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Vignette 23: Indigenous Management Systems Can Promote More Sustainable Salmon Fisheries in the Salish Sea

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23 INDIGENOUS MANAGEMENT SYSTEMS CAN PROMOTE MORE SUSTAINABLE SALMON FISHERIES IN THE SALISH SEA

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Introduction and Overview

Indigenous peoples of the Northern Pacific Rim have harvested salmon for more than 10,000 years (Cannon & Yang 2006; Muckle 2007), and Pacific salmon (*Oncorhynchus* spp.) form the foundation of social-ecological systems encompassing communities from California to Kamchatka and Northern Japan (Yoshiyama 1999; Muckle 2007; Tabarev 2011). Through continuous placed-based interdependence with salmon (Campbell & Butler 2010; Cannon et al. 2011; Ritchie & Angelbeck 2020), Indigenous societies formed deliberate and well-honed systems of salmon management (Carpenter et al. 2000; Turner & Berkes 2006; Menzies & Butler 2007). These systems promoted the sustained productivity of salmon fisheries, which likely rivaled early colonial commercial fisheries in their scale (e.g., Craig & Hacker 1940; Glavin 1996; Meengs & Lackey 2005), yet far outperformed them in their resilience and continuity (Campbell & Butler 2010).

In Canada and the United States, Indigenous sovereignty and resource stewardship were forcibly disrupted beginning in the mid-19th century and replaced by colonial government authority. Colonization altered the scales, methods, and locations of salmon harvesting and governance, stripping rights and jurisdiction from Indigenous people, and beginning a struggle for access and authority that continues to this day (Higgs 1982; Harris 2001; Heffernan 2012; Carothers et al. 2021). Commercialization transformed the values and motivations of fishers, as fishing companies and colonial governments sought to develop and extract resources for global markets, and outlawed Indigenous subsistence and trade fisheries (Newell 1993; Yoshiyama 1999; Harris 2001). In the rush to extract wealth from the watersheds of the Pacific Northwest, salmon habitats were damaged, often irreparably, by logging, mining, diking, dam construction, urbanization, and other destructive land uses (Baird 1875; Stone 1892; Miller 2010).

Among the most profound transformations in management brought on by colonization was the shift to mixed-stock ocean fisheries, which gradually replaced Indigenous in-river salmon fisheries as the primary method and scale of harvest (Cobb 1921; Higgs 1982; Morishima & Henry 2000). Many salmon in the Eastern Pacific traverse United States, Canadian, and international waters during their migratory life cycle, and fish are routinely harvested outside their state or country of origin (Malick et al. 2017; Pacific Salmon Commission 2020a). Today, most salmon caught from Southeast Alaska south to California are harvested in marine mixed-stock fisheries, an anomaly in a 12,000+ year history of Pacific salmon fishing.

With a changing climate contributing to declining abundance, and conservation risks posed by modern non-selective mixed-stock fisheries, salmon stocks are struggling to provide sustainable social, economic, and ecological benefits for society. In Canada, long-term and recent declines continue to erode the health and resilience of salmon centered social-ecological systems (COSEWIC 2018; Walters et al. 2019; Steel et al. 2021). Likewise, in Puget Sound, record low sockeye and Chinook returns to the Fraser, and Endangered Species Act-listed Chinook, chum, and steelhead populations limit the cultural, environmental, and livelihood benefits provided by these formerly abundant species (National Marine Fisheries Service 2006; National Marine Fisheries Service 2017; Pacific Salmon Commission 2020b). However, salmon from the Salish Sea are routinely harvested in faraway mixed-stock fisheries, sometimes at unsustainably high rates (National Marine Fisheries Service 2019; Pacific Fisheries Management Council 2020; Pacific Salmon Commission 2020b). The migratory life cycle of salmon thus poses additional challenges to sustainability by creating mismatches between management decisions, fishery opportunities, and the biologically relevant processes that sustain salmon populations (e.g., river disturbance, rainfall and temperature, and ocean climate and productivity; Bottom et al. 2009; Malick et al. 2017).

Despite the destructive impacts of colonization, Indigenous culture and knowledge are resurgent in Canada and the United States. In the face of declining salmon stocks, variable and changing climate conditions, and negative downstream consequences of mixed-stock fisheries, Indigenous fishing technologies and management systems are being documented and reinvigorated (Menzies & Butler 2007; White 2011; Claxton 2015; Atlas et al. 2017). Importantly, many Indigenous fishing technologies enable terminal and selective fishing, reducing mixed-stock fishery risks and creating opportunities to harvest abundant species or hatchery-marked fish. Having supported vibrant salmon-dependent communities for millennia before European settlement, we believe systems of Indigenous salmon management can support long-term opportunities for equitable and sustainable harvest of salmon across western North America.

Indigenous Fishing Technologies and their Application around the Salish Sea

In the Salish Sea, a wide variety of fishing technologies were formerly employed by Indigenous peoples, and the technology, social organization, and governance frameworks of salmon fisheries were tailored to the unique demands of each watershed or fishing location (Figure 1). A more complete discussion of Indigenous fishing technologies can be found in our recent article (Atlas et al. 2021)

Weirs

Around the Salish Sea, one of the most common fishing technologies was weirs—river-spanning fences that channeled salmon into traps or fishways—that were built annually in most river systems (Stewart 1977; Higgs 1982; Harris 2001). In larger rivers around the Salish Sea, there were often multiple weirs (Harris 2001; Ritchie & Angelbeck 2020). Authority over a specific weir location was typically held by hereditary leaders who regulated access in accordance with laws guiding reciprocal relationships with returning salmon and surrounding villages, promoting sustainability, and protecting access for communities that depended upon them (Harris 2001; Trosper 2002; Mathews & Turner 2017). Historical and ethnographic evidence indicates that deliberate conservation measures in the management of weir fisheries allowed returning salmon to pass weirs and reach upriver spawning areas, and strictly enforced rules governed their use (Swezey & Heizer 1977; Higgs 1982; Harris 2001; Ritchie & Angelbeck 2020). Weirs remain a trusted tool for monitoring, in-season management, and selective harvest.

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Fish Traps

Throughout the Salish Sea, intertidal fish traps—built from stone or wood and net fibre—were a common method of harvesting salmon among Indigenous and early-colonial people (Stewart 1977). Archaeological evidence of intertidal fish traps is present in estuaries around the region, living testaments to the utility, durability, and widespread application of this technology (Caldwell et al. 2012; Greene et al. 2015). Intertidal fish traps typically targeted salmon as they staged in estuaries and lower rivers. Ethnographic evidence suggests that traps were often used to selectively harvest salmon, and that traps were dismantled during periods of inactivity to allow salmon to escape unharmed (Menzies & Butler 2007; White 2011).

Fish traps remain a promising tool for low-impact selective fisheries, and a pilot project in the lower Columbia River has demonstrated their potential as a sustainable, economically viable, and less fossil fuel intensive alternative to current mixed-stock fishing technologies like gillnets, seines, and ocean trolling (Tuohy et al. 2019). Fish traps are currently being considered for legalization in the lower Columbia River by the Washington Department of Fish and Wildlife through an Emerging Commercial Fishery Designation (RCW 77.65.400). If successful, a similar legal action could be taken in Puget Sound to legalize fish traps for selective harvest of hatchery fish and release of Endangered Species Act-listed wild salmonids (Tuohy et al. 2020).

Reef Nets

Reef nets are endemic to the Salish Sea, and have long been used by Straits Salish Tribes on both sides of the border to harvest salmon in shallow-water marine approaches to their spawning rivers (Easton 1990; Claxton 2015). The long leads of the reef net are anchored at their ends, tapering back in a funnel shape towards a central net that is fished between two boats (Figure 1). Migrating fish are observed from an upright position, or from a platform in many modern reef net vessels. When salmon have entered the heart of the net the sides are raised into the adjoining boats allowing the fish to be harvested selectively or released.

The construction and use of reef nets was done following Indigenous Straits Salish law and tradition, and was a major source of subsistence, wealth, and cultural stability for Straits Salish people in the pre-colonial era. Reef netting canoes were traditionally captained by individuals who held inherited rights to long-established reef netting locations. The nets were themselves sacred objects imbued with feminine life-giving qualities (Claxton 2015). Despite being protected under treaty agreements, reef nets were outlawed in Canada in the early 1900s (Claxton 2015), and reef net sites used by Indigenous Peoples were appropriated in Washington State to make way for commercial fish traps (Lummi Tribal Archives 1894).

Reef nets continue to be used in commercial fisheries in Washington State. Given the depressed status of many salmon species in Puget Sound, they have recently been highlighted as a selective fishing technology, and efforts are underway in the United States and Canada to reinvigorate reef net fisheries for tribal subsistence and commercial harvesting (e.g., Claxton 2015).

Conclusions

Indigenous fishery systems offer alternatives to contemporary resource management due to differences in cultural values and knowledge systems that motivated their development. Whereas colonial societies have largely emphasized extraction of resources for short-term profit, Indigenous management has tended to emphasize multi-generational sustenance and reciprocity (Trosper 2002; Ban et al. 2019; Curran et al. 2020). Indigenous management also shares several key attributes with contemporary resource management; for example, both are guided by knowledge gained through the continuous observation of natural systems (Carpenter et al. 2000; Turner & Berkes 2006; Lertzman 2009). However, key differences exist in the scale, time horizons, and organizational hierarchies of Indigenous and contemporary resource management systems (Figure 2).

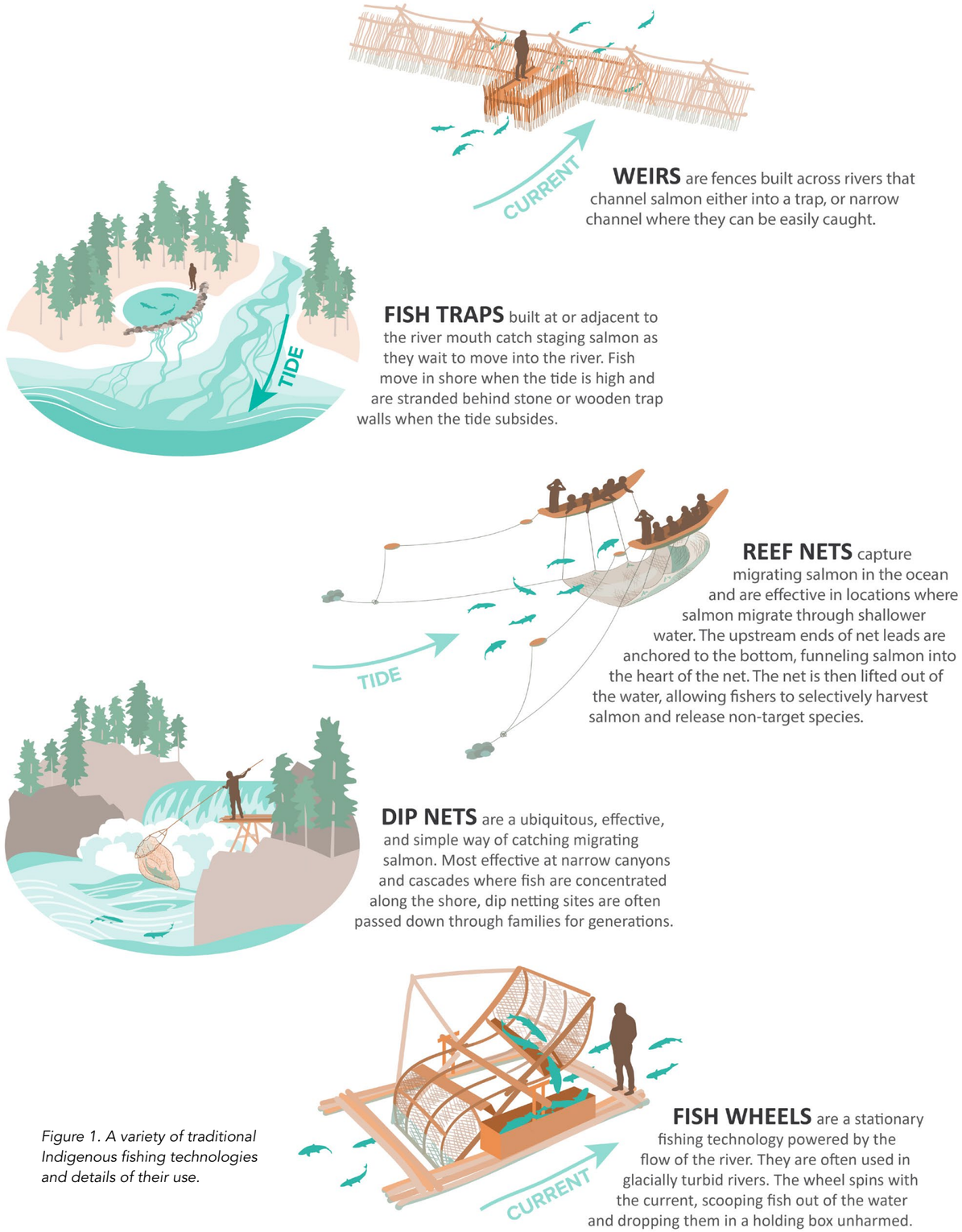

Figure 1. A variety of traditional Indigenous fishing technologies and details of their use.

Fisheries targeting single stocks may be a particularly valuable tool when the status of individual populations is variable and management resources are limited. In cases where circumstances necessitate mixed-stock harvesting, reef nets, seine nets and fish traps—centuries old technologies with deep roots in the Salish Sea—can support selective harvest. By allowing fishers to harvest healthy wild or hatchery-enhanced stocks, and safely release non-target species, these technologies hold the potential for much wider application in selective fisheries. A critical first step is overturning antiquated laws prohibiting fish traps and weirs to enable broader use in fisheries in Washington State and British Columbia.

There is an urgent need to realign the scales of fisheries to reduce conservation risks, create equitable opportunities for sustainable harvest, and support salmon-dependent species and ecosystem processes (Healey 2009; Ward et al. 2009; Gayeski et al. 2018; Walsh et al. 2020). Despite ongoing environmental changes and declining abundance, salmon are resilient and often highly productive, and can support sustainable harvest if fisheries are downscaled to target specific healthy stocks. In the absence of this transformation, salmon managers will continue to face a set of wicked tradeoffs posed by mixed-stock fisheries, where harvesting abundant stocks erodes the biodiversity that underpins future fishing opportunity and resilience (Connors et al. 2020). But more selective and terminal fisheries will produce limited benefits if mixed-stock ocean fisheries continue to intercept a majority of harvestable salmon before they return to their natal watersheds, and terminal fisheries are not immune to overharvesting (Freshwater et al. 2020). For many species, allocation decisions driven by the Pacific Salmon Treaty remain a barrier to recovery and limit the potential for transformation towards more locally managed fisheries. Thus, mixed-stock fisheries will likely need to forgo some opportunity if the social and ecological benefits of terminal and selective fisheries are to be realized (Connors et al. 2020).

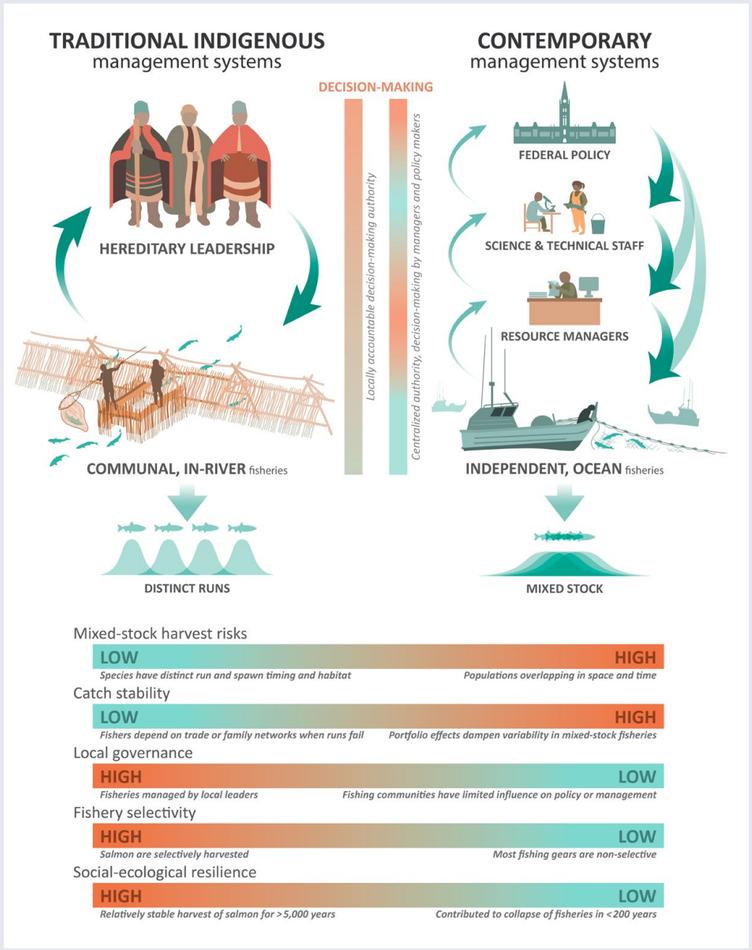

Figure 2: A comparison of Indigenous and contemporary fishery management systems depicting how decision-making authority is distributed within each system, with insights into their social-ecological performance across five key metrics.

Amidst rapid and deep-rooted changes in ecosystems and fisheries, 10,000+ years of Indigenous stewardship knowledge and a growing scientific consensus tell us that revitalizing Indigenous systems of harvest and resource governance should be an urgent priority. Broader application of terminal and selective fishing technologies can help rebuild resilient locally managed fisheries, and in doing so contribute to long-needed shifts in the balance of power, legitimacy, and opportunity. With humility and in a spirit of collaboration, let us work together to bringing the story of salmon fisheries full circle, supporting the revitalization of Indigenous management systems that formerly supported sustainable fisheries for millennia. In doing so, we will move closer to a goal shared by many Pacific Northwesterners: that wild salmon remain at the foundation of North Pacific cultures and ecosystems for generations to come.

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Yelm Jim's fish weir on the Puyallup River, circa 1885. Source: Washington State Archives.