The Decline of Wild Salmon: Catalyst of Social-Ecological Leaps in British Columbia

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#### Abstract

The ecological crisis goes far beyond global warming: the decline in biodiversity also affects communities' wellbeing worldwide. Those impacts are particularly striking when it comes to cultural keystone species, i.e. species that shape the culture – and the social fabric – of a people. In British Columbia, salmon species are recognized as cultural keystone. However, salmon populations have plummeted over recent decades. While the psychosocial consequences of this decline have been explored in the literature, research is scarce as to how positive socialecological change can stem from community responses to such disasters. Through in-depth, semi-structured interviews with relevant stakeholders (n=11), this research demonstrates that the decline in salmon populations in British Columbia has proven to be a catalyst for responses promoting social-ecological change, and explores how some of the communities impacted found innovative ways to "leap" forward in front of such adversity. By bridging the gap between the concepts of cultural keystone species and the transformative dimension of social-ecological resilience, I present cultural keystone species as unique drivers of change which should be accounted for in social work practice. Indeed, the results demonstrate the far-reaching ramifications of such change, by focusing on instances where conservation, restoration and monitoring projects successfully contributed to addressing deeply entrenched issues such as colonialism, extractivism or capitalism. Therefore, this research shows that salmon-oriented initiatives, beyond their impact on the ecosystems, also have an impact on the social fabric of the communities involved — for the better. Finally, I also reflect on the role of social workers in social-ecological change, arguing that their expertise in intervening at the junction of people and their environment must include the ecological context, providing concrete examples on how such work can take place.

#### Résumé

La crise écologique va bien au-delà du réchauffement climatique: le déclin de la biodiversité affecte également le bien-être des communautés dans le monde entier. Ces effets sont particulièrement frappants lorsqu'il s'agit d'espèces clés culturelles (cultural keystone *species*), c'est-à-dire d'espèces qui façonnent la culture – et le tissu social – d'un peuple. En Colombie-Britannique, les espèces de saumon sont reconnues comme des espèces culturelles clés. Cependant, les populations de saumon ont chuté au cours des dernières décennies. Bien que les conséquences psychosociales de ce déclin aient été étudiées dans la littérature, les recherches sont rares sur comment les réponses communautaires à de telles catastrophes naturelles peuvent également être des leviers de changement socio-écologique positif. Grâce à des entretiens approfondis et semi-structurés avec des parties prenantes concernées (n=11), cette recherche démontre comment le déclin des populations de saumon en Colombie-Britannique s'est avéré être un catalyseur pour des réponses promouvant un changement socio-écologique, et explore comment l'adversité causée par cette catastrophe a transformé ces communautés de manière innovante et leur a permis de "bondir" vers l'avant. En comblant l'écart entre les concepts d'espèces clés culturelles et la dimension transformatrice de la résilience socio-écologique, je présente les espèces clés culturelles comme des moteurs de changement uniques qui devraient être pris en compte en travail social. En effet, cette recherche explore les ramifications d'un tel changement en se concentrant sur des cas où des projets de conservation et de restoration ont contribué avec succès à résoudre des problèmes profondément enracinés tels que le colonialisme, l'extractivisme ou le capitalisme. Cette recherche démontre que les initiatives orientées sur le saumon ont des impacts non seulement sur l'environnement naturel, mais également sur le tissu social des communautés où elles prennent place. Finalement, je réfléchis également au rôle des

travailleurs sociaux dans le changement socio-écologique, en soutenant que leur expertise dans l'intervention à la jonction des individus et de leur environnement doit inclure le contexte écologique.

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#### The Decline of Wild Salmon: Catalyst of Social-Ecological Leaps in British Columbia

## Introduction

#### **Pacific Salmon: Keystone Species**

Pacific salmon (*Oncorhynchus* spp.) are considered keystone species, which means that their role is disproportionately large in their environment and that they are crucial in maintaining the structure of their ecosystem (Caro & Girling, 2010; Earth Economics, 2021; Kurlansky, 2020). Indeed, salmon connect the ocean to the land – sustaining a massive transfer of nutrients and energy through their migrations that take them thousands of kilometres out in the ocean before they come back, years later, to spawn in the exact same stream where they were born (Kurlansky, 2020). Iconic animals such as resident orcas, bears, eagles and wolves rely heavily on salmon to sustain themselves, especially before the winter months (Kurlansky, 2020; Morton, 2021). Towering trees gorge on the nitrogen and other nutrients brought inland by salmon (Morton, 2021).

Beyond their keystone importance to their ecosystems, Pacific salmon species are also cultural keystone species, which means that they are also vital to social systems – especially for Indigenous peoples (Earth Economics, 2021; Garibaldi & Turner, 2004; Kurlansky, 2020). Humans rely on salmon for many purposes, such as spirituality, culture, livelihood, and food (Sherriff, 2021). Salmon weave the social fabric of many communities; they bring people together (Mueller, 2017). In other words, salmon are not solely a natural resource; they represent an integral part of the social environment.

Pacific salmon are a unique demonstration of how intimately ecological and social systems are interconnected, and how they cannot be fully understood if approached independently. First Nations of the Pacific Northwest understand and value this intricate interdependency between humans and salmon (Amberson et al., 2016; Earth Economics, 2021; Hormel & Norgaard, 2009). Settler communities also depend on salmon throughout the coast: recreational anglers, fishing guides, commercial fishers, hatchery workers – and many more – all have a unique connection to salmon as well. As Bottom et al. (2009) highlight: "today, salmon are a cultural icon for people of all races in the region, providing diverse cultural services through the support of educational, recreational, spiritual, and community values" (p. 7), and therefore an important consideration for social workers aiming to support community wellbeing.

#### The Decline of Salmon Populations in British Columbia

Recent decades have seen an unprecedented collapse of wild salmon stocks throughout the Pacific Northwest. In British Columbia, salmon populations have declined by 90% since the 1970s (Nesbitt & Moore, 2016; Reid et al., 2022; SOS Coalition, 2023). Some streams that once teemed with salmon during spawning season now lie barren. There are seven species of the *Oncorhynchus* genus in British Columbia (hence the use of plural when referring to salmon in this article) and more than 9,000 genetically distinct salmon populations (Pacific Salmon Foundation, 2023). Each one of those populations has its own behaviour patterns and physical traits – and once they go extinct their rich and adapted genetics are forever lost.

Andrea Reid, a Nisga'a citizen and assistant professor at UBC, consulted Indigenous knowledge holders to see how they explain this critical state for wild salmon (Reid et al., 2022). They identified many factors explaining the decline of wild salmon, such as aquaculture, climate change, contaminants, industrial development, and infectious diseases (Reid et al., 2022).

The decline in salmon populations has had many consequences throughout the Pacific Northwest. Many communities relied heavily on salmon as the main driver of their economy.

Salmon are also important socially, by tying families, friendships, and communities together. Therefore, there are numerous adverse social impacts to the decline in salmon populations, which can be framed as a loss of connectedness – whether to oneself, to relatives or even to a whole community (Earth Economics, 2021; Hormel & Norgaard, 2009; Murphy, 2019). In the film *Artifishal*, Frankie Joe Myers, vice-chairman of the Yurok Tribe, explains the stakes for his community:

When your society, when your culture, when your belief is connected directly to the world around you... When you're raised with the sense that you are a part of everything in your surroundings, in your natural environment, it does something to your community psychology and mindset when you start to see that world crumble and break. As the decline of the salmon runs comes back, you can see a direct correlation with the decline of us as a people. (Murphy, 2019, 1:07:34)

The quote from Frankie Joe Myers underscores the profound interdependence between the ecological and social environments in the context of declining salmon populations in the Pacific Northwest. It highlights how the well-being of human communities is intricately linked to the health of their natural surroundings and, in this case, the fate of wild salmon.

## **Purpose and Research Question**

An important body of literature exists regarding the sociocultural importance of salmon to Indigenous peoples (Amberson et al., 2016; Earth Economics, 2021). However, as will be discussed in the literature review, little attention has been paid by researchers to the consequences for non-Indigenous communities. Furthermore, while some of the literature covers the impacts of this decline on social systems, it lacks focus on community agency and resilience. Although the decline in salmon populations presents sheer adversity, my research revealed that it also triggered unique responses which promoted social-ecological change in British Columbia.

Ungar (2021) defines resilience as the ability to persist, adapt or transform in the face of adversity. While there are many instances of community persistence and adaptation to the decline, the transformative aspect of resilience especially sparked my curiosity. Community responses of resilience are the focus of this research, which explores how the decline in salmon populations can lead to transformative resilience. These stories of resilience ought to be acknowledged and recognized – because they can inform a social work practice that recognizes the large potential of cultural keystone species to drive change in social-ecological systems.

Therefore, the main question that guided this research goes as follows:

How do community responses to the decline in salmon populations promote transformative resilience in British Columbia?

To answer that question, I met with people who have salmon and their community at heart, and I focused on their stories of resilience - i.e. how they challenge the status quo.

Through an analysis of community-based understandings of what is done to promote salmon health and community wellbeing, this research aims to bridge the gap between the ecological and social systems at stake and bring the interactions between them to the front of the stage. By focusing on a wide set of perspectives collected through interviews with key informants, I embrace the complexity of the issue, and bring to the forefront local perspectives on the relationship between salmon health and human well-being. Furthermore, I look at community-based solutions to the social-ecological problem of the decline in wild salmon. Beyond providing a problem-centered analysis of the situation, this research brings to the forefront community resilience, which, following Eve Tuck's (2009) call to suspend damageoriented research, can facilitate envisioning change in a way that relies on aspirations and complexity rather than deficits.

# Significance

Despite the fact that investing the intersections between humans and their environment is at the core of social work practice, I have been unable, similarly to earlier researchers (Norgaard & Reed, 2017), to identify any research in social work focused on the importance of cultural keystone species in human wellbeing. This can be largely explained by the inherent bias towards the social environment that we see in the discipline (Zapf, 2009), which comes at the expense of the natural world and biosphere-related considerations. Therefore, this research aims to add another voice – through a case study of salmon in British Columbia – to a growing number of social workers who see the ecological concerns of our time as worthy of attention for our discipline. One of those voices is Ungar (2002), who argues that "there is a comfortable fit between the science of ecology and a profession like social work, which has as its expressed purpose fostering healthy and interdependent transactions between persons and their environments" (p. 481).

Furthermore, I argue that this fit can be supported by mobilizing social-ecological resilience theory and incorporating it to social work. The idea of cultural keystone species as vectors of social-ecological resilience has not been explored in the literature yet, which is surprising considering how strongly people connect to cultural keystone species. Therefore, this research questions the extent to which cultural keystone species can be leveraged to promote social change. This is important for social workers because the emotional attachment that people can hold toward specific species cannot be minimized (Garibaldi & Turner, 2004). Exploring an

iconic example of such attachment, through an empirical case study in a Canadian context, will increase social workers' understanding of how relationships (in this case between salmon health and human wellbeing) within social-ecological systems interact with resilience. Therefore, this research will provide social workers with a tangible understanding of how social work practice can take ecology into account.

## **Literature Review**

#### **Ecology and Social Work**

In the realm of social work, the historical narrative predominantly favours social aspects over ecological determinants of health (Zapf, 2009). In his book *Social Work and the Environment: Understanding People and Place*, Michael Kim Zapf (2009), professor of social work at the University of Calgary, explains how ecological determinants of health were subjugated to the social early in the history of social work. For example, Mary Richmond (1922), a key pioneer of social work, wrote in her book *What is Social Case Work?* that if the ecological environment has an influence upon emotional, mental and spiritual life, it is because of its social aspects. This inclination towards a social-centric paradigm early in the profession shaped the approaches of many generations of social workers afterwards. For instance, in the 1980s was the work of Carel B. Germain, a scholar who, influenced by Bronfenbrenner's ecological systems theory, introduced the ecological approach to social work. However, the notion of environment that was promoted by Germain has been critiqued as too narrow because it focused almost solely on the social environment (Bay, 2015).

At the same time, Ann Weick (1981), another scholar in social work, argued that one's environment is multidimensional – and therefore should also include the physical environment. She stated that "an emphasis on psychological aspects of behavior has constricted social work's view of the social environment and narrowed its theoretical base for intervention" (Weick, 1981, p. 140). A broader view that sees the environment as multidimensional therefore allows a new synthesis of person and environment, which would give more freedom to social workers "to practice in ways compatible with the profession's values" (Weick, 1981, p. 143).

The conversation around the importance of considering ecology and the physical environment in social work really started flourishing in the 1990s. Hoff & Pollack (1993), for

instance, promoted a new ecological framework that relied on reciprocity between people and nature, thus looking not only at the influence of the environment on the person, but also at the influence of humanity on the environment. Berger & Kelly (1993), at the same time, offered an ecological credo for social workers, that they presented in twelve points. One of those points pertains directly to the duty for social workers to speak out when it comes to ecological challenges, knowing that they will impact human wellbeing:

Social work acknowledges the obligation of its professionals to speak out when they have knowledge of damage to the environment that will adversely affect the quality or sustainability of life for current or future generations of living systems. (Berger and Kelly, 1993, p. 525)

Overall, their approach emphasizes interconnectedness within Earth's biosphere – just like Folke (2016) suggests when it comes to social-ecological systems theory. Furthermore, they argue that "social work promotes stewardship of the Earth's resources by its human inhabitants" (p.525). I will circle back to this idea in the discussion, when looking at the importance of community-based governance in salmon social-ecological systems. Another key piece in the 1990s was Hoff & McNutt's book *The Global Environmental Crisis: Implications for Social Welfare and Social Work*, in which they argued that the goals of individual well-being and social welfare were outdated, and suggested a change of paradigm centered on sustainability and environmental protection.

Deep ecology had a strong influence on the conversation around ecology in social work. Deep ecology is a framework initiated by Arne Naess, who suggested that all elements of the natural world have intrinsic value and are interdependent (Naess & Rothenberg, 1989). Naess summarizes his argument in eight statements, in the book *Ecology, Community, and Lifestyle:*  *Outline of an Ecosophy* (Naess & Rothenberg, 1989). Ungar draws heavily from the work of Naess in an article published in 2002 in which he advocates for a deeper, more ecological social work practice, and presents it through the eight principles suggested by Naess.

A year later, John Coates (2003) also draws on deep ecology when looking at the ecological crisis as a spiritual crisis. Lena Dominelli (2018), a social work scholar with an important background in anti-oppression, talks about "green social work" as a "new environmental paradigm for the profession" (p. 9). As explained by Bay (2015), "green social work is identified with structural social work and uses anti-oppressive ideas and aims to tackle environmental injustice in practical ways" (p. 6).

Overall, the literature, and especially applied examples, is still very shy when it comes to social work and the environment. Focusing on a specific relationship – in this case between humans and salmon – therefore seems pertinent, knowing that "deep and meaningful close relationships play a vital role in human flourishing" (Feeney & Collins, 2015, p.113). That being said, there is hope that one day a true "social-ecological" practice could arise, similarly to the historical change from *casework* to *social work* – which was far more than semantic (Rine, 2016).

## The Determinants of Health: Beyond the Social

The determinants of health, and most specifically the social determinants of health, are intimately tied to social work, which throughout its history has recognized the importance of context in understanding human wellbeing (Rine, 2016). The social determinants of health are defined by the World Health Organization as "the conditions in which people are born, grow, live, work and age. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels" (2023, para. 1). While determinants of health are

mostly explored through their social aspect, some authors suggest that our understanding of the social determinants of health is incomplete:

The literature focused on determinants of health has been primarily concerned with how the "social" determines human (ill) health or (lack of) well-being, often to the exclusion of other forces that may not be considered strictly "social" in nature, including colonialism. We note that the concept of social determinants of health, by definition, tends to exclude or marginalize other types of determinants not typically considered to fall under the category of the "social"—for example, spirituality, relationship to the land, geography, history, culture, language, and knowledge systems. (Greenwood et al., 2018, p. xxii)

Indeed, many scholars heavily criticize the limited realm of the social determinants of health and how place-based, environmental, and ecological determinants of health are often evacuated from the conversation (Zapf, 2009). Sarah de Leeuw (2018), professor at UNBC and Canada Research Chair in Humanities and Health Inequities, suggests for instance that geography – referring to the physical world – should be considered a determinant of health for Indigenous peoples. Just like Zapf suggested, de Leeuw also warns of the risk for place-based determinants of health to be overshadowed by social determinants of health frameworks and methodologies. While acknowledging the human relationship with place and space – and their reciprocity – de Leeuw (2018) reminds us that "there is little work that offers explicit and critical push-back against the discursive dominance of the term 'social'" when it comes to health inequalities (p. 194). As Raphael et al. (2020) remind us, "geography illuminates interrelations between land, space, territory and human experiences that are themselves shaped by socio-political and economic dimensions of society" (p. 52). Trevor Dummer, from the School of Population and Public

Health of UBC, suggests that "more targeted research is needed on the impact of industrial pollution for human and environmental health and its geographical distribution" (Raphael et al., 2020, p. 53). This statement is supported by many scholars, especially in the field of critical environmental justice (CEJ) studies (Brulle & Pellow, 2006; Waldron, 2018). This field strives to bring to the forefront the impact of colonialism and racism on the environment of historically oppressed communities.

#### **Pacific Salmon: Backbone of the Pacific Northwest**

## The Uniqueness of Anadromous Fish

Pacific salmon are anadromous, which means they will spend part of their life in freshwater and part in saltwater. Only 1% of fish species in the world are anadromous (Bonsack, 2016), which speaks of how unique they are. Salmon are born in freshwater systems; the alevins (freshly hatched salmon), hide in the sediment of the riverbed, feeding off their yolk sac. When the alevins have gone through their yolk sac, they feed in the freshwater system for a period of time that varies between species and populations (Kurlansky, 2020). They are now considered fry. Following this, they will start their migration to the sea, which requires significant transformation and adaptation to a saltwater environment – a process called smolting, which requires a series of physiological changes. Following this, salmon will migrate out into the open ocean, and come back after two to seven years, depending on the species, to the exact same river where they were born. They will then swim upstream, without eating (which would deplete the river for the next generation), all the way up to the spawning grounds where they were born. The longest salmon run in British Columbia is on the Fraser River, where some salmon work their way upstream for 1,300 kilometres. Not only do they do so without eating, facing rapids, predators, and more, but they also undergo physiological changes (again) to prepare for spawning. Sockeye, for example, turn red by pushing the pigment of their flesh into their skin (Kurlansky, 2020). The female will find a good spot and will start moving the gravel to build a redd, where she will lay her eggs. During that time, the males are fighting to be in the best position to quickly fertilize the eggs as soon as there are laid. All Pacific salmon species (except for steelhead) usually die within two weeks of spawning, out of exhaustion. The eggs will hatch a few weeks later, beginning the cycle anew.

Pacific salmon are all part of the genus *Oncorhynchus*. The *Oncorhynchus* species found in British Columbia are sockeye, chinook (springs), coho (silvers), pinks (humpies), chum (dog), steelhead and cutthroat trout. While steelhead and cutthroat trout are part of the *Oncorhynchus* genus, there is an ongoing debate amongst scientists as to whether that is where they belong or not (they used to be part of the *Salmo* genus, which includes Atlantic salmon). This is partly because, contrarily to other *Oncorhynchus* species, they will spend most of their lives in freshwater. The term "salmon" in this research refers to all *Oncorhynchus* species, although more emphasis was put on the five species that spend most of their lives at sea.

## The role of salmon in social-ecological systems

Salmon transfer energy and nutrients from the ocean to the land. This is why the temperate rainforest along the coast of British Columbia is often referred to as "salmon forest". Salmon bring an important source of food for many animals in British Columbia. Furthermore, the nitrogen they bring from the ocean also feeds the trees in the nutrients-poor soil of the coast: "the larger the salmon run, the more trees grow" (Morton, 2021, p. 35). Therefore, humans do not only rely on salmon itself, but they also rely on the role that salmon fulfills in the ecosystem.

Alexandra Morton explains a shocking example of an instance in which the decline in salmon population had consequences on grizzly bears, which in turn had consequences on humans – thus illustrating the complexity of the relationships at stake in salmon ecosystems:

The grizzly bears in the Broughton Archipelago hardly looked liked bears. Their ribs were clearly visible through their long shaggy fur. Their legs looked much too long, because their stomachs were drawn up against their spines. They were starving and would not live through the winter. Just [...] 0.1 percent of Glendale River pink salmon returned. [...] By December, many bears were too hungry to hibernate and boldly tried to enter houses, enticed by the smell of food. First Nation villagers tried to show respect for grizzly bears that were now on their front porches. Government conservation officers intervened and shot them. (Morton, 2021, p. 315)

Morton began her career as a whale biologist but started focusing on salmon when the orcas she was studying left the Broughton Archipelago because of the lack of food caused by the decline in salmon populations – another illustration of the decline. During the course of my research, I had the privilege to attend to potlatches in the Big House of Alert Bay (in the Broughton Archipelago), and I saw the cultural importance of salmon to the Kwakwaka'wakw First Nations there.

Many First Nations directly identify to salmon. *The Sociocultural Significance of Pacific Salmon to Tribes and First Nations* report presented to the Pacific Salmon Commission took a closer look at Indigenous perspectives on salmon (Earth Economics, 2021). The authors consulted First Nations throughout the Pacific Northwest and explain how salmon is a cultural keystone species (Earth Economics, 2021). They conclude that participants emphasized that the health of salmon is closely connected to human wellbeing in the Pacific Northwest. Furthermore,

they highlight that "Western (non-Indigenous) sciences have generally disregarded Indigenous knowledge, technologies, and policies that might mitigate harm to both salmon and related sociocultural values" (Earth Economics, 2021, p. 23). This research aims at pushing in the other direction, by giving a central place to Indigenous voices and experiences.

#### **Conceptual Framework**

## **Keystone Species**

The keystone concept has been used in ecology for many years. Robert Paine, a marine ecologist, developed the concept in 1969 after studying starfish (Pisaster ochraceus) in Makah Bay, Washington State. Paine was tossing the starfish away from the shore, to see what would happen to the ecosystem in the absence of this top predator. Pretty quickly, he found that instead of allowing other species to further thrive (as he thought they would in the absence of a top predator), the absence of starfish was greatly compromising biodiversity. Indeed, starfish were keeping the dominant mussel (Mytilus californianus) in check, thus allowing for more diversity (Caro & Girling, 2010; Paine, 1969). In the absence of starfish, the mussels overcrowded the ecosystem, driving away 10 of the 17 species Paine had identified. Paine (1969) wrote a letter to the editor of *The American Naturalist*, introducing the concept of keystone species. In the 1970's, while on a trip to Alaska, Paine met another scientist, Jim Este. Este was studying the impacts of the environment on the biology of sea otters on Amchitka Island, before the Cannikin nuclear test that was set to take place in 1971 (Kohlhoff, 2002; U.S. Geological Survey, 2023). Paine suggested that he looks instead at the impacts of sea otters on the ecosystem. Their discussion led Este and his colleague Palmisano (1974) to explore and further understand the capital importance of sea otters in marine environments of the Pacific Northwest. By eating sea urchins, sea otters prevent the depletion of kelp forests through sea urchins overgrazing (Caro & Girling, 2010; Estes & Palmisano, 1974). Healthy kelp forests are extremely important for coastal ecosystems, by providing habitat for many species of invertebrates and fish (including salmon) and by reducing coastal erosion.

While Paine opened the way to the use of the keystone concept in ecology, the idea of foundational species made its way to social sciences in the 1990s. While the concept was

described by other scholars before them, Ann Garibaldi and Nancy Turner, two ethnobotanists working in British Columbia, further developed the concept of cultural keystone species in 2004 in an article published in the journal *Ecology & Society*. Here is the definition they suggested:

Just as certain species of plants or animals appear to exhibit a particularly large influence on the ecosystem they inhabit, the same is true in social systems. We have termed these organisms "cultural keystone species" and define them as the culturally salient species that shape in a major way the cultural identity of a people, as reflected in the fundamental roles these species have in diet, materials, medicine, and/or spiritual practices. (Garibaldi & Turner, 2004, p. 5)

Already then, Garibaldi & Turner (2004) identified salmon as cultural keystone species for Pacific Northwest peoples.

Cultural keystone species are the social systems counterpart of the ecological concept, and are crucial in community stability (Coe & Gaoue, 2020; Garibaldi & Turner, 2004). This fundamental role, obviously, has an impact on human wellbeing – and a compromised access to those species can have catastrophic consequences (Coe & Gaoue, 2020). The following example, explained by a participant to a study led by the nonprofit Earth Economics, illustrates this situation through salmon in British Columbia:

I was at a meeting recently when two of the women got up – and there was probably a hundred people there that represent people on the Fraser watershed and the coast fisheries, like Kwakwaka'wakw people and Coast Salish people and Nuu-chah-nulth people. We all met in Kamloops. And two women literally started crying because they just opened their last jar of fish. They are done. They had no dry fish. They weren't allowed to dry fish. They were done. They had their last fish. They were literally crying there. And that's what I see when, you know, we go to these meetings. I see all the people that go without because of Big Bar [landslide]; people are going without. And because the fish are not coming back, there are people going without. (Earth Economics, 2021, p. 49)

This testimony demonstrates how intimately tied human wellbeing and keystone species can be, especially for Indigenous peoples. While Garibaldi and Turner drafted a framework for the (somewhat arbitrary) measurement of the cultural keystone species status, the literature remains vague as to how exactly a species should be deemed "cultural keystone". Coe & Gaoue (2020) addressed this issue, by conducting a systematic literature review on the concept. They found that many different methods were used to "measure" cultural keystone species status, if done at all (Coe & Gaoue, 2020). However, they contextualize the issue by acknowledging that "valid arguments could be made for whether cultural keystone status is best observed at a local level through qualitative methodologies" (Coe & Gaoue, 2020, p. 7). This thesis is not focusing on the concept of cultural keystone species in and of itself; it rather aims at leveraging it to look at community agency and resilience. Therefore, I will not measure the cultural keystone status of Pacific salmon species – since they are already widely recognized as such in the literature (Earth Economics, 2021; Garibaldi & Turner, 2004).

## The Transformative Dimension of Resilience in Social-Ecological Systems

This research is grounded in a social-ecological systems framework, shifting the focus from "the environment as externality to the biosphere as precondition for social justice, economic development, and sustainability" (Folke et al., 2016, p. 1). This framework has been mobilized by scholars in social work, such a Michael Ungar, Professor at Dalhousie University, who holds the Canada Research Chair in Child, Family and Community Resilience. It has also been used to examine "the interplay of resilience and well-being concepts in fostering a socialecological perspective that promises more appropriate management and policy actions" (Armitage et al., 2012, p. 1). This interplay has been explored in the case of salmon in Oregon by Bottom et al. (2009), who concluded their study by arguing that "strengthening salmon ecosystem resilience will require expanding opportunities for greater social-ecological response diversity in changing environments" (2009, p. 12). In other words, there is high variability between salmon social-ecological systems, and one-size-fits-all solutions are not adequate to foster resilience.

The concept of social-ecological systems is quite popular, but this comes with a downside. Colding & Barthel (2019), through their review of how the concept is used in the literature, found that more than half of the articles they looked at were not even defining the concept. Furthermore, they also found that how the concept is understood varies significantly (Colding & Barthel, 2019). Ostrom also notices the same issue in an article published in *Science* in 2009. Therefore, it seems crucial to define how the concept will be approached in this study to avoid a common mistake highlighted in the literature. As a starting point, the definition of social-ecological systems I will use is one the one mentioned earlier, suggested by Folke et al. in 2016, who explain that, "in essence, the social-ecological systems approach emphasizes that people, communities, economies, societies, cultures are embedded parts of the biosphere and shape it, from local to global scales" (p. 1). However, I will focus more specifically on resilience, drawing largely on Ungar's definition of the concept of social-ecological resilience.

Resilience is a key concept in social work, which permits a further understanding of people's ability to cope with adversity. The book *Multisystemic Resilience: Adaptation and* 

*Transformation in Contexts of Change*, edited by Ungar, brings to the forefront social-ecological systems theory to better understand resilience, by defining it as follow:

A social-ecological system is conceptualized as an intertwined system of humans and environment; it is a way of understanding people and the biosphere as interconnected and mutually interdependent. Resilience of social-ecological systems is generally understood to be the capacity to sustain human well-being in the face of disturbance and change, both by buffering shock and by adapting or transforming in response to change. In common with other systems, resilience involves responding to both shocks and to other types of change, and it is about persisting, adapting, and transforming—in other words about bouncing back to original states and potentially bouncing forward into new and perhaps more desirable states. (Ungar, 2021, p. 774)

The focus of this research is on the transformative aspect of resilience. Indeed, environmental justice movements play a crucial role in social transformation. For example, this was illustrated by Temper et al. (2018), who looked at different instances of resistance to extractivism, and found that this resistance allowed social change in unique ways. Naomi Klein (2014) also presents a similar idea in her book *This Changes Everything*, where she looks at the potential of the climate crisis to catalyze large social change. She presents "a vision of the future that goes beyond just surviving or enduring climate change [...], a vision in which we collectively use the crisis to leap somewhere that seems, frankly, better than where we are right now" (Klein, 2014, p. 136).

Klein's insights align with this thesis' focus on the transformative dimension of resilience. This vision of transformation echoes to go beyond the ability to persist and adapt, but focuses on the possibility of bouncing forward in front of adversity – instead of bouncing back

from it. Furthermore, Klein emphasizes that environmental justice movements play a pivotal role in instigating broader social transformations – just like the model above suggests. The interconnectedness of environmental challenges, societal paradigms, and the transformative dimension of resilience becomes apparent through Klein's lens, prompting a much broader, critical examination of the environmental challenges we face – such as the decline in salmon populations.

## **Research Methods**

This research employs a comprehensive methodology that delves into the intricate web of interactions between salmon health and human well-being, aiming to bridge the divide between ecological and social systems. This research focuses on a wide set of perspectives collected through in-depth interviews with key informants. Those interviews explored community-based responses to the decline of salmon populations in British Columbia, in order to better understand how cultural keystone species can be leveraged to promote social-ecological change.

#### **Stemming Away from Damage-Centered Research**

Beyond providing a problem-centred analysis of the situation, this research brings to the forefront community resilience, which allows envisioning change in a way that relies on desire and complexity rather than deficiencies. This methodological stance follows Eve Tuck's (2009) call to suspend damage-oriented research. Indeed, Tuck argues that researchers should focus on communities' aspirations rather than assuming that change will spontaneously stem from a thorough description of the difficulties they are facing (2009). Therefore, this research will shed light on instances where communities' aspirations became reality, focusing on the processes at stake and their outcomes in terms of wellbeing. However, the adversity caused by the decline in salmon populations will be described nonetheless, in order to provide an accurate picture of the context.

#### **An Iterative Process**

I quickly realized as I started the interviews that I could not focus solely on the "social side" of salmon. My initial idea was to focus on how community responses to the decline in

salmon impacted human wellbeing, without addressing how salmon themselves were impacted. This changed as I realized that there was no way I could separate the health of salmon with community health. Therefore, I fully delved into the ramifications of salmon biology and health in the interviews, without trying to redirect towards the more comfortable "social side" of things. For example, I learned about how Passive Integrated Transponders (PIT) tagging helped biologists understand how specific populations were doing, or how using plastic ducks to scare the fry in hatcheries increased their chances of survival upon release. This was not what I was expecting when starting this research, but it contributed to broadening my understanding of the topic and understand better the interactions between ecological and social systems.

## **Data Collection**

The data collection process involved interviews with eleven key informants in the spring of 2023. Four interviews were conducted through videoconference, and seven interviews were conducted in person, in a variety of environments (e.g. workplace office, hatchery, etc.). Prior to each interview, documentary research was conducted to learn more about the participant's organization and/or community. This allowed me to go more in-depth during the interviews. This research was approved by the Research Ethics Board of McGill University (#22-12-001). Participants were recruited following a purposive method, through which key organizations were contacted. The criteria for the key informants were an active involvement with salmon and a strong knowledge of their community. I was able to obtain a representation of key informants working for both Indigenous organizations (n=4) and settler organizations (n=7).

Participant	Where the interview took place	Profession	Affiliation
AV	Zoom	Natural Resource Operations	First Nation
		Manager	Government
DO	Zoom	Senior Fish and Wildlife	First Nation
		Biologist	Government
DH	Workplace	Hatchery Manager	Environmental NGO
JA	Zoom	Program Manager	Environmental NGO
JC	Workplace	Hatchery Worker	Environmental NGO
JD	Community	Fisheries Biologist	First Nation
			Government
JJ	Workplace	Hatchery Volunteer	Environmental NGO
JS	Zoom	Director, Grants and	Environmental NGO
		Community Programs	
MB	Community	Research Coordinator	Environmental NGO
TB	Workplace	Fish Biologist	Environmental NGO
TR	Community	Strategic Priorities Director	Parapublic
	-		environmental agency

Table 1: Presentation of the participants

The interviews were semi-structured and lasted between 50 and 120 minutes. Interviews were all fully transcribed and then coded using the software Dedoose. Six main themes were drawn: 1) personal relationship with salmon; 2) community wellbeing; 3) adversity; 4) resilience; 5) governance; and 6) future. Those themes were subdivided into subthemes/concepts relevant to this research, which were used for the analysis. Here is the coding tree that I used:

Table 2: Coding tree used for the analysis

Codes	Subcodes
Relationship with Salmon	Fishing
	Life history
	Personal experience of the decline
Community Well-being	Food
	Identity
	Livelihood
	Positive feelings

	Social fabric	
	Colonialism	
	Community negative feelings	
	Decline in salmon populations	
	Disconnection from nature	
Adversity	Food	
	Genetics	
	Maladapted responses?	
	Offshore vs terminal	
	Variability	
	Activism	
	Building capacity	
	Hatcheries	
Resilience	Mobilization	
	Monitoring	
	Restoration	
	Stewardship	
	Collaboration	
Governance	Department of Fisheries and Oceans (DFO)	
	Funding	
	Indigenous-settlers relationships	
Future	Норе	
	Threats	
Salmon Health/Technicalities	Habitat	
	Life cycle	

# **Qualitative Rigour**

Qualitative research requires thoughtful consideration and strategies to ensure methodological rigour. Deborah Padgett (2012), a prominent figure in the field, identifies strategies to promote rigour in qualitative research. One such strategy emphasized by Padgett is the necessity for prolonged engagement with the community under study. In my research, I actively cultivated enduring relationships with some participants, and kept being involved about salmon-related work throughout the research. I volunteered with some key environmental organizations and maintained pre-existing and new connections with people for whom salmon is an integral part of their life.

Padgett also speaks of the importance of triangulation in qualitative research. She identifies different types of triangulation: theory triangulation, methodological triangulation, observer triangulation, data triangulation and interdisciplinary triangulation (Padgett, 2012). While this research did not incorporate all facets of triangulation as outlined by Padgett, it nonetheless merges different theories from various disciplines. Furthermore, this research was complemented with documentary analysis and an immersion in the community outside of the context of this research.

Another strategy proposed by Padgett is peer debriefing and support. In my case, the guidance and supervision provided by my MSW supervisor, Dr. Jill Hanley, played an important role in mitigating potential biases. Regular debriefing sessions allowed for critical reflections on the research process, ensuring a more objective and nuanced interpretation of the findings. Dr. Hanley's expertise and constructive feedback significantly contributed to the overall validity and reliability of the study.

Overall, the incorporation of strategies outlined by Padgett in the design of this research, such as prolonged engagement, triangulation, and peer debriefing, has been instrumental in upholding methodological rigour in this qualitative study, and therefore promotes more nuanced and objective findings.

#### **Positionality**

As a white settler, it is crucial that I take the time to reflect on how my social location and my worldviews are inherently biased by my privileges. Furthermore, when it comes to relationships between humans and salmon, I must acknowledge that I am not able to understand the full extent of the relationship, especially for First Nations. Therefore, this research aims to provide a snapshot of stories rather than positioning myself as an expert.

I started the data collection for this project in January 2023, when I moved to Tofino on the west coast of Vancouver Island. I had the opportunity to develop relationships with many people who have salmon and their communities at heart. I quickly realized how deeply salmon was embedded in this place and the people who live here. I supported biologists with juveniles sampling, hatchery workers in fry release, and joined a local nonprofit for the protection of wild salmon. I became friends with people who share the same interests.

This research project was conducted throughout the different stages of the salmon cycle. It started in the winter, before the outmigration of the fry, and ended late in the fall, while last salmon runs of the year were spawning. Many personal experiences enriched this research within that timeframe. For instance, I joined a local nonprofit for the protection of wild salmon, where I learned from colleagues and salmon advocates from the Ahousaht, Keltsmaht and Tla-oh-qui-aht First Nations. I swam rivers with salmon, and experienced first-hand that spiritual connection that some of the key informants spoke about. Learning how to prepare and cook fish with Huuay-aht people was also another a significant experience. I also had the privilege to attend a potlatch held by the 'Namgis in celebration of the removal of the fish farms and the return of wild salmon in their territory. Finally, a relationship was maintained with some participants beyond the context of this specific research project. For example, I participated in juvenile salmon monitoring trips and got involved in volunteer work at a hatchery. All these experiences inspired me in this research, and while they are not used as data for this specific research project, they nonetheless sharpened my understanding of the topic and supported an informed analysis of the results.

## **Presentation of the Manuscript**

The following article will be submitted shortly to the journal *Ecology & Society*, a "journal of integrative science for resilience and sustainability" (*Home - Ecology & Society*, 2023) and follows the formatting required by this journal for submission, including the 5,000 words limit. This journal was selected because many important articles pertaining to social-ecological resilience were published in it. Furthermore, the famous article by Garibaldi and Turner that presented the concept of cultural keystone species was published in *Ecology & Society* in 2004.

While my research adopted an iterative approach at first, this article focuses specifically on bridging the gap between the concept of cultural keystone species and the transformative aspect of social-ecological resilience, through a case study of the decline of Pacific salmon in British Columbia. This article directly answers my research question, by looking at the ways through which the decline in salmon populations sparked transformative resilience in British Columbia.

I was responsible for the design of the research project, data collection and data analysis and am the sole author of this article, although I did receive guidance from my supervisor, Dr. Jill Hanley.

## Manuscript

# THE DECLINE OF PACIFIC SALMON: CATALYST OF SOCIAL-ECOLOGICAL LEAPS IN BRITISH COLUMBIA

# ABSTRACT

The ecological crisis goes far beyond global warming: the decline in biodiversity also affects communities' wellbeing worldwide. Those impacts are particularly striking when it comes to cultural keystone species, i.e. species that shape the culture – and the social fabric – of a people. In British Columbia, salmon species are recognized as cultural keystone. However, salmon populations have plummeted over recent decades. While the psychosocial consequences of this decline have been explored in the literature, research is scarce as to how positive socialecological change can stem from community responses to such disasters. Through in-depth, semi-structured interviews with relevant stakeholders (n=11), this research demonstrates that the decline in salmon populations in British Columbia has proven to be a catalyst for responses promoting social-ecological change, and explores how some of the communities impacted found innovative ways to "leap" forward in front of such adversity. By bridging the gap between the concepts of cultural keystone species and the transformative dimension of social-ecological resilience, I present cultural keystone species as unique drivers of change which should be accounted for by social workers and policymakers. Indeed, the results demonstrate the farreaching ramifications of such change, by focusing on instances where conservation, restoration and monitoring projects successfully contributed to addressing deeply entrenched issues such as colonialism, extractivism or capitalism. Therefore, this research shows that salmon-oriented initiatives, beyond their impact on the ecosystems, also have an impact on the social fabric of the communities involved — for the better.

## **INTRODUCTION**

## Pacific salmon: keystone species

Pacific salmon (*Oncorhynchus* spp.) are considered keystone species, which means that their role is disproportionately large in their environment and that they are crucial in maintaining the structure of their ecosystem (Caro & Girling, 2010; Earth Economics, 2021; Kurlansky, 2020). Indeed, salmon connect the ocean to the land – sustaining a massive transfer of nutrients and energy through their mighty migrations that take them thousands of kilometres out in the ocean until they come back, years later, to spawn in the exact same stream where they were born (Kurlansky, 2020). Iconic animals such as resident orcas, bears, eagles and wolves rely heavily on salmon to sustain themselves, especially before the winter months (Kurlansky, 2020; Morton, 2021). Towering trees gorge on the nitrogen and other nutrients brought inland by salmon (Morton, 2021).

Beyond their keystone importance to their ecosystems, Pacific salmon species are also cultural keystone species, which means that they are also vital to social systems – especially for Indigenous peoples (Earth Economics, 2021; Kurlansky, 2020). Humans rely on salmon for many purposes such as spirituality, culture, livelihood, and food (Sherriff, 2021). Salmon weave the social fabric of many communities; it brings people together (Mueller, 2017). In other words, salmon are not solely a natural resource; they represent an integral part of the social environment of many communities. Therefore, Pacific salmon are a unique manifestation of how intimately ecological and social systems are interconnected, and how these systems cannot be fully understood if approached independently. First Nations of the Pacific Northwest understand and value this intricate interdependency between humans and salmon (Amberson et al., 2016; Earth Economics, 2021; Hormel & Norgaard, 2009). Settler communities also depend on salmon

throughout the coast; recreational anglers, fishing guides, commercial fishers, hatchery workers – and many more – all have a unique connection to salmon as well. As Bottom et al. (2009) highlight: "today, salmon are a cultural icon for people of all races in the region, providing diverse cultural services through the support of educational, recreational, spiritual, and community values" (p. 7).

## The decline of salmon populations in British Columbia

Recent decades have seen an unprecedented collapse of wild salmon stocks throughout the Pacific Northwest. In British Columbia, salmon populations have declined by 90% since the 1970s (Nesbitt & Moore, 2016; Reid et al., 2022; SOS Coalition, 2023). Some streams that once teemed with salmon during spawning season now lie barren. There are seven species of Pacific salmon in British Columbia (hence the use of plural when referring to salmon in this article) and more than 9,000 genetically distinct salmon (Pacific Salmon Foundation, 2023). Each one of those populations has its own behaviour patterns and physical traits – and once they go extinct their rich and adapted genetics are forever lost.

Andrea Reid, a Nisga'a citizen and assistant professor at UBC, consulted Indigenous knowledge holders to see how they explain this critical state for wild salmon (Reid et al., 2022). They identified many factors explaining the decline of wild salmon, such as aquaculture, climate change, contaminants, industrial development, and infectious diseases (Reid et al., 2022).

The decline in salmon populations has had many consequences in British Columbia. Many communities relied heavily on salmon as the main driver of their economy. Salmon are also important socially, by tying families, friendships and communities together. Therefore, there are numerous adverse impacts to the decline in salmon populations, which can be framed as a loss of connectedness – whether to oneself, to relatives or even to a whole community (Earth Economics, 2021; Hormel & Norgaard, 2009; Murphy, 2019).

## Transformative resilience in social-ecological systems

While the decline in salmon populations presents sheer adversity, communities are not staying idle, and this research shows that their responses are promoting social-ecological change in British Columbia. To gain a better understanding of that change, the concept of transformative resilience will be mobilized. Resilience in social-ecological systems is defined as the ability to persist, adapt or transform in front of adversity:

A social-ecological system is conceptualized as an intertwined system of humans and environment; it is a way of understanding people and the biosphere as interconnected and mutually interdependent. Resilience of social-ecological systems is generally understood to be the capacity to sustain human well-being in the face of disturbance and change, both by buffering shock and by adapting or transforming in response to change. In common with other systems, resilience involves responding to both shocks and to other types of change, and it is about persisting, adapting, and transforming—in other words about bouncing back to original states and *potentially bouncing forward into new and perhaps more desirable states* [emphasis added]. (Brown, 2021, p. 774)

While there are many instances of community persistence and adaptation to the decline in salmon populations, how the social-ecological systems at stake *transform* in front of the decline is of particular interest. Michael Ungar, director of the Resilience Research Centre at Dalhousie University, illustrates some examples of this process:

A resilient system that transforms under stress must find a new behavioral regime that allows it to continue its previous functions (or perform new functions) by taking advantage of new strategies and resources. All systems have this capacity, whether it is advances to energy storage systems that have allowed renewable energy to transform the energy sector or personal transformation of a heart attack victim who makes dramatic changes to his lifestyle after discharge from hospital. In each instance, systems (human, built, or natural) are *fundamentally changed by their exposure to stress* [emphasis added], finding a different behavioral regime better suited to the internal and external threats the system faces. (Ungar, 2021, p. 20)

Those kinds of responses, where social-ecological systems move into a better-suited, more desirable regime, are the focus of this research. While an important body of literature exists regarding the negative impacts of the decline in salmon populations (Amberson et al., 2016, 2016; Earth Economics, 2021; Hormel & Norgaard, 2009; Norgaard & Reed, 2017), little attention has been paid by researchers to community responses and agency in such context. Therefore, this research demonstrates how the decline in salmon populations in British Columbia has proven to be a catalyst for responses that promote social-ecological change in some of the communities impacted and allowed them, just like salmon, to leap forward.

## METHODS

Through an analysis of community-based understandings of how salmon health and human wellbeing mingle, this research bridges the gap between the ecological and social systems at stake and puts to the forefront the interactions between them. By focusing on a wide set of perspectives collected through interviews with key informants, this research explores community-based responses to the social-ecological problem of the decline in wild salmon in British Columbia. Beyond providing a problem-centred analysis of the situation, this research brings to the forefront community resilience, which allows envisioning change in a way that relies on aspirations and complexity rather than deficiencies. This methodological stance follows Tuck's call to suspend damage-oriented research. Indeed, Tuck (2009) argues that researchers should focus on communities' desires rather than assuming that change will spontaneously stem from a thorough description of the difficulties they are facing. Therefore, this research will shed light on instances where communities' aspirations became reality, focusing on the processes at stake and their outcomes in terms of wellbeing. However, the adversity caused by the decline in salmon populations will be described nonetheless, in order to provide an accurate picture of the context.

Eleven key informants were interviewed in the spring of 2023. Four interviews were conducted through videoconference, and seven interviews were conducted in person, in a variety of environments (e.g. workplace office, hatchery, etc.). This research was approved by the Research Ethics Board of McGill University (#22-12-001). Participants were recruited following a purposive method, through which key organizations were contacted. The criteria for the key informants were an active involvement with salmon and a strong knowledge of their community. I was able to obtain a representation of key informants working for both Indigenous organizations (n=4) and settler organizations (n=7).

The interviews were semi-structured and lasted between 50 and 120 minutes. Interviews were all fully transcribed and then coded using the software Dedoose. Six main themes were drawn: 1) personal relationship with salmon; 2) community wellbeing; 3) adversity; 4) resilience;

5) governance; and 6) future. Those themes were subdivided into subthemes/concepts relevant to this research, which were used for the analysis.

This research project was conducted throughout the different stages of the salmon cycle. It started in the winter, before the outmigration of the fry, and ended late in the fall, while last salmon runs of the year were spawning. Many personal experiences enriched this research within that timeframe. While those experiences are not used as data for this specific research project, they nonetheless sharpened my understanding of the topic and supported an informed analysis of the results.

#### RESULTS

For the purpose of this article, the results of this research are grouped into four categories: 1) personal relationship with salmon; 2) community wellbeing; 3) adversity; and 4) resilience. The codes "governance" and "future" were integrated to the "resilience" theme after a preliminary analysis of the results. The key findings from the interviews are presented here, along with some illustrative quotes drawn from the interviews.

## Personal relationship with salmon: connection with nature/spirituality

The results here focus on individuals' connections with salmon and what makes salmon unique on a personal level. The participants' endeavours in terms of the protection of wild salmon are also explored.

For some participants, a spiritual connection can be felt from swimming in the rivers and observing the fish spawning (AV). This can contribute to seeing salmon as more than a resource, but also as an animal that deserves respect in its journey. Participants also report that salmon is

so foundational to British Columbia that hopefully all British Columbians can have a sense of connection with salmon. This connection is seen as a matter of responsibility because salmon are foundational to the province's identity and ecology. However, it is acknowledged that many people primarily associate salmon with food, often overlooking the deeper significance of these fish in the ecosystem and the culture.

A participant emphasizes the remarkable nature of salmon, describing them as a small miracle, given their ability to navigate vast distances and return to the same stream to spawn (TR). Another key informant characterizes salmon as a lifestyle, noting the strong passion and emotion people invest in their relationship with these fish (JC). Many key informants highlight fishing as a means of connecting with salmon. One participant remembers fishing with his family: "Christmas... great. But Boxing Day, we would go steelhead fishing on the Cowichan" (DH).

Overall, participants report a very special relationship with salmon, which appears to be a central aspect to their life.

## Community wellbeing: salmon as a social fabric

The results here explore the importance of salmon at the community level and how salmon connects people to one another.

Salmon as a food source was mentioned by key informants who worked for First Nations. They express the importance of salmon as a healthy and affordable food. Some Nations have a food fish program, where they distribute salmon for free in the community. Furthermore, community members are paid to fish for the salmon that are distributed. In other communities where terminal fisheries (i.e. where mature salmon are harvested in or near their natal stream) still exist, the whole community gets involved in fishing:

Fish day, as we called it in Port Alberni. Our nation would all go on that Sunday morning to the paper mill dam. All would get up before first light and get down there. We would have a big beach seine, and the entire community would come together. We had this mega beach seine and we'd go and beach seine tons and tons of sockeye, and then we'd distribute it amongst the community. We'd have it all open fire. Every week the community would come together to fish together and then distribute it evenly amongst our community. (JD)

Salmon hold a central place in the cultural identity of many First Nations in British Columbia. It also plays a defining role in settlers' communities, like the Cowichan Valley, where the river's connection to salmon weaves together the community's sense of place: "We're from the Cowichan Valley. Our sense of place is defined by the river. The river is defined by salmon (...) I would say that our community is brought together by the river, and that's all about salmon" (TR).

Another participant also stresses the unique ability of salmon to bring people together, because of British Columbians shared love for those iconic fish: "It is fully within the fabric of small coastal towns. Like that and logging are what they're made of. But nobody loves logging. People love salmon though" (JA).

In summary, salmon are at the core of West Coast communities, both Indigenous and settler. Salmon connects people together, whether it's through fishing, the sharing of food, jobs, ceremonies, etc.

## Adversity: the social-ecological consequences of the decline in salmon populations

Having explored the role of salmon in fostering connections within individuals and communities, this section describes the consequences when this profound source of connection, whether with oneself, nature, others, or the broader community, is compromised. As a participant explains:

You can't really talk about salmon without talking about declines and I think it makes everyone really depressed. It's just like everyone who works around fish. So many people care about them and the idea that they're just collapsing and disappearing is really hard for lots of people to take. And people are angry, angry whether they've maybe lost access, right? (TB)

The spiritual dimension of the decline in salmon populations weighs heavily on many individuals:

For certain people, First Nations, settlers, being on a river or just fishing is highly spiritual. Fly fishing for people is like meditation. For certain individuals, it's very important. It's probably the most important thing in their life, and it's very detrimental when things aren't going well. (JA)

The absence of salmon carries a significant social cost. In regions such as Clayoquot Sound, where terminal fisheries barely exist, opportunities for community-based fishing are scarce, as highlighted by this participant:

Port Alberni Somass fish are a unique situation where we still have that social aspect and fisheries and seeing all our relatives at the dock and joking around and helping each other. And so that still happens when there is fish. But when there's no fishing out here, you don't get any of that. You have a couple of guys on a boat going out to try and get

some fish from a river that doesn't have much fish. Cause they want to feed their families. And so that's not like an "OK community, let's go out and go to this river and fish together and distribute it amongst us and like process and smoke together." That doesn't happen. There's just, there's no fish to do that with. (JD)

Likewise, another key informant also stresses the importance of ceremonial fish and the detrimental impacts of a scarce harvest (DO). Sadness, a sense of defeat and nostalgia are particularly pronounced among the older generations, especially when it comes to species like steelhead (AV). Furthermore, there is a lot of "pointing fingers": people who are impacted are looking for the silver bullet that explains the decline. On the other hand, the high variability between the different species, populations and years makes it hard for some people to make sense of the decline when things are not necessarily looking so bad at first sight. Most participants are concerned about the genetics that are getting lost. They raise concerns about maladapted responses to the decline, such as large-scale hatcheries run by the DFO.

Challenges in the recognition of First Nations' rights in the realm of fisheries exacerbates the adversity, and prevents access to this healthy, affordable food, which contributes to healthrelated issues such as diabetes (JD). Additionally, the decline in fishing activities hinders the younger generations' opportunities to engage with their territory (JD).

While salmon bring people together, their absence prevents some communities from mobilizing the unique ways they had to connect – ways that are at the core of their culture. Salmon serve many functions, for which there is no replacement, including economically. Indeed, many participants mention the importance of fishing and logging in their local economy, and how both of these are in serious decline: Logging and fishing were big drivers of the local economy for the Nuu-cha-nulth nations, and even the non-Indigenous nations. And so that loss of economy, not being replaced by any other industry, has some pretty serious negative socioeconomic impacts. (JD)

#### **Resilience: when adversity catalyzes change**

These results focus on the change that stemmed from the decline in salmon populations. Solidarity emerges as a significant theme, particularly when it comes to the Big Bar landslide, a disaster that prevented the passage of the fish on the Fraser River in 2019. Various individuals and organizations came together to help the fish pass the barriers caused by the landslide, showcasing the power of collaboration:

Everybody has been really supportive about helping those fish pass the Big Bar slide area. And it all worked out, this year there's no barriers anymore. But it definitely brought a lot of people together from all aspects of life, from DFO to everybody who's working hard to do what they can. (DO)

This includes solidarity between First Nations, but also with settler organizations. Furthermore, some partnerships were born from this event, and the collaboration is still happening today (e.g. fish monitoring) even though there are no barriers to the fish anymore.

However, when it comes to harvesting, a key informant questions whether those collaborative approaches would remain if salmon populations were to rebound to historical numbers.

When there is fish, people argue about how much they can take and they get all upset at each other, but since there's no one harvesting anything, everyone is on the same page, with the same goal. It's much more collaborative. But then I wonder, like, what if Clayoquot Sound got really abundant again with salmon? I worry, would we end up like the other table<sup>1</sup> now? Being like: the pie is now restored, we have a pie out. Are we going to start arguing over how we're going to divide that pie? (JD)

Streamkeepers groups, which are oriented towards the conservation and restoration of local streams, play a crucial role in bringing people together, driven by the shared belief that their efforts will have a tangible impact. This seems to promote a sense of shared purpose and community involvement (JA). Something similar applies to local, conservation-based hatcheries. Participants speak of different examples of First Nations that started hatcheries without the avail of colonial authorities, and successfully restored salmon populations that were on the brink of extinction. Hatcheries, however, can be highly controversial, and the debate over their efficacy and suitability remains a point of discussion within the community.

A participant underscores the need to focus on specific, localized efforts to find hope amid the broader challenges (TB). For this reason, certain groups have chosen to focus on handson, non-controversial work oriented towards habitat restoration rather than delving into policy and political issues. This brings people together and allows for capacity building, some organizations providing resources and training to their workers – which they often hire from the First Nations: "At the end of the day, this is a social organization with salmon being the vehicle" (TB).

Overall, British Columbians are not idle in front of the decline of salmon populations. In many instances, the decline has sparked new initiatives, as this participant explains: "I think that the fact that salmon is in a dire state has been a catalyst, bringing people together. I think before they were a small miracle that people took for granted" (TR).

<sup>&</sup>lt;sup>1</sup> Referring to another salmon roundtable (which gathers key salmon stakeholders for a specific region) where tensions are high in decisions regarding salmon management.

#### The decline as a catalyst for leaps in some of the communities impacted

Key informants report that community-driven responses have proven to be the most effective in navigating the challenges posed by the decline in salmon populations. The ability to develop context-specific solutions has empowered these communities to address the issue innovatively, fostering a sense of hope and capacity building. The following examples aim to provide an outlook on the diversity of those responses.

#### Stewardship on the Sarita River

The Huu-ay-aht Nation's management of the Sarita River salmon stands out as a key example of resilience. Indeed, the Huu-ay-aht assumed control over the monitoring of their fish, and successfully negotiated the right to commercially sell surplus fish as part of their treaty. This initiative has demonstrated remarkable ecological improvements, including with regard to the genetic integrity of the Sarita salmon populations. Moreover, it has generated employment opportunities and revenue for the Huu-ay-aht while offering fisheries management training for its citizens. As shown in the following quote, this initiative on the Sarita River has also strengthened the connection between people and salmon, emphasizing the central role of Indigenous selfgovernance in salmon management.

We get paid by DFO to do the snorkel surveys and count the fish on our territory. And those are new things. Forever DFO just did them. They would have permission to do them on our territory. And once we started having a higher capacity here, I said "You guys can pay us to do this. We need the situational awareness and the income." That was a big shift for us. I think having actual staff and actual citizens in the waters, counting the fish, having that situational awareness, it really brought that info home for us. (AV)

Moreover, these initiatives appear to be backed by settlers, thus supporting Indigenous governance in conservation efforts. For example, volunteer days at the hatchery on the Sarita River benefited from an enthusiastic response from settler sport fishermen and their families. As a participant explains: "There's a lot of celebration in the fishing world when people see that Indigenous governments are managing their fisheries resources in a sustainable way." This further underscores the transformative potential of collaborative efforts in preserving salmon populations. This example shows how a community, in the face of a shock, can leap forward to an even more desirable state.

## *Community hatcheries: key social-ecological hubs*

Community hatcheries have emerged as an essential tool to enhance salmon populations. These hatcheries, which are more conservation-oriented than their larger, state-run counterparts, serve not only an ecological purpose of fish enhancement but also have a significant social impact. They provide a platform for community members to connect, discuss conservation efforts, and engage in meaningful conversations about environmental preservation.

There is a ton of value to the hatchery connection that people have. For example, there's a little hatchery in Port Moody that burnt down about ten years ago, just a random fire, and it was a very rustic little hatchery. So they rebuilt something ten times the size. It's a big public interpretive center. It gets a good amount of school programs and some public traffic, but they're still only producing 10,000-12,000 eggs because it's such a small creek, that's all they need. So they've got what looks like overbuilt infrastructure for what the output of fish is, but the community value is massive. So that's where we really

invest. When the fish value isn't really there, the conservation value isn't huge, but the public value is, then that's worth it. Absolutely. (JS)

As part of this research, I visited hatcheries and engaged with volunteers in their daily activities. This experience revealed the hatchery's role as an essential social hub, which provides an ideal platform for collaborative efforts in the realm of conservation. For instance, during my visit to a hatchery, an issue pertaining to the destruction of riparian habitat for the expansion of a highway was raised, underscoring the sense of stewardship stemming from taking part in the hatchery activities.

#### Water governance in the Cowichan watershed: the power of collaboration, beyond hydropower

The Cowichan River finds its source in the Cowichan Lake, where a dam situated at this source serves a dual purpose, acting as a water bank for the river and providing power to a local mill. A severe drought occurred in 2003 and confronted the community with a choice between prioritizing the mill's operations or preserving the salmon run through water management. When the mill's operations were chosen over the salmon run by the province, the mill's workers opted to walk out of the job. This event eventually led to the formation of the Cowichan Watershed Board, a governing body responsible for making decisions pertaining to water management within the region. Nowadays, all decisions concerning water management are made by the board, which represents a significant shift in governance:

Over the last 20 years we've really developed this relationship where we work together. If you look at the number of Chinook coming back on the east side of the island, every system is in trouble. The exception being the Cowichan, where it's pretty stable. And, you don't want to link cause and effect too closely in the natural world, but I think it's partially because of the efforts that have gone into ensuring water for fish in the river as opposed to just for industry power generation, looking at fish habitat and trying to make the right decisions and working together to do that. So I won't say it's all because of that, but I think it certainly, that's part of the equation. And so that alone speaks volumes I think to the ability of the community to work together. (TR)

## DISCUSSION

A participant explains the power of salmon to demonstrate where we're failing: "They are a very visible demonstration of the challenges that we're facing across the whole society. [...] I think that salmon is so iconic that they will serve to illustrate to all of us that things are no good" (TR). Indeed, most of the participants explain that salmon, as cultural keystone species, are at the core of the identity of British Columbians. Therefore, while losing salmon has catastrophic consequences, they break the status quo in a way that cannot leave people idle. This circles back to Ungar's concept of transformative resilience and shows how exposure to stress can sometimes fundamentally change social-ecological systems for the better. Furthermore, the results demonstrate that community partnerships in restoration and conservation efforts are not only beneficial for ecological systems (which is already largely supported in the literature), but are also highly beneficial for social systems (i.e. communities) themselves.

For instance, salmon are also highly illustrative of the challenges we face when it comes to governance. Failures in colonial approaches – often represented by the DFO – are demonstrated not only by the decline in salmon but also by negative consequences at the community level. In contrast, successful governance models, such as the Cowichan Watershed Board and the Huu-ay-aht treaty, underscore the effectiveness of alternative models through social-ecological improvements such as heightened community capacity, better food access, more employment opportunities, and healthier salmon runs.

However, establishing a direct causal relationship between the decline in salmon populations and substantial shifts in governance remains challenging, especially when considered in the context of the broader social shifts that have unfolded in recent years, mostly in terms of reconciliation efforts. In order to attain a more nuanced and comprehensive understanding of this issue, and to mitigate the possibility of a correlation, a more comprehensive and in-depth exploration through detailed case studies would be required.

Overall, the results bridge the gap between social-ecological resilience and the concept of cultural keystone species by demonstrating the central role of Pacific salmon in social-ecological resilience – because of the unique ways through which they connect communities and the biosphere together. Furthermore, they provide an accessible, relatable entry point to change that is unique. Recognizing and leveraging this exceptional ability to catalyze change becomes imperative in policymaking because the ramifications of this change extend far beyond salmon species themselves, but also to their whole social-ecological systems. In other words, the mobilization of cultural keystone species appears as an essential driver of transformative resilience in front of complex, deeply entrenched issues such as colonialism, extractivism or food insecurity.

#### CONCLUSION

This research explored the potential for the collapse of cultural keystone species to act as a catalyst for responses that promote social-ecological change. Through a series of semistructured interviews with key informants, this study showed how the social-ecological significance of salmon has sparked community-led initiatives. This aligns with the concept of transformative resilience, which suggests that, in the face of a shock, communities can experience detrimental adverse consequences, but can also leap forward to better regimes. Furthermore, this research shows that those community-based responses seem to be the most adapted to promote wellbeing in social-ecological systems involving salmon.

While salmon continue to play a vital role within the social fabric of British Columbia, the dynamics of the connections formed around salmon species have changed substantially in recent decades. Extraction-oriented modes of engagement, taking root in the heydays of commercial fishing, have given way to a contemporary landscape characterized by restoration work, community hatcheries, monitoring projects, and similar conservation-driven activities. These new avenues of connection illustrate the evolving nature of human-salmon interactions in British Columbia, and are not only mirroring, but also actively shaping the broader context within which they unfold.

## LITERATURE CITED

- Amberson, S., Biedenweg, K., James, J., & Christie, P. (2016). "The Heartbeat of Our People": Identifying and Measuring How Salmon Influences Quinault Tribal Well-Being. Society and Natural Resources, 29(12), 1389–1404. https://doi.org/10.1080/08941920.2016.1180727
- Bottom, D. L., Jones, K. K., Simenstad, C. A., & Smith, C. L. (2009). Reconnecting Social and Ecological Resilience in Salmon Ecosystems. *Ecology and Society*, *14*(1).
- Caro, T. M., & Girling, S. (2010). *Conservation by proxy: Indicator, umbrella, keystone, flagship, and other surrogate species*. Island Press. http://site.ebrary.com/id/10437872
- Earth Economics. (2021). *The Sociocultural Significance of Pacific Salmon to Tribes and First Nations* (Special Report to the Pacific Salmon Commission).
- Hormel, L. M., & Norgaard, K. M. (2009). Bring the Salmon Home! Karuk Challenges to Capitalist Incorporation. *Critical Sociology*, 35(3), 343–366. https://doi.org/10.1177/0896920508101502
- Kurlansky, M. (2020). Salmon: A Fish, the Earth, and the History of Their Common Fate. Patagonia.

https://public.ebookcentral.proquest.com/choice/publicfullrecord.aspx?p=6122137

- Morton, A. (2021). Not on my watch: How a renegade whale biologist took on governments and *industry to save wild salmon*. Random House Canada.
- Mueller, M. L. (2017). *Being salmon, being human: Encountering the wild in us and us in the wild*. Chelsea Green Publishing.

Murphy, J. (Director). (2019). Artifishal.

- Nesbitt, H. K., & Moore, J. W. (2016). Species and population diversity in Pacific salmon fisheries underpin indigenous food security. *Journal of Applied Ecology*, 53(5), 1489– 1499. https://doi.org/10.1111/1365-2664.12717
- Norgaard, K. M., & Reed, R. (2017). Emotional impacts of environmental decline: What can Native cosmologies teach sociology about emotions and environmental justice? *Theory and Society*, 46(6), 463–495. https://doi.org/10.1007/s11186-017-9302-6
- Pacific Salmon Foundation. (2023). *State of Pacific Salmon*. Pacific Salmon Foundation. https://psf.ca/salmon/
- Reid, A. J., Young, N., Hinch, S. G., & Cooke, S. J. (2022). Learning from Indigenous knowledge holders on the state and future of wild Pacific salmon. *FACETS*, 7, 718–740. https://doi.org/10.1139/facets-2021-0089
- Sherriff, L. (2021, October 20). 'No fish means no food': How Yurok women are fighting for their tribe's nutritional health. *The Guardian*. https://www.theguardian.com/globaldevelopment/2021/oct/04/salmon-klamath-river-yurok-women-nutrition-health
- SOS Coalition. (2023, January 26). *The Problem*. SOS Coalition. https://www.fnfisheriescouncil.ca/save-our-salmon-coalition/
- Tuck, E. (2009). Suspending Damage: A Letter to Communities. *Harvard Educational Review*, 79(3), 409–428. https://doi.org/10.17763/haer.79.3.n0016675661t3n15

Ungar, M. (Ed.). (2021). Multisystemic Resilience: Adaptation and Transformation in Contexts of Change (1st ed.). Oxford University Press. https://doi.org/10.1093/oso/9780190095888.001.0001

#### **Discussion of Thesis Findings**

This section complements the discussion of the results found in the manuscript. Further insights for social workers will be provided, such as how including cultural keystone species and ecological considerations can be approached as a way to promote cultural safety. The importance of community-based governance will also be explored, including how it can promote change that challenges dynamics of oppression and injustice. Finally, the limitations of this study will be acknowledged, and reflections for future research will be listed.

#### **Implications for Social Work**

#### Implications for Social Work Education

I argue that social workers should have a certain amount of literacy when it comes to ecology in general, which could help them better understand and support the communities they work with as they grapple with environmental change. This aligns with a growing body of literature (Dominelli et al., 2018; Zapf, 2009). By developing a strong knowledge of the ecosystems they are working within, social workers could be better positioned to identify and respond to the environmental dimensions of social issues, and therefore promote interventions that incorporate both social and ecological considerations. I experienced this firsthand throughout my research. While I believed at first that an extensive knowledge of salmon biology and ecological importance was not necessary to understand the social dynamics at play, I ended up realizing that the more I learned about salmon, the better I could understand the socialecological dynamics at stake – and that their social and ecological components could not be separated. For instance, the work that takes place on the Sarita River, where the Huu-ay-aht are doing extensive work to restore the genetics of salmon populations, could not be understood without some knowledge of how hatcheries work and their consequences on salmon genetics.

Furthermore, the recognition of cultural keystone species emerges as an essential component of cultural safety for social workers. Indeed, the results demonstrate that humans can have very deep, particular connections to certain species. Beyond looking at how humans can "connect to nature" as a broad and vague concept, I suggest that delving into the intricacies of those connections and getting a sharper, more detailed and nuanced understanding of the relationships at stake is crucial for social workers. Equipped with an awareness of the cultural significance of cultural keystone species, practitioners could more effectively navigate the interplay between culture, ecology, and community dynamics.

#### Implications for Social Work Practice

While engaging with cultural keystone species to promote transformative resilience may seem vague and perhaps a bit inaccessible at first sight, it can be done in many ways. For instance, just initiating a conversation with "salmon small talk" can allow an important sphere of peoples' lives to emerge. Talking about the salmon runs, the water levels or certain places can spark conversations that lead to valuing and strengthening relationships with the ecosystem and the people who live in it. An elder might talk about their grandchildren bringing them fish; someone else might talk about a certain river they haven't been to in a while, or friends they would like to go fishing with; someone who works in conservation could talk about their job; a group of youth could mention wanting to go fishing or canoeing down a certain river. Our role as social workers, in the end, is to make those relationships stronger, to enhance connections, since they are at the root of resilience. This research has shown that communities can face extreme adversity and reinvent themselves. However, as shown in the results, this can't be done in silos: everyone has to be working together. Social workers need to talk to one another. Whether they are working in a school, a seniors' home or a community clinic, they need think about how they all relate, together, to the environment that surrounds them. The Salmonids in the Classroom program, community hatcheries, restoration NGOs, just to name those examples, are unique spaces for healing the land and people at the same time, because they enhance connections. Social workers don't need to reinvent the wheel with new programs here: they just need to get onboard with what's already out there.

#### **Implications for Policy: the Importance of Community-Based Governance**

Changes in modes of governance came up as core aspect of the transformative change that stemmed from responses to the decline in salmon populations. The ability for communities to take ownership of the management of salmon was often cited by participants as a key measure to promote wellbeing:

I think the mechanism of change is going to come from the bottom up as opposed to top down. And that's why I'm doing the work I'm doing now: it's because I think that's going to be meaningful for this watershed. People that live here, salmon on the river, there's nobody better situated to look after the watershed than the people that live in it, right? (TR)

An important component of adversity identified in the results is the variability from one watershed to another, in terms of salmon species and many other aspects. As the quote above suggests, people who live in the watershed are best situated to look after it. Therefore, this research demonstrates that policy should include funding and capacity-building for local

communities to take ownership of salmon management, just like the Huu-ay-aht are doing on the Sarita River, or just like the Cowichan Watershed Board does. This can be done through funding, but also by transferring over responsibilities traditionally fulfilled by the DFO over to the communities.

Such transfers of responsibilities do not only have beneficial impacts on salmon health: it also has positive social impacts for the communities themselves. For community members to go on the rivers, find employment, see the salmon, has many positive impacts. An important criticism of colonial governance that emerged is that everything is siloed. A transfer of responsibilities to the communities themselves can contribute to connecting all those different fields together, especially when it comes to connecting ecological and social matters. This participant explains this very well:

The Cowichan people have a teaching which means "everything's interconnected" and the problem that we've had with our sort of colonial governance and management is that everything is siloed, right? The people that manage salmon don't talk to the people who manage water, who don't talk to the people who manage forest, who don't talk to the people who manage linear development, who don't talk to the people who manage residential development. And they all have impacts on the watershed. So that's craziness. That's not a way of doing business, and yet that's the standard way of doing business. And so, the thing about salmon is that it provides an opportunity for all interest to come together if it's done progressively. (TR)

This statement aligns with Ungar's perspective. In the article *A Deeper, More Social Ecological Social Work Practice*, he argues that "public policy is needed that expands the capacity of communities and their members to function on their own by providing the resources they need to

sustain their well-being" (Ungar, 2002, p. 488). ). For example, the food fish program in Huu-ayaht – where community members are entitled to a certain number of free fish – is a great illustration of community members sustaining their wellbeing on their own through funds provided by the federal government as part of their treaty. Overall, Ungar suggests a divestment from centralized structures to community-based governance, and for social workers to situate themselves in community-relevant structures. Examples of such community-relevant structures are local governments, community hatcheries, salmon in the school programs, NGOs, fishing docks, aquariums, local youth programs, and much more.

#### **Responses that Go Beyond the Decline**

In her book *This Changes Everything: Capitalism vs. the Climate*, Naomi Klein (2014) explains how tackling climate change has to be done by also confronting other problems such as capitalism. I argue something similar with the crisis around salmon in British Columbia. Tackling this problem must extend to the underlayers of the decline: colonialism, capitalism and extractivism – i.e. systems based on oppression and injustice (Rodríguez, 2024). Those were some of the principal root causes identified by the participants through the interviews. This research shows that, in face of the adversity caused by the decline in salmon populations, communities have shown resilience by transforming themselves in order to bounce *forward*. Contributing factors to such transformation are the attachment British Columbians have to wild salmon and the ecological importance of Pacific salmon species. The processes at stake mostly revolved around community initiatives and new modes of governance. However, how farreaching is this change? The results suggest that the changes put in place in some of the communities do challenge colonialism, capitalism and extractivism. This was done for instance through the transfer of salmon management to local communities, with or without the avail of colonial authorities. Many hatchery projects exemplify this, such as the Nitinat hatchery. Other examples, such as the eviction of fish farms from Kwakwaka'wakw territories, does not only challenge colonialism, but also capitalism by facing companies who makes hundreds of millions of dollars off farmed salmon, at the expense of the environment (Morton, 2021). One of the participants worked for a NGO that was founded by loggers and scientists who wanted to restore streams following the destruction caused by clear cut logging in some watersheds.

Therefore, salmon appear as an important entry point for challenging some of the ailments of our times, and a promising way to promote solutions that extend far beyond salmon, similarly to what Klein suggests when it comes to the climate crisis. However, the results suggest that salmon could be an even more powerful catalyzer than the climate crisis, because of the unique attachment British Columbians have to them and because of their importance in daily lives. In other words, it hits closer to home.

## Limitations

It is still difficult to draw a clear causal link between the decline in salmon populations and significant changes in governance, particularly when considering the larger social changes that have occurred recently, mostly in terms of reconciliation efforts. A more thorough and indepth investigation through comprehensive case studies would be necessary to achieve a more nuanced understanding of this issue.

Furthermore, this study relies uniquely on the case study of Pacific salmon in British Columbia, which limits the extrapolation of findings to other cultural keystone species. Therefore, more case studies – with other species – would be needed to draw larger conclusions regarding the concept of cultural keystone species. This would contribute to a more robust and comprehensive understanding of the broader implications of cultural keystone species on socialecological dynamics.

Also, salmon is a special case because it is both an ecological and cultural keystone species. Exploring the role of cultural keystone species that do not play an ecological keystone role would be pertinent, in order to better understand the specificities of cultural keystones. Another study could for instance look at wild crabapples (*Pyrus fusca*) or saskatoon berries (*Amelanchier alnifolia*), which are considered cultural keystone species but not ecological keystone species (Garibaldi & Turner, 2004).

Finally, the sample used for this study also presents limitations. While interviewing key informants is pertinent in order to have an in-depth understanding of salmon-related resilience, I ended up interviewing a lot of people working in environmental organizations. For example, it would have been interesting to interview people involved in commercial fishing. Also, there was a gender disparity in my sample, with more males than females. Interviewing more people identifying as women or non-binary would be pertinent, because the decline in salmon populations might impact them differently – and they might see different responses to it than their male counterparts.

## **Future Research**

While this research explored how A (the decline) led to B (transformative resilience), more has to be explored in terms of the processes at stake. In other words, what makes transformative resilience happen in some cases and not happen in others? Two avenues are identified to answer this question. First, a detailed case study of an instance of transformative resilience would be required. Second, identifying instances where communities are facing a serious decline in salmon populations without demonstrating significant transformative resilience would be pertinent. This would help identify what exactly promotes resilience, through a comparative analysis, and could contribute to providing more tools to social workers and policymakers who want to promote such change.

Also, other questions could also be answered from the data I collected for this research. For instance, it would be interesting to conduct a study oriented on the consequences of transitioning from terminal fisheries to offshore fishing for some communities – such as where I live in Clayoquot Sound. Another study could focus entirely on the community value of hatcheries – and their role beyond salmon health considerations.

Finally, while this research was focusing on cultural keystone species, I question if expanding these to culturally salient ecological features, i.e. a specific lake, river, forest or mountain, or even a beach. For instance, what happens if a lake where people enjoy swimming is prone to cyanobacteria (blue-green algae)? Would this adversity catalyze change within the surrounding community? It would be interesting to explore how communities relate to such features that are not specific species. With the humongous challenges that humanity is facing through the climate crisis, I firmly believe that exploring all the potential catalysts for change is crucial. As a key informant mentioned: "we don't need more science, there's enough science. What we need to have is social science that delves into what makes social-ecological change happen, because we know that some major changes need to take place in a near future to avoid even more catastrophic consequences. Therefore, not staying limited to cultural keystone species appears pertinent, if not necessary.

## Conclusion

The decline of wild salmon populations in British Columbia is a complex issue that has far-reaching ecological, cultural, political and social implications. This research explored the significance of Pacific salmon as cultural keystone species and the relationship between the decline of salmon populations and transformative resilience in British Columbia. I presented in this research how the decline has become a catalyst for social-ecological change in some of the communities impacted. I also demonstrated that cultural keystone species are unique drivers of change that should be accounted for by social workers and policymakers.

Overall, this research highlights the importance for social workers to start putting the groundwork required to fully reinvent their profession by merging the social and ecological systems in the discipline. "Social-ecological" workers could learn about biology, ecology, restoration work just like they do for trauma, communication techniques and psychosocial assessment. This new generation of social workers could support communities in transforming for the better. Social work is about connections – connection to people, resources, one's values, etc. It is time for social workers to take the connection to the environment to the next level, and acknowledge the importance of ecology in promoting positive change. This case study of salmon in British Columbia showed the strength of the attachment people have to Pacific salmon, and demonstrated the intimate connection between social and ecological considerations.

Amberson, S., Biedenweg, K., James, J., & Christie, P. (2016). "The Heartbeat of Our People": Identifying and Measuring How Salmon Influences Quinault Tribal Well-Being. Society and Natural Resources, 29(12), 1389–1404.

https://doi.org/10.1080/08941920.2016.1180727

- Armitage, D., Béné, C., Charles, A. T., Johnson, D., & Allison, E. H. (2012). The Interplay of Well-being and Resilience in Applying a Social-Ecological Perspective. *Ecology and Society*, 17(4). https://www.jstor.org/stable/26269231
- Bay, U. (2015). Ecological Social Work. In U. Bay, *Encyclopedia of Social Work*. NASW Press and Oxford University Press. https://doi.org/10.1093/acrefore/9780199975839.013.1166
- Berger, R. M., & Kelly, J. J. (1993). Social Work in the Ecological Crisis. *Social Work*, *38*(5), 521–526.
- Bonsack, K. (2016, October 20). *Migratory Fish Runs*. https://climate.uconn.edu/habitatsresources/coastal/fish-runs/
- Bottom, D. L., Jones, K. K., Simenstad, C. A., & Smith, C. L. (2009). Reconnecting Social and Ecological Resilience in Salmon Ecosystems. *Ecology and Society*, *14*(1).
- Brulle, R. J., & Pellow, D. N. (2006). Environmental Justice: Human Health and Environmental Inequalities. *Annual Review of Public Health*, 27(1), 103–124. https://doi.org/10.1146/annurev.publhealth.27.021405.102124
- Caro, T., & Girling, S. (2010). Conservation by Proxy: Indicator, Umbrella, Keystone, Flagship, and Other Surrogate Species. Island Press. http://ebookcentral.proquest.com/lib/mcgill/detail.action?docID=3317497

- Caro, T. M., & Girling, S. (2010). *Conservation by proxy: Indicator, umbrella, keystone, flagship, and other surrogate species*. Island Press. http://site.ebrary.com/id/10437872
- Coates, J. (2003). *Ecology and social work: Towards a new paradigm*. Fernwood Publishing. http://catdir.loc.gov/catdir/bios/ipg051/2003464126.html
- Coe, M. A., & Gaoue, O. G. (2020). Cultural keystone species revisited: Are we asking the right questions? *Journal of Ethnobiology and Ethnomedicine*, 16(1). https://doi.org/10.1186/s13002-020-00422-z
- Colding, J., & Barthel, S. (2019). Exploring the social-ecological systems discourse 20 years later. *Ecology and Society*, *24*(1), art2. https://doi.org/10.5751/ES-10598-240102
- Dominelli, L., Nikku, B. R., & Ku, H. B. (2018). *The Routledge handbook of green social work*. Routledge.

https://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk& AN=1743298

- Earth Economics. (2021). *The Sociocultural Significance of Pacific Salmon to Tribes and First Nations* (Special Report to the Pacific Salmon Commission).
- Estes, J. A., & Palmisano, J. F. (1974). Sea Otters: Their Role in Structuring Nearshore Communities. *Science*, *185*(4156), 1058–1060.
- Feeney, B. C., & Collins, N. L. (2015). A new look at social support: A theoretical perspective on thriving through relationships. *Personality and Social Psychology Review : An Official Journal of the Society for Personality and Social Psychology, Inc, 19*(2), 113–147. https://doi.org/10.1177/1088868314544222

- Folke, C., Biggs, R., Norström, A. V., Reyers, B., & Rockström, J. (2016). Social-ecological resilience and biosphere-based sustainability science. *Ecology and Society*, 21(3). https://www.jstor.org/stable/26269981
- Garibaldi, A., & Turner, N. (2004). Cultural Keystone Species: Implications for Ecological Conservation and Restoration. *Ecology and Society*, 9(3), art1. https://doi.org/10.5751/ES-00669-090301
- Greenwood, M., De Leeuw, S., & Lindsay, N. M. (2018). *Determinants of indigenous peoples' health: Beyond the social* (Second edition). Canadian Scholars.
- Hoff, M. D., & McNutt, J. G. (1994). *The global environmental crisis: Implications for social welfare and social work*. Avebury.
- Hoff, M. D., & Polack, R. J. (1993). Social Dimensions of the Environmental Crisis: Challenges for Social Work. Social Work, 38(2), 204–211.

Home—Ecology & Society. (2023). https://ecologyandsociety.org/

Hormel, L. M., & Norgaard, K. M. (2009). Bring the Salmon Home! Karuk Challenges to Capitalist Incorporation. *Critical Sociology*, 35(3), 343–366.

https://doi.org/10.1177/0896920508101502

- Klein, N. (2014). This changes everything: Capitalism vs. the climate. Alfred A. Knopf Canada.
- Kohlhoff, D. (2002). Amchitka and the bomb: Nuclear testing in Alaska. University of Washington Press. http://site.ebrary.com/id/10468622
- Kurlansky, M. (2020). Salmon: A Fish, the Earth, and the History of Their Common Fate. Patagonia.

https://public.ebookcentral.proquest.com/choice/publicfullrecord.aspx?p=6122137

- Morton, A. (2021). Not on my watch: How a renegade whale biologist took on governments and *industry to save wild salmon*. Random House Canada.
- Mueller, M. L. (2017). *Being salmon, being human: Encountering the wild in us and us in the wild*. Chelsea Green Publishing.

Murphy, J. (Director). (2019). Artifishal.

- Næss, A., & Rothenberg, D. (1989). *Ecology, community, and lifestyle: Outline of an ecosophy*. Cambridge University Press. http://catdir.loc.gov/catdir/enhancements/fy0642/88005068t.html
- Nesbitt, H. K., & Moore, J. W. (2016). Species and population diversity in Pacific salmon fisheries underpin indigenous food security. *Journal of Applied Ecology*, 53(5), 1489– 1499. https://doi.org/10.1111/1365-2664.12717
- Norgaard, K. M., & Reed, R. (2017). Emotional impacts of environmental decline: What can Native cosmologies teach sociology about emotions and environmental justice? *Theory* and Society, 46(6), 463–495. https://doi.org/10.1007/s11186-017-9302-6
- Ostrom, E. (2009). A General Framework for Analyzing Sustainability of Social-Ecological Systems. *Science*, *325*(5939), 419–422. https://doi.org/10.1126/science.1172133
- Pacific Salmon Foundation. (2023). *State of Pacific Salmon*. Pacific Salmon Foundation. https://psf.ca/salmon/
- Padgett, D. (2012). *Qualitative and Mixed Methods in Public Health*. SAGE Publications. https://doi.org/10.4135/9781483384511
- Paine, R. T. (1969). A Note on Trophic Complexity and Community Stability. *The American Naturalist*, *103*(929), 91–93.

- Raphael, D., Bryant, T., Mikkonen, J., & Alexander, R. (2020). Social determinants of health: The Canadian facts (2nd edition). Ontario Tech University.
- Reid, A. J., Young, N., Hinch, S. G., & Cooke, S. J. (2022). Learning from Indigenous knowledge holders on the state and future of wild Pacific salmon. *FACETS*, 7, 718–740. https://doi.org/10.1139/facets-2021-0089
- Richmond, M. E. (1922). *What is social case work? An introductory description*. Russell Sage Foundation. https://catalog.hathitrust.org/Record/001119704
- Rine, C. M. (2016). Social Determinants of Health: Grand Challenges in Social Work's Future. *Health & Social Work*, 41(3), 143–145. https://doi.org/10.1093/hsw/hlw028
- Rodríguez, I. (2024). Just Transformations: Grassroots Struggles for Alternative Futures. Lightning Source.
- Sherriff, L. (2021, October 20). 'No fish means no food': How Yurok women are fighting for their tribe's nutritional health. *The Guardian*. https://www.theguardian.com/globaldevelopment/2021/oct/04/salmon-klamath-river-yurok-women-nutrition-health
- SOS Coalition. (2023, January 26). *The Problem*. SOS Coalition. https://www.fnfisheriescouncil.ca/save-our-salmon-coalition/
- Temper, L., Walter, M., Rodriguez, I., Kothari, A., & Turhan, E. (2018). A perspective on radical transformations to sustainability: Resistances, movements and alternatives. *Sustainability Science*, 13(3), 747–764. https://doi.org/10.1007/s11625-018-0543-8
- Tuck, E. (2009). Suspending Damage: A Letter to Communities. *Harvard Educational Review*, 79(3), 409–428. https://doi.org/10.17763/haer.79.3.n0016675661t3n15
- Ungar, M. (2002). A Deeper, More Social Ecological Social Work Practice. *Social Service Review*, 76(3), 480–497. https://doi.org/10.1086/341185

Ungar, M. (Ed.). (2021). *Multisystemic Resilience: Adaptation and Transformation in Contexts* of Change (1st ed.). Oxford University Press.

- U.S. Geological Survey. (2023). Jim Estes Explains How Sea Otters Run the world. https://www.usgs.gov/centers/werc/news/emeritus-and-distinguished-alumni-profile-jimestes-explains-how-sea-otters-run
- Waldron, I. (2018). *There's something in the water: Environmental racism in indigenous and black communities*. Fernwood Publishing.
- Weick, A. (1981). Reframing the person-in-environment perspective. *Social Work*, *26*(2), 140–143.
- World Health Organization. (2023). Social determinants of health. https://www.who.int/teams/social-determinants-of-health

https://doi.org/10.1093/oso/9780190095888.001.0001

Zapf, M. K. (2009). *Social work and the environment: Understanding people and place*. Canadian Scholars' Press. http://catdir.loc.gov/catdir/toc/fy0904/2009397672.html