

Spawning trouble: A criminological examination of salmon aquaculture in coastal British Columbia

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ABSTRACT

Despite considerable evidence of ecological harm, ongoing breaches of law and regulation and systemic failure on the part of regulators, the salmon aquaculture industry has to date been spared criminological consideration. This dissertation aims to begin to address this lacuna through an interrogation of the discourse of environmental harm and risk associated with salmon farming in British Columbia, as represented through a significant moment in its history, the Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River. An ethnographic content analysis of the Commission hearings was undertaken, which drew on the Framework methodology. In making meaning of the data, I enlist several theoretical frameworks, including political ecology and risk as theorized in risk society and governmentality scholarship. To this end, I draw on the work of Ulrich Beck, for whom the development of the “risk society” in which a critical-reflexive engagement with the ecological risks of techno-industrialization is a central preoccupation. This is compared with analyses derived from Michel Foucault, where risk is viewed as a form of governmentality. I contend that the environmental governance of salmon aquaculture through “sustainable development” manifests an expression of biopolitical power, deriving from and operating upon a network of relations between the population, the resources upon which it depends and the environment. Material relations are also considered through the lens of Treadmill of Production theory, with a focus on both the drivers of the treadmill as originally conceptualized – capital, labour and state – and countervailing forces such environmental and Indigenous groups. Through a process of capital accumulation via intensive agri-industrial production, the salmon aquaculture industry externalizes the costs of its ecological additions and withdrawals, engendering local, regional and even global impacts through spatially and temporally networked global systems of production and consumption. In this dynamic, the regulatory system is a site of contestation. I consider this adumbration of the material and ideological relations of power with a generative intent and take up some of its overarching implications for engaging with the regulation of salmon aquaculture and with other systems of ecological governance in British Columbia and beyond.

Keywords: salmon aquaculture; sustainable development; Michel Foucault; biopolitics; risk society; symbolic violence

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LIST OF ACRONYMS

AAA Aboriginal Aquaculture Association

ACRDP Aquaculture Collaborative Research and Development Program

AIMAP Aquaculture Innovation and Market Access Program

AMD Aquaculture Management Directorate (DFO)

ASWP Atlantic Salmon Watch Program

BAMP Broughton Archipelago Monitoring Program

BC British Columbia

BCSFA B.C. Salmon Farmers Association

BCMAL BC Ministry of Agriculture and Lands

BKD bacterial kidney disease

C&E Compliance and Enforcement

C&P Conservation and Protection Directorate (DFO)

CAAR Coastal Alliance for Aquaculture Reform

CAIA Canadian Aquaculture Industry Alliance

CEAA Canadian Environmental Assessment Act

CFIA Canadian Food Inspection Agency

DFO Department of Fisheries and Oceans

DOJ Department of Justice Canada

DPAD death of fish or any permanent alteration to, or destruction of, fish habitat (Fisheries Act, s. 35)

EBM Ecosystem-based management

ENGO environmental non-governmental organization

ESSRF Environmental Science Strategic Research Fund

FAO Food and Agriculture Organization of the United Nations

FNFC First Nations Fisheries Council

HADD harmful alteration, disruption or destruction of habitat (Fisheries Act, s. 35)

HSMI heart and skeletal muscle inflammation

IFMP Integrated Fisheries Management Plan

IHN infectious hematopoietic necrosis

IMAP Integrated Management of Aquaculture Plan

ISA infectious salmon anemia

ISAv infectious salmon anemia virus

MOE BC Ministry of Environment

MRS mortality-related signature

NGO non-governmental organization

OIE World Organisation for Animal Health

PARR Program for Aquaculture Regulatory Research

PCB polychlorinated biphenyl

PCO Privy Council Office

PCR polymerase chain reaction

RACO Regional Aquaculture Coordination Office

SAP Sustainable Aquaculture Program (2008)

SAR 1997 Salmon Aquaculture Review (by BC Environmental Assessment Office)

SFU Simon Fraser University, Burnaby, BC

SLICE trade name of in-feed emamectin benzoate therapeutant fish

SST sea surface temperature

ToP treadmill of production theory

UBC University of British Columbia, Vancouver

UBCM Union of BC Municipalities

WSP Wild Salmon Policy

I. Introduction: Criminology, environmental harm and salmon aquaculture

But of the audits that we have done on how government oversees a particular industry, really I have not been more disturbed than I have been with aquaculture....The gaps, there are so many of them, they are so important....There's no monitoring of wild fish, no thresholds for the use of medication. Industry reports are not validated, no monitoring of the ocean floor required – it just goes on and on....I have probably not been more concerned about an audit that oversees an industry.

- *Julie Gelfand, Commissioner of the Environment and Sustainable Development at Office of the Auditor General of Canada*

Despite considerable evidence of environmental harm, ongoing breaches of existing law and regulation and systematic failure on the part of regulators, the salmon aquaculture industry has to date been spared criminological consideration. This thesis, which focuses on the environmental regulation and governance of salmon farming in British Columbia, is intended as an initial step in redressing this lacuna. More specifically, the questions taken up centre on the discourse of environmental harm and risk associated with salmon aquaculture, as represented through the *Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River* (“the Cohen Commission”). An ethnographic content analysis of the Cohen Commission hearings was undertaken, drawing on the Framework methodology.

Given the paucity of criminological work in relation to salmon aquaculture, my investigation takes on somewhat of an exploratory (and also descriptive and explanatory) cast. At the same time, I approach salmon aquaculture as nested within a series of material and social relations, operating simultaneously at multiple levels (from micro to macro), and I am unabashed in bringing to bear a range of perspectives and theoretical approaches related to such a conceptualization. The goal of this research is to formulate an account of the social framing of the environmental harm associated with open net-pen salmon farming, including the relationship between the risk of harm – where risk is

understood as an object of scientific inquiry, an orientation to social and material relations within a capitalist political ecology, and as a technique of governance – and the broader environmental regulatory environment. My analysis proceeds through a reverse zoom, beginning with the specifics of inferential mechanisms and claims to knowledge as advanced through processes of symbolic exchange at the Cohen Commission and then moving to institutional and structural considerations grounded in political ecology and risk as a form governance – while iteratively exploring connections across levels.

My efforts are driven via the following questions:

- What claims are made by witnesses and participants in the formal techno-legal process of the Cohen Commission regarding the nature of environmental harms and risks associated with salmon aquaculture?
- How do such claims reflect and reproduce social relations relevant to the operation and regulation of the industry, particularly in regard to the operation of power in its various forms?
- How might claims evidence the exercise of *symbolic violence* in the framing of science and other forms of knowledge production and their relation to the environmental governance of salmon aquaculture?
- In what ways do claims materially reflect and reproduce relations of production in a capitalist political ecology, particularly in connection to a *treadmill of production* perspective?
- What is the relationship between such claims and an understanding of techniques of environmental governance conceptualized through *risk society* or *biopolitical* models of power and governance?

In making meaning of the data, I enlist several theoretical frameworks, including political ecology in the form of treadmill of production theory and risk analysis in its various epistemological guises – in particular, as theorized in risk society and governmentality scholarship. To the latter end, I draw on the work of Ulrich Beck (1992a, 1992b, 1994, 1995a, 1995b, 1999), for whom modern Western society can be characterized as a “risk society” in which a critical-reflexive engagement with the distribution of ecological risks of techno-

industrialization is a central preoccupation. This conceptualization is compared with analyses derived from the work of Michel Foucault (1976, 1980, 1982, 1988, 1991) where risk is viewed as a form of *governmentality*: that configuration of knowledge/power

formed by the institutions, procedures, analyses and reflections, the calculations and tactics of the very specific albeit complex form of power which has as its target population, as its principle form of knowledge political economy and its essential technical means apparatuses of security (Foucault, 1991, p. 102).

Whereas Foucault wrote very little directly addressing environmental or ecological issues, his concept of *biopolitics* logically extrapolates into this area (Rutherford, 1999). The emergence in the eighteenth and nineteenth centuries of a new form of power concerned with the “administering of life” (Foucault, 1976, p. 139) and the care and control of populations requires the “constitution and management of the environment in which these populations exist and upon which they depend” (Rutherford, 1999a, p. 45). With Rutherford (1999a), I contend that environmental management and the related discourse of *sustainable development* can be regarded as an expression of biopolitical power, deriving from and operating upon the management of continuous and multiple relations between the population, its resources and the environment (p. 45).

While it is not a central theoretical focus, in the interplay between subjective and structural explanation, the social theoretic work of Pierre Bourdieu proves instructive in understanding how broader power relations are manifest at the level of the Commission and the participants and witnesses who appeared before it. The concept of *symbolic violence* – a process of legitimating and reinforcing structures of inequality through the imposition of systems of meaning (Bourdieu & Passeron, 1977) – provides a useful explanatory tool. Symbolic violence operates as a form of misrecognition: “the process whereby power relations are perceived not for what they objectively are but in a form which renders them legitimate in the eyes of the beholder” (Bourdieu & Passeron, 1977, p. xiii). “Naturalization” occurs not only through positive inculcation but also via

the exclusion of ideas deemed unthinkable. Thus, a notable focus here is that which is *not* said.

The exercise of symbolic violence against a social agent will influence her *habitus*, shaping the system of dispositions through which she perceives, judges and acts in the world. Such habitus is acquired through everyday life and taken for granted, often as part of the natural order (e.g., Bourdieu, 1986). The exercise of symbolic violence and the reproduction of habitus are not deterministic processes, however. There is always resistance by strategizing agents in a struggle over social categorization and recategorization – and always the potential for actors to advance counter-narratives (Bourdieu & Wacquant, 1992, p. 167). Symbolic violence is shown to be at play in the epistemic techniques through which salmon aquaculture is advanced and which, to varying degrees, come to be seen as given: the presumption in favour of development and its acceptance as “inevitable,” the reversal of the precautionary principle, and the adoption of an inappropriate onus and standard of proof regarding environmental impacts, such that systems of proof in an idealized positivist epistemology and the appropriate epistemological underpinning of decision-making in the public policy context become conflated.

Of particular interest in the regulatory setting is Bourdieu’s concept of a field (Bourdieu, 1994). Agents often exercise their habitus in the context of positions within a relatively autonomous structured social space that is subject to its own organizing schemata, sets of values, rules of behaviour and principles of domination. Within (and sometimes across) such fields agents engage in various forms of struggle and negotiation over modes of capital (economic, cultural, social). The link between regulatory (in)action and the social contestation of individuals operating within the regulatory agency as Bourdieuan field is explored.

Finally, I evidence a generative intent. I consider some of the overarching implications of this adumbration of the material and ideological relations of power for engaging with the regulation of salmon aquaculture and with other systems of ecological governance in British Columbia and beyond.

To provide an outline of the structure and content of this study, I summarize the remaining chapters below.

Chapter Two: Theorizing environmental harm and risk

An analysis of the structures through which we conceptualize, investigate and assign environmental risk is imbricated with our understanding of environmental harm itself. A critical point of departure, then, is an interrogation of the social construction of environmental harm and its particular criminological relevance. I outline the socio-legal epistemological framework underlying my analysis in relation to various eco-philosophical orientations, locating it within an ecocentric perspective. Political economic theorizations of the production of environmental harm and risk are then considered, specifically through the lens of treadmill of production theory (Schnaiberg, 1980), with a focus on both the drivers of the treadmill as originally conceptualized – capital, labour and state – and countervailing forces such as environmental and Indigenous actors.

I then consider the structuring effect of environmental risk, drawing on the work of Ulrich Beck (e.g., 1992a, 1992b, 2003). For Beck, modern Western society can be characterized as a “risk society” in which technological risks cannot be wholly contained within bureaucratic actuarial management, leading to the production of a reflexive modernity. This conceptualization is compared with analyses derived from Michel Foucault (e.g., 1976, 1980), where risk is viewed as a technique of governance through biopower, working via demographic interventions for the “benefit” of the population in toto. I contend that environmental management through “sustainable development” manifests an expression of biopolitical power, deriving from and operating upon the management of relations and flows between the population, its resources and the environment.

Chapter Three: Salmon aquaculture in British Columbia: History, regulation and impacts

An analysis of salmon farming requires contextualization of the industry in terms of its historical development, the environmental concerns and debates surrounding it, and relevant regulatory law and policy – topics which make up the next chapter of my dissertation. I address the formal environmental reviews pertaining to the industry – of which the Cohen Commission is the most significant – and provide an overview of the major environmental issues associated salmon aquaculture. These include matters of disease, fish escapes, waste discharges, marine life impacts, human health. It is important to acknowledge the tension that exists in proffering “facts” pertinent to a subsequent analysis when that very analysis may point to how those same facts are constituted. I believe that a reflexive engagement with this circularity can establish a hermeneutic and dialectical process through which a situated knowledge can emerge.

Chapter Four: Methods and methodology

Here, I describe my methodological approach, in terms of theoretical orientation and practical techniques. My approach proceeds from an understanding that individuals co-create their symbolic world within a macro-level social and material structure. In this way, an on-going dialectical exchange between levels and forms of explanation is established. I draw on a Framework approach (Ritchie, Spencer & Connor, 2003), as “set of principles and practices” (rather than “prescriptions and packages”) (Charmaz, 2008) useful in balancing methodological structure with iterative fluidity. A hybridized deductive and inductive approach is applied that allows for the application and “testing” of theoretical constructs in light of the emergence of themes through reflexive interaction between researcher and data (Altheide, 1996). Transcripts of hearings at the Cohen Commission comprise the primary data source for an analysis that develops iteratively toward increasing abstraction and the crystallization of thematic content.

Chapter Five: Results and discussion

Chapter Five presents the themes that emerge from my documentary analysis. The conceptualization of issues of environmental harm and risk – including the contestation over their scientific understanding and its relation to ecological governance – are interrogated. I begin with consideration of the Commission as a techno-legal apparatus of truth production, one located at the intersection of the distinct but variously overlapping and interpenetrated epistemic domains of policy, law and science. The symbolic violence of concision exercised on participants who mounted a counter-hegemonic challenge to the construction of salmon aquaculture as essentially safe is examined. This is found to be reinforced by the framing of “expertise” around regulatory science to the exclusion of other ways of knowing.

The epistemic challenges of understanding ecological systems through a reductionist positivist epistemology throw into question the Commission’s uncritical reliance on empiricist science. I argue that the continuation of uncertainty in the context of the latter’s status as arbiter of truth (challenged though that status may be) facilitates various epistemic elisions that reproduce the governance system while sanctioning the continued expansion of the salmon aquaculture industry. Themes include *uncertainty as a green light*, whereby the onus to prevent economic development is seen to lie with opponents who are held to the essentially unmeetable standards of a predetermined dominant frame. An epistemic *evidentiary catch 22* functions to make assessment of risk dependent on prior evidence, the production of which is dependent on said assessment. The mechanics of how this worked to exclude from policy considerable evidence of harmful disease and emergent (epigenetic) research, are examined. Conversely, the theme of *certainty from uncertainty* demonstrates how an absence of data can be employed to reinforce the status quo. Such techniques are seen to be at play in the symbolic violence that excludes Indigenous and other forms of knowledge. Throughout I note the shifting role of *common sense* – variously shunned as the untrustworthy poor cousin of proper

science or appealed to as a practical and reasonable “generally understood” criterion of determination.

I then consider issues of environmental harm and risk from salmon aquaculture through a political ecological lens, applying a treadmill of production (Schnaiberg, 1980) analysis to the role of capital, labour and (in particular) the state, as well Indigenous and civil society actors. The drive to capital accumulation is seen to lie at the heart of salmon farming’s ecological additions and withdrawals and the particularly harmful forms they take (e.g. open net-pens versus closed-loop systems). I show how, as revealed through the Commission, the political-regulatory system is captured by the salmon farming industry. The contestation at the Commission over the status of Infectious salmon anemia (ISA) in British Columbia offers an effective illustration of how the regime of salmon aquaculture is one in which the property and privacy rights of corporations within a neoliberal political economy take precedence over the public right to a healthy environment.

Finally, I take up issues of environmental risk more directly via governmentality, and risk society perspectives. The Commission illuminated how efforts to capture the ecological and environmental threats posed by salmon farming within a risk framework break down, revealing fundamental incoherence or inconsistency. On one level, then, Beck’s model of the risk society seems an apt fit with salmon aquaculture as it is carried out in British Columbia, where the intensive farming of an alien species has created potentially catastrophic risks that transcend the limits of an insurance model. Under a Foucauldian framework, risk is interwoven with governance such that regimes of environmental regulation extend biopolitics to the natural world, managing flows of production and power in relation to interactions between humans and the environment. I aver that for a threat of ecological harm to be recognized under such governance, it must be recognized within systems of risk assessment, yet, paradoxically, once so “quantified” it loses its power to preclude. Risk becomes an affirmatory biopolitical force that facilitates the continued reproduction and expansion of the industry. I demonstrate how this process is facilitated through a rhetoric of

sustainable development and how normative processes of *stakeholder* inclusion in practice may work to increase the power of industry.

I explore both how an economy of environmental risk also creates fissures, through which oppositional forces irrupt to subvert dominant agendas, and how the system of regulatory and biopolitical governance actuates mechanisms and techniques to resist such challenges. Ultimately, I contend that the absence of vigorous regulatory involvement is not merely the inevitable consequence of an epistemological breakdown in the face of ecological complexity but indicative of regulatory action as reflective of political ecology. In this regard, a risk-class analysis (Curran, 2018a) provides a better fit. Similarly, from a Foucauldian perspective, uncertainty that exists outside of the biopolitical apparatus also motivates resistance, just as it is also taken advantage of by the economic forces of expansion.

Chapter Six: Conclusion

In my final chapter, I consider some implications of themes that emerged from relations of power instantiated and reflected at the Commission from an ecological justice perspective. Here, the regulatory regime is considered as a space of contestation, one in which its function as a “public interest” is seen not as a fiction but as a limited concession. Because of this, the role and form of the regulator is not pre-determined but open to reconfiguration as the result of a dynamic process of contestation. Whether as an agent of sovereign power or a ground for the exercise of more a diffuse governmentality, the organs of the state are here seen as sites of struggle over meaning – over what it means to regulate, what it is that is being regulated, and the regulatory mandate in relation to each.

I contend that such epistemic openings reveal the potential for a more genuinely participatory and democratic decision-making process, rooted in the movement to an unfolding ecological justice that synthesizes the development of political and economic democracy. I maintain that a meaningful response to the systemic harm resulting from salmon aquaculture as currently practiced is fundamentally connected to both the development of economic democracy and

the process of reconciliation with Indigenous people. I further argue that such a reconfiguration of political ecology and subversion of biopolitical control can rejuvenate the precautionary principle such that it becomes grounded in praxis.

Challenges to the symbolic violence through which the realms of scientific inquiry, ethics and politics are compartmentalized were in evidence at the Commission. Such disruptions, which threaten to displace a reductionist empiricist science from its position of assumed authority atop a hierarchy of knowledge, portend the possibility of a pragmatically embedded horizontal epistemological space. Support for liminal research that straddles hegemonic approaches inside the regulatory field and marginalized knowledge outside of it may begin to push the epistemic boundaries in this regard. I contend that such work could support and be supported by a resilient subpolitics, but only if connected to broader struggles for ecological justice.

II. Theorizing environmental harm and risk

A. Conceptualizing environmental harm

Climate change, habitat destruction, mass species extinction, industrial pollution – the litany of impacts that humans are visiting upon the natural world grows ever-longer and, so it seems, ever more severe. Yet, while a (perhaps ultimately disempowering) media narrative of catastrophism becomes increasingly prevalent, the nature and extent of this harm remain matters of active debate, both in popular consciousness and in the scientific and academic realm. The sheer complexity of ecological and eco-physical systems combined with their capacity for synergistic and non-linear interactivity means that precise assessment of the degree or significance of environmental damage – or risk thereof – is often fraught. Moreover, the social construction of environmental issues at some level underlies any proffered environmental metrics. What *environment* as a signifier refers to, how our relation to it is conceived (scientifically, romantically, spiritually, ethically), whether activity is recognized as impacting the environment or is subsumed within another discourse or social framework¹ – all are open to constitution and reconstitution in response to the play of material, social and cultural forces.

Even at the level of dictionary definition, the tension implicit in the intension of *environment* is evident. Oxford offers both, “the surroundings or conditions in which a person, animal, or plant lives or operates” and, “the natural world, as a whole or in a particular geographical area, especially as affected by human activity” (Environment, n.d.). In the sense captured by the first definition, a binary is implicit: that of the subject as ontologically distinct from the world that surrounds – the cleavage of *man versus nature*. The second suggests the unitary

¹ Illegal dumping of toxic waste, for example, is an environmental issue but also one of human rights and equity. Environmental exposure to toxins at the workplace is also a matter of occupational health and safety. (See: Hannigan, 2014; White & Heckenberg, 2014.)

whole, the undifferentiated world of which we are an inextricable part (but nonetheless impact).

One historicity of environmentalism sees an inversion of the long-standing opposition of culture and nature – between civilization and wilderness (e.g., Larsen, 2012).² The advance of resulting imperative to tame and subdue the wild is marked by a corresponding alienation from the natural world; but as humanity becomes too “successful,” the necessity of now “siding” with nature both for its own sake and humanity’s own survival gradually becomes apparent (Lanthier & Olivier, 1999; Meyer, 2001, pp. 35-56). While various environmental schools of thought seek to erase this dichotomy, it remains a powerful conceptualization that is difficult to wholly transcend. Thus, deep ecology, perhaps the environmental philosophy that most overtly decries the human/nature divide, nonetheless seeks to “preserve” nature in its pristine state, to set it apart from the negative impact and “contamination” of human beings (e.g., Devall & Sessions, 1999). The inconsistency of what by deep ecology’s own tenets is logically a form of *self-contamination* appears to pass unrecognized. An apprehension of environmental harm that remains true to the credo that *the environment is us* is compelled therefore to go beyond any simple view of an agent inflecting damage upon an externalized object and instead recognize a process in which object and subject are mutually creating and never fully distinct (Irwin, 2001; Murdoch, 2001; Halsey, 2004).³

² The gendered associations of this division have prompted eco-feminists to link this subjugation of nature with the subjugation of women (e.g., Merchant, 1980, 1996).

³ Morton (2007) puts the challenge thusly:

Ecological writing keeps insisting that we are "embedded" in nature. Nature is a surrounding medium that sustains our being. Due to the properties of the rhetoric that evokes the idea of a surrounding medium, ecological writing can never properly establish that this is nature and thus provide a compelling and consistent aesthetic basis for the new worldview that is meant to change society. . . . Putting something called Nature on a pedestal and admiring it from afar does for the environment what patriarchy does for the figure of Woman. It is a paradoxical act of sadistic admiration. (pp. 4-5)

That said, I admit at the outset to my own sadism. Both because of the need to engage with the discourse as it is, as well as the practical difficulty in erasing the subject/object divide (given the necessity of marking identifiable components within an integrated system), I will here refer to humanity and nature as distinct – while accepting that, ultimately, they are not.

The failure of the human/nature divide is again illustrated by the reality that almost no human activity is without environmental consequences of some kind. Even the most conscientiously practiced biodynamic agriculture, for example, visits immediate harm upon the creatures harvested and involves permanent changes to the “natural” environment. Taken to its logical endpoint, pristinism reduces to an end to all human activity and to hence humanity itself. Nonetheless, the removal of strips of bark from a yellow cedar tree such that it is not killed and the forest ecology not significantly disrupted, a practice carried on by the First Nations of coastal British Columbia for thousands of years, seems in a distinct category from the large-scale industrial clear-cutting of that same forest. Delineating the precise basis for this distinction, however, raises a series of epistemological issues couched in varied understandings of ecology, the environment and life itself.

Ecologically, we might approach the issue of harm by first assaying the extent of the disruptions to the relevant natural systems: How permanent are they? Do they interact with other damaging activities? Is the damage local, regional, or global in scope? Have the limits of the absorptive capacity of the system been exceeded? (See, for example, Miller, 2000.) Ecological assessment, like all scientific endeavour, is not a neutral or value-free undertaking, however (e.g., Kuhn, 1996). Moreover, knowing the nature and extent of the harm, does not, in itself, answer the normative question of acceptability. Environmental destruction is usually associated not only with costs but with some kinds of benefits, be they distributed narrowly or widely.⁴ Should these benefits be weighed against costs in determining whether something is environmentally harmful (or whether that harm is “justifiable”)? How should such a balancing occur – in purely economic terms, through some metric of the overall distribution of social good, or merely via subjective value judgements? Or should

⁴ In addition to economic or cultural value, Halsey (2004), drawing on the work of Deleuze and Guattari, points to the importance of *flows of pleasure* in propagating environmental harm (the subjective enjoyment of driving a sports car, admiring a mahogany table, etc.) (pp. 843-844). It is important to note, however, that such phenomena cannot be reductively treated as natural or innate, but are themselves socially constructed.

any such measure even be attempted? In other words, are there fundamental deontological principles of environmental regard that are permanently exempt from utilitarian consequentialist calculations of any kind? These are matters not amenable to “objective” resolution. Rather, the questions asked and the answers formulated arise from a socially nested ethico-political matrix of values and beliefs.⁵ In deconstructing this matrix we can begin to elucidate the factors that define particular perceptions of the environment and our obligations toward it, as well as how these perceptions reflect the larger play of social and economic forces. One such attempt derives from a view of humanity and the natural world as pragmatically distinct yet ontologically interpenetrated such that the technological control and exploitation of the processes of life create the potential for the ethical and/or instrumental regard for life forms and their systemic relational interactions. (Lanthier & Olivier, 1999; Rutherford, 1999a, 1999b).⁶ This permits a view of environmentalism as not necessarily wholly “liberatory” but capable of functioning as a form of governmentality that facilitates the managing flows of populations, resources and life itself – a perspective that will inform my analysis of the salmon aquaculture industry.

B. Environmental harm and criminology

The social construction of environmental harm takes on further salience in the criminological context. While environmentally damaging activities are sometimes recognized in criminal law, often they simply form part of the accepted and

⁵ I should state directly and at the outset that I am alive to the reality that, as a researcher, I am embedded within these forces. It is through deliberate and on-going efforts at reflexivity that I hope if not to escape circularities created by this reality at least to bring them to the surface of my analysis.

⁶ While under this view it is through a process of exploitation that environmental harm becomes realized, this is not to say that societies not engaged in such exploitation have no awareness of “the environment.” They may in fact have a stronger regard for and connection to “nature.” They will tend to view harm in a different manner, however, subject to their own set of influences. Other conceptions of the distinction, or lack thereof, between humankind and nature will engender differing understandings of environmental harm, including the contention that the concept is in fact meaningless. A completely instrumental view of the world that sees only resources to be exploited without limit has no room for any such “harm.”

normal way of doing things. It is not surprising then that the notion of *environmental crime* is from the beginning contentious (White, 2009, pp. 1-3; 2010, pp. 6-7).⁷ The long-standing divide over criminology's proper domain recurs as a central conceptual and political issue in *green criminology*.⁸ The more conservative position – that inquiry should be restricted to the legal-procedural arena (to practices proscribed by law) – is challenged by a socio-legal conception under which the parameters of inquiry are more broadly delineated, extending to activities conceived as damaging regardless of whether they fall under formal legal prohibition (Halsey & White, 1998).⁹ As with the study of white collar and state crime (Sutherland, 1949; Schwendinger & Schwendinger, 1975) (and consistent with a reflexive engagement with environmentalism itself), the adoption of a generative and critical perspective that extends the criminological

⁷ The study of environmental harm necessarily incorporates a range of theoretical perspectives and disciplinary fields – legal, economic, sociological, biological and ecological – and crosses multiple issues and environments (White, 2003). As such, it can be argued that criminology's general identity as a “rendezvous subject” makes it particularly well suited to the study of environmental wrong-doing (South, 1998).

⁸ The term *green criminology* is itself contentious. On the one hand, there has been (and to some extent continues to be) a debate over nomenclature, with various competing alternatives being proposed and critiqued – *eco-global criminology* (White, 2010b, p. 6, 2014), *eco-crime* (Walters, 2010a), *conservation criminology*, for example (Gibbs et al., 2010). Unfortunately, arguably the most suitable term – *environmental criminology* – has been appropriated to what should more properly be called *place-based criminology*, i.e., a field of study focused on the role of urban design in the prevention of street crime (White, 2008).

At a step back, there is also the broader issue of the appropriateness of classifying the criminological study of environmental crimes, harms and hazards under one over-arching label. Does it risk removing the field from potentially fruitful lines of analysis deriving from more “mainstream” approaches? Where do lines drawn to emphasize and distinguish become instead the boundaries around which others will move to ghettoize? Epistemologically, the moniker may represent something of a break from other criminological subfields that typically cohere around theoretical orientation rather than subject matter. On the other hand, criminologists such as Lynch argue that green criminology's identity inures precisely in that it is not merely a hold-all for the investigation of environmental wrong-doing from any and all perspectives but a praxis grounded in engagement with the genesis of such harm in the political economy (Natali, 2013, pp. 74-75). Arguments aside, green criminology has become the dominant umbrella under which now resides an expansive and well-established body of scholarship that engages with and critiques issues of environmental harm from a range of interacting and invitational perspectives (South, 1998, pp. 212-13; White, 2008, p. 14; South et al., 2013, p. 28). It has also proved a useful header and point of unity for the practical organization and advancement of the study of environmental issues within criminology.

⁹ As Forti puts it, “any criminologist intent on dealing with the explosive factual-normative mixture of ‘crime’ in some way, with his choices, will ‘bring to life’ a reality that did not exist before” (quoted in Natali, 2013, p. 77).

gaze beyond the received view – to examine not just what *is* prohibited or regulated but to what *should* be – is particularly appropriate in regard to crimes against the environment (Heckenberg, 2010, p. 39; White, 2010). Much of the most severe environmental damage is the result of practices that are legal¹⁰ – large-scale clear-cutting, dragnet fishing, open pit mining, freeway expansion, and legally permitted emissions of toxic pollution, to name but a few. A concept of *eco-justice* then is distinct from, but related to, the strictly juridical discourse regarding acts or omissions proscribed by law, extending instead to notions of human and ecological ethico-political regard and egalitarian concerns (Beirne & South, 2007; Brisman & South, 2019; Chunn, Boyd & Menzies, 2002; White, 2003; White & Heckenberg, 2014).¹¹

In this vein, various scholars have undertaken criminological work that embodies an expansive conception of environmental harm, one that recognizes legal strictures but is not limited by them. The field has grown to the extent that a full canvassing would be well beyond the scope that is appropriate here, but a

¹⁰ This is not to overstate the degree of clarity legal discourse creates. The legality of an act may not be clear before the fact and is only constituted by the legal process itself. Whereas hindsight is sharper than foresight, the re-viewing of rendered decisions is part of a continual process of reinterpretation under new circumstances and is in fact the heart of the legal-procedural apparatus that creates juridical meaning.

¹¹ In its need to come to engage with the reality that much of the most egregious behaviour is in entirely legal, green criminology parallels the study of corporate crime. Most environmental harm is in fact the product of corporate activity and many of the challenges in studying corporate crime are reproduced in the examination of environmental wrong-doing: the socialized nature of the harm and the difficulty definitively identifying victims (individuals who may not even be aware of their own victimization), the challenges assigning responsibility within the corporate structure, the complexity of data and the difficulty of access (assuming data are even kept), as well as the socio-political power of corporations and their corresponding ability to resist unwanted scrutiny (e.g., Snider, 1993, pp. 21-42).

Whereas the etiology of corporate crime is often highly complex, for environmental wrong-doing it may be all the more so, even in cases where it is not perpetrated by corporate actors (or not ones of significant size). Gunningham and Sinclair's (2002) study of dumping by small unregulated body shops provides a good illustration of this (pp. 41-53). At the most general level, the harm that results from consumer society may be driven by corporations but is bound up with the habits and practices of ordinary individuals. Is the endless cycle of purchasing and throwing away – a cycle in which most of the population of western society partakes – a "crime"? If so, it seems to represent an environmental crime that is not necessarily corporate crime (or at least not wholly corporate crime). The destruction of forests for slash-and-burn agriculture is another example that, while also linked to corporate economic power, seems more clearly an environmental crime than a corporate one. It would be a mistake then to wholly subsume environmental harm under the rubric of corporate crime.

review of some representative engagements with environmental harm and environmental risk is useful in situating my analysis undertaken here in relation to the discipline. The range of manifestations of environmental harm, broadly conceived, that have been the subject of criminological investigation include: global or transboundary issues such as climate change (Brisman, 2018; Hall & Farrall, 2013; Halsey, 2013; White, 2018a), air pollution (Walters, 2010), the international movement and dumping of toxic waste and e-waste (Bisschop, 2012, 2016; Block, 2002; Pearce & Tombs, 1998; Rosoff et al., 1998; Ruggiero & South, 2010; White, 2008), illegal logging and deforestation (Green, Ward, & McConnachie 2007; Boekhout van Solinge, 2010; Boekhout van Solinge & Kuijpers) overfishing and the regulation of ocean resources (Anderson & McCusker, 2005; Lugten, 2005; McMullan & Perrier, 2002), oil pollution (Greife & Stretesky, 2013), the systematic exploitation and abuse of animals (Beirne, 2004, 2007), and the illegal trade in endangered species (McMullan & Perrier, 2002; Tailby & Gant, 2002; Wyatt et al., 2018).

Despite this engagement with a range of environmental issues, direct theorization of the meaning of environmental harm within criminology remained limited until quite recently.¹² Within the bounds of more traditional criminological theorizing and analytical focus, Agnew (2013) has brought social structure and social process theories to bear on “the ordinary acts that contribute to ecocide” (p. 58). Lynch has advanced the eco-city perspective as a green criminological extension of social disorganization theory. Under this view, ecological harm results from the lack of ecological harmony within the urban environment. Making environmental design and planning central, then, serves as an ecological crime control strategy (Lynch, 2013). In the same article Lynch also develops a method for comparing victimization by environmental crime with victimization from street crime, thus bringing the two within the same general conceptual category.

¹² A special issue of *Critical Criminology* has focused on issues regarding researching environmental harm in a criminological context. See *Critical Criminology*, 25(2), June 2017: Special Issue: Researching Environmental Harm, Doing Green Criminology. Issue Editors: Ragnhild Sollund, Avi Brisman.

Scholars and researchers have considered environmental harm in relation to issues of social justice and equity at scales ranging from the local to the global. There is a truly vast environmental justice literature concerned with inequalities in distribution of environmental risk by race or class that ranges across multiple disciplines.¹³ Yet within criminology it has remained surprisingly limited (certainly, on the crime side of the crime-harm “divide,” at least. (See Griefe et al, 2017; Simon, 2000; Stretesky & Lynch, 1999.) The disproportionate environmental burden borne by aboriginal peoples and the degradation of Indigenous lands is taken up by Brook (2000) and Rush (2002). At the international level, Low and Gleeson (1998) have examined decisions by multinational corporations to cite toxic waste production in less developed countries. Van Solinge and Kujipers (2013) examine how the hamburger and soy consumed in the global north is causally linked to the destruction of plant, animal and human life in the Brazilian rainforest. The impact of the global commodity chain is similarly highlighted in Clark’s (2013) study of the involvement of western corporations in conflict minerals in the Democratic Republic of Congo and their ubiquity in everyday consumer electronics. The relationship between social

¹³ For example, just within the specific parameters of studies utilizing data from the Toxics Release Inventory (a publicly accessible database of various pollutant releases in the United States by facility) to examine differential distributions of environmental risk in various jurisdictions or geographical regions, a partial list of research includes: Arora & Cason, 1999 (Southeastern United States); Neumann, Forman & Rothlein, 1998 (*Oregon*); Mennis & Jordan, 2005 (*New Jersey*);] 95:2 *Annals of the Association of American Geographers* 249); Downey, 1998 (*Michigan*); Perlin, Sexton & Wong, 1999 (*The Kanawha Valley, Baton Rouge-New Orleans corridor, Greater Baltimore Metropolitan Area*); Abel, 2003 (*St. Louis and Milwaukee*); Krieg, 2005 (*Buffalo, NY*); Sadd, Pastor Jr, Boer & Snyder, 1999 (*Greater Los Angeles*). At the county level, Daniels and Friedman (1999) find a positive relation between the proportion of the population that is black and the level of toxic releases in the air.

Continuing with TRI data, various studies have parsed interactions between environmental justice variables (e.g., Perlin, Wong, & Sexton, 2001). Others have developed more sophisticated measures of risk beyond direct proximity. Faber and Krieg (2002) look at cumulative exposure; Cutter, Scott, and Hill (2002) examine the relation between six indices of exposure; Chun, Kim and Campbell, (2011) employ Bayesian techniques to account for auto-correlation – the tendency for spatial observations to be related to other observations located closely to them, hence non-independent once locations are considered – and finding that a relationship between facilities and Asian status observed with regression analysis to be explained under Bayesian analysis by percentage of population that is American Indian, population density, and the percentage of residents aged 55–74; Williams (2010) uses the Risk-Screening Environmental Indicators (RSEI) to model risk from industrial exposure in a Tampa Bay neighbourhood.

conflict and environmental harm has been taken up in a collection edited by Brisman, South and White (2016).

There is a growing body of research on environmental harm as manifest against living creatures as individuals in their own right. A *species rights* perspective looks at the obligations and duties owed to non-human animals on the basis on a utilitarian moral calculus (maximizing pleasure and minimizing pain), inherent value, or an ethic of responsible care (White & Heckenberg, 2014, pp. 117-137). (See, for example: Aaltola, 2016; Beirne, 2004, 2007, 2009, 2014; Goyes & Sollund, 2016; Nurse, 2016; Sollund, 2013; Wellsmith, 2010; White, 2018b; Wyatt, Johnson, Hunter, George, & Gunter, 2018). This includes in contexts such as food production (Cudworth, 2017) and animal experimentation (Menache, 2017). Goyes and Sollund (2018) extend the field of animal abuse to include biotechnology and bioprospecting.

Various criminologists have looked to capitalism, a globalized political economy, or the processes of ever-expanding commodification as inherent drivers of environmental harm. Lynch and Stretesky (2003) examine the corporate appropriation of what it means to be *green*, contrasting an understanding constructed by corporate interests with the term as understood from an environmental justice perspective, before going on to examine the criminological implications of each. Walters (2007) and South (2007) examine biotechnology and GM technology as a process of colonizing the natural world, one that involves extending the domain of property rights to life itself. The commodification of water as a public resource is analyzed by South and Walters (2016), while White (2003) interrogates the relation of environmental and ecological justice to the broader commodification of nature under capitalism, considering multiple strategic levels of response. Similarly, Simon (2000) argues that environmental crimes should be understood as part of a regularized pattern of activity taking place within a global political economy dominated by multinational corporations. White (2002, 2010) also sees the marginalization of environmental crime both within criminology and society at large as indicative of its hegemonic neutralization within a paradigm of the continued – and presumed

beneficial – expansion of material consumption. Power shapes our understanding of environmental harm and the law’s engagement with it; thus, “[e]nvironmental harm is intrinsically contestable, both at the level of definition and in terms of visions of what is required for desired social and ecological change (White, 2010, pp. 6-7). In a related vein, Ruggiero and South (2013) look at the role of power in the movement of environmentally harmful activity from legal grey area to either routinized or regulated activity, highlighting the links between organized crime and “legitimate” actors and how legitimated “crimes of the economy” often represent the most serious forms of harm and destruction.

Stretesky, in collaboration with others, has drawn upon Schnaiberg’s *treadmill of production* theory to examine how the growth imperative within capitalism influences the social and legal treatment of environmental harm (Lynch et al., 2013; Stretesky, Long & Lynch, 2013a, 2013b, 2014), discussed in Chapter 5. Noting the lack of a coherent theoretical basis to much of the study of green crime, Lynch, Barrett and Stretesky (2013) apply ecological Marxism and treadmill of production approaches to argue for a green criminological theoretic approach that focuses on ecological disorganization as produced through the productive forces of capitalism. Lynch, Stretesky and Long (2018) also apply treadmill of production theory to the assassination of Indigenous activists, drawing theories of imperialism, colonialism, genocide and ecocide in relation to the particular harm experience by Indigenous peoples in the context of the treadmill’s acceleration of ecological withdrawals. Crook, Short and South (2018) adopt a similar political economic approach in making the case that the impacts of colonialism on Indigenous people are a form of ecocidal-genocide.

Gardner (2013) brings together the social construction of environmental crime with state-corporate crime to explore how corporations and states exploit race, class and gender relations to hide the systemic nature of environmental crime and displace its impacts onto the same marginalized populations then charged them with the responsibility to avoid it. The mutually reinforcing political and material interactions between the forces of governance and production that manifest in the form of state-corporate environmental crime also are taken up by

Smandych and Kueneman (2010) in the context of the Alberta Tar Sands. And the role of the state-corporate political economic nexus is examined by Yeager and Smith in relation to the legal fight of Indigenous people to hold Chevron to account for its pollution of the Ecuadorian rain forest (2010). Analysis of the global political economy similarly informed Low and Gleeson's (1998) examination of decisions by multinational corporations to cite toxic waste production in less developed countries. Friedrichs and Friedrichs (2002) scrutinize of the environmental and social impacts of the imposition of structural adjustment programs upon developing nations by World Bank. Working in intersection of culture with material relations, some green criminologists have sought to integrate cultural criminology into the field through the development of a green-cultural criminology – the focus of which is the interrelationship of culture and environmental crime through mediated depictions of environmental harm and risk, and resistance to both (Brisman & South, 2013, p. 117) (See also Brisman, 2017; Carrabine, 2018; Ferrell, 2013; Natali, 2016; van Uhm, 2018.)

Criminologist, Rob White has lent considerable analysis to the understanding of environmental harm, developing typological as well as etiological categories. He offers four broad perspectives: *geographical, locational, temporal and focal* (White, 2008, pp. 93-102; 2013). Geographical considerations range from the planetary level, through to the regional, national and the local. Environmental issues do not recognize jurisdictional boundaries, and responding to them may necessitate international or global mobilization. Harm can also be globalized in a different sense, however. A pattern of localized harm may repeat on a wider level, leading to the phenomenon of “glocalization” (White, 2008, p. 92). Locational considerations point to a division between “natural” and “built” environments.¹⁴

¹⁴ A clear distinction is not always possible. The English countryside, beautiful and “natural,” is very much shaped by human intervention. The “pristine” arctic is polluted by chemicals carried there from the south.

A related distinction is between brown, green, and white issues: brown relate to pollution and the quality of the urban environment, green to matters of conservation and wilderness preservation, and white to technology and science concerns (GM food, human cloning, etc.) (White, 2008, p.98). Each of these may animate different sectors of the population to different degrees. Temporal considerations include not only the duration of environmental effect, but also

Focal considerations, the fourth typology, relate to the philosophical basis upon which environmental harm is understood and how the relationship between human beings and the environment is conceived (White, 2008p. 94). One approach to examining environmental harm is to ask, who or what is the environmental “victim”? Differing philosophical outlooks yield differing answers. And White (2008, 2013) and, earlier Halsey and White (1998), consider this question of environmental victimology from the familiar perspectives (focal considerations) of *anthropocentrism*, *biocentrism* and *ecocentrism*. Anthropocentrism sees the environment instrumentally and views restrictions on its economic exploitation as only acceptable when that exploitation begins to threaten human beings or their interests (Halsey & White, 1998, pp. 349-52). Biocentrism, in contrast, holds all life-forms, human and otherwise, as morally equivalent and thus sees any damage to the environment as unjustifiable (Halsey & White, 1998, pp. 352-55). Ecocentrism, the authors’ preferred view, attempts to balance an ethical obligation to the natural world – to *non-human environmental entities* such as rivers, mountains, ecosystems (White, 2018b) – with the need to interact with the environment to meet human needs. This philosophy acknowledges that humans are inextricably nested within a network of ecological relations that we cannot help but impact to some degree (Halsey & White, 1998, pp. 355-59). The particular capacity of humans to “develop and deploy means of production that have global consequences means that humans have a unique responsibility to ensure that such production methods do not exceed the ecospheric limits of the planet” (Halsey & White, 1998, p. 355).

Hence, anthropocentrism restricts the realm of victims to human beings, while biocentrism operates under an expansive view in which there is no inherent distinction between life in all its forms and humans – all can be the victims of environmental harm. Victimhood under ecocentrism would seem to take on a more nuanced character than under either of the previous two perspectives,

the latency period until effects become manifest. Environmental timeframes can extend well beyond the period of immediate anthropocentric concerns: systemic effects may ripple across generations or affect the evolutionary balance for thousands – or even millions – of years to come (White, 2008, pp. 100-102).

requiring the investigation of the particularities of damage, disruption and benefit in light of the needs of human beings, societies, other life-forms and the systemic processes that connect each to each other. Further, I believe ecocentrism's norm-based call for a "wide array of specific legal and political strategies, based upon a core ecocentric ethic revolving around socio-environmental interests" (Halsey & White, 1998, p. 358) is inherently reflexive, provoking an on-going iterative evaluation and revaluation of our relationships with the natural environment.¹⁵ Thus, socio-legal matters of justice and equality are central to an ecocentric perspective. The environmental victim is not a fixed entity, but subject to ongoing determination and redetermination.

A similar constitutive approach is apparent in White's more recent (2013) consideration of three interconnected approaches to environmental harm: *environmental justice* (which focuses on harm to humans, including the social patterning of environmental harm and risk), *ecological or conservation justice* (which focuses on harm to the natural world), and *species justice* (which focuses on harm to nonhuman animals). White (2013, 2018b) argues that an ecocentric approach to environmental harm requires the development of an ecojustice framework via the dialogical interaction of these three approaches through which their differences, inconsistencies and antagonisms are resolved. As such, I believe an ecocentric approach to the development and achievement of ecojustice offers a rich and fruitful perspective on which to build an evolving, reflexive and dialectical green criminological analysis, a process that may be contextualised further through analysis of the constitutive role played by risk.¹⁶

¹⁵ Sollund's (2013) comparison of illegal wildlife trafficking with human trafficking provides an excellent example of such reflexivity in the conceptualization of environmental victimization. From an ecofeminist perspective, Sollund challenges dominant conceptualization of nature as well as the anthropocentrism of environmental law and regulation by demonstrating parallels in the commodification of animals, women and children.

¹⁶ I note, however, that my consideration of harm to salmon from a species justice perspective here is limited, and where I to take it up it is at a population level. Consideration of our obligations under an ethic of care or species rights in regard to salmon as individual sentient creatures is an expansive and important topic in itself, and I leave that to subsequent endeavours.

C. Political ecology and the treadmills of production and crime

In analyzing what the Cohen Commission reveals about the political ecology of salmon aquaculture – the connection between its environmental and ecological impacts and prevailing political, economic and social conditions and relations (Bryant, 2015) – I draw on Allan Schnaiberg's (1980; Gould, Pellow & Schnaiberg, 2008) Treadmill of Production (ToP) theory, which links the creation of ecological harms to economic and political forces of production, in particular the continuous drive to growth inherent within the economic system. Stretesky, Long and Lynch's (2014) criminological adaptation of this theory – the treadmill of crime – is also of relevance. Central to both accounts is the concept of *ecological disorganization* – the disruption of ecological connections and ecological functioning. Capitalism¹⁷ is seen as accelerating ecological disorganization through its on-going transformation of energy – and corresponding increase in entropy – as part-and-parcel of a continuous expansion of production and consumption and the pursuit of profit. Whereas there is no internal limit on growth within capitalism, the world in which it operates is finite – both the resources available for exploitation and the capacity of bio-physical systems to absorb the output of industrial production are limited – meaning that capitalism as a system is inherently unsustainable. In this context, technological development facilitates ever-greater exploitation and transformation of resources and hence acceleration of the treadmill. While technological innovation may lead to more efficient resource and energy use, it also facilitates increased aggregate production and

¹⁷ Treadmill of production theory is not directly (or not wholly) a theory or critique of capitalism, although its original formulation does adopt a structural analysis that points to the overarching engine of the treadmill as the extraction of surplus value via a production process based in class exploitation. Though the players may be somewhat different, a similar drive to ever-increasing production could be seen in socialist countries, however (though arguably the same fundamental process of production was in play in the traditionally socialist countries – only with the state as capitalist rather than the corporation). Forces of production were always recognized in the theory as primary and have tended to become only more so (Buttel, 2004, pp. 30-31). I ground my utilization of the theory in an understanding of capitalist relations of production as furthering *capital accumulation* (see Foster, 2005), which I see these as ultimately “driving the drivers.”

consumption. Hence, any environmental gains are outweighed by the relentless dynamic of exponential growth internal to the system.¹⁸

Schnainberg (1980) categorized these economic disruptions of the environment into two types: *ecosystem withdrawals* and *ecosystem additions*. Ecosystem withdrawals comprise materials withdrawn from the ecosystem as natural resources to be transformed into products for the marketplace. Ecosystem additions are the by-products and waste – pollution – that result from the production process, as well as ultimately the products themselves. (See Stretesky et al., 2014, pp. 20-32). Stretesky et al. (2014) hold that the exploitive and destructive relationship between economic forces and the environment that creates ecological disorganization through ecological additions and withdrawals can also drive social disorganization, by, for example, weakening social bonds to conventional institutions or inducing anomie (pp.89-105).

Under the treadmill of production analysis as originally conceived, corporations, labour and the state comprise the key triumvirate of actors incentivized to drive – and ever-accelerate – the treadmill. As mentioned, capitalists strive to maximize profit – both a *raison d'être* and a structural requirement for survival in the marketplace – through expanding production, leading to ever-increasing ecological disorganization.¹⁹ Labour is also inclined to support increased production given the potential for accompanying job creation. The class nature of the economy sets up a fundamental tension between labour and capital, however. Whereas labour is interested in more jobs and higher wages, the profit motive pushes capitalists in the opposite direction. Individual

¹⁸ Stretesky et al. (2014) consider the example of increasing vehicle fuel efficiency. While more stringent efficiency requirements have meant that individual automobiles are more efficient, total oil consumption in the transportation sector has steadily increased. Efficiency gains are overshadowed by a greater number of vehicles, each driving (on average) a great number of miles. (pp. 22-26)

It should be noted that it is not the case that capitalist economies grow at a steady and constant rate. Instead, they move through (business) cycles of expansion and contraction, at an average growth rate of approximately three percent per annum since the 19th century. This means that the economy doubles in size roughly every 20 years (Swersky, 2016)

¹⁹ Not all of capitalism is concerned with the production of material goods, of course – yet both the service and financial sectors are enmeshed with physical production. Finance capitalism, for example, indirectly fuels production through the selling of debt.

firms are incentivized to squeeze wages and take advantage of technological development to reduce employment and shift to more capital-intensive rather than labour-intensive production. Hence, while labour may benefit in the short-term from siding with employers to increase output, capitalist control of the means of production implies that these benefits may not endure.²⁰

The third primary player, the state, is incentivized in a capitalist economy to increase the speed of the treadmill primarily through its dependence on the private sector for tax revenue. I note here that the dominant ideological construction of the relationship between the state and capital is of the former as a supervening entity that “interferes” (for better or worse) on the “natural” (capitalist) operation of firms in the market, which are seen as otherwise free-standing, independent entities. Marxist theorists have demonstrated to the contrary that the state, in fact, was part-and-parcel of the development of capitalism and remains essential to its continued functioning – and to the continued functioning of the creatures of statute we call corporations that are the predominant tool through which capital operates (Tombs, 2012). The state is thus essential to the operation of the treadmill, but its role is also multi-faceted and subject to contestation, both because it is – at least to some degree – under

²⁰ The question of why workers as consumers and citizens continue to participate in and generally support the continued reproduction of the treadmill in spite of its negative impacts to the environment and to their well-being has historically received only minimal attention within ToP theory. While recognizing the importance of analyses centred on the ideology of consumerism and the construction of desire through advertising and “mass culture” (e.g., Zukin, 2004; see also the extensive work of the Frankfurt School, e.g., Adorno & Horkheimer, 1979; Horkheimer, 1976; Marcuse, 1964), Curran (2017b) looks directly to the role of the “treadmill of consumption.” Analogous to his understanding of the relational nature of risk, Curran sees the treadmill of consumption as a “positional economy,” such that “the effectiveness of specific individuals’ or groups’ economic resources and consumer goods is contingent on their position vis-à-vis others” (p. 34). This can take the form of “relational exchange entitlement,” meaning that, for example, when goods are in short supply, increasing purchasing power for some will crowd others out of the market. Increasing technological innovation and its concordant restructuring of social practices and organization can lead to “defensive consumption,” whereby acquiring products (e.g., smart phones, automobiles) becomes necessary to continued participation in modern life in a developed economy. Purchasing certain goods may also connect to one’s status in the community – not just in the form of a “keeping up with the Joneses” conspicuous consumption (Veblen, 1994) – but in relation to ascriptions of decency and the avoidance of stigma and the ability to take part in social engagement and patterns of normalized behavior. Thus, Curran argues that economic, social and cultural factors can all place acceleratory force on the treadmill of consumption (and hence of production)

democratic control or influence and because it is the source of law, including of laws that regulate production, and thus can impact the speed of the treadmill. The extent to which organs of the state such as the regulatory agency serve merely as ideological cover, offering a semblance of oversight and amelioration while simultaneously facilitating capital's continued expansion, rather than as a genuine check on power and sight of meaningful political contestation, is taken up below.

Environmental organizations may also act on the treadmill through their ability (sometimes and to some degree) to shape definitions of environmental crime, pressure the state to regulate corporate activity, or influence public opinion or consumer behaviour in a way that pushes corporations to reconfigure production practices. (See Stretesky et al., 2014, pp. 32-37). A crucial further actor on the treadmill, one who has received insufficient attention, is Indigenous people (Lynch, Stretesky, & Long, 2018), many of whom have in many ways been on the front-line of resistance to environmental exploitation (ecological additions and withdrawals) across the globe – a resistance that connects culturally to conflicting views of the environment and our relationship to the natural world and materially to the history of colonialism, on-going economic imperialism, and fundamental conflicts over sovereignty and self-determination.

The treadmill of crime adaptation of Schnaiberg's work holds that the ecological disorganization resulting from the treadmill of production is itself productive of social disorganization and in turn of crime (Stretesky, Long & Lynch., 2014). In making this claim, crime is in part understood non-critically, seemingly taking hegemonic concepts that equate crime with street crime as given. If we consider social disorganization from a broader and less normative position, however, the chain connecting ecological disorganization to social disorganization to social conflict becomes readily apparent. A "treadmill of crime" analysis can frame the origins of the social contestations and, in some instances, active conflict stemming from the ecological harms and risks of aquaculture.

D. Governmentality and the risk society

Risk is central to environmental discourse. It is through understandings of risk that the epistemological linkage between ecological problems and the broader processes of societal modernization and capitalist expansion (described above) is made, allowing power and knowledge to influence the relationship between society and nature. (See, e.g., Fairbrother & Bennett, 1999.) Risk assessment underpins environmental regulations and standards both at the general level of statutory provisions or government policy (the “acceptable” cancer risk from dioxin levels, for example) and at the level of the specific (the permitting of effluent concentrations at a particular facility). Moreover, cost-benefit analyses that weigh the risks of industrial activity against the projected costs of mitigation are ubiquitous. Risk assessment is the socially constructed apparatus through which development and the exploitation of “natural capital” is legitimated and advanced.

Risk here typically appears in an “objective” form, as a calculated numerical probability of a certain outcome multiplied by a quantified value (often expressed as a dollar-value) that represents the resulting harm. It also appears in a more colloquial and (seemingly) less precise sense, as a hazard, a possible consequence of our behaviour that hangs over our heads, all the more threateningly so for its apparent amorphousness. The societal movement from *hazard* to *risk* is taken up at length in the work of Ulrich Beck. While humanity has throughout history and prehistory faced potentially devastating hazards (plagues, famines, natural disasters, for example), *risk* for Beck is a distinctly modern concept focused on the techno-economic decision-making processes of (post)industrial rationalization. The actualizations of risk are not the capricious acts of the gods; rather they are the more or less predictable outcomes of modern industrial human activity (Beck, 1992a, pp. 98-100; 1995b, p.78).

Hence, as industrialization progressed, actuarial systems of insurance were developed, enabling the capitalist system to internalize the negative eventualities that would otherwise hinder its progression (Beck, 1992a, p.98;

Ewald, 1991). “Predictable” events are categorized and suitable levels of compensation calculated. Now operating at the statistical level of the population, this calculus of risk allows for a certain abstracting away from explicit moral directives. The categorical imperative against individuated harmful activity transmutes into a systemized “risk analysis” (Beck, 1992a, p. 99). Most critically, however, the formerly unforeseeable now becomes the object of current action (Beck, 1992a, p. 100). In fact, such risk assessment is often only “weakly numericized” – and the appearance of objectivity is illusory (see Porter, 1995) – but its psychological and social function remains (Rose, p. 332).

Beck’s distinctive claim is that since the middle of the twentieth century the continued development of technology has come to threaten or subvert the foundations of the established risk logic (Beck, 1992a, pp. 100-105; 1994, p.2). Ironically, while risk calculations become ever more numerous, the sheer global scale of the threats posed by nuclear, chemical and genetic technology undermines their legitimacy, transcending insurance principles: “the residual risk society has become an uninsured society” (Beck, 1999, p. 53). This transcendence takes on a reflexive character as the very scientific and technological responses to the catastrophic potentialities of modern industrial society raise their own threats, prompting a recursive dynamic that defies closure (Beck, 1992b, pp. 56-7). Similarly, public demand for ever-increasing safety prompts the issuance of ever-tighter techno-bureaucratic security claims, which have the effect of focusing increased attention on hazards that are ultimately unmanageable (Beck, 1992a, pp. 106-109).²¹ All the while, technology, according to Beck, is fixed on a self-reproducing, economically determined course.²² Faced with “self-annihilating progress,” the public loses faith in the regulatory system

²¹ The resultant weakening of the legitimacy of risk management professionals in the eyes of the public has historically prompted further resort by the latter to the “objective” shelter of numbers and quantifications, which the public view as guarantees against abuses of discretion (Porter, 1995, p. 196).

²² Global-scale hazards such as nuclear power cannot be experimentally tested – to know the risk one has to build the reactor. Technology thus has the power of a *fait accompli*, which liberates doubt and brings the social into what is otherwise (according to Beck) a purely formal process of technical standard setting (Beck, 1992a, pp. 107-9).

broadly conceived, and conflicts over the nature and distribution of risk become the central dynamic shaping late modern industrial society, displacing the distributive material concerns of an earlier epoch (Beck, 1992a, pp. 109-14). Ultimately, Beck sees the “egalitarian” distribution of systemic ecological risk across a destabilized and reflexive society as holding out positive potential. As new alliances form across social, professional and international boundaries and opportunities arise for dissenting voices to seize the day and reconfigure the “technoeconomic juggernaut,” space opens for a more poly-vocal, ecologically-grounded democratic process (Beck, 1992a, pp. 118-120; 1992b, p. 227; 1999, p. 40).

Beck’s risk society thesis has met with significant criticism, particularly concerning its emphasis on a claimed democratic distribution of risk and failure to acknowledge that, as Mythen puts it, risks “invariably track the tramlines of poverty and disadvantage” (Mythen 2005b, p. 141). (See, for example, Atkinson, 2010; Mythen, 2005a; Scott, 2000). While Beck did come to grant that “pollution follows the poor” (1999, p. 5) and make some allowance for the unequal geographic distribution of risk (2009) and the continuation of certain inequalities, even within a risk society, he continued to see a non-hierarchical distribution of modern risks as superseding other forms of equality (2010). For Beck, the “boomerang” quality of risk – such that the individuals producing the risks cannot ultimately escape their own exposure to them (e.g., contaminants emitted by the chemical plant eventually seep into the groundwater on which the owners depend, and so on) – means that even the advantaged will come to bear the cost. (Aphoristically, “poverty is hierarchic, smog is democratic” [Beck, 1992b, p.36]). Through this ostensible universal nature, risk comes to *replace* class and other forms of inequality (Beck, 1992b, 2009, 2013).

In recent years, some theorists have attempted a synthesis of Beck’s reflexive modernity risk analysis with materialist distributional perspectives to produce a risk-class analysis aimed at developing a theory of the “social structuration of risk.” Rather than replacing class inequalities, risk here is seen as an “additional site of structuration of class inequalities” (Curran, 2018a, p. 303).

(See Christophers 2015; Curran 2013, 2015, 2016, 2017a, 2018; Dorn 2016; Tyfield 2018.) “Environmental bads” are recognized as distributed in a relational or positional manner, meaning that it is not merely the case that some individuals or groups happen to be less exposed than others, but that some have less exposure *because* others have more. Curran claims that the capacity to avoid risk or impose it on others is a function of *relative* wealth differentials (Curran, 2013). In this sense, risk-class theory possesses an inherently normative orientation (Curran, 2016, 2018a). We can see, *prima facie*, how in its concern with processes that lead to the *production* of risks, treadmill of production theory might offer a useful complement to the risk *distributional* analysis provided by risk-class theory.

In his theorizing of risk, Beck blends objective and cultural or relativist perspectives, cleaving to fundamentally objective naturalist and anthropogenic notions of risk as it exists “in the world,” while recognizing the differing conceptualizations and rationalizations given to the nature and causes of risk across societies and eras (Mythen, 2004, pp. 96-100). Governmentality scholars, however, emphasize the construction of risk as a technique of governance in itself, rather than the other way around, (See, for example: Castel, 1991; Ewald, 1991). Governmentality emerges as a form of *biopower* – power concerned with the fostering of life and the care of populations – and comes to be exercised not merely through sovereign edict or disciplinary technique but via a series of apparatuses and a complex of forms of knowledge (*saviors*) permeating the social body (Foucault 1991, p. 251). *Population* now arises as a political and economic problem centred on the balancing of available resources with the growth of the population (the “population-riches problem”) (Foucault, 1988, p. 104; 1991, p. 93).²³ The biopolitical response regulates human beings at the level of the “species body” – “the body (both individual and collective) imbued with the mechanics of life and serving as the basis of the biological processes” (Foucault,

²³ Via techniques of governmentality, *population* emerges “as a datum, as a field of intervention and as an objective of governmental techniques” through which the economy is isolated as a specific sector of reality (Foucault, 1991, p.102).

1976, p. 139) – and is expressed through the demographic interventions of social welfare, public health, education, etc. (Barret-Kriegal, 1992). This shift to actuarial governance based in “calculative rationality” is marked by the replacement of individualized moral imperatives with a collectivized and desubjectified focus on the behavioural characteristics of individuals grouped and regimented by category (Lupton, 1999, p.132). As biopolitical governance has, to some extent come to usurp disciplinary and sovereign modes of power, risk as a “moral technology,” operating through surveillance, categorization, cajoling, has come to facilitate this management of populations (Lupton 1999, p. 87, Rose, 2000).

The need to “manage” the environment as an extension of the biopolitical management of the population at large is apparent in the discourse of *ecological crisis*, where concerns over population growth, or (more progressively) the extent, distribution and utilization of resources as balanced against the capacity of the global environment to regenerate and to reabsorb the externalized consequences of this activity, are central. As Rutherford (1999a) observes, this recognized need to live within the carrying capacity of the earth – within the constraints of biological laws seen as independent of the “laws of man” – opens the environment to the domain of biopolitical governance (p. 56). This leads to the discourse of *sustainable development* and its claims that continued growth can be maintained via economic engagement with ecological limits, now perceived as flexible and permissive of the nuancing of production, distribution and consumption and their formal and informal regulation within an increasingly complex and globalized system. (See, for example, Worldwatch Institute, 2010.)

The establishment of multiple regimes of environmental regulation marks the extension of governmentality into the natural world. Regulatory standards are framed in “scientific” terms, set by scientific advisory groups. However, the resultant patina of objectivity belies the political, economic, and social flux and conflict underlying “scientifically acceptable” levels of exposure and risk. In addition to political legitimation, such legal-scientific standard-setting provides an “epistemic policing, both by framing the definition of ecological risks and by

certifying what is to count as scientifically acceptable knowledge of the natural world” (Rutherford, 1999a, p. 56). The essentially neoliberal character of this development is seen in how fundamental political decisions regarding the natural world become subsumed into the regime of calculable rationalities that is governmental practice, while previously assumed natural limits to human activity are transformed into a set of parameters subject to strategic manipulation in the furtherance of continued capital accumulation (Fuller, 2008). At the same time, the uncertainty endemic to these attempts to locate environmental-societal standards within risk-based regimes of environmental management and ecology knowledge creates a space for social conflict.

I will now turn to consider these ruminations on environmental harm and the importance of risk in light of the specifics of salmon aquaculture as it has developed in coastal British Columbia. I begin by reviewing the history of salmon farming in this region and some of the environmental and other conflicts and controversies it has engendered. I will then consider epistemic and epistemological issues in relation to the impact of salmon farming on marine ecology and wild salmon. My focus here is on the thematic content of inferential constructions employed within the dominant construction of scientific and technical research on salmon aquaculture – and how they evidence a symbolic violence limiting and framing the production of knowledge that impacts the operation of the industry. I will then connect these findings to a more general political ecological perspective, informed by a treadmill of production approach. Finally, I will consider the significance of these emergent epistemic techniques in light of analyses of risk offered by Beck and Foucault, here applied to an ecological management context. Whereas, for the purposes of analysis, I treat these fields distinctly, I view this separation as more epistemological (or heuristical) than ontological. The elements of each intersect and inform each other at multiple levels, and some of these interconnections are explored herein.

III. Salmon aquaculture in British Columbia: History, regulation and impacts

A. History

Since the establishment of the first operations in 1984, the salmon farming industry²⁴ in British Columbia has expanded steadily to the point that the province is now the fourth largest global producer of farmed salmon, yielding 98,200 tonnes from 50 active sites in 2016 (British Columbia & Canada, 2016). Whereas this growth has made the industry a considerable economic force and provided employment opportunities, it has also spawned extensive controversy over ensuing biophysical, social and economic impacts, a pattern that mirrors the experience of other major salmon farming jurisdictions. Conducted in open net-pens suspended in the coastal regions of the ocean, this form of industrial production tends to produce significant impacts on the local environment and conflicts with other users of marine resources, residents, tourism operators, and environmentalists (e.g., Philips, 2005).

The development of the salmon farming industry in B.C. can be divided into two phases. The first, marked by the rapid expansion of locally-based, comparatively small farms, continued until 1989, when increasing output of the Norwegian industry led to a glut on the international salmon market and a consequent sharp decline in global price (Halberl, 2001, p.6). This spelled bankruptcy for most of the BC operators but opportunity for the larger multinational Norwegian corporations, who (arguably in an instantiation of

²⁴ Throughout this study, I employ the terms *salmon farms* and *salmon farmers* – the terminology commonly used to refer to the agri-industrial facilities/plants and the multinational corporations that run them. While there are similarities between this type of salmon production and “farming” as it is more generally understood (particularly in its dominant agri-industrial form), there are also differences. Immersing production in the underwater marine environment makes for an even greater and more dynamic set of ecological interactions and impacts than found in conventional land-based agricultural production, for example. Symbolically, the pastoral and likely generally positive connotations of farms, farmers and farming may work to put a positive gloss on the industry. Indeed, it is controllable that the placement of salmon aquaculture within a *farming* frame is itself an exercise of hegemonic power, as further suggested by the analysis presented here.

capitalist “creative destruction” [Harvey, 2007, pp. 200-03]) used the downturn as an opportunity to consolidate their operations and expand their reach into British Columbia (Halberl, 2001, p.6). British Columbia’s environmental and geographic potential for salmon aquaculture – its 16,000 miles of variegated coastline and inlets with significant tidal flushing and moderate climate – was complemented by a weak regulatory regime attractive to Norwegian producers seeking to avoid the stricter regulations introduced in response to the industry’s environmental impact at home (Keller & Leslie, 2004, pp. 88-90). This second phase of production, characterized by substantial foreign multinational ownership and control of the industry, continues to the present (Halberl, 2001, pp. 6-7), with three foreign-owned multinational operations – Mowi ASA (formerly Marine Harvest) and Grieg Seafood (both Norwegian) and Cermaq (headquartered in Oslo, Norway, but now a subsidiary of Mitsubishi) now comprising 92 percent of the industry in British Columbia (Findley, 2018).²⁵

The rapid expansion of salmon farming in British Columbia has provoked concern and opposition among First Nations, fishers and environmentalists alike over its perceived impact on the marine environment and local communities and economies. This has taken the form of campaigns by environmental organizations and environmentalists and First Nations,²⁶ alliances between coastal and interior First Nations and environmentalists,²⁷ protest efforts,²⁸ legal

²⁵ Farms are located off the west coast of Vancouver Island, the Broughton Archipelago, and the Discovery Islands.

²⁶ Active groups include: Raincoast Research (Alexandra Morton), Watershed Watch, Living Oceans Society, Salmon Are Sacred, Skwah First Nation, David Suzuki Foundation, EcoJustice, Wilderness Committee, Sea Shepherd Canada, Clayoquot Action, Tla-o-qui-aht First nation council, the Indigenous Food System Network – among others

²⁷ See, for example the Campbell River declaration of 1997 signed by 27 First Nations and environmental groups – calling for a moratorium on new farms until all open net cage operations are replaced with “safe closed containment systems” and until “Interim Measures Agreements or Treaties regarding fisheries resources are in place for B.C.’s coastal First Nations” (A New Alliance Recommends Solutions to Salmon Farming Problems, 1997). The Coastal Alliance for Aquaculture Reform (CAAR) is a more recent NGO-driven initiative.

²⁸ For example, the “Get Out Migration,” involved a 500 kilometre walk to raise awareness about the impact of salmon farming. It is linked to an on-going, grass-roots effort that included a rally of more than 5,000 at the Victoria legislature, activities and events across multiple communities in British Columbia, a First Nations’ led “paddle for wild salmon,” and multiple other actions and efforts (Salmon Are Sacred, n.d.).

action,²⁹ market campaigns,³⁰ independent scientific research,³¹ as well as engagement with federal and provincial agencies and government. Industry has mounted its own campaign for the hearts and minds of the population and politicians, largely conducted through the auspices of the industry association, the British Columbia Salmon Farmers' Association (BCSFA).

As with other instances of environmental harm from industrial development, First Nations have been at the forefront of opposition – one recent example (post-Commission) being the occupation of a Cermaq fish farm by members of the Musgamagw Dzawada'enuxw. Citing the presence of salmon farms as a continuation of genocidal practices visited upon First Nations, they served the farm with a 72-hour eviction notice. Cermaq responded with a trespass lawsuit, which they subsequently dropped (Grigg, 2016). An occupation in 2017 by the Kwikwasut'inuxw Haxwa'mis, 'Namgis and Mamalilikulla First Nations of the Marine Harvest (now Mowi) farms at Midsummer Island and Swanson Island endured for months. Whereas Marine Harvest obtained an injunction ordering them to leave, the protestors' efforts spurred the initiation of consultations with the provincial government. Subsequent negotiations between First Nations, the provincial government and industry saw an agreement to remove multiple salmon farms from the Broughton Archipelago reached, though production will be transferred to other farms ostensibly outside the migratory route of wild salmon (Shore, 2018). The Musgamakw Dzawada'enuxw Tribal Council voted against the agreement, however, after the province extended

²⁹ For example the *Kwicksutaineuk/Ah-Kwa-Mish* First Nation attempted to bring a class action lawsuit against the province for failing to prevent harm to wild fish by fish farms (*Kwicksutaineuk/Ah-Kwa-Mish First Nation v British Columbia (Agriculture and Lands)* [2010] 1 C.N.L.R. 259 (BCSC)). Numerous other legal actions have been pursued by First Nations and, in particular, by long-standing anti-salmon farming activist and scientist, Alexandra Morton, many of which have been won in court. Some of these are discussed below and in Chapter 5.

³⁰ An example is the "Farmed and Dangerous" campaign (CAAR, n.d. c.)

³¹ See Krkošek et al., 2007. Combining science, direct action, and celebrity activism, "Operation Virus Hunter," is a collaboration between Alexandra Morton and the Sea Shepherd Society. The latter's research vessel, the *Martin Sheen* has travelled the west coast studying (and attempting to spotlight) the industry and its impact. See:

<https://seashepherd.org/campaigns/virushunter/operation-virus-hunter/>.

several tenures within the Nation's territory for an additional five years. In January 2019, the Dzawada'enuxw First Nation filed a lawsuit against Canada arguing that the federal government licensed ten salmon farms in their waters without their consent. The suit alleges that the farms' pollution and poisoning of wild salmon is in violation of the Nation's Aboriginal rights as protected by s. 35 of the *Canadian Charter of Rights and Freedoms*. The Dzawada'enuxw claim the farms "harm their waters and profoundly impact wild salmon populations, sea life, animal life, and the Dzawada'enuxw Nation community's way of life" in violation of the Nation's Aboriginal rights and title (Gilpin, 2019).³² The Nation had already sought an injunction to prevent the renewal of some of the site licenses by the province (Gilpin, 2019).

The contest over truth in relation to environmental issues is waged in the public arena. Claims-makers on each side of the divide on salmon aquaculture appeal to a rhetoric of *sustainability*. BCSFA messaging maintains that salmon farming is safe – or at least that there is evidence on both sides of the issue, and until the matter is definitively resolved and in light of ever-improving standards and the farmers' commitment to protecting the environment, production should be permitted to expand unimpeded (BCSFA, n.d.).³³ Furthermore, BCFSA presents salmon farming as pro-environmental, relieving pressure on wild fish stocks, while providing much needed economic opportunity in areas that have suffered particularly from the decline of the wild fishery (BCSFA, n.d.). In

³² At a press conference announcing the lawsuit, Faron Soukochoff, elected chair of the Dzawada'enuxw First Nation proclaimed:

Our salmon stocks continue to decline rapidly and soon I fear the very possibility that our salmon will be no more. It is a keystone species and its decline impacts us on so many levels.... Everything in existence has a perfect balance, a symmetry....Casting aside all that we hold dear in the pursuit of the almighty dollar throws off that balance, bringing chaos to order. I was raised on the land and water and taught to respect all of the creator's creation — the animals, the sea, the land, Mother Earth, and I will teach my sons and my grandchildren the same teachings, to show them that perfect balance, the symmetry, and why we must do all we can to take care of what has been bestowed on us as First Nations people, as human beings. (Gilpin, 2019)

³³ See, for example, bcsalmonfarmers.ca. An examination of the broader construction of sustainability in the broader discourse of salmon farming outside the Cohen Commission is beyond the scope of this study. It is clear that BCSFA propagates common corporate social responsibility tropes such as *transparency* and *care* in their public relations efforts (e.g., Livesey & Kearins, 2002).

contrast, voices of opposition retort that, in fact, salmon aquaculture is a key cause of that decline – and that the true “sustainable” alternative is a properly managed wild fishery.

B. Regulation

Responsibility for the regulation of salmon aquaculture in British Columbia is divided across multiple federal and provincial institutions, primarily the federal Department of Fisheries and Oceans (DFO), as well as the Canadian Food Inspection Agency (CFIA), and historically the British Columbia Ministry of the Environment (BCMoE) and the Lands Branch of the British Columbia Ministry of Agriculture and Lands (BCMAL).³⁴ Other ministries and agencies bearing responsibility include Environment Canada, Health Canada, the Canadian Environmental Assessment Agency, and Transport Canada. DFO executes most of its responsibilities for aquaculture through the Aquaculture Management Directorate (AMD), headquartered in Ottawa. Regional Offices of the AMD are called Regional Aquaculture Coordination Offices (RACOs). In terms of legislation, the *Fisheries Act* is of prime importance, in particular the *Pacific Aquaculture Regulations*, pursuant to it. Other pertinent legislation includes the *Marine Mammals Regulations*, the *Aquaculture Activities Regulations*, the *Canadian Environmental Assessment Act*, the *Species at Risk Act*, and the *Oceans Act*. Jurisdictional complexity and uncertainty (overlap and/or gaps), combined with the labyrinthine structural and operational bureaucracy of the primary regulatory organizations – DFO, in particular – are key characteristics of the overall regulatory structure.³⁵

³⁴ The Ministry of Environmental has since been renamed the Ministry of Environment and Climate Change Strategy. At various times it has also been named the Ministry of Environment, Land and Parks and the Ministry of Water, Land and Air Protection BCMAL is now known as the Ministry of Agriculture. The federal-provincial division of responsibility was shifted in 2010, in response to a legal challenge brought by Alexandra Morton. The primary remaining provincial jurisdiction is in regard to Crown land site tenures, which now falls under the rubric of the Ministry of Forests, Lands and Natural Resource Operations and Rural Development.

³⁵ Under section 91(12) of the *Constitution Act, 1867*, the federal government has jurisdiction over “sea coast and inland fisheries,” while under section 92(13), the provincial legislature has

Until 2009, the province bore the greater share of responsibility for the regulation of salmon aquaculture, which was effectively characterized as a farming activity and thus primarily under the rubric of BCMAL. This jurisdiction was successfully challenged in court by anti-fish-farming activist and scientist, Alexandra Morton.³⁶ The court found that salmon aquaculture is a *fishery*, meaning that while they are in the water, the fish are not the property of the salmon farmer.³⁷ The consequence of this decision was that chief responsibility shifted to DFO.³⁸ Justice Hinkson acknowledged that the land beneath the salmon farms was of provincial jurisdiction and thus ruled that tenure remains the responsibility of the province.

It is important to recognize that while government agencies are charged with overseeing the industry – and hence reducing the potential liability that the aquaculture corporations may otherwise be exposed to – in practice, the regulatory regime is largely one of self-regulation. While DFO (and prior to 2011, BCMAL in conjunction with BCMoE) does undertake infrequent compliance monitoring and auditing of farms, for the most part, the farms self-monitor and self-report. The farms themselves are largely responsible for determining their own procedures and practices and for monitoring and reporting disease and sea lice (and reporting the release of therapeutants into the water) fish mortality, fish escapes, mammal kills and mammal drownings, fish transfers, and so on. They

exclusive power over “property and civil rights” in the province. The Province of British Columbia owns the coastal waters and submerged lands of “inland seas” and those located major headlands (bays, estuaries and fjords in which salmon farms are located. This includes areas where salmon farms are located: the Strait of Juan de Fuca, the Strait of Georgia, Johnstone Strait and Queen Charlotte Strait. Environmental protection is not directly identified within the Constitution Act and falls across several areas – a further source of jurisdictional uncertainty and constitutional wrangling.

³⁶ *Morton v British Columbia (Minister of Agriculture and Lands)*, [2009] BCJ No 193, 2009 BCSC 136, 92 BCLR (4th) 314, 42 CELR (3d) 79.

³⁷ *Morton v British Columbia (Minister of Agriculture and Lands)*, [2009] BCJ No 193, 2009 BCSC 136, 92 BCLR (4th) 314, 42 CELR (3d) 79 and *Morton v British Columbia (Minister of Agriculture and Lands)*, [2010] BCJ No 124, 2010 BCSC 100, 2 BCLR (5th) 306, 48 CELR (3d) 231.

³⁸ Rather than take the opportunity to reassess the license conditions of salmon farms – particularly of those located directly on the migratory routes of wild salmon (consideration of which was not made at the time the original licenses were issued) – DFO simply grandfathered the existing license conditions upon assuming responsibility.

are also able to exercise tremendous proprietary control over their operations – physically and intellectually (despite that a farm is legally a fishery and in that sense an activity taking place in a “public” context). Despite evidence of significant issues and possibly catastrophic impacts to wild fish, salmon farms in B.C. have been strikingly successful in resisting the independent testing of farmed fish as well the dissemination of specific disease data pertaining to their facilities. This points to the reality of corporate power within a capitalist system, something that is taken up in more detail under my discussion of political economy in Chapter V.

1. Regulatory reviews

The industry has been the subject of multiple environmental reviews, one of the most important of which, the Salmon Aquaculture Review, followed the 1995 imposition by the (NDP) provincial government of a moratorium on salmon farm licenses. (Expansion of existing operations was permitted, however, and overall production continued to increase significantly while the moratorium was in effect [Halberg, 2001, p. 7].) Since the release of the recommendations of this review in 1997, notable regulatory improvements have been enacted in the areas of escapes, waste discharge, fish health, siting and predator control.³⁹ The province also put in place some monitoring and surveillance programs, along with a requirement for Fish Health Management Plans as a condition of salmon farm licensing. The (BC Liberal) provincial government lifted the moratorium in September 2002. Whereas the provincial government touted the current regulatory regime as “the toughest in the world” (Government of British Columbia, n.d.), opponents of the status quo view it as inadequate to prevent ongoing harm to wild fish and the environment. They argue that, rather than piecemeal regulation, what is required is a fundamental shift away from open net-

³⁹ These regulations included: *Aquaculture Regulation*, B.C. Reg. 78/2002; *Finfish Aquaculture Waste Control Regulation*, B.C. Reg. 256/2002; and *Waste Discharge Regulation*, B.C. Reg. 320/2004.

pen operations – which allow for the unimpeded exchange of material with the surrounding marine environment – toward closed-containment, closed-loop systems (e.g., Pendleton et al., 2005).⁴⁰

These issues were turned over again in the most extensive process to publicly scrutinize the salmon farming industry. The Cohen Commission was charged with examining the 2009 collapse and ongoing decline of the Fraser River sockeye population.⁴¹ The role of salmon aquaculture was a significant object of examination in this extensive public inquiry (the Commission considered 900 public submissions, listened to 160 witnesses, and analyzed 2,100 exhibits, totalling 14,000 pages of evidence), and its judicial nature and power to subpoena evidence meant that it comprises the most thorough-going accounting of the workings and regulation of the salmon aquaculture industry in British Columbia undertaken to date. In October 2012, Justice Cohen released his report. Leaving no doubt regarding his findings on the role of salmon farms, his opening announcement included the statement, “I conclude that the potential harm posed by salmon farms to Fraser River sockeye salmon is serious or irreversible” (Gordon, 2012). The report was highly critical of the role of DFO, pointing to its clear failure to protect wild salmon species as a result of, inter alia, its “divided loyalties” in being charged with the promotion of salmon farming in direct opposition to its primary mandate to protect wild fish, inversion of the precautionary principle, and lack of meaningful research.⁴² Cohen made 75

⁴⁰ In 2016, the Federal NDP proposed a bill to transition salmon aquaculture to closed-loop systems (Bill C-228 An Act to amend the Fisheries Act (closed containment aquaculture)). It was voted down by governing Liberals and opposition Conservatives.

⁴¹ For the Commission’s Terms of Reference, see Appendix A.

⁴² For example, in regard to salmon farm management, Cohen found that DFO faces conflicting roles in having to tell the world that Canada’s farmed salmon products do not threaten the sustainability of wild salmon, yet at the same time credibly examining the possibility that such products are not safe. DFO’s regulatory work – to site farms, to set conditions restricting farm growth, and to monitor farms and take enforcement actions against them – all suffer from this institutional conflict. (Cohen, 2012a, p. 418)

He also noted that the paltry sums available to wild salmon research as compared to that spent on research and promotion of aquaculture (p.418) and that the reality that DFO can “continue to promote the harvest of farmed salmon even if the wild salmon stocks suffered as a result and the

recommendations, including immediately relieving DFO of its responsibility for the promotion of aquaculture, freezing expansion of salmon farming in the Discovery Islands and limiting licenses there to one-year terms. Crucially, he also recommended implementing the precautionary principle as an existential axiom for the industry: if DFO cannot show within eight years that salmon farming poses a minimal risk of serious harm to wild salmon it should prohibit all net-pen operations in the Discovery Islands, and if it becomes apparent before then that the risk is more than minimal then it should order an immediate stop to operations. As of October 2018, DFO claims to have “acted on” all the 13 recommendations specific to aquaculture (Government of Canada, 2018). None of these has yet been fully implemented, however.⁴³ DFO has commenced a research partnership with the Pacific Salmon Foundation and Genome BC to study the microbes present in Pacific Salmon. Following the Commission, the federal Conservative government moved to expand production at existing farm sites and grant new tenures in the Broughton Archipelago (Harper Government approves, 2014).⁴⁴ That said, the Cohen Commission remains a watershed event. The scope and depth of analysis went beyond that of prior reviews, leading to recommendations that spoke to fundamental aspects of the industry

wild fishery became unsustainable....makes these conflicting mandates unmanageable within a single department.” (p. 418)

⁴³ In fact of the entire 75 recommendations, only one has been fully addressed, one that does not pertain to aquaculture: that DFO will make the rationale for sockeye harvest rules public (*Final Report Volume 3* pp.29-30, rec.#25).

⁴⁴ Such a policy could be located within the more general approach to environmental issues of the prior federal Conservative government, which implemented the gutting of environmental regulation, cutting of enforcement budgets, muzzling of government scientists and targeting of environmental organizations (Aulakh, 2014; O’Neil & Hoekstra, 2013; Snider 2015, Wilt, 2016). Five months after the close of evidentiary hearings at the Commission the government introduced C-68, which substantially weakened a range of environmental regulation. Most significant for issues concerning salmon aquaculture, it repealed the then-existing *Canadian Environmental Assessment Act* and replaced it with a substantially weakened version and watered down to the point of ineffectuality protection for fish habitat under the *Fisheries Act* (historically, a critical provision of one of Canada’s most important pieces of environmental legislation). In response, Cohen invited supplementary submissions from applicants and reviewed these changes in his final report, highlighting the absence of any notice to the Commission or consultation with participants and criticizing the changes’ negative impact in relation to his findings (Cohen, 2012c, pp. 71-83.) He concluded that “many of the amendments will have a significant impact on policies and procedures examined by this Commission, and on important habitat protection measures” (p. 82).

(discussed below in Chapter 4). As such it became a key point of reference for opponents. Recently, there have been some shifts regarding salmon farming in BC, including the removal of farms from several sites. These changes are built on decades of opposition and organizing – particularly on the part of indigenous groups – but both symbolically and through the information, analysis and recommendations produced, the Cohen Commission stands as an important marker in this history, one that will form the basis of my analysis here.

C. Environmental Impacts

To provide context for a theoretical consideration of environmental discourse in the conflict over salmon aquaculture, I present here a brief description of the primary issues raised by those concerned about the impact of the industry. As any attempt to present the “facts” in advance of an analysis of their constitution in the service of broader objectives would involve an inevitable circularity, my aim is not to offer a definitive assessment of the harm caused by salmon aquaculture. Rather, it is to suggest that examining these claims and how they and the evidentiary basis for them are then treated – their ascribed legitimacy and influence upon the management of the industry – offers a means to begin to adumbrate relations of power and its exercise. The analytical work that is the basis for this study involved running such claims (as evidenced at the Cohen Commission) through a theoretical assessment of factors (such as *risk*) that play both a constitutive role in what counts as evidence and a structural one regarding the uses to which that evidence is put.

1. Fish and ecological health

Of the various environmental threats posed by salmon farms, arguably the most far-reaching is the capacity to introduce, amplify or create disease.

Internationally, salmon farming has suffered a succession of disease and parasite issues and it appears has served as an incubator for disease and a

vector for its transmission across the globe (Staniford, 2004, p.3). High stocking densities facilitate the rapid multiplication of disease, and the suspension of open net-pens in the ocean means that fish are fully exposed to pathogens in the aquatic environment, and, conversely, diseases introduced through farmed fish cannot be securely contained within the farm site (Conte, 2004, p. 210; Ford & Meyers, 2008, p. 411). Pens become “reservoirs of disease,” biomagnifying and shedding pathogens into the marine waters. Moreover, the siting of farms within the narrow channels and inlets on the migration routes of wild salmon means that wild fish have no choice but to come in close proximity to farms and the disease risk they pose.

As with other examples of intensive agri-industrial animal farming, endemic levels of disease also create ideal conditions for the mutation of viruses into novel and potentially more virulent forms. For example, leading-edge genomic research by DFO geneticist, Dr. Kristi Miller, and the Salmon and Freshwater Ecosystems Molecular Genetics Laboratory at DFO – research that has become the subject of considerable controversy as discussed below – suggested the emergence of a new virus that appears to be linked to the 95 percent mortality of some Fraser River stocks just prior to spawning (Miller et al., 2011). As well, the globalization of the industry has meant that the fish or fish eggs transported across jurisdictions sometimes bring with them diseases that are non-native to their destination (McVicar, 1997). Despite claims by DFO that it was impossible for infectious salmon anemia (ISA) – a disease that has devastated salmon farms in Chile, Norway and eastern Canada – to take hold in British Columbia, testing performed by two leading ISA labs on samples collected in British Columbia waters by independent scientist and salmon farming opponent, Alexandra Morton, returned putative positive results (Taylor, 2011), prompting the Commissioner to re-open Commission hearings. DFO’s own testing failed to show the presence of the virus, yet further testing of farmed fish subsequent to the Commission has repeatedly returned positive results (CBC News, 2016). Whether ISA can cause disease in Pacific salmon is an open question. Several studies have shown that Pacific salmon are resistant to the

Norwegian strain of ISAv⁴⁵ (e.g., Rolland & Winton, 2003); however, others have found evidence of disease and harm (e.g., MacWilliams, Johnson, Groman, & Kibenge, 2007). The potential for ISAv to mutate and adapt to Pacific salmon is real and of concern, however (MacWilliams et al., 2007).

At the Commission, Miller also testified her lab had also found evidence of Heart and Skeletal Muscle Inflammation (HSMI) in British Columbia. Since the Commission – and following similarly adamant government denials – research under the auspices of Strategic Salmon Health Initiative (a collaboration between the Pacific Salmon Foundation, Genome BC and Fisheries and Oceans Canada, formed following the Commission) and elsewhere has revealed the presence of the disease in both farmed and wild fish (Strategic Salmon Health Initiative, n.d.). HSMI, which destroys the hearts and muscles of fish, first emerged in Norway, where it rapidly spread through Norwegian salmon farms. Also following the Commission, in 2015, Alexandra Morton successfully sued DFO for allowing Marine Harvest to transfer smolts (young fish) infected with Piscine Reovirus (PRV – the virus associated with the disease⁴⁶) into pens on migration route of Fraser River sockeye. On the basis of that ruling, she again successfully challenged in court the failure of DFO to test the 16 to 52 million smolts that are moved into fish farms every year. Given that the virus is now recognized as endemic to fish farms, the industry itself has admitted that 90 per cent will become infected with PRV (Nikiforuk, 2019, February 14). Despite this, DFO refuses to test and continues to use the uncertainty around the effects of PRV in British Columbia as a basis for classifying the virus as “low-risk.”

One of the most contentious, and potentially most serious (Costello, 2006 p.145), issues regarding the impact of salmon aquaculture on wild fish is the link between salmon farms and the spread of sea lice (*Lepeophtheirus salmonis*).

⁴⁵ The convention is to indicate the virus associated with a disease by adding a lower case *v* to the abbreviation for the disease.

⁴⁶ The causality of PRV in Norwegian fish farms has been conclusively demonstrated. The link between the Pacific variant and disease is less certain, however. Injection of PRV-infected material into sockeye, chinook and Atlantic salmon in BC produced infection but not active disease. It may be that that the combination of infection and the cumulative stressors found outside of the laboratory are necessary to induce disease (Fisheries and Oceans Canada, 2018).

Small parasites that attach themselves to the exterior of fish and feed off the mucous or skin, sea lice are common in small numbers on wild adult salmon, where they usually do not cause serious harm to their host (Johnson, 1998, p. 82). Until the advent of salmon aquaculture, they were not normally observed on juveniles, however (Morton, 2004, p. 148). Salmon farms upend the natural pattern of “migratory allopatry” – for salmon the outgoing smolt migration and returning adult migration happen at different times such that adults and juveniles do not normally cross paths in the water. The natural salmonid life cycle, in which the parent fish dies immediately after spawning serves to break the vertical (i.e., parent-to-offspring) transmission of disease. Open net-pen salmon farms, however, “close the loop” and undermine this natural disease-limiting mechanism, creating a reservoir of adult fish that juvenile salmon come into contact with during their out-migration (Cohen, 2012a, p. 402). And the location of salmon farms in sheltered bays and inlets means that they are often directly in the migratory path of juvenile salmon as they emerge from their river nursery habitat and make their way to ocean estuaries (CAAR, n.d. e). The high stocking densities make the farms intense breeding grounds for sea lice, dramatically increasing their numbers in the surrounding waters through which the native smolt travel (CAAR, n.d. e).

Lacking well-developed scales and weighing only a few grams, salmon fry are much more susceptible to attack by sea lice than are their adult counterparts (Johnson, 1998, p. 85). Research has indicated that one to three sea lice are sufficient to kill pink and chum salmon fry (Krkošek et al., 2007). Much higher numbers have been observed on juvenile salmon in the vicinity of salmon farms, and data suggests that up to 95 percent of migrating juvenile salmon can be infected (Morton et al., 2004, p.152). In addition to direct mortality, sea lice can serve to transfer disease between farmed and wild salmon, including Infectious Salmon Anaemia and furunculosis (Johnson, 1998; Dannevig & Thorud, 1999; APHIS Veterinary Services, 2002). A study on the impact of sea lice infections on

wild pink salmon in the Broughton Archipelago⁴⁷ concluded that sea-lice induced mortality is typically in excess of 80 percent and predicted a 99 percent collapse in the pink salmon populations of the area within two generations (four years) (Krkošek et al., 2007, p. 1772).⁴⁸ Subsequent fallowing of the farms in question (fortunately) prevented the verification of this hypothesis. Whereas there is a growing body of research supporting the link between sea lice from fish farms and mortality in wild salmon, the issue remains contentious, with at least at least one study claiming that lice do not have a significant impact (Marty, Saksida & Quinn, 2010). Notably, re-examination of the data used in this study by Krkošek et al. concluded that there was in fact a positive correlation (Krkošek et al., 2011). Such scientific contention around the impacts of salmon farming is not uncommon, something that will be taken up in the context of the Cohen Commission in Chapter V.⁴⁹

In response to bacterial diseases, salmon farmers have historically used large amounts of antibiotics (usually given through medicated baths or feed), thereby promoting antibiotic resistance and a deepening of the problem. For example, in one farm in the Broughton Archipelago, the introduction of fish infected with a strain of furunculosis resistant to all approved antibiotics led to the infection of chinook stocks in an adjacent inlet and their collapse the following year (Morton, 1996, p.32). In response, special authorizations were given by

⁴⁷ A group of islands north of Johnstone Strait, off northeastern Vancouver Island, the Broughton Archipelago is home to the highest concentration of sea farms in British Columbia. It has also been the focus of considerable controversy following the 2002 collapse of pink salmon runs in the area, a collapse many believe stemmed from a large-scale kill of outward migrating juvenile pink salmon caused by sea lice originating in local salmon farms. Although returns fluctuate significantly from year-to-year, both DFO and the Pacific Fisheries Resource Conservation Council concluded that the collapse was “not natural” (PFRCC, 2002, p. 90).

⁴⁸ Subsequent fallowing of the farms in question (perhaps fortunately) prevented the verification of this hypothesis.

⁴⁹ It is worth noting that one of the authors of the 2007 study by Krkošek et al., Alexandra Morton, is a long-standing anti-salmon farming activist and that two of the authors of the 2013 Marty et al. study, Gary Marty and Sonja Saksida have worked extensively for the fish farming industry. All of the above appeared as witnesses at the Commission.

Following the Commission, DFO has put in place stricter monitoring requirements for sea lice, with a formal threshold is three lice per adult fish, which once exceeded requires the farms to initiate treatment.

BCMAL to permit fish farms in the area to use erythromycin to treat the outbreak even though this antibiotic is not permitted for human consumption or discharge into the environment (Halberl, 2001, p.8). The effectiveness of these treatments is often poor. For example, once a farm is affected with Bacterial Kidney Disease (BKD), the ongoing mortality rate is frequently 50 percent despite the addition of high doses of antibiotics to feed (Keller & Leslie, 2004, p.93). Further, the capacity of such drugs to accumulate in the broader environment is a serious concern. One study found that 74 to 100 percent of wild fish caught in the vicinity of fish farms had antibiotics in their tissue, some to a level unacceptable for human consumption (Haberl, 2001, p. 9). Levels of antibiotics beneath fish farms have been measured at 400-500 parts per million (Morton, 1996, p.33). In recent years, farms have been successful in reducing antibiotic use, with the major producers reporting an average usage of 50 grams of antibiotics per tonne of salmon produced (BCSFA, 2015, p.15).

Parasites such as sea lice are controlled with pesticides. Significant concerns have been raised regarding their potential to accumulate in the environment, adverse effects on aquatic life, and the risk of ingestion by humans via aquatic species affected by pesticide use (Halberl, 2004, p. 9). The chemical of choice for sea lice control has been emamectin benzoate, a powerful neurotoxin (Valles & Koehler, 1997, p. 4) (marketed as SLICE®). Despite a lack of thorough scientific research on its effects as well its potential to bioaccumulate, salmon farmers have used an average of 7,240 kilograms of SLICE annually since 2005 (CAAR, n.d. b). SLICE is not a targeted treatment and is toxic not only to crustaceans but to fish, birds and mammals also (Novartis, 1999, p.7). Bioaccumulation is a particular concern in light of the method by which SLICE is administered. The chemical is added to fish feed and ingested by the salmon, whereupon it is absorbed into their tissues. By feeding on these pesticide-saturated fish the lice then absorb the emamectin benzoate into their own bodies and succumb to it (CAAR, n.d b).Originally, the use of SLICE, while common, was only available through special authorization under

the Emergency Drug Release Program.⁵⁰ In June 2009, however, Health Canada quietly approved the use of the chemical (Health Canada, 2010). Attempts by the Coastal Alliance for Aquaculture Reform (CAAR) to obtain the approval criteria were met with the response that testing was conducted by the manufacturer and hence proprietary (CAAR, n.d. b). With Health Canada authorization came the removal of the previously mandatory 68-day interval between applications. Investigation by CAAR indicated that, on average, “this chemical is being used at least once during the production of every farmed salmon from British Columbia – with over 80% of this product going to the US market” (CAAR, n.d. b).

Salmon farmers are engaged in an “arms race” with sea lice, as lice on the farms build resistance, prompting ever more new (and more extreme) measures. The development of resistance to emamectin benzoate has led to the introduction of hydrogen peroxide fish baths and ships that sluice the salmon – both of which raise animal welfare concerns – and even powerful vacuum cleaners to filter lice out of the sea water (Canadian Press, 2019; Salmon Business, 2019.) The situation for farms in Clayoquot Sound (on the west coast of Vancouver Island) reached such an extreme in 2018 – with never before seen levels of up to 55 lice per farmed fish (the treatment threshold set by DFO is 3 *lice per fish*) – that Cermaq applied to employ Lufenuron, a chemical used to treat fleas in pets (Nikiforuk, 2019, June 11; Lewis, 2019). Regulators in Norway, the world’s largest producer of farmed salmon and the country where the chemical is manufactured, have not approved Lufenuron for use on farmed salmon given concerns that it renders fish unsafe for human consumption. Health Canada granted approval, however, with a mandatory 350-day waiting period between use and harvest (Nikiforuk, 2019, June 11). Lufenuron, which interferes with the production of chitin, prevents sea lice from developing an exo-skeleton. It is non-species specific, however, and has similar effects on a wide range of

⁵⁰ See Sections C.08.010 and C.08.011 of the *Regulations Respecting Food and Drugs*, C.R.C., c. 870. Whereas emamectin benzoate is technically a pesticide, because it is fed to fish rather than applied externally it is classified under the regulations as a drug.

crustaceans molluscs and other creatures found in the marine environment (Lufereon, n.d.).

2. Escapes

A system based on suspending nets in the marine environment inevitably will encounter breaches – and consequently fish escapes – resulting from a range of system failures: net tears or structural pen damage from weather events or propeller or boat collisions, attacks by seals and sea lions or other predators, as well as lack of maintenance, human error or vandalism (CAAR, n.d. c). The escape of farmed Atlantic salmon into Pacific waters raises concerns regarding their potential effects on indigenous fish and wild Pacific salmon, in particular. Interactions between farmed and wild salmon may result in the introduction and spread of disease in wild stocks (e.g., Naylor et al., 2005). As well, Atlantic salmon are faster and more voracious feeders than their Pacific counterparts and may out-compete native fish (Halberl, 2001, p. 7). They also have a breeding advantage and present the possibility of eventually displacing wild populations (Gross, 1998, p.135).⁵¹

The BCSFA has claimed that escapes are rare and that any risk Atlantic salmon pose to native species, either through competition or genetic interaction, is small “to the point of being negligible” (BCSFA, 1996, p.11). The available evidence suggests otherwise, however. Provincial government figures place the number of escapes between 1987 and 2008 at 1.65 million (BCMAL, n.d.). This is likely a gross underestimate, however, as numbers are self-reported by farms. Ongoing low-level “leakage” is conservatively estimated to be responsible for an additional 80,000 fish escaping into the marine environment each year.⁵² The

⁵¹ Whereas the great majority of salmon farmed in B.C. are Atlantic, escaped Pacific species raise their own set of disquietudes. For example, because wild salmon are genetically linked to the stream of their birth, a stream to which they return to spawn and complete their life cycle, hybridization of farmed Pacific salmon with indigenous fish may undermine this genetic memory (Fleming, 1997, p.8).

⁵² Research indicates that 0.5 to 1 percent of juvenile Atlantic salmon in production “leak” from their pens each year (Alverson and Ruggerone, 1997). Assuming 0.5 percent of the

continual failure to report these smaller events greatly reduces the official escape count. Reported numbers for escapes appear to vary widely. For example, in spite of tougher guidelines for pen system resilience introduced in 2002, reported escapes reported escapes for 2008 and 2009 were more than the prior six years combined (BCMoE, 2009). Whether this is because of an actual increase or better reporting is unclear. By way of contrast, following DFO's assumption of primary responsibility for aquaculture, reported numbers of escapes have decreased substantially. For example, DFO reports that in 2016 a mere 22 salmon escaped from BC salmon farms (BCMAL, n.d.) out of the more than 70,000 tonnes of salmon produced (DFO, 2016). Even the highest recorded escapee numbers to date – 111,826 fish in 2008 (BCMoE, 2009) – likely represent a significant under-reporting when compared to the continued evidence of on-going low-level escapes extrapolated to a production level of 81,400 tonnes of farmed salmon for that year.

Cases of the successful spawning of escaped Atlantic salmon in British Columbia streams have been reported by fishers and First Nations, as well as by the Atlantic Salmon Watch Program (ASWP) (CAAR, n.d. c). The provincial fisheries ministry has confirmed that Atlantic salmon had spawned on the Tsitika River on Vancouver Island, something previously thought to be highly unlikely (David Suzuki Foundation, 1999). A study by Volpe et al. (2000) found Atlantic salmon in more than 80 wild salmon spawning streams in British Columbia; feral juvenile Atlantic salmon were discovered at three locations (p.899). A survey of 41 pacific salmon-bearing rivers and creeks on Vancouver Island concluded that Atlantic salmon were present in over half of these (Fisher, Volpe, & Fisher, 2014). However, research on the nature and extent of Atlantic salmon populations in British Columbia rivers at present is minimal, and as such the potential short- and long-term impact of escaped fish on indigenous stocks remains a contentious matter.

approximately 80,000 tonnes of farmed salmon produced annually in BC is leaked, this translates into approximately 80,000 fish.

3. Waste discharges

Raising salmon in open net-cages means that excess food (often laced with pesticides or antibiotics) and fish faeces accumulate on the ocean floor, smothering the benthic environment, depriving species of oxygen and contaminating the ocean floor (e.g., Hall-Spencer et al., 2006). At an economic level, taking advantage of the ocean's "free" dumping services presents as example of the externalization of the costs of this pollution on to affected communities, ecological and human. Whereas salmon farmers maintain that waste discharges can be kept to within acceptable environmental limits through the use of "realistically achievable" performance standards (BCSFA, 1996, p. 25), at current production levels, the accumulative extent of waste discharges from salmon aquaculture in British Columbia is significant. The industry itself concedes that a single fish farm releases untreated fecal matter equivalent to a city of 65,000 people (Hardy, 2000, p. 52). Unlike most municipal effluent, waste from fish farms is deposited directly into the marine environment, without any treatment or filtering.

Contamination of marine life is of particular concern to First Nations, for whom filter-feeding shellfish are a traditional food source. Numerous clam beaches used by First Nations in the Broughton Archipelago have been destroyed by an accumulation of sludge attributed to salmon farm waste (Blueschke & Blaney, 2006). And pesticides, antibiotics, and other chemicals (such as the toxic anti-foulant used on nets) have been linked to contamination of molluscs, crustaceans, rockfish and groundfish (CAAR, n.d. f). Once again, comprehensive studies determining the extent of contamination of the marine biota are lacking. The experience of First Nations stands in marked contrast to this scientific vacuum, however.

A 200,000-fish operation releases a nitrogen-load equivalent to 20,000 humans and a phosphorous-load equivalent to 25,000 humans (Hardy, 2000). The concentration of this intense nutrient loading that is a consequence of hundreds of thousands of salmon excreting in a confined area can contribute to

the uncontrolled growth of algae, leading to dense algal blooms. This explosive growth is followed by a die off. The result is a process of eutrophication as the bacteria which eat the decaying algae rapidly consume all available dissolved oxygen, killing salmon and creating a dead zone for marine aerobic life (Pure Salmon Campaign, n.d., p.1). While algal blooms can occur naturally as a result of the upwelling of nutrients, nutrient loading from salmon farms can also be a causal factor. They are common to salmon farms across the coast of British Columbia and can result in significant mortality. In September 2007, for example 260 tonnes of Atlantic salmon died as a result of an algal bloom on a Marine Harvest Canada operation in Klemtu, British Columbia (CAAR, n.d. a). In June 2016, an algal bloom killed 25 tonnes of salmon at two Cermaq farms in Clayoquot Sound (Bailey, 2016).

4. Marine mammals and other species

To the marine mammals that are the natural predators of salmon – seals, sea lions, dolphins, porpoises and river otters – open net cages packed with fish are an irresistible attraction. Various methods have been employed by farmers to deal with predators that threaten their stock,⁵³ the most controversial of which has been the shooting of sea lions and seals. Farmers can obtain a permit from DFO to legally destroy marine mammals. If not shot, seals or sea lions often drown after becoming ensnared in the net-cages while attempting to feed on farmed salmon (CAAR, n.d. g). Reporting on DFO's aquaculture website indicates 7,930 marine mammal fatalities at B.C. salmon aquaculture facilities between 1990-2018 (Fisheries and Oceans Canada, 2019). Figures are based on self-reporting, however, and the number of unreported kills is not known (CAAR, n.d. g).

The salmon farming corporations point to a significant reduction in killings of marine mammals since the 1980s and 1990s. That these figures are self-

⁵³ These include dogs, predator nets, electric fences, acoustic deterrent devices, seal bombs, guns and traps (Halberl, 2010, p.10).

reported should be kept in mind, however. Individual incidents which have come to light raise cause for concern. For instance, following a tip from a concerned citizen, a filmmaker shot underwater footage that revealed a harbour porpoise, steller sea lion (both listed as species of special concern under Canada's *Species at Risk Act*) and a Pacific white sided dolphin drowned in the predator nets at Mainstream's Wehlis Bay farm in the Broughton Archipelago – all within a two-week period in March 2007 (CAAR, n.d. g). In 2012, Grieg Seafood was charged with unlawful killing of dozens of marine mammals (CAAR, n.d. g).

A full assessment of the effects of salmon farming on other species should extend beyond the proximate impacts on the immediate biotic environment. Salmon are predators that feed on other fish. As a result, meeting the local demand for fish-based fishmeal has meant devastating impacts to fisheries in other parts of the world, most notably in Chile and Peru where the business of creating fish food for salmon aquaculture has exerted a heavy toll on local pelagic fisheries (Bellona, 2009).⁵⁴ In Peru, 98 percent of landed anchoveta stocks are converted into fish meal and fish oil, mostly used for animal feed. For sardines fished from Mexico's Gulf of California the figure is 85 percent (Living Oceans, 2013). Ninety percent of harvested forage fish is destined for the fish meal and fish oil industry and it has been estimated that, as of 2006, the global aquaculture industry utilizes 68.2 percent of total fish meal supplies (Living Oceans, 2013). In recent years, suppliers of salmon-feed have reduced the percentage of content that is fish, yet they remain a significant component of fish pellets. Ironically, while advocates present salmon farming as a sustainable alternative to wild fish, salmon aquaculture is itself based on fisheries that are likely are less regulated and further over-exploited than the displaced British Columbian salmon fisheries that it is ostensibly protecting.

⁵⁴ Regarding food conversion efficiency, it is worth noting that the further one is removed from the direct consumption of plants and grains, the lower the efficiency rating. For example, producing one kilo of beef requires seven kilos of grain (Horrigan et al., 2002, p.445). Removed by two degrees from plant sources of food, eating predators becomes less efficient still. The dramatic ecological problems that result from the meat-heavy Western-diet are reproduced in salmon aquaculture (Horrigan et al, 2002).

5. Human health

The widespread consumption of farmed salmon raises various potential health concerns (sometimes referred to as the *inviromnent*). A 2004 global assessment found that in comparison to wild salmon, farmed salmon had significantly elevated levels of a variety of persistent bioaccumulative contaminants, almost all either known or probable carcinogens (Hites et al, 2004). Applying a risk analysis, the authors concluded that consumption of farmed Atlantic salmon may pose risks that detract from the beneficial effects of fish consumption with the potential for an elevation in attendant health risks (pp. 228-9).⁵⁵ While the marketing of farmed salmon often trades on the oft-touted health benefits of a diet that includes fish and seafood, the nutritional content of farmed salmon can differ notably from that of its wild counterpart. While not a complete scientific study, laboratory analysis commissioned as part of a CTV news investigation found dramatic differences in the nutrient value of farmed and wild fish. For instance, samples from wild salmon revealed almost eight times the levels of vitamin D and more than three times the level of vitamin A than those present in the samples tested from farmed fish (CTV News, 2010).

The heavy use of antibiotics to control or prevent disease outbreaks on farms inevitably promotes the development of resistant bacterial strains (Burrige et al, 2007), a particular concern given that the same antibiotics employed on fish farms are also used to treat humans. As antibiotic resistant bacteria can transfer resistance to other bacteria, including human and animal pathogens, these practices pose serious potential risks for human health and medicine (Cabello, 2006, p. 1137).

⁵⁵ There were some geographic variations: European fish were the most polluted, South American the least and North American in between the two (Hites et al, 2004, p. 228).

D. A global comparison

It is beyond the scope of this exercise to engage in a detailed comparison, but I will conclude this overview by briefly noting that the general issues identified above are reproduced in the other major farmed salmon producing areas around the world (i.e., Norway, Chile, Scotland and Ireland). While it is important not to over-generalize and to remain mindful of the particularities of specific locations, a broad commonality can nonetheless be observed: Consistently, once established, salmon farming expands rapidly in an environment of minimal regulation, despite notable evidence and accounts of the negative impacts of the farms. As production increases, affected groups and individuals begin to raise concerns and mobilize against farms and against aquaculture policy more generally. Eventually, production expands to the point that its negative effects are impossible to ignore, regulations are tightened and new measures brought in. While these changes may have some effect in ameliorating the most egregious, or at least most visible, impacts, damage typically continues. As a result, controversy over the nature and harm of salmon aquaculture continues, and once again “uncertainty,” itself facilitated by the ameliorative steps taken, provides the backcloth to expanded production.⁵⁶

⁵⁶ See, for example: Bellona, n.d.; Lura, H. & Saegrov, 1991; Fiske, et al., 2001; Johnson, 1993; Staniford, 2002; Scottish Office, 1997; Anderson, 2006.

IV. Methods and Methodology

A. Methodological background and approach

My methodological approach is grounded in recognition that, while the meanings actors bring to their world exist as subjective experiential phenomena, they remain structured by material conditions and the broader operations of social power. I see the subjective and “objective” – agency and structure – as engaged in an ongoing dialectic, each informing and reproducing the other. In this way, one level is not wholly reducible to the other, nor can a simple nomologically deterministic relationship between the two be drawn. Hence, while comprehending how individuals understand and interpret their situations and the mapping of an overarching structural account are both important in their own right, neither constitutes an ultimate endpoint: each level of analysis is brought to bear upon the other. Individuals may co-create the symbolic world through their immediate interactions (see, for example, Mead, 1934), but they do so within a macro-level social structure that defines the context in which such interactions occur and shapes the form they take. In this way, an on-going dialectical exchange between levels and forms of explanation is established. Analysis of the interplay between levels of theoretic resolution also functions as a type of triangulation, a means of evaluating the validity of each and of the results overall.

This process is complicated by the reality that, unlike interview-based research, documentary analysis does not permit the type of interactive exchange between researcher and subject by which the former – it is hoped – gains insight into the mental states of the latter. Given the absence of a privileged access into the mind of a participant, however, I maintain that the requirement for an inferential leap across epistemological uncertainty present in both types of research.⁵⁷ That said, my unit of analysis is the document, not the individual.

⁵⁷ The possibility of an inter-subjective understanding between researcher and participant depends on a series of epistemological assumptions: (1) that individuals have privileged self-knowledge of their own intentions, motivations and assumptions; and (2) that this self-knowledge

Thus, any attempt to get “inside the head” of the witnesses who appeared at the Commission is both limited and mediated by the nature of the data source. It is the documents – and not the humans themselves – from which semantic themes emerge. Comparison with direct sources, such as the critical analysis that I draw on as background for this study, offers some opportunity for triangulation – a more far-reaching endeavour could involve interviewing or surveying witnesses and other claims-makers. Such a project is beyond the scope of this dissertation but presents a promising opportunity for further research. Nonetheless, I contend that it is not unreasonable to draw qualified inferences from the semantics of texts (which are here both a record of symbolic exchange and carriers of meaning in themselves) to the intentions and attitudes of the people behind them.

This focus on the interplay between subjectivity and structure accords with the theoretical grounding of my analysis, thus making for a concordance between investigative methodology and analytic framework. Beck sees the individual as (at least partially) structured by the distribution of risk, yet in the context of reflexive modernity the individual has the capacity to shape the social understanding of risk – and hence its form and nature (Beck & Beck-Gernsheim, 2001). Power in Foucauldian terms is interwoven with hegemonic institutional interests yet also filters through the matrix of governance to the micro- or capillary level of everyday life. Moreover, it is not simply wholly oppressive but is productive of resistance⁵⁸ – subordinated discourses can be reconfigured and the domination of truth-telling by powerful actors challenged. Like those of Foucault, the theories of Bourdieu can be interpreted as preserving the utility of a structuralist approach to culture while offering a way out of its deterministic implications. Bourdieu’s concept of *habitus* – the socially cultivated predispositions of thought, speech and action (see, e.g., Bourdieu & Wacquant 1992) – offers predictive and descriptive value for culture and practice without

can be translated into the mental states of others who (3) possess their own privileged self-access to the “actual” meaning of these derivative mental states.

⁵⁸ See, for example, Foucault, 1980, pp. 104-105, 109-133, 151.

implying mechanistic reproduction. An active agency persists, one with the ability to “engender an infinite array of discourses that are grammatically conforming” (Bourdieu & Wacquant, 1992, p.145). An actor thus can be expected to “encode” cultural artifacts in diverse and unique ways even if he is to some extent bounded by the “limits of the system of categories he owes to his upbringing and training” (Bourdieu and Wacquant 1992, p.126).

The iterative and idiographic nature of qualitative research vitiates against methodological rigidity, and I set forth from the position that any unconditional a priori commitment to a fixed methodology would be at odds with the interpretive and emergent elements of this study. Nonetheless, in any careful approach consistency and rigour remain overarching principles. Thus, while remaining open to methodological evolution during the realization of the study, I began with a working model, one that drew on the Framework approach described by Ritchie, Spencer and O’Connor (2003). I believe that the complexity and newness to criminological investigation of the subject matter suggest that the most appropriate methodology sits in a “goldilocks” position between structure and openness. Analogous to Charmaz’ reading of Grounded Theory as a “set of principles and practices” rather than “prescriptions and packages” (2008, p.9), I took the somewhat algorithmic orientations of Framework more as guiding heuristics than as sets of rigid constraints and made some considered departures.

Fundamental to the Framework approach is a process of constant comparison, continued until saturation and resulting in systematically increasing levels of abstraction. The researcher engages in an iterative process, creating a “conceptual scaffolding” that allows for the iterative movement between the summarizing and synthesizing of data, to descriptive accounts, to the more thematic explanatory level. Framework eschews the application of any pre-existing theoretical framework, favouring the inductive development of “theory” from a presumed atheoretical starting point, one free of preconceived theoretical concepts, and at the outset I should note some potential methodological and philosophical deviation from the model, strictly conceived. I do not believe that it

is epistemologically possible – nor desirable – to begin a process of inductive investigation from a place truly devoid of prior assumptions or beliefs (a reality best met by the adoption of reflexivity on the part of the researcher regarding his or her own position as a social agent in relation to the area of investigation). Moreover, the data under investigation and the Commission itself are in large part structured by pre-determined analytic categories, and, whereas these did not determine the final thematic constructs, they did play a role in classification at a lower analytical tier. The complexity and degree of background knowledge required to understand the data even at a denotive level further undermines the viability of a purely inductive process. Most fundamentally, my research decision to approach the data at the outset with certain theoretical perspectives at work makes for an explicitly hybridized methodology that is both deductive and inductive – one that brought theoretical constructs to bear at the outset but also included coding not derived from these a priori theoretical apparatuses. Categories and themes hence were allowed to emerge through a (loose) Framework methodology and theoretical models then applied with an eye to both providing a fuller explanation of these less abstract explanations while also testing the “fit” of the theoretical frameworks. I have in mind Altheide’s (1996) ethnographic content analysis methodology, a reflexive interaction between investigator, concepts, data collection and analysis in which categories and variables guide the initial development of the study, while others develop as the study progresses. This quality of *emergence*, whereby patterns and meanings develop through the iterative examination and comparison of documents over time, is fundamental to this methodology.⁵⁹

⁵⁹ Altheide (1996) lays out a 12-step process as follows: (1) Pursue a specific problem to be investigated (p.23). (2) Become familiar with the process and context of the information source (e.g., ethnographic studies of newspapers or television stations) (p.24). (3) Become familiar with several examples of relevant documents, noting particularly the format. Select a unit of analysis (e.g., each article), which may change (p.24). (4) List several items of categories (variables) to guide data collection and draft a protocol (p.25). (5) Test the protocol by collecting data from several documents (p.26). (6) Revise the protocol and select several additional cases to further refine the protocol (p.26). (7) Arrive at sampling rationale and strategy (p.32). (8) Collect the data, using preset codes, if appropriate, and many descriptive examples (p.37). (9) Perform data analysis, including conceptual refinement and data coding (p. 41). (10) Compare and contrast

If induction inevitably depends on pre-existing conceptual schemes of one form or another, then attempts to achieve an absolutely neutral or objective stance external to the data are epistemological folly. The formation of such classifications inevitably draws on the researcher's own lived experiences, specific and general, that shape – and are in turn shaped by – both data and analysis. At the same time, I attempted not to let my preconceived notions rigidly delineate the parameters of the content analysis. I endeavoured to approach the research topic with an “open but not empty mind” (Janesick, 2000, p. 384), alert for non-conforming evidence that did not easily fit within a preconceived theoretical accounting of the discourse in question and that may point toward a revision of conceptual schemes or their applicability in this context.

B. Data sources

There is a plethora of potential data sources relevant to a study of the environmental harm of salmon aquaculture, its social construction and regulatory significance. In this dissertation, I draw upon one particularly rich trove, the Cohen Commission. Struck following the collapse of the 2009 Fraser River sockeye run, the Commission was given a broad mandate to inquire into the decline of sockeye in the Fraser River, and make recommendations for improving the sustainability of the fishery, including, changes to the management policies and practices of the Department of Fisheries and Oceans (See Appendix A – Cohen Commission Terms of Reference).⁶⁰ Appropriate to the complexity, multivariate and interactive nature of the problem at hand, the Commission adopted a wide-ranging investigation of factors relevant to sockeye populations in the Fraser River.

“extremes” and “key differences” within each category or item (p.41). (11) Combine the brief summaries with examples of the typical case as well as the extremes (p.41). (12) Integrate the findings with your interpretation and key concepts in another draft (p.44).

⁶⁰ Since the early 1990s, sockeye returns steadily declined, reaching a record low in 2009 and leading to the closure of the fishery for the third consecutive year. There was a dramatic improvement in 2010, followed by a return to poorer numbers since.

As a source of data, the Cohen Commission offers some notable features. Unlike the wide range of media or other material that might form the foundation of a broadly-based content analysis, the Commission constituted an elaborate truth-finding – or truth-generating – machine in itself, one that brought significant epistemic horsepower to bear on a specific and highly contentious sociopolitical issue. The judicial nature of the Commission meant that a range of witnesses extending well beyond the reach of most research contexts were presented with – and compelled to answer under oath – lines of questioning of a nature that a researcher would likely be unable to pursue. The Commission’s power to compel witnesses and the disclosure of documents meant that significant information pertaining to the regulation and promulgation of salmon aquaculture not previously publicly available, including internal federal and provincial communications and reports and the provincial database of disease incidents on British Columbia salmon farms, was exposed and scrutinized. The extent of the Commission’s activity was considerable. The Commission began hearings in June 2010 and continued to December 2011, sitting for a total of 133 days (the transcripts of which total 14,166 pages).⁶¹ Witnesses testified in panels organized by theme (with most themes running across several days, e.g., Aquaculture consumed nine days in itself). The 179 witnesses who appeared included: senior DFO management and scientific staff; provincial and municipal government officials; independent scientists, conservationists and representatives of ENGOs; representatives of the aquaculture industry; and representatives of the commercial, sport, and Aboriginal fisheries; as well as the authors of the technical reports produced for the Commission. Standing at the Commission was granted to 53 organizations (either individually or as part of a coalition), and 2,145 exhibits were entered (approximately 700 of specific relevance to salmon aquaculture). Further, Commission Counsel prepared 21 policy and practice reports and contracted scientists produced technical reports on 15 project

⁶¹ In December 2011, three additional days were added for hearings to address new evidence that had emerged on the presence of ISA (an extremely pathogenic virus linked to fish farming across the globe) in British Columbia waters.

areas.⁶² From the public, 892 submissions were made to the Commission. At the close of the evidentiary hearings, participants submitted extensive oral and written submissions. Finally, in April and May 2012, the Commissioner invited participants to provide supplementary submissions on the relevance of changes to multiple pieces of legislation contained in Bill C-38, an omnibus bill, described as budgetary but which introduced widespread reductions in the protections offered by various environmental legislation, including the federal *Fisheries Act*. Justice Cohen issued his 1,191-page final report on October 31, 2012.⁶³

Although the scope of the Commission went beyond the impacts of salmon aquaculture, it in many ways represents a culmination of efforts to bring about a formal and thorough official investigation of the issue (e.g., Hume, 2012). The depth of the inquiry and strength of Justice Cohen's recommendations (summarized in Chapter 3) make it a pivotal event in the history of the industry in British Columbia. Further, the themes that emerged in the Commission and the findings of Justice Cohen have only been further supported and substantiated by subsequent analysis (e.g., Office of the Auditor General of Canada, 2018) and become more salient in developments since, including the ongoing failure of DFO to act in the presence of further serious disease and even in the face of court orders to do so. Hence, it stands as an important subject for a socio-legal analysis of salmon aquaculture in British Columbia. And its establishment as a techno-legal apparatus for the development of policy pertaining to the management of a – sweeping – area of environmental risk makes it particularly suited to my ends here.

⁶² After circulating a preliminary discussion paper and soliciting ideas for research projects from participants, the Commissioner contracted experts to undertake research projects in 15 areas and selected expert contractors to complete them. With one exception, the contractors did not engage in primary research but rather reviewed and summarized existing research. The reports of each contractor were peer-reviewed and discussed by their authors in a roundtable setting. They were then finalized, circulated to all inquiry participants, and entered formally into evidence as exhibits in the inquiry's hearings.

⁶³ The period of the Commission (from 2010 to 2012) overlapped with the shift in primary jurisdiction over aquaculture from the province to the federal government. At the time of hearings considered here, DFO had assumed formal responsibility and draft aquaculture regulations were in place. Some policies and procedures had yet to be finalized, however. Testimony and materials variously reference the old or new regimes (or both), depending on context.

Given that my methodological approach is iterative and marked by close coding, inducting all documents related to the Commission into the dataset would have proven unworkable. Hence, I narrowed the scope of data in two ways: first, by restricting inclusion to the transcripts of hearings; and, second, by coding only a subset of all transcripts. I expand on the methodological implications of these choices below, but some preliminary remarks are in order. Of the various material generated by the Commission, hearing transcripts are most relevant to the goal of examining the attitudes, dispositions and beliefs of parties connected to the salmon aquaculture industry. They represent a compelling instantiation of the dialectic between subject and structure. They are a record of both a process of symbolic interaction playing out within an institutional setting that shapes discourse – often through the very resistance of actors to the formal constraints of the process – and of the broader social forces of which the hearing is itself a part. While transcripts do not allow a researcher to interact with the data as they are being generated, as would be the case in an interview setting, they nevertheless provide the opportunity to see how individuals respond to often vigorous lines of questioning made in the pursuit of a range of objectives. This process of “truth production” has a powerful structuring effect that must be recognized within the framework of analysis, the adversarial nature of formal questioning within a judicial setting being particularly salient.

In selecting transcripts, I adopted a purposeful sampling strategy (e.g., Marshall, 1996a; Mason, 2002, Patton, 2002; Ritchie et al, 2002) actively selecting records with an eye to assembling as productive a sample as possible. The Commission proceeded through the various issues individually, holding discrete hearings on environmental and human (putative) causal factors and issues of management and mitigation. While such an approach is likely essential to a systematic analysis, it tends to occlude the interrelatedness of these topics and the holistic nature of the problem at hand. Upon filtering Cohen Commission material, it became clear that most transcripts (and Commission material more generally) were to some degree germane to my purposes. Hence, my approach was to select those transcripts that were *most* relevant, aiming not for

completeness but salience. While this might suggest a degree of arbitrariness, I contend that there is a considerable qualitative jump here from material that is in some way relevant to that which is significantly so, such that the line I have drawn between the included and the excluded is fairly bright. Specifically, I included transcripts from hearings on Diseases, Aquaculture, and Infectious Salmon Anemia. Of the many topics addressed, these bore directly on the issue of the salmon aquaculture or its impact.⁶⁴ All totaled, these comprise approximately 1,500 pages of transcripts. While these transcripts make up the entirety of my formal objects of study and the only documents I formally coded, there are other related Commission materials of relevance, which I consider as ancillary data and at times reference and cite directly in discussing my findings. These include the wider set of transcripts, technical reports authored for the Commission (and which were frequently a topic of examination at the hearings), as well as the multitude of exhibits that are referred to at various points in the transcripts and inform their content – sometimes as a central focus of testimony. I also attended several hearing sessions in person, which afforded me a sense of the physical setting and social context of the setting in which the speech acts under examination were made. It also allowed for a richer engagement with the more nebulous characteristics on display, such as demeanour, attitude and tone – qualities that are not always well-reflected in written transcripts yet are a propos to the production of knowledge and circulation of power. Again, in the interest of setting workable parameters, I did not formally code these attributes.

It should be noted that a still broader documentary record was also part of the process of iterative investigation. Initially, there was a need to absorb considerable “background” information pertaining to an array of complex and intersecting issues. This extensive set of material includes: published scientific research; regulatory scientific, technical and policy analysis; corporate annual reports; media stories and press releases; ENGO and independent analyses and

⁶⁴ Methodologically, this could be conceptualized either as a purposive sampling from a population defined as including all broadly relevant transcripts or as simply an examination of the entire population of directly relevant transcripts. While I adopt the former, I also maintain that the choice of construal does not meaningfully affect the results herein.

reports; and internet, radio and television advertisements pertaining to media campaigns and other efforts to sway public opinion. The websites of industry associations, government regulatory agencies, and ENGOs and activist groups engaged with salmon farming issues presented points of access for a variety of material: advocacy reports, scientific studies, regulatory and permitting information, analyses, media campaign material, and more. While not included as data, this extended documentary material informed my understanding and analysis of environmental, social and regulatory issues surrounding salmon aquaculture.

It is important to make clear that, while some engagement with them on their own terms is inevitable, my aim was not to attempt to reproduce, expand upon or directly critique the analysis or opinion of the witnesses who appeared before the Commission or the findings of the Commission itself. Nor was it to attempt to proffer a definitive analysis of the environmental and social impacts of salmon aquaculture in British Columbia.⁶⁵ My intent was instead to begin to uncover both the structured and structural conditions of which these accounts are a part, i.e., to illuminate the distinct and often conflicting symbolic worlds that various relevant actors inhabit and, in particular, the various power relations that shape such worlds (e.g., Forte, 2002)

C. Data Analysis

To the end of reflexivity, I approached the process of data analysis by first reflecting upon my own personal background and social position and the relation of each to the conceptual lenses through which I viewed the issues surrounding salmon aquaculture. I made notes on these observations in a project research journal, to which I returned throughout the analytical process. My prior history in environmental activism, including some engagement directly with salmon

⁶⁵ It would constitute tremendous hubris on my part to attempt to trump what, structural and processual limitations aside, was incontestably a truth-producing apparatus of tremendous investigative capability.

aquaculture, and the ways in which that might influence what I might see was clearly of significance here. Non-neutrality is not equivalent to bias, and while I make no pretence of the former, I was continually conscious of avoiding the latter, endeavouring to unearth and then interrogate assumptions to the fullest degree possible. The challenge for the researcher seeking to reveal relations and flows of power that structure experience, understanding and action (both individual and institutional) is that they themselves are embedded in them. Reflexivity provides one means to, if not escape from the prison-house, at least to begin to reconstruct it from within – to cultivate a “reverse discourse” as critique and praxis.

The process of data analysis began with familiarization, in which I reviewed the data with the intent of gleaning an initial sense of its nature, scope and diversity.⁶⁶ Familiarization also extended to the expansive technical details and background information related to the issues under investigation. My intent in this initial phase was to provide a solid foundation to the “conceptual scaffolding” from which the complete analytical structure would hang (Ritchie et al., 2003, p. 221). To facilitate data organization and analysis I utilized qualitative data analysis software, specifically QSR NVivo. *Word frequencies*, *word trees*, and *text queries*, were helpful here, though given the structured nature of the hearings, they likely played less of a role in illuminating topics than might be the case in a more open-ended context. More useful was the aforementioned research journal in which, prior to the initiation of formal coding, I made notes on my early explorations. As the analytical process progressed, I continued to utilize the journal to record and facilitate the process of thematic development. I also made use of the annotation feature of NVivo to make direct notes on sections of text that stood out as particularly pertinent. Journal notes and annotations were synthesized into more formally structured memos as part of the ongoing process of conceptual development, integration and revision.

⁶⁶ As noted, I undertook this in concert with a broader familiarization process with the industry and the issues surrounding it.

Familiarization provided an early opportunity to look for gaps or over-concentrations in the dataset (Ritchie et al., 2003, p. 221). Here I aimed to take stock of a potential pitfall regarding keeping my research questions “plumb” with my methodology (Chenail, 1997). As noted, unlike much naturally occurring data, the Cohen Commission was an investigative forum in itself, one with its own “research” objectives, its focus being the Fraser River sockeye fishery. Salmon aquaculture was examined in regard to its impact on a particular salmon population, one primarily viewed anthropocentrically in economic terms – as a commodity. In this context, salmon farming was but one area considered among many, including commercial and recreational fisheries management and enforcement, aboriginal fisheries, aboriginal world-view and cultural context, forecasting, habitat management and enforcement, forestry, pollution, hydro-electric development, water temperature, disease, predation and climate change (among others). Conversely, there are issues of environmental concern related to salmon aquaculture extending beyond the impacts to this one (albeit highly important) salmon fishery and indeed beyond wild salmon – issues hence outside the Commission’s mandate (e.g., impacts on marine mammals or human health). Given my use of the Commission as data is at a meta-level in relation to its own ends, i.e., in furtherance of an analysis of the construction of issues related to salmon farming in British Columbia, this situation is not inherently problematic. Moreover, how the problem is defined and framed by the Commission and the decisions it made regarding the implementation of its mandate are data in themselves. The data are inextricable from the institutional context that created them – and this institutional context is, in fact, one of the objects of study. Nevertheless, I endeavoured to remain alive to the implications of the reality that the evidence presented at the Commission, as well as the Commission’s own findings, are never wholly separable from the context, operation and goals of the Commission, itself – the landscape in which my analysis is grounded.⁶⁷

⁶⁷ This aspect of my study has some commonalities with institutional ethnography (e.g., Smith, 2005, 2006) – an ethnographic textual study of institutionalized social relations within the organizational context of the Cohen Commission. Like institutional ethnography my focus is on looking to what people do and say in specific instructional contexts with the aim of finding the

At the early stages of engagement, management of what proved to be a rich and capacious body of data figured prominently. This involved the sorting, labelling and synthesizing of data. Within NVivo, a coding categorization is referred to as a *node* – “a collection of references about a specific theme, place, person or other area of interest” (“About Nodes,” n.d.). (For a complete listing of the nodes I developed, see Appendix B.) Containers for themes and other information, they can be organized in a hierarchy with overarching parent nodes at the highest level and various nested sublevels of child nodes (sub-nodes) beneath. While their primary function was in thematic development, I also assigned nodes, as *classifications*, to individuals appearing at the Commission hearings, participants, counsel and witnesses. Much of the content of the transcripts is technical, dense and couched in an elaborate context of assumptions and theoretical understandings. Consequently, many of the initial categories I utilized were indigenous to the participants (references to specific diseases, for example). This density also meant that considerably thematic richness was apparent close to the surface, and consequently “analyst-constructed” novel categorizations were instantiated relatively early in the process.⁶⁸ In general terms, I followed a course of first indexing and then grouping by recurrent topics or issues, thereby beginning a process of increasing abstraction (Ritchie et al., 2003, p. 221). As mentioned my approach involved the adoption of various perspectives a priori, and these were incorporated as higher-level themes or concepts in the initial thematic framework that was drawn up (i.e., as higher-level thematic nodes).

The emergence of higher-level concepts or themes prompted re-examination of lower-level ones as consistency and coherence were checked, explanatory factors sought or hints at further emergence teased out. Such a

translocal (with an emphasis more on how things work and are put together than on obtaining a window into inner lives).

⁶⁸ For more on the distinction between indigenous and analyst-constructed classifications, here in regard to higher-level typologies, see Patton, 2002. Ritchie et al. (2003) suggest that a useful test for the appropriateness of lower level data categorizations is to consider whether they would be easily recognized by the participants themselves (p. 243).

process of constant comparison involves a fluid movement up and down all levels of the “analytic hierarchy,” from raw data to abstract explanation (Spencer, Ritchie & O’ Connor, 2003, p. 212). Perhaps not surprisingly given the nature of the dataset, categories proliferated rapidly at the outset, something facilitated by the ease of coding with NVivo. Rather than run the risk of prematurely clipping what might grow into a fruitful category, I initially let nodes develop and multiply without great concern for concision. As my analysis progressed, it became clear that some categories were redundant and that others failed to adequately capture the phenomenon in question; thus, categories were eliminated, merged or redefined). In general, I strove to maximize efficiency and parsimony without sacrificing nuance. Category modification occurred at multiple levels of abstraction and with implications across levels, with higher level mergers prompting reassessment of sub-nodes, for example.⁶⁹

Under the Framework method, the first appearance of significant abstraction in classification is at the level of the *typology* (Ritchie et al., 2003, p. 244). Typologies are noteworthy in that they (typically) combine two or more lower level descriptors, thereby offering a richer portrayal of phenomena, and in that categories within a typology are mutually exclusive, i.e., data can only be ascribed to one typology. In this way, Ritchie et al. see typologies as “sectoring” the social world into distinct segments (Ritchie et al., 2003, p. 244). Whereas typologies can be useful analytical tools in this regard, employing an axiom of exclusivity to cut nature at a joint and discern/impose absolute divisions may not always be epistemologically appropriate. On the other hand, the “cross-tabulation” that a typological approach allows can prove pragmatically valuable. My own tack was to recognize the practical value in seeking to maximize

⁶⁹ At this point quantitative analysis could play a role, allowing for an exploration of relationships between manifest coding variables. While analysis of the content of descriptive elements of primary significance, the frequency with which they occur has relevance to the collective make-up of the data. Further, manifest analysis can play a role in the development of theoretical explanations, revealing for example who is permitted to speak, whose voice is heard or not heard. Given pragmatic constraints, I decided to focus here on the primary thematic goals. Future work based on this data may include an examination of correlation between themes with participant subgroups to the end of further exploration of why such associations are present.

meaningful difference and distinction between typologies but to avoid becoming unconditionally wedded to a principle of exclusivity. I note that the holistic nature of the ecological subject matter directly or indirectly taken up at the Commission found its way into much of my own mapping, such that the nodes I created are often interpenetrated. That said, I did typological categorization of nodes. Examples include nodes related to the categorization of actors (e.g., *attitudes toward salmon farming*) and base-level characterizations of risk (e.g., *salmon farming poses no risk to wild stocks versus salmon farming is a significant risk*). Moreover, while not formally coded, links were explored across and between evinced attitudes, circumstances and decisions, as well as from these to subgroups of witnesses and Commission actors represented in the sample. It was clear early on that distinct dispositional and situational positions regarding the topic under investigation at the Commission were particular to the various subgroups of individuals identified. As well, associations with clusters of individuals not part of a pre-identified subgroup or across subgroups emerged, e.g., the similarities in attitude toward the promotion and development of the industry between senior regulatory officials and fish farmers themselves. Such cross-categorization similarities tended to offer greater potential for novel insight and more significant grist for the thematic mill.

The movement from descriptive to explanatory analyses involved looking for patterns of association between phenomena. In the process of developing explanations, all utterances were examined, including those which did not seem to conform to the emerging explanatory account. While examples of truly “rogue” testimony – by which I mean something like a witness consistently making extensive declarations strongly at odds with their expected position, were few, there were specific instances which could be described as outliers. Completeness demands that they be given a proper accounting (Ritchie et al., 2003, p. 252), and in the end I believe they served to enrich the final narrative. Negative evidence – that which is not said – also proved to be significant to the development of higher-level thematic development, especially by the lights of an analysis that looks to processes of naturalization and misrecognition.

As noted, the initial development of explanatory-level accounts included “indigenous” explanations and associations offered by participants themselves. Their ready presence at this relatively early stage in the process of thematic development should not be taken to mean that participants’ own accounts lacked theoretical sophistication; quite to the contrary, many were grounded in a high level of technical and conceptually sophistication. In the context of the methodological process of this study, however, they represent unabstracted explanations, preliminary to my development and application of theory. I am also mindful that there is no wholly neutral epistemic position from which an “objective” understanding of tendered explanations can be passively received and that the “plain” meaning of such statements are themselves nested within the researcher’s own web of belief and limited understanding.

Further iterative engagement with the data and the comparison and re-comparison of such explanations across the differing socially-situated groups and individuals facilitated the entry of “meta” accounts. These typically began with the teasing out of an underlying logic implicit within statements, leading to the application of higher-level concepts (Ritchie et al., 2003, pp. 253-4).⁷⁰ As mentioned, however, my aim was not the pure inductive development of theory; rather it was the application and testing of theoretical frameworks with an openness to inductive modification. Whereas I pulled the data through an analysis founded in formal theory – political economy, risk theory and social theory – I also endeavoured to remain alive to other explanations that emerge from the data that are not directly linked to any chosen theoretical lens. An example here may be the *Evidentiary Catch 22*, the emergent theme holding that investigation of the role of fish farms in salmon decline is predicated on pre-existing evidence to that effect, but collection of such evidence is only possible through investigation. This is an example of a theme that connects to higher level understandings of the operation of risk (and its nesting within structures of

⁷⁰ Such constructs are similar to the *sensitizing concepts* of grounded theory in that they represent initial concepts the researcher brings to the examination as a point of departure for further examination (an example here is the concept of *environmental harm*) (e.g., Glaser, 1978; Charmaz, 2003; Padgett, 2004).

power), yet which also emerged from a “grounded” engagement with the data. Saturation is usually viewed as reached when on-going analysis ceases to produce new emergent themes (e.g., Bowen, 2008, p. 140). Within the general framing provided by my theoretical approach, I continued the analysis iteratively to this point. In the following chapter, I discuss some of the key themes that emerged from this process.

V. Results and Discussion

A. Process and Procedure: The Commission as a techno-legal apparatus of truth production

Before moving to an analysis of semantic content that emerged from the output of the Commission, I first consider the influence of processual and procedural issues deriving from the structure and operation of the Commission, itself. Canada has a long tradition of responding to pressing socio-political problems by striking judicial inquiries.⁷¹ While they can prove to be effective investigatory mechanisms, they also can provide a more cynical opportunity for a government to put daylight between itself and a contentious issue or set of issues. The separation of politics and law is (rhetorically, at least) a foundational principle of liberal democracy, and deferral to the authority of a respected and (presumed) independent and impartial judge may serve to “depoliticize” a situation. There may also be an element of “do-ism” at work, in which a government can be seen to be acting on a problem, but actual decision-making is deferred. In fact, criticism of the judicial inquiry approach is often directed not the at inquires themselves (though many have been subject to criticism regarding their form, process and outcome) but to the fact their recommendations often languish, unimplemented and “gathering dust.”

Hence, it is perhaps not surprising that striking a judicial inquiry was Ottawa’s preferred response to the problem of the collapsing Fraser River sockeye. It should be kept in mind, however, that this wide-ranging, open-ended issue – what are the causes and what is to be done? – might have been addressed in any number of ways, and the adoption of a formal legal mechanism says much about how the issue is conceived. The appropriateness of bringing to bear the hegemonic authority of the legal system to the issue is debatable. That it

⁷¹ For a through-going examination of the differing forms judicial inquiries can take and the case for integrating and balancing principles of judicial independence, separation of powers and the rule of law on one hand and of procedural fairness on the within their operation, see Hoole, 2015.

is highly divisive and politically charged, with many of the relevant claims-makers having deeply vested and often material interests at stake, suggests that an adversarial approach and the power to compel evidence may have been necessary to reveal information and accounts that would otherwise remain undisclosed. At the same time, other aspects of the issue could have been investigated through a combination of independent scientific inquiries (including the funding of independent research), community assemblies,⁷² and/or other fora more suited to various elements of the problem.⁷³ These might have made room for the Indigenous legal systems that were thoroughly excluded, and which tend to eschew the adversarial approach in favour of a more restorative and consensus-based orientation.

The Commission's aim was to make recommendations to inform policy by applying an inquisitorial-adjudicative process to (predominantly) scientific findings. In this regard it was located at the intersection of distinct but variously overlapping and interpenetrated epistemic domains – policy, law and science – each of which comprises its own rules, procedures, norms and habitus, including for the production and legitimation of knowledge.⁷⁴ Among these, the primacy of the judicial frame, however, was readily apparent. The Commission was grounded in – Canadian colonial – law as both discourse and social institution. It was presided over by a judge who heard arguments presented by legal counsel

⁷² Prior to holding judicial proceedings, the Commission did travel to various locations in the province and around and hold community meetings, but these appear to have been ancillary to the main inquiry process.

⁷³ While praising Cohen for his adherence to “scrupulous standards of fairness, transparency, and impartiality” in the administration of the Commission, Hoyle (2015) questions whether he should have accepted the charge at all. He contends (I believe with merit) that the more fitting means to address the scientific questions posed in the Terms of Reference would have been to separate them from the policy questions completely – via the establishment of a scientific advisory panel, equipped with the time and resources to conduct original research, and the commitment of subsequent policy development to a distinct end-stage process. (pp.294-295).

⁷⁴ As Hoole (2015) notes, the terms of reference confronted the Commissioner with polycentricity at (at least) three different levels: “in assessing the efficacy of policies and practices within a government bureaucracy; in pursuing answers to questions of science; and in fostering cooperation amongst diverse groups and interests impacted by the sockeye fishery” (p. 69). I think it is fair to say that, while the Commission made an admirable effort in regard to the first two elements, significant progress on the third was structurally impossible.

on behalf of clients who had opposing interests and objectives. The primary method for adducing or testing evidence was the adversarial examination and cross-examination of witnesses (appearing in panels organized by theme) by participants in furtherance of their own particular (and partisan) interests. Formal rules for procedure, evidence and standing were all put in place. Yet, the Commissioner was given an investigatory charge distinct from that of a typical (common law) court. His mission was not to determine guilt or innocence or fault,⁷⁵ nor to simply choose between competing sides – the essential binary of the courtroom – but to provide an explanation for a problem, along with recommendations for how best to remedy it. To this end, the Commission had its own counsel and array of legal and scientific experts, contracted to investigate and report on various relevant issues. Thus, the Commission constructed an explanatory narrative through a hybridized adversarial-investigatory process. Within the hearings, however, the adversarial side of this pairing was clearly dominant.⁷⁶

Through its intersection with the scientific themes and analysis on which much of the Commission’s work was centred, the structuring role of legal discourse and procedure in the production of knowledge is thrown into sharp relief. The role of legal counsel is to represent the interests of a client (or in the case of Commission counsel, the public). The position of that client is determined outside of the proceedings and the role of counsel is then to present that position

⁷⁵ Although the Terms of Reference for the Commission directed the Commissioner to “conduct the inquiry without seeking to find fault,” (see Appendix A), the Commissioner subsequently ruled that

... to the extent the evidence leads me to a conclusion that any individual, community or organization has engaged in conduct which, directly or indirectly, is a factor causing or contributing to the decline of Fraser River sockeye salmon; or that the conduct of any individual, community or organization forms the basis for making recommendations to change policies, practices and procedures in relation to the management of the fishery, then I am authorized to make findings or recommendations based upon that conduct. (Commission of Inquiry, Ruling, September 2010, para 13).

Hence, the Commissioner found that he could consider the conduct of particular individuals and attribute responsibility for harmful environmental activity to the participants in so far doing so offered probative evidentiary value in relation to the determination of his recommendations.

⁷⁶ In this regard, Cohen chose to emphasize the courtroom nature of the process. That he decided to follow a *black letter law* position in regard to rules of evidence was something that Commission Counsel noted as “unfortunate” on more than one occasion.

in the strongest light, to make the best case – “Truth” being the outcome of this adversarial clash of positions in the courtroom. In this sense, (western) legal procedure is ostensibly at odds with scientific process – or, at least, with the dominant positivistic ideal of the scientific method (and much of science’s own doxa), which valorizes conservatism of claims, neutrality, openness to on-going revision, and falsifiability. In reality, the scientific expertise and knowledge put to the role of informing policy is “mandated science” (Salter, 1988), deeply embedded in the regulatory bureaucracy and/or the nexus between that apparatus and industry. The underlying assumption at the Commission and elsewhere is that scientists are guided by an ideal (and unitary) method that is removed from whatever influence such a material context might exert.⁷⁷ It is also assumed that this one ideal applies across scientific contexts – pure, applied, regulatory or commercial – an abstraction that in itself constitutes a form of symbolic violence. Through the instantiation of this ideal, science will arrive at the definitive (or at least, best possible) understanding of what is actually happening. Thus, while the Commission established a process through which science was cross-examined and (to a lesser extent) adjudicated, it remained the epistemic apparatus for the establishment of “fact,” one held up as separate and distinct from the recognized political nature of policy.

The data considered here suggest that this separation was largely illusory. While this ideal of science served a rhetorical and ideological function through the exercise of symbolic violence – such that it was ascribed to bureaucratic regulatory science but not to independent or “outsider” research – close examination made clear that the science and scientists appearing at the hearings often failed to embody it. Multiple clashing scientific claims – as to assumptions, methods, findings and their significance – occurred, revealing competing values and ethical positions, epistemological assumptions, and factual understandings. These in turn reflected the divergent political, cultural, institutional and social contexts in which the various sciences are carried and out.

⁷⁷ It is also assumed that this one ideal applies across scientific contexts – pure, applied, regulatory or commercial – an abstraction that in itself constitutes a form of symbolic violence.

Nonetheless, the interaction of the procedural/methodological ideals of law and science shaped the presentation and interpretation of evidence and testimony at the Commission. Judicial process has long accommodated and incorporated scientific and expert evidence as part of its discursive field, and, while the scientific was subordinate to the legal, it was also essential to its functioning: the base question of what is happening to the Fraser River sockeye was understood as a scientific one. The resulting tension between using a legal process to answer a scientific question showed itself throughout the proceedings. The frequent battles over admissibility are rendered bizarre from a scientific perspective. Why not just admit everything and then let it stand on its scientific merits? This position was in fact advanced by Commission Counsel at various times – with mixed success. In principle, the Commission could have elevated other epistemologies – most notably, the world-view of First Nations,⁷⁸ the people most closely connected to the fish and their ecology. However, without the dominance of (techno-bureaucratic) scientific discourse as its epistemological frame, it is unlikely the Commission would have had the legitimacy to perform its function of truth-production. This hegemonic interaction of science and law is evident in much of the findings detailed below.⁷⁹

1. The symbolic violence of concision

In practice, the adversarial process of the Commission usually functioned to amplify the differences between parties.⁸⁰ It is clear that the format also served to

⁷⁸ The representatives of Indigenous groups appearing at the Commission identified themselves as *First Nations*, and I do so here. When referring in general to issues of indigenous concern I employ the more general term *Indigenous*. Aboriginal also appears in relation to contexts in which it has a specific meaning, such as *Aboriginal law*.

⁷⁹ It also serves to obscure biases within the framing of the issues. For instance, a technical report was commissioned on the role of salmon enhancement facilities (hatcheries) and disease in wild sockeye, which made 37 specific recommendations. However, no analogous report was commissioned on the link between salmon farms and disease.

⁸⁰ An exception to this was apparent in the attitudes of various First Nations groups who expressed a desire to approach the issue from a “bigger picture” perspective and proceed from areas of common ground (discussed further under *Whose Knowledge Counts?*).

put people on their guard from the outset and provoke reactions ranging from defensiveness to outright hostility. Tension was also heightened by the reality of multiple parties represented by dozens of lawyers competing for access on a multitude of expansive issues, all within a limited timeframe. Consequently, counsel often expressed that there was insufficient time to fully explore the issues at hand (e.g., “Well, I have much more on this, Mr. Commissioner, but regretfully I’m out of time” [110825 p.15]) and engaged in ongoing horse-trading and negotiating around timing. An extended example may serve to convey the intricacy of such matters, as well as the iron-fist-in-a-velvet-glove rhetorical style that was common to much of the on-the-record exchange between counsel:

MR. BLAIR [BC Salmon Farmers Association]: Good morning, Mr. Commissioner, members of the panel. I was pleased to have Mr. Martland clarify what was going on when the Province was using more time. I wasn’t so pleased to hear him use the word "complicit". I would have thought he might have gone to "generous" but I guess either way, the Province has used some time.

I do just want to take a moment, Mr. Commissioner to speak about the sharing of time. I know that practice has been developed over the last several months and it has worked efficiently. I do want to say that I was allocated 50 minutes for this particular panel. The coverage of the key issues, key to my client’s perspective, have been well covered by Mr. Martland, Mr. Taylor and Ms. Callan. So I will take much less time as a result of that which is why I was in a position to be able to share so generously, or complicitly with the Province.

I do want to point out, however, that I think the way the process has developed is to the extent that I don’t use the 30 minutes I’ve been allotted, I made it clear to Mr. Martland that I think it’s an efficient use of the remainder time, if there is remainder, that I continue to be permitted to share it, and I would, in the course of events if there is time, with the federal government for reply. I think if there’s a need, if there is time for the federal government to be able to reply – many of these are their witnesses, and so that is my preference, if there is extra time left, that it go to the federal government for reply and not be otherwise allocated.

We’ve been told how we could share time, and I keep waiting for time to come my way. Hasn’t happened yet; I’m okay with that. Mr. Martland, that’s fine with you?

MR. MARTLAND [Commission Counsel]: It’s a hypothetical issue. Let’s wait till we get there.

MR. BLAIR: Thank you.⁸¹

This impact of time constraints and pressure for concision is worth considering further. I contend there is a symbolic violence at work here that marginalizes and disadvantages non-dominant perspectives and positions via the “naturalization” of orthodox accounts. Participants who posed a counter-hegemonic challenge to the assumption that salmon aquaculture is essentially safe (e.g., conservation groups and First Nations) tended to experience greater issues with time pressure than those who either reinforced, or at least did not directly challenge, such an understanding. Moreover, even if all parties are subjected equally to similar time pressures, their impact on how and in what manner voices and accounts are heard is not uniform. Whether presented directly or constructed through cross-examination, a “received view” will – by virtue of this very identity – require less explanation and justification than a narrative that challenges such an account. The weight of belief is already on the side of the former. In contrast, a subaltern narrative must overcome the “taken-for-grantedness” surrounding the hegemonic perspective and extended web of (largely unarticulated) assumptions, categories and relations that comprise the doxic understanding. In the face of such a challenge, resistance from witnesses and evaluators is high, requiring more extensive (and often more confrontational) cross-examination. The resulting increase in required time is likely to be all the greater when the issues are technical and necessitate considerable exploration of (or challenge to) background information or underlying principles, as was frequently the case. It was most acute when participants believed entire perspectives to be either entirely missing or wholly inadequately addressed, as was often the case with Indigenous viewpoints:

MS. GAERTNER [First Nations Coalition]: Sorry, Mr. Commissioner...[t]his is about scheduling for the remainder of the week. Mr. Martland has done his best on trying to divide the time going forward; however, I've got a difficulty tomorrow that I need to raise with you which is

⁸¹ In presenting my findings, it became apparent that the rhetorical-procedural nature of Commission cross-examination, as well as the sometimes holistic, iterative or gestalt subtleties of the emergent thematic content, at times call for the use of fairly lengthy exemplars to the end of a more complete appreciation.

the Policy and Practice Report for the regulation of aquaculture is almost silent as it relates to the First Nations and Crown relations around that and so I've got some work ahead of me to get things done so that you understand that relationship as best I can. Mr. Martland was only able to give me 20 minutes to do the work and I had asked for 90 and so I'm really in your hands. I just wanted to give you a one-up that tomorrow there will be a fair bit of pressure. (110829, pp.106-107)⁸²

Processual issues are again important here. While counsel may forcefully challenge witnesses during cross-examination, they are also bound by procedural rules, including the prohibition on leading questions – lawyers must be careful to avoid putting words in the mouth of a witness. Hence, meaning and intent may not be directly stated, instead merely implied. A frequently observed rhetorical/procedural technique was the incremental moving of a witness into a position where he or she could be seen either to be in agreement with the participant's position or where a contrasting position is demonstrated to be untenable. This can be a time-consuming process, depending on the degree of sophistication, rhetorical skill (or lack thereof) and hostility of a particular witness and/or lawyer, as well as the depth and intricacy of the deconstruction attempted. Given that the majority of witnesses represented the status quo around salmon farming, it is not surprising that opponents often had a more difficult time in this process and were more likely to run up against the limits imposed by the clock. As an example of how involved this process could be, in one instance counsel for the Aquaculture Coalition (Greg McDade) (after working with other counsel previously to secure additional time) attempted (by my analysis, successfully) to incrementally demonstrate through cross-examining the author of research purportedly showing that salmon farms have low disease mortality, that this research involves fallacious, questionable or arbitrary assumptions and conclusions – an exchange consuming some 44 pages of hearing transcript (110829, pp. 16-59).

⁸² It might be further noted that while the jurisdictional process is rationalized through chronometric scheduling, indigenous cultures tend to operate on more flexible and open-ended temporal understandings, the subordination of which is arguably another aspect of symbolic violence in operation.

2. Expertise, identity, and voice

As mentioned, the Commission relied heavily on the testimony of experts, and the demonstration of expertise was critical to establishing credibility. The designation of *expert* carries symbolic capital and the assumptions attending it – specialized knowledge beyond that of the “ordinary person,” neutrality, objectivity – mean that contesting an expert’s account is more onerous than is reinforcing it. Although there were challenges to the broad framing of expertise, particularly in regard to its power to exclude (as will be seen), the process of “certifying” a witness as an expert was enacted through a standardized and uncontested procedure. In what is perhaps a literal projection of symbolic violence, each witness’s c.v. was displayed and reviewed, and their level of scientific prestige thereby demonstrated in accordance with an implicit and predetermined evaluative scheme – one in which expertise is acknowledged through a tacitly understood accretion of credentials and markers of achievement within a dominant system of recognition.

The dominance of conventional science and expertise can be seen in the selection of witnesses at the Commission.⁸³ Given the challenges evident in understanding the ecological causation and the mechanics of pathogenic agents in the natural environment, one might expect that a pluralistic approach in which a range of viewpoints and worldviews are considered and significant weight given to the voices of those culturally and materially connected to the fish and their ecology – coastal communities, activists, fishers, fish-farm workers and First Nations – would have been adopted. Instead, while there was some presence from representatives of environmental organizations, the bulk of witnesses comprised government scientists, academic researches, bureaucrats, or industry representatives, a reality that reflected the dominant characterization of the issue

⁸³ I assigned classifications to witnesses who appeared at the hearings under consideration according to their general orientation toward salmon aquaculture as it is currently practiced, as evidenced through their testimony at the Commission (and in some cases material they produced for the Commission). Accordingly, there were 24 *proponents*, 5 *opponents*, and 3 of *neutral/mixed* orientation. A list of participants and their representation cited here can be found in in Appendix B, witnesses in Appendix C.

as a technical/scientific one, given to regulatory/bureaucratic solutions.⁸⁴ At the hearings bearing directly on salmon aquaculture – Salmon Aquaculture, Disease and ISA – no Indigenous representatives, community members, salmon farm workers, fishers or consumers⁸⁵ appeared as witnesses. The acceptance of a narrow understanding of expertise and the complete absence from the witness selection of “ordinary people” as individuals who may have valuable contributions to offer in favour of official experts is indicative of the operation of symbolic violence.

Also worthy of note was the complete absence of any head office executives or management from the salmon farming industry – the handful of multinational corporations that comprise more than 90 percent of the salmon farming production in British Columbia. Such individuals may have been able to provide much material information and perspective – around decisions to locate facilities in British Columbia, how (if at all) they view environmental concerns, what (if anything) they think should be done about them, and so on – something especially relevant in light of their power to direct and institute change. While I did not have access to documentation from the process by which witnesses were selected, given the near total absence of direct consideration of corporate structure and power at the Commission, I would suspect that attempting to have them appear never entered into consideration. Whereas other classes of

⁸⁴ By my classification twelve of the witnesses appearing at the hearings under consideration (Disease, Aquaculture and ISA) were government scientists/researchers, eight held government bureaucratic/manager roles, six were in academic research positions, two were industry representatives, two represented private research and testing firms (that provide services to industry), two represented NGO/advocacy organizations, and one was an independent scientist. These numbers and the underlying mutually exclusive categories are of limited value in themselves, however, as these categories were heavily interpenetrated. Most government scientists and government managers had significant previous or ongoing connections to industry, for example.

⁸⁵ Regarding putative human causes of sockeye decline, the Commission placed its attention on the production-side – salmon aquaculture, over-fishing, resource extraction, development. The absence of consideration of consumption is notable, particularly in light of the dominant response to environmental issues, which is to place responsibility for both the problem and its solution on the shoulders of consumers (as atomized individuals making sovereign decisions in the marketplace).

exclusions are naturalized through marginalization, this one is likely grounded privilege.

Expertise can be taken to imply neutrality, and hence to function as a bulwark against allegations of structural or intellectual bias or calls for more diverse representation. Consequently, NGO representatives who appeared as witnesses (along with an industry public relations executive, presumably providing “balance”) were assigned to a panel demarcated in a way that distinguished it from those populated with purely “scientific” experts. This was the only panel for which it was felt necessary to attach a qualifying appellation, “Perspectives on Management, Risks and Finfish Aquaculture,” the less authoritative and more subjective *perspectives* contrasting with the unqualified designation applied to the other aquaculture panels. (See 110907, p.1.) The implication would seem to be that a panel consisting entirely of scientists or bureaucrats working within, or who have established histories with, government or industry is not offering a particular perspective, only facts and knowledge.

As mentioned, no representatives of Indigenous communities appeared on the expert panels under consideration, and the efforts of the First Nations Fisheries Council to have an aboriginal perspective included in the Aquaculture Policy and Practice Report were unsuccessful. Compartmentalization was again employed, with aboriginal voices and aboriginal knowledge restricted to a separate panel (held early in the sequence of hearings), titled, *Aboriginal Worldview, Cultural Context and Traditional Knowledge*. Strikingly, the topic of salmon aquaculture was not taken up at this hearing. In this way, Indigenous knowledge was seen to be highlighted within the process but also framed as distinct and isolated from the dominant forms of knowledge – and not as a living way of knowing that might inform and integrate with other ways of understanding the world.

Power is naturalized – though not unchallenged: the composition of panels was raised directly and objected to by salmon farming opponents. For example, Greg McDade for the Aquaculture Coalition broached the matter before the panel on disease:

MR. McDADE: Now, gentlemen, let me turn to my questions. First of all, Dr. Marty, you're employed full-time as an employee of the Province?

DR. MARTY: Yes.

Q And it's your program that in part is under examination here.

DR. MARTY: Yes.

Q And, Dr. Sheppard, you and Mr. Swerdfager are full-time employees of the Government of Canada?

DR. SHEPPARD: That's correct.

Q And you were – when you were with the Province, it was your program that has been extensively examined here that you're defending?

DR. SHEPPARD: When I – during my employment with the Province of British Columbia, I managed the Fish Health Program, which is part of the assessment of animals within the Animal Health Branch.

Q And, Dr. McKenzie, you're a full-time employee of one of the fish farm companies?

DR. McKENZIE: That's correct.

Q And so I take it all you gentlemen are supporters of the status quo. Let me ask that question differently. Is there anyone here – there's no one here who's an independent expert from the government and the companies as to the structure here.

DR. MARTY: Maybe you should define "independent"?

MR. McDADE: I just want to make a statement, Mr. Commissioner, that the choice of experts for this important panel on disease is missing any expert who can comment in opposition to the current structure. But we'll work with what we've got, even if it's working with one hand behind our back.

The range of participants (as opposed to witnesses) was more diverse, perhaps reflective of the need (and/or genuine desire) to satisfy criteria of inclusivity or of the Commission as fulfilling a democratic function. Indigenous groups were present as both individual Nations and coalitions. Community interests were (arguably) represented by environmental organizations and associations, though ones that tend toward a formalized or professionalized nature (e.g., ENGOs with charitable status and staff rather than localized grass-roots organizations); grassroots and community activist groups did not appear at all – a situation that reflects further gradations of power. Again, salmon aquaculture workers had no presence, nor did local community members (as

community members).⁸⁶ Fishers had legal representation at the association but not individual level. In so far as the question of inclusion – who is understood as having “a substantial and direct interest in the matters investigated in the inquiry or portions thereof” (Commission of Inquiry, Rules for Standing, s. 11) – is a reflection of relations of power, basic material concerns also matter: appearing before the commission requires the resources to first become apprised of it, obtain legal representation, and then attend hearings.⁸⁷

Beyond the issue of who gets to speak was who gets to speak for whom. While indigenous participant organizations were successful in raising challenges to dominant understandings and framing of topics, it was non-indigenous experts who spoke to indigenous issues, arguably reproducing the paternalist attitudes of settler society. Counsel for the First Nations Coalition (Brenda Gaertner) expressed a forceful objection to the omission of indigenous witnesses,⁸⁸ noting also the minimal time allotted to First Nations for cross examination and that

it was offensive to hear members of the panel asserting that they understood First Nations issues and that they could explain those to you [the Commissioner]. It's not appropriate in this inquiry or otherwise for anyone other than First Nations representatives to be providing to you their perspectives on these issues. (110908, p. 90)

She continued:

We spent the evening last night considering our options. We are proceeding with this panel. We're going to proceed with our 15 minutes. We're going to do our best as we can, but it is difficult. It is extremely difficult to operate under this situation and so we needed to let you know that and to let you know that there has to be room at the table for First Nations on these issues. And this is an example where the conflict might just be too much for people. There may not be a single issue or a single perspective for First Nations but that does not mean that they are not part

⁸⁶ “Communities” were indirectly referenced regarding socio-economic impacts of declining fish stocks, and workers even more indirectly in so far as economic impacts of declining stocks were discussed.

⁸⁷ Whereas the Commission held public forums at various locations around British Columbia, evidentiary hearings, which formed the basis for Justice Cohen's final report and recommendations, were held entirely in Federal Court in downtown Vancouver. Transport and accommodation costs for someone travelling from one of the primary salmon farming areas, all of which are to varying degrees remote, would be considerable.

⁸⁸ This position was also supported by the Heiltsuk Tribal Council.

of this table and they need to be. And they need to be heard and you need to hear it from them directly. (110908, pp. 90-91)

Nonetheless, First Nations and other opponents were able to make their voices heard – despite vociferous opposition and in some cases highly personalized attacks. In this regard, the Commission did function as a forum in which dominant frames were subject to challenge, some of which are discussed herein.

While the defining and labelling and subsequent temporal and physical ordering of voices was the first means employed to control and limit input into the process, my primary concern here is with the specific meaning of that which was said, its interpretation and relation to the construction of knowledge. It is these thematic areas that will be taken up next.

B. Epistemology, Science and Policy

As with other agri-industrial processes, salmon aquaculture exists within a larger web of ecological systems, which it disrupts while remaining dependent upon as a source of inputs and a sink for the absorption of externalities. The process of production reconstitutes the natural environment – reconfiguring food-webs and the interactions between organisms, redirecting thermodynamic flows – while at the same time remaining wholly reliant upon it. Causality in such a system is stochastic, based in the non-linear complex interactions of a multitude of relevant variables (Sugihara et al., 2012). Hence, the decline in British Columbia's indigenous salmon populations can be traced to over-fishing, the destruction of habitat by logging, aquatic pollution, the construction of hydroelectric dams and other development activity, climate change (leading to marine and river temperatures and changing snowpack-melting patterns), and even salmon enhancement efforts⁸⁹ – all apart from the direct influence of salmon aquaculture (Hume et al., 2004, p. 123).

⁸⁹ The role of hatcheries in spreading of disease and “genetic dilution” of wild stocks is a contentious one and was also taken up by the Commission.

Moreover, the salmon life cycle and factors influencing salmon population are not well understood and epitomize interactive multi-causality. (See, for example, Arkoosh et al., 1998.) It is clear from the great variability in annual salmon returns that variations in ocean conditions have a profound impact, but any attempt to specify precisely what those changes are is still largely speculative. (See, e.g., McKinnell et al., 2011) Localized impacts – declines of individual runs, for example – may be more clearly linked to proximate causes, yet even at the micro-level, a network of variously enmeshed and interactive factors is at play. These challenges throw into question the Commission’s uncritical reliance on reductionist science as the epistemic frame for both broaching the question of what is happening and determining policy;⁹⁰ through various epistemic elisions grounded in symbolic violence they also, I argue, create opportunities for the furtherance of the salmon aquaculture industry. The extent of this epistemic “failure” as manifest at the Commission hearings and the mechanisms by which it serves the status quo in regard to salmon aquaculture are taken up next.

1. The ocean of the unknown

The essential question that the Cohen Commission addressed – what is happening to the Fraser River sockeye and why? – is one of extraordinary scope. (See Appendix A.) And while the evidence that was marshalled, interrogated and propagated in the service of formulating an answer ranged across multiple discourses and comprised a wide array of truth claims, from the distinct and incompatible to the rhizomatically interwoven, it was also limited and shaped in distinct and definite ways. In the dynamic through which knowledge claims are accepted or rejected – or, more fundamentally, recognized as claims to knowledge at all – the negative, what is *not* known, can be as important in

⁹⁰ Wynne and Mayer (1993, p. 34) use the interesting and important example of the immune system and the causal web of genetics, diet, environmental pollution, socio-psychological trauma and stress that together construct *immunity* to show how a reductionist approach to such complex systems can render causation invisible.

shaping attitude and behaviour as what is. As Stocking and Holstein (1993) show “scientific ignorance, no less than scientific knowledge, is socially constructed through a process of claims making” (p. 188). Ignorance is not just the absence of knowledge. How the negative space of ignorance is represented, configured, maximalized or minimalized, in turn reflects the status of credibility of corresponding claims to knowledge (Stocking and Holstein, 1993). Ironically, in the discourse of salmon ecology as applied to fish farms, the negative knowledge that emerges through the failure of the predominant positivist reductionist approach in evidence at the Commission only ensures its continuing hegemony and the marginalization of other knowledge claims.⁹¹ The maintenance of this *uncertainty* requires the exclusion or marginalization of other ways of knowing, in particular of Indigenous knowledge – which includes extensive first-hand accounts of fish suffering from disease, lesions, and sea lice.

Perceptions of science as a hard-nosed, rigorous and objective process leading to a comprehensive understanding rooted in clear fact occlude the reality of narrative construction based on limited data of uncertain meaning. The dearth of research on wild fish and the resulting significant unknowns are discussed directly at various points within the Commission proceedings, including at the outset of testimony by each author of the two technical reports on disease written for the Commission (Dr. Kent and Dr. Stephen) (110822, pp. 11-16).⁹² Moreover, as we will see, there is direct recognition that in many ways the dominant methodologies themselves are ill-equipped to provide the answers sought. And it is worth beginning by considering the sheer vastness of the ocean of the –

⁹¹ Of course, considered broadly, science as a practice is in reality not monolithic and fixed. Across the natural sciences, methodological, and even epistemological, differences are apparent. As we shall see, the conceptualization of the nature, methods and objects of science becomes critical to the construction of environmental risk and the management of economic development within in a capitalist political economy, where, I argue, that various types of misrecognition are at play.

⁹² I reference hearing transcripts using the same six-digit code that was employed at the Commission: the first two digits represent the hearing year, the next two, the month, and the final two, the day.

scientific – unknown that the forum served to highlight, as well as some of its implications for managing or protecting wild fish.⁹³

(a) Art and fiction in the black box

As one witness stated, “we don’t know the details of how each ecosystem works and people say [ecosystem-based management] is not rocket science and it isn’t. It’s way more complex” (Bevan [Associate Deputy Minister, DFO], 101101, p. 85).⁹⁴ This complexity and subsequent lack of knowledge persists at the species-level. For salmon, it seems that the majority portion of their life cycle that is spent in the ocean is largely a black box – even a “black hole” (110906, p. 58). Basic aspects, including where in broad geographical terms the salmon reside, remain at the level of educated guesses. One researcher (Dr. Welch) referred to the determination of the movement of post-smolt salmon in the North Pacific as a process “where science...meets art,” a “best guess” and a “lovely work of fiction that fits the very thin amounts of data that we have, but I don’t think is necessarily appropriate or correct for Fraser River sockeye or possibly...any stock of sockeye salmon” (101025, p.42). The picture is further complicated by the fact that salmon populations actual consist of genetically distinct “stocks” that exhibit individual patterns of behaviour and considerable variability in susceptibility and resistance to pathogens.⁹⁵ And, while the aggregate population has suffered a

⁹³ It is important to make clear that, while some engagement with them on their own terms is inevitable, my analysis is not an attempt to reproduce, expand or even directly critique the analysis or opinion of the experts who appeared before the Commission. Instead, my intent is to employ the dataset they comprise to begin to uncover the subjective, social and structural conditions of which they are a part.

⁹⁴ Titles of individuals are those as they appeared in the Commission.

⁹⁵ The multiple life-stages of salmon spent across multiple environments complicates the picture still further. For example:

[All Fraser River sockeye] begin life in freshwater, grow to maturity in the North Pacific, and return to freshwater to spawn. However, some spend one to two years in nursery lakes while others do not; some migrate out through the Fraser River in days while others spend several months in the estuary; some migrate north through the Strait of Georgia while others migrate south through Juan de Fuca Strait; most return to their natal streams to spawn in their fourth year while others do so in their third or fifth year; and some move directly from the Strait of Georgia into the Fraser River while others hold off at the mouth of the river for four or five weeks before moving upstream. Fisheries managers also

decline, individual stocks have varied considerably, with some continuing to thrive and others declining precipitously. These changes may – or may not – reflect an underlying cyclical pattern of productivity (Cohen, 2012b, pp. 21-22).⁹⁶

Multiple witnesses testified as to how, when it comes to measuring the impact of disease in this context, the challenges are particularly acute. Dr. Kent (Microbiology and Biomedical sciences, Oregon State) pointed to two methodological issues that come into play. One is that the protected nature of salmon species limits sample sizes and hence the robustness of the resulting study. The second, and more significant, is the difficulty of ensuring that the identity of a population is stable across time. In addition to the practical difficulty of measuring a population, this challenge also involves the epistemological issue of defining what that population is, something that relates in part to the nature of the salmon life-cycle: salmonids begin their lives in freshwater subpopulations, which merge into one smolt population, and then move into the ocean. Dr. Stephen (Director, Biotechnology and Aquatic Animal Health Sciences Branch, DFO) asks, rhetorically:

How do you calculate a rate when you can't find the underlying population? Rates require you to know the denominator of the population, as well as the numerator over time. And we know that sometimes the way we capture fish creates a bias in the numerator and how we see the

group returning adults according to four run-timing groups, depending on when during the summer months they begin their return migration. (Cohen, 2012b, p. 21)

⁹⁶ Dr. Stephen draws an interesting comparison between salmon and human populations that references social variables and evokes geographic and social ecological theories of human behaviour:

DR. STEPHEN: [Y]ou've asked the difference between species. I think you just have to look outside our windows here and look at the difference between the same species of people and different life histories, different challenges, different patterns depending on where you live, your socioeconomic status. Similar things happen in animals, so even within one group of sockeye salmon, depending on where they reside in the lake, I think there was some work done by Leo Margolis years ago where if you caught Kokanee at one depth versus another depth, they'd have a different parasite suite because they're looking at different parts of the food chain.

Now add on the fact you have different species, I don't think you can assume that their ecologies are the same, so their timing of their exposures, their susceptibilities and their capacity to handle those would be the same. And now when we go out to other species, whether it's sturgeon or river otter, that complexity gets even more abundant. (110822, p.59)

population creates a bias in the denominator. ...[T]here are significant methodological challenges, not just in the diagnostic tests but in how we actually access, follow and track population to get those numbers. (110822, p. 106)

In comparing a hypothetical wild salmon epidemic to a human one, the former head of Fish Health for DFO (Dr. Kent) points out a fundamental difference:

[T]he big problem, the big difference would be is if it's a disease like an acute viral disease...we'd have dying humans, or sick humans at the hospital that we could document....Unfortunately in the ocean when a fish dies, it just disappears. And so we don't have the opportunity...to find dying fish. They're just not available.... Dying sockeye salmon out in the ocean would be very difficult to encounter. In fact...in my opinion, you could have conceivably very large numbers of fish dying, due to a new viral disease or other pathogenic phenomenon, and not detecting it. (110823, p. 106)

In fact, the irony is that because of the problem of disappearing fish, the more severe the impact of any particular pathogen, the more difficult it is to investigate. As Dr. Stephen put it, "if you had increased mortality in a population, infectious disease would be impossible to investigate" (110823, p.88).

The in vivo research challenges in freshwater, while not presented as quite so daunting, are still significant. Observing mortality is possible in this environment though in practice often still methodologically problematic. As one researcher stated, "when we have...the Fraser River watershed the size of Germany, there's a lot of places which are terribly inaccessible, and we simply don't have the people on the ground to make those sorts of observations" (Dr. Johnson [Aquatic Animal Health, DFO], 110822).

In either setting, it was noted how population surveys that are completed face problems of generalizability. A suite of pathogens found in one stock, for example, may be quite different from that present in another.⁹⁷ A refrain heard from multiple experts on disease was that there is high variability in pathogen-load across time (spawning year) and space (geography, systems and sub-

⁹⁷ Many pathogens have life cycles that involve intermediary hosts. The distribution of these hosts – rather than of the salmon – is often what determines the distribution of the pathogen (Kent, 110822).

populations) and that explaining, much less predicting, these variations remains largely beyond the purview of current science. For example:

DR. JOHNSON [Head, Aquatic Animal Health Section, Pacific Biological Station, DFO]: Again what it shows is that within any of these systems ... the prevalence of IHN [a viral disease] in adult sockeye can range widely from, you know, zero percent up to, I don't know, what's the highest, 52 percent in some years. And there's really no discernible pattern over time. (110822, p. 29)

Thus, even if an accurate snapshot of a population at a particular time is obtained, its predictive value is minimal. The complex non-linear interaction of multiple factors that underlies variability is also enmeshed with methodology.

Again, separating the ontic from epistemic proves challenging. For example:

DR. JOHNSON: ...I think that all of these field studies are going to be somewhat influenced by the time that when these samples were collected. So, I mean, these studies have been done year after year. They go on a field trip to the river, and the field trip is, you know, timed to try to capture the same portion of the run every year. But basically some years the fish are early, some years they're late, and so you may be capturing – it's not to say that these prevalences are set in stone. So if you go and the fish have just arrived on the spawning grounds, you may find ten percent. If you go back after they've spawned, or just prior to their spawning, that could have increased, or it could have decreased, if those individuals that are carrying the virus fell out of the population.⁹⁸ (110822, pp. 29-30)

The difficulty of studying salmonids in their natural environment is one reason why research has largely focused on captive populations, originally in hatcheries and, more recently, fish farms. In contrast, research on the impact of disease at the population level in has been very minimal.

⁹⁸ Issues of consistency in measurement also apply to the object of study directly. For example, in regard to programs to measure sea lice infestation:

DR. JOHNSON:...We also need to know what we actually want to measure and the appropriateness of the types of measurements that we're doing. And we need to have a consistent and proven mechanism by which we report on, say, the numbers of pathogens present. There's a variety of ways that you can do it. But it needs to be something that you can compare. And we've also talked about that -- how in this case we talked a bit about how the age structure, just because you have a sea louse on a fish doesn't mean that it will have the same impact -- well, the different developmental stages of sea lice and the host have different levels of impact. (110822, p.72)

(b) The limits of the lab

Whereas problems of internal validity may be less prevalent in the laboratory than in the field study, witness testimony revealed how challenges related to external validity loom large. Salmon are highly sensitive to environmental conditions. Thus, the extent to which it is possible to generalize from a highly artificial setting in which conditions such as water quality and temperature,⁹⁹ food sources and pathogen exposure are all tightly controlled, to the natural environment, in which multiple factors vary and interact, is significantly limited. As Dr. Johnson testified, generalizing to an environment “that varies widely and has a significant impact on the fish and how they respond to these pathogens” is “the major challenge” (110822, p.13).¹⁰⁰ The nature and consequences of disease in the natural environment are highly variable and complex. While an in vitro study will typically examine the impact of one particular pathogen under controlled conditions,¹⁰¹ in vivo that organism will act as one part of a range of pathogens and other environmental variables (such as water quality, chemical pollution, and water temperature), which cumulatively impact the health of any particular fish at any particular time. In the wild, a fish may carry a pathogen but manifest no symptoms of disease until stressors reach a sufficient cumulative level.¹⁰² In fact, clinical signs of the associated disease may never be apparent, yet the added

⁹⁹ As cold-blooded animals that spend their entire lives immersed in water, fish are particularly sensitive to changes in water quality and temperature.

¹⁰⁰ Research has been further inhibited by the fact that sockeye are very difficult to maintain in a laboratory environment, a further indication of the artificiality and difficulty of obtaining information from a wild animal in under research conditions far removed from the ecological and environment setting that is its habitat (Johnson, 110822).

¹⁰¹ As Johnson puts it, “I think to date the vast majority of the research that’s been done on diseases of fish has been related to a specific pathogen. I cannot think of any papers off the top of my head where they’ve actually studied multiple infections in fish” (Johnson, 110822, p.16).

¹⁰² Alternatively, conditions in the laboratory can themselves lead to the expression of disease that may not occur in the wild. The act of relocating fish into a laboratory environment was also identified as a stressor, for example:

DR KENT: I guess the other problem with sockeye is they often have IHN, which when you bring them into the laboratory can cause problems in the laboratory environment, just simply through the stress of them being taken from the river and then contained in tanks. (110822, p.33)

stress caused by that pathogen can still contribute to mortality. Conversely, a fish may be sick but not have any apparent signs of disease. The diagnostic picture is further complicated by the reality that differing diseases can manifest similar symptoms. Even the classification of an organism as a pathogen is not necessarily clear-cut. An organism may be ubiquitous but harmless under normal conditions, only becoming pathogenic under particular circumstances.¹⁰³

The fundamentally different manifestation of disease and cumulative impacts in vivo from in vitro has implications for efforts to determine the impact of disease in salmon farms on wild fish. A condition that is chronic in farmed fish, producing an emaciated but marketable salmon, will likely prove deadly in the wild, where the disease is likely only one of many cumulative stressors to which a fish is subject.¹⁰⁴ A sick fish is easy prey for a predator and therefore unlikely to be included in a study sample. At the Commission, the phrase “death by a thousand cuts” was used to describe the plight of wild sockeye and the cumulative stressors visited upon the fish (110818, p. 2). But the impact of salmon aquaculture may be manifest beyond the simple addition that this expression suggests.¹⁰⁵

A practical import of the reality of cumulative impacts and the complexity of health and disease is that monitoring at fish farms should focus on fish *health*,

¹⁰³ In humans, giardia is an example of a well-known organism that acts in this way.

¹⁰⁴ These include interactions between diseases and between diseases and the environment. As Dr. Stephen describes them

[t]hese are hugely complex on some levels when you're getting down to mechanisms, and we're only talking about the interaction with pathogens and pathogens. You're not looking at interactions of pathogens with pollutants, for example....And the question of complexity comes back to describing individual mechanisms of disease versus population impacts. So I absolutely agree these are complex systems and I just wanted to make the addition that it's to our detriment if we only think about pathogens in these sorts of equations. (110822, pp. 63-64)

¹⁰⁵ In fact, at the Commission Miller stated that her lab was starting to get positive results for HSMI, a further disease of significant concern that first emerged from fish farms in Norway. Research now indicates that Heart and Skeletal Muscle Inflammation (HSMI), a disease that has caused serious impacts to salmon aquaculture across the globe, is caused by piscine reovirus, a virus identified in BC farms. Interestingly, Dr. Kristi Miller's epigenetic research indicates that the virus becomes activated under conditions of stress, conditions such as those that salmon returning to spawn would face. While farmed fish can often recover from HSMI, for wild fish it may be the straw that breaks the salmon's back, so to speak, and would be consistent with the large pre-spawn mortality seen in the 2009 sockeye returns.

but instead focuses on disease, and, in particular, on mortality. The failure to think holistically was a recurring issue at the Commission. An example raised is the historical interest in “the bug,” rather than “the fish,” reflective of the traditional bias toward the dominance of the reductionist model of science that examines causal agents under artificial and isolated conditions:

I think it’s a combination of a methods issue and a historical approach issue. I mean back in the history of fish disease, the fish sort of didn’t count in some ways and most of them were interested early in just getting the bug and describing the bug. And fish tend not to be like a dog or a cat or a human, looked at in sort of that value of the individual. So they’re more like poultry farms where the same thing, they euthanize some chickens and they can get now a more comprehensive suite of diagnostic tests. They can get the physical exam. They can get the bacteriology, the histopathology in a larger suite. So part of it, I think, reflects the history of practice and the way they can access samples. (Stephen, 110823, p. 106)

A focus on “the bug rather than the fish” – and, by extension, I would argue, rather than the ecology – is emblematic of the limitations of making decisions regarding salmon aquaculture solely within a positivist framework. Pushed to its logical endpoint, the reductive process goes even beyond the fish as unit of isolated analysis.¹⁰⁶

(c) The response to methodological limits

In some instances, the reality of such limitations was presented at the Commission as spurring something of a paradigm shift. In fish stock management, for example, a recognition of ecological causation within a model of *ecosystems-based management* (EBM) has become the received view, for example. Consider the following eloquent statement from a DFO senior manager (Bevan):

We don’t know the details of how each ecosystem works and people say it’s not rocket science and it isn’t. It’s way more complex. Rocket science is Newtonian physics. You have – you have an equal and opposite reaction and so on and we have a situation where the web is so complex it is very difficult to understand; therefore, you can’t push it. You can’t take

¹⁰⁶ It also points to how the totalizing commodification of farmed salmon, such that concern for the individual is wholly absent, carries into the mechanisms of disease assessment and study.

huge risks with it. You've got to be cautious and you've got to understand that you don't know. And I think that's one of the huge issues in the past, we assumed we knew. We assumed we knew how much fish was there. We assumed we knew that if you've harvested at a particular fishing mortality, the fish could be maintained at maximum sustainable yield. And that presupposes a stable state in the ecosystem, so we assumed the ecosystem was stable, constant, and the only variable that we needed to control was the fish harvesting and we assumed, as I said, that we knew with some degree of certainty the population. And we didn't know the population with that level of certainty and we certainly didn't understand how that population was reacting in the ecosystem and we've paid the price for that hubris. (101101, p. 85)

Yet, in practice, *management* within the complexity of an ecological system may be as – or perhaps more – hubristic a goal than management of a stock in isolation – as now assessment of the non-orthogonal, multi-variate complexity of the eco-system itself becomes the basis for decisions.¹⁰⁷ Consequently, it may devolve to little more than rosy-sounding rhetoric. On the stand, a senior DFO manager was forthcoming as to the practical difficulty entailed:

MR. SWERDFAGER [formerly Director General, Aquaculture Management Directorate, DFO]: I continue to experience great difficulty with the concept of ecosystem-based approach to management.... I think that the idea has tremendous theoretical allure, and I think to build an argument against it is probably difficult. I think that the idea of integrating multiple variables, multiple aspects of the ecosystem, understanding it on a broad-based multi-disciplinary scientific perspective makes an awful lot of sense.

Translating that into specific management decisions and actions is much more difficult. Typically, many of the licensing decisions, for example, or allocations, or when I used to work in the Wildlife Service harvesting allocations and so on, are binary issues. They're yes or no. It's very difficult to translate that necessarily into broad-based ecosystemic approaches.

So I apologize if this sounds smooth, but making the transition between the concept of ecosystem-based approaches into direct management action is a challenge. So I endorse the general concept, but with reservations about how to make it real.¹⁰⁸ (110831, pp. 111-112)

¹⁰⁷ To be clear, I am not saying that the goal of enacting policy based on assessment that attempts to account for a broader set of impacts and interactions is in principle a bad idea: it is certainly preferable to not doing so.

¹⁰⁸ Swerdfager goes on to say that if "it remains as focused as possible on aquaculture" such an approach could work but that

[i]f, by contrast... we start to say, okay, where does aquaculture fit in the context, for example, of forestry development, fisheries allocations, mining activities, et cetera, et

I argue that the language of EBM is embedded in the biopolitical apparatus that facilitates the reproduction and expansion of salmon aquaculture through a discourse of sustainable development. Like the *precautionary principle* (or *approach*)¹⁰⁹ – the doctrine that in the face of uncertainty as to harm activities likely to pose a significant risk to the environment should not proceed unless they can be shown to be safe – which also has become firmly entrenched within the bureaucratic language of DFO policy, its application, reveals a remarkable semantic flexibility – characteristic of the master category of sustainability itself: Sustainability in what form? Across what geographical, locational and temporal scales? In practice, such discourse appears to play a “motherhood” role, offering a positively-inflected green cover for policies and practices that fail fish and their environment. In fact, simplifying ecosystems and reducing biodiversity could by some measures *increase* sustainability, as less specialized and more adaptable species are favoured (Smil, n.d.). Moreover, when research is undertaken in the cause of EBM, it may simply contribute to the ever-widening epistemic gyre. As Michael (1995) explains:

More information provides an ever-larger pool out of which interested parties can fish differing positions on the history of what has led to current circumstances, on what is now happening, on what needs to be done, and on what the consequences will be. And more information often stimulates the creation of more options, resulting in the creation of still more information. (p. 473)

Applied to the complexity of eco-systems, the combination of informational and terminological openness makes for a vast array of plausible options and outcomes that are compatible with the continued operation of the industry as

cetera, et cetera that some people may feel, as part of the ecosystem-based approach, that will not work."

I am confident that we will be able to take a systems-based approach on the aquaculture scale, though.

The issue, of course, is whether an approach that excludes consideration of the impact of all activities beyond the one in question remains eco-systems-based. (110831)

¹⁰⁹ DFO prefers *approach*. This terminological variability in itself reveals the semantic flexibility in the employment of the concept. In general, the choice of *precautionary approach* over *precautionary principle* reflects a more flexible and less prescriptive interpretation, such that accommodations to potential harms or risks – rather than the proscription of activity altogether until safety can be shown – are seen as sufficient.

usual. At the same time, the gold standard for evidence in the research context – in reality, the only acceptable standard for actionable evidence – remains a positivist experimental methodology that (historically, at least) has been unable to meet its own epistemic threshold.

Within the dominant scientific frame there were also challenges to the idea that accurate assessment of wild populations will always be limited, however. For example, asked whether it is possible to get “the same quality and quantity of information from wild stocks,” Dr. Korman (Fish Ecologist, Ecometric Research) asserts:

I think the fish could be sampled when they’re – during the test fisheries as they are for genetics that there could be a disease profiling done on that. I don’t know what the costs are, whether the Department can afford it, but...

[...]

You’re not going to be able to sample the same fraction of fish just due to the magnitude of the runs and the cost of individual samples, but that’s not to say that you couldn’t develop a statistically representative sample of those populations. (110829)

More fundamentally, opponents of salmon farming argued that the complex and cumulative factors that result in mortality in wild salmon could come to be understood if the right holistic and ecologically-grounded approaches were adopted. At the Commission hearings, Gaertner made the case that the en route and pre-spawn mortality of Fraser River sockeye salmon are indicators or potential indicators of increased susceptibility to pathogens and disease and that in this context epigenetic work of the type undertaken by Miller represents an approach that may prove particularly illuminative. Such developments should be situated in the context of the ideological function of the *Ocean of the Unknown*, one in which adherence to a reductionist conception of rigor in the face of failure functions to legitimize the expansion of the salmon aquaculture industry. Despite inherent methodological challenges, much vital knowledge is missing not because it is inherently undiscoverable but because the initiatives to conduct the requisite basic research are simply absent. Researchers at the hearings did

outline some of the basic research that they felt should be carried out.¹¹⁰ A prominent theme in the data was captured in the refrain heard from researchers on all sides of the issue that “more research is needed.”¹¹¹ This, of course, is a methodological trope of science, one which suggests both its epistemic conservatism and its need for self-reproduction. Given the state of knowledge, it is also undeniable. The larger point, however, is that failing to provide for that research while simultaneously requiring it as a prerequisite to action ensures that nothing will change (while providing pro salmon farming claims makers a rhetorical out when pressed). I take up the implications of this next.

2. Uncertainty as a green light

While a reductive paradigm of linear efficient causality may be poorly equipped to assay the destabilization and damage wrought by salmon aquaculture, testimony at the Cohen Commission demonstrated how elision between this positivistic conception of scientific certainty and the appropriate epistemic base from which to derive sound public policy has functioned to further the industry. Ironically, the precautionary principle is stood on its head as *failure* to meet a stipulation of absolute certainty as to harm serves to license the continuation and expansion of harmful activity.¹¹² Through the operation of symbolic violence, the relative

¹¹⁰ Dr. Welch who testified (twice) at the hearings went so far as to outline a proposed study and submit it as a public submission to the Commission. Analyzing data from acoustically tagged sockeye smolts, Welch found that survival rates were much lower in the (salmon farm laden) Discovery Passage/ Queen Charlotte Straight than in the Straight of Georgia. Welch and colleagues proposed research testing the effect of fish farm exposure on smolt survival in the Discovery Islands. Other recommendations for direct research on the impact of fish farms included the expansion (and repetition once data for more years are available) of the analysis performed by Connors on the correlation between disease outbreaks on farms and wild salmon productivity, discussed below.

¹¹¹ For a summary of some of the wide-range of research gaps identified by witnesses at the Commission, see Cohen, 2012b, pp. 69-71.

¹¹² The precautionary principle/approach is a normative concept, one that is controversial as to its formulation. Some versions, for instance, hold that, in the face of uncertainty, development should cease and only to proceed if and when safety can be demonstrated, others state that evidence of (potential) damage only requires the implementation of reasonable mitigation measures. As we shall see, its interpretation and implementation are inherently political processes, subject to negotiation and contestation among claims-makers – with powerful economic actors often having an incentive to see the principle either abrogated or watered down to the extent that it provides

paucity of scientific research on the impacts of salmon farming and the difficulties resulting from the unreasonable epistemic demands placed upon that which has been undertaken – consider again, for example, the reality that, in an ecological context, the greater the mortality in wild fish, the less evidence of it there will be – foster a de facto assumption that continued operation and presumed expansion is the norm. The onus is placed on opponents to conclusively demonstrate why development should be abrogated or checked and to do so according to the dictates of predetermined hegemonic frame. Uncertainty becomes a green light, thus revealing the overriding presumption in favour of development: capital has the “right” to operate (and expand) as it sees fit, and it is only where destruction is particularly glaring can countervailing measures even begin to find purchase.

This theme was widely present in much testimony, and many exemplars could be offered. A direct and succinct one is found in Ms. Gaertner’s cross-examination of Dr. Dill (Biological Sciences, SFU) in regard to the use of underwater lights at salmon farms, which reveals this principle directly in operation in the legislation regime. The official rationale for lighting salmon farms is to accelerate the growth of fish, but First Nations and others have long-thought that the underlying motive is that the lights attract wild fish into the pens, which the salmon then eat – thereby saving the farmers money on feed. Here Dill agrees with Gaertner that the draft regulations on this issue directly invert the precautionary principle:

- Q If I can go to the bottom of page 2, this is one of those, you know, reversals again. Apparently, as I read this paragraph:
There are currently no measures in place and there is no direct science to advise that lights are a concern and require management measures. Therefore, there are no specific measures at this time for incorporation of indicators...

Would you agree with this approach from a precautionary perspective or do you agree that we might want to take some steps?

DR. DILL: I think it’s exactly backwards as written. The fact that there’s no direct science to advise their concern is simply because there’s

little or no real impediment to development activity. (See, for example, Vanderzwaag, 2002; Chalifour, 2009.)

been no science done. (110829, pp. 96-97)

Another example is seen in regard to DFO's decision upon assuming jurisdiction, following the *Morton* decision, for the regulation of salmon aquaculture to grandfather all of the existing provincial license for all farms with no changes to license conditions. This despite that many of these original grants were made as far back as the 1980s, with no consideration of impacts to wild salmon and before much of the jurisprudence around the Crown's constitutional obligations in regard to consultation with First Nations was established.¹¹³ DFO management (Ms. Dansereau) testified that in making this decision there was no need to undertake new analysis or reconsider siting decisions because DFO had been involved in past siting decisions and because "there's no threat at this point, or there's no threat that we are completely aware of" (110928 p. 40) – a concise example of how the less that is known, the more that can be done.

In revealing testimony, Ms. Mia Parker (former Manager, Regulatory Affairs, Grieg Seafood), construes the precautionary principle explicitly in this inverted form:

Up on the screen is the declaration on the precautionary approach from Rio 1992. The precautionary principle is, I think, very elegant, because it doesn't say when in doubt, don't. It says in the absence of scientific certainty of risk, proceed cautiously and put measures in place as though those risks exist and deal with them. So I feel like it's a really elegant connection between risk-based management and adaptive management. So you have a scientific risk assessment that says there's potentially risk here. We can't guarantee there's risk, we definitely can't guarantee there isn't risk. So let's put measures in place as though the risk exists. Let's collect information, let's do more research, and then let's adapt those measures that we put in place. (110907, p.26)

At least as it is understood by environmentalists and those who believe it should have real force, the precautionary principle *is* in fact taken as saying, "when in doubt, don't." More precisely, it holds that if there is reason to believe there is

¹¹³ DFO initially short-term granted licenses for one-year "to provide further opportunities for consultation with First Nations," (Cohen, 2012a, p.394) but subsequently renewed them for multiple year terms, with conditions unchanged.

risk, one should refrain until it is clear that proceeding would not cause harm.¹¹⁴

Parker continues:

So if you look at something like the one-kilometre setback from a fish-bearing stream.... So was there any knowledge that one kilometre was enough or too much, or that there was a definite risk there? No. But they applied the precautionary principle and put that setback in place.

MR. BLAIR [BC Salmon Farmers Association]: Ms. Parker, can you indicate whether or not that siting restriction, as you've called it, of a kilometre, is that an example of the application of the precautionary principle by industry or by the regulators or by both, and if you can just give us a sense of if it was applied, when it was applied relative to the commencement of the salmon farming industry?

MS. PARKER: Well, it's actually a principle that's applied by both the regulator and by industry. Originally when it was applied, there was a two-tiered approach so that there was a one-kilometre setback from "significant" streams, and a smaller setback for streams that were rearing habitat only. But that's a fairly esoteric decision to make, so the industry defaulted to just using a one-kilometre setback. It's simpler and it provides the maximum amount of protection without any haggling over what does "significant" mean. (110907, pp. 26-27)

I aver that establishing an arbitrary parameter as the basis for siting decisions – and hence for the reproduction and expansion of the industry – in the face of an what is a real but unquantified risk, does not signify the implementation of the precautionary principle, but its negation. Nonetheless, this in itself demonstrates the semantic plasticity – as grounded in uncertainty – that the principle can be made to exhibit in practice.

¹¹⁴ This inversion is facilitated by the fluid and shifting way that “risk” is construed (a topic taken up more directly below). What would the “absence of scientific certainty of risk” to which Parker refers actually mean? How does a “scientific assessment of risk that says there is “potentially risk,” differ from a scientific assessment that shows “actual” risk? The only way to meaningfully draw a distinction would be were the latter referring to a fixed probability (the chance of rolling of a six on a die), but ecological risk will rarely if ever satisfy such criteria.

(a) *Weaponizing doubt and the radical implications of “conservatism”*

The irony is not merely that of how an ostensible demand for rigour within a narrowly defined frame diminishes, rather than enhances, our understanding, but how this absence of knowledge becomes the basis for a very non-epistemologically cautious business-as-usual. Hence, in the face of evidence of harm, defenders of the status quo (primarily, the BCSFA, Canada and the Province of British Columbia) were able to “reasonably” cleave to a contrary position and, in effect, make use of a time-tested public relations strategy employed most notoriously by the cigarette manufacturers and more recently by the fossil fuel industry. Here, the aim is not to refute the claim that cigarettes cause cancer or that human carbon emissions cause climate change but only to convince the public that the issue is unresolved – for doubt usually sides with the status quo. Cox (2006) refers to this rhetorical tactic as a trope of uncertainty:

In a sense, the trope of uncertainty is an attempt to reverse the assumptions associated with the precautionary principle. Whereas the precautionary principle stresses the need to err on the side of caution before human or corporate actions harm the environment or human health, an appeal to uncertainty or a call for further research turns this caution against scientific claims themselves. (p. 34)

Despite that this challenge is at odds with the front of certainty ascribed to science, the rhetorical power of doubt can be framed as consistent with the epistemic conservatism of “good” science. And unlike with climate change or cigarettes, in the case of salmon farming there is no regulatory establishment (or international panel) inclined to sound the alarm and challenging the assertions of industry.

Even when establishment science produces dramatic results that at face value would seem to be grounds for concern, appeals to an epistemic conservatism, scientific independence and neutrality, and the “need for further research” can effectively thwart any attempts to act on them. For example, at the hearings dedicated to aquaculture, Dr. Garver (Research Scientist, DFO) testifies to his estimate that during a disease-related die-off from Infectious hematopoietic

necrosis (IHN) a fish farm could shed “650 billion virus particles per hour.”¹¹⁵ Despite this, when it comes to the risks associated with the virus Miller identified, Garver resists taking a policy position beyond “further research is necessary,” appealing to the conservatism of the scientific method and the ostensible resulting compartmentalization of science from bureaucracy:

MR. MCDADE [Counsel for the Aquaculture Coalition]: And you’re not prepared to recommend action to the senior people at DFO until you’ve done all of those laboratory studies and have found proof to your satisfaction?

DR. GARVER: Until I find that this virus is causing disease and that it is associated with the MRS [mortality related signature – Miller’s epigenetic finding associated with sockeye mortality], and that it is indeed transmissible, then I probably would not recommend action at this time. If – we must understand that when you sequence an entire organism, you’re going to find a lot of agents in there that are undefined. If we sequence your DNA, we’ll find all kinds of viral elements.

Q Well, Dr. Miller was at least hypothesizing that some 27 million salmon might have died from this in 2008. Wouldn’t that be something that you would take some action about?

DR. GARVER: And that is indeed what we’re doing, we’re researching whether this sequence causes disease.

Q So for you, action, when millions of salmon are dying, is to take research. (110825, pp. 9-10)¹¹⁶

¹¹⁵ He outlines his estimate thusly:

DR. GARVER: If you have a farm that has approximately a million fish -- I've been told that that could be a bit high since I've done this calculation, but based on a site with a million fish, and they're experiencing a 30 percent infection, which based on some of the die-off events that could be -- that could be quite high, but nonetheless, we decided to do 30 percent because that's what we'd had in our challenge, and then you times that by the number of particles that we quantified in the water, and you do get 650 billion viral particles shed per hour. (110826, p. 6)

¹¹⁶ Miller also appeals to compartmentalization and the independence of science, but here from the position of a critic of the bureaucratic regulatory structure (if an internal one):

[T]he sentiment that I got was that research should not fog policy, so – but my take, as a scientist, is that research should inform policy, and if policy has to change based on new findings, then that's what it has to do. But I don't come from a manager's standpoint, I come from a scientist's standpoint. (111215, p.127).

Here, she, perhaps ironically, criticizes the division between the science and policy, and specifically the neglect (subordination?) of the former by the latter. While the concerns of this dissertation are with themes directly connected to science risk, and power, the Commission transcripts offer fertile ground for broader social constructionist analysis, in which a wide range of thematic content might emerge. In this vein, Miller presents as a heroic “rebel from within.” My admittedly superficial analysis of perceptions among salmon farming opponents beyond the Commission seems to lend further support to this theme.

McDade continues to question the witness on this distinction and his characterization of himself as the neutral and objective scientist, raising his efforts to “water down” a report from Miller to DFO management regarding concerns around disease from fish farms, to which he reasserts his role as “a scientific person.” Counsel for Canada (Taylor) then intervenes:

MR. TAYLOR [Government of Canada]: Well, I’m going to get up at this point. Mr. McDade is asking a question of a scientist and the scientist is answering. Mr. McDade wants an answer from a manager, but a manager is not on the stand.

MR. McDADE:

Q So this is not – do you feel, do you agree with that, Dr. Garver, that this is not your business as to what action is taken?

DR. GARVER: The management is aware of these briefing notes, these memos. I conduct science.

Q Well, we saw yesterday in a memo that Dr. Miller prepared to go to management, we saw all those comments from you trying to water that down. Why would you try and resist her telling senior management what her views were?

DR. GARVER: I gave my scientific opinion, that’s what I – that’s my job. I weigh the evidence, and I put it out there. That’s what they hire me for. I am a scientific person. (110825, pp. 10-11)¹¹⁷

The valourization of scientific certainty as the final arbiter of truth here functions as a dodge but also a twist – a twisting of how science actual understands itself. Rather than acknowledge the heterogeneity of scientific methods, criteria for evidence or system or standards of proof (e.g., Numbers & Kampourakis, 2015), the appeal is to a construction of science as a machine for the production of wholly unified objective authority. The existence of debate means that “the science is out,” and until it is “in” nothing of significance can be said and judgement – and hence action – must be reserved. This is at odds with the actual operation of science as both social institution and epistemic technique. One universality that *is* perhaps present across science, is the recognition of disagreement and debate as an important part of the scientific process.

¹¹⁷ Of course, in addition to being a scientist, the witness is also a government employee. Here Bourdieu’s concept of field is relevant. Garver seeks to position himself, and by implication the scientific unit in which he works (Pacific Biological Station, DFO), as in particular ways autonomous from the managerial structure of DFO – as maintaining an independence crucial to his perceived role as independent knowledge provider (and nothing more). The actual degree of such scientific independence within DFO was something very much at issue at the Commission.

Moreover, the presence of debate, does not preclude scientific investigation from producing findings that are of value within the boarder social context. This ideological construction of a (universal) scientific method as a certainty device also is at odds with the methodological axiom (and perhaps trope in itself) that science does not prove but only refutes negations (null hypotheses). In this way, defenders of the status quo enact a symbolic violence by genuflecting before an ideal of science, while exploiting its structural aversion to the certainty they demand it provide.

(b) *The Catch 22*

The challenges of studying wild salmon feed into and amplify the theme of *uncertainty as green light*. This takes the form of an *evidentiary Catch 22*: in short, a requirement that the efforts deemed necessary to justify to an acceptable standard the existence of harm can only be undertaken if such harm has already been demonstrated. For example, when asked directly what can be concluded from the current evidence as to whether a pathogen is significantly impacting the survival of wild sockeye salmon, Dr. Kent (Microbiology and Biomedical sciences, Oregon State), holds that we cannot say and invokes the familiar theme of “more research is necessary,” within the common scientific propositional form of *the evidence does not show x*, as distinct from *we know -x*:

MR. MARTLAND [Commission Counsel]: ...[T]he conclusion I read you as reaching is that the evidence doesn't show this, but that's different than the stronger conclusion of saying it's not happening. We know that's not the case.

DR. KENT: It's option one, yes, that the evidence that there is – the evidence does not show this, based on the data that we have. No. And so therefore we cannot say that there is not an infectious agent, or other disease phenomenon, and that's kind of an important role in the survival of sockeye salmon, and we just do not have any hard evidence to support that at this time.

(110822, p.19).¹¹⁸

¹¹⁸ In her enthusiasm to prove that salmon farms pose no risk, counsel for British Columbia (Callan) fails to appreciate this distinction:

MS. CALLAN: . . . Dr. Kent, you've concluded that no specific pathogen is a major cause of demise to the Fraser River sockeye salmon?

Yet when pushed as to why in assessing the risk of disease he did not consider all available evidence, this logical distinction in effect becomes blurred. When questioned as to why he did not review the provincial salmon farm disease audit records when writing his report for the Commission on disease, Kent responds with the claim that he was already aware of the diseases that were present and that there was “no indication of a role of fish farms being a major source” (110823).¹¹⁹ If “no indication of fish farms being a major source of disease” is to be treated as distinct from “fish farms are not a major source of disease,” then data that might further elucidate a connection between farms and disease presumably should not be dismissed a priori.¹²⁰

McDade pursues this point by asking the witness how he would know without looking at the diagnosis what role fish farms were playing – “[w]ouldn’t you have to know how many times these diseases have been diagnosed?” – to which he offered a vague reference to “grey literature” and information he had been given (110823, p.26).¹²¹ Hence, the fact that a disease has not been

DR. KENT: No, that's not -- I've concluded that we cannot identify a specific pathogen to be the cause of the demise of that. In making that conclusion, based on the lack of data - I know this may seem like splitting hairs - but I'm not saying we've excluded the possibility that a single pathogen is the cause of the demise of sockeye salmon. (082511, p.99)

¹¹⁹ When asked (by Callan) to confirm that (as of the date of his report), “no exotic salmon pathogen of significance has been documented to have been introduced into British Columbia, Kent responds with, “Right. And I would say it would be hard for me to even think of an exotic pathogen that’s of less concern that’s been introduced. I can’t really recall any” (110823, p. 16).

¹²⁰ Despite Kent having established his career studying disease on fish farms. His technical report on fish disease made no reference to the impact of fish farms – or to fish farms at all. When cross-examining Kent, McDade draws attention to comments from peer reviewers of Kent’s report on the absence of consideration of salmon farms. For example:

Q And I’ll just show you to the bottom – the comment at the bottom of the page, starting:

A really looming question that hasn't been covered in the report surround the questions relating to fish farms and the potential of this component of [in] their disease history. . . (110823, pp.26-27)

McDade presents Kent with excerpts from multiple research papers which variously point to aquaculture as amplifying disease and increasing disease virulence, as well as being associated with emerging diseases, most of which Kent is not familiar with. He defends not citing any such work in his report on the basis that the reports deal with disease in fish farms and not wild fish, thereby negating a priori any possible link.

¹²¹ The reliance on grey literature (non peer-reviewed literature) is interesting given that Kent also states that one rationale for not examining the fish health records is that they are not peer-reviewed publications. In his testimony the witness tends to vacillate in his evidentiary

recognized as present in wild fish means that there is no need to consult the data to determine if it is present in farmed fish, which in turn furthers the presumption that it is not present in wild fish. The epistemic circle is self-reinforcing. A further example from this witness' testimony:

Q Now, Dr. Kent, let's move to a slightly different topic. I take it you'd agree with me that fish farms can cause a significant change in the environment that wild fish swim through in relation to potential risk of disease.

DR. KENT: I don't agree with that. There is a potential for risk, but "significant", that has yet to be proven. There is – that would be a concern, but I wouldn't say they are a significant risk. It's one of the areas of risk that would need to be addressed.

Q So you say it's a risk but not a significant one, or of unknown significance?

DR. KENT: Unknown significance would be more accurate. (110823, p.42)

Hence, Salmon farms are excluded from consideration because they are not a known risk. They are at best a "potential risk," here equated with a risk of "unknown significance" – a risk of risk – and therefore something in need of assessment. But the reality is that in order for such an assessment to occur there

justifications between grey literature and peer reviewed published research. It is not only that the Catch 22 results in the absence of the research that might render reliance on grey literature unnecessary, it is that the robustness of the standard itself is flexible, as is seen with the selective invocation of the peer-reviewed standard, whereby it is required in order to demonstrate harm from salmon farms but not so when considering evidence that suggests they are safe, as seen in the case of the fish health records in question. Counsel (McDade) asks,

Q Well, wouldn't they be relevant to your report if there's diseases that are all over those spreadsheets?

DR. KENT: They'd be useful. It's not peer-reviewed literature, but they would be useful.

Q Well, what's the distinction from peer-reviewed literature?

DR. KENT: It's been validated by professionals. It would be of use, but I – given the limitations that I had with my time, the most useful data were peer-reviewed papers for the study.

Q And so if DFO hasn't studied a matter, if there's no peer-reviewed paper on it, for you, it didn't exist?

DR. KENT: No, I said it has less significance to me. (110823, p. 31)

Ironically, Kent's Technical Report for the Commission was subject to negative comments from a peer reviewer regarding his exclusion of salmon farms from consideration, which Kent was quick to dismiss: "[f]ish farms and sea lice are dealt with in more depth in another report" (110823, p. 27).

needs to already be evidence of risk – something that first requires an assessment.¹²²

In fact, the provincial salmon farm disease audit records (eventually) admitted into evidence at the Commission revealed 1,100 references to classical signs of ISA, a highly pathological disease, associated with devastating impacts in salmon farms across the globe.¹²³ At the time, the official position was that the virus was not present in coastal British Columbia, or more precisely that there was no evidence to confirm its presence. In his technical report for the Commission, Kent did not even list ISA_v as a pathogen of potential concern. He states that there is “no direct evidence” of a connection to fish farms. His justification for this position is based in the distinction between a clinical sign of a disease and diagnosis of a disease. Consider the following exchange:

Q ... Again, if we could look at what it says at the end of that. Again Dr. Marty said "Classic lesion of ISA".

DR. KENT: ...[I]t is a classic lesion of ISA, but let's talk about a pathogen that we know occurs in B.C., it's a classic lesion of *vibriosis*, as well, too.

Q So for each of these samples, one would want to test for either disease.

DR. KENT: Yes, of course.

Q And if there's an open diagnosis, when one doesn't know which of the diseases it is, it could be either, isn't it?

DR. KENT: It could be, but if the – yes, of course, it could be either. You have not ruled out that if you see a lesion like this, you have not

¹²² Here we see a combination of theme of Catch 22 in combination with the tropes of more research is needed and epistemic conservatism – prompting agreement from opponent and proponent:

Q This is a study out of the Department of Biology at Dalhousie in Halifax, which examines the relationship of fish farms throughout the world and disease. And if you're reading the abstract, can I suggest to you, Dr. Kent, that it is the fact that wherever you have aquaculture fish farms, you have found impacts on the wild fish populations.

DR. KENT: I'm not going to deny that, but also you should be aware that spatial and temporal co-occurrence does not mean cause and effect.

Q Right. But the reason why you can't often prove cause is because no one's studying the disease in the wild population.

DR. KENT: I agree with you on that. That's one of the few statements you've made that I totally agree with you on.

MR. McDADE: Well, we're getting somewhere then, Doctor, thank you. (110823, pp. 53-54)

¹²³ It should be noted that the Province of British Columbia fought to keep these records secret, only relenting in the face of legal action.

ruled out that it's ISA and you haven't ruled out other things, as well, too.

Q So my question, Dr. Kent, is without reviewing this document, how could you rule out ISA in B.C.?

DR. KENT: Based – there's no additional evidence that ISA is occurring. These lesions are too non-specific to make me go to a conclusion that based on the viral screening which has not found the virus, when I see these two lesions – I haven't reviewed the histopathological slides, but I know that Gary Marty is a very competent, Board certified pathologist, and that these particular lesions are just way too broad that I would be suspecting ISA, particularly because the virus has not occurred here....¹²⁴ (110823, p. 39)

¹²⁴ This tail-chasing goes on at some length. For example, in regard to the references to ISA in the fish health database:

DR. KENT: I'd like to hear -- I'd like to hear how this diagnosis of what they mean by classical signs of ISA lesions are. Who came up with assigning this to say these are ISA-like lesions? Did Dr. Marty call these ISA-like lesions?

Q Yes, I think he did. If we could go back to 2864. If we could go to the abbreviation section, and if we go to say, "HEM", and if we could scroll over to see what it says there on that cell. Again I think we have that same problem [as read]:

HEM is often associated with VHSV and bacterial infections.

And then he says [as read]:

Renal congestion and haemorrhage is one of the classic signs of infectious salmon anaemia, ISA, but ISAV has never been isolated from fish in B.C.

Do you see that?

DR. KENT: Yeah, I see that. Thank you. Thanks for clarifying that ISA has not been seen in B.C.

Q Right. But these are classic ISA lesions, are they not?

R. KENT: They're not pathognomonic for ISA.

Q How do you know that?

DR. KENT: How do we know it's not pathognomonic?

Q How do you know that?

DR. KENT: I know it's not pathognomonic for ISA because haemorrhage and congestion of visceral organs could be caused by a variety of different pathogens and non-infectious agents. So it's not pathognomonic for ISA.

Q But it could be ISA.

DR. KENT: It could be ISA, sure.

Q Right.

DR. KENT: It's a histopathological change that's not inconsistent with ISA. So just jumping to saying that it's ISA-like lesions is really misrepresentation of a histopathological report, because there are many other causes of these non-specific lesions.

Q But those are Dr. Marty's words.

DR. KENT: He list ISA as one of the causes and he also – you notice his first thing is a non-specific result of endothelial damage. (110823, p. 38)

Thus, when confronted with evidence suggestive of disease, any move to diagnosis is blocked by a prior assumption that the pathogen, and hence the disease, is not present; but thorough testing for the pathogen will not happen without the disease first having been diagnosed in fish. In fact, the individual responsible for making diagnoses referenced by the witness, Dr. Marty (Fish pathologist, Animal Health Centre, BC Ministry of Agriculture), points to the absence of ISA in British Columbia as a justification for not testing for ISA. He also references the supervening role of CFIA when it comes to internationally listed diseases, a compartmentalization arguably reflective of political economic imperatives:

So in several of these cases, it's not routine, when you have that level of confidence, it's not routine to always test for it when it's not known to occur, especially when you always have this active audit program going on. In fact, CFIA actually discourages us to test for international foreign animal diseases. They prefer that they be called. (110831, p. 44)

(i) The art of the diagnosis

In the above example, the witness avoids engaging with the connection between salmon farms and disease by making an argument from authority regarding the diagnostic expertise of provincial fish veterinarian, Dr. Marty. It is important to situate appeals to expertise, conservatism and scientific orthodoxy in relation to the inherently subjective and qualitative nature of diagnosis. Much of the process is not reducible to principles, propositions or axioms, but is learned directly through experience – through doing. As revealed through the testimony of diagnosticians at the Commission, it appears, at least in part, as a craft or art through which the role of ingrained or “felt” knowledge is crucial. Interestingly, when asked about the course of making a diagnosis, Dr. Marty is able to provide little by way of detail. (“It sometimes is a difficult thing to describe” [110831 p. 45]). Dr. MacKenzie, a salmon farm veterinarian, then steps in to outline the holistic process as he sees it, prompting the following exchange:

MS. SCHABUS (STCCIB): So if I understand your evidence, then, a given symptom, if it was found on a fish in isolation, a symptom isn't indicative of any particular disease or health problem, there may be

symptoms that would give rise to a whole list of, on that differential diagnosis, and further information and experience would be required to narrow it down and come to a diagnosis; is that –
DR. McKENZIE: Certainly with time you develop an experience. Unfortunately, with fish, a lot of clinical signs are consistent among many diseases. They're not what we call pathognomonic. You don't see it and, "Oh, that's it." But you do see trends, and over years of experience, and I've cut open thousands of fish, and you've gone through – worked through many cases, you learn that knowledge. You gain that experience. And you get to a point where you have a really good – your differential diagnosis gets far more refined with time and expertise filling in the gaps for you. So yes, with times you gain that.¹²⁵ (110825, pp. 47-48)

¹²⁵ McKenzie offers a rich description of the process as he sees it:

DR. McKENZIE: Perhaps I could just go to a little more of the farm level, because Mark certainly – or Dr. Sheppard certainly comes in, in place in an auditory process, and again, he's a little bit on the outside in the sense that he may not have the history or the knowledge of how these fish – I what changes may have occurred or in the recent past.

So just fundamentally, as a veterinarian, we go through a process. And every time we look at a problem or a disease diagnosis or a concern, we go through a mental process, and that's fundamental to our training. So we go through a process of we identify history, what history or conditions may have created a greater probability for different outcomes or different causes for the disease. We then look at behaviour. We may look at changes in behaviour, changes in mortality occurrences, or in activities such as where they occupy in the water column, or something along those lines. So those are our first pieces of evidence that we collect as veterinarians on a routine basis.

The next is we start to look at the fish, itself. We look at gross examination of individuals, look at the external appearance, are there any – is there any evidence of particular things we see. With plankton you see gills that are a different colour. We see external lesions. We see darkening of fish. There's a number of things that we bring into play there.

Then we add in the necropsy, which is experience of looking at fish, looking at different pathology, findings of different diseases, and what consistent clinical findings we see in those fish. And from our experience, we take those conditions and we, again, add them to our mental picture. So we're making a list of the information that we're collecting.

The next step is to collect external information, laboratory information. So maybe those are tissues that go to Dr. Marty. Maybe they're tests that we can look at and microscope at the farm. Maybe there are other options, we do bacterial cultures on the farm. Those are – again, we keep building that list.

As a veterinarian, what you do is you create what we call a differential diagnosis. So we create an immediate list of, say, the top 10 things that would cause this picture, and as we go through our process of adding in all this information, we start knocking off, what is the most likely. Most likely. In some cases, I feel it's disease A and I send the results to Dr. Marty for a very specific test, and it'll come back, "Yes, that's exactly it." That reaffirms not only my clinical experience, because I've seen this, I've seen that, and it was positive, just like I thought, so you gain knowledge and experience through that process. So it's a bit of a learning process every single time we do a case. But at that point, you have a diagnosis.

So you have to put all of those pieces of information together. It's not a single test. If Dr. Marty sends me a negative and I – that just is – that's another piece of information that knocks off these three causes and gets me closer to the final diagnosis in the field, so that I can manage that particular situation.

In light of possible institutional pressures and potential career consequences associated with making a diagnosis, a cynic might hold that this art (artfulness?) is convenient. But it also once more points to the operation of science (or at least diagnostic procedure) as encompassing processes and methods at odds with a reductive empiricism, and hence further throws into question appeal to the latter as grounds to dismiss concerns regarding disease on fish farms.

Critically, Dr. Kent's deferral to the expertise of the diagnostic process reveals how the evidentiary Catch 22 can function through the rationalized compartmentalization of knowledge creation within a techno-bureaucratic regulatory system. In fact, the diagnostic procedure itself is built on a structural diffusion of responsibility. Provincial fish health monitoring involved a two-step process in which Dr. Marty, head of the provincial Animal Health Centre in Abbotsford, sampled the fish and recorded any clinical signs of disease but then sent his notes to Dr. Sheppard, who was responsible for making a diagnosis (or not) based on those notes.¹²⁶ The practical result of this is that both parties have an "out" – plausible deniability if challenged on the failure to diagnose a disease. Institutional and socio-political factors that would militate against confirming or even investigating the presence of disease in salmon farms will be taken up in more detail under my discussion of regulatory capture, but it should be noted here that both Marty and Sheppard would be under considerable pressure not to make a diagnosis.

The presence of ISA or HSMI in BC presents significant economic risk to the industry. HSMI is considered the third most important salmon disease in Norway (Gillis, 2018), and ISA, likely the most deadly salmon virus known, is a

So that's kind of the process we go -- mental process we go through for diagnosis. (110831, pp. 46-47)

¹²⁶ In testimony that might be taken to capture the Catch 22 in a nutshell, Dr. Marty stated the following regarding his process when identifying classic ISA lesions:

And so in all of these cases I have a standard comment that I use with this lesion that says something like, "Sinusoidal congestion," which is the lesion of concern, "is a classic lesion associated with ISAV." That's just a statement of fact that provides my clients with information. And I also include a clause after that, "but ISAV has not been" -- "never been identified in British Columbia" (110831, p.44).

listed disease with the World Organization for Animal Health (OIE), meaning that its demonstrated presence could result in the closing borders to fish from British Columbia and the shutting down of production.¹²⁷ In Bourdieu's terminology, we see that through the exercise of habitus within jurisdictionally distinct but interconnected bureaucratic fields, Marty and Sheppard have maneuvered (or have been maneuvered) into a structurally advantageous relationship. This structural reality facilitates Kent's ability to justify through externalization of responsibility examining the fish health records himself as unnecessary.¹²⁸

¹²⁷ Over the tenure of the Commission hearings, the issue of ISA became prominent thanks to the independent efforts of Alexandra Morton and other researchers to obtain samples and have them tested. Since then, the long-standing failure of Marty's lab to diagnose HSMI, which research has now detected in farmed fish in British Columbia (Cicco et al., 2017), and its alleged downplaying of the presence of serious disease in farmed salmon, have also garnered public attention and been taken up by the media (e.g., Gillis, 2018).

In the time since the conclusion of the Commission, DFO's disregard for the precautionary principle – and, in particular, its use of the *absence* of information as a justification for inaction – has received repeated explicit judicial censure in court decisions regarding the transfer of smolts infected with the virus believed to cause HSMI (PRV) to fish farms (See "Regulatory Failure and Regulatory Capture," below).

¹²⁸ Kent's refusal to engage with the issue of salmon farms and disease is all the more striking considering that much of his expertise appears to be in disease in fish farms. At the hearings, this led to an inversion of the usual process of credential valorization, with Kent attempting to downplay his qualifications and McDade (Aquaculture Coalition) highlighting them:

Q Dr. Kent, I took a look through your list of published reports, and this is -- this seems to be the part of your resumé dealing with the early 1990s. As I scroll through these studies, they're almost all involving net-penned or farmed fish, aren't they?

DR. KENT: Those are. Actually, I'm surprised that you'd go to this part of my c.v. These are non-peer-reviewed papers. The peer-reviewed papers would be found earlier in my c.v.

Q So if we go to page 20, for instance, that would be peer-reviewed papers, I think, from the same period?

DR. KENT: That's correct.

Q Those are also all about farmed fish and net-penned fish.

DR. KENT: Mostly, yes. That's right.

Q And could we go to page 24? I see you've written two books, and those are in the middle of the page.

DR. KENT: That's correct.

Q And those are both about diseases of net-penned fish?

DR. KENT: That's correct.

Q So you're primarily an expert in diseases in fish farms.

DR. KENT: No. I disagree with that. (110823, p. 25)

McDade then accuses Kent of deliberately ignoring the role of fish farms in disease in wild salmon. In another interesting blend of subjective and objective language, Kent eventually states his "general feeling" is that the fish farms are not "the primary source based, on the evidence at this point, of the demise of the sockeye salmon" (110823, p. 27).

(ii) Miller's research and the Catch 22

The Catch 22 is seen in questioning over email exchanges between DFO geneticist, Dr. Kristi Miller, and DFO management. Miller drew connections between her epigenetic research suggesting that a parvovirus was prevalent at high levels in wild sockeye to a virus identified in the early 1990s by Dr. Kent (who at the time was the head of DFO Fish Health) and others and that seemed to have emerged from chinook salmon farms off the coast of Vancouver Island. She found that the signature for the virus was associated with the observed, but otherwise unexplained, early entry into rivers and streams by spawning sockeye salmon – a phenomena associated with up to 90% mortality. Miller testified that given the prevalence of the signature, if this candidate parvovirus was indeed responsible mortality would be in the “millions of fish” (110823, pp. 93-94). The signature was found to be strongly present in the 2007 smolts, fish that returned (or failed to return) as the devastated 2009 run. Confirming the connection was made challenging by the fact that the line of research that Kent and Stephen were engaged in was dropped and that there were no associated extant fish samples. Her suggestion that DFO test for the presence of this virus on salmon farms was rebuffed by DFO management. Mr. Leadem (Conservation Coalition) cross-examines Dr. MacWilliams (Fish Health Veterinarian, DFO) regarding an email sent by Miller:

QThis appears to be an e-mail exchange from Dr. Miller-Saunders to yourself, Dr. MacWilliams. Have you seen this before?

DR. MacWILLIAMS: Yes, I have.

Q And it appears that there was a meeting in Laura Richards office regarding your reasoning...

...for not initiating any testing of aquaculture fish (specifically Atlantic salmon) for the Parvovirus we have recently identified in high prevalence in wild sockeye salmon populations. You stated that until such a virus is accredited as an OIE [World Organisation for Animal Health] ...- rated disease, causing considerable observable mortality, and the molecular assay is validated and certified as such, one cannot ask industry to test their fish. Moreover, you stated that there is no benefit to testing, and if we were to ask industry to voluntarily submit fish for testing, that you would

recommend to them that it would not be in their best interest to comply.

Does Dr. Miller-Saunders have your conversation accurate?

DR. MacWILLIAMS: No. I believe my statements at that meeting were misinterpreted, and I chose not to answer this e-mail.

Q Sorry?

DR. MacWILLIAMS: And I chose not to answer this e-mail.

Q So are you denying that you made those comments in the context of a meeting with Dr. Richards and Dr. Miller?

DR. MacWILLIAMS: I'm saying that those comments are misstated in this e-mail, the comments that I made.

Q All right. What comments did you make? Did you say, for example, that there would be no benefit to testing?

DR. MacWILLIAMS: No. I cautioned that asking industry to test in that species with a test that we're not really sure what positive means, we don't know what negative means, the implications of the test are unknown, I thought it was premature to take that out of a research context into a surveillance-type approach. I think it's more appropriate to design an experiment and assess whether a hypothesis with an appropriate experimental design and controls in place, as opposed to taking a test with unsubstantiated, unknown results to an industry setting.

And the comments I made about OIE were, again, cautionary, saying that even in the interest of international trade, there are certain standards required of testing before it's applied, in that a test needs to be robust, repeatable....

That the "implications of the test are unknown" is presented as a justification for not testing farmed fish (which is also framed in terms of scientific caution and respect for the [hegemonic] scientific method). Yet fully understanding the implications of the test necessitates applying it to farmed fish. Likewise, the fact that the virus is not yet listed by the OIE forecloses testing (especially considering "the interest of international trade," a topic to which we will return) despite that testing in fish-farms could be part of the process of listing.

Dr. Johnson (head of the Aquatic Animal Health Section of the Salmon and Freshwater Ecosystems Division in the DFO's Pacific Region Science Branch), Miller's superior, is then questioned regarding a similar email sent him by Miller, which was read as follows:

I am following up from our conversation in the office regarding your reasoning for not recommending that we initiate testing of aquaculture fish (specifically Atlantic salmon) for the Parvovirus we

recently identified in high prevalence in wild sockeye salmon populations. My recollection of your reasoning was that there was no reason to test Atlantic salmon before we underwent large-scale screening of pink and chum salmon and understood the potential role this virus may have across multiple species of wild fish. Is this correct?

MR. LEADEM [Conservation Coalition]: Did you answer her?

DR. JOHNSON: I never responded to this e-mail.

Q Does she have it accurate?

DR. JOHNSON: We were going to have a meeting subsequent to this. No, it's not accurate.¹²⁹

Q What's your version of it, then?

DR. JOHNSON: We discussed the possibility of – because the Parvovirus has been found in both fresh and saltwater, we discussed the possibility of screening all salmonids in British Columbia, including ones that we'd collected as part of our sockeye surveys, which included pink and chum salmon, and if I'm not mistaken, I would consider farmed Atlantic salmon as one of the species of salmon that we have in British Columbia.

We also discussed the possibility of holding off on the screening of farmed Atlantic salmon until the results of the challenge trial being done with Parvovirus were completed. There was also some discussion about the specificity and the sensitivity of the tests she was using, which is a non-validated diagnostic test.

Q Does Canada have a plan to actually start to sample net-pen fish, Atlantic salmon specifically, for the incidents of Parvovirus?

DR. JOHNSON: Although I was not able to make the meeting because of Cohen-related activities, as I understand, the fish farms will be providing samples for screening for Parvovirus.

Q As of when?

DR. JOHNSON: I am not sure of the actual date. That could be something you could ask Dr. Miller tomorrow. (110823, pp. 81-82)

In actuality, no plan was in place at the time; the industry instead later came forward with a proposal to participate with DFO in a project to test wild sockeye – and not the Atlantic salmon in their farms – which was (understandably) rejected by Miller. Again, both witnesses justify the absence of action on the basis of a desire for scientific rigour (broad monitoring of all salmonids, farmed and wild, or the implementation of a controlled study). Yet without such evidence already in hand, the impetus for action is minimal, and none is taken.

¹²⁹ Miller subsequently testified that the email was an accurate reflection of what she heard from Dr. MacWilliams say and that she took notes to that effect at the meeting in question (110825).

In this context, it is worth considering how the kind of research undertaken by Miller may begin to point to an extrication from the Catch 22 and many of the epistemic challenges that arise when studying salmon in the wild (discussed under “The Ocean of the Unknown”). By combining in vivo sampling (radio tagging or telemetry) with molecular epigenetic analysis, a (statistical) picture emerges that can shed light on what is happening in the environment of the fish and how they are reacting to it. Tagging fish in the ocean enables an estimate to be made of the percentage that make it back to spawn. Miller found that fish displaying a particular signature – indicative of specific activated and deactivated genes – have a 13.5-fold increased mortality over those without the signature. The period of sockeye decline was associated with change in in-stream mortality (the number of fish that go missing in rivers and streams while returning to spawn) from a historical average of 10 to 15 percent to between 45 to 95 percent, depending on the population. Microarray analysis, which allows for the simultaneous study of thousands of genes, was indicative of a viral disease, and in particular, a parvovirus previously identified by DFO and, as mentioned, thought to have emerged from chinook fish farms off Vancouver Island. Despite the importance of this work, Miller testified at the Commission as to how the funding for it had been cut back and that she was struggling to raise the comparatively small sum of \$50,000 necessary to continue the required groundwork. This is a further poignant illustration of how, while the methodological limitations to researching salmon farms and wild fish are significant, the Catch 22 extends beyond these considered in isolation – into political and institutional arenas. Unlike the challenges that inure to the epistemological limitations previously described, however, these latter obstacles can be readily addressed – with the requisite political will.

At the same time, this is not a call for a circumlocution of uncertainty (and note that statistical analysis and the probability of sequential matches remains at the heart of genetic research). Moreover legitimate criticisms of Miller’s approach were voiced at the Commission (grounded in its novelty and basis in further degrees of separation regarding causal inference). Whereas since the

Commission it appears that the presence of highly pathogenic diseases like ISA and HSMI in British Columbia waters have been confirmed, including through Miller's work, her subsequent research regarding the parvovirus in question has indicated that it may not in fact be a "smoking gun," after all. Miller, herself, made the point that her research does not stand in opposition to the more standard histological fish health work but as a valuable further layer, one that can work synergistically with the latter. This is especially so given the paucity of fish health research on wild fish, discussed above. Her lab's extensive genomic database and active and wide-ranging program of field research, she attests, could provide the basis for a valuable compliment to more standard research:

Q And that's what you were referring to when you were saying it was a little – it was really concerning to see that they actually don't have a real good grip on assessing disease and dealing with disease when it comes to wild stocks, right?

DR. MILLER: That's what I came away with, yes.

Q And everybody in that panel actually agreed that it was important to do integrated fish health research in the first panel that came before you.

DR. MILLER: Yes. Yes, absolutely.

Q Yet they didn't really have anything much to suggest how they would do it with their traditional methods, right?

DR. MILLER: That was again my feeling, and yeah, very much so, yes.

Q And we had that conversation at the end. That's actually what you're trying to do with your genomics research. And while you're being modest in saying that you can obtain data quickly, but actually the reason why you are able to do that now is because you actually already collected a lot of data and you have so many datasets in your genomic research going back decades by now.

DR. MILLER: We have a very good resource available to us now, certainly, in our lab with our genomics.

Q So your lab is probably in the best position, just has a head start, because of that basis – that information base when it comes to wild fish and disease, right?

DR. MILLER: I believe that we can add a layer to our knowledge of fish disease and wild fish by using the genomic, and by using the microarray data that we already have, yes.

Q And you have a head start on everybody else because they actually don't have that information in hand.

DR. MILLER: That is correct.

Q And actually haven't ever really focused, as we heard from those panels on wild stocks.

DR. MILLER: No, they haven't. I've been working on wild sockeye salmon for about seven years now.

Q And you're probably the only – the Fish Health people haven't been doing that really.

DR. MILLER: No.... (111215, pp. 137-138)

Ultimately, I contend that the analysis of the epistemological assumptions underpinning the Catch 22 presented here suggests resolutions do not rest in the validity or isolated epistemic power of any particular research. Rather, it is the value of that research in combination with what amounts to a social meta-analysis – how it is framed and understood, the uses to which it is put, and the social implications that are drawn – that determine its influence. The normative shift toward a reconfiguration of social and material relations around salmon aquaculture should itself incorporate this reformulation of the role of knowledge and knowledge production.

3. Certainty from uncertainty (asserting reductionist hegemonic science)

The themes of *uncertainty as a green light* and *the evidentiary Catch 22* conscript known unknowns to the reproduction of the status quo, functioning to limit the inclusion of new research that may signal a need to change direction.

Government and industry representatives and scientists also adopted a positive strategy of asserting the value and appropriateness of the current regulatory and scientific paradigm, switching with relative ease between a frame in which the unknown predominates to one of certainty regarding the appropriateness of the status quo. As with the Catch 22, this dynamic also involves an elision between subjective and objective language that reveals a symbolic violence at work. Claims are framed by appeal to the epistemic authority of “objective” science. Yet, when pushed, proponents often shifted to subjective language and “personal feeling.”

An example is found in the discussion of material produced directly for the Commission itself. After discussing at length the dearth of research on disease

and parasites in wild fish, Dr. Kent is asked about his approach to his report on infectious disease, in which he ranked diseases by risk, something he characterized at the hearing as “basically potential for impact.” Kent continues:

And as I outline in here, basically a high-risk pathogen would be one that is known to be virulent or pathogenic to salmon in general, and likely pathogenic or documentedly pathogenic, highly pathogenic to sockeye. So that would be one criteria. And the second criteria to fall within the high-risk scenario would be as a likely scenario where sockeye salmon in B.C. in general and Fraser River sockeye in specific would be exposed or infected by that. Moderate would be – low, I’ll just talk about low risk. Low risk is the opposite. Documented or to be, or based on – documented or suspected to be low, not very virulent, or very unlikely to be infecting sockeye salmon, particularly Fraser River sockeye salmon. And then the midrange would be intermediate to that. (110822, p. 17)

Although Kent admits that his assessment is subjective, he nonetheless produces an ordinal ranking of pathogens,¹³⁰ thereby hypostasizing risk. Moreover, closer examination of Kent’s report reveals that the ranking of risk is based on the state of knowledge, such that an absence of research leads to an assignment of a lower risk level. He, in fact, admits as much: “So a lot of these low organisms are ones that are not known, are not documented to be virulent, but that doesn’t mean that they have been shown not to be, with experimental studies, that they have not been empirically shown not to cause disease (110822, p. 25).” An epistemological inversion occurs, such that the less is known about a pathogen, the safer it is assumed to be: uncertainty directly becomes the measure of certainty.¹³¹

¹³⁰ “And certainly there is a lot of subjectivity in that. These are – my rankings” (110822, p. 16).

¹³¹ On the matter of sea lice, Kent appears to go still further, taking the controversy itself around the issue as reason to lower their threat-level – though he seems also to admit that based on the literature it should actually have been given greater prominence:

DR. KENT: I did look at it some. I saw from the reviews of my document – of this report that I prepared that others – some people wanted me to expand on that a lot – much more. There's a lot of papers out there. It's a very controversial issue as far as the impact of sockeye – of sea lice on wild salmonids in B.C. and particularly pink salmon....

Sea lice have occurred on salmonids for a long time and based mainly on that knowledge and review of the literature, I put this – and the limitations of time that I had to prepare this report, I put this as a lower priority than some people might have. If you're just going to – if you were going to review the – conduct a report based on the number of citations, the sea lice would have been much higher.... (110822, pp. 41-42)

He also attempts to diffuse responsibility on the basis that the topic of sea lice will also be taken

A clear example of the subjectivity that can manifest in this frame is revealed with Kent is challenged on why in his report on disease he chose to exclude any consideration of the role of salmon farms – arguably a quintessentially subjective decision. McDade draws his attention to reviewer comments on his report:

Q And I'll just show you to the bottom – the comment at the bottom of the page, starting:

A really looming question that hasn't been covered in the report surround the questions relating to fish farms and the potential of this component of [in] their disease history...

You'd agree with that, wouldn't you?

DR. KENT: I agree that that was what was written there.

Q Well, no –

DR. KENT: I don't agree that that's a big looming question, though. I agree that was written in the document, that that's what a reviewer stated. I disagree with that.

If you want my subjective opinion on this, I agree that that is not the looming question as the demise of the sockeye salmon. In my opinion, I think it's certainly on the radar, but it wouldn't be the most looming question and concern.

I think where – I see where you're going with this, that you're trying to emphasize that fish farms are a much more important role in the sockeye salmon than I've particularly – based on my experience and knowledge, would believe. And that's basically – of course the bias in my report is directed towards my general feeling, that the fish farms are not the primary source based on the evidence at this point, of the demise of the sockeye salmon. (110823, pp. 26-27)

The individuation of risk factors is also important here. Despite lip service to the importance of a holistic approach, the cumulative impact of pathogens and other adverse environmental conditions is not considered, thus allowing for a negative certainty, in which it can be claimed with confidence that each individual pathogen – taken in isolation – is not a significant cause of the sockeye decline.¹³²

up in other reports (110822, p.42).

¹³² In fact, counsel for British Columbia (Callan) runs through each of the pathogens Kent identifies in his report as high-risk in an attempt to get him on record as saying – or implying – precisely this (with varying success). For example:

Q Dr. Kent, you've identified bacterial kidney disease or *R. sal* as a high risk bacterium?

(a) The tennis match

An extended series of exchanges at the hearings could be taken as a microcosm of the broader dynamic of uncertainty, both in this positive sense of certainty from uncertainty and the negative of the Catch 22 and Green Light. What became known as the “tennis match” consisted of an elaborate and protracted back-and-forth regarding the impact of sea lice from salmon farms and of salmon farms more generally on wild fish.¹³³ This was played out not just on the stand but via a series of reports and counter-reports from expert witnesses. At root, the tennis match was a debate around the quantification of risk, specifically, the parameters and assumptions underpinning the statistical analysis by which risk is numericalized. In contrast to the dominant notion of numericalization as providing a “mechanical objectivity” (Porter, 1995, p. 213) – a standardized and reproducible objective knowledge, existing at a remove from social context or epistemological framework – the hearings served as a venue in which the depth of uncertainty and subjectivity underlying this process were laid out. And it is notable how the many hours of highly detailed testimony and probing cross-examination, ostensibly centred on unpacking underlying assumptions, in the end

DR. KENT: That's correct.

...

Q Would you agree, based on Dr. Korman's report, that BKD is unlikely to explain the difference between poor 2009 run and the extremely large 2010 run?

DR. KENT: Yes, based on the data that we have right now, as far as -- this is work looking at BKD on fish farms, I assume, this, what I'm looking at right here?

Q That's right.

DR. KENT: Yes, that's right, yeah. ... (110823, pp. 2-3)

¹³³ For example:

MR. MARTLAND [Commission Counsel]: What happened here is I think I used a tennis analogy. You [Noakes] fronted the first volley over the net which was in your report proper. Dr. Connors responded through a written document, and his response is now Exhibit 1542. In turn, you responded August the 10th with what's Exhibit 1538.... (110826, p. 26)

A similar protracted back-and-forth focused specifically on the issue of sea lice and involved Jones and Saksida versus Price. It followed a strikingly similar pattern, through which similar themes of positive and negative uncertainty emerged, along with that of common sense as a standard of pragmatic rationality. (See 110906.) In the interest of concision, I limit my focus to the above “tennis match.”

served more to amplify rather than diminish the contested nature of the claims and the lack of agreement.

In work commissioned for the Inquiry, Dr. Brendan Connors examined the relationship between salmon farms and sockeye productivity. When looking at individual farm-related variables (e.g., sea lice abundance, disease frequency, etc.), a correlation with salmon population anomalies could not be established (Connors, 2011). However, the paucity of data (only a few years were available, making for a short time series) meant that the statistical power was weak. In other words, if a relationship was present, it could not be demonstrated to an acceptable level of certainty.¹³⁴ In the second phase of his analysis, Connors undertook a “a multi- model inference approach” – one which models the interaction of multiple variables and thus aims for a more ecological grounding. He found that “increases in aquaculture production, SST [sea surface temperature], and pink salmon abundance all increase sockeye salmon mortality” (p. 22). Yet the “large uncertainty around these estimated effects makes drawing definitive conclusions from these findings tenuous.” (p. 22) Once again, it is the *absence* of data that favours the status quo, in this case not by preventing analysis altogether but by limiting the inferences that can be drawn.¹³⁵

¹³⁴ An inability to reach definitive conclusions was found in other analyses of sea lice taken up at the Commission. Consider Dr. Johnson’s comments on her literature review, for example:

DR. JOHNSON: Yes. The original goal of this paper was to try to review all of the literature and to try to get it so we could actually make direct comparisons. During that review, it became very obvious that there was so many differences between different studies that it is extremely difficult to make meaningful comparisons between studies. For example, some studies used infection methods that resulted in copepods being on the gills, which are not a normal place for copepods. But yet those data are often used to talk about impacts on the host.

So this sort of puts together all the things we sort of observed when we were trying to come up with an overall level of sea lice that would be detrimental to a host and all of the problems that we sort of encountered in trying to do that (110822, p. 71).

¹³⁵ The absence of necessary research sometimes creates a “damned if you do, damned if you don’t” situation for those trying to demonstrate harm from salmon farming. Dr. Connors is questioned as to why he aggregated the farm specific data that was available. His response was that it was because of the absence of data on the actual salmon migratory routes. So specificity of one factor requires specificity of the corresponding ones in order to produce meaningful results. Taylor undercuts Connors effort to make this point, however, attempting to cast it as a mischaracterization of the data:

DR. CONNORS: ... I felt like I would be criticized if I assumed migration routes, or if I didn't assume migration routes. And so given those assumptions, I had to aggregate them at the. . .

If quantification represents a Beckian movement from *hazard* to *risk*, the latter here fails to provide actuarial completeness. Yet even in failure, the risk paradigm serves a purpose, as the inability to demonstrate harm is taken up by salmon farming proponents as evidence of safety. In this regard, the movement is also from “common sense,” e.g., that farms shedding trillions of virus particles into confined channels frequented by wild salmon pose a hazard, to a statistical pronouncement: that a significant correlation between the two cannot be demonstrated. This can be read as science trumping common sense, but such a framing obscures the fact that this epistemic victory is actually achieved through the symbolic capital embedded in quantification: symbolic violence is again exercised through what is *not* known.

“Common sense” and “science” were not always at odds, however, and counter-veiling voices were present within the scientific debate. A volley in the tennis match came from Dill, who used Connors findings to conclude that it is likely that salmon farms are “having some sort of impact on wild salmon productivity, most likely with other factors in the marine environment” (Dill, 2011, p. 33). He also drew attention to the reality that across the globe, “wherever there is aquaculture practice there is evidence from population records of declines in wild salmon” (p. 33) and referenced a meta-analysis by Ford and Myers (2008), which found that “wild salmon stocks have declined, often as much as 50%, wherever aquaculture production has increased” (Dill, 2011, p. 10).¹³⁶

Q And, Dr. Noakes, you agree that the statement is wrong, and in fact there were individual farm data available?

DR. NOAKES: That's correct.... (110826, p. 94)

¹³⁶ Regarding common sense: Despite the conflict over specific technicalities, even several pro salmon farming voices did not contest the claim that the presence of fish farms amplifies sea lice on wild salmon (or that fallowing reduces sea lice on wild fish) and that, when taken in combination with other stressors, there is likely a consequent negative impact on these fish. Another strongly pro salmon farming claims-maker (Kent) did not dispute that disease outbreaks increased the number of pathogens around net-pens or that fish swimming past a net-pen would be at increased risk of becoming infected with pathogens than those swimming through open water. For pro salmon farming voices, however, the (ostensible) absence of scientific certainty here assumed primary epistemic significance, overriding whatever value “common sense” may otherwise have.

By way of contrast, Dr. Noakes (2011) was highly critical of Connors, analysis, concluding that “[t]here is no significant correlation between farmed salmon production within the main migration path of Fraser River sockeye salmon, the waters between Vancouver Island and the mainland of British Columbia, and the returns of Fraser River sockeye salmon” (p. ii). Yet the certitude of this pronouncement again derives from an *absence* of data. According to Dr. Korman, the researcher charged with synthesizing the data for use by other researchers, farm fish health records were only available from 2003 or 2004 to 2010. Given that the upper life-span of salmon is five years, that meant that only four years of data were available to correlate with survival rates of Fraser River sockeye (Korman, 2011; 110825, p.86). Dill also testified that more data was needed (“perhaps eight to ten years”) and that it would not be difficult to design and implement studies to test the hypotheses regarding the impact of fish farms on wild fish (110826, pp. 79-80). Noakes himself notes that “[t]here is no ongoing monitoring of the diseases identified [in Technical Report 1, Infectious Diseases] for any species of wild or hatchery Pacific salmon in BC” (p. 25) with the result that that a link between a disease outbreak on a farm and disease in wild fish cannot be established (p. 26). Despite this Noakes, proclaims that, “[o]verall, the evidence suggests that salmon farms pose no significant threat to Fraser River sockeye salmon and that salmon farming has not contributed to the recent decline in Fraser River sockeye salmon productivity (p. i).” Connors wrote a written response to Noakes’ criticisms, and then Noakes a counter-response, each of which were the subject of extensive exploration and deconstruction at the hearings. What is striking is the contrast between the extent of this outpouring compared to the similarity in each witness’ direct reading of the statistical analysis: Connors claiming statistically weak effects and Noakes, no effects. Each side extrapolated beyond the strict findings, however. In a “common sense” inference, Dill pointed to the general association across the globe between the introduction of open net-pen aquaculture and the subsequent decline of wild salmon, but he was also careful to reiterate Connors’ own

conclusions that the data here were insufficient to make a strong connection. He also directly negated Noakes' negation:

It must be understood that the short time series of data available for this investigation precluded identifying salmon farms as an important driver of the decline of Fraser sockeye. But it must be equally understood that at this stage of our knowledge it is not possible to say they are *not* implicated [Emphasis in original]. (Dill, 2011, p. 4)

Noakes went much further. After claiming that the industry “leads the world” in regard in the management and control of disease and waste “through proactive policies and practices” (Cohen, 2012b, p.64) he makes the unqualified assertion not that a relationship has not been established but that there isn't one – that salmon farms and salmon farming pose no significant threat to Fraser River sockeye and have not contributed to their decline.

Gaertner attempts to destabilize Noakes' statistical construction of risk, alluding to the underlying fluidity and perhaps cultural complexity or relational significance embedded in the concept:

QI'm just trying to understand your answer - that the risks did not show that we need to take more precautionary steps with the farms. And I just find that curious. How are you measuring that risk? From what vantage point are you measuring that risk? Because you'll appreciate that my clients might measure that risk differently.

DR. NOAKES: No, I appreciate that. But what I'm looking at is in terms of, as I say, when I went through my report I had four categories that I was looking at – escaped farmed salmon, waste discharge, and sea lice and disease, and when you look at all of those different areas in looking at – for evidence of a relationship with Fraser sockeye you simply don't see it. There's no significant, there doesn't seem to be a significant relationship there. So on the basis of that evidence, it appears as though there's a fairly low risk. Again, risk, I appreciate that your client will have a different assessment because they have a different viewpoint.

Q And other scientists will have a different assessment because they'll have a different viewpoint.

DR. NOAKES: Absolutely. (110829, p. 89)

In a direct invocation of legal determinations of proof, Commission counsel (Martland) puts it to Noakes and Dill that the difference between their positions is, “to use a criminal law analogy, the difference between not proving a case and

actually declaring the person to be innocent.”¹³⁷ Dill replied that he “started from the basis that there is some evidence of an impact of salmon farms [e.g., the Connors’ report], and was looking for what the causative mechanism might be underlying that. So I would not at this point be able to come down on the side of innocence.” Noakes response is interesting in that he purports to ground his sweeping overall conclusion strictly in “hard evidence”:

DR. NOAKES: Yeah, I guess I approached from an evidence base, I mean, I really tried to limit the speculation in terms of this could happen, or this could happen. What I really looked at was what data, what evidence do we have.... So, I mean, to me, that’s more than just not proving guilt. I think that that’s pretty good evidence that in terms of that, there’s a – you would declare that person innocent, or whatever.

And again, you just go back down through in terms of not only looking at the actual data themselves, but some of the trends... So it’s not just the data themselves, it’s the trends and it’s the whole body of evidence when you look at it, that it’s pretty convincing in terms of I don’t think it’s just that we didn’t prove that he was guilty, I think it’s leaning quite heavily towards innocence.

But again, it’s again, it’s a question of how much speculation you want to bring in this. If you’re sort of black and white and want to look at the evidence, then that’s what it’s telling me, rather than woulda, coulda, shoulda. (110825, pp. 107-08)

Hence, under the mantle of scientific authority and the avoidance of speculation, Noakes appears to violate the very principles of scientific (and logical) inference upon which such authority is claimed to stand, deriving certainty from uncertainty in defence of the status quo. Later, after multiple days of hearings on disease, Gaertner asks Noakes to revisit his finding that “the evidence suggests that salmon farms pose no significant threat to Fraser River sockeye salmon” and whether he now thinks, “based on the evidence and all of the challenges associated with it, that that is speculative” (110829). Noakes continues to go beyond merely claiming that any “guilt” on the part of salmon farms has not been

¹³⁷ Criminal law and criminal investigation references as analogies and comparison made several appearances at the Commission. This may be due not merely to the judicial setting and inclusion of federal and provincial prosecutors, but also to the investigatory aims and structure of the Commission itself, which have parallels to the narratives of detective or mystery stories in popular culture – the mystery of *What is happening to the Fraser River sockeye?*

established to an acceptable standard of proof, cleaving unconditionally to his declaration of innocence:

DR. NOAKES: No. I'm basing this on my assessment of the data that I was provided with....

Q So having heard the evidence over the last three days, having sat here....do you agree with me that it's now speculative?

DR. NOAKES: No. I mean, again, it's my assessment and I had the same data and I haven't heard anything to convince me otherwise. (110829, p. 92)

By way of contrast, other experts testified that Connors approach was reasonable and valuable and that Noakes criticisms were not justified.¹³⁸ Nonetheless, the tennis match illustrates how the *scientification* of evidence can render such evidence less, rather than more, useful and effectively nullify any concerns raised regarding established regulation or practices. The tennis match saw the bogging down of many hours of hearings in highly technical debate on which little in terms of "hard" scientific conclusion actually turned. The result goes beyond obfuscation, however, facilitating an epistemologically flawed

¹³⁸ For example, another expert in statistics testified alongside Dr. Noakes and Dr. Connors:

DR. KORMAN: Well, for one thing I think that when you look at the bottom-line conclusions of Dr. Connors's report, he's not making claims of very strong effects. So the argument between Noakes and Connors in the end as far as conclusions is Noakes saying, you know, no effects shown, Connors saying weak effects in the case of the longer-term dataset only. So from a decision point of view, you know, that the justice may have enough information right there without getting into all the minutiae about how they come to that argument.

In terms of what Dr. Connors did, I think a lot of his rationale is well justified in terms of using variables that other researchers have suggested in terms of the modelling framework that he did, and in terms of his interpretation. And while there is some speculation or assumptions made in his modelling, that's a totally normal part of the scientific process to basically begin with a set of assumptions, evaluate the data. There are some limitations to that result, which he I think adequately stated in his report as being limited. But that's – it would be irresponsible of us not to do the analysis that Dr. Connors did, in my opinion. So I don't have a problem with it because he was quite cautious in his interpretation. (290811, p.10-11)

A further methodological issue was raised by Gaertner in regards to Noakes' "pre-whitening" the data – a technique that, according to Noakes, is "the correct way of taking the trend and autocorrelation out of a time series so that you can appropriately look for causal links in correlation between two time series" (110829, p. 90). Connors takes issue with his approach, claiming that "it's well-recognized that when there are strong time trends in variables that pre-whitening or first differencing or removing that time trend can sometimes reduce the correlations that are actually present in the data and that's been shown by simulations and some other studies." (110829, p. 90)

reinforcement of the status quo (*a certainty from uncertainty*), one made all the more effective due to the guise of scientific authority it assumes.

(b) The smoking gun

In another interesting allusion to criminality and criminal procedure, Miller's genomic analysis is taken up by salmon farming opponents as the possible *smoking gun* – the definitive piece of evidence proving the link between salmon farms and the sockeye collapse. Under cross-examination from McDade, Miller agrees that the genomic signature she has identified might be “the smoking gun,” a provocative phrase that connotes criminal evidence and perhaps the Commission as trial – with salmon farming, the defendant:

MR. MCDADE: And if, in fact, that's the case, using the terminology that we heard yesterday, this, in fact, may be the smoking gun for the 2009 declines?

DR. MILLER: It could be the smoking gun.

Q And we have heard you, I think, say, although this matter is not proven, yet, to be a virus that causes disease, you're prepared to say that's your strong speculation that, in fact, that will be proven?

DR. MILLER: I have some level of confidence that we will find disease with this virus, but we do have to do the work.¹³⁹ (110825, p. 95)

The statement garnered considerable attention in the media and created excitement among anti-salmon farming claims-makers. Miller subsequently qualified the claim, saying that she felt “a little backed into a corner” and that what she meant was that it “could be a major factor. Not the major factor, because I also agree with others that there is no single major factor.” Miller then expounds on the further work necessary to be certain that the genomic signature represents a viral disease and how the focus on a single piece of evidence (and single cause) is misplaced:

DR. MILLER: And it is my view that if you take a fish that is already compromised and you put that fish into an environment that is

¹³⁹ The importance of this holistic consideration of cumulative impacts and specific context carries through to the subsequent efforts of Miller and others to come to a more fulsome understanding of the impact of disease from salmon farms on wild fish. The very different effects of HSMI on a farmed fish (sickness but maturation and harvesting) as opposed to a wild fish (predation and death) present one illustration.

highly stressful, that doesn't have a lot of food, that may not be the optimum temperature, that may have other things like sea lice and other things that they are up against, that you could weaken a fish to the point that they can't – they simply can't take that level of stress.

And I do believe if we are able to demonstrate that this virus does cause disease and mortality in that early marine phase, and if it is activated under stress like it has been shown to be activated under stress in other species, this family of viruses, that there is a potential that it could be associated with high levels of mortality. That does not mean that it directly causes mortality. But if you weaken an animal, you start with a weak animal and then you weaken it further by poor conditions in the environment, it is the accumulative effect of those stressors that likely causes the mortality that we are seeing in the early ocean environment. That is really what my feeling is on it. I don't think that one factor all by itself has caused this decline. (110825, pp. 29-30)

Of course, the Popperian (1968) model of the scientific method that makes up much of science's rhetorical account of its own operation is at odds with the idea of a single and all-conclusive finding that constitutes a *smoking gun*. Moreover, such a notion, with its implicit single efficient causal force, stands against ecological causation and salmon mortality understood as deriving from cumulative stressors, of which pathogens from salmon farm disease may be only one. Thus, the excitement at the prospect of discovering smoking gun illustrates how opponents can also seek *certainty from uncertainty*, even as the allure of definitive evidence goes against their own professed holistic perspective. It also likely reflects the reality of operating within a hegemonic frame that requires conclusive proof as a precondition to change, while in effect militating against the production of such proof. The result is a tendency of opponents to reach for dramatic or reductivist characterizations.

This inclination is likely reinforced by the structural and political economic forces that restrict the ability of opponents to access information and – even when they are so able – to exert any significant influence over policy as a result. The symbolic violence that constructs as common sense the notion that the profit interests of private corporations should *naturally* assume utmost priority and that a vigorous regulatory response amounts to a significant intrusion on individual

(read “corporate”) “economic liberty” (see Girard, Day & Snider, 2010; Snider, 2009, 2015) may further the impetus to seize what appears as a powerful counter-claim, especially if it arises from within the system and is imbued the authority of high-profile science. This subaltern status also means that for proponents the legitimacy of their claims – and in the case of organizations even their own material viability – depends on the ability to construct a narrative that will mobilize public opinion (which they also usually normatively seek to shift). In the process of assembling, presenting and contesting environmental claims as to harm from salmon farming (Hannigan, 2014), this necessitates garnering attention from the media, the political economy of which favours dramatic, simplistic and black-and-white narratives that can be easily sold to audiences (or rather attract audiences that then can be sold to advertisers).¹⁴⁰ The inevitable consequence of a system in which a genuine smoking gun is both epistemically unlikely yet necessary to advance an effective counter-narrative is the delegitimization of opposition forces. It also distracts both from the potential to develop a cogent and persuasive holistic model and to recognize the full significance of cumulative evidence and its import for an appropriate threshold for action on the threats posed by salmon farms.¹⁴¹

(c) Determining salmon farm mortality – How many dead fish are there?

A further example of how the presence of an absence and epistemic gaps can paradoxically create “certainty” is revealed in cross-examination of Dr. Korman

¹⁴⁰ The drive to certainty may also push opponents to frame action and actors in black-and-white and moralistic terms of heroes and villains in a way that may not always be helpful to their ends. The attempt to remove all emotion and value from scientific pursuit is a positivistic error, but such matters nonetheless still require reflexive engagement. Outside of the Commission, much of the commentary and discussion among opponents framed Miller as a rebel hero truth-teller. McDade was actually given the sobriquet “The Lion” for what was seen as powerful and courageous performances and (sometimes ferocious) cross-examinations.

¹⁴¹ In the time following the Commission, Miller’s continued work did not show a causal relationship with the virus in question but contributed to establishing the presence of other serious and heretofore denied pathogens in British Columbia, a process consistent with one aspect of the scientific process that – even at the Commission – was generally agreed upon as indicative of how science should work.

and Dr. Noakes on their calculation of fish mortality and rates of disease on salmon farms (appearing in Technical Report 5A – Salmon Aquaculture and also utilized in Technical Report 5C). We see that even fundamental issues such as rates or prevalence – or even existence – of fish disease mortality on farms prove elusive and contested when subject to interrogation. This and other related analysis before the Commission, both in testimony and commissioned reports, were subject to an extensive deconstruction by McDade and others at the hearings.

A primary issue was that, as is the case when studying wild fish, mortality can disappear fish from our epistemic net. This is also true when testing for disease, where “fresh silvers” – recently died (and not yet decomposed) fish that float to the surface of the pen – can be reliably tested for disease but longer-deceased fish cannot. Estimates of numbers of fish who died of disease were based only on fresh silvers, but as McDade rhetorically asks, “the old would die of exactly the same proportion of disease as the fresh silvers. There’s no distinction in terms of their cause of death, is there?” (110829, p. 18).¹⁴² Furthermore, the categories of mortality adopted are those utilized by fish farms themselves, some of which are vaguely defined and open to subjective interpretation.¹⁴³

MR. MCDADE: What I’m suggesting is if you have a bunch of people putting something in a number of categories, there’s a lot of subjectivity as to which category it gets put into.

DR. KORMAN: That, yes, that seems that way.

....

Q – you only dealt with fresh silvers, and in fact all those other, that "Other" category, potentially has as much disease in it as the fresh silvers did.

DR. KORMAN: Yeah. Sure. (110829, pp. 22-23)

As McDade raises, a fish that is sick may be more susceptible to meeting its end in accordance with one of the other categories, such as “environmental,”

¹⁴² And when considering the prevalence of disease on farms more generally, this approach fails to capture diseased fish that are still alive.

¹⁴³ They include non-specific categories such as “other,” for example.

“predator” or “poor performer,” something with which Korman is forced to agree (110829, p. 21). The result is that calculating disease prevalence by looking at fresh silvers as a proportion of total farmed salmon numbers results in a (likely substantial) underestimation. In his report and on the stand, Dr. Noakes suggests that the resulting calculated annual farmed salmon mortality – two percent – is low, indicative of the sound fish husbandry of the salmon farming operations and the effectiveness of the regulatory system.¹⁴⁴ McDade takes issue with this, again highlighting the inherent subjectivity and seeming arbitrariness of such a claim:

Q But let me do this. This absolute number 2 percent, Dr. Noakes, in your report you seem to suggest that 2 percent was low. And that’s a subject opinion, isn’t it?

DR. NOAKES: Yes, 2 percent generally that would seem pretty low.

Q Well, 2 percent a year of disease or death, and we’re not talking about disease, we’re talking about death from disease potentially, if in a population that is regularly fed, that’s protected from predators, that seems quite high to me. So 2 percent compared to what? Maybe that’s the right question.

DR. NOAKES: Well, 2 percent compared to, say, a 3 percent mortality of wild fish per day.

Q Well, the 3 – aren’t we comparing apples and oranges there, because the wild fish die from predation and looking for food, not from disease.

DR. NOAKES: Well, I mean, you just wanted to – you just wanted a comparison, so...

Q Well, you’re a respected scientist, and you’re saying 2 percent is low. Do you have any basis for studies to suggest that that’s the norm, or less than the norm or more than the norm?

DR. NOAKES: I haven’t looked at other aquaculture or agriculture in terms of mortality. So, for instance, I don’t know what the average mortality is on a chicken farm, for instance. Again, completely different system, but 2 percent to me seems to be low in terms of an annual mortality rate.

Q Well, let me suggest this to you. I looked up the Spanish flu on Wikipedia last night. Spanish flu killed 80 million people and that was 2.-something percent of the population. And that’s considered one of the greatest epidemics in our history. That’s a very extraordinary amount of death, isn’t it, for a disease. (110829, p. 24)

¹⁴⁴ Korman also states that in his opinion this is “impressive” as compared with other industries, but when later pushed admits that he does not actually know anything about the procedures and results of those other industries (110829, p. 58).

Appeal by the witness is then made to independent expertise (in the form of audits by the province) and to morality rates in wild fish, without any provision of the basis for which such a cross-contextual comparison can be made:

Q ...And if it's – now that we've added up the numbers in a different way, and it may be 4 or 6 percent, you'd have to double that, wouldn't you.

DR. NOAKES: I mean, that's an upper limit. And as Josh [Korman] is pointing out, I mean, the whole thing has to be ground-truthed in terms of your fish – your fish disease checks. I mean there's independent of what fish health events are mandatorily reported by the industry, there is an independent audit that's done by the Province. Now, again, they're only looking at fresh silvers, but the incidence of disease in there was quite low.

Q You're putting a lot in there on that, that the fresh silvers had no disease, in your view, but they're all dead fish, aren't they.

DR. NOAKES: I'm putting a lot of confidence in the people who are actually doing that monitoring in terms of being able to make the proper diagnosis, because they're the experts.

Q Well, I just wanted though, I want to get the grounding for your comment in your report that 2 percent mortality per year was low. And let me suggest this to you. If in fact the expected mortality on a healthy fish farm is less than 1 percent, would that change your opinion about whether 2 percent was low?

DR. NOAKES: Well, I need to know where the expected mortality of 1 percent came from, how that calculation was done.

Q Well, that's just a hypothetical.

DR. NOAKES: Well, I mean –

Q You were the one who said 2 percent was low.

DR. NOAKES: Yeah, and that's – I mean, that's my opinion, 2 percent is low, and again it's based on looking at, say – and again most of my experience has been with wild salmon and other marine populations. And when you look at the natural mortality there, it's about 3 percent per day. So relative terms, 2 percent per year is a pretty low mortality rate. (110829, p. 25)¹⁴⁵

¹⁴⁵ McDade continues to push this point, bringing up that a two-percent mortality in a population might indicate a disease prevalence (and amount of viruses being shed) that is far higher. Noakes points to the limits of working with the data he had, and eventually comes close to admitting that his comparative judgement that the prevalence is low does not derive from any objective assessment but is merely opinion:

Q But if when you said 2 percent was low, if in fact 30 percent of the fish were sick or had the pathogen and were shedding pathogens, that would be high, wouldn't it.

DR. NOAKES: All I can go on is in terms of what the data tells me, and the data, as I say, that we had available was the fish health diagnostics from the reports from the

A fish can be extremely (even fatally) sick and potentially shedding pathogens in significant numbers but unless given a specific diagnosis it will not be treated as such.¹⁴⁶ McDade presents Dr. Marty's provincial audit fish health database, which Korman used for his report for the Commission on the impacts of salmon farming. For purposes of analysis – for Korman and for the audit program – an “open diagnosis” is effectively a healthy fish, despite that many of the fish so listed in the database had symptoms of very serious disease¹⁴⁷ (e.g., fish appear with “sinusoidal congestion,” which is described in the database as a

B.C. Salmon Farmers and from the provincial audits, and that's all I have to go on.

Q So will you at least admit to me that your statement in your report that 2 percent is low is a completely subjective opinion without substantiation?

DR. NOAKES: It's certainly my opinion, and I wouldn't say it was without substantiation, in the sense that I'm relaying that 2 percent on my own experience in terms of dealing with other kinds of fish populations, and in particular in terms of what the natural mortality would be on say wild salmon in the ocean, which is about 3 percent per day when they're in juveniles.

Q And would you say 4 percent was low?

DR. NOAKES: I mean, I'm not going to set an upper limit. All I'm going to say is that these are the data that I had, and based on the information that I had, I had 2 percent and my judgment on that is again based on my experience, was that 2 percent in my opinion was a low number. And I admit that that's my opinion and others may have their opinion. You might ask the other panel members, for instance, if they think 2 percent is low.

Q No, what I'm asking you, Dr. Noakes, is whether you changed your opinion in any way now that the evidence has come out that it might have been as high as 4 percent.

DR. NOAKES: No, I haven't changed my opinion, and again --

Q No, of course not.

DR. NOAKES: -- it's based on the data and based on my own experience. (110829, p.28)

McDade goes on to refer to the Fish Health Program's own literature that indicates that “in a healthy robust population, silvers should generally represent less than 1 percent of the dead group” (110829, p.40).

¹⁴⁶ Marty's system of diagnosis became a further source of controversy in itself. Accusations that it functioned to prevent actual diagnosis of disease, particularly of ISA, were made and discussed below.

¹⁴⁷ This is clear from the following exchange:

Q But in the vet's opinion it isn't sufficient to diagnose it as a particular disease, you've counted it as nothing.

DR. KORMAN: That's correct.

Q Even though it's quite clear that fish had the symptoms of at least some symptoms of a potential disease.

DR. KORMAN: Yes.

“potentially classic lesion of ISA” – the highly pathogenic disease whose potential presence in fish farms and spread to the wild became a matter of tremendous concern and controversy).¹⁴⁸ In fact, by McDade’s count 58 percent of tested fish in the database had some indication of disease. An open diagnosis is applied to cases where fish have significant clinical signs but it is not clear which candidate diseases is the definitive diagnosis. (See 110829 pp. 33-39.) Despite that “open” diagnosis is technically an acknowledgement of disease, administratively it functions as an indication of health. Again, an ostensible requirement for epistemic conservatism in practice functions to occlude rather than illuminate, while giving the appearance of certainty and security.

Further, even though fish are tested individually, diagnosis is made at the level of the *farm*, an additional threshold that, in the absence of a positive diagnosis, is occluded, and which when considered in terms of the impact on wild fish is arguably an epistemic category error. Sick fish on a farm have the potential to spread disease to wild fish even if the farm as a whole is determined not to meet a designation of infected. Moreover, even if an individual fish is diagnosed, if it is not found in other members of the (usually small sample), it won’t be considered a farm-level event, meaning no farm-level diagnosis.

¹⁴⁸ See, for example,

Q Right. But it wasn't a healthy fish. It had sinusoidal congestion.

DR. KORMAN: Yeah, and --

Q And it was dead.

DR. KORMAN: Yeah.

Q So that isn't a fish that you would say was a healthy fish.

DR. KORMAN: No, that individual fish was not healthy. But we weren't summarizing the status of individual fish. We were looking at farm-level disease events. (110829, p. 34)

...

Q All right. But for your purposes, you treated a "none" diagnosis as if it was a healthy fish didn't you.

DR. KORMAN: Yes. (110829, p. 37)

The *forensic* nature of the investigation expounded is alluded to directly by McDade – another framing in terms of “criminal” activity and the need to unearth through a detective-like investigation information that should be in the public domain:

Q Right. Those of who watch detective shows on TV would understand that this is a cold case.....So to use the criminal law analogy, we might have somebody lying on the floor with bullet holes through his chest but because we haven't identified who their murderer is, we have an open case? (110829, p. 41-42)

McDade brings up that the number of fish sampled at a farm during an audit – typically a mere five fish or thereabouts – is actually too small to make an inference to the population with an acceptable confidence interval. The province’s own *Fish Health Protection Regulations Manual of Compliance* stipulates that in order to certify a farm disease-free at a 95 percent confidence-level, a minimum of 60 fish need to be sampled (Exhibit 1566). Perhaps surprisingly, the fish ecologist statistician commissioned to undertake analysis for the commission seems not to have considered this.¹⁴⁹ Most critically, should a new disease emerge in salmon farms – as has many times been the case and as was at issue here in the case of parvovirus – it will not be diagnosed, even if significant and its manifest signs are frequently observed.¹⁵⁰ McDade puts forward that an actually precautionary approach to disease tracking would be to track *symptoms*, rather than diagnoses:

Q Now, Dr. Korman, you’ve heard that this Commission has heard about a potentially new or unknown disease being present in the sockeye?

DR. KORMAN: Yes.

Q You didn’t measure for that?

DR. KORMAN: No....the salmon farmers or the Province wouldn’t be able to measure things that they don’t even know exist yet or certainly don’t have the techniques to measure them yet. ...But I do concede the point, or not concede it, but I do agree with the point that there

¹⁴⁹ See:

Q Five fish, do you consider relevant?

DR. KORMAN: Well, that’s a pretty low sample size. I guess there are cost issues associated with that that are driving that. However, the fact that it doesn’t show up, for example, with ISA virus testing, which they do. So you’re right. From this document, it looks like their sample size at each farm should be larger to make a firm statement about that farm. However, because they do so many audits, you’d still expect that if that disease was prevalent, even if they got it wrong at one farm, the fact is, after six farms they would have enough fish sampled.

Q If it was present in every farm. If it’s only present on one farm, you’re going to miss it, aren’t you?

DR. KORMAN: Yeah, if it’s only present on one farm but I mean one of the issues is, is this thing spreads and that’s why it caused such devastating losses. So would it be reasonable to expect to only find it on one farm? I mean probably not, right?

Q Well, it’s marine anemia that I’m talking about. Do you know how that spreads?

DR. KORMAN: Oh, I thought you were talking about ISA. (110829, pp. 57-58)

¹⁵⁰ Q ...[I]f you have an unknown disease, Dr. Korman, a new disease, then you’re not going to have an entry for it on that sheet, are you?

DR. KORMAN: Yeah, I don’t know how Dr. Marty handles that. (110829, p.57)

could be all sorts of diseases these fish have that we haven't identified yet.

Q So wouldn't it make sense, or isn't it a reasonable proposition that one could look at charting the symptoms of a particular disease?

DR. KORMAN: I'm not qualified to say how reasonable it is because like I say when we were looking at all those histopathological results, I don't know how many of those a normal fish with no disease would have presence so I just can't say whether that's reasonable or not.

...
Q ...This is the fact that 60 percent of the diagnoses are open. And we have an unknown disease or potentially an unknown disease. And if there was a rise in one or more symptoms over time, that would be something that would be statistically valuable to know?

DR. KORMAN: Sure, yeah. (110829, pp. 44-45)¹⁵¹

The epistemic absences are further highlighted by the issues that the "disease" of particular concern at the hearings in regard to aquaculture ("marine anemia") is one that the provincial veterinarian who was responsible for diagnosing audited fish did not believe it existed and "was probably better characterized as a syndrome, a set of symptoms that occur together, rather than a specific disease" (110829, p. 49). McDade draws out the obvious implication:

QNow, your spreadsheets, Dr. Korman, were entirely reliant on Dr. Marty's diagnosis, right?

DR. KORMAN: No, well, Dr. Marty was, I understand, the pathologist. It would also be, for example, Dr. Sheppard as the vet would be using his results, results from the lab so my results were not entirely relying on Dr. Marty's exams.

Q But if the vet who's doing the diagnosis doesn't believe in the disease, then it's not going to show up in the diagnosis column, is it?

DR. KORMAN: I suppose that's right. (110829, p. 49)

The end result is that declarations of low mortality and safety have feet of clay – and are based in mechanisms and processes whose superficial appearance of certainty and objectivity belies an underlying set of methodological decisions, categorizations and interpretations that upon closer examination are neither objective or neutral, and, which seem constructed (whether through

¹⁵¹ McDade then goes to highlight apparent correlations in the data that seem of interest (such as a spike in ISA symptoms on farms in 2007 (which would correlate with when juveniles for the 2009 would be passing them), which Korman agrees appear significant (110829, pp. 45-47).

selective pressure or deliberate intent) to produce outcomes favourable to industry. Aronson (1984) describes two types of knowledge claims made by scientists: *cognitive claims* and *interpretive claims*. The former stake out the significance of findings with a research field, while the latter aim to expound their implications for a broader social context and non-specialist audience. Conventional wisdom holds that it is at the level of cognitive scientific claims – e.g., “salmon farm mortality is low” – that social, cultural or economic factors come into play in way that might complicate or problematize the neutrality that is seen as a necessary prerequisite to their validity. Yet the analysis of *certainty from uncertainty* undertaken here reveals that such forces are at work at both the cognitive and interpretive level – in methods, results and interpretation – that social and material influences are embedded in the process itself, if rendered initially invisible by the symbolic violence of hegemonic orthodoxy.

4. Whose knowledge counts?

(a) The role of indigenous knowledge

One way to address the epistemic challenges of the kind that the *Catch 22* and *Certainty from Uncertainty* present would be to move beyond the epistemological base of reductionist (and mandated) science and recognize the relevance of Indigenous knowledge. The absence of First Nations witnesses at the Commission already has been noted. None of the witnesses who were called to offer their expert opinion (be it scientific, regulatory or managerial) represented an Indigenous perspective – a significant marker of how the nexus of power-knowledge did not extend to indigenous expertise. Yet, when asked, all witnesses acknowledged the importance of including First Nations’ knowledge and First Nations themselves in decision-making. For the most part, however,

concrete examples of meaningful accommodation or collaboration were limited.¹⁵²

This trope of paying lip service to the importance of indigenous concerns while minimizing both their discursive message and material contribution was a mainstay of how challenges from First Nations to prevailing knowledge production were met. It represents a symbolic violence against the value of such understanding tied to a Colonial history. Rather than being flatly opposed, criticisms were recognized – and even supported – so long as they could be addressed at the level of the abstract and hypothetical. “Motherhood” statements calling for better regulation, a holistic approach to fish health, increased environmental protection or enhanced regulatory and industry transparency yielded unanimous support. Yet, in the face of active and unconditional opposition from various indigenous peoples who bear the brunt of salmon farming’s impacts,¹⁵³ for proponents, the underlying legitimacy of the industry and of the current regulatory system remained a foundational commitment.¹⁵⁴

¹⁵² There were occasional references to more substantial collaboration with First Nations – though representatives of the referenced indigenous peoples were not present to offer their perspectives, however. For example:

DR. GARVER: ... Our program, at least the Virology Program is quite involved in multiple fish health projects with the First Nations. In particular, my research group is working on a project right now with the Okanagan First Nation Alliance looking and assessing disease, in enhancing the Okanagan River sockeye stock. So we already do, at least in my program, we do have an exchange where the scientists are collaborating and interacting with the First Nations directly. (110825, p. 37)

¹⁵³ This is not to say that all First Nations oppose aquaculture or that they represent a unified and monolithic perspective. There are First Nations who are actively involved in salmon farming, and the Aboriginal Aquaculture Association, which represents First Nations engaged with aquaculture, was represented at the Commission. It is worth noting that DFO actively encourages First Nations involvement in aquaculture and has provided financial incentives for First Nations to this end. It is also worth noting that, while there are – in some cases very deep – alliances between First Nations and environmentalists in opposing fish farms, any inclination to simply lump the broader perspectives of the two together should be resisted. First Nations and Indigenous people more generally often explicitly resist dichotomies of science/industry vs. nature/environmentalists, for example, which are seen as colonial constructions (though, of course, this is not a universal either).

¹⁵⁴ There were numerous instances of clear and unconditional opposition to salmon farming expressed by First Nations at the Commission. For example, this exchange between Gaertner (First Nations Coalition) and Backman (Director of Environmental Compliance and Community Relations, Marine Harvest Canada):

Q. ... I'd like to start with the Heiltsuk which would be the last nation on this list. You've testified that you're familiar with the net-pen salmon farms that operate in

(i) The motherhood approach

Even when considered at a purely practical level within the existing system, having federal and provincial agencies work collaboratively with indigenous people on-the-ground makes consummate sense. In a context where DFO and BCMAL had/has serious challenges staffing and operating programs across the many remote sites in question, on-going direct monitoring by individuals in the environment would likely prove invaluable. When concrete contributions were recognized, however, they tended to be as an auxiliary to the dominant regime. Hence, Dr. Johnson (Head, Aquatic Animal Health, DFO) agreed that First Nations should be involved in helping to define “socially and ecologically tolerable levels of disease,” yet the specific example he provided pointed to First Nations in the role of surrogate DFO officers, useful given DFO’s limited resources and the fact they are already “on the river” (110823, p. 95). This was to be part of a broader-based initiative that holds that “everybody’s involvement, including First Nations, is useful, provided that those individuals involved are adequately trained and they’re given the resources to do that work” (110823, p.

partnership between Marine Harvest and the Kitasoo; is that right?

MR. BACKMAN: Yes.

Q Okay. Are you aware of concerns that the Heiltsuk had expressed in relation to the licensing of salmon farms within their traditional territory?

MR. BACKMAN: I am aware.

Q Okay. Are you aware of the commercial salmon hatchery in the town of Ocean Falls within Heiltsuk traditional territory?

MR. BACKMAN: I'm aware, yes.

Q Are you aware of the lawsuit brought by the Heiltsuk seeking to quash the water and occupation licences for this fish hatchery?

MR. BACKMAN: I am aware that there's been action taken in the past, yes.

Q Okay. So you would know that Heiltsuk Nation has a zero tolerance position towards the net-pen farming of salmon in their territory?

MR. BACKMAN: And our most recent visits to the chief and council a couple of years back, they did reflect that.

Q Okay. And so you would also be aware that the Heiltsuk Nation's concerns with net-pen salmon farms come from their perspective that the potential risks these pose to wild salmon stocks make them undesirable, correct?

MR. BACKMAN: Yes. (110908, p. 107)

95).¹⁵⁵ While even in this auxiliary capacity, First Nations could offer much to enhance the existing regulatory scheme, testimony indicated that in reality DFO had no plans to develop an “aboriginal guardian” program for aquaculture.¹⁵⁶

Another example of the “motherhood approach”:

Q And having seen that decrease [in the health of Fraser River sockeye stocks] over the last years and decades, that is a concern that you would agree with me is best approached by actually integrating Indigenous knowledge and finding a more comprehensive way of overall planning for fish health?

DR. STEPHEN: If I may, I think the importance here is not to start thinking about primacy of information about whose might be more or less important but to actually build that collegial trusting relationship where we can see the evidence and how it contributes to different parts of this complex problem.¹⁵⁷ (110823, p. 104)

¹⁵⁵ This arguably condescending attitude comes to the fore at other points when even the “motherhood” approach drops away and the noble obligation of the regulatory scientist as sole holder of “expertise” is featured. For example.:

DR. JOHNSON: I guess it's the responsibility of all of us who are fish disease experts or fish disease specialists or veterinarians to work more to help the public and First Nations understand these issues and thereby potentially reducing the amount of this misinformation that goes around. I think that's a really important thing to start with. (110823, p. 99)

¹⁵⁶ MR. ATAGI: ...At this point I have not been aware of any protocols that have been built in place specifically for aquaculture.

Q So in the memo to the Deputy Minister that we just saw earlier, we learned that DFO will not be developing an aboriginal fisheries guardian program in the first year of the new Pacific Aquaculture Program. Are they considering the use of an aboriginal fisheries guardian program going forward?

MR. THOMSON: I don't know of any plans to develop an aboriginal fisheries guardian program for aquaculture specifically. (110901, p. 111)

An Aboriginal Guardian Program for fisheries (not aquaculture) was established by DFO in 1992 and provided training and equipment to enable indigenous communities to develop management and enforcement capacity. It was suspended in the late 1990s but then reinstated in 2008.

¹⁵⁷ Dr Miller is also questioned as to efforts to communicate with First Nations in regard to her genomics research, particularly in light of its potential significance. She points to some dialogue through Genome BC and seems to suggest that restrictions in regard to the Commission may have limited communications:

DR. MILLER: I think given that there was this Commission ongoing and I don't know what my directive would have been within DFO about what groups to this about (sic). Obviously I hadn't approached the aquaculture industry, I hadn't approached First Nations. I did see some direction on that.

There certainly would have been some members of the First Nations aware of this work who are involved in the Fraser Panel at Pacific Salmon Commission because I did -- they funded some of this research and I have talked to them about this although not since we've identified this virus. So there would have been some information through that route.

We also had a portion of our Genome BC, which targeted doing some social

Here, a call for the integration of aboriginal knowledge into fish management is reframed in terms of a hierarchy of information – the suggestion that aboriginal knowledge be included is taken as an assertion of its superiority, an assertion to be rebuffed with the motherhood call to build a “collegial trusting relationship” (a possible implicit acknowledgement of the historical – and ongoing – distrust between indigenous people and settler society and its institutions). The social and cultural capital of hegemonic science allows to exercise symbolic power – adopting a pose of enlightened pluralism while simultaneously subordinating indigenous knowledge and retaining control over the uses to which it is put.

(ii) Rights failures are also knowledge failures

Aboriginal rights have constitutional recognition within Canada under section 35 of the Canadian Charter of Rights and Freedoms, and aboriginal sovereignty and title are active areas of contestation both within the Canadian legal system and outside of it. First Nations people describe their relation to the Canadian state as one of nation-to-nation. While government representatives and scientists were often quick to acknowledge the constitutional or “special” status of First Nations, their testimony suggested that efforts to meet the consequent obligations, such as the duty to consult, were for the most part minimal and lacking in substance – something that clearly accords with the experience expressed by counsel for First Nations and First Nations associations.

Addressing formal requirements of consultation – though meetings, information sessions, etc. – appears to have substituted for substantive, dialogical engagement. For example, following the *Morton* decision and its assumption of jurisdictional responsibility, DFO seems to have undertaken a

sciences and kind of getting – learning how to work well with managers, with First Nations, with stakeholders and we did do a little bit of dialogue with First Nations within that program. That wasn't me directly, but – so the intent was absolutely to engage various groups and absolutely including First Nations. (110825, p. 38)

series of formal consultations with First Nations regarding the relicensing of fish farms, yet the result was that all licenses were simply grandfathered across with conditions unchanged (despite that many of these licenses were originally granted without any apparent consultation whatsoever). (See 110830, pp.23-25.)¹⁵⁸ Many First Nations in fact had seen the transfer of jurisdiction to DFO as a significant opportunity to engage with Canada on the infringement of their s. 35 rights by fish farms.¹⁵⁹ Yet, despite cohosting a series of nine community

¹⁵⁸ Thomson (Director, Aquaculture Management Directorate, DFO) admits that, as of the time of Commission, there had been no accommodations made under the duty to accommodate Aboriginal rights in relation to any salmon farm licensing and no assessment of whether any such accommodations were required. (See 110830, pp. 99-101.)

¹⁵⁹ This is manifest powerfully through cross-examination of Thomson (Director, Aquaculture Management Directorate, DFO) by Gaertner:

Q Would you agree with me that the work of the First Nations Fisheries Council, first, in obtaining the mandates from both the UBCIC and the Summit to meet with DFO officials on strategic issues and concerns regarding the transfer of primary regulatory authority of the Department of Fisheries and Oceans, and in providing information and hosting meetings with the First Nations around the province and gathering, theoretically, the concerns have been useful for the Department of Fisheries and Oceans?

MR. THOMSON: Yes.

Q And would you agree that this work needs to continue?

MR. THOMSON: I agree that we need to continue working with the First Nations Fisheries Council on aquaculture issues, yes.

Q And you'll agree with me that as early as June 16th and 17th, 2009, at meetings that both of you attended, that DFO was put on notice that First Nations had concerns regarding such things as the protection of wild fish stocks as it relates to the siting of farms?

MR. THOMSON: Yes.

Q That First Nations needs to be consulted about all decisions regarding fish farms in their territories?

MR. THOMSON: Yes.

Q They were concerned with how enforcement of fish farms would be carried out?

MR. THOMSON: Yes.

Q They raised concerns as to whether farms can or will be moved upland or inland and contained?

MR. THOMSON: I honestly don't remember that particular point.

Q If that was in your minutes that I've tabled, would you agree with that?

MR. THOMSON: Okay. I would agree if it's in the minutes, yes.

Q And that First Nations believe that they've been involved too late in the process?

MR. THOMSON: Again, if it's in the minutes, I would agree with it. I don't remember that particular concern at that particular meeting.

Q That they raised concerns about how First Nations roles would be dealt with in the management of fish farms?

MR. THOMSON: Yes. (110831, pp. 6-7)

Q That they should have been consulted before first fish farms were ever entered into the water?

MR. THOMSON: I've certainly heard that concern in many meetings.

sessions around British Columbia “to disseminate information to First Nations communities and to facilitate discussions between DFO and communities to support the drafting of the new BC regulations” the First Nations Fisheries Council concluded they found the overall consultative process to be severely lacking and that “information sessions” did not meet Canada’s duty to consult with First Nations on aquaculture decisions (Exhibit 1656). Several First Nations, along with the Union of British Columbia Indian Chiefs wrote to DFO and/or Minister Gail Shea expressing the opinion that consultations were inadequate and that the validity of licenses issues under the Pacific Aquaculture Regulations would be in doubt (Exhibits 1654, 1659, 1701). Meaningful consultation necessitates a two-way process, and in addition to being an abrogation of constitutional responsibility, the failure to engage in meaningful consultation is also a failure to recognize the importance of First Nations’ knowledge and understanding.

Despite that the general extent and nature of aboriginal rights and title is subject to ongoing contestation within the Canadian legal system, the existence of an aboriginal fishing right under Canadian law is well-established (e.g., *Sparrow*), and, although the subject of significant criticism from First Nations, efforts at “co-management” in regard to fisheries have been made.¹⁶⁰ Regarding

Q They asked questions of how you'd be responsive to new science as you looked at the siting of these farms?

MR. THOMSON: Yes.

Q And they asked questions on how the Pacific Aquaculture Regulations would work with the Wild Salmon Policy?

MR. THOMSON: Yes.

Q And can you confirm for the Commissioner that as early as 2009, First Nations advised DFO that they saw the transfer of regulatory jurisdiction to Canada as an opportunity, both legally and otherwise for their substantive concerns regarding potential impacts and infringements to their s. 35 rights to be substantially considered and addressed by the Crown?

MR. THOMSON: Do you want to take it?

MR. SWERDFAGER: I think that certainly, I would agree that some First Nations made that point to us. Others did not. And some of the materials and the opinions that were conveyed to us dealt with those topics, others focused more specifically on aquaculture. (110830, pp. 6-7)

¹⁶⁰ Actually existing fisheries co-management goes directly to the issue of power: whereas First Nations see it as reflection of joint sovereignty, DFO sees it more as a departmental program (Cohen, 2012, pp. 198-99).

farmed salmon, however, recognition from Canada falls short of even these efforts, and testimony at the Commission indicated that DFO had no intention of establishing any kind of co-management of salmon aquaculture. Further, in regard to the development of overall planning for salmon aquaculture through the Integrated Management of Aquaculture Planning (IMAP) process, Thomson states directly that DFO does not regard this as a collaborative endeavour:

MS. GAERTNER . . . And it was your understanding that that work on the policies was going to happen at a collaborative level through the Aquaculture Working Group?

MR. THOMSON: No.

Q That was not your understanding?

MR. THOMSON: I wouldn't use the term "collaborative". I would use the term that we would provide an opportunity to work through – take input and take advice from First Nations, that we work through some of the policy development processes, but I wouldn't say that – I wouldn't use the term "collaborative".

Q So your approach is a one-way street. You'll go there –

MR. THOMSON: No.

Q Let me finish my question. You'll go there, you'll get information, you'll leave and you'll make your decisions.

MR. THOMSON: I think the drafting of policies and the back and forth with First Nations and other groups is always a complicated matter in that you're never sure exactly when to take – I use a bake cake analogy, when to have a cake baked or not. I find it useful occasionally, we have drafts and have discussion point on (sic). I also find it useful to start with a clean slate at times and get an input.

What we've taken in the case in the IMAP development is we went for a blank slate approach which we gathered input from First Nations through the IMAP information sessions that the First Nations Fishery Council helped to host and provide a document on, before we even started drafting what the IMAP for finfish would look like.

Well, now we've drafted part of that IMAP and we'll take that forward to First Nations for consideration and provide further input on it. So that's the approach I've taken. (110901, pp. 93-94)

Counsel for the First Nations Fisheries Council indicated that their first time seeing the draft policies around salmon aquaculture that DFO indicated were operational was when they were entered into evidence at the Cohen Commission (110901, p. 96).

(iii) Disease observations and reporting

Representatives of First Nations expressed a profound concern about the impacts of disease from fish farms, the results of which they believed they have witnessed first-hand. However, the Commission process revealed how they have been excluded from the formal processes of disease assessment and management and given only minimal access to information regarding disease outbreaks and response decisions. A specific example concerns the evidence brought to light of ISA virus in BC – an extremely significant matter. It is revealed that while industry representatives were present at DFO’s technical briefing, indigenous representatives were wholly absent:

MS. PENCE [First Nations Coalition]:

And I see that there’s also members of the provincial government there and for B.C. I see the names Barron Carswell and Gavin Last and then I also see that there’s three industry reps who attended that, Mr. Rob Morley for the B.C. Seafood Alliance, Ruth Salmon for the Canadian Aquaculture Industry Alliance, and Mary Ellen Walling for the B.C. Salmon Farmers Association. Do you see that there? Were they part of that technical call on the 10th?

DR. KLOTINS [Manager, CFIA]: If their names are there, then they were part of that call. Yes.

Q And my simple question is why were First Nations not included as part of that call on November 10th?

DR. KLOTINS: I didn’t set up the meeting and I really – I really don’t know. Sorry. (111219, p. 87)

When pressed, government scientists and bureaucrats agreed that increased transparency and greater certainty around decision-making protocols would be desirable. This tended to be framed in terms of broad-based accountability and responsibility (both of which are significantly limited in practice by the privacy and proprietary concerns of industry). First Nations were here regarded as part of the *public* – their specific constitutional, not to mention socio-economic, status sidelined. For example, Gaertner questions Dr. Stephen on this report recommendation to develop “consistent and transparent processes”:

Q I’m just trying to understand better how we can make data and information more transparent. And I heard yesterday a little bit of

concern about making it public. My clients have been saying that they are not a member of the public and that they should be getting the information at the same time as other governments. What other ways can we look at to determine and improve transparency of information regarding such matters as disease and pathogens? What can we do to improve this? (110823, p. 98)

Stephen's response is limited to a call for the development of general standardized reporting protocols: "almost a decision algorithm, if you like, that would be standard and consistent so that people would understand both within an organization, between organizations and outside, that, yes, we agree we've met our standard for precaution from releasing these fish" (110823, p.98).

Beyond disrespecting Aboriginal rights and sovereignty, inadequacies in information sharing again reveal the devaluation of indigenous knowledge. Consider also the following response to a question on information sharing in the context of meeting consultative obligations, which amounts to a goal of increasing one-directional through website aimed at the general public:

Q . . . So specific to consultation with First Nations on aquaculture, what types of information would DFO be sharing with First Nations, or have been contemplated to share?

MR. THOMSON: Well, I think the type of information we want to share with First Nations is a very similar type of information we want to share broadly with the public, which is, you know . . . we had a very clear objective to increase the transparency around this industry so we've already to start to put a great deal of more information on our website than was previously publicly available about the aquaculture industry. And ultimately, we're going to continue to increase that. So for example, one of the areas that I think that would be useful to get into is to start having a public website that shows the applications for aquaculture sites so there's an opportunity for First Nations and others, of course, to understand what's being applied in their traditional territories or the areas of their interest. (110830, pp. 111-12)

Note also that a focus on *how* information is shared deflects from the issue of *what* information is shared – access to specific health events and disease outbreaks being of primary concern to First Nations. The interests of industry trump both the public's right-to-know and the rights of First Nations. The failure to engage meaningfully with Indigenous people eschews the potential for productive

dialogue in which each party might engage with information provided by the other and together synthesize a greater collective understanding. Instead, we see a process of hierarchical governmental information management that – at best – aims to meet legal obligations, minimally interpreted.

(iv) Indigenous ecology and the use and abuse of “common sense”

The suppression of Indigenous ways of knowing was resisted by First Nations participants and counsel who attempted to reframe the epistemological limits imposed by a naturalized colonialist paradigm. For their part, Indigenous parties at the Commission explicitly referenced the concordance between an “aboriginal world-view” and an ecological understanding, frequently casting this as a (sometimes subtle, sometimes direct) critique of the prevailing method. In this regard, Indigenous criticism of the salmon farming industry and its regulation was not grounded in the dichotomy of a “pre-modern” worldview standing in opposition to a western scientific one. Instead, it took the form of a hybridization in which the ecological is incorporated into an indigenous socio-cosmic understanding. Whereas dominant voices often reproduced the stereotype of Indigenous society as not part of the modern world,¹⁶¹ the indigenous stance actual presents as a contesting discourse *within* the current context.¹⁶²

Consider the following remarks, made following a very extensive back-and-forth between witnesses on the correct interpretation of disease data and their link to fish farms,¹⁶³ wherein the precautionary principle is ironically alluded to in reference to ecological science (and systems theory) in a critique of overreliance on hegemonic reductionist science:

¹⁶¹ The predicate “traditional,” as in “traditional knowledge,” is emblematic here, functioning as a double entendre that both suggests a superficial respect while also connoting atavism.

¹⁶² Gaertner tentatively probes such a synthesis through questioning Connors on whether his MMI statistical model moves statistical analysis in the direction of a more “holistic” approach (something with which he tentatively agrees) (110829).

¹⁶³ The parties to this debate were contracted by the Commission to produce the technical report on the impacts of salmon aquaculture. They issued reports and counter-reports and the scientific sparring continued in the hearings.

MS. GAERTNER: Gentlemen, I want to thank all of you for the work that you've done to help our work here, because that's essentially what you are doing, is trying to help us with a very difficult problem.

My clients, the First Nations in many parts of this province, are ecologists, or using an English word or whole system thinkers and they've asked us to adopt a precautionary approach when looking at the information that's presented but also when looking at the models that scientists use because, of course, we've heard lots of good evidence about how models can be limiting in their understanding and Mr. Commissioner, I will be asking you to use this panel as an excellent example of how models can be limiting and how scientists can have different views depending on the models they use.

So we want to take this – the other good thing, and I am not a scientist, but one of the things that I've learned with First Nations is they use the common sense indicator a lot and so we're going to talk a little bit about the common sense indicators in my work today.¹⁶⁴ (110829, p. 84)

Her reference to “common sense” is met with a caution from Dr. Dill that “common sense is not always a good guide to science,” but he also goes on to acknowledge that for him the conservative minimum of 600,000 farmed fish that die each year from disease on the British Columbian Coast is “a common sense indicator this many farms in this small location within the migratory route are likely to have some effect on smolts and migratory adults as they pass by them” (110829, p. 85). By way of contrast, Dr. Noakes maintains that there's “a fairly low risk in terms of transfer of pathogens.” Gaertner then suggests to Noakes that he is moving away from a “holistic ecological ecosystem approach to looking for very specific data about a very specific relationship” (110829, p.86). His response is to invoke criticism of “ecosystem models”: “So you have to be really

¹⁶⁴ Later, Gaertner advances broadening the process by which the issues to be studied and research questions to be asked are determined, something with which the entire diseased panel, in principle, agrees:

MS. GAERTNER:... Dr. Farrell recommends that going forward the designing of the scientific studies, the questions that are being asked, the review of the outcomes, be not left to academic debate but rather that there be a group of individuals representing a broader perspective be involved right from the get-go regarding the design and questions and results of these studies. I'm going to open it up to the panel as to whether or not you would agree that as a go forward basis that would be useful.

DR. DILL: I think that would be very useful.

DR. NOAKES: Yeah, I would agree.

DR. CONNORS: Agreed.

DR. KORMAN: Yeah. (110829, p. 93)

careful in terms of interpreting data in an ecological model. Some are good, but they're not necessarily going to give you a better answer than just a very simplistic and well-reasoned model that you can apply the data to" (110829, pp.86-87). Similarly, when asked whether as a "general statement" it makes sense to avoid siting salmon farms on wild salmon migratory routes, Deputy Minister Dansereau retorts with, "We don't function from general statements" and rehashes the need for scientific investigation: "so we would have to investigate and continue to investigate to see whether or not there was a reason to do that" (110926, p.79).¹⁶⁵

The disjunct between the quest for definitive scientific answers and the need to make decisions in the face of apparent harm again points to the inappropriateness of placing social and ecological policy expectations wholly on the shoulders of reductionist science. Whereas the "common sense" approach of First Nations suggests that salmon farms should not be sited in the narrow and confined topography that wild salmon traverse, senior DFO bureaucrats admitted under cross-examination that they were unaware of even one example of a site being rejected out of consideration of wild salmon routes.¹⁶⁶ As we have seen, direct appeals to common sense are also made by exponents of the status quo and of the need for "scientific certainty," thereby illustrating how "common sense" in fact can serve as a legitimating standard when employed within a hegemonic discourse. We can see how (as with signifiers such as *sustainability* and *risk*) *common sense* works as a "master frame" (Carroll & Ratner, 1996; Markowitz,

¹⁶⁵ Note that in his findings Cohen himself was skeptical of testimony that siting decisions considered impacts on migratory salmon and concluded that the evidence demonstrated otherwise (Cohen, 2012a, p. 419).

¹⁶⁶ For example:

Q Well, in all the documents that we've seen, in the 600,000 or so documents in the database, I've yet to see a document suggesting the province ever rejected a site because of wild salmon migratory routes. Are you aware of any of those?

MR. LAST: No.

Q What about you, Mr. Swerdfager, can you think of a site that's ever been rejected by the federal government because of its impacts on wild salmon migratory routes?

MR. SWERDFAGER: No, I can't. (110830, p. 70)

2005), whose meaning must be constructed, negotiated and contested through the articulation of power and resistance. In this regard, the elision between a science that stands in opposition to common sense – and by implication Indigenous knowledge – and science as “common sense” is also a symbolic violence which serves to entrench the status quo. The incompleteness of scientific findings as against an idealized scientific method allows for either the hypostasizing of “known unknowns” – meaning that the epistemic threshold for restrictions on salmon farming have not been met – or appeal to a “common sense” position that harm is unlikely. The end result is the same either way. And the underlying rejection of Indigenous knowledge and sovereignty that this represents is revealed when Indigenous participants pushed back directly on the rhetoric of inclusion:

MS. GAERTNER: Can you commit that no multi-year licences will be issued by Canada for any existing finfish licences along or potentially impacting the migratory route of Fraser River sockeye salmon, until that consultation process has been developed and implemented in a meaningful way?

MR. SWERDFAGER: No, I’m not prepared to make that commitment today. (110821, p.111)

The difficulty proponents have with contemplating Indigenous knowledge as something that should be accorded equal respect to that of “conventional” science is further revealed when Gaertner pushes to go beyond tokenistic lip service toward the goal of a truly integrated approach. Dr. Stephen (President, Centre for Coastal Health; Professor, Veterinary Medicine, Calgary), naturally, agrees in principle, but then presents the challenges to the current hegemonic approach presented by such a program as an inherent obstacle:

Q ...And so in the end, what you’re seeing is the way forward in dealing with issues of fish health, as you are suggesting and recommending it, to actually have a more comprehensive approach that deals with overall fish health and brings all these experiences and expertise together. I’m putting it to you, Dr. Stephen.

DR. STEPHEN: Yes, I would agree that we’d like to have a holistic view of health.

Q And an approach, a comprehensive approach of dealing with fish health in light of that?

DR. STEPHEN: Absolutely. With the proviso, of course, that we don’t

really do that well or know how to do that well. Some of the scientific methodology for putting together complex socioecological systems and studying those and understanding the change in systems that are often unpredictable, there's a lot of both cultural change in science and methodological development that has to go into really doing that successfully.

Q And what I'm going to suggest to you is exactly that. My clients, as an Indigenous people and Indigenous peoples generally have a more holistic world view and a way of looking at issues that way. And so specifically when it comes to fish health, my clients being Indigenous peoples, they live along the river, my client specifically along the lower Fraser River. And they have a very close relationship with salmon. They're very concerned about the overall decrease in fish, in fish health. So when you're looking at Indigenous knowledge and Indigenous concerns, the way Indigenous peoples articulate those concerns in a holistic manner, I'm suggesting to you that this is actually a very important element that will have to be at the key of developing a more comprehensive approach to dealing with fish health. (110823, pp. 102-03)

Through the Commission, First Nations representatives were able to bring to light the subordination and marginalization of Indigenous knowledge, and analysis of testimony sheds light on some of the techniques through which this subordinate status is legitimated

(b) Case study: Alexandra Morton at the Commission

In contrast with the attitude of proponents to First Nations, where, at least superficially, a demeanour of civility was maintained, the aggressiveness of attacks on the few NGO or activist witnesses was often striking, typically alternating between scathing sarcasm and open hostility. In no case was this more evident than that of prominent anti-farming activist, Alexandra Morton. In proceedings that were on many occasions animated and dramatic, the efforts to keep her work out of the official record stands out as particularly intense and extensive.¹⁶⁷ Her treatment offers a striking illustration of the discursive techniques used to counter such voices. Not only industry counsel, but also

¹⁶⁷ While this is clearly evident in the transcripts, having attended these and other hearings, I believe that it was even more so in person.

counsel for Canada and the Province of British Columbia went to great lengths in trying to block her evidence from appearing on the record, undermine her testimony and smear her character. This was likely in significant part due to her status as perhaps the most prominent anti-salmon farming voice in Canada, as well as to the implications of her critique.¹⁶⁸ Moreover, Morton is an activist who is also a biologist, one who has conducted and published important research on the impacts of salmon farming, research she claims is intended to fill the gaps that were left by the absence of government or industry studies. In this way, her work represents a direct challenge to the *Uncertainty as a Green Light* discursive technique that cites an absence of evidence to the contrary (in effect because the research has not been done) in support of “business as usual.” Regardless, the treatment of Morton and her evidence vitiates an image of the state as committed to a genuine investigation and analysis of the evidence regarding the impact of salmon farms before the Commission.

(i) The political is personal

This hostile approach to Morton on the part of status quo forces is seen in the manner in which they characterized her personal history with salmon aquaculture. Whereas the biographical history of government and industry researchers was something to be plumbed to reveal the depth of expertise, Morton’s extraordinary commitment to the issue was instead taken as an indication of bias.¹⁶⁹ Despite having been published in prestigious journals

¹⁶⁸ The alignment of industry and government here was characteristic of positions taken throughout the hearing: in all proceedings examined, the positions of industry and government were practically indistinguishable.

¹⁶⁹ It should be noted that, while the most openly hostile and protracted attacks were reserved for Morton, pro-farming voices were not above alleging bias against “mainstream” scientists who alleged possible impacts from salmon aquaculture. For example:

Q Now, I want to ask Dr. Noakes and Dill about the material that Dr. Dill used and referred to and relied upon in terms of reference to articles and so forth. I suggest to you, Dr. Dill, that you use literature in your report and to support the propositions in your report, that is literature that tends to be against aquaculture. Is that a fair assessment?

DR. DILL: No.

Q All right. Do you consider the literature you used to be a balanced set of literature?

(including *Science*), Morton's work was presented as tainted by her opinions and political actions regarding salmon farming.¹⁷⁰ Again, we see symbolic violence in the invocation of a naturalized construction of science as disinterested and existing somehow outside of the social world. If an individual is spurred by their research findings to political action she is seen as losing her "objectivity" and thus no longer trustworthy as a researcher.¹⁷¹ This stands in contrast to the implicit pro-industry positions of government scientists, which adduced no such concerns, at least from proponents.¹⁷² Consistent with the hegemonic status of the scientific frame in which they are operating, government scientists did not engage in pro-industry advocacy – at least not explicitly – and some took pains to make clear that they would not consider it their place. Of course, activism is not necessary when one's position is already dominant. The guise of apoliticality reveals a naturalization at work, and the decision not to act is in reality *de facto* a decision to endorse the status quo. It is only through the operation of power that it is not generally recognized as such.

DR. DILL: I believe I mentioned the controversy in the Broughton, if that's the area you're speaking of specifically. I think that's the only place where there might be any concern.

Q Well, certainly there's mention of controversy. But in terms of reliance, is it literature that tends to be against aquaculture that you relied on?

DR. DILL: I relied on what I considered to be the best science. (110826, p. 48)

¹⁷⁰ In fact, Morton was criticized by Taylor for having the temerity to take issue with research published by the "respected scientists" appearing at the Commission – an interesting contrast with earlier testimony in which Kent admitted that he had relied on "grey literature" in writing his report for the Commission.

¹⁷¹ Consistent with this frame, Morton defends her activism by explicitly situating it on the foundation of her research and engagement with official organs and processes. For example:

Q Well, I suggest that your public campaigning has got -- sorry, so starting when are you identifying your campaigning?

MS. MORTON: Well, it depends how you define public campaigning, 'cause it started with 10,000 letters to DFO and then it went into doing ten years of research on sea lice. There was engaging in the salmon aquaculture dialogue and review and the CRIS study and the special legislative committee, so there's been a lot of participation in public processes, and when my -- when I began to see that the archipelago that I was living in was still suffering from this industry, I figured that the next step was to go to the public and so that -- you know, that really got started about two years ago. (110908, p. 78)

¹⁷² As mentioned, many of recognized experts had deep connections to history. At least one certified expert (Dr. Sadksida) had worked only for salmon aquaculture industry over her entire (15-year) career, before heading up an industry-funded research institute that provides research and testing for industry (The Centre for Aquatic Health Sciences).

At the hearing, Morton described how she came to be involved with issues surrounding salmon farming. Having spent decades living in the remote Broughton Archipelago studying the local whale population, she testified that she originally thought the salmon farms would be a positive development for the area but soon she began hearing from fishers who were now seeing fish covered in (what she later discovered to be) sea lice.¹⁷³ Her initial response was to seek answers from DFO. She stated that ten years of reflexive responses stating that there was “no evidence of a problem” led her to realize that there was no evidence because there was no research, and that she could do the necessary research herself. Morton’s testimony suggests that she lives-and-breathes her work such that it would be difficult to separate it from her life in general and that it is motivated by deep personal commitment rather than the pressures and/or rewards presented within an institutional setting.¹⁷⁴ In Bourdieuan terms, we see how Morton’s position outside the techno-bureaucratic structure of knowledge production – her distinct habitus – enables epistemic possibilities yet deprives her of symbolic capital, thereby delegitimizing her work in official eyes. Morton has examined tens of thousands of fish; at the Commission, she spent more than 2,000 hours examining the full documentary record and was the only person to examine the entire fish provincial health database of 20,000 records (which the province fought to exclude from examination) and to write an analysis of her findings. When asked what percentage of time she spends in the field studying fish, her response was that

...it’s hard to separate, because my – I had a hydrophone in my house, so I’m listening for whales 24 hours a day, so that was part of the

¹⁷³ She offers the following anecdote:

MS. MORTON: It was a neighbour that came to me with one pink and one chum salmon approximately four centimetres long sprinkled with what looked like small sesame seeds attached to it, and they were sea lice, but he didn't know that and I didn't know that. But he said, "What are these?" because, he said, his guests were coming from Scotland because sea lice from salmon farms had destroyed the sea trout and the Atlantic salmon. And when they saw the salmon farms, they said to him, "Do you have the plague of lice, yet?" And so he was really upset and he said, "Can you figure out, what -- are these sea lice? Are they now exploding around these farms as well?"(110907, p. 60)

¹⁷⁴ This is an impression that is also supported by the extent of her work on this issue over many years and beyond the context of the Commission.

research in the whales, because you can tell every pod by their voice, so I was basically doing research 24 hours a day.... And then, beginning in 2001 with the sea lice, I just abandoned everything else and just worked on this. (110907, p.61)

In the contrast between Morton's immersive and naturalistic work and the more detached laboratory approach – including the ensuing debates and antipathy between the two – we can see a parallel to the epistemological divide between qualitative and quantitative research, i.e., Morton's closeness to her work and its subjects can be seen as either a strength (a direct connection to what is actually happening) or a weakness (a sign of bias).¹⁷⁵ I would argue that, as with social science, the antipathy between the two methodologies, while ultimately misplaced, is nevertheless indicative of the relative status of each. The antipathy to Morton is grounded in more than a methodological difference (or a mere difference of habitus and field). Rather, it goes to the balance of symbolic capital and the manifestation of symbolic violence.

This is seen in the subtle – and not-so-subtle – attempts to undermine Morton's credibility. These include implications that her work is not reliable or rigorous, including a flamboyant drawing of attention to a typo in her work and one on her c.v., for example. Indications of sexism are present, perhaps tying into stereotypes of female emotionality versus male rationality – the contradistinction between a supposedly emotionally-driven activism and rationally-grounded science. For example, counsel for Canada first addresses Morton as "Ms." and then asks if she prefers to be called "Doctor." (Morton has an honorary doctorate). All other witnesses with doctorates are simply referred to as "Doctor." In a subsequent hearing, counsel for the BCSFA remarks to a DFO scientist who does not have a doctorate, "I keep wanting to call you "Doctor", if you don't mind. We're using that term liberally here," an obvious jab at Morton. Relentless efforts to undermine her qualifications, particularly as compared to the

¹⁷⁵ It is worth mentioning that when challenged with one of her own studies that ran contrary to her other research in that it showed the absence of a correlation between salmon farms and sea lice on wild fish, Morton construes this a strength (110908, p.76).

“real” (government and industry) experts, including attacking the college she attended as a hotbed of radical activism:

MR. TAYLOR: I want to ask you about American University. That’s where you got your degree isn’t it?

MS. MORTON: Yes, it is.

Q And that’s in Washington, D.C.?

MS. MORTON: That’s correct.

Q And you obtained your degree in 1977, did you?

MS. MORTON: Yes, that’s correct.

Q That’s a private university?

MS. MORTON: Yes, it is.

Q And is it known as famous for political activism?

MS. MORTON: I don’t know.

Q All right. What do you know its reputation to be?

MS. MORTON: It was close to where my mother was living, and so that’s where I began to take classes. I hope we’re going to get back to the sockeye here at some point.

Q Is it what’s referred to as a liberal arts college?

MS. MORTON: I don’t know.

Q Okay.

[INTERUPTION FROM AUDIENCE]

THE COMMISSIONER: Ladies and gentlemen, again, if I could ask you to respectfully honour the process here. We welcome the public’s participation, and certainly we welcome your being in the public gallery, but if you would allow counsel to do their work, I would be very grateful. Thank you.

MR. TAYLOR:

Q And that university has a college of arts and science, doesn’t it, and did at the time you were there?

MS. MORTON: If you tell me it does, it did.

Q Well, that’s the college you were in, isn’t it?

MS. MORTON: Yes, but, you know, I was just taking my courses, going through it, and don’t have a recollection of exactly what that university was and all degrees and scope.

Q Did you get a bachelors of arts and science?

MS. MORTON: I got a bachelor of science. I graduated *magna cum laude*.

Q All right. Now, will you agree with me that you are an advocate against open net fish farms?

MS. MORTON: I am an advocate for wild salmon. (110908, pp. 43-44)

In what might be seen as a notable instance of chutzpah, counsel for Canada accuses Morton of flouting biosecurity measures by coming (on the water) into the vicinity of salmon farms (to observe or film and as part of anti-fish farm protests). He points to the existence of “no trespassing” signs, to which

Morton retorts that they were illegitimate and the farm in question had to take them down. More significantly is his assertion that coming close to net-pens may violate principles of biosecurity. In fact, as is later made clear, this is not the case. However, Morton (and Catherine Stewart) are quick to point out that the net-pens themselves are constructed on a premise of biosecurity violations: “Well, it’s confusing to me how a farm could consider a biosecure situation when the reason that they use the nets is so that millions of gallons of water will pass through the farm from inside to the outside” (110908, p. 64).¹⁷⁶ Hence, Morton’s attempt to investigate the salmon farms is reckless whereas the hazard posed by the farms themselves is wholly reasonable.¹⁷⁷

(ii) The battle of the report

Morton undertook the Herculean task of examining and attempting to synthesize the entire evidentiary record of the Commission to the end of producing an integrated explanation of the fate of the Fraser River sockeye, which she summarized in a 60-page report. Canada, British Columbia and the BCSFA vociferously objected to the admission of this document into evidence. Counsel for Canada (Taylor) attempted to paint a picture of Morton as a woman driven by her anti-salmon farming obsession to beyond the bounds of her knowledge such that she mischaracterizes or misunderstands the work of other scientists to her own ends. Counsel for the BCSFA (Blair) went so far as to suggest that admission of the report would constitute a breach of professional ethics (as a Registered Biologist) on the part of Morton:

¹⁷⁶ Further: “MS. STEWART: Well, I would agree that it’s inherently contradictory. You can’t secure, biologically, an open net pen that relies on tidal flushing and the free flow of water. There’s no securing possible” (110908).

¹⁷⁷ Morton claimed that she witnessed DFO personnel physically restrain one of their own officers to prevent them from accessing a salmon farm:

MS. MORTON: Well, when I was living in Echo Bay, my neighbour was the DFO patrol officer, and he got rumours that herring had spawned on the chains of a net called the Birdwood farm. He was physically restrained from going -- his job was to enumerate herring spawn, but he was physically restrained by other DFO officers from going there. He tried to get onto the First Nations patrol boat, but also was restrained. They had the argument in boats out in front of my house. (110907, p. 10)

MR. BLAIR: Now, Ms. Morton may choose to do so in the world of the blogs and the web and endless postings, which we've – all could read if we chose to, but to make good that breach of a Code of Ethics violation here, under oath, would be professional misconduct. Her own Code of Ethics would seal that. I can't imagine it's a wise area to tread, to file a document which amounts to a professional breach of her Code of Ethics. (110907, p. 67)

The contrast with the fact that the Commission itself contracted the production of numerous expert reports on issues deemed relevant, including salmon aquaculture and disease, offers a clear illustration of how power is exercised through process. While several of these reports were determinedly challenged by pro-change voices for ignoring or under-representing the role of salmon aquaculture – strikingly, the disease report does not consider the role of salmon farms at all, for example – their admissibility was never at issue.

Considerations of bias and objectivity are again highlighted by the fact that these “official” reports were subject to substantial inter-expert debate. Regarding the impact of salmon aquaculture, the authors could not come to an agreement and issued a series of reports and counter-reports. (At the proceedings, this became known as “the tennis match,” discussed above.) Thus, controversy or concerns around objectivity are not themselves genuine motivators for exclusion. In fact, counsel at one point attempts to contrast this controversy with Morton's certainty, legitimate scientific debate now cast as standing against the intractability of the ideologue – another illustration of how the construction of “proper science” is shifting and mercurial: in one context the existence of debate is a signal against action (a trope of uncertainty), in another it is the standard by which (subordinated) knowledge and methodologies should be judged. Morton responds that the appropriate metaphor is not tennis but mudslinging – that this is not an intellectual or academic exchange, but a take-down for material ends.

Q ... [I]t's like a ping-pong match, or a tennis match, there have been reports in support of those earlier reports, and reports that are quite scathing in terms of the methodologies used? You'll agree that it's a ping-pong match, or a tennis match back and forth on some of that science? You'll agree you've certainly read it, correct?

MS. MORTON: I would characterize it more as mud slinging. I don't see the ping-pong. We all agree, those of us that are out there, that the sea lice are coming from the farms. Even Dr. Marty's study said as the number of sea lice increase on the farms, they increase on the adjacent pink and chum salmon. That should have put the whole argument to rest right there. (110907, p. 48)

Note again the appeal to "common sense" inference from naturalistic observation and (consensual) lived experience ("We all agree, those of us that are out there, that the sea lice are coming from the farms.") McDade contrasts Morton's direct fieldwork with that of the actual DFO scientists:

Q So I take it you know most of the DFO scientists who've testified before the Commission over the last couple of weeks at least?

MS. MORTON: I do, yes.

Q How many of them have you seen out in the field?

MS. MORTON: ...So nobody that I've seen on the stand, other than Dr. Connors, has actually looked at the fish. (110908, p. 61)

Examples of alleged misrepresentation, each of which Morton rebuffs, include Miller's work on salmon leukemia virus,¹⁷⁸ criticism of DFO's screening of egg importation,¹⁷⁹ and criticism of DFO for promoting salmon farms.¹⁸⁰ In each

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MR. TAYLOR: Now, under "Conclusion" in the second paragraph at the end of that paragraph you say:

What Miller found ran deeply against DFO policy. The sockeye appear to be dying of a cancer-causing virus that originated in salmon farms on the narrowest portion of the Fraser sockeye migration route.

I'm going to put it to you that that statement that you make there is contrary to Dr. Miller's evidence and ask you to say you agree with me or you don't. I don't need anything more than that.

MS. MORTON: I don't agree with you because she said she had no further place to go with salmon leukemia because nobody had done the work to sequence the virus. (110908, pp. 67-68)

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MR. TAYLOR: At the bottom of that page you say:

Canada has no mechanism to react to the threat of exotic viruses that are travelling in farmed salmon eggs worldwide.

You know full well that there's quite a rigorous egg importation protocol and regime in place in British Columbia, don't you?

MS. MORTON: No, sir, there is not.

Q All right.

MS. MORTON: The fish health certificate does not have infectious salmon anaemia on it. (110908, p. 69)

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case, Taylor compares Morton's statements or testimony to those of the experts or bureaucrats who bear direct responsibility for these areas. The partitioning of responsibility by expertise is used to delineate and then degrade critical positions, working in tandem with the diminution of the mere presence of the latter. Thus, the exclusion of Morton's analysis becomes relevant, something she, herself, points to:

Q All right. But that doesn't accord with the evidence in this inquiry from people such as Mr. Thomson or Mr. Swardfager, does it?

MS. MORTON: Well, if you would allow my 60-page document to go in as evidence, there is evidence there. I was also a reviewer for Dr. Beamish's paper with the ICES Journal of Marine Science. I also viewed Dr. Jones' laboratory experiment on juvenile pink salmon sea lice, so I actually have enormous experience and I'm sorry that we weren't able to talk to that, speak to that. (110908, p. 69)

(iii) Science and activism

Taylor paints science and activism as incompatible such that to be effective the latter demands simplification, and by implication distortion, of the former: "So you not only simplify, but you present your message in the most effective way? I like to communicate things as clearly as possible" (110908, p. 77). Again, appeal is made to the epistemic conservatism of science, ever-restricted to only what can be inferred with certainty and in contrast to the attention-seeking and sensationalistic work of activism, which is subject to no such constraints:

Q When you present as a campaigner and not as a biologist, you do not have to confine yourself to your expertise?

MS. MORTON: The biologist is underlying everything. If the government had reacted to my concerns, I would never be talking publicly.

Q And, in fact, campaigners have great freedom in what they say to media?

MR. TAYLOR:And you'll see there as you go partway through the paragraph there it says:

DFO policy is to promote salmon farms. They are being pressured --

I think that means pressured.

-- by the salmon farming corporations to do so and field staff seem unable to communicate accurately about salmon farm impacts.

That's your interpretation of DFO policy I take it, is it?

MS. MORTON: That's my personal experience. (110809, p. 69)

MS. MORTON: There's nobody restraining my freedom. I'm not paid by anybody, so I try to communicate as clearly and as fairly as I see possible.

Q And if you have to choose between clear and fair, what choice do you make?

MS. MORTON: I choose fair as often as possible, yes.

Q And effective media statements encourage simple, startling messages?

...

MS. MORTON: The issue is startling and clear is required to communicate it.

Q So media messages do not involve the peer review processes that restrict what scientists say in peer-reviewed literature?

MS. MORTON: The media messages that I use are based on my experience and peer-reviewed science. (110908, p. 78)

Whereas science framed as a “pure” pursuit, at a remove from the socio-political and subject to legitimation processes that convey symbolic capital (such as peer review), a scientist who (overtly) steps into the socio-political necessarily reneges on their science and enters the inflammatory world of the activist. It should be recognized that, whereas the political economy of communications requires that activism work within a landscape of often simplistic narrative frames that may necessitate condensed and attention-grabbing rhetoric, it is not the case that activist messaging is removed from scientific critique. Moreover, in reality the communication of science is inherently political and governments have entire communication departments dedicated to messaging – or suppressing – scientific findings and their implications (e.g., Meyer et al., 2012). There is an epistemological slippage in play that transposes methodological principles onto broader social concerns. Extrapolated from the methodological context, conservatism becomes its opposite – manifest as precautionary principle inverted. These issues of whose voices were heard and how their messages are framed are grounded in relations of political economy political ecology, which I take up next.

C. The political ecology of salmon farming

As we have seen, analysis of claims made at the Commission pertaining to science, knowledge and the production of each reveals the importance of material relations as a shaper of individual and institutional behaviour and form. The ideological hegemony of reductionist science and resultant techniques of elision through symbolic violence connect to relations of production and the positionality of actors within the socio-economic system. In this section, I explore in more detail these structural elements as they relate to the regulation, governance and reproduction of salmon farming in British Columbia from the perspective of political ecology, drawing on treadmill of production analysis outlined in Chapter 2. In addition to illuminating the tendencies to ecological harm contained within economic relations, this will inform my final analytical frame, which considers risk through the lenses of reflexive modernity and biopower – economies of risk that both shape and are shaped by material conditions.

1. The intensive farming of a non-native species

Through the lens of treadmill of production theory, salmon farming can be seen as involving multiple transactions between economy and ecology that take the form of ecological withdrawals and additions. While not a manufactured product in the traditional sense, farmed salmon are a commodified (mostly) alien species imposed upon the local environment en masse and reared through an intensive agri-industrial process. Attendant to the primary addition of the fish themselves are further ecological additions: organic matter, drugs or pesticides administered to the fish, and, perhaps most significantly, diseases and parasites. These additions are associated with their own related ecological withdrawals, including withdrawals from other fisheries that go into the production of salmon feed. In light of evidence that farmed salmon consume indigenous herring and other wild fish, local fish species may also be the subject ecological withdrawal, as are local “nuisance” species, such as seals and sea lions, killed by salmon farmers. The

employment of pesticides and drugs also connects to a multitude of withdrawals and additions in their chains of production. Like eco-systems themselves, ecological additions and withdrawals are also highly networked in their origins and impacts.

Regarding the primary drivers of the treadmill – capital, labour, and the state – the environmental threats posed by salmon farming connect directly to the industry as an expansionist capitalist industry operating in a globalized market economy, and capital – acting within capitalism – is clearly the primary driver of these withdrawals and additions. In particular, the most significant environmental threats from salmon aquaculture link directly to intensive agri-industrial production techniques driven by profit maximization: farming of the more profitable non-native Atlantic salmon and the use of open net-pens stocked to high densities. Whereas for the mostly non-native corporations that operate the farms, raising the faster-maturing Atlantic salmon in the Pacific Ocean makes economic sense,¹⁸¹ from a local and ecological perspective the overall risks are significantly increased. As discussed, whether through the displacement of local populations or introduction of exotic diseases, there is considerable reason to believe that Atlantic salmon constitute an invasive species detrimental to indigenous salmon and the ecological system within which they dwell.¹⁸² The threats posed by Atlantic salmon are then compounded by the fact that in order to minimize production costs and maximize total returns the fish are reared in high densities (with hundreds of thousands of fish in a single pen) and with only the minimal barrier of a net cage suspended from floats separating them from the surrounding aquatic environment in which they are literally immersed.¹⁸³

¹⁸¹ It does so at least by short-term instrumental logic – how impactful the “blowback” from the associated ecological damage will ultimately prove is an open issue.

¹⁸² The United Nations Food and Agriculture Organization takes the position that “a strict precautionary approach would not permit deliberate introductions [of non-native species]” and that “the introduction of aquatic organisms for aquaculture should be considered a purposeful introduction into the wild” (FAO, 1996, p.29).

¹⁸³ Within this system, the farmed salmon are wholly commodified, with no value accorded to them as living creatures whatsoever. Their deindividualization is such that they are in effect a fungible commodity. Like barrels of crude or gold bullion, one unit (one fish or one tonne of fish) is interchangeable with any other. Contrast this with the (traditional) Indigenous relationship in which the fish are culturally foundational. Materially, salmon sustained – and continue to sustain –

Restrictions on the flow of material between farmed fish and the surrounding environment are essentially non-existent, enabling the farms to use the marine environment as a sink for waste.

The externalization of the impacts and costs of pollution from salmon farms on the environment and the public was raised by salmon farming opponents at the Commission. Catherine Stewart of CAAR addresses the issue in the context of the viability of closed-containment systems:

I've spoken with the manager, for example, at Marine Harvest Sayward Hatchery, their closed containment facility there where they raise smolts, and one of the things he mentioned to me when we were touring the facility was that one of the most significant costs they had to deal with was dealing with the solid waste, removal of the solid waste, transporting it by truck. It's a burden on the industry.

It's a cost that currently they don't have to deal with. They're basically, they're getting a free ride. There's no polluter pay. It's our receiving oceans that pay the price.

So whenever we hear the industry saying that closed containment isn't economically viable, we want to compare the value of those ecosystem services that are currently being provided at no cost to the industry, so that we're looking at apples to apples and there's a more level playing field when factoring in the actual operating costs. (110908, pp. 13-14)

Packing cages with as many fish as possible only serves to magnify the resulting environmental impacts, as the farms become concentrated reservoirs of disease production and dispersal, requiring the heavy use of drugs and pesticides that bring their own subsequent impacts. Hence, the role of the profit imperative within a capitalist economy in creating the conditions for environmental harm and ecological disorganization from salmon farming is critical.

The complete absence of labour at the Commission was noted above. Treadmill of production analysis sees labour as tending to favour acceleration of the treadmill. The class reality that workers do not control capital but must sell their labour to those who do, is a fundamental imbalance reflected in the relative influence of each within the political economy. Work on salmon farms is generally

societies, yet outside of the process of commodification and commodity fetishism. In this way, salmon retain a rich social and symbolic significance.

low-paying, precarious, and non-unionized. Thus, it is unlikely that salmon farm workers are capable of driving – or impeding – the treadmill or shaping the broader narrative, a condition reflected in their absence at the Commission. This is not to say that this is an unalterable or predestined condition, however. Organization by workers may shift the dynamic.¹⁸⁴

The federal and British Columbia governments had an outsized presence at the hearing, reflective of their essential role in both supporting and regulating the salmon farming industry. Treadmill of production principle holds that the fundamental interest of the state is in expanding production, and this was borne out at the Commission in its vigorous support of the industry and the current permissive regulatory regime. Political and regulatory efforts are primarily oriented toward legitimating the industry and facilitating its operation and expansion, including by managing, minimizing and neutralizing the voices of opposition forces allied against it. These objectives, which are not realized in a wholly deterministic or reductive fashion, derive from the state's economic and ideological orientation within a capitalist political economy. From the perspective of the protection of the environment in the public interest, this presents as regulatory failure or capture.

2. Regulatory capture

One way in which the state acts upon the treadmill, shaping the nature and potentially the rate of production, is through the administrative system of regulatory agencies and government bodies charged with oversight of various industries or sectors.¹⁸⁵ In this context, a strong case can be made that

¹⁸⁴ The conditions and lived experience of salmon aquaculture workers is a promising topic for potential future research.

¹⁸⁵ The fact that the harm caused by actors in this context – mostly corporations, the dominant economic institutions of modern capitalism – is overwhelmingly dealt with through a system that is separate and distinct from the criminal law is arguably a result of capitalist political economy. Despite evidence that corporate crime and wrong-doing are responsible for overwhelmingly more harm (financial and physical) than the street crime that is the focus of the criminal justice system (e.g., Healy & Serafeim, 2016), the regulatory system issues lenient *mala prohibita* penalties (when any at all are dispensed) that carry none of the stigma of the latter. Arguably, this disparate

successive provincial and federal governments and the primary agencies charged with the environmental oversight of salmon aquaculture – Fisheries and Oceans Canada (DFO), British Columbia Ministry of the Environment (BCMoE), British Columbia Ministry of Agriculture and Lands (BCMAL), and the Canadian Food Inspection Agency (CFIA) – operate as “captured regulators” (Bernstein, 1955; Campbell, 2016), beholden to the industry they are supposed to oversee or at minimum deeply compromised by conflict of interest. I explore the nature of these relationships as revealed through the Commission in more detail here. I begin by providing some further background on the history of the regulatory relationship between government and the industry as context for the emergent themes, which in many ways represent a continuation of this historic pattern.

(a) The history of the regulatory relationship

From the early days of salmon aquaculture in British Columbia, the system of administrative regulation has proved deeply problematic – at least when viewed from the goal of the protection of wild fish and marine ecology. Many of the challenges that the implementation and enforcement of an effective salmon aquaculture regulatory regime has faced are common to environmental regulation generally: the complexity and contentiousness of the issue at hand, a lack of jurisdictional clarity, including federal-provincial turf wars and issues of provincial independence, insufficient regulatory resources (deriving in part from an inconstant and timid government commitment in the face of powerful deregulatory business lobbies), and inherent conflicts of interest (e.g., Boyd, 2003; Girard, Day & Snider, 2010; Snider, 2015; White, 2003). Ecological issues do not fit neatly within constitutional heads of power. Multiple government agencies and departments, at both the federal and provincial level, regulate activity related to salmon farming, often with overlapping areas of jurisdiction.

treatment is rooted in the ability of the powerful actors to shape the response – and conception of – their own bad behavior away from criminal conceptions. (See, for example, Glasbeek, 2002, 2018.)

And poor interagency communication and the compartmentalization of issues have long-proved an impediment to effective regulation (Hume, et al., 2004).

The federal Department of Fisheries and Oceans (DFO) was given primary responsibility for the ongoing management of aquaculture in 1988 (Haberl, 2001, p. 12). Otto Langer (Hume et al., 2004), a former senior fisheries biologist with the department, recounts how from the early days of the industry, the efforts of scientific and enforcement staff to monitor fish farms and ensure that effective regulation was in place were subsequently undercut by significant underfunding, repeated departmental restructuring and political interference, jurisdictional squabbling, and the fundamental conflicts of interest in which the department was placed. Most fundamentally, through the creation of an Ottawa-based office of aquaculture, DFO was charged with the active promotion of fish farming, an objective that in practice soon came into direct conflict with its underlying mandate to protect wild fish and fish habitat (Hume et al., 2004, 2004, p. 130) – and one which has endured to this day. DFO subsequently bowed to provincial political and industry pressure, agreeing to lift the moratorium on fish farming that had been in place, despite having no agreement with the province on environmental standards or how monitoring would take place (Hume et al., 2004, p. 131).¹⁸⁶ As noted in Chapter 3, the department initially opposed the importation of Atlantic salmon because of concerns over disease transmission and displacement of wild stocks, yet, reversed its position in response to industry pressure.

Langer (Hume et al., 2004) further argues that enforcement and monitoring activity has always been minimal, and penalties levied against offending corporations negligible, both in number and magnitude. In many cases, attitudes on the part of regulators toward environmental damage appear to have ranged from wilful ignorance to outright complicity. In the 1990s, DFO, in

¹⁸⁶ As a result of pressure from Ottawa and Victoria, DFO also reversed its position that standards for waste management that the province had established in consultation with industry were unacceptable as they would result in significant harm to marine life (Hume et al., 2004, 2004, p.134-135).

conjunction with BCMAL set up the Atlantic Salmon Watch Program to monitor the fate of escaped salmon in the wild. Complaints have been made, however, that once reports of escapes surviving and spawning in local streams started coming in, the program was effectively abandoned, left with no substance beyond a webpage and phone number – reportedly, messages left at this number typically receive no response (T Buck Suzuki, Escapes, n.d.). As the Health Canada authorizations for the use of SLICE discussed in Chapter 3 indicate, regulators have been willing to modify regulatory requirements for the convenience of salmon farming corporations. In 1995, salmon farm operators refused to comply with an order to treat sea lice infestations unless they could keep their intended use of the unregistered toxic chemicals (pyrethrin and hydrogen peroxide) from public disclosure (Grigg, 2010). In response, BCMAL allegedly conspired with the farmers to cover up their use, withholding this information from BCMoE in violation of an information sharing agreement intended to facilitate joint oversight (Grigg, 2010).

Historically, the federal *Fisheries Act*, prohibited, inter alia, “works and undertakings that harmfully alter, disrupt or destroy fish habitat.”¹⁸⁷ Yet until the

¹⁸⁷ See section 35, *Fisheries Act*, R.S.C., 1985, c. F-14. At the behest of industry (Galloway, 2013), the Conservative government of Stephen Harper significantly reduced protections under the *Fisheries Act* in 2012, a move condemned by environmentalists and scientists as “the biggest setback to conservation law in more than 50 years” (Wilt, 2016). (For example, six hundred and twenty-five scientists signed a letter opposing the change [Nikiforuk, 2012]). The general prohibition on “the harmful alteration, disruption or destruction of fish habitat” under section 35(1) (known as HADD) was replaced with one limited to only “serious harm” to “fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery.” “Serious harm” was defined as “the death of fish or any permanent alteration to, or destruction of, fish habitat,” (known as DPAD). The introduced ambiguity and vagueness – such as around defining a “permanent alteration” or making the, now required, causal connection between habitat alterations and dead fish (see the Section B, above) – made effective enforcement much more difficult. When combined with budget cuts to DFO of \$100 million over three years (O’Neil and Hoekstra, 2013) and a shift within DFO to environmental self-assessment by project proponents (and even to self-determination of whether a project requires (self)-review), the result was a dramatic drop in authorizations to projects that would negatively impact fish habitat (from a high of 700 in 2003 to just 74 by 2015 [Wilt, 2016]). The current Liberal government introduced Bill C-68 (scheduled for third reading in the June 2019), which restores the previous HADD provision as well as adding requirements to rebuild depleted fish stocks and creating a public registry to track projects that impact fish and fish habitat.

Per section 40 of the *Fisheries Act* contraventions may be prosecuted as summary or indictable offences. Potential penalties for summary offences are fines up to \$300,000 and/or six months’ imprisonment; for indictable offences, fines up to \$1 million and/or imprisonment for up to three years could be imposed – though in practice never are.

Federal Court required DFO to exercise jurisdiction, it appears that the Department had chosen not to enforce these provisions in regard to salmon farming (neither issuing permits that would authorize such activity, nor bringing enforcement actions against it).¹⁸⁸ The single set of charges laid against a fish farm operator under *Fisheries Act*, followed the laying of a private prosecution by a private individual, subsequently taken over by the Department of Justice (Thompson, 2010). The record from when the province was also responsible for environmental oversight is hardly different. The last annual inspection report on marine finfish aquaculture sites issued by BCMAL and BCMoE (2008) records a total of four successful enforcement actions, which resulted in fines ranging from \$115 to \$173 (p. 52). Despite the large numbers of escapes noted above, and the 111,826 reported escapes for that year, only one enforcement action against a company for “failure to report a possible escape” appears. The company was fined \$173 (p. 52).

(b) *Regulatory oversight as manifest at the Commission*

Through the Commission, the continuation of this regulatory failure, both at the level of the institutional and legal structure of the regulatory agency and the impact of the political economy more generally, was made clear often in illuminating detail.¹⁸⁹ Hence, Mr. Atagi (Conservation and Protection, DFO) testified that he believed the staffing of the compliance and enforcement program for aquaculture was not sufficient for “a marine finfish inspection program”

More specific prohibitions that pertain to salmon aquaculture include s. 36(1)(b), prohibiting the deposit of remains or offal of fish or other marine animals on land adjacent to water, and s. 36(1)(c), forbidding the leaving of “decayed or decaying fish” in nets or other fishing apparatus.

¹⁸⁸ See *Morton v. British Columbia (Minister of Agriculture and Lands)*, 92 B.C.L.R. (4th) 314 para. 41. At the time of this decision, only one of the farms in the Broughton Archipelago had been required to acquire a permit to harmfully alter fish habitat before commencing operations in the area.

¹⁸⁹ I note that my relationship to the Commission is shifted somewhat in this and following sections. While I continue to engage with the Commission here as a site of truth-production, examining further the apparatus of such, I am less focused on the operation of epistemic techniques and more on the information produced. The latter remains “constructed,” and I remain careful to eschew the allure of naïve realism.

(110901, p. 17). The diffusion of responsibility and, in some instances, of procedure can function to hamper oversight and occlude harm, as seen through DFO's diagnostic services for CFIA, a client agency whose objectives are not the protection of wild fish. Another challenge that was illuminated is the splitting of DFO's responsibility for enforcement activity in regard to aquaculture between Conservation and Protection (C&P) and the Aquaculture Management Directorate (AMD).¹⁹⁰ Further, general enforcement of s. 36 of the *Fisheries Act*, which prohibits the deposition of "deleterious substances" into fish habitat, has been assumed by Environment Canada – though it appears the division is by no means clear (Exhibit 35, pp. 34 and 40). Fish habitat witnesses spoke to issues regarding communication, information sharing and coordination between the two bureaucracies. (See 110407, pp. 10-21.) Whereas in the case of salmon aquaculture, formal responsibility for section 36 remains with DFO, Environment Canada may still be involved (Cohen 2012a, p. 369). The picture is further complicated by the fact that, whereas salmon farms are now recognized legally as a fishery, many of their activities extend far beyond those of a conventional fishery, requiring involvement from agencies beyond DFO. The "deposition" of "deleterious substances" such as pesticides and pharmaceuticals, for example, while falling under the jurisdiction of the *Fisheries Act* also necessitate authorizations by *Health Canada*.¹⁹¹ As Catherine Stewart (CARR) pointed out at the Commission, there is a "black hole" around pest and pathogen depositions in regard to the *Fisheries Act* (10971, p. 18).¹⁹²

¹⁹⁰ Challenges arising from diffuse or split responsibility were identified by Justice Cohen in his final report.

¹⁹¹ These issues of regulatory uncertainty, overlap and inadequacy were recognized by Justice Cohen and taken up in Chapters 7 and 8 of his Final Report (Volume 1).

¹⁹² Subsequent to the Commission the *Aquaculture Activities Regulations* were enacted, which address pesticide and drug deposition. They do not specify particular limits on use, but instead offer a motherhood requirement for responsible use (where reasonable), requiring the facility to

7(1).....take reasonable measures to minimize detriment to fish and fish habitat outside the facility, having regard to

- (a) the cost and effectiveness of the available measures;
- (b) the degree and nature of the detriment that may result from the deposit; and
- (c) the physical characteristics of the facility and the type of aquaculture that is engaged in.

Despite very real issues of bureaucratic rationalization, institutional entrenchment and domain protection/expansion, it is conflict and capture that emerge most clearly as fundamental to the failure of regulatory oversight, a reality grounded in the primary role of the state as protector and promoter of capital. This is manifest in DFO's general approach to enforcement, discussed next.

(i) The soft touch

The evidence adduced at the Commission suggests DFO adopts a *compliance* or *cooperative* approach to regulation (Hawkins, 1990; Kagan and Scholz, 1984, Snider, 1993), in which the emphasis is on a light touch and reliance on suasion, education, rewards and voluntary action or administrative remedies as a means to bring violators into compliance. This stands in contrast to a *denunciatory* or *deterrence-based* model, in which obedience to the law and the adherence to definite statutory regulatory requirements, extending to criminal sanctions, is the norm. As a business-friendly approach that minimally interferes with corporate autonomy and revenue, the cooperative model can be seen as embodying a neoliberal ideology,¹⁹³ and it is this paradigm that has come to prominence in the neoliberal era.¹⁹⁴ While the evidence shows that regulators have always tacked

¹⁹³ At a very general level, I mean here the rise of neoliberalism as described by David Harvey (and many others): a socio-economic project/assemblage aimed at "liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets, and free trade." The role of the state is to create and preserve an institutional framework appropriate to such practices. (Harvey, 2005, p. 2).

¹⁹⁴ In other contexts, neoliberal "crime control" adopts a more punitive response. While a thorough consideration is beyond the ambit of this paper, a comparison with the criminal justice response to street crime is informative. Garland (2001) has argued that neoliberal crime control bifurcates between a "criminology of the self" and a "criminology of the other." The former individuates the victim, requiring her to take responsibility for her own protection through increased personal security and property protection measures and risk-avoidance techniques. The latter is based on an "othering" of the criminal who now becomes demonized in the furtherance of retributive punishment.

By way of contrast, in my experience regulatory agencies tend to a congenial and service-oriented attitude to those they are tasked with regulating, one in which laying charges is seen as the antithesis of the appropriate relationship with the agency's "clients." The juxtaposition with the view generally held by city police forces regarding the individuals seen as falling under their purview needs little comment.

to cooperation and flexibility in their dealings with industry, following the neoliberal turn, such principles have in fact become regulatory doxa.

This is reflected in DFO's official enforcement policy as considered at the Commission. For example, the following are the "compliance principles" appearing in the National Compliance Framework developed by DFO's Conservation and Protection Branch (and in operation at the time of the Commission):

- Proactive (promote voluntary compliance);
- Collaborative (build support through partnerships);
- Problem solving (special attention to specific problems);
- Risk based (effort and response proportional to risk);
- Innovative (optimize use of technology and other tools);
- Intelligence-led (increased role of intelligence and analysis in supporting enforcement operations);
- Cost efficient / effective (better use of resources);
- Balanced (appropriate mix of activities undertaken to achieve Compliance) (Exhibit 878)

Further, the Department's (contemporaneous) British Columbia Aquaculture Compliance and Enforcement Strategy 2011/2012 "aims to create a consistent, strategic, risk-based and integrated approach that will promote, assist and compel compliance with the Pacific Aquaculture Regulations and related policies." (Policy and Practice Report 20, p. 92). It intends to "focus effort on education and compliance promotion" and states that DFO will "manage compliance risks by implementing an integrated risk management process into decision-making and operational planning" (p.92). Note the presence of risk as a governing principle (taken up in more detail in section D, below), such that level of enforcement activity is to be matched to the (presumed/assessed) level of risk. Risk thus appears as a principle for the allocation of scarce enforcement resources – one which evidences multiples layers of variability and uncertainty. These latter extend not only to the magnitude of the risk but to its basic nature – is the risk in question the risk of a legal breach, the risk of harm, some

unspecified factorial of both? As was seen to be typical when risk is invoked in an administrative context, its meaning is not elaborated or explored. The resulting semantic openness affords the convenient justification of a full range of regulatory interventions – including none whatsoever.

As evinced in (non)enforcement of the *Fisheries Act* and related regulation, in practice, such approaches tend to reduce to little more than self-regulation on the part of corporations; when penalties are imposed at all they are almost invariably minor and non-criminal.¹⁹⁵ As Snider (1990) notes, “full enforcement is neither the goal of regulatory agencies nor the reality; penalties are handed out in inverse proportion to offending firms’ size and power; and sanctions are so small that they hardly qualify as licensing fees, let alone deterrents” (p. 421). There is a sizable body of research documenting the reluctance of regulators to invoke formal procedures against corporate offenders.¹⁹⁶ Whereas DFO’s Director of Aquaculture Management, Andrew Thomson, testified to the “continuum of compliance activities” available, ranging from letters of non-compliance through to restorative justice activities to prosecution in court,¹⁹⁷ he also stated that the primary response to infractions “of greatest concern” is the issuance of “non-compliance letters” (“minor issues” leading to letters at a later date).¹⁹⁸ Both Thompson and Atagi (Conservation &

¹⁹⁵ To proffer another example of enforcement activity by DFO in a different context, a study by Sierra Legal Defence Fund (2000) (now Ecojustice) of violations of the *Fisheries Act* by pulp mills in eastern and central Canada in the period 1995 to 1998 found more than 2,000 violations, the vast majority of which were ignored.

¹⁹⁶ See, for example: Elliot, & Schaedla, 2016; Girard, Day & Snider, 2010; Hutter, 1988; Michalowski & Bitten, 2005; Morgenstern, 1982; Pearce and Tombs, 1998; Rosoff, Pontell, and Tillman, 2006; Shover Clelland, D.A., & Lynxwiler, 1986; Slapper and Tombs, 1999; Snider, 1993, 2009, 2015; Tombs & Whyte, 2015; Woolfson, Foster & Beck, 1996.

¹⁹⁷ The full-range of response for *Fisheries Act* includes warnings includes, directions by Fisheries Inspectors, orders by the Minister, injunctions, and prosecutions. Section 42 allows for civil suites to recover costs or prevent harm (should negotiations prove unsuccessful). As of the time of the Commission, this section had never been used (Cohen, 2012a, p.353).

¹⁹⁸ DFO’s enforcement policy appears, in principle, to broach models of *enforced self-regulation* (whereby regulated businesses design their own standards and monitoring practices, which then take on the force of law) and the *regulatory pyramid* (whereby initial response to infractions are light and non-punitive but are supposed to gradually escalate in the face of increasing non-compliance) (See Braithwaite, 1992; Braithwaite and Fisse, 1983; Ayres and Braithwaite 1992.) These models reserve a role for criminal prosecution as a “benign big gun” that sits atop a pyramid of progressively severe regulatory responses. The problem is that for the gun to act as a

Protection, DFO) acknowledged that no salmon farm has ever been convicted in court. Documentary and oral evidence at the Commission alluded to DFO's "performance-based" philosophy regarding standards, as described in DFO's master-plan for aquaculture management, the Integrated Management of Aquaculture Plan (IMAP).¹⁹⁹ Under performance-based (variously "principles-based" or "results-based") approaches, holistic objectives for the regulated facility developed jointly between the corporation and the regulator replace fixed, quantitative standards applicable to individual elements. The corporation itself determines how it will meet these overall goals, the assumption being that it is the corporation that is in the best position to do so. (See, for example, Pearce and Tombs, 1998).²⁰⁰ In this way, results-based regulation represents a logical

meaningful deterrent it must occasionally be utilized. The irony is that, whereas proponents contend that a key advantage of these approaches over the enforcement approach is that they place a much smaller demand on regulatory resources, their effective operation would in reality necessitate considerable regulatory oversight and would move regulatory practice in the direction of an "enforcement" model.

In fact, the absence of ticketable offences for salmon farms undermined an even theoretical "spectrum of enforcement" approach:

Q Can you comment on some of the differences between enforcing aquaculture conditions of licence versus other sorts of enforcement work that C&P has traditionally done?

MR. ATAGI [DFO Compliance Officer]: One of the big issues with aquaculture versus a normal harvest fishery is that everything at the current time is by conditions of licence, so we have no ticketable offences in which to rely upon for minor offences. (110901, p.28)

¹⁹⁹ At the time of the Commission the plan was in draft form. The current version is striking in its construal of the role of DFO as to serve the industry (as supporter, promoter and subsidizer). For example:

The Government of Canada undertakes numerous initiatives to ensure a successful and sustainable aquaculture industry across Canada. These initiatives streamline the regulatory process, strengthen science to create performance-based environmental standards, spur innovation to enhance the sector's competitiveness and productivity, and support the development of certification schemes to meet rigorous quality standards in international markets. (Fisheries and Oceans Canada, 2016, p. 17)

²⁰⁰ Most regimes of environmental legislation were initially established under a "command-and-control" model under which compliance is measured against fixed numerical standards. For example, environmental regulations for "end-of-the-pipe" allowable concentrations of certain toxic chemicals are deemed (often somewhat arbitrarily) to represent an acceptable standard for effluent released in to the environment. Exceeding these concentrations constitutes a violation punishable by law. Opponents of set regulation put forth that the general application of determinate standards were inappropriate to corporate offenders, arguing instead for "flexible" standards tailored to each corporation's specific circumstances (with suitable recognition of the cost of compliance and its impact on corporate revenues).

extension of the compliance approach: in each case minimal interference with the interests of the corporation assumes primacy.²⁰¹

Critiques of compliance-based regimens advance that their popularity derives from the economic power of corporations to shape regulation in their own interests. Girard, Day and Snider (2010) contend that regulators come to internalize “the structurally generated, taken-for-granted realities of business/government interaction, turning this into regulatory ‘common sense,’ the everyday mentalities and sensibilities, habits and routines that guide agency and individual behaviour” (p.235). Structured by a political economy in which the regulated are also the primary economic producers, this symbolic violence within the regulatory field shapes the habitus of regulators. As the authors put it, “[t]his individual and cultural recognition of the realities of power makes it only “sensible” to recognize and adjust to the fact that criminalizing dominant economic players is not realistic” (p. 235). Power disparity comes to be enshrined in official policy as a self-defeating acquiescence to the dominance that creates regulatory ineffectiveness. Compliance models are a reflection of this power imbalance as “a fundamental and acceptable constraint on the state’s ability to regulate corporate crime” (Snider, 1990, p. 429).²⁰²

²⁰¹ This is not to say that tailoring specific criteria to individual facilities is necessarily inappropriate. In reality, even regimes characterized as “command-and-control” display considerable flexibility and openness to the dialogical development of individualize measures. However, as with the compliance approach more generally, the rub in actively advocating for the corporate-led development of standards is that it accentuates the already existing imbalance of information, resources and power in favour of those very entities who seek to avoid the imposition of meaningful regulatory limitations.

This is perhaps nowhere more strikingly evidenced than in the financial sector, where “principles-based” regulation, in tandem with “new governance” approaches that see the regulator as just one player in a mosaic of intersecting social forces, have long been the prevailing orthodoxy. In practice, if not truly in theory, this meant extensive deregulation and the almost complete removal of regulatory oversight, such that the fox did indeed have full watch over henhouse. The ultimate result was the financial crisis of 2008 and its still unfolding succession of financial scandals and debacles. (See for example, Will, Handleton & Brotherton, 2013.)

²⁰² The problem is compounded by the phenomena of the revolving door whereby personnel go back-and-forth between working for regulator and the industry the regulator is supposed to oversee. This revolving door is sometimes pointed to as a factor in the gentle approach adopted by regulators toward regulatory industries (McMahon, n.d.). The phenomenon was evident at the Commission, with many of the witnesses who appeared in a regulatory capacity having a history with industry and vice versa (sometimes moving back-and-forth repeatedly).

(ii) Proprietary information

The picture that emerged from the Commission, then, is of an industry in large part self-regulated, with most of the responsibility for monitoring lying with the facilities themselves. Despite that salmon farms operate in public waters and at law are considered a fishery, the property and privacy rights of corporations take precedence over both the public's right-to-know and the ability of the regulator to intervene in the public interest. DFO's own reliance on industry reported data, along with the proprietary attitudes of the industry regarding it, mean that, on the rare occasion when the Department wishes to pursue charges, gathering evidence for prosecutions is extremely challenging. This differs from other fisheries where there is the capacity for at-sea and dockside monitoring by DFO itself.²⁰³ While there are government auditing programs – the adequacy of which was subject to challenge at the Commission – it is up to the farms to routinely monitor fish health and report disease outbreaks (at the level of the farm, not the fish). When they do so, the details of this information are not publicly accessible. At the time of the Commission, BCMAL would only publish quarterly summary reports of the aggregate events for all operations.²⁰⁴ Information on which specific farms experienced events is not available. As mentioned, two participant groups at the Commission – the Aquaculture Coalition and the Conservation Coalition – had to bring an application to gain the right merely to review the fish health database for their appearance at the commission.

Some of the institutional aspects of the administrative regime that work to further shield the industry from public oversight have been referred to in Section

²⁰³ Atagi stated:

If we were to go further with enforcement action, we would have to prepare for prosecution. There is no – we are heavily dependent on self-reporting from the industry and there is – in some other fisheries we have independent mechanism such as dockside monitoring, at-sea observers, electronic monitoring to independently provide the department with information, as well. (110901, p.28)

²⁰⁴ Since assuming responsibility for aquaculture management from the province, DFO has, to its credit, improved reporting and transparency requirements for several aspects of the industry. For example, farm-specific figures for antibiotic and therapeutant use are now available (though only on an aggregate annual basis), along with sea lice counts (average per fish). However, reporting on fish health and mortality is now confined to *annual* reports that proffer aggregate data across all (BC) farms, with no specifics as to operator or time of occurrence.

B of this chapter. These include the split system of disease diagnosis within the governmental testing bureaucracy and resulting diffusion of responsibility. And as noted, sick fish may be present and may be diagnosed by the farms' own veterinarians, but the disease will only warrant official recognition when it rises to the level of a "fish health event." In other words, "diagnosis" is something that occurs at the level of the *farm*, not the *fish*. Hence, much disease that is recognized and possibly treated by the farms is nonetheless screened out of public reporting. An "open diagnosis" effectively means no diagnosis, which effectively means no disease – such information drops from the register. The irony is that the strong reductionism of the standard conceptualization of disease in fish becomes inverted in scale in the diagnosis itself: the focus is no longer on "the bug rather than the fish" but the population rather than the fish. Diagnosis is only permitted at a de-individualized and statistical level. Once again, there is an abstraction away from direct evidence through an – ostensibly – scientific process that presents a front of legitimacy and safety while occluding both evidence of harm and the elements of subjectivity that inure to the diagnostic process (referred to above). Taken in a neoliberal regulatory context in which the primary responsibility for diagnoses and treatment lies with industry and in which it – and government – actively shield information about such efforts from public scrutiny, farms become near black boxes (though ones with pretty casings), effectively isolated from meaningful public oversight.

(iii) DFO's conflict of interest

DFO's conflicting mandate as protector of wild fish stocks and promoter of salmon aquaculture was a matter prime concern at the Commission. For example, Catherine Stewart (CAAR) stated that she believes DFO's "constitutional mandate to protect ocean and ecosystem health and wild stocks" to be in direct conflict with the "political mandate in recent years to be a promoter and an advocate for the aquaculture industry" (110907, p.7). She called for DFO to be relieved of its promotional role (which could perhaps be given to Industry

Canada of Agriculture Canada) and made the point that “there are a lot of good people and very well-intentioned and very dedicated people in DFO,” who are nonetheless “constrained by the political mandate” (110907, p. 18). Interestingly, the senior national DFO manager saw this dual role not as a conflict but as an advantage, and that DFO’s “close work” and connections with industry facilitated “sustainability-premised solutions” (110830, pp. 9-11). This theme was echoed by a Deputy Minister of DFO, Claire Dansereau, who tellingly stated that she believed it was DFO’s job to “show the world that the Canadian products are safe, Canadian products are sustainable, and that’s because we are the regulators that we can speak with a certain amount of authority on those areas” (110923, p. 2) – in other words, DFO’s role is construed as utilizing its purportedly effective management to the end of promoting the industry.²⁰⁵

Both federal and provincial governments have made clear their desire to promote the development of aquaculture as an economic support to fishing communities hit hard by the decline of the commercial fishing industry – a collapse brought about, in large measure, by the lax environmental regulations supporting the forest and mining industries (Grigg, 2010). DFO has maintained multiple programs and initiatives to subsidize and market the aquaculture industry.²⁰⁶ Evidence entered at the Commission (and taken up in detail by Justice Cohen in his report [Cohen, 2012a, Chapter 8]) revealed DFO’s extensive efforts to work hand-in-hand with industry on projects to promote farmed salmon, including to large retailers, such as Safeway (Exhibits 1634 and 1836).

Swerdfager represented the interests of the salmon farming industry at the Boston Seafood Show (110831, p.80).²⁰⁷ He and other DFO personal brought US

²⁰⁵ She went on to acknowledge that, nonetheless, there may be a “perception” of a conflict and assert that it would be preferable if enforcement of section 36 of the *Fisheries Act* were assigned to another Ministry, such as Environment Canada (110926, pp.36-37).

²⁰⁶ Technically, DFO does not engage in the “marketing” of farmed salmon but assists with “market access,” arguably a fine-grained distinction.

²⁰⁷ Swerdfager resists the notion that DFO engages in the promotion of aquaculture:

MR. SWERDFAGER: ...The Sustainable Aquaculture Program, which is what's referred to here as a \$70 million program, does not have as its goal to build our aquaculture industry to make it more successful and competitive. The Sustainable Aquaculture Program is very much focused on fostering a

trade commissioners together to promote the “sustainability” of Canadian salmon farming. They also engaged in a number of “market outreach” sessions. A DFO Executive described how he was part of a junket that met with California senators to promote BC farmed salmon (110831, p. 80). The multiple programs to subsidize and promote the aquaculture industry became a topic of inquiry at the Commission. The Sustainable Aquaculture Program (SAP) was a \$70 million national program that ran from 2008 to 2013. Intended to enhance the “global competitiveness and environmental performance of Canada’s aquaculture industry” and “make it more successful and competitive” (Exhibit 1728, p. 1) it included monies for, “streamlining federal, provincial and territorial regulations and policies,”²⁰⁸ scientific research that will support “performance-based environmental standards,” innovation to “to enhance the sector’s competitiveness and productivity,” and supporting “the aquaculture sector’s ability to meet domestic market demands and rigorous international trade and marketing requirements” (Exhibit 1728 – DFO Backgrounder). Funding from the SAP to

sustainable aquaculture industry in our country. A large part of its investment is in the Science capacity of DFO, to support science directly tied to a regulatory agenda. There is certainly an element of the Sustainable Aquaculture Program that is oriented towards fostering and creating the conditions of success of the industry, but this goal statement here, if you will, is too much focused on the economic development side of the agenda and does not appropriately address the true mandate of the program, which is the sustainability dimension that I referred to this morning.

MR. LEADEM: Well, you certainly would agree that Government of Canada has committed \$70 million to promote aquaculture in Canada; is that not correct?

MR. SWERDFAGER: No, I would not. Sorry, I don't wish to be difficult, but I would not choose that phrasing. I don't think that the government's commitment is, to use your term, "to promote aquaculture." In my view, that implies, and perhaps I'm just misunderstanding your word, but that implies a whole series of marketing activities, and so on, and so on, and so on. The Sustainable Aquaculture Program, which is a \$70 million program over five years, I could describe it to you if you wish, I know your time is short, so I will just simply identify that it has a strong science component to it, it's got a very strong environmental regulation component to it, it's got an innovation and sustainability component, and a strong focus on third-party certification. So I would not characterize it as something that is, "promoting the aquaculture industry." (110830, pp. 83-84)

The program includes transfers of public funds to the aquaculture industry to improve management and enhance competitiveness and better position itself in the marketplace. It would be very difficult to construe this as anything other than a subsidy.

²⁰⁸ The removal of the “burden” of the “red tape” that is hampering business and its natural drive to productivity and efficiency is a constant of neoliberal deregulatory initiatives.

promote aquaculture amounted to \$25 million. No similar funding appears to have been available for the promotion of the sale of wild fish.²⁰⁹

DFO administers other national programs that directly or indirectly subsidize industry efforts in research, public relations, communication and marketing. At the time of the Commission, these included the Aquaculture Collaborative Research and Development Program (ACRDP) and the Aquaculture Innovation and Market Access Program (AIMAP). ACRDP is an “industry driven program that teams industry with DFO researchers to meet the program’s goals of improving competitiveness of the aquaculture industry, increasing collaboration between DFO and industry on scientific research to enhance aquaculture, facilitate and accelerate technology transfer, and increase scientific capacity for essential aquaculture research and development (Cohen, 2012a, p. 388).”²¹⁰ AIMAP offered national grants (\$23.5 million over five years) “to improve the competitiveness of the Canadian aquaculture industry by encouraging an aquaculture sector that continuously develops, along with positioning Canadian aquaculture products as having high value in the marketplace based on their environmental performance, traceability and other considerations.” (Exhibit 1777, p.1). It would seem that DFO is directly assisting the industry in its construction/appropriation of environmental discourse, including “green” marketing under the rubric of “sustainability.” In the contested

²⁰⁹ Government and the regulatory system arguably also indirectly subsidize the salmon farming industry. The savings incurred by the industry through government’s failure to mandate closed-loop systems and to permit the continued use of the marine environment as a sink for the industry’s ecological additions (and source for withdrawals) are a subsidy paid from the public purse. The polluter in fact does not pay – but the public does.

²¹⁰ A DFO review of the ACRDP makes clear its intended role as promoter supporter and subsidizer of the industry salmon farming industry, a role that includes working directly to counter the negative perception of aquaculture by the public and NGOs. It found the industry requires assistance in overcoming a number of challenges that are beyond its ability to address effectively, including technical barriers and challenges related to the environment. There are also communication challenges as there is a negative perception of aquaculture among certain influential NGOs. In bringing a rigorous scientific approach to the issue of environmental impacts associated with aquaculture, ACRDP has the opportunity to clarify some of the misinformation that persists. The industry includes small firms that are marginally profitable and do not have the financial means to invest in research and development that could improve its competitiveness.... The ACRDP therefore has a role to play in the improvement of the industry’s competitiveness and the transfer of knowledge from scientists to industry operators (Exhibit 1937, p.2)

space of the construction of an environmentalism as rooted in activism, social movements or grassroots public concern versus that of a “corporate social responsibility” approach of greenwashing and tokenist change that does not fundamentally impact the process of capital accumulation (e.g., Capaldi, 2005; Lynch & Stretsky, 2003; Shamir, 2005), DFO has clearly chosen sides.

(iv) DFO, independent scientists and NGOs

By way of contrast, almost no evidence of DFO working with independent scientists – ones not affiliated with industry or DFO – was adduced at the hearings. This was not for a lack of efforts on the part of independent researchers, however. Dr. Michael Price, a biologist with the Rainforest Conservation Foundation, had been surveying sockeye the Discovery Islands since 2007. Yet he testified his efforts to contact DFO it set up its own research program where in vein (110906, p. 86). Alexandra Morton tried for ten years to get DFO to consider her research, to completely no avail. CAAR did undertake monitoring work monitoring with DFO and industry as part of the Broughton Archipelago Monitoring Program (BAMP). Catherine Stewart stated that, while there had been some “positive outcomes” from this project, the “pace of collaborative science and the pace of change has been glacial and very discouraging” (110907, p. 50). Subsequent to the Commission, CAAR in fact abandoned these efforts.

On matters of environmental contention there is often a split between “moderate” groups and individuals who are willing to work with industry and government to reach a compromise and “radical” ones who stick to their guns and remain mostly on the outside of such (usually government and/or industry directed) processes. A criticism of the former by the latter is that they are engaged in accommodating themselves with a process that is not actually intended or designed to reach a genuine compromise. Instead it provides public relations (greenwashing) benefits for industry and government while bogging down opponents in endless negotiations that often require tremendous

commitments of time and energy – all while restraining their ability to act outside of the process and fostering isolation from those elements of the movement that are not included. Such approaches may present as a pragmatic strategy in the face of the power differential between industry and environmentalists, one that arguably has in some case achieved genuine (though still contentious) concessions (e.g., Hunter, 2016). At the same time, the divide-and-conquer corporate public relations strategy of, first, identifying the “moderates” and the “radicals,” and then co-opting the former while isolating the latter, is a long-standing and well-recognized one.²¹¹ Such dynamics have also led to criticisms of some large and professionalized NGOs for acting in bad faith and participating in such processes only to advance their own organizational interests and positionality within the political economy.

To the extent that such processes are facilitated through government regulators and ultimately serve the interests of industry, then, they may represent another shade of regulatory capture. The regulator may be “captured” not just by industry but also by other institutional actors that, while proclaiming otherwise, in effect, support the status quo – or if the relationship is not one of capture, then it is, at least, one of symbiosis. While ENGOs may lack the economic clout of industry, they may possess greater symbolic capital in the form of public trust – which can then be lent to/ appropriated by corporate interests. Whether or not the failure of BAMP represents such a situation, it nonetheless appeared as another bridging project that ultimately served only to facilitate division while producing very little in terms of positive results.

(c) *Regulatory capture and the threat of disease: Infectious salmon anemia (ISA) and a putative new virus*

²¹¹ It is worth noting that a communications analysis developed for DFO by an outside consultant – and entered into evidence at the Commission – included quotes from DFO senior management that identified CAAR as the “most reasonable organization to work with one-on-one” – as distinct from the “subset which broke off that includes Alexandra Morton/ Save Our Salmon” (Exhibit 1697, p. 5).

In reference to the highly contested issue of Infectious Salmon Anemia (ISA) and evidence of its presence in British Columbia waters, the Cohen Commission saw some of the most powerful evidence to date of the degree to which the regulatory process can be compromised in the interest of the salmon farming industry. For years, DFO categorically denied that ISAv, a particularly virulent salmon virus, was present in British Columbia, despite numerous accounts of fish observed displaying the symptoms of the disease.²¹² ISA has emerged in every other jurisdiction in which Atlantic salmon are farmed, often with devastating results for both farmed and wild fish (Taylor, 2011).

(i) Independent testing for ISA and the political and regulatory response

In 2010, Alexandra Morton, working with Dr. Routledge at SFU, collected wild fish samples that were then analyzed by Dr. Kibenge (chair, Department of Pathology and Microbiology, Atlantic Veterinary College, University of Prince Edward Island), who heads one of only two labs in the world approved by the OIE (The World Organization for Animal Health) to report ISAv (OIE Reference Laboratory for Infectious Salmon Anaemia, n.d.). His tests showed positive for the presence of ISA virus (ISAv) (UPEI, Atlantic Veterinary College, n.d.). These results prompted Justice Cohen to reopen Commission hearings. Through the Commission it came to light that research undertaken by Dr. Miller and her team at the DFO's Pacific Biological Research Station also produced positive results for ISAv or an extremely similar virus in wild sockeye. It was also revealed that DFO research dating back to 2006 indicated the presence of ISAv in wild sockeye, including in 100 percent of Cultus Lake samples, a stock that experienced a mysterious and massive pre-spawn mortality (Exhibit 2045). Not only did DFO shelve this report but it failed to disclose the results to the Commission itself. Morton also sent samples to be tested by Dr. Nylund (Professor, University of Bergen), considered to be the world's foremost expert on ISAv. These too produced a positive result, although the degraded nature of

²¹² As discussed above, it has now come to light that the B.C. Ministry of Agriculture and Lands disease reports contain over 1,100 reports of "classic" ISAV lesions in farm salmon.

the sample meant that the result could not be reproduced (Exhibit 2033). Of the labs that tested samples, it was only DFO's official laboratory that was unable to find evidence of ISAv. Results there proved inconclusive, but not negative.²¹³

This collective set of results was characterized by CFIA, the Minister for DFO and the BC Minister of Agriculture, as *negative* for ISA – a position strikingly at odds with the actual evidence and one that once again inverts the precautionary principle (Exhibits 2091 and 2092). The theme of *certainty from uncertainty*, which we saw manifest mostly at the level of the regulatory scientists directly, illustrated how a lack of evidence can be interpreted to reinforce the status quo. In the case of the political reaction to evidence, we see how *considerable* (though not definitive) evidence also can be directly negated to that end – the high political stakes perhaps pushing the violence to actual scientific conservatism and sound reasoning that much further.

In fact, the Minister of Fisheries, released a statement that implicitly criticized the findings of Miller and the other labs:

After Canada's reputation has needlessly been put at risk over the past several week[s] because of speculation and unfounded science, additional in-depth, conclusive tests, using proper and internationally recognized procedures, are now complete and we can confirm that there has never been a confirmed case of ISA in BC salmon, wild or farmed.²¹⁴ (Exhibit 2004)

When questioned, Miller and Kibenge both testified that they took this as an implied criticism of their work. Miller pointed out how it elides the distinction between ISA virus and ISA, the disease, but that even in the case of the latter, she believes that the claim is false (11215).²¹⁵ Subsequent to its own testing, the

²¹³ This may be because they are testing for the wrong thing. If there is a Pacific variant of ISAv that, due to a mutation, exhibits a slightly different genetic sequence, then it may not show up on the DFO test.

²¹⁴ Interestingly, the Provincial Fish Health section head testified that the regulations governing the screening of imported fish eggs for ISA virus are in her opinion inadequate and that a DFO and CFIA press conference that announced that there was no ISA in BC was "entirely premature."

²¹⁵ McDade also puts this statement to the DFO scientist in charge of testing for ISA, leading to the following exchange:

Q In the third paragraph -- well, the first actual quote from the federal Minister is:
. . . because of speculation and unfounded science. . .

DFO also put a press release reaffirming that “there have been no confirmed cases of infectious salmon anemia or wild or farmed salmon in BC.” It also – falsely – claimed that these results were consistent with the findings of Dr. Nylund’s lab and that of the 48 samples that were part of the original investigation “are all negative” (Exhibit 2029). In actuality, DFO’s findings in regards to Morton’s samples were inconclusive as a result of their degraded condition – not surprising given the chain of custody through which they had to pass.

At the hearings, McDade pressed Stephen Stephen (Director, Biotechnology and Aquatic Animal Health, DFO) on DFO’s press release, leading him to admit (indirectly) that it contains misrepresentations.

Q In the fourth paragraph, it says that:

DFO has tested all 48 samples...and the results are all negative for the virus.

Is that a correct statement, Mr. Stephen?

MR. STEPHEN: I think Dr. Wright might be able to provide a better answer to that than I.

Q Well, before Dr. Wright answers, I want to know what your views

Do you agree with that statement or is that an overstatement? "Unfounded science".

MS. GAGNE: I'm not a communication expert so "unfounded" is probably -- we could have a debate over the word.

Q You were aware by December 2nd, weren't you, that your PBS lab was finding ISA virus?

MS. GAGNE: I don't remember exactly when I became aware of that. What date did you say?

Q By the date of this document, December 2nd.

MS. GAGNE: Honestly I'm not sure when exactly. It's the beginning of the month probably that I became aware of it, but I'm not sure when exactly.

Q This document would be misleading if you were aware of that, wouldn't you -- wouldn't it?

MS. GAGNE: I don't think so.

...

MS. GAGNE: Just remember that we have repeated several times there is a difference between an ISA segment and an ISAV, a virus.

MR. McDADE:

Q Did you ever, at any time, speak up to your communications people and say they were misleading the people based on your results? Did you ever say anything about that?

MS. GAGNE: There is a -- I work, I am busy, I don't read all the communication statements, and no, I have not -- repeat again your question?

Q Did you ever speak up to your communications people suggesting that DFO was misleading people based on your inconclusive results?

MS. GAGNE: No, I have not. (111216)

were.

MR. STEPHEN: I was advised by our laboratories, yes, that was a correct statement.

Q That's Nellie Gagné's laboratory?

MR. STEPHEN: That's correct.

Q Now, you heard her testify, didn't you?

MR. STEPHEN: I did.

Q And you heard her testify that her statements were not negative, they were inconclusive because there wasn't enough RNA present to be able to make a conclusive statement; isn't that right?

MR. STEPHEN: I'm not sure I recall that exactly, no. I heard a lot of testimony in a day and a half.

Q Well, let me suggest to you that she agreed that without some qualification that would be misleading, the qualification being that the results were too degraded to be able to test. Before you answer, Dr. Klotins, I want Mr. Stephen's answer on this.

MR. STEPHEN: Could you repeat the question, please.

Q I understood her evidence to be that the samples were so degraded that she couldn't say that they were negative, that they were inconclusive, and further that she would have expected a statement to that effect in the release, otherwise it would be misleading. What's your view on that?

MR. STEPHEN: On my understanding from the information I was provided that those samples were negative.

Q You didn't know that they were inconclusive.

MR. STEPHEN: I knew that some samples were inconclusive based on degradation of other materials, the 299 fish that were collected from Dr. Routledge. But I wasn't aware that these particular ones were degraded to that level, no.

Q The next statement says:

These results are consistent with the findings of an independent laboratory in Norway...

Now, did you hear Dr. Nylund testify that he found positives?

MR. STEPHEN: I did.

Q Doesn't the word "consistent" there mean they're all negative? How is a positive from him consistent with negatives from the other?

MR. STEPHEN: I don't know. (111219, pp. 41-42)

In fact, Dr. Klotins (Acting national manager, Disease Control and Contingency Planning, Aquatic Animal Health, CFIA) testified that their ability to confirm positive results would be effectively impossible. Nonetheless, CFIA seized the

samples (from Kibenge, Routledge and then Morton) and moved to assume complete control:²¹⁶

DR. KLOTINS: We basically knew right from the beginning we probably wouldn't be able to confirm the results [of positive tests for ISAv that had been conducted by non-government laboratories], but we wanted to get an idea of whether ISAv actually exists out there or not, and which is why we did some of the testing, corroborative testing. ... [We knew we would be unable confirm the results] because we had no oversight on the collection. So the CFIA, because our decisions are very important, can affect multiple stakeholders and partners, including international trade, and because these were wild fish, so it would affect the commercial fishing industry in particular, we need to be very sure that when we make decisions about calling an area or a particular population of fish positive that they truly are positive. (111216, p. 96)

Hence, the outcome is pre-ordained, achieved here under the guise of bio-security, strict adherence to protocol and concern for scientific validity. CFIA's powerful symbolic capital as protectors of the food supply and bulwark against disease and epidemic enables the Agency and its representatives to assert the lack of confirmation with hegemonic force, in effect providing a confirmation of absence – industry and international trade thus rendered safe.

In fact, following the positive results, CFIA contemplated a further significant act of sovereign control – the prohibiting of all labs in Canada from testing wild fish. Klotin's response when asked why provides a compelling example of the *evidentiary catch 22* facilitating the exercise of complete control, the protection of capital and the shutting down of inconvenient research:

DR. KLOTINS: It was an option I put forward, basically because we could not confirm chain of custody, and it would – it would be more of the same where we couldn't confirm results. And we already knew we were going to come out with a surveillance plan.

Q So what you're really saying is we don't want any more citizens testing fish. We want to be the only ones doing it.

DR. KLOTINS: We wanted to provide the oversight on that testing, yes, because we are by legislation the final arbiter of fish health status in Canada.

²¹⁶ CFIA has authority to do so under the *Health of Animals Act*.

- Q So let me just understand this chain of custody. By your definition, if anybody else samples for these fish, you don't have – you've got chain of custody issues?
- DR. KLOTINS: Yes. If they're not under oversight of CFIA.
- Q And the only way you can get proper samples, then, is if CFIA samples.
- DR. KLOTINS: Or we contract the sampling, but we provide the oversight.
- Q But you're not presently sampling.
- DR. KLOTINS: We're not presently sampling. We've got a surveillance plan under development.
- Q And you never sampled wild fish before this date?
- DR. KLOTINS: No.
- Q So as I understand your rationale, we're in a little bit of a Catch-22. Only things we sample will meet our test, and we're not going to sample anything. Isn't that the situation as of October 2011?
- DR. KLOTINS: October 2011? That was October 2011, but now we're in December 2011, and I don't agree with your statement.
- Q All right. Well, as of October 2011, there was no sampling program for wild salmon in place by CFIA, was there?
- DR. KLOTINS: Not at that time. (111219, pp. 48-49)

McDade, goes on to put it to Stephen and Klotins that DFO and CFIA would never have gone public with this these results had not Routledge (the SFU researcher) done so first and that DFO and CFIA's own conceptualization of chain of custody protocol prohibits a priori ever confirming those results:

- Q So the answer to that is, Mr. Stephen, is you would not have gone public either at DFO?
- MR. STEPHEN: It would be CFIA's responsibility to do the reporting, but again we do not report presumptive results. We have to confirm those results first.
- Q And that can take months; is that right?
- DR. KLOTINS: It's possible.
- Q Well, and, Dr. Klotins, as I understood your testimony on Friday, there was no way that these samples could ever be confirmed because you had chain of custody issues.
- DR. KLOTINS: Correct.
- Q So these would never have been more than presumptive positives, no matter what.
- DR. KLOTINS: This particular event, yes.
- Q All right. So the Canadian public would not have known about this but for SFU.
- DR. KLOTINS: At some point we do report on our investigations, but it is possible the Canadian public would not have known. (111219, p. 38)

McDade shifts presciently to the example of HSMI:

- Q And if a new disease came forward, something like HSMI, discovered by a researcher at a university, the same result would occur at CFIA; is that a fair statement? No one would ever know until you could do confirmatory testing yourself.
- DR. KLOTINS: That particular disease is not a reportable disease. It would be a new – possibly a new emerging disease. That is not – it's not notifiable to CFIA, and whether we would do any more investigation on that disease would depend on degree of mortality and how many fish populations were being affected.
- Q Mr. Stephen, what is DFO doing about the report of HSMI in the Clayoquot Sound fish farm?
- MR. STEPHEN: I don't – I'm not aware of DFO doing anything at the moment. I only learned of Dr. Miller's results when she forwarded them to the Commission on last Tuesday. I have not had any communication with anybody based on that disease at the moment. (111219, p. 38)

The Minister of Fisheries' statement and the position of DFO and CFIA stand in sharp contrast to the position at the Cohen Commission of Miller, Nylund, and Kibenge, who all agreed on the importance of further research on and testing for ISA in British Columbia. Yet following Miller's positive test findings, DFO management advised her to curtail her research on ISA (111215, pp. 126-127). DFO subsequently committed to survey work; consistent with their overall approach to fish health one of the goals of this work was "to confirm that ISA is *not* present in BC waters" (Exhibit 2065), an interesting illustration of how when the stakes are high enough concerns about the "impossibility" of proving a negative can be put to one side. It is also another powerful reversal of the precautionary principle: in the face of presumptive evidence of harm, the response is not to pause the activity in question and undertake further investigation to determine if there is harm, but, in the interest of continuing such activity, to undertake research to demonstrate that there is no harm. Miller suggests that the position of DFO management was that research labs should not even be working on disease – at least not listed diseases, for which positive findings have potential trade implications:

MR. MARTLAND: In the course of the discussion you describe, was any direction given to you or comment made as to whether you should continue or stop with the testing you were doing?

DR. MILLER: I don't think that Stephen Stephen, in Ottawa, was very pleased that we were doing this testing, because we are not the validated lab. You know, we're – and I tried to explain, you know, we're doing this in a research context, we're looking at a variety of different pathogens, ISA being one of them, and I fully agreed that anything that we get that's positive should be validated in one of their testing labs. But I – basically, there was the feeling that the labs that are not NAAHP labs should not be looking at disease. (111215)

Miller's intimation carries the clear political economic implication that in balancing the value of research – and of research that may have significant implications for wild fish and fish ecology – against the siloing of research from diagnosis in the interests of trade, the latter will take precedence.

The political economic imperative to not find disease would appear to underpin the treatment of Miller and others who suggest that fish farms may be a source of disease in wild salmon. Miller testified that she felt intimidated by DFO management and the CFIA and that she was particularly concerned that the extensive genetic bank she oversees could be confiscated as happened to the samples in Dr. Routledge's possession after Dr. Kibenge's positive ISA_v test results:

MR. ROSENBLOOM [Area D Salmon Gillnet Association]: My question to you is ... what did Mr. Stephen say to you were the consequences of you having come up with a positive finding of ISA?

DR. MILLER: Just to understand this, specifically what he talked to me about was that there was a policy in place about ISA that was developed between DFO and CFIA. Policy cannot be a moving target, so research could come up with new results of new orthomyxoviruses, but that the sentiment that I got was that research should not fog policy, so – but my take, as a scientist, is that research should inform policy, and if policy has to change based on new findings, then that's what it has to do. But I don't come from a manager's standpoint, I come from a scientist's standpoint.

Q Did you interpret his comments to you in any way that he was attempting to intimidate you, Dr. Miller?

DR. MILLER: I personally took a level of intimidation at the idea of my samples perhaps being taken away. I don't know that he meant –

you know, I mean, it was said to me by a number of different individuals over again, and of course I did read about what happened to Rick Routledge's samples in his freezer in his graduate students' program when CFIA took away all those samples and they weren't able to continue with the research that they were doing.

Of course, I look at my own program and I think I have a lot to lose here if CFIA decided to sweep in and take all my samples. I've got thousands of samples and a very big program in jeopardy, so whether Stephen Stephen meant that or not, I certainly have been very concerned about that.

Q Did he say anything in terms of how positive findings might be consequential in terms of our relations with the Americans?

DR. MILLER: I think he just intimated that I, as a scientist, would not understand the complexities of these issues and that, as a scientist, I should not be undertaking research on something if I didn't understand the ramifications of what the results could do.

Q And you took that as being intimidation, did you not?

DR. MILLER: Some level of intimidation. (111215, pp. 126-127).

(ii) Totalizing control

Ultimate authority for a declaration as to the presence of a disease and for the governmental response rests with CFIA. As mentioned, under the rubric of disease control and the prevention of outbreaks, the agency can adopt a form of totalizing control.²¹⁷ The confiscation of samples, for example – and hence possible derailment of research – under the (in this case genuinely absurd) auspices of biosecurity can function as a powerful means of intimidation and control over research.²¹⁸ (Klotins of CFIA took the equally absurd position that if

²¹⁷ A small illustration of this power is evidenced following the statement of Stephen (of DFO) that he did not know how the claim that DFO's test results were consistent with Nylund's made it into the official DFO press release. Dr Klotins of CFIA stated that it was at CFIA's instruction based on their assessment.

²¹⁸ Klotins asserts this authority on the stand in relation to the interpretation of the independent laboratory testing of ISA:

DR. KLOTINS: I have to disagree, as I said, we do the interpretation of the test results. We know the PCR test is not a perfect test. Indeed, in some of those 48 samples of the kidneys that we obtained from Dr. Miller's lab, those were in good condition and they did test negative. And the gills were variable results. In terms of Dr. Nylund's results, he could not replicate his findings, and we considered them negative at this time.

Q You defined them as negative, but --

Routledge and Morton did not get their samples back there would not be a chilling effect on research because CFIA has a program to compensate researchers if their animals are destroyed – based on the market value of the animal minus the value of the carcass.) The totalizing role of CFIA is consistent with a political economic and treadmill of production analysis. Though ostensibly charged with protecting the safety of the food supply, CFIA is also the de facto protector of agri-industry, in particular of market access. Given that potentially a single positive result can mean that an entire industry finds itself quickly shut out of global markets, the stakes are highest here. Hence, it follows that instrumental rationalized sovereign power would be at its peak in this context.

Part of this hard power includes the ability to decertify labs. At the hearings, McDade puts it to Stephen that as punishment for reporting the positive results for ISA, the federal government will move to strip Kibenge's lab of its OIE certification:

Q And, Mr. Stephen, I suggest to you that the federal government is going to try and take away his OIE certification as a punishment for this; is that right? That's what you're going to do, isn't it?

MR. STEPHEN: I have no authority to do anything about his OIE certification.

Q I predict within the next 12 months Canada will go after his credibility; isn't that right?

MR. STEPHEN: I disagree. (111219, p. 45)

In fact, subsequent to the hearings CFIA undertook an audit of Kibenge's lab and found "potential for cross-contamination." As a result, the OIE then ordered a further audit, which found the lab "fell well short of acceptable quality standards"

DR. KLOTINS: Yes.

Q You were fully aware when this statement was put in that Dr. Nylund would not have said that they were consistent with a statement that they were all negative?

DR. KLOTINS: Dr. Nylund reports on the ability of his – of the test or his testing results as they were done in the laboratory. After laboratory tests are done, then the interpretation of the test results are – need to be evaluated, and it's done by – in our case, by the CFIA, as we are legislated to make that determination. So even in veterinary medicine, when we get test results it is not the laboratory that makes the determination of the disease or not. They tell us under their protocols they believe the tests are positive or inconclusive and then the clinician makes the decision, the interpretation on what those test results actually mean to the patient.

and recommended suspension of its reference laboratory status. The OIE then did so. Kibenge was quoted as saying that he believed CFIA had pushed the audits because of his troublesome findings: "What they are doing here is essentially punishing me for having testified at the Cohen Commission and trying to suppress the findings ... It's an attack on my credibility" (Woo, 2013).²¹⁹

Miller also testified that she was instructed not to discuss her work with the media and that she was prevented from attending scientific conferences. She believed that the gag order came directly from the Prime Minister's Office:

DR. MILLER: I mean, as I learned, and I only learned through the inquiry process, that the decision of not allowing me to speak to the press after the *Science* paper came out, came out of the Privy Council Office, and not from DFO. I had permission to speak from the Deputy Minister, and I believe the Minister's office. So what I am not aware as a scientist is at what level these decisions are made.²²⁰ (110825, p. 21)

Perhaps the most visible instantiation of state power in the service of capital took the form of the two unidentified security personal (dressed in black and complete with earpieces), who flanked Miller whenever she appeared at the Commission,

²¹⁹ Shortly after the announcement of detection of ISA in British Columbia and the consequent reopening of the Commission hearings, CFIA adopted "*a stream of commerce*" policy, in place for one year. As explained in an internal email from Alfred Bungay, DFO National Manager for Aquatic Animal Health in an internal email:

Until then [December 10, 2012] the permit requirement at the border will not be strictly enforced. That is to say if a shipment [of Atlantic salmon eggs] arrives at the without a CFIA permit or it does not meet all of the requirements the CFIA may still allow the shipment to enter Canada. (Bungay, Alfred, n.d.)

Thus, CFIA's response to evidence that the most lethal salmon virus known is present in BC was to *lower* farm salmon importation standards.

²²⁰ Another example of that points to the exercise of political control is evidence of explicit direction from the Minister of Fisheries and Oceans office to staff to draft a letter confirming that all DFO testing is confirmed as negative for ISA and that the public should have complete faith in the regime (Exhibit 2137), which is put to DFO Manager, Stephen Stephen:

MR. PENCE: And my question to you, Mr. Stephen, is this the usual routine for the minister's office to tell staff what the message should be as opposed to staff on the ground informing the minister as to what the messages might be?

MR. STEPHEN: Well, I haven't had a lot of correspondence with the minister's office communication outside of this particular investigation and over the last few months. This was an email I received, yes, and it did include some recommended comments in sections. I was asked to draft something but I did not follow this to the letter, as you see here. My wording was to verify what we could, in fact, talk about in testing lab review and public confidence. And, of course, the lab review was being led by CFIA, so I would defer to them for comments on that section. (1112109, p. 83)

presumably intended to prevent the press or public from attempting to communicate with her – and vice versa.

It would appear then that CFIA was caught in its own deep conflict of interest, prioritizing concern over the potential negative trade implications that would flow from definitively identifying ISA in British Columbia salmon over its mandate to protect the Canadian food supply. This predilection can be seen in an email from CFIA executive, Joseph Beres, to his colleagues, in which he offers congratulations on their handling of the media on the issue of ISA in BC salmon: "It is clear that we are turning the PR tide to our favour – and this is because of the very successful performance of our spokesmen at the Tech Briefing yesterday... Congratulations! One battle is won, now we have to nail the surveillance piece, and we will win the war also" (Exhibit 2110). Not surprisingly, when questioned directly as to whether CFIA is proceeding from the conclusion-first position that there is no ISA present, government witnesses denied that this is the case. Nonetheless, looking at their actions rather than words, might lead one to conclude otherwise. As one commentator put it, "if the CFIA's version of science is to start with a trade-friendly conclusion and then research to support it, this does not bode well for BC's wild salmon and the entire marine ecology founded on this iconic fish" (Grigg, 2012).

(iii) DFO's response to evidence of new disease

The manner in which DFO reacted to Miller's epigenetic research suggesting a link between a virus from salmon farms and the 2009 collapse of the Fraser River sockeye run (Miller et al. 2011) is also instructive. As mentioned above, Miller emailed her superior, Stewart Johnson, to confirm her understanding that the rationale for why in light of this evidence DFO was not testing farmed fish was told that, as that the virus in question was not a listed disease, if inspectors tried to test her supervisor would advise farmers not to comply (Cohen Commission, Exhibits 1500 & 1501). The rationale provided by Johnson was framed in terms of scientific rigour and conservatism – holding off on testing until a widespread screening of salmonids is developed. But there seems to have been no real

intent on the part of management to develop such a program. Miller was unable to even obtain confirmation of this justification. Instead of a plan to test farmed fish, industry proposed working with DFO in a project to test, not the Atlantic salmon in their farms, but wild sockeye. It would seem that DFO once again inverting the precautionary principle to place the interests of industry ahead of those of the public.

Claims grounded in the themes of scientific specialization and methodological conservatism facilitate the regulatory agency in advancing the interests of the regulated. The intersection of scientific specialization with bureaucratic structural compartmentalization again comes into play. Miller's desire to begin testing of farmed fish is impeded by the reluctance of the Animal Health Branch (DFO) to recommend proceeding without further proof. Consider the following exchange between McDade and Garver, in which we again see the inversion of the precautionary principle and the theme of the *evidentiary catch*

22. McDade draws Garver's attention to a document written by Miller:

QIf you see the phrase in the second large paragraph:

Given the potential devastating impacts of this disease on sockeye salmon, and possibly other Pacific salmon species, we propose research that will conclusively establish whether plasmacytoid (sic) leukemia... is ...the primary cause of river entry timing shifts...

Now, Dr. Garver, Dr. Miller strikes me as a relatively level-headed person not prone to a Chicken Little "the sky is falling" material. When a senior scientist at your Department says potentially devastating impacts, that's a significant finding for you, is it not?

DR. GARVER: I'm sorry, for me? You're –

Q Well, what I'm trying to do is get to the sense of what level of certainty do you need about a potentially devastating impact to the sockeye salmon, to actually take action, rather than more studies? What would it take to get you to actually recommend some action? How far do we have to go in proof?

DR. GARVER: Well, as I alluded to, and I think it has been brought out several times, we're following a scientific approach. So we need to establish that this sequence is indeed causing a disease.
(110825, pp. 8-9)

In the above exchange we see competing normative conceptions of science, which connect to competing notions of the function of the regulator in relation to

the public and to industry. McDade puts at issue the notion of a neutral and objective research process existing at an apolitical remove from policy. Science – at least science as embedded within the civil service – is imbrued with a normative responsibility to the public good that Garver (and others) are failing to meet. Garver’s response that the research is underway and we must not rush to judgement until there is definitive proof alludes to a methodological conservatism that also could be construed as exhibiting an implicit normative component – that it would be “wrong” to act before this standard is reached. Yet Garver’s adherence to structural compartmentalization indicates that responding to such threats is simply not within his purview as scientist (which may also contain a normative element in so far as it would be considered wrong to take it as so). When McDade pushes him further on Miller’s hypothesis that “that some 27 million salmon might have died from this in 2008,” Garver responds that DFO is taking action – “we’re researching” (110825, p. 7). He goes on to further assert his commitment to the division of responsibility between scientists and management: “The management is aware of these briefing notes, these memos. I conduct science (110825, p.10)”

However, the consistency between Garver’s professions to apolitical neutrality and his actions is put at issue by McDade. Miller’s push for testing within DFO necessitated obtaining buy-in from the Fish Health experts. Here Garver was not reluctant to supervene outside of his area on Miller’s expertise, making edits that “water down” her concerns. McDade again attempts to illuminate the structural resistance to taking action that might impact the salmon farming industry:

Q Well, when in the public health field when SARS was first discovered to be killing human beings at some risk, the virus hadn’t been cultured and proven to the levels that you talk about, had it?

DR. GARVER: It had been identified –

Q But –

DR. GARVER: – and it was definitively linked to the disease. So, yes, they did determine Cox’s postulates.

Q Before public health people took any action? My suggestion to you is public health officials, when the health of human beings are involved, take action before the final proof of the virus is in.

MR. TAYLOR: This witness hasn't been put up as a public health expert, and Mr. McDade hasn't done anything to establish that he's going to have any basis of knowing what the question's about.

MR. McDADE: Well, let me re-ask the question, then, in a different way.

Q Dr. Garver, does your Department have any guide whatsoever to suggest you take action before you have proof?

DR. GARVER: I'm sorry, can you rephrase that question?

Q Do you have any guide in your Department that suggests that you should take action in the absence of final proof? What level of risk does it take to actually start doing something?

DR. GARVER: I believe we are doing quite a bit.

Q Well, let me ask – let me change gears again, then. One of the things I'm interested in is in 2008 and 2009, when Dr. Miller was raising the level of concern about this potential virus, she wanted to test in the fish farms for this MRS or SLV and you resisted that, didn't you?

DR. GARVER: I didn't resist testing. (110825, p. 11)

When Miller is asked why she did not test, Miller references the resistance from Fish Health:

Q So why – why – let me ask you, then, Dr. Miller. Why didn't you go out and test in 2009?

DR. MILLER: ...

I think that, you know, the Fish Health experts within DFO were not comfortable in continuing on or paying a lot of attention to this until we actually had a virus. I suggested there was a virus. We didn't have one at that time. We now do have a candidate virus. And so now we – I am moving forward with Kyle and doing some challenge work using – using tissue that is positive for the virus as the basis of the challenge.

But I think that there was a lot of reluctance to take any action based on a genomic signature, because people don't understand what is a genomic signature, and how well can you actually predict a mechanism from one. So, you know, I'm expecting and hoping that things will be different now that we've actually identified a virus associated with that. But we'll see. (111225, p. 12)

Miller suggests that opposition to testing on the part of Fish Health personnel is due to a failure on their part to understand the nature and significance of genomic research; when pressed, she intimates interdisciplinary rivalry and that her approach may even be seen as a threat. The use of genomics in a fish health context that was previously grounded almost

exclusively in histopathological observation of farmed or laboratory fish could amount to something of a paradigm shift (Kuhn, 1996), or at least a significant change in habitus (or *nomos* – the underlying “rules” that direct practices and experiences within a field), one that shakes up relations of economic, social and symbolic capital.²²¹ From the perspective of field theory, Miller might be seen as an *insurgent* who threatens to change the “laws” of the diagnostic field, destabilizing the position of *incumbents* (Cattani, Ferriani, & Allison, 2014).²²²

The refusal on the part of Fish Health personnel to countenance the possibility of pathogens from salmon farms as causal agents in the collapse also points to the direct role of the regulatory apparatus in the protection of industry. The political economy of capital imprints itself upon the regulatory field, with the result that interiorizing the “common sense” of a compliance orientation into habitus becomes essential to operating successfully within the system (Snider, 2009). The bureaucratic response to the threat of emergent disease from salmon farms as revealed through the Commission indicates that this internalization was not limited to managers and administrators (though it appears to have been felt most strongly there) but extended to research personnel also. As Miller puts it, while the objective of the genomics lab was to determine whether disease or other stressors may be a factor, the mandate of Fish Health is to demonstrate “freedom from infection.” Poignantly alluding to the precautionary principle, she characterized this divergence thusly: “Their approach is to make sure it’s not there. My approach is to ask if there’s any way that it is there” (111215, p. 140). The absence of knowledge conveniently equates to the absence of regulatory

²²¹ I am reminded of Kuhn’s referencing to the great physicist Max Planck, who claimed that “new scientific truth does not triumph by convincing its opponents and making them see the light, but because its opponents eventually die.” (Kuhn, 1996).

²²² There is an interesting negative epistemology at work in this approach, which begins by determining an epigenetic signature, then running it against known genetic signatures of other diseases – thus identifying what it is not – and then looking for a virus *in vivo* that matches the signature (which then leads to histopathology and more standard efforts to demonstrate pathology, such as efforts to culture the virus). In addition to being somewhat iterative and inductive, it is also both seductive (because it has the capacity to offer information otherwise unavailable and, perhaps because of the “whodunnit” quality of the investigation) and – because it precedes from a negativity, an absence – unsettling, in that it destabilizes “settled” assumptions of how science should work.

impediment to the smooth operation of corporate commerce. When research that had been undertaken began to be connected by Miller to a possible specific virus, the response of DFO was to undermine their own research.

(d) Developments subsequent to the Commission

One venue in which opponents of salmon farming have exercised their opposition and met with some success is the courts, institutions of the state that arguably have a greater level of freedom from political and economic influence than the regulatory system. Indeed, from a structuralist perspective, the Commission as a quasi-judicial process may have worked as a form of check on the industry. Even though government did little directly to act on its findings, the Commission seems to have served as a catalyst and source of revelation for public opposition. Beyond its tenure, the courts have continued to function as another window into the captured nature of government regulators.

(i) Opponents meet with success at the courts

As mentioned, DFO's disregard for the precautionary principle emerged as an issue again in successful court challenges to DFO's policy of not testing smolts transferred from hatcheries to marine fish farms for piscine reovirus (PRV), the pathogen responsible for HSMI in Atlantic salmon. In a 2015 decision on a case brought by Alexandra Morton, the Federal Court ruled that licensing conditions of a Marine Harvest fish farm at Shelter Bay that allowed for the transfer of PRV-infected smolts violated the Fishery General Regulations (SOR/93-53) prohibition on the release of fish that carry a disease agent that may be harmful to wild fish (s. 56(c)).²²³ The court took DFO to task for performing the same violence to the precautionary principle that we have considered in evidence at the Cohen Commission:

²²³ *Alexandra Morton v. Minister of Fisheries and Oceans and Marine Harvest Canada Inc.*, 2015 FC 575

Invoking the precautionary principle, the respondents submit that the licence conditions are intended, in the face of scientific uncertainty, to prevent transfers that may be harmful to the protection and conservation of fish. However, they also contend that that same scientific uncertainty with respect to whether PRV is the agent of HSMI justifies the transfer of PRV infected smolts. A lack of full scientific certainty is the very situation addressed by the precautionary principle. The respondents' arguments with respect to the precautionary principle are inconsistent, contradictory and, in any event, fail in light of the evidence. (para 44)

The court also held that, in allowing farms to decide for themselves whether or not to test, DFO improperly delegated its responsibility for the protection of the fishery to the very corporations it was supposed to be overseeing. It is hard to imagine a more powerful picture of regulatory failure than one in which the regulator refuses to require that the 16 to 52 million smolt transferred into wild salmon habitat each year – smolts for which there is strong evidence of infection with a disease that presents a serious threat to the already greatly suffering wild stocks – first be tested. And it is hard not to conclude that the only reason a regulator that pays repeated lip service to the importance of the precautionary approach would not require this is because the resulting demonstration of the extent of that disease would severely impact the ability of the industry to carry on in business-as-usual fashion. In its divided loyalty between the salmon farming industry and the wild fish, DFO's no-test policy offers a clear illustration of where DFO's fealty truly lies.

More recently, in response to an action brought by Alexandra Morton and the 'Namgis First Nation, a Federal Court again ruled that the government's failure "to address wild Pacific salmon health and status in making the PRV policy" that allows the transfer of smolts without first testing for PRV is illegal and a complete affront the precautionary principle – along with the Fishery General Regulations and First Nations rights.²²⁴ A scant two-days after the ruling DFO delivered a technical briefing for the media in which it announced that, there is currently no evidence to suggest that PRV-1 (the variant of the virus identified in British Columbia salmon) causes disease and mortality in sockeye salmon" and

²²⁴ *Morton v Canada* (Minister of Fisheries and Oceans), [2019] FCJ No 178, 2019 FC 143

that “the risk to Fraser River sockeye salmon due to PRV transfer from Atlantic salmon farms located in the Discovery Islands area is minimal” (Nikiforuk, 2019, February 14). As one columnist put it, “[t]he DFO claim was a bit like saying the risk to the residents of Vancouver of acquiring shingles is strictly minimal as long as you don’t include any data about the health of aging immune systems in seniors” (Nikiforuk, 2019, February 14). Members of the review committee that issued the briefing were sent a memo from DFO Management requesting that they stick to approved “bullet points” when talking to the media – prompting some of them to take their opposition directly to the media. As John Werring, Senior Science Advisor with the David Suzuki Foundation stated, “we’re communicating results to the general public that are based on huge levels of uncertainty.... DFO may be able to muzzle its own scientists, but it can’t muzzle the general public. And I was a member of the general public sitting in that room” (Ottawa accused of silencing critics, n.d.).

In her 201-page ruling, Justice Strickland directly referenced DFO’s failure to assess risk in an ecological context and to recognize the importance of cumulative stressors. DFO has justified the no-testing policy on the relatively few deaths attributed to HSMI on fish farms, where sick fish can survive and the failure of PRV to induce serious disease in sockeye in the lab. Notably, it appears that farmed fish are most susceptible to the disease when stressed by salmon lice treatment. In finding that the policy of fish transfer “represents a risk of serious or irreversible harm” (para 140) she pointedly noted that DFO submitted “virtually no information as to the status or health of wild Pacific salmon in British Columbia or how this may, or may not, have factored into the decision to continue the PRV policy” (para 199).²²⁵ Justice Strickland gave DFO until June 2019 to come into compliance with the *Fisheries Act*.

²²⁵ In analyzing DFO’s 2015 risk assessment for PRV:

It contains no information concerning the monitoring of wild salmon as to health or numbers. Nor does it acknowledge that some conservation units of wild Pacific salmon are at risk or address whether or not wild Pacific salmon are potentially at a higher risk from PRV because of the differing environment and stressors they experience as compared to farmed fish. And, as indicated above, the subsequent Auditor General’s report indicates that DFO is not monitoring wild Pacific salmon health. (Para 200)

(ii) Commissioner of the Environment and Sustainable Development

A further “official” assessment of the DFO’s performance in regard to aquaculture came via the Commissioner of the Environment and Sustainable Development whose 2018 audit of salmon farming in Canada to determine “whether Fisheries and Oceans Canada and the Canadian Food Inspection Agency managed the risks associated with salmon aquaculture in a manner that protected wild fish” gave both agencies a failing grade (Environmental Commissioner of Canada, 2018). The Commissioner found that DFO had made insufficient progress in undertaking risk assessments for key diseases, required to assess the effects of salmon farming on wild fish, having completed only one of the ten risk assessments of key diseases that it had committed to completing by 2020 (in accordance the Cohen Commission recommendation) (para 1.27). The Commissioner also found that, while DFO and CFIA “had put in place some measures to mitigate the spread of infectious diseases and parasites from farmed salmon, key elements were missing,” including that DFO’s auditing program for farmed salmon was “out of date, and the Department had limited laboratory capacity to provide timely surveillance test results” (para 1.29).²²⁶ The failure by DFO to demonstrate how it was implementing the precautionary principle was also noted (para 1.47). The long list of shortcomings identified included multiple failings in regard to the assessment of the harm to wild fish from drug and pesticide deposits, including cumulative effects, and the adequacy

She also noted that DFO has its own analysis to this effect. A science advisory report of DFO’s Canadian Science Advisory Secretariat finds that

[t]he extent to which pathogens released from aquaculture sites are stressors requires knowledge of infection and disease in wild aquatic populations. In Canada and other jurisdictions, pathogen surveillance of wild animal populations is virtually non-existent and should be established. Without this knowledge the extent to which pathogens are stressors cannot be assessed. (Canadian Science Advisory Secretariat, 2009, p.3)

²²⁶ The Commissioner also found that DFO was planning to transfer responsibility for controlling risks related to the movement of live fish to CFIA, but had undertaken no formal assessment of gaps in the protection of wild fish that this change might create (1.44) and that DFO’s “laboratory capacity to provide timely surveillance test results to the Agency so that the Agency could make timely decisions on disease control” was so lacking that “in some cases, the Department provided test results to the Agency one year after samples had been taken.” (1.45)

of regulations around them (paras 1.51-1.74). The audit also found that the rules that are in place were not being adequately enforced (paras 1.75-1.76).

The level of utter dismay the Commissioner, Julie Gelfand, evidenced at the press conference for the release of the report is worth nothing:

But of the audits that we have done on how government oversees a particular industry, really I have not been more disturbed than I have been with aquaculture....The gaps, there are so many of them, they are so important....There's no monitoring of wild fish, no thresholds for the use of medication. Industry reports are not validated, no monitoring of the ocean floor required – it just goes on and on....I have probably not been more concerned about an audit that oversees an industry. (Nikiforuk, 2018, May 1)

It would seem in the time since the Commission little has changed in regard to the regulatory capture of DFO and other agencies and that a pattern of inadequate oversight and monitoring, effecting the de facto unimpeded operation of the industry, continues largely unabated.

D. Governmentality, risk and the risk society

The institutional framing of risk as a technique of rationalization in the service of industrial expansion is captured succinctly in a statement made at the Cohen Commission hearings by (former Manager of Regulatory Affairs at Grieg Seafood) Mia Parker: “[Y]ou don’t need certainty to move forward [with salmon aquaculture]. What you need is a scientifically-based risk assessment, and then you put the measures in place that make sense within that risk assessment” (110907, p.28). Once operations are approved, risk appears again in a governance role, in monitoring and determining compliance. For example, as DFO’s (then current) compliance and enforcement strategy for aquaculture states, the organization will “manage compliance risks by implementing an integrated risk management process into decision-making and operational

planning and developing an integrated aquaculture compliance risk assessment” (Policy and Practice Report 20, pp. 93-94).²²⁷

The Commission process made clear how, in actuality, such efforts to capture the ecological and environmental threats posed by salmon farming within a risk framework break down, revealing fundamental incoherence or inconsistency. A salient example is found in regard to procedures around the importation of salmon eggs, intended to prevent the introduction of disease. Whereas in the following quote the witness points to the system of regulatory risk management as assurance of the safety of this activity, under questioning, the inherent logical failure of the regime very quickly becomes apparent:

MR. MCDADE: So you mentioned the screening of eggs. Mr. Backman, would you agree with me that your company has not – has imported eggs from other countries?

MR. BACKMAN [Director of Environmental Compliance and Community Relations, Marine Harvest]: Marine Harvest has in the past imported eggs, yes.

Q Yes. And I take it this is self-evident. You’ve only screened for the diseases you know about at the time you brought them in?

MR. BACKMAN: The screening required both at the point source of the eggs and here again in British Columbia is quite robust. They’re quarantine procedures. I think we’ve already heard a lot about the process that happens at the point of the source, and the – and then what happens here in British Columbia. And but your point is taken that everything that is screened for is diseases that are – that are known, described, and are able to be tested for.

Q And in other countries, your company and your parent company have seen a number of new diseases come into their fish farms, even though they were taking all the care that they could possibly take.

MR. BACKMAN: I’m not – I’m not an expert on the disease situation in other countries. But I’m sure that new diseases are being discovered as time goes forward. We have the very discussion about Dr. Kristi Miller and her work tells us that there’s – this is a field that is growing.

All right. And there’s no way to protect against that, is there. Simply nothing you can do to protect against that?

MR. BACKMAN: We operate according to the available procedures that

²²⁷ Similarly, the Aquaculture Management Directorate and Compliance & Protection’s contemporaneous British Columbia Aquaculture Compliance Protocol calls for “delivery of an integrated coherent and adaptive aquaculture compliance program, informed by risk” (Exhibit 1708, p.1)

are internationally accepted as in Canada and British Columbia, and we make the tests and for the variety of diseases that are being tested for.

Q So for instance parvovirus, if it turns out to be the thing that's been connected to the decline of the sockeye, you haven't been testing for that?

MR. BACKMAN: There isn't yet a test for that, Mr. McDade.

Q Okay. (110907, pp. 99-100)

In order to be processed into the apparatus of risk management, a disease must first be identified as a bearer of risk. This now-familiar circularity means that the regimen of disease management presents as self-contained and complete while failing at a fundamental level to meet its central purpose. In the end, the reality that, while conditions on farms may be "managed," the impacts of farms on the environment and ecology in which they are embedded really cannot be, was admitted even by government scientists. For example:

MS. ROBERTSON [Musgamagw Tsawataineuk Tribal Council]: Would you also agree that protective measures that are taken to protect farmed salmon from disease, we have vaccines, culling, that kind of thing, they're not available to us to protect...wild salmon?

DR. DILL: They're not available for us to protect wild salmon directly, but if we do a good job of protecting farmed salmon from disease, we can potentially reduce the amount of transmission to wild salmon.

Q Thank you. But if there was an outbreak...and a transmission to a wild population, it's very, very difficult, if not impossible, for us to control what happens to those wild fish once there's a disease outbreak.

DR. DILL: That's true. (110829, p.106)

I take up the implications of the "failure" of risk from a governance perspective directly and in further detail next.

1. Salmon aquaculture and the risk society

On one level, then, Beck's model of the risk society seems an apt fit with salmon aquaculture as it is carried out in British Columbia, where the intensive farming of an alien species has created potentially catastrophic risks that transcend the limits of an insurance model – and where risk assessment must confront the

ecological non-linearity, hyper-complexity and unpredictability that, as described above, inhibit a totalizing scientific understanding and hence make estimations of probability and “cost” notoriously difficult. This is captured concisely in Dill’s response to a question from Robertson:

Q: I mean, in many respects, and particularly considering the evidence we’ve heard on viruses, would you agree that pathogens are – they’re kind of one step ahead of us. We can’t identify them until they cause a disease. We certainly can’t respond to them until we know that they’re there; would you agree with that?

DR. DILL: Yes. And not only that, they’re sort of one step ahead of us evolutionarily because of the huge population sizes, so if you put them under strong selection pressure, it’s quite easy or quite common for them to evolve strains that are resistant to our antibiotics, as you know from human health situations.

Q So the risks are huge, potentially.

DR. DILL: Potentially. (110829, p. 105)

Indigenous salmon populations are threatened with extirpation (via out-competition, genetic interaction, or perhaps most significantly disease and parasite transfer), creating cascading effects throughout the coastal ecosystem,²²⁸ while other organisms – from benthic invertebrates to marine mammals – also bear the brunt of salmon farming practices. Risks, too, take on an (uncertain) global dimension, as illustrated by the global movement of salmon eggs – and hence, potentially, of disease – or the conversion of South American pelagic fish stocks into fish meal for British Columbian operations farming Atlantic salmon. Thus, ostensible efforts to establish salmon aquaculture as a “sustainable” local alternative to stressed wild fisheries in fact visit devastating impacts on other fisheries in another hemisphere. And, also in accord with Beck’s thesis, we also see how attempts to deal with these impacts introduce new risks that themselves defy assessment and only compound prior ecological threats. Pesticides and antibiotics employed to deal with the influx of pathogens bioaccumulate both in the ecosystem, where they impact other species and

²²⁸ For example, Pacific salmon play a critical role in the nutrient cycle. Their consumption by bears after spawning is essential to returning nitrogen to the forest soil, where it is incorporated by the coniferous trees that characterize the coastal eco-zone (Kuhlmann, 2009).

promote resistance, and in the fish directly. The corresponding impacts on human health are equally difficult to quantify.

2. Biopolitics and governmentality

Risk also appears as a interwoven with governance under a Foucauldian framework, here in the context of regimes of environmental regulation that extend biopolitics to the natural world, managing flows of production and power in relation to interactions between humans and the environment.²²⁹ Whereas political and economic factors may undermine their “effectiveness,” it remains the case that such bureaucratic regulatory mechanisms force consideration of life into the decision-making process. Ecological science has developed as a key component of this biopolitical apparatus – problematizing aspects of life while proposing and elaborating systems of intervention to normalize relations to nature in ways deemed environmentally benign. Rose and Miller have characterized such specialized discourses as “the intellectual machinery of government.” These programs:

presuppose that the real is programmable, that it is a domain subject to certain determinants, rules, norms and processes that can be acted upon and improved by authorities. They make the objects of government appear thinkable in such a way that their ills appear susceptible to diagnosis, prescription and cure by calculating and normalizing intervention. (Rose and Miller, 1992, p. 182)

Such an approach to governance is evident in regimes of environmental management and regulation. Here too, risk appears as a crucial discursive mechanism, one through which control over the (formerly) wild is extended. As we have seen, until a threat can be formerly recognized within the regulatory mechanism of risk assessment, it will not be regarded as real. It remains an “unknown risk,” hence unconsidered and devoid of power to drive intervention or shape regulation or policy. Yet, paradoxically, once “quantified” – as in a risk

²²⁹ One way to view this process is as biopower extending its domain from the physical body (disciplinary power) to the political body (biopolitics) to the ecosystem-as-body (biopolitics extended).

assessment regarding fish escapes or the probability of Atlantic salmon establishing self-sustaining populations on the British Columbia coast, for example – the power to preclude that is rooted in the “truly” unknown is lost. As we have seen, in order to *prohibit*, a putative harmful factor (say disease from salmon farms) must be shown to be an efficient cause of the harm in question, but once that factor is classified as a *risk*, the *certainty of possibility* of harm is a priori denied. Unlike the sovereign power of the state to negate or preclude, the power of risk is positive – biopolitical – it legitimates and affirms, creating the possibility for development to proceed and industry to expand. Until an object is a “risk” it remains unrecognized, but once it is recognized it is only as a commodity in an economy of risk – its ontology now limited and shaped as part of a system directed toward facilitating the continued reproduction and expansion of the dominion of capital over the natural world.

The details of the “risks” posed by salmon aquaculture as represented at the Commission reveal how the *unknown* is reified, subject to degree, measure, and management and how illusory claims to “objectivity” conspire with the mercurial and fluid nature of risk to further the status quo. We have seen, for example, how in the ecological context the greater the harm, the harder it may be to actually demonstrate that harm via the dominant epistemic regime: “I’d agree that if you had increased mortality in a population, infectious disease would be impossible to investigate,” Dr Stephen admits (110823). Quantifications may prove weak (or in many cases non-existent) and predictive power illusory, yet at the Commission government and industry fish pathologists, veterinarians and managers agreed that the “risks are manageable” and that “the risk can never be zero” (110831, pp.66, 89). As a result, specific numericalized criteria may at times be constructed – but are grounded in sand. Siting guidelines, for example, stipulate that farms be located a minimum of one kilometre from the mouth of a significant salmon-bearing stream. Yet, as Dr. Fleming points out, the figure is “arbitrary given the migratory paths of the fish, the interactions, the dispersal of diseases and pests, parasites, and the potential of escape interactions with other

streams” (110830, p.18).²³⁰ By facilitating possibility, risk now becomes a technique of governmentality. Policies, procedures, and operations may be adjusted and fine-tuned in order to “minimize risk,” but the power of the unknown to fundamentally negate the biopolitical paradigm of which it is an inherent component is always denied.

Hence, the outcome of such assessments/decisions is that the project under consideration is almost invariably found to be of negligible, low, or otherwise manageable risk.²³¹ The CEAA environmental screening approvals for several farm sites – all ones located on the migratory route of the Fraser River sockeye – were examined at the Commission, and in all cases, the risk posed to wild salmon was found to either “low” for “negligible” (Cohen, 2012, p. 400). Neither DFO nor BCMAL management could point to a single case in which an application was denied as a result of its potential impact on Fraser River sockeye.²³² Moreover, as discussed in Part C, the nature and level of DFO’s

²³⁰ In the case of The Fraser River Sockeye – the fish under consideration at the Commission – the set-back is also largely irrelevant as there are no fish farms within one kilometre of the mouth of the Fraser River. As Justice Cohen stated in his findings, “[i]f Fraser River sockeye are at risk from salmon farms along their migration route, it is the route itself that must be protected” (Cohen, 2012a, p. 419).

²³¹ At times, the contested nature of risk was recognized within the hegemonic scientific frame and proponents exhibit a concordant humility, sometimes perhaps performatively as a strategy to maintain legitimacy (see “An inappropriate scientific model” above), but at other times with a seeming genuine epistemological humbleness, as seen in this exchange:

MR. MARTLAND...I wonder if I can just use a metaphor and tell me if it works. When we think about the impact on wild salmon I think you're saying two different things. ...[M]y analogy, I suppose, to carpentry. We don't have the things that we want to measure, but more than that, the measuring tape is not standardized. ...[Y]ou were talking about not having a standard against which to assess or understand risk. Is that that sort of a complaint, as well?

DR. STEPHEN: Well, let me just clarify. It's not that we don't have a standard. There's multiple standards with different perspectives, so – and I don't want to suggest which would be more correct at this point. But there are definitely different measuring tapes out there and as you've heard earlier, especially if you want to measure health and well-being of salmon, going out and counting pathogens is insufficient to really measure that and that's been the focus of most of the fish health work. So this is why we've got this deficit of knowing where to measure and the tools to measure and then having a variable measurement tape, to use your analogy. (110822, p. 45).

²³² A notable difference between risk management in environmental regimes and actuarial governance in the criminal justice system is that, in the former, the system serves to assist a development of the population of projects through the normalization of designations of low or manageable risk (and to only exclude the most egregious proposals); in the latter control is exercised most acutely through the designation of high risk to particular groups or demographics.

enforcement of law and regulation (including of the *Fisheries Act*) is based on recognized levels or risk, meaning that an absence of research means an absence of risk, which means an absence of enforcement – not merely as a practical result but (indirectly) as official policy. We see how, consistent with this biopolitical function, the regulatory apparatus defines and limits the objects of investigation so as to facilitate the economic penetration and exploitation of “nature” and the reproduction and expansion of the industry – both in light of the information it creates and in spite of it.

3. Sustainable development and its discontents

The concept of *sustainability* or *sustainable development* figures prominently in the systems of environmental governance of salmon aquaculture. At the Commission, it was described eloquently (perhaps grandiosely) by Swerdfager as the synthesis of environmental management with economic and social development:

At the general or sort of more conceptual level, I think historically there's been a view that in the paradigm particularly that arose in the '60s and '70s of having the environment and the economy-type departments clash, essentially, and you load up both departments and sort of smash them together in a battle between economy and environment and see who kind of comes out ahead. That particular paradigm has been around obviously since that period, and it's certainly one that some people feel today holds some allure and some attraction, that dichotomy between environment and economy.

At the same time, I think there's been a growth in the sense of the paradigm around sustainability or sustainable development, and under that approach, I think that what we're looking at much more is trying to take very much a focus on environment, economy and social issues at the same time.

I'm quite aware that when I say that, there's often an internal or sometimes even an external overt rolling of the eyes. It sounds perhaps like a platitude to say that we're focused on sustainability, but I actually believe that it's true. I think that in order to make progress as a society, we need to be able to move on all three fronts at once. We need to be able to be actively engaged in protecting the environment, developing our economy and working at the social scale.

In my opinion, DFO is uniquely well placed to do that. I think that

because of our science presence, we are uniquely well placed to understand the environment because we work closely with industry, with stakeholders, with communities, both here in British Columbia, but more generally, nationally and indeed internationally. I think we're uniquely well placed to understand the dynamics of industry, whether it's in this case aquaculture or more broadly fisheries and, as a result, can work in a manner that moves us towards those sustainability-premised solutions. (110803, pp. 10-11)

Biopolitically, what many see as a blatant conflict of interest between the protection of wild fish and the promotion of salmon aquaculture, becomes instead a natural synthesis in the interest of continued "sustainability." At another point, Swerdfager stridently resists the notion that the use of public money to advance the salmon aquaculture industry constitutes a subsidy. Yet he provides an unequivocal reply to the following question – which taken together amount to a neat encapsulation of "sustainability" as the biopolitical environmental management of capitalist development:

MR. LEADEM: Can I at least get you to agree with me that Canada has devoted \$70 million with respect to some concept of sustainability within the aquaculture industry?

MR. SWERDFAGER: Yes, I could agree with that characterization of it, yeah. (110830, p. 84)

A related concept central to the "intellectual machinery" of the environmental management of aquaculture and deeply embedded both in DFO policy and in testimony is that of *ecosystem-based management*. The overarching Integrated Management of Aquaculture Plans (IMAPs) that DFO was at the time of the Commission developing are grounded in this approach, which, according to DFO,

involves protecting ecosystem features by managing the risks caused by human pressures on ecosystems, taking into account the provision of ecosystem goods and services that ultimately benefit societies and economies. This involves incorporating ecosystem information into management decision-making, and takes into account science advice at the ecosystem levels, and uses precaution in management where there are uncertainties. (Exhibit 1601)

This expression of an encompassing system of control that processes ecosystem-level information into a matrix of risk management (embodying a

precautionary approach) – all in the service of protecting ecosystems while benefiting human societies and economies – encapsulates well the biopolitical ambition. The ubiquity of terms – in effect, buzzwords – like *sustainability*, *EBM* and even the *precautionary principle* within the discourse connects to their semantic flexibility, such that, for example, the active promotion of salmon farming by the very department charged with the protection of wild fish is entirely compatible with sustainable development though ecosystem-based management. Or consider that, despite the commitment to EBM and to the incorporation of “ecosystem-based values,” DFO management (Dr. Laura Richards, DFO Regional Director) testified that DFO has not undertaken research on the cumulative impacts of salmon farms, even for the confined area dense with farms that is the Broughton Archipelago (110926, p.71). At one point, Swerdfager admits that he considers the successful implementation of EBM to be extremely challenging given the wide-range of interacting factors that must be addressed (110831, pp. 111-112). In fact, at the *discursive* level, the language of EBM, of ecological thinking elaborated across multiple dimensions, remains effective – the corresponding open-endedness and adaptability around inputs and outputs works to the benefit of the biopolitical system, allowing for the incorporation of seemingly incompatible or extra-jurisdictional elements within a managerial framework.

4. Stakeholders and biopolitics

Biopower is exercised not as a “single, all-encompassing strategy”, but, as “a more or less stable or shifting network of alliances extended over a shifting terrain of practice and discursively constituted interests” (Foucault, 1984, p. 103). This networked and never wholly constituted nature opens points of resistance (taken up below), but it also facilitates the incorporation of non-state actors into the governance framework in a way that may ultimately enhance its legitimacy and efficacy. One element of this is the devolution (or dissolution) of responsibility to industry we have considered – the process of self-regulation

regarding monitoring, reporting (of disease outbreaks, fish escapes, wildlife kills, etc.) and overall procedures and protocols (e.g., as developed through Fish Health Management Plans). Concomitant with an understanding of industry as *stakeholder* – and hence active participant in its own regulation – is the discourse of *transparency*. Despite the lengths to which government and industry were prepared to go to prevent public access to information – the secrecy surrounding disease records or stymieing of efforts to test farmed fish, for example – DFO’s plans for reform trumpeted at the Commission centred on access to information and transparency. Swerdfager expounds at length on how DFO is tearing up the playbook and throwing open the doors when it comes to the public right to know, for example:

I think it’s important to emphasize that these are terms and conditions that we are requiring. We are not going to have a discussion with farmers as to what we would like to get from them and how we would like to get it from them and so on. The discussion is very much one of “our modem is stuck on send.” We’re just telling people here’s what you shall produce, and within reason, here’s how you shall produce it. Obviously, we’ll have some discussion in terms of modalities around that, but we are compelling the production of certain information from farmers in a very, very detailed and rigorous way. (110830, p.22)

Because under a devolved model regulator and regulated are together constitutive of governance, *transparency* legitimates both. As Livesey & Kearins (2002) demonstrate *transparency* does not amount to a removal of mediation and instead may be one way in which *sustainability* is constituted. Decisions as to how to categorize, assign and present data are a way of “imposing form on nature and society” (p. 250). In fact, following the Commission, DFO’s changes to reporting requirements increased specificity in some areas (e.g., therapeutants and sea lice), but decreased it in others, critically, in regard to fish health and mortality (now confined to *annual* reports that proffer aggregate data across all (BC) farms, with no specifics as to operator or time of occurrence). To the extent that a discourse of transparency shifts responsibility for oversight to the public, it represents a “responsibilized,” new governance approach to regulation (Simmons, 2013). While increasing access to information is a worthy effort in

itself, it is not surprising that under a neoliberal biopolitical regulatory system it should constitute the locus – and limit – of reform. Informational approaches to governance legitimate relations of production and power, appealing to tropes of accountability, democracy and participation while occluding the inequities that undermine the public’s actual ability to hold power to account – and it is this which likely lies behind the enthusiasm for them evinced at the Commission.

Another aspect involves the enlisting of “moderate” NGOs and other professionalized organizations into the biopolitical field. Arguably, in the case of salmon aquaculture, the Coastal Alliance for Aquaculture Reform (CARR), an alliance of environmental groups that was engaged in working with industry to improve environmental practices, played such a role.²³³ Catherine Stewart described the aim of the alliance as follows:

... [a]nyone concerned about the current status of open net cage farms in B.C. is usually branded by industry as anti-aquaculture. But as the name of the coalition indicates, we’re not opposed to aquaculture, we recognize it has a place in our world. Our concerns are how it’s practiced, and where it’s practiced, and what its impacts are, and trying to, as the name indicates, reform the industry and put it on a more responsible, a sustainable footing. (110908, p. 9)

Before finally abandoning its efforts in the face of industry recalcitrance, CAAR adopted an inside/outside strategy that involved pressuring government and running market campaigns, while simultaneously working with industry on efforts around monitoring in the Broughton Archipelago, fallowing of sites during wild salmon out-migration and on a closed containment pilot program (with Marine Harvest).²³⁴ (See 110908, pp. 58-59.) While such joint-initiatives may or may not lead to actual improvements in environmental practices, they likely contribute to the positive environmental image of the industry and the appearance of

²³³ The groups were The David Suzuki Foundation, T. Buck Suzuki Foundation, Georgia Strait Alliance, Watershed Watch and, the Living Oceans Society.

²³⁴ The latter project received \$5 million in private funding from the Betty Moore Foundation. The ability of NGOs and trusts to influence the public sphere is sometimes considered as a form of *private governance*. It is interesting to contemplate whether and to what degree this phenomenon is a play here. The demonstrated limited ability of the NGO sector to impact salmon farming operations, suggests that their actual “governance” capacity, historically at least, has been marginal.

corporate social responsibility. The ability of organizations like CARR to exert significant influence is structurally limited by economic and material conditions, yet their exercise of symbolic capital may nonetheless play an important legitimization role within a biopolitical realm of sustainable development.²³⁵

The incorporation of stakeholders directly into the governance process – something referred to in regulatory theory variously as *responsive governance*, *smart regulation*, *new governance*, or *negotiated governance*, among sundry other appellations – looms large within DFO policy and procedure. For example, the process of producing an integrated and “holistic” approach to aquaculture management in the form of Integrated Management of Aquaculture Plans (IMAPs) was intended to “enhance First Nations, industry and stakeholder engagement in decision-making regarding management and conservation measures affecting aquaculture activities”²³⁶ (Exhibit 1602, p. 389). In the minds of proponents, “negotiating” acceptable standards (in what now, paralleling the natural world, might be seen as an ecosystem of actors) enhances the legitimacy and participatory democratic basis of the regulatory system. It is also a responsabilization consistent with a neoliberal notion of environmental protection and sustainability as realized via individuals making market transactions (where here the “market” is seen as neutral arena for negotiating standards). This connects to the operation of biopolitics as internalized at the level of the self. As with pluralist accounts of democracy in general, however, the material, social and political power differentials between actors are often neglected. The resulting symbolic violence can lead to a front of democracy that occludes a regime in

²³⁵ NGOs (including CAAR) may also be involved in certification schemes, another form of extra-governmental regulation or arguably neoliberal private governance. The United Nations Food and Agriculture Organization (FAO) identifies 30 such aquaculture-related schemes administered by industry, NGOs, retailers, governments and other organizations. A primary organization in this regard is the Aquaculture Stewardship Council, which was founded as a joint-initiative between the World Wide Fund for Nature (WWF) and the Dutch Sustainable Trade Initiative (IDH) with the goal of “[a] world where aquaculture plays a major role in supplying food and social benefits for mankind whilst minimizing negative impacts on the environment.” Numerous farm sites in British Columbia have been certified under this scheme, and Mowi has been granted multi-site certification. See: <https://www.asc-aqua.org/>.

²³⁶ DFO has since established an Aquaculture Management Advisory Councils (AMAC), as an ongoing multi-stakeholder advisory body. See: <http://www.pac.dfo-mpo.gc.ca/consultation/aquaculture/fin-nag/index-eng.html>)

which the powerful are quite literally able to set their own rules (Simmons, 2013). They do so within a biopolitical system of management now rendered both more diffuse and more socially embedded.

5. Dissent and resistance in reflexive modernity and governmentality

The economy of risk itself creates fissures, however, through which new oppositional forces irrupt. This is true for both Beck and Foucault. For Beck, the critical-reflexive engagement with scientific risk by its “cognitive agents” results in a *subpolitics*, a techno-economic realm of struggle in which those previously not involved in the “substantive technification and industrialization process” now act to “shape contemporary society from below”: environmentalists contest accepted policy and “counter-experts” challenge scientific orthodoxy (Beck, 1994, p.23). The systemic contradictions between the technological production and political administration of risks ultimately undermine public faith in each, leading to doctrinal struggles over the direction of modernity, itself (Beck, 1992b, p, 40). At the Commission, First Nations and environmentalists contested both the nature and objectives of regulatory science advancing an alternate vision of the means through which we understand the natural world and our fundamental relation to it.

At the same time, through themes such as *uncertainty as a green light*, *the evidentiary Catch 22*, or *certainty from uncertainty*, the Commission revealed in detail how through various epistemic elisions reductionist regulatory science is able to maintain and reproduce its hegemonic status – despite its subjection to ongoing challenge. Dialectically, the dominance of regulatory science both makes these techniques efficacious (though far from completely so), while the efficacy of the techniques supports such dominance. An emergent subpolitics may be mounting challenges to the old order, but a vision of a new pluralistic and advocacy-based science grounded in reflexive modernity – and generated by “a new kind of capitalism, a new kind of labour, a new kind of global order, ...a new

kind of nature, a new kind of subjectivity, a new kind of everyday life and a new kind of state” (Beck, Bons & Lau, 2003, p. 2-3) – appears to remain at a significant remove.

Foucault also views the process of penetrating bureaucratic regulation into the natural world as generative of resistance. He saw power as an agonism, a “permanent provocation,” and power relationships as always in flux, dynamic and open to instability (Foucault, 1982, p.222). Iterative definitional struggles occur on multiple levels. As we have seen, appeals to *sustainability* are not limited to governmental bodies but also made by salmon aquaculture corporations or their associations – perhaps a part of the more general corporate appropriation of environmentalism – and some environmentalists. This, in turn, foments still further resistance on the part of those opposing salmon farming altogether. Whereas regulatory techniques centred on access to information or participatory engagement by stakeholders (First Nations, environmentalists, fishers, residents and other affected parties, in addition to industry) may work to extend legitimation and control, they simultaneously open up potentialities that cannot be wholly predicted or managed. However crude or controlled, information generated through the reporting system is still put out into the world; participation in a stakeholder process may provide insight and access otherwise not available. In both cases, what comes to light may be taken up by further actors outside of the formal system who are able to apply pressure in ways not determined in advance.

Moreover, rather than fostering belief in the legitimacy of the system, the structural limitations of the various official stakeholder engagement processes may instead lead to disillusionment on the part of participants and foment resistance. CAAR, for example, eventually abandoned efforts to enact change by working with industry and government. Alexandra Morton began her efforts by attempting to bring her observations to the attention of DFO officials in the good faith belief that they would enact appropriate changes. And we have seen how many Indigenous people are, at best, highly sceptical of governmental outreach

efforts and often eschew or directly oppose them – attitudes often come to through long and hard-felt historical experience.

Thus, we can see how a questioning of dominant understandings of nature is reflexively produced by ecological biopolitics – “an insurrection of subordinated knowledges,” opposing the “tyranny” of globalizing regulatory systems (Foucault 1980, pp. 81-5). For Foucault, such *reverse discourse* is part of a pragmatic genealogical objective that can open new tactical modes of political struggle. Whereas some of this generative resistance may be reflexively integrated and absorbed into the biopolitical system (e.g., in the case of CAAR or efforts to promote salmon aquaculture among First Nations), that process is never wholly deterministic or fully complete. It may itself create new avenues (e.g., earlier organizations or movements are now seen as “sold out” or compromised and hence inefficacious or even, in their perceived bolstering of power, counter-productive). *Sustainability* as a “master frame” (Carroll and Ratner, 1996; Markowitz, 2005; Shamir, 2005) is incorporated/constructed within the biopolitical process through concepts that are themselves the product of political negotiation – *the precautionary principle, sustainable development, ecosystem-based management* – and their meaning and import remains subject to ongoing symbolic contestation, in action.²³⁷

6. The meaning of *biosecurity*

A poignant example of how this lack of closure allows oppositional voices to resist and reconstitute the discourse of risk is manifest in concerns regarding *biosecurity*, first raised by government counsel in regard to Alexandra Morton’s

²³⁷ The Commission itself presents a salient example of both governmentality and reflexive modernity at work: In attempting to set epistemic boundaries, to define what does and does not get to count as “legitimate” knowledge and data (and the conditions for determining both) in a socio-ecological context, it inevitably fails to provide closure and ironically only serves only to engender further doubt and resistance – while also producing, extending and reconfiguring forms of knowledge.

“trespass” on a salmon farm.²³⁸ The irony of squaring the claim that salmon farms are safe and present little risk of significant harm with the simultaneous one that merely approaching a farm constitutes a serious biosecurity breach is not directly broached. However, counsel for the First Nations Coalition deftly turns concern around biosecurity within salmon farms (and hatcheries) to the biosecurity in the environment surrounding such facilities and the broader risk that they themselves pose to the marine ecology. Using Johnson’s own biosecurity principles of minimization of exposure to pathogens, she extracts an admission from him that, given our knowledge of the risks present and our actual ability to modulate them, there is but one effective course of action:

MS. GAERTNER: [I]f ... we wanted to protect wild stocks from being exposed to pathogens, what human behaviour could we do? We could move net farms, is that agreed?

DR. JOHNSON: That’s one thing that I guess you could do, yes.

Q Is there anything else that you’re aware of that we could immediately do, particularly in the marine, to prevent exposures to pathogens by Fraser River sockeye salmon?

DR. JOHNSON: Other sources of pathogens are pretty much out of our control. (110823, p.91)

The technical and biopolitical understanding of risk as a set of procedures and protocols regarding the management of both salmon farms and the movement and behaviour of classes of people in regard to those farms is turned on its head. “Biosecurity” becomes a matter of *common sense*: the obvious way to prevent salmon farms from harming wild fish is to move them away from wild fish. It is also one element of “marine risk” that is under our direct control. Through such Foucauldian reverse discourse opponents can attempt to subvert the biopolitical agenda by adopting the rhetorical constructions of proponents – resisting and reconstituting this symbolic violence from within the social order. This destabilization of risk can undermine its role as facilitator of capital expansion such that, even if quantification is accepted, the determination of an acceptable number can be shown as qualitative and value-laden. Yet beyond this, it can also

²³⁸ In the incident in question, Morton and volunteers approaching the harvest boat to sample sea lice during the harvesting of salmon at a Grieg salmon, in response to which Grieg contacted DFO and the RCMP (110901, pp. 41-46).

move the conceptualization outside of the rationalized world of official procedure and definition or the abstracted one of probabilistic calculation – grounding it in a more organic conception of common sense, one that provides a basis for resistance – as Gramsci might say, a *good sense*, the development of a critical common sense that is grounded in praxis.²³⁹

7. Resistance from “outside” the system

While public opposition to salmon farming and concern over its associated harms is bound up with the role of the regulatory agencies and governmental oversight, it seems at best only partly catalyzed by a reflexive regulatory response and the information consequently brought to light. There is certainly evidence that information engendered both by and in response to regulatory efforts becomes part of a positive feedback cycle of increasing demand for further information and intervention.²⁴⁰ As well, the perceived failure of regulatory efforts – the bringing into the light of what is *not* known – has stimulated this demand. The history of the regulatory situation suggests, however, that the absence of vigorous regulatory involvement is not merely the inevitable consequence of an epistemological breakdown in the face of ecological complexity but indicative of how regulatory action is reflective of political ecology. In one sense, the failure of the apparatus of risk is catalyzed by the divorce between the assessors and

²³⁹ For Gramsci, “common sense” can become “good sense.” It must begin with a philosophy which already enjoys, or could enjoy, a certain diffusion, because it is connected to and implicit in practical life, and elaborating it so that it becomes a renewed common sense possessing the coherence and sinew of individual philosophies. But this can only happen if the demands of cultural contact with the “simple” are continually felt. (Gramsci, 1971, p. 330)

Through critical elaboration, the “chaotic aggregate of disparate conceptions” that is common sense can be transfigured into “good sense,” leading to the development of a new hegemony in which formerly fragmented subaltern groups are unified (Gramsci, 1971, p. 422).

²⁴⁰ At a more general level, the idea that reflexive engagement inevitably produces enlightened resistance seems overly optimistic. While I did not find significant evidence to the effect in the context of the Commission, the question must be asked as to whether, rather than a reflexive modernity, the failure of the systems of official regulatory science might be just as likely engender a subpolitics of reactionary ignorance. In neglecting this possibility, Beck’s approach seems somewhat Pollyannaish.

bearers of risk. Gaertner again is effective in getting this point on the record through cross-examination of Swerdfager:

Q ...If those that are wearing the risk – and in this case the First Nations who rely on the Fraser River sockeye, and if there is an impact and they lose their fish, if they are not part of the package, if they are not the scientists, then you appreciate that it's difficult for them to accept the outcomes, and to accept that somebody else is assessing the risk. Do you agree with me on that?

MR. SWERDFAGER: I agree that whoever wears the risk – and it's not just First Nations, and I don't think that's necessarily what you were saying – but certainly anyone who bears the risk to some degree needs to be part of the discussion and dialogue on how we proceed with it. (110831, p. 114)

This socio-political economy of risk distribution is a driver of opposition to salmon aquaculture. And it is this context that Beck, in claiming that risk has become the central organizer of social relations in modern western society, neglects. Contra Beck, the significant disparity in the nature and degree of risk salmon farming poses to First Nations and fishers on the one hand and affluent city dwellers on the other is linked to issues of class, race, colonial identity and other independent relations of power. Risk is not a unified structuring force. One demonstration of such is seen in the fundamental challenges the salmon farming industry has visited upon many Indigenous peoples, not just to their way of life at the level of habitus, but to their fundamental cultural integrity and ability to exercise sovereignty and control over their territory. This has been matched with a corresponding level of resistance, however – one that it seems may now be resulting in actual change in the industry.

In this regard, the risk-class synthesis, outlined in Chapter 2, offers a more apt fit. As critics of Beck have pointed out, epistemic uncertainty as to risk is not the same as radical unknowability (Curran, 2013; Mythen, 2005b). Gradational distributions of risk are apparent, as is the ability of individuals to take steps to minimize their exposure or transfer it to others, based on their absolute and relative class position. One form of risk-class injustice identified in this literature is the “relational monopolization of scarce private escape routes” (Curran, 2018a, p. 307). These need not be absolute in terms of either their differential control or

the avoidance possibilities they provide. Yet, via the operation of political economic power, they remain unequally distributed to the significant advantage of those who have exclusionary access. (Curran, 2018a, pp. 307-08). The relational and positional impact of the harms and risks of salmon aquaculture is not only evident through relations of production (via corporations as capitalist instruments/actors externalizing costs through the process of extracting surplus value), but more generally through the differential availability of options for avoidance. The collapse of wild salmon has the most serious consequences (beside for the salmon themselves) for those who depend upon the fish, most directly for food, but also for a living and for cultural sustenance. And the extent to which individuals will have access to “escape routes” – other food choices, sources of income, or social arrangements – are disparately distributed. Sen considers how access to resources and commodities facilitates “beings and doings” – “functionings” – which include not only achieving basic material well-being but participating in the community in a meaningful and socially-valued manner. To the extent that First Nations and fishers (at least local and individual ones, as opposed to corporate fleets) have escape routes at all, they likely come at a high cost, necessitating the sacrifice of cultural identity as well as economic capital as a result of the abandonment of the material base (the wild fish) in which the latter is grounded. Avoiding risk means reconfiguring, limiting, and possibly erasing, many such functionings.

By way of contrast, the generators of the risks in question – foreign multinational corporations – are located at a near-complete remove from them. Beck’s “boomerang” disappears over their own horizon. And, as with access to escape routes, there is something of a zero-sum utility in effect: the benefits that accrue to these actors come at the expense of wild fish and the people and other creatures that depend upon them. In other words, it is not the case that the social, material and ecology relations that result in revenue for the salmon farming industry merely *happen* to result in an unequal distribution of harm and risk of harm; it is rather that these benefits are achieved *by* their imposition, on

local ecology and local populations, through the associated ecological and economic withdrawals.

Foucault's resistance to totalizing narratives of rationalization and insistence that relations of power be understood in historical specificity presents an important point of differentiation from Beck. That the encompassing of salmon aquaculture within a regulatory regime can be seen as a biopolitical extension of regulatory science and the apparatus of governmentality does not imply that the discourse of environmentalism or environment resistance is wholly contained within – and generated by – this biopolitical machine. Nor is such a framework sufficient to fully describe the forces driving the propagation of salmon aquaculture on coastal British Columbia. Uncertainty *outside* of the biopolitical apparatus also motivates resistance, just as it is also taken advantage of by the economic forces of expansion. An *absence* not captured by risk can serve as an implicit authorization of expansion in the context of an underlying political and economic imperative. These latter forces link to national and global relations of power and production that, while recognized by Foucault, are somewhat in contrast to his focus on the genealogy of the specific and the local – though I would argue that his unearthing of marginalized and subjugated discourses was not at a remove from concerns manifest at the level of the *grand narrative*, such as the development of industrial capitalism and class society. Hence, the macro-scale political ecological analysis I outline above remains essential to a thorough-going understanding of the forces at play in the salmon farming industry, its regulation and relation to government. At the other end of the spectrum is the multitude of oppositional voices that do not arise from reflexive engagement with regulatory science but from lived experience with salmon farming and its immediate impacts. Such a lack of analytical closure is in fact consistent with Foucault's approach.

VI. Conclusion

We have seen how, within the techno-legal apparatus of knowledge production that was the Cohen Commission, truth-claims regarding salmon farming and its environmental impacts evidenced a symbolic violence nested in both political ecological and biopolitical regimes. Through this process, it also became clear how various actors reproduce, resist and reconfigure discourse from within and without systems of power: how claims to knowledge and its absence, the hypostasization of risk and its negation, facilitate the reproduction of net-pen aquaculture while both illuminating and occluding the associated environmental harm, a process that in turn generates opposition. While a biopolitical apparatus and the affirmatory power of risk discourse functions to legitimate the salmon farming industry, the material forces of capitalist political ecology also reveal the limits of their ideological reach. The political negation of risk is evidenced in the pattern of response evinced at the Commission by provincial and federal governments to the concerns of communities and the public: A blanket denial is cleaved to as long and as tenaciously as possible. Only when continued denial becomes completely untenable are concessions begrudgingly made and then only in the most restricted sense. Regardless of positive results from world-leading laboratories and extensive evidence of “classic ISA lesions” in fish on the farms, there is no ISA in British Columbia. Despite seeming to be endemic in salmon farms, the HSMI virus is harmless here – until research definitively shows the contrary. And so on. Such political denials of risk are justified via negative evidence – in a refusal to look. It is not that the biopolitical has failed; rather, it has not even been engaged. It is through such moments when sovereign power is exercised most directly, that the underlying machinery of risk is revealed. I here contemplate some of the implications of my findings for how we engage with and make decisions regarding the natural world, in the context of salmon aquaculture and beyond.

The regulatory regime as contested space

Evidence of salmon farming practices as presented at the Cohen Commission revealed systemic regulatory failure – at least when considered in light of professed regulatory objectives. The adaptability of techno-bureaucratic and biopolitical management is seen in the regulatory system’s ability to “neutralize” – at least partially – concerns over systemic harms or threats of harm that might otherwise escape the management process. Rather than produce ever more reflexive regulation, governance systems instead internalize the unknown (through techniques seen in *uncertainty as a green light*, *the evidentiary Catch 22*, and *certainty from uncertainty*), thereby revealing their dialectical role in facilitating industry in driving the treadmill of production, a function that is only reinforced by the treadmill’s subsequent acceleration. While the dramatic risks posed by salmon aquaculture are generative of subpolitical resistance (most strongly around issues of disease and parasites), the resulting impact on the governance system cannot be separated from a capitalist political economy that works to protect the industry and powerfully resists structural change – the latter including a relational distribution of environmental risk around class and other social categorizations. Beck is right that the inability of administrative regimes to manage the risks generated by the industries they are supposedly regulating creates scepticism and the rise of opposition (and counter-experts such as Alexandra Morton); but he is wrong on why they fail. It is not merely that they cannot contain the risks – it is that they are in many ways set up not too.

My analysis suggests how biopolitical governance in an ecological setting may differ from its operation elsewhere, such as crime management, in that the power-knowledge nexus looks to be less developed – seen in the ways in which an *absence* of knowledge is employed to create scientific *certainty* and knowable risk. Ultimately, these techniques appear to lack the discursive power of the more recognized forms of actuarial governance and thus be less effective at exercising control. Their presence appears more at the rhetorical level, possibly increasing their susceptibility to reverse discourse and to agonisms of resistance – and

perhaps seen in the outrage generated by some of the official claims to safety and the absence of harm. This vulnerability may connect to some of the success salmon farm opponents have seen. Similarly, the semantic flexibility within the biopolitical discourse of *sustainable development* facilitates an expanded domain of resistance as well as of control: the range of variables that might be factored within a framework of *ecosystem-based management* is not ultimately foreclosed by the processes of rationalization internal to the regulatory agency. Hence, the logic – and contradictions – of the system themselves engender internal challenges, for example: Why doesn't the management of sea lice within an ecosystem context lead to the prohibition of net-pen salmon farming altogether? Why is a regime of biosecurity not configured to see salmon farming as a grossly unacceptable hazard? How can a meaningful *precautionary approach* in any way permit the operation and expansion of the industry in the face of substantial evidence (scientific and otherwise) of significant ecological harm?

Whereas the state and its regulatory bodies appear to a large extent complicit in advancing the interests of the salmon farming industry at the expense of the natural environment, their role is not wholly predetermined. It remains the case that regulations and engagement do somewhat limit and shape the operations of the industry and in fact have moderated some of its worst excesses. Hegemonically, the notion of the regulatory agency serving a “public interest” thus can be seen not as a fiction but as a limited concession. Locating the agency at a greater distance from overtly political institutions indicates the importance of neutralizing or insulating this compromise and enhances the legitimacy of both the state and the corporate subjects of regulation (Gilardi, 2002). This political underpinning, however, also opens the potential for a future rupture. The role and form of the regulator is not pre-determined but open to reconfiguration as the result of a dynamic process of contestation. Whether as an agent of sovereign power or a ground for the exercise of more a diffuse governmentality, the organs of the state are sites of struggle over meaning – over what it means to regulate, what it is that is being regulated, and the regulatory mandate in relation to each.

Toward ecological justice

Such epistemic openings reveal the potential for a more genuinely participatory and democratic decision-making process. Adopting an ecocentric point of view, a reflexive theoretical empiricism might feed a communally-grounded set of ethics, principles and rules through which the determination of “environmentally sound conduct derives from the specifics of a particular bio-region as situated within a broader context of global processes and conditions” (Halsey and White, 1998p. 358).²⁴¹ (Eco)justice in this context requires reconfiguration of multiple systems of power – at the micro-level of interpersonal exchange in the process of negotiation and interaction, the meso-level of institutional practice and culture, and the macro-level of relations of production and consumption.

Schlosberg (2007) identifies justice as involving four interlocking elements: *fairness* (equality and equity in the distribution of rights and goods); *acknowledgement* (recognition, respect and the maintenance of individual dignity); *engagement* (meaningful participation in the community and in governance processes and procedures) and *capacities* (the opportunity to actualize potential and to flourish). I believe implementing these components in the context of ecological governance necessitates a fundamental reconfiguration of social relations. These include processes of reconciliation with Indigenous communities that move beyond a zero-sum rebalancing of hierarchy and instead toward a synthesis, one in which new forms of organization and ways of being are created beyond the preconceived parameters either of settler or Indigenous society. Such a process is necessarily deeply imbricated with the development of both a bottom-up participatory democracy and of economic systems not premised in exploitation.

²⁴¹ It also opens up space to explore the fundamental tension between a “nature endorsing” position and a “nature sceptical” critical questioning of all truth-claims.

Reconfiguring political ecology

The relationship between the environmental harm associated with salmon farming and a capitalist political ecology is worth considering a little further. In one sense, salmon aquaculture represents the continuation of the enclosure of the natural world and the movement to ever-increasing commodification that is fundamental to capitalist relations of production. Whereas fisheries are commercialized, fish as they exist in the wild (and until the point of capture) are not – they are external to the market system. Aquaculture extends the process of commodification to the fish in its entire life cycle, from embryo to supermarket item. And to the extent salmon farms appropriate (withdraw) marine resources that would otherwise go to sustain non-market forms of value – and then externalize the associated additions as pollution (despite the current ubiquity of references to “making the polluter pay”) – they may represent a form of *primitive accumulation* or *accumulation by dispossession*, a neoliberal privatization and commodification of public assets and wealth (Harvey, 2004).

Overcoming the harm linked to salmon aquaculture as it is currently practiced thus necessitates a de-commodification of life itself and a reinvigoration of public responsibility for, and collective stewardship over, the oceans and the bounty and wonder they contain.²⁴² Whereas an expansive consideration of the topic requires a far greater consideration than is possible here, I hold that achieving this democratic stewardship begins with a recognition that meaningful political democracy – one that goes beyond formal voting procedures and structures – necessitates economic democracy. This includes challenging the

²⁴² The role of consumption also comes into focus here. Neoliberal environmentalism is rightly criticized for its – now dominant – normative response to environmental issues that tasks individuals with enacting change via the sovereign choices they make in the marketplace. The need to respond to environmental challenges as a *polity* and to do so at the level of relations of production is clear. Arguments that economic, social and cultural networks and flows of consumption can be driven by structural forces, such that the consumer power of some reduces the availability and use-value of others consumption (Curran 2017b), however, reinvigorate the case for a – collective – political responses at the level of consumption also.

economic organizational structures – primarily the collective of capital that is the corporation – through which capital accumulation occurs.²⁴³

Despite that a farm is legally a fishery, and in that sense embodies an activity taking place in a “public” context, my analysis has demonstrated some of the tremendous proprietary control the industry is able to exercise over the farms and the fish within, as well as information pertaining to both. Farm tenures themselves have historically been treated as de facto unassailable. The Crown’s obligation to consult First Nations has not limited (or historically impacted in any way) the granting of farm licenses, yet, once issued, the associated rights are regarded as virtually absolute – wholly naturalized as conveying the power to control and exclude, and thereby contradistinct from the ever-evolving and contested reality of aboriginal law.²⁴⁴ This once again demonstrates how a meaningful response to the systemic harm resulting from salmon aquaculture as currently practiced is fundamentally connected to both the development of

²⁴³ Under the symbolic violence of neoliberalism, the valorization of an idealized market individual – personal sovereignty, individual responsibility, the assumption of risk in return for the promise of reward – is projected onto the legal person that is the corporation, an entity that is structurally at odds with these traits. The doctrines of separate legal personality and limited liability operate to insulate both shareholders and managers from responsibility and accountability. Barring exceptional circumstances, the invisible intermediary of the corporation absorbs any claims resulting from the actions of the people who act through it. Shareholders are merely investors who do not legally own the property used to do harm and whose liability is limited to their initial investment. At the same time, managers are only employees of the corporation and their conduct will normally be ascribed to it. Unless they can be shown to have made the impugned conduct their own, they will generally be able to avoid responsibility. (See, for example, Glasbeek, 2002, 2017; Skyes, 2000.)

Further, whereas neoliberal rhetoric centres on individual competition in the free market as the generator and allocator of wealth, the legal formulation of the corporation actually represents a direct undermining of the competitive market – it is a device for removing the effect of market decisions from those who, according to market principles, should bear responsibility for their actions. The corporation is a responsibility avoidance machine, through which managers and directors act without risk to themselves – escaping accountability for their actions by assigning them to the legal person that is the corporation – and shareholders can reap returns while limiting any potential personal losses (e.g., Bakan, 2005; Glasbeek, 2002, 2017). Curran (2018b) explores this through the concept of *organized irresponsibility*, as developed by Beck, in the context of corporate crime, arguing that the “dysfunctional dialectic” of collectivist and individualist aspects of corporate law creates a situation in which actors within corporations can vacillate between individual and collective agency as is convenient.

²⁴⁴ In fact, although they in practice appear to be treated like *fee simple* strong tenures, farm tenures are at most leases and most commonly are mere *licenses of occupation* (under British Columbia’s *Land Act*), a weak form of tenure intended for temporary occupation (Policy and Practice Report, 2011, p. 44).

economic democracy and the process of reconciliation with Indigenous people and recognition of Indigenous sovereignty.

It is telling that DFO and the Canadian state have endeavored to encourage First Nations to take up salmon aquaculture as proprietors (and have established funding programs for those interested in doing so). The official rationale for these efforts is the provision of much-needed economic opportunity, but there appear to be other underlying political objectives. In documents in evidence at the Commission, DFO in essence admits that at the heart of such efforts is the hope that once First Nations are themselves salmon farmers they will change their attitude in regard to the industry.²⁴⁵ This “absorb and neutralize” strategy has a long history within colonialism as the dominant means of controlling Indigenous populations. Incorporation into – and then subsequent dependence on – the market economy was well-recognized by both colonial administrators and native populations as the most effective means to subjugation – and was often strenuously resisted by the latter (Graeber, 2012).²⁴⁶ This is not to hold that First Nations should be denied economic opportunity or the freedom to proceed however they wish; rather, from a critical perspective, it points again to the importance of building alternative economic organizations and structures, which here might include ones grounded in collective or community control of demonstrably sustainable (as measured by a broader, community-linked criteria) fisheries or aquaculture operations.

²⁴⁵ For example, in a communications review, a senior DFO official states that, “[W]e need to use shellfish aquaculture as a gateway for First Nations into aquaculture” (ex. 1697). The use of the term “gateway,” connotative of “gateway drug,” is perhaps telling.

²⁴⁶ A somewhat similar sentiment may be found in the following excerpt from the First Nations Fisheries Council’s written response (adduced at the Commission) to DFO on the publication of the draft Pacific Aquaculture regulations:

It is offensive to First Nations that in the opening statement only positive statements are made with respect to First Nations engagement in aquaculture. There is a total lack of recognition of rights and Title, of issues and concerns which have been raised repeatedly by First nations with respect to many aspects of the current aquaculture management system. The repeated emphasis in the opening statement about First Nations receiving benefits from aquaculture companies totally misses the point of the significant issues and concerns which have been repeatedly raised by B.C. First Nations with respect to the Aquaculture industry. (Exhibit 1656)

Grounding the precautionary principle in ecological praxis

To the extent that the realization of an ecojustice allows a subversion of the affirmative force of biopolitics, it enables the precautionary principle to go beyond the “motherhood” role of providing green cover for policies and practices that fail wild fish and those who depend on them – and instead take on the genuine capacity to preclude. Strong formulations of the precautionary principle (to the effect that the activity in question must be shown to be demonstrably safe before it can proceed) have been criticized on multiple grounds – either as too vague or too restrictive in requiring the proof of a negative (that something does *not* cause harm) (e.g., Peterson, 2007). In fact, such criticism serves to highlight how the precautionary principle should not remain an idealized axiom removed from the world and applied wholly in the abstract to reveal the one true ethical imperative. Instead, its implications should be determined through lived experience in the context in question. Realizing the substantive meaning the principle takes on as reflective of power relations within the context in which it is instantiated not only accords empirically with my analysis of the operation of power, but also *normatively*: the invocation of the principle *should* initiate an iterative, negotiated process, grounded in praxis, one through which even its own meaning and import will be determined. It is in this dialectic of agency and subjectivity and the structural and ideological relations of power that the potential for change resides. An invigorated precautionary principle can serve an important foundational basis for a “sustainability” that is neither corporate greenwashing nor biopolitically managed endless and unconditional growth.

Locating science within an ecocentric approach

Throughout the Commission hearings, the compartmentalization of science from ethics and politics was abundantly evident (for example, “it’s not really my place to say as a scientist to...put those societal values about risk and the economic benefits in place. I leave that to the politicians.” [110829]). Of course, in point of

fact, how we define and structure science – its methods and objects of study, the parameters we place on it, the meaning we assign its conclusions – are inevitably bound to the realms of the ethical and the political, particularly when that science is mandated to serve specific socio-economic ends. The Commission hearings saw extended contestations over the definition of science and challenges to its hegemonic form.

Destabilizing the hierarchy of knowledge, atop of which sits a reductionist positivist science supervening on various forms of practical reason (and in practice through symbolic violence blocking significant change and reinforcing the status quo), opens the possibility of an epistemological space that is horizontal, dynamic and rhizomatic. Here, a critical common sense that combines a more expansive understanding of empirical research and knowledge-production with both practical and technical expertise might begin to challenge taken-for-granted biopolitical limitations (the principle that with “appropriate regulation” the industry is sustainable, for example). In one sense, Alexandra Morton may embody this synthesis within her own praxis, one that leads her to conclude: “As a biologist, as someone who’s looked at this from inside and out, I don’t see how the industry can exist legally or biologically in the ocean....I don’t think anyone can regulate this industry correctly in the ocean” (110907).

I have considered multiple examples of this “pragmatic” approach. In the following one, addressing pathogen shedding from farms, Morton resists the location of the precautionary principle within the biopolitical framework:

MS. MORTON: [I]n the Broughton Archipelago and the Institute of Ocean Sciences came up with this, a particle can go ten kilometres in six hours. And for those of us who heat their houses with wood, as the logs float around we have a high understanding of where things will go, or boats that drift away. So the movement is enormous. When I hear that there’s a precautionary principle to keep farms one kilometre from a stream, biologically that’s highly insignificant. It really doesn’t mean anything.

So these waters have much greater tidal flow than in the Broughton Archipelago. We saw Kyle Garver’s work, how if a farm has a 30 percent loss from an epidemic, that there will be 60 billion particles, viral particles shed per hour, and a complete clogging of the channel was what his image showed.

This is not to argue that on this or any other specific issue such an assessment should be taken as definitive. Perhaps other modelling might conclude, for example, that large tidal flows mean large-scale virus particle dilution, and hence a reduction of risk. The point is rather that proceeding from a position of ecological justice means taking reasonable, practically-grounded constructions of ecological harm seriously and lending them real ethical weight within our frameworks for decision and action – while also continually reassessing them against similarly practically-grounded but dialectically evolving epistemic criteria. I consider this to be what implementing the precautionary principle should mean in actual practice. The response to the category error of demanding epistemically impossible scientific certainty as a precondition to social change should not be resort to a naturalized and taken-for-granted “common sense” – something which perhaps potentiates still greater dangers. Nor is the solution to take the opposite tack and, as opponents have sometimes done, fall into a scientism that fetishizes specific politically favourable research or results. (See “the smoking gun.”) Instead, the reflexive application of a continually interrogated “common sense,” one grounded in an ethico-political set of evolving communal values, could provide the foundation upon which a bridge from scientific knowledge to social change might be built.

As with Morton’s work, Kristi Miller’s research may exemplify challenges to the epistemic hierarchy of regulatory knowledge production, though from a distinct position. Morton operates outside the bureaucratized scientific-regulatory field, and while this delegitimizes her work by official criteria, it also creates an agonism that challenges this system and the ways in which it shapes and limits knowledge. Miller, on other hand, is located *inside* the field and presents an internal challenge to these institutionalized procedures and processes. As a result, she is subject to direct and indirect mechanisms of disciplinary and sovereign coercive control, subtle and not-so-subtle forms of intimidation and exclusion. Such research may not constitute a Kuhnian (1996) paradigm shift in the sense of a radical transformation of the conceptual scheme within the

“normal science” of a discipline, but it does represent a fundamental challenge to the institutionalized methods and procedures of disease identification as practiced within the techno-bureaucratic regulatory system – away from the histopathological to a hybridized epigenetic and in vivo approach.

The appropriation of this research by actors outside of the institutional setting amplifies the pressure exercised from within – because of the “dangerous” uses to which her work could be put by “agenda-driven” activists, allegedly unconcerned with the scientific method and its concomitant principles of discipline and rigour. However, it also creates opportunities for further epistemic possibility beyond institutional boundaries (through the direct incorporation of in situ “naturalists,” such as fishers and first Nations, for example). This kind of disrupting of the received view of discipline-specific scientific methodology by non-conforming research could work to expand the boundaries of what counts as knowledge in that context. Fomenting and sustaining such an expansion, however, requires increasing the weight of such voices both inside and outside institutional frames of knowledge. This includes challenging “stakeholder” processes in which industry is treated as just another interested/affected party with a voice at the table – something that occludes not only that it is the industry that is the generator of harm and subject of (ostensible) regulation, but that its attendant political economic power fatally skews the resulting process and outcome.

Building a true community of epistemic inclusion requires the meaningful participation of subaltern voices such as fishers, local residents, fish farm workers and Indigenous people. The marginalization of Indigenous people is such that they are often disproportionately affected by the distributional and relational effects of the political economy of risk while also having connections to ways of understanding that are external to it. And the call made at the Commission to recognize Indigenous people as ecologists exemplifies this synthesis toward the development of a practical-scientific (holistic) knowledge. Indigenous activism and alliances with environmentalist and environmental organizations has likely affected public attitudes and may be realizing some

tentative victories. Nonetheless, it should be noted that the recent agreement between the province, industry and First Nations, to remove, at minimum, ten salmon farms from the Broughton Archipelago, and a further seven unless the companies can reach subsequent accords, will see lost production shifted to less contentious (and claimed-safer) sites. It also has been reached within a context in which the federal government plans a near-doubling of salmon aquaculture production by 2028 (from 200,565 tonnes in 2016 to 381,900 tonnes in 2028) (Shore, 2018) and was opposed by the Musgamakw Dzawada'enuxw Tribal Council who at the same time saw the renewal of licenses in their territory (for five years) (Gilpin, 2019). Instantiating relations of power that exist at a partial remove from the biopolitical is not equivalent to being wholly outside of the system. Such an agreement represents a political – and biopolitical – compromise. It may *both* better enable the system to adapt *sustainably* to facilitate increased production – increased biopolitical colonization of the natural world – *and* represent a genuine positional maneuver that reduces harm and opens up further possibilities for a more inclusive and democratic political ecology. Resistance to biopolitical and economic systems of control and exploitation must ultimately operate in recognition of this dialectic, seeking strategically and immanently to shape its unfolding to the maximization of the potential for positive change. The movement toward ecological justice in the context of salmon aquaculture and beyond is intimately connected to this ongoing engagement through a multiplicity of social contestations.

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Species at Risk Act, S.C. 2002, c. 29

Waste Discharge Regulation, B.C. Reg. 320/2004

APPENDIX A: COHEN COMMISSION TERMS OF REFERENCE

Order in Council

Her Excellency the Governor General in Council, on the recommendation of the Prime Minister, hereby

- a. pursuant to paragraph (b) of the definition “department” in section 2 of the *Financial Administration Act*, designates the Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River as a department for the purposes of that Act; and
- b. pursuant to paragraph (b) of the definition “appropriate Minister” in section 2 of the *Financial Administration Act*, designates the Prime Minister as the appropriate Minister with respect to the Commission referred to in paragraph (a).

Terms of Reference for the Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River

Whereas the decline in sockeye salmon stocks in the Fraser River in British Columbia has necessitated the closure of the fishery for a third consecutive year, despite favourable pre-season estimates of the number of sockeye salmon expected to return to the Fraser River;

Whereas that decline has been attributed to the interplay of a wide range of factors, including environmental changes along the Fraser River, marine environmental conditions and fisheries management;

Whereas the Government of Canada wishes to take all feasible steps to identify the reasons for the decline and the long term prospects for Fraser River sockeye salmon stocks and to determine whether changes need to be made to fisheries management policies, practices and procedures – including establishing a commission of inquiry to investigate the matter;

And whereas the Government of Canada has committed to full cooperation with an inquiry;

Therefore, Her Excellency the Governor General in Council, on the recommendation of the Prime Minister, hereby

- a. directs that a Commission do issue under Part I of the *Inquiries Act* and under the Great Seal of Canada appointing the Honourable Bruce Cohen as Commissioner to conduct an inquiry into the decline of sockeye salmon in the Fraser River (the “Inquiry”), which Commission shall
 - i. direct the Commissioner
 - A. to conduct the Inquiry without seeking to find fault on the part of any individual, community or organization, and with the overall aim of respecting conservation of the sockeye salmon stock and encouraging broad cooperation among stakeholders,
 - B. to consider the policies and practices of the Department of Fisheries and Oceans (the “Department”) with respect to the sockeye salmon fishery in the Fraser River – including the Department’s scientific advice, its fisheries policies and programs, its risk management strategies, its allocation of Departmental resources and its fisheries management practices and procedures, including monitoring, counting of stocks, forecasting and enforcement,
 - C. to investigate and make independent findings of fact regarding
 - I. the causes for the decline of Fraser River sockeye salmon including, but not limited to, the impact of environmental changes along the Fraser River, marine environmental conditions, aquaculture, predators, diseases, water temperature and other factors that may have affected the ability of sockeye salmon to reach traditional spawning grounds or reach the ocean, and
 - II. the current state of Fraser River sockeye salmon stocks and the long term projections for those stocks, and
 - D. to develop recommendations for improving the future sustainability of the sockeye salmon fishery in the Fraser River including, as required, any changes to the policies,

practices and procedures of the Department in relation to the management of the Fraser River sockeye salmon fishery,

- ii. direct the Commissioner to conduct the Inquiry under the name of the Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River,
- iii. authorize the Commissioner to consider findings, as he considers appropriate, of previous examinations, investigations or reports that may have been conducted that he deems relevant to the Inquiry and to give them any weight, including accepting them as conclusive,
- iv. direct the Commissioner to supplement those previous examinations, investigations or reports with his own investigation and to consider the Government's response to previous recommendations,
- v. authorize the Commissioner to rent any space and facilities that may be required for the purposes of the Inquiry, in accordance with Treasury Board policies,
- vi. authorize the Commissioner to adopt any procedures and methods that he may consider expedient for the proper conduct of the Inquiry, to sit at any times and in any places in Canada that he decides and to conduct consultations in relation to the Inquiry as he sees fit,
- vii. authorize the Commissioner to engage the services of any staff, experts and other persons referred to in section 11 of the *Inquiries Act* at rates of remuneration and reimbursement as approved by the Treasury Board,
- viii. despite subparagraphs (v) and (vi), direct the Commissioner not to conduct any hearings during the periods beginning on February 12, 2010 and ending on February 28, 2010, and beginning on March 12, 2010 and ending on March 21, 2010, to minimize the costs of the Inquiry and the inconvenience to witnesses during the Vancouver 2010 Olympic and Paralympic Winter Games,
- ix. authorize the Commissioner to grant, to any person who satisfies him that they have a substantial and direct interest in the subject

matter of the Inquiry, an opportunity for appropriate participation in it,

- x. authorize the Commissioner to recommend to the Clerk of the Privy Council that funding be provided, in accordance with terms and conditions approved by the Treasury Board, to ensure the appropriate participation of any person granted standing at the Inquiry under subparagraph (ix), to the extent of the person's interest, if the Commissioner is of the view that the person would not otherwise be able to participate in the Inquiry,
- xi. direct the Commissioner to use the automated documents management program specified by the Attorney General of Canada and to consult with records management officials within the Privy Council Office on the use of standards and systems that are specifically designed for the purpose of managing records,
- xii. direct the Commissioner, in respect of any portion of the Inquiry conducted in public, to ensure that members of the public can, simultaneously in both official languages, communicate with and obtain services from the Inquiry, including any transcripts of proceedings that have been made available to the public,
- xiii. direct the Commissioner to follow established security procedures, including the requirements of the *Policy on Government Security*, with respect to persons engaged under section 11 of the *Inquiries Act* and the handling of information at all stages of the Inquiry,
- xiv. direct the Commissioner to perform his duties without expressing any conclusion or recommendation regarding the civil or criminal liability of any person or organization,
- xv. direct the Commissioner to submit, on or before October 29, 2010, an interim report, simultaneously in both official languages, to the Governor in Council, setting out the Commissioner's preliminary views on, and assessment of, any previous examinations, investigations or reports that he deemed relevant to the Inquiry and the Government's responses to those examinations, investigations and reports, **(as replaced by Order in Council P.C. 2010-954 of July 23, 2010)**

- xvi. direct the Commissioner to submit, on or before October 29, 2012 **(as replaced by Order in Council P.C. 2012-1132 of September 24, 2012)**, one or more reports, simultaneously in both official languages, to the Governor in Council, and
 - xvii. direct the Commissioner to deposit the records and papers of the Inquiry with the Clerk of the Privy Council as soon after the conclusion of the Inquiry as is reasonably possible; and
- b. authorizes, pursuant to section 56 of the *Judges Act*, the Honourable Bruce Cohen of Vancouver, British Columbia, a judge of the Supreme Court of British Columbia, to act as Commissioner.

APPENDIX B: COHEN COMMISSION PARTICIPANTS AND REPRESENTATION

Participant or Joint Participants	Counsel	Law Firm	
1	Government of Canada	Mitchell Taylor, Q.C.	
2	Province of British Columbia	Boris Tyzuk, Q.C.	
3	Pacific Salmon Commission	John Hunter, Q.C.	Hunter Litigation
4	BC Public Service Alliance of Canada Union of Environment Workers BC	Chris Buchanan	Hastings Labour Law Office
5	Rio Tinto Alcan Inc.	David Bursey	Bull Housser & Tupper
6	BC Salmon Farmers Association	Alan Blair	Gowlings Lafleur Henderson LLP
7	Seafood Producers Association of BC	Mike Walden	Walden & Company
8	<u>Aquaculture Coalition:</u> Alexandra Morton Raincoast Research Society Pacific Coast Wild Salmon Society	Gregory McDade, Q.C.	Ratcliff & Company
9	<u>Conservation Coalition:</u> Coastal Alliance for Aquaculture Reform Fraser Riverkeeper Society	Tim Leadem, Q.C.	Ecojustice

	Georgia Strait Alliance Raincoast Conservation Foundation Watershed Watch Salmon Society Mr. Otto Langer David Suzuki Foundation		
10	Area D Salmon Gillnet Association Area B Harvest Committee (Seine)	Don Rosenbloom	Rosenbloom Aldridge
11	Southern Area E Gillnetters Association BC Fisheries Survival Coalition	Angiola- Patrizia De Stefanis	Alliance Lex Law Corporation
12	West Coast Trollers Area G Association United Fishermen and Allied Workers' Union	Christopher Harvey, Q.C. Christopher Watson	Mackenzie Fujisawa
13	BC Wildlife Federation BC Federation of Drift Fishers	Keith Lowes	Keith Lowes
14	Tsawwassen First Nation Musqueam First Nation	Kevin Lee	Ratcliff & Company LLP
15	<u>Western Central Coast Salish First Nations:</u> Cowichan Tribes Chemainus First Nation Hwlitsum First Nation Penelakut Tribe Te'mexw Treaty Association	David Robbins	Woodward & Company
16	<u>First Nations Coalition:</u> First Nations Fisheries Council Aboriginal Caucus of the Fraser River Aboriginal Fisheries Secretariat	Brenda Gaertner	Mandell Pinder

Fraser Valley Aboriginal Fisheries Society
 Chehalis Indian Band
 Secwepemc Fisheries Commission of the
 Shuswap Nation Tribal Council
 Upper Fraser Fisheries Conservation Alliance
 Adams Lake Indian Band
 Carrier Sekani Tribal Council
 Council of Haida Nation
 Other Douglas Treaty First Nations who
 applied together (the Snuneymuxw, Tsartlip
 and Tsawout)

17	Métis Nation British Columbia	Joseph Gereluk	Joseph Gereluk Law Corp.
18	Sto:lo Tribal Council Cheam Indian Band	Tim Dickson	Farris, Vaughan, Wills & Murphy
19	Laich-kwil-tach Treaty Society Chief Harold Sewid Aboriginal Aquaculture Association	Allan Donovan	Donovan & Company
20	Musgamagw Tsawataineuk Tribal Council	Krista Robertson Lee Robin Schmidt	Robertson Law
21	Heiltsuk Tribal Council	Lisa Fong	Ng Ariss Fong

APPENDIX C: WITNESSES APPEARING AT SELECT COMMISSION HEARINGS

Brian Atagi, Area Chief Aquaculture, Conservation & Protection, DFO

Clare Backman, Director of Environmental Compliance and Community Relations, Marine Harvest Canada

David Bevan, Associate deputy minister, former senior assistant deputy minister, Ecosystems and Fisheries Management, DFO

Dr. Brendan Connors, Postdoctoral fellow, School of Resource and Environmental Management, Simon Fraser University

Claire Dansereau, Deputy minister, DFO

Dr. Lawrence Dill, Professor, Department of Biological Sciences, Simon Fraser University

Dr. Ian Fleming, Professor, Ocean Sciences Centre, Memorial University of Newfoundland

Nellie Gagné, Molecular biology scientist and laboratory supervisor, Molecular Biology Unit, Gulf Fisheries Centre, DFO Moncton

Dr. Kyle Garver, Research scientist, Aquatic Animal Health, Pacific Biological Station, DFO

Kerra Hoyseth, Senior Aquaculture Biologist, Aquaculture Environmental Operations, DFO

Dr. Stewart Johnson, Head, Aquatic Animal Health Section, Pacific Biological Station, DFO

Dr. Simon Jones, Research scientist, Aquatic Animal Health Section, Pacific Biological Station, DFO

Dr. Michael Kent, Professor, Microbiology & Biomedical Sciences, Oregon State University

Dr. Frederick Kibenge, Chairman, Department of Pathology and Microbiology, Atlantic Veterinary College, University of Prince Edward Island

Dr. Kim Klotins, Acting national manager, Disease Control Contingency Planning, Aquatic Animal Health Division, Canadian Food Inspection Agency

Dr. Josh Korman, Fish ecologist, Ecometric Research Inc.

Gavin Last, Assistant director, Policy and Industry Competitiveness Branch, BC Ministry of Agriculture and Lands

Dr. Christine MacWilliams, Fish health veterinarian, Aquatic Animal Health Section, Salmonid Enhancement Program, DFO

Dr. Gary Marty, Fish pathologist, Animal Health Centre, BC Ministry of Agriculture

Dr. Peter McKenzie, Veterinarian and Fish Health Manager, Mainstream Canada

Dr. Kristina Miller, Head, Molecular Genetics Section, Salmon and Freshwater Ecosystems Division, DFO

Alexandra Morton, Executive Director, Raincoast Research Society

Dr. Don Noakes, Professor, Department of Mathematics and Statistics, Thompson Rivers University

Dr. Are Nylund, Professor, University of Bergen, Norway

Dr. Craig Orr, Executive Director, Watershed Watch Salmon Society

Mia Parker, formerly Manager, Regulatory Affairs, Grieg Seafood BC Ltd.

Michael Price, Biologist, Raincoast Conservation Foundation

Dr. Laura Richards, Regional director, Science Branch, Pacific Region, DFO

Dr. Sonja Saksida, Executive Director, Centre for Aquatic Health Sciences

Dr. Mark Sheppard, Lead Veterinarian, Aquaculture Environmental Operations, DFO

Dr. Craig Stephen, President, Centre for Coastal Health; professor, Faculty of Veterinary Medicine, University of Calgary

Stephen Stephen, Director Biotechnology and Aquatic Animal Health Sciences Branch, DFO, Ottawa

Catherine Stewart, Salmon Farming Campaign Manager, Living Oceans Society

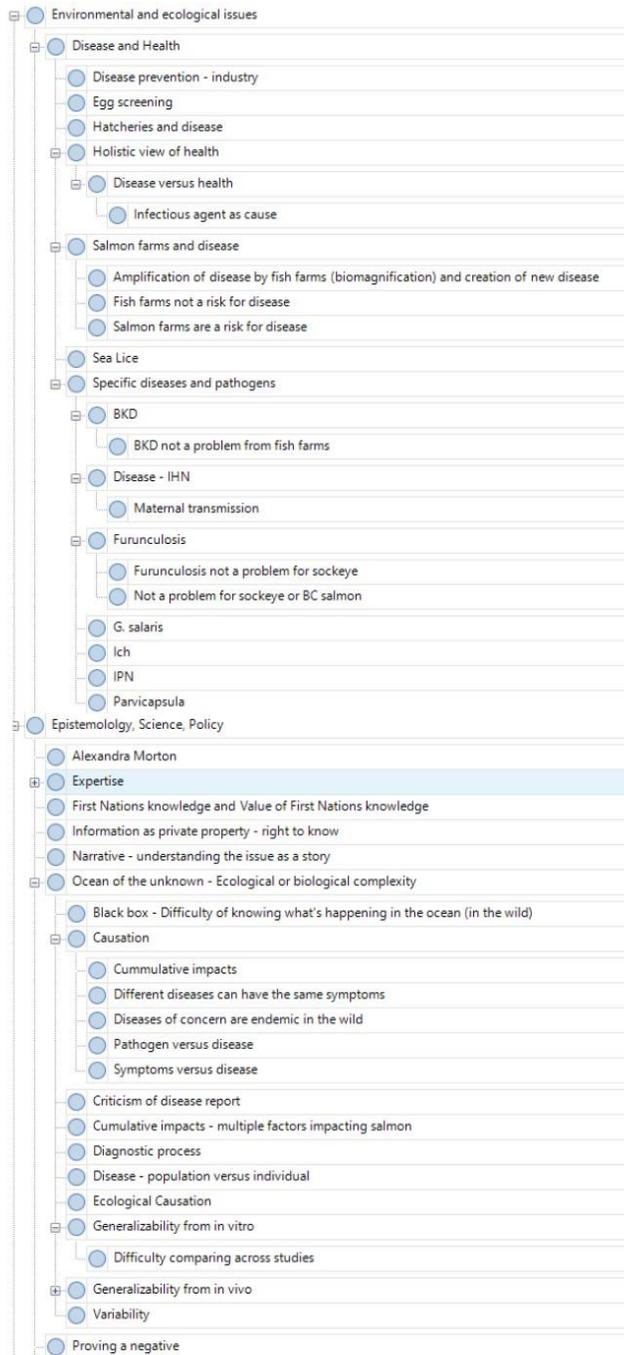
Trevor Swerdfager, formerly Director General, Aquaculture Management Directorate, DFO (NHQ)

Andrew Thomson, Director, Aquaculture Management Directorate, DFO (Pacific Region)

Dr. David Welch, (President and CEO, Kintama Research Services Ltd.)

Dr. Peter Wright, National manager, National Aquatic Animal Health Laboratory System, DFO Moncton

APPENDIX D: CODING TABLE



- Regulatory scientific performance
 - Bias for lab research
 - Bias toward sexy science
 - Catch 22 need evidence to act but can't get evidence without acting
 - Miller's approach as a way out of Catch 22
 - Certainty from uncertainty
 - Mortality
 - Risk provides certainty - framework to move ahead - Beck
 - Smoking gun
 - The tennis match
 - Compartmentalization
 - Difficulty in setting standards
 - Difficulty knowing chance of exposure
 - Difficulty of management decisions in light of ecological complexity
 - First Nations involvement with reg regime or scientific process (inclusion or exclusion) - Co
 - Genomic work - Miller etc
 - Complexity of issue
 - Criticism of Miller's work
 - Critique of DFO Gagne
 - Genomics as a statistical process
 - Holistic approach to info
 - Miller's approach as superior to standard fish health
 - Research versus diagnostics
 - Ignoring information Absence of information
 - Inadequate scientific funding (resources)
 - Industry interests - come first or don't come first
 - Involvement of industry
 - Known unknowns
 - Lack of knowledge and Lack of research
 - Dead fish versus sick fish
 - Difficulty maintaining sockeye in lab
 - Lack of baseline data and lack of oversight
 - New virus
 - Political considerations
 - Studies done on Atlantic salmon
 - More research as the only response
 - Policy threshold requires scientific standard of certainty
 - Responsibility - partitioning of - diffusion of
 - Science as divorced from policy
 - Science as incompatible with bureaucracy
 - Scientific method - against pure research
 - Scientific method - args over methodology and causation and epistemology - controversy
 - Activist science - Bias
 - Scientific Method - Problems with standard scientific approach
 - Scientific method - science as art or craft
 - Scientific method works
 - Sea Lice
 - Are an issue for sockeye
 - Criticism of the Price papers
 - Not an issue for sockeye
 - SLICE
 - Uncertainty as a green light
 - Scientific method - Conservatism or narrowness of scientific method or approach
 - Absence of definitive proof equals no proof
 - Inverse of conservatism or supposed conservatism actually produces recklessness
 - Iterative or holistic alternative - ecosystems approach

•	Uncertainty of science or of scientific method - subjective aspects - diagnosis
•	Uncertainty from certainty
•	Unknown unknowns
•	What can we actually manage
•	Salmon farmers as responsible stewards (or not)
•	Salmon farms have an impact on wild salmon
•	Salmon farms have no impact on wild salmon
•	Symbolic violence
•	The analysis is solid
•	Political economy
•	Absorb and neutralize
•	Divine right of capital
•	Assumption that fish farms are something that we have to regulate around
•	Economic benefits of salmon farming
•	Enclosure of the commons
•	Externalize costs
•	First Nations involvement in aquaculture business - or relationships with FNs
•	Lack of disclosure or transparency- access to information
•	Political control
•	(Possible) Censorship and silencing
•	Hostility to research
•	Messaging about ISA - including misrepresentation
•	Political control backfiring
•	Trade implications
•	Regulatory capture
•	conflict of interest
•	ISA
•	Failure to act
•	ISA - establishing virus as causal agent
•	ISA - Testing and regulatory regimen, including lack thereof
•	ISA and disease in Pacific salmon
•	ISA from salmon farms or not
•	ISA in BC or No ISA in BC
•	ISA occurring naturally in BC
•	Kents work on salmon leukemia virus
•	Stephens work on ISA
•	Uncertainty of link between infectious agent and disease
•	New virus - Parvovirus - salmon leukemia virus - marine anemia
•	Complexity of causation
•	Criticism of Miller's work
•	Cummulative impacts - parvovirus
•	Parvovirus reproduction stimulated by stress - cummulative impacts
•	Disease from fish farms
•	Extent of harm
•	Fish farm samples
•	Holistic quality of genomic work

<ul style="list-style-type: none"> Identifying the virus <ul style="list-style-type: none"> Complexity of process - uncertainty at present Cooperation or non-cooperation of salmon farmers Degree of certainty of virus - reverse methodology Parvovirus Response continuum - not black and white - not absolute epistemology Retrovirus - salmon leukemia Ruling out other diseases Infectious agents versus host response Marine anaemia - symptom not disease Novel doesn't mean new The smoking gun Uncertainty Virus not from fish farms work in progress Regulatory regime - CFIA oversight Regulatory regime - compliance versus enforcement - new governance <ul style="list-style-type: none"> Industry cooperation or non-cooperation Regulatory regime - holistic approach - ecosystems approach Regulatory regime is flawed Regulatory regime is good Split between frontline staff and senior management
<ul style="list-style-type: none"> Salmon as a resource Process procedural issues - Commission as techno-legal apparatus of truth production <ul style="list-style-type: none"> Admissibility Breach of proper procedure Conflict Contestation Differing styles of counsel or differing reaction from witnesses Humour Legal versus scientific Nature or the hearing Process driving results Technical nature of discourse slows the court - complexity leads to inertia Time constraints - concision Who is NOT heard - also lack of representativeness - including first nations
<ul style="list-style-type: none"> Risk <ul style="list-style-type: none"> Assessors of risk are divorced from bearers of risk Biopolitics and sustainable development Biosecurity Holistic determination of risk - First Nations - or ecosystems-based management <ul style="list-style-type: none"> Duty to consult - triggering risk level Implicit assumptions about risk shaping findings Movement from concrete hazard to abstract risk Precautionary principle Precautionary principle inverted Resistance outside the risk machine

- Risk - subpolitics
- Risk and common sense
- Risk Assessment
- Risk is minimal or acceptable or managable
- Risk not considered - ignored
- Risk of risk - meta-risk
- Risk that cannot be quantified or controlled
- Socially acceptable levels of risk
- Subjective risk assessment underpings objective results
- There is no risk from salmon farms
- Zero risk is impossible
- Unexpected results