; Turner 1995). And, in the absence of dry wood, dried kelp was used as fuel for the cooking fire

(Elmendorf 1961). Post-European contact, dried kelp and other seaweeds served as fertilizer for potato and vegetable gardens (Turner 2001).

Finally, kelp and other seaweeds had medicinal importance. They were often traded inland to treat iodine deficiency and goiter, and included in medicinal steam baths (Turner 1995). The Saanich also shaved off pieces of bull kelp holdfasts to make a medicinal tea that helped with internal ailments (Turner and Hebda 2012).

B.3.5 Playful Uses of Kelp

In addition to its prominent role in hunting and household technology, bull kelp was also put to more playful uses. “Children up and down the [Pacific Northwest] coast played many different games with seaweeds” (Turner 2001). Bulbs from various species of kelp were deployed as squirt guns, targets for spear throwing, and poppers when stomped on or thrown in the fire (Turner 1979; Turner 2001). Coast Salish and Kwakwaka’wakw children fashioned toy blowguns and ammunition out of kelp (Turner 1979), while Nuuchah-Nulth children played a hockey-like game on the beach with sticks made from kelp stipes and a puck made out of holdfasts (Turner 2001). Makah children cut up kelp to make miniature wagons and wagon wheels and frequently dragged the stems along the beach. They would also use kelp stipes to pretend they were harpooning whales (Gunther 1973).

Playing with kelp is not just for children. During a recent cultural event, the Samish made toy rattles (not to be confused with sacred ceremonial rattles) out of dried bull kelp bulbs filled with pebbles (Leslie Eastwood, Samish Indian Nation Elder, pers. comm., June 5, 2017). Early ethnographers also described a Haida Nation throwing game played with kelp stalks (Turner 2005b). Bull kelp stalks were cut into foot-long pieces and placed upright in the ground about 20 feet apart, and two teams of two players positioned themselves on opposite sides. Using sharpened salmonberry sticks as spears, players took turns trying to hit and split open the opposing team’s kelp stalks. If any player hit the smallest kelp stalk, his/her team won the game immediately.

B.4 Symbolic Uses of Kelp

B.4.1 Status and Ceremony

Among many Pacific Northwest Tribes, various types of body modification — including pierced lips for labrets, facial tattoos, and cranial modification — were linked to regional systems of acknowledged status and marriageability (Suttles 1990). Cranial modification, in particular, was used to distinguish high-status individuals (Turner 2001), and, given its visibility in the archaeological record, we know the practice began at least 2,500 years ago (Cybulski 1990). If done incorrectly, a cranial modification could result in death, so this was indeed a reliable signal of the status and cultural knowledge of a child’s parents and relatives.

Kelp was specifically used by the Koskimo (Gusgimukw) — a Kwak’wala-speaking Tribe from Quatsino Sound on northwestern Vancouver Island — to bind the heads of infants and achieve the desired shape (Boas and Hunt 1921; Turner 2001). Kelp blades saturated with perch oil were

wrapped around the infant’s head just above the ears and replaced at periodic intervals for a specific number of months. Different Tribes varied the replacement interval or the overall length of binding, resulting in observable differences in head shape (Boas and Hunt 1921).

Kelp was also used in ingenious ways during dramas performed at winter ceremonials and potlatches to create various special effects (Boas 1916; Turner 1979; Turner 2001). The Tsimshian and Kwakwaka’wakw created sound effects, such as the illusion of voices or snoring, by having people speak through kelp stipes hidden under the stage. Other uses included using kelp as hoses to pump smoke onto the stage or to pump in water to put out fires quickly. Kelp and other seaweeds were also used in steam baths for spiritual purposes (Turner 1979).

B.4.2 Mythical Marriages Made in Kelp

In various Pacific Northwest myths and stories, kelp plays a prominent role in marriages linking land and sea. As mentioned above, multiple Coast Salish groups tell a common story about a girl who marries a man of the sea and ensures that her people have access to the sea’s bountiful resources (Gunther 1925; Elmendorf 1961; Rector & Karsen 2015). Some versions of the story emphasize reciprocal ties of kinship and interdependence between indigenous people and the ocean. In the Samish telling of the story, the maiden’s gradual transformation into a sea-being prevents her from visiting her people, but her hair — blades of bull kelp moving with the tides (Figure 2) — reminds the Samish of her presence and protection (Rector & Karsen 2015; Samish Indian Nation Elders, pers. comm., June 5, 2017).

However, in one Klallam version, the maiden becomes a fearful kelp-haired being who drowns people (Gunther 1925), highlighting one of the potential dangers of the Coast Salish reliance on the sea for subsistence. Similarly, the Kwakwaka’wakw Mink Legend conveys some of the fundamental incompatibilities between land and sea through an ill-suited marriage between Mink and Kelp (Boas 2002 [1895]). Mink tries various times (unsuccessfully) to marry. On his second attempt, he marries long-haired Kelp despite his mother’s warnings that she will submerge with the high tides. He tries to overcome this obstacle by plugging his nose and holding his breath when the tide comes in. He tells his new wife to let him go if he runs out of breath and pinches her. But when the tide comes in, Kelp ignores his increasingly desperate pinches and holds on to him until he drowns. Instead of the old “ball and chain,” we might say that Mink was held down by the old “bulb and stipe.”

B.4.3 Tangled Up in Murderous Mythical Kelp

The supernatural realm of the indigenous Pacific Northwest is inhabited by a wide array of powerful beings, both benevolent and nefarious. Within this mythos are multiple examples of murderous kelp. KEkanetu, the Klallam maiden who married a sea-being, eventually transformed into a kelp-covered creature who drowns passersby (Gunther 1925). According to Quileute Tribal legend, high tides are caused by Duskiya (Dask’iya), a kelp-haired supernatural being who snatches away children (Powell 1990). In the Tlingit Raven myth, after they kill their evil father, the sons of ŁAkîcîne’ pursue and vanquish other monsters, including a deadly patch of kelp. This kelp bed, called Kelps-washed-up-against-one-another-by-the-waves (WücxkAduŋ’-t-gîc), would close in on and drown all who tried to pass. However, the brothers managed to dart through and

then kill the kelp. They piled the dead kelp in one place, and it became a kelp-covered rock that is still visible today (Swanton 1909).

B.5 Conclusion

In conclusion, the close relationship between kelp-based coastal ecosystems and Pacific Northwest indigenous cultural systems links not only ecology and culture, but also joins land and sea and the human and supernatural. This connection highlights the role of kelp as both ecological and cultural foundation species, such that the loss of kelp species and habitats leads to the simultaneous loss of essential ecosystem function and important cultural knowledge (Garibaldi and Turner 2004). Although many of the stressors associated with kelp decline are associated with recent human impacts, the evidence presented here suggests Pacific Northwest kelp forests have a long prehistory as sustainable social-ecological systems. Thus, the traditional ecological knowledge, subsistence practices, and symbolic culture of our Tribal co-managers are essential contributions to the recovery and conservation of kelp within Puget Sound.

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Appendix B — Puget Sound Kelp Conservation and Recovery Plan

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