

**Infectious Salmon Anaemia Virus:
The political power of a small infectious agent**

by

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Abstract

This paper has the purpose of analyzing the ISA virus scientific issue in British Columbia with a focus on the last three days of the Cohen Commission of inquiry. I use Science, Technology and Society as a main theoretical framework to approach the issue and Postcolonial and Political Economy framework to address the controversy in a critical way that underlines the social and political implications of ISA. The method used to conduct the research is a case study supported with document analysis. The research showed the possibility of a highly politicized scientific field and the possibility of government and industry influence in the decision- making regarding the presence of the virus in BC. The failure to find a real solution for the controversy can be associated with the impossibility of science to be the only institutionalized knowledge producer in regards to resource management. It is recommended a more significant collaboration with First Nations and an inclusion of their knowledge production as scientifically valid.

Keywords: ISA; virus; science; controversy; knowledge production; Cohen Commission

Dedication

*For Valentina, Petrit and Bruno. Thanks for your
unconditional love and support.*

For A., who always believed in me.

For Sagar, who makes my life meaningful.

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Chapter 1.

Introduction

In 2009 British Columbia (BC) saw a dramatically low return of wild sockeye salmon to their native rivers. The event made harsher the already present tensions between aquaculture companies, fisheries, scientists and aboriginal peoples. The debate on the presence of aquaculture in BC waters heated up and Prime Minister Steven Harper promised a Commission of inquiry on the wild salmon in BC. In 2011, Dr. Kristi Miller published a paper on her genomic findings (Miller et al., 2011) on wild salmon that suggested the presence of an infectious agent that increased significantly the mortality of the salmon at the different stages of their life.

Miller's findings opened a very lively debate on the possibility of the presence of the Infectious Salmon Anaemia virus, ISAV, in British Columbia. The virus is an internationally reported disease and its presence in wild or farmed salmon would be a significant strike to salmon exportation, which is a major source of income for BC. The Cohen Commission was never specifically focused on ISA but on general causes for the decline, nevertheless Commissioner Cohen opted for an extension of the inquiry in December 2011, after the Commission was concluded in November, to specifically analyze the virus issue.

In October 2012 Judge Cohen published the final report of the inquiry but ISA was not mentioned. In January 2016, Alexandra Morton, activist and scientist against farm fisheries, Molly Kibenge, first scientist to report the presence of the virus to the government, and others published on the Virology Journal a paper with new findings on ISAV that could confirm its presence in BC. The debate is still open but does not seem to find an answer to the question: is ISAV present in British Columbia?

The research questions driving this dissertation are:

- Is this scientific controversy influenced by other agents such as political ones, industry stakeholders or media?

- Can science alone reach a compromise on the ISAV controversy?
- What is the role of First Nations' Knowledge production in the scientific controversy?

1.1. Methods and theoretical frameworks

The ISAV is a specific issue within the big panorama of the aquaculture and wild salmon health controversy in British Columbia. To research this issue a case study approach was used. The case study was supported with existing documents and literature.

The research process started with a general document analysis on salmon, aquaculture, other related issues, and stakeholders. Together with a general understanding of salmon and aquaculture the documents outlined an idea of the relations between salmon and First Nations and First Nations and European Settlers. In order to better understand the ongoing position of aboriginal peoples of Canada I added further documents. My understanding is still very superficial and I admit, accept and welcome the possibility of a misinterpretation of the texts or of the relations between settlers and indigenous people. Being a foreigner, external to the Canadian events and history, I am in a position of external observer.

The second step was to concentrate on specific documents and the chosen ones were the Cohen Commission's transcripts and exhibits, in particular the ones related to the extra three days of inquiry on Infectious Salmon Anaemia disease which were added by judge Cohen to discuss the scientific controversy over the virus. Media and advocates of all the stakeholders used and interpreted the transcripts and exhibits to convey their own message so in order to avoid being influenced by one or another interpretation I analyzed the original documents.

My research questions were addressed using the Science, Technology and Society (STS) theoretical framework, in particular by the work of Sheila Jasanoff and her specific ideas and critiques on development and progress. Together with Jasanoff, Bruno Latour was both inspiring and crucial to understanding the social and political implications of science and of scientific controversies.

Postcolonial theory and Political Economy perspectives completed my approach by addressing my critique of the capitalistic structure of value creation and resource management, and my critique of the racialization of the Canadian society through education, laws and media portray of aboriginals.

This paper is not intended to be partisan. It is not my intention to support either of the parts or to critique industry or the government. This is intended to be a critique of the paradigm that puts science at the center of our social world when science is increasingly heavily biased by economic and political influences. This is also a critique of the racism in the field of knowledge production, which keeps indigenous peoples around the world powerless and being considered incapable of evolving or of contributing scientifically to the modern scientific controversies.

The theme of indigenous knowledge is particularly significant in Canada, in the management of salmon and, in general, natural resources, and for my interests. The relationship between local knowledge and mainstream, globalized, western knowledge is a complicated one. Indigenous knowledge was marginalized and relegated to niches in society until the 20th century by Europeans. The capitalistic societies have both oppressed traditional knowledge and exploited parts of it which were aligned with western standards, picking and choosing small useful details from a complex system of practices and information developed by local peoples.

The Second World War weakened the power of Western politics and economics and allowed indigenous groups to regain space in the territory of knowledge production. Far from being in a post- colonial world, though, capitalistic societies have new means to oppress and exploit local knowledge, or to undermine its validity in relation to decision making related to global issues, such as climate change, biodiversity protection, and health. The ISA virus controversy is tightly bounded to First Nations' lands and natural resource management, thus it is fundamental to understand the ongoing power relations between the stakeholders to have a more wide comprehension of the processes in act.

Chapter 2.

Literature review

The purpose of this paper is to analyze a scientific controversy in the perspective of social sciences. Science, technology, and society studies (STS), the theoretical framework that allows placing “hard science” in the social world domain, and, that allow me to introduce, contextualize and explain the ground on which I built my essay.

STS is necessary to justify the social interest in a scientific controversy providing the elements to identify a political issue inside laboratory research. In this context, Bruno Latour’s political epistemology and Sheila Jasanoff’s critique of development, science, and technology, are key concepts.

Nevertheless, STS does not provide sufficient critical tools to understand all the *raison d’être* behind specific outcomes or situations that might occur from a scientific controversy in the social world. In order to fill this gap, and to portray accurately the power relations implicit between the diverse networks interacting in a dispute, a political economy, Marxist, perspective is provided.

Finally, a brief history of the development of aquaculture of salmonids in BC is outlined for the purpose of introducing the field of interest.

2.1. Science and technology studies

Trevor J. Pinch, the author of what is consider the decisive sociological account of something as "hardly scientific" as the solar neutrino problem, offers an introduction to a social constructivist approach to the study of science and technology. With the contribution of Bijker, he seeks to integrate sociology of science, the science- technology relationship and technology studies.

They argue that scientific knowledge is not different from any other kind of knowledge and that, as the other cultures of knowledge, its explanation is sought in the

domain of the Social World rather than in the Natural World (Pinch & Bijker, 1984). Previous literature had argued the same thing: Bloor in particular, associated with a variety of Study of Scientific Knowledge called Strong Programme, calls for an extension of sociology of knowledge into the 'hard sciences', claiming that sociologists should be impartial when analysing beliefs, and that they should not seek for different explanation when analyzing a "scientific falsehood" rather than a "scientific truth" (Bloor, 1984).

Pinch and Bijker consider the development of the bicycle to underline that the success of a scientific fact, or a technological artifact, is not based on a natural truth but shaped by a range of different variants, and that only in retrospect are development and success linear. Adopting a multi-directional model then, allows one to ask why some variants fail and some succeed (Pinch & Bijker, 1984). Part of the selection is determined by what solutions were found for what problems and the relevant problems are determined by social groups and by the meaning different social groups give to the artifact.

Scientific facts as something socially constructed rather than something simply recorded, were widely analyzed by Bruno Latour. He attempts to understand the reasons for which scientific facts are placed beyond sociological explanations (Latour & Woolgar, 2013). In their path of demonstrating how a hard fact can be socially deconstructed, Latour and Woolgar present the case study of Thyrotropin-releasing factor (TRF). TRF, also called Thyrotropin-releasing hormone (TRH), or thyroliberin, is a hormone produced by the hypothalamus. Latour and Woolgar argue that TRF was constructed by the actions of the scientist responsible for its re-definition and they show how it is possible to socially deconstruct the scientific fact without analyzing its history in chronological order but focusing on the contemporary debate. Their approach considers the meaning and significance of TRF according to different contexts. In particular, they underline the different meanings of a fact according to the different "networks" (Latour & Woolgar, 2013) of individuals for which it is significant. Different networks have different understandings of the same facts and, moreover, they change in space and time. The networks are inserted then in a context, which comprises laboratories, strategies and layouts adopted by the different groups looking into the same issue. The way in which the networks act during the construction of a new object determines the development of that object: choosing a particular strategy or layout, among equally valid ones,

determines decisively the nature of a constructed object. Even the achievements and successes of a laboratory could influence, or determine, the stabilization of a hard fact.

Thus, facts are socially constructed and scientists operate in a context, within history, constructing, not discovering facts. Latour's work emerged from the affiliation with the previously mentioned "strong programme" implying a political agenda in his program. The "strong programme" agenda was in fact summarized as: "Questions of epistemology are also questions of social order", where knowledge is not a given but something shaped in its reception (Kennedy, 2010). Science is one of those "things" which becomes political because it has to be represented and received; ultimately science is political because it is brought to the attention of the public. Kennedy analyses Latour's political epistemology focusing, as Latour himself, on the re-evaluation of scientific realism. This re-evaluation seeks to shift the attention from a version of realism that sees science as discovering truths to one in which science constructs facts, a shift from the truth of a fact to its reliability. Kennedy identifies this shift into a strong connection between realism and representation. Latour critiques the classic realism which aims to delete representation in order to allow us an unmediated, true, knowledge of nature, arguing instead to focus on representation. He recognizes the complex network of mediations that allow the very existence of our realities.

Rather than our representations mirroring a prior Reality (singular), this network of representations produces the realities (plural) we experience, and fresh modes of representations produce new realities. Immense labour goes into constructing those networks, and into maintaining them, for it is only in their maintenance that our sense of "reality" remains relatively stable; and it is in the production of fresh networks that our sense of "reality" alters. (Kennedy, 2010)

This perspective of realism sees "things" as real not when we definitely know them, but precisely when we have a dispute over them or when they concern us. In this sense, real things are undeniably political.

Thus, a scientific controversy is always at the same time a political issue, and something sociologists should care about. Science creates new problems, in a sense, or analyse existing ones bringing suddenly to the public attention issues that have a huge impact on the public interest and policy makers. For example, asbestos was a useful

construction material until research related it to cancer, smoking was socially acceptable and Camel was publicized as the doctors' favourite brand of cigarettes (Gardner & Brandt, 2006) and we are still working on sugar (Johnson et al., 2007).

A sociological understanding of science and technology can be used then, for political ends increasing the pressure on scholars to take a side in scientific controversies. Jasanoff proposes a different view on understanding the relationship between science and society than controversy. She proposes instead 'co- production' (Sheila Jasanoff, 1996). Jasanoff recognizes natural sciences as "the most potent source of authority in the modern world" (Sheila Jasanoff, 1996) therefore she questions the relationship between scientific knowledge and recommendations for social policy.

In questioning this relation, Jasanoff realizes that both the academic and the political network do not have an articulated knowledge of each other's practices and discourses. She identifies a problem in the transposition of the concept of "controversy" from the laboratories to those complex and shifting social and political 'things' concerning science and technology. Her personal experience leads her to identify the key role of scholars of Sociology of scientific knowledge (SSK) as necessarily political, since they are involved with the "making and unmaking of human knowledge" (Sheila Jasanoff, 1996), and politically instrumentals. SSK scholars are often cast as experts in conflicts that would have a great benefit for society if solved, and their involvement is partisan. Their inquiries are framed to make clear the connection between the knowledge and the political contribution every time to the change or creation of new social orders.

Since the sociological interpretation of science and technological facts is considered to be significantly influential in creating social order and in making policies, it is important to analyze the very base of the social with science and technology. Jasanoff questions the ideas of development and modernity themselves. The spontaneous equation that we make between science and technology and progress, she argues, is not convincing anymore. Science and technology cause not just an increase of comfort but also an increase in global risk and disasters. "After so many years of effort, have we acquired a more mature understanding of what it means for human societies to be developed?" (S. Jasanoff, 2002).

For the whole 19th century the narrated story was that of scientific and technological progress pursued to “improve the conditions of poorer societies”, and to promote development, however policy makers never felt the need to rethink the connection between science, technology and human betterment. Critics of technology do not agree with the purely positive idea of it: sometimes, they argue, technology aggravates what is already wrong within a society (Ellul, 1964). Some scholars are concerned with nuclear power and high global risks derived from a nonchalant vision of technology and development and some others point out the problematic fast pace of technological growth and the consequences it might have on the social growth instead (Scheuerman, 2009). Marcuse instead related the ‘technological rationality’ with a one dimension society (Mesaros et al., 2013). Even when technology is meant to be progressive, there is no certainty to avoid improper use and unintended consequences (Sclove, 1995).

Jasanoff identifies some recurrent themes in the critique of technology: “inequality, hyper rationality and unintended consequences” (S. Jasanoff, 2002). Technology exacerbates the already existing inequalities and class divisions in two way: by providing the ruling class, the producers, with new instruments to control and deskill independent-minded workers (Noble, 1977), and by transferring hazardous technologies from the north to the south of the world. Moreover, the technology transfer is often, moreover, accompanied by the appropriation of indigenous knowledge as intellectual property (Shiva, 1997). Hyper rationality is a consequence of an uncontrollable thirst of technology, order and governability (S. Jasanoff, 2002) that reaches the most intimate spheres of the human lives and behaviours inhibiting, rather than enhancing, human potentiality and simplifying complexity, eliminating variations and life form that do not easily follow orders and are not manageable (Scott, 1999). Finally, unintended consequences are those which are not foreseen by those who build the technology.

Nothing so dramatically illustrates this problem as the succession of environmental problems that imprinted themselves on human consciousness during the last third of the twentieth century: pollution from pesticides and hazardous substances (Carson 1962) acid rain from power plant emissions, ozone depletion through the use of seemingly benign chemical refrigerants, and climate change as a consequence of energy-consuming industrial and agricultural development. (S. Jasanoff, 2002)

It is impossible for designers to manage the improper use of technology even when the purposes of it are entirely positive.

Jasanoff calls for a restoration of a plurality of meanings attached to progress and development. Science and technology, and sociology, though, have an internal dispute based on profoundly different visions of what are the implications for our technological world. Sociology, for example, recognizes the local value of technological artifacts and the active update of them by users according to the context (Pinch & Bijker, 1984) whereas in a high-tech consumer world, technology is seen as value-free, impersonal and detached from a local meaning (S. Jasanoff, 2002). This impersonal view of science leads to seeing it as without implications in the perpetuation of power relations. Technology and science, though, operate within a historical and special context and they encode power relationships, perpetuating hierarchies and structural inequalities (S. Jasanoff, 2002).

She argues that sharing a unique idea of development means to ignore history and the peoples, to ignore the different pasts and the different presents forcing other societies to be up to date with the “developed” countries’ standards. This is an obvious consequence when policy makers accept the idea that they do not have to deal with the past. A democratic development would seek to find the better option for the public good instead of applying the same one to all the different forms of life sustained by the same democratic system (S. Jasanoff, 2002).

2.2. Capitalism and science

Science and technology (S&T) are the main drivers of this unquestioned idea of development, thus, it is necessary to question the way in which S&T drive human improvement: the interests they represent, the independence they might or might not have, can deeply influence our history. The role of science and technology is subject to intense debate especially in the context of a capitalistic society. Neoliberalism has exacerbated the relations of power between science and industry, and it is debatable whether science is, or has ever been, an independent branch of knowledge creation.

Capitalism relies heavily on scientific and technical expertise and this leads to a reciprocal influence defined on one side as “industrialization” of academy, and on the other

as “collegialization” of industry research (Kleinman & Vallas, 2001). Daniel Lee Kleinman and Steven P. Vallas recognize this apparent contradiction and analyze the consequences of the influence on both sides of S&T, finding a process of convergence called “asymmetrical convergence” in which science and industry share codes and practices, but in an imbalanced way that gives industry an upper hand.

The ‘capitalization’ of the academy can be related mainly to the globalization of the economy, and to harsh economic competition (Slaughter & Leslie, 1999): science and technology become in this context tools to increase competitiveness. Industry looks at them in the same way and seeks to fund research that is economically relevant for their own interests. Their job is facilitated by the rise of global markets which leads to a significant decrease in funds for education and research obliging the academy to seek support in industry (Slaughter & Leslie, 1999). The seeking of profit, typical of industry, is not compatible, though, with research inspired by curiosity and dependent only on scientists, and the scientists. Concerns over ownership then, becomes a barrier for the free flow of information advisable in science and technology, resulting for scientists in an unavoidable loss of autonomy over decisions on their research (Merton, 1973).

While the idea of a completely independent research might be more of a myth than reality (Kleinman & Vallas, 2001), and the influence of industry on academia has not always had negative impacts, the current trend sees a systemic shift that is remaking knowledge production under contemporary capitalism (Kleinman & Vallas, 2001). Moreover, there has been little studies on the way in which industry practices and codes infiltrate in academia, changing it.

Again, STS, which studies the relationship between industry and science (for example (Hansen, 2011)), does not provide a critical understanding of these relationships and of the wider consequences and possible manipulations on matters of public concern.

2.2.1. The tobacco case study

The process of the ‘industrialization’ of science is not gradual, ethical or without consequences. Manipulation is always a major risk. The case of the tobacco industry, even if very different from the scientific issue considered in this paper, provides a

significant example of how dangerous and fundamentally wrong it is for hard science to work for the interests of an industry and for social science to renounce to the role of watchdog in the creation of knowledge.

Sources of knowledge such as scientific institutions create perceptions of objectivity (Latour, 1988) and knowledge, *di per sé*, is a social construction interconnected with power. "Industrialization" and professionalization of science makes them vulnerable to corporate influence (Nussbaum, 2007). Science, thus, with its ability to create perceptions of objectivity, legitimates corporate power and economic interests rather than socially useful and trustful knowledge.

The tobacco industry influenced scientific knowledge production to slow the decline of the social acceptability of smoking. In order to do so, tobacco companies realized that since the concerns over smoking were global, they had to act as an industry sector and not as single companies to avoid the efforts that were redirected against the brands (Landman, Cortese, & Glantz, 2008). The first act in this direction was starting the International Committee on Smoking Issues, ICOSI, which created, in turn, a subcommittee called Social Acceptability Working Party, SAWP. The purpose of the subcommittee was to recruit sociologists in order to combat the social cost and passive smoking issues (Landman et al., 2008) by conducting research to emphasize the social importance of smoking, to support that "smoking is 'normal' behaviour" ("Goals of the Social Costs/ Social Values project," 1980). The plan for academics included participating in academic conferences hiding the industry support, writing pro-industry papers and sharing the findings, through professional journals, with popular press to influence the society ("Goals of the Social Costs/ Social Values project," 1980).

The SAWP committee's most important project was the Social Costs/Social Values project which had the specific aim to counter act the global movements against smoking, especially the new ones by non-smokers concerned with passive smoking related issues. A first step for SC/SV was to build a manual with arguments that every group related to the industry could use to refute the social costs issue (Landman et al., 2008). The second step was to publish a book, "Smoking and Society" with a collection of academic papers on the positive aspects of smoking and against the taxation of tobacco which was seen as an unfair means of "raising revenues by the government" (Landman et al., 2008). In

the book, the psychologist Hans Eysenck argues that genetic factors, not smoking, might increase the percentage of smoking related diseases in smokers. The claim substituted the old one that refuted arguments against smoking by stating that they were still not proven. In 1988 “Smoking and Society” was followed by “Smoking and the State”. The promotion of the book was aggressive with national tours, media training for the authors and with Ogilvy&Mother, a giant communication multinational agency, hired to commission favourable book reviews.

2.2.2. The example for the rest

I briefly mention the tobacco case study because it was a widely studied and discussed thematic on which there is not much room left for controversy, at least from a medical and scientific point of view. The cited case study inspired other researches to look into the practices of the industry in politicizing science, manipulating media, and influencing public opinion. The tobacco industry made public all those mechanisms with which industry manufactures consent and avoids policy changes dangerous for the businesses.

The Union of Concerned Scientists (UCS) is a resource to observe industry practices critically. The UCS was founded in 1969 by faculty and students of the Massachusetts Institute of Technology and since then their work is based on sharing information and seeking the truth with the aim to build a safer world (“Our History and Accomplishments,” n.d.).

In a 2012 report, as part of their Scientific Integrity program, the UCS analyzed and identified recurring patterns and methodologies in the way industry corrupts science at the expenses of the public (*Heads they win, tails we loose. How Corporations Corrupt Science at the Public's Expense*, 2012). Building up on the tobacco's case documents and others, the report identifies three main topics: corruption of science, shaping of public perception, and curbing the effectiveness of federal agencies.

Science can be corrupted in different ways. Industry can interrupt researches that bring undesired results or can prevent the reporting of those results. Under-reporting negative results is unscientific and unethical, and a great waste of resources. It is

estimated that annually twelve thousand clinical trials have failed to be fully reported, meaning sometimes, especially in medicine, unnecessary suffering and deaths (Dickersin & Chalmers, 2011). To explain it with an example: in 2002 the microbiologist John Zahn was censored by his supervisors at the U.S. Department of Agriculture and forbidden from publishing or presenting his research on no fewer than eleven occasions (*Heads they win, tails we loose. How Corporations Corrupt Science at the Public's Expense*, 2012). His research showed that industrial hog farms produce emissions that contain antibiotic resistant bacteria. His supervisors received questions from a representative of pork the industry (Kuehn, 2004).

Industry can intimidate or coerce scientists. Coercing scientists is not a new occurrence. From Galileo, accused of heresy by the Church and obliged to retract his theories, to the American politicians in the 1950s controlling scientists with alleged affiliations with communists, coercing scientists has accompanied the history of science itself. Nevertheless the phenomenon we are experiencing is that of companies and industry attacking science. Research is heavily dependent on industry funding (Kleinman & Vallas, 2001) and researchers risk being fired, having their research defunded, being transferred, not being given research positions if they clash with the company's interests. (Kuehn, 2005).

Other scientists are accomplices and sell their names and positions for ghost articles designed and written by corporations but published with other names to obscure the company's involvement (McGarity & Wagner, 2012). This practice gives credibility to their research, which is often conducted by manipulating study design and research protocols to obscure negative effects and promote positive results (*Heads they win, tails we loose. How Corporations Corrupt Science at the Public's Expense*, 2012).

The ultimate goal of corporations is to shape public opinion and, as a consequence, to prevent policy changes that might restrict or harm their business. In order to shape public opinion, even when research is heavily attacking their activities, industry downplays evidence and promotes false certainty (*Heads they win, tails we loose. How Corporations Corrupt Science at the Public's Expense*, 2012). The tobacco documents, archived and conserved by the University of California ("Truth and Reconciliation Commission of Canada. Report," 2015), prove how companies strategically plan their

attack against science and evidence, spreading doubts and avoiding reaching a fixed point and thus undermining regulatory will to protect the public. The great war of our century is climate change and in 1998 ExxonMobil, the American Petroleum Institute, and other top oil companies, gathered together with the specific aim of undermining scientific evidence, by forming the Global Climate Coalition and the Global Climate Science Team (Schulman, Abend, & Meyer, 2007). The groups inflated the debate around the uncertainties of climate science by developing a communication plan that could make “the average citizen understand (recognize) uncertainties in climate science” so the companies could “undercut the ‘prevailing scientific wisdom’” on climate change and prevent the USA from entering into the Kyoto agreements (Schulman et al., 2007).

The UCS's report identifies, then, through other techniques by which industry attacks science, influences public opinion and the effectiveness of Federal Agencies. The already mentioned points, though, are sufficient, for my purposes, to place the relationship between industry, science and the public in a more critical perspective than that often offered by STS. This does not have a negative or positive meaning *di per sé*. The aim of a company is to produce value for its shareholders and that it does. Their primary objective is not to serve the community or the public. When the relationships of power between industry, politics, science and the public become unethical or disproportioned the interest of the majority cannot be guaranteed.

2.3. Capitalism and racism

In the previous sections of this review, I consider the power relations between industry and science, the consequences of a scientific controversy for the public and the perspective of Science and Technology studies. This analysis, though, only partially considers the parts involved in looking into the actors and networks in a capitalistic, modern, western society. The public itself is somehow an accomplice to the perpetuation of capitalistic practices by accepting compromises in exchange for privileges, commodities and economic safety. While my interest is not in the responsibilities, I am interested, nevertheless, at looking at other players in the game who do not recognize our society's

values and rules as the ones to pursue. British Columbia is not just a home for the descendants of colonizers, but also of First Nations peoples, who, as other societies, did not follow in their technologic and economic growth the same path as the 'developed' countries.

Every concern, issue or controversy needs a public and the public is constructed in the same way as facts: according to the context, space, and time (Kennedy, 2010). Looking into different publics, though, sometimes hides the risk of interpreting in one's own perspective for a deep difference in ways to see things and life and in ways to value them. In understanding an issue in someone else's perspective a difference I value might prevent a full understanding of the differences.

Value has multiple meanings. Value creation, for example, can be "the ultimate measure by which (a corporation) is "judged" ("Value creation," 2009). For psychologists and sociologists values are related to human societies and/or to human nature: true friendship, mature love, self-respect, happiness, inner harmony, equality, freedom, pleasure, social recognition, wisdom, salvation, family security, national security, a sense of accomplishment, a world of beauty, a world of peace, a comfortable life, an exciting life (Williams, 1974).

'Capitalism culture' (Robbins, 2013) displays a set of values which were strategically built, which are not natural, which are not shared by other cultures, and which are in contrast with the previous values of North America itself (Fox & Lears, 1983): values such as individualism, accumulation, worship of private property and alienation. Oliver Cox sees also racism as a product of Capitalism, an issue of class struggles and racial oppression masked as caste oppression (Wilson, 1996). Racism is a tool of capitalism to control the masses of workers and poor (Cox, 1948).

Both the Negroes and the poor white are exploited by the white ruling class, and this has been done most effectively by the maintenance of antagonistic attitudes between the white and the colored masses. (Cox, 1948)

Capitalistic search for antagonism between poor and rich, black or white, does not have a counterpart in the indigenous population of Canada (Gladstone, 2015) First Nation peoples are different and they present different behaviours or sets of values but they seem

to share a belief in '*Namwayut*': 'we are one' (Huambachano, 2015) and some indigenous cultures of North America pursue the principle of the "collective common good", '*Ayani*'. '*Namwayut*' does not fit into that set of values that allows capitalism to grow and perpetuate itself. Attempts to interrupt the transmission of the indigenous peoples' value are sadly found in the Canadian history ("Truth and Reconciliation Commission of Canada. Report," 2015).

Capitalism uses racialization not only to control the masses, but also for economic purposes. According to the contemporary Marxist literature, the State is compelled to help producers in their process of accumulation because the State depends on economic means and prosperity: if racialization is economically productive, thus, the state is prone to institutionalize oppression. It is considered that the constitution of the United States protected slavery because the constitutional convention of Philadelphia was dominated by the planters class from the South and the merchants class from the North (Wilson, 1996).

When analyzing environmental issues on aboriginal land, there are two different metrics in which the situation is approached: the capitalistic one, in its advocates or critiques, and the First Nation's one. Aboriginal peoples' creation stories always begin with their connection to the Mother Earth, because to the Earth they belong, as well as trees, animals and other living creatures (Jacobs, 2010). This is not to romanticize native knowledge and culture, which would be just another case of appropriation: this is to underline that the spiritual connection they have with their land makes it necessary to look into how industry relates to different kinds of knowledge production and cultures. Indigenous people have resisted centuries of colonization, and despite changes and adaptations they have preserved their traditional knowledge of who they are thanks to their relationship with the Mother Earth (Lawrence & Dua, 2005).

The history of First Nations in Canada started with racism through the enforcement of colonial laws on aboriginal people. The colonial institution did not see the nation-to-nation treaty as being between independent powers and thus did not recognize them as valid under national or international law (Coates, 1999). The treaties were formally acknowledged, but frequently ignored, allowing Canada to perpetuate its colonial power and to claim ownership on aboriginal territories (Jacobs, 2010).

Canada is considered an egalitarian and multicultural state that guarantees civil and cultural liberties. Racism is considered an American phenomenon, not Canadian, so it is harder to unveil it in the relations with aboriginal people. Augie Fleras and Leonard Elliott argue that it is necessary to dig deeper, to find that racism is institutionalized in a society that systematically oppresses others for ethnic or racial reasons (Fleras & Elliott, 2003). It might be necessary to understand, in a scientific controversy, if, while looking for answers, all the different forms of knowledge production that share an interest in the issue, are equally considered.

2.4. Aquaculture in BC

Aquaculture is a relatively recent industry with a successful story of expansion in numerous countries. The industry's prosperity was based on the promise of producing cheap fish for a growing population, to control over-fishing and preserve marine biodiversity, to create job opportunities and to diversify national economies. The expansion, though, was not cost free and the lack of both sufficient research into potential "unintended consequences" (S. Jasanoff, 2002) on the environment, and regulations made it a controversial industry.

Up until 1971 the only commercial activity related to salmon in Canada was fishing with a harvest of about 2,500 metric tons. No one (reference) would have imagined at the time the proportions of the latent demand for Atlantic salmon.

In British Columbia, the first example of a farm fishery came just one year later, 1972, when Allan Meneely was issued a private license to run his activity: Moccasin Valley MariFarms, near Egmont. The fishery reared Coho and Chinook salmon, varieties of Pacific salmon, in hatcheries. It took then more than a decade and 30 other companies before, in 1984, Fisheries and Oceans Canada (DFO), allowed the importation of Atlantic salmon's eggs from Scotland to be farmed in three different spots in BC (John. M. Anderson, 2007).

The revenues then rocketed and in 1995 with the value of farmed salmon being almost double that of commercial farm fisheries contributing \$613 million to the B.C economy (Haberl, 2001). In 2011 farm fisheries and commercial fisheries gave jobs to 13,900 citizens and produced \$2.2 billions in revenues. Between 1990 and 2011 disparity between the two industries kept increasing with commercial fisheries losing 70.5 percent of revenues and with farm fisheries increasing them by 298 percent (*Bulletin of the Aquaculture Association of Canada, 2013*).

2.4.1. Issues

Despite the significant initial growth of the industry and the appeal of the economic incomes, salmon farming was questioned for a number of potential environmental issues in British Columbia, as well as in the rest of the salmon farming countries.

As previously mentioned, BC farms shifted from autochthonous species, such as Coho and Chinook, to Atlantic salmon the reason being purely economic: consumers identify Atlantic salmon with being of better quality and more desirable than the other species and this drove the choice of farm fisheries (John. M. Anderson, 2007). There are two levels of concern from different groups on choosing the Atlantic salmon: the first was on the Atlantic salmon overtaking the Pacific salmon by breeding with the autochthone species or by competing for food; and the second concern is over the risk of introduction of new diseases developed in farm fisheries, or simply external to the BC environment, that might damage the wild population (Haberl, 2001).

A third issue is the health of the fish. The conditions of the farmed fish are not the same as in a natural environment: being confined in net cages and experiencing high rates of stress, it is fairly easy for them to contract or carry diseases that might then be transmitted to the wild salmon, especially when their roots are close to the farm fishing sites. To prevent diseases, farmers use antibiotics, which leads to antibiotic resistance and to a worse situation causing periodically a collapse in the returning salmon (Haberl, 2001). Antibiotics affect the whole zone with a concentration around farm fisheries around 400 and 500 parts-per-million (Haberl, 2001).

Organic waste is an issue as well. Organic waste is basically pellets not consumed by fish and fecal material produced by the fish in the nets used to prevent farmed fish from escaping. This organic waste sinks to the seabed first in the zone around the farm and then to a much larger area thanks to the movements of the currents. The organic material is then decomposed by micro-organisms creating a demand for oxygen. If the quantity of waste is more than the critical level micro-organisms are able to decompose with the available supply of oxygen, the latter is substituted, as an oxidising agent, by sulphate. If sulphates then, are depleted in the soil, they cause the production of methane through fermentation (Culver & Castle, 2008).

Not to mention parasites and new diseases.

Chapter 3.

Infectious salmon anemia virus

Infectious salmon anemia virus, or ISAV, is a pathogen of the marine-farmed Atlantic salmon (*Salmo Salar*). It is the only species of the genus *Isavirus* and one of the genera of the family *Orthomyxoviridae*, which are influenza viruses (Kibenge et al., 2016). ISAV is a flu for salmon, but it is a very severe and deadly one. To make a comparison: ISAV is for salmon what the influenza pandemic of 1918-1919, known as “Spanish Flu” has been for humans.

ISAV occurs in two different genotypes: the North American one and the European one. Between the two, the European genotype has more genetic variations and it is more widespread (Kibenge et al., 2016).

The virus was detected for the first time in Norway, in 1984, and since then has always been a significant problem for the aquaculture and the ecosystem of the country despite attempts at control measures. Since the late 1990s the virus was identified in other countries causing huge damages to the industry: in 2000 it devastated the salmon industry in the Faroe islands, in 1998-1999 in Scotland, it is a recurring issue in Chile, Maine and New Brunswick (Iowa State University, 2012).

ISAV can be transmitted indirectly both in freshwater and seawater, even though it is more likely to occur in the marine stage of the salmon. The transmission may occur by proximity or close contact between fish or through mechanical vectors such as sea lice. Nevertheless the disease can be transmitted also vertically passing from mother to egg. The clinical signs vary from anemia, darkened skin, lethargy and increased mortality. Their interiors might be swollen and darkened. The mortality is initially as low as 0.5 to 1 percent but if not immediately controlled it can kill more than 90 percent of the fish in a few months' time (Iowa State University, 2012).

As previously mentioned, ISAV is considered to be present worldwide and to cause damages in almost all the major sites of the salmon fishery, but it has never been reported in BC. As stated in the government official website inspection.gc.ca “ISA has not been

found in the Pacific Ocean watershed or the Pacific Ocean off British Columbia” (Government of Canada, 2012). This statement is considered controversial.

3.1. Salmon(s)

To understand why this scientific controversy is significant, it is worth mentioning that salmon are a precious resource for BC. They are considered a keystone for the environment. There are seven species of Pacific salmon: Chinook, Sockeye, Coho, Chum, Steelhead and Cutthroat. Sockeye, in particular, is a precious source of food and commercial fishing (Pacific Salmon Foundation, 2011).

All salmon have a fascinating life cycle, starting their lives as fry in the spring in the rivers of BC, continuing in the ocean until mature and then coming back to the same river they were born in, swimming upstream. Once in the river, they spawn and, almost always, die (Pacific Salmon Foundation, n.d.). This particular characteristic makes it not only interesting, but underlines that during their lifetime salmon travel hundreds of miles: from the BC rivers to as far as the Gulf of Alaska. During these long migrations they feed basically the whole ecosystem. “In the Northwest, a river without salmon is a body without a soul” (Jim Lichatowich, 2013) because salmon are a food resource for more than 194 other species during their life time: sharks, seals, dolphins, orcas, otters, seals, sea lions, bears, wolves, raccoons, eagles, gulls, insect, juvenile salmon themselves among others and some species of trees as well. The carcasses of the salmon transported into forests for kilometers, mainly by bears, feed the whole forest (Gende, Edwards, Willson, & Wipfli, 2002).

One of the species that benefits the most from salmon are humans. The fish has historically been a fundamental resource for First Nations Peoples of British Columbia. For them salmon is a primary source of both food and income and they respect the animal including its representation in dances, costumes, songs and traditions (Brooks & Colombi, 2012).

3.2. The case

In the summer of 2009 between 10.6 and 13 million Sockeye were expected to return to the Fraser River, as they have every year. Instead, the official count, provided by the Department of Fisheries and Oceans (DFO), was about 1,7 million. Commercial boats were told to release every Sockeye they caught while fishing Chinook, a species that was not facing a crisis. Officials did not provide any definitive answer on why the numbers in 2009 were so low, but apparently fish were said to have died at some point of the migration (Hume, 2009).

As previously briefly mentioned the life of a salmon is always the same cycle. They spawn and they return to the same river around 4 years later. In 2005 almost 9 million salmon spawned giving hope for a huge return in 2009 (Hume, 2009). The disaster then, was even more unexpected and shocking.

The DFO, responsible for both the interest of the salmon farming industry and the wellbeing of wild salmon, refused to take action after the collapse, and the Harper government subsequently announced a \$14 million inquiry (which ended up costing \$26 million) commission headed by the honourable Bruce Cohen: the Cohen Commission. The Commission was announced on November the 5th, 2009 and went on for 133 days. The Cohen Commission heard the voices of First Nations peoples, fishermen, scientists, members of the public, and farm fisheries (Dearing, 2010).

3.2.1. The science of the controversy

Earlier the same year, 2009, Kristi Miller, Head of Molecular Genetics at DFO, launched, together with Scott Hinch, the largest ecological genomic study ever made on a wild species (University of British Columbia, 2009). During the study, published in 2011, Miller identified a common genomic profile correlated with the survival of the fish both in ocean tagged and in river tagged animals. She concluded her research paper suggesting that the mortality related genomic signatures might reflect a viral infection (Miller et al., 2011). During the Cohen Commission's public hearings she testified, stating:

DR. MILLER: Well, we basically were able to contrast the genomics of the fish that made it to the spawning ground successfully, or in the case of the

study at the spawning grounds, the fish that were successfully spawned with those that were unsuccessful, either in terms of their migration or their spawning. And in doing so, we found that in all three of our independent tagging studies, that the same genomic signature was associated poor success no matter whether the fish were tagged in the marine environment about 200 kilometres before they enter the river, whether they were tagged in the lower river, or whether they were tagged at the spawning grounds. The same signal was emanating from the data. (Cohen Commission, 2011a)

The study focused on Sockeye salmon, which was the species suffering the most at the time. It is important to remember that BC displays a wide variety of wild Pacific salmon whereas the Atlantic salmon is available only as a farmed fish, not being native to the region. The issue hereby discussed is significant inasmuch as it might be an economic disgrace for farm fisheries if they were endangering Atlantic Salmon and a cultural, ecological, spiritual, and image disgrace for British Columbia if it was affecting the wild population in its rivers.

Alexandra Morton, biologist and activist, and Rick Routledge, professor of Statistics at SFU, were more concerned than others about the crisis of the Sockeye and investigated on the causes of the decline. In 2011 Routledge collected and froze around 300 sockeye smolts in River Inlet and sent the hearts of some of them to Dr. Frederick Kibenge and the gills of the same smolts to Dr. Are Nylund to be tested for ISA. Both the laboratories reported cases of ISA in the tested samples. Other laboratories had ISA positive results: Dr. Kyle Garver, Dr. Sonja Saksida, and the previously mentioned Dr. Kristi Miller (Yardley, 2011). Doctor Kibenge was head of the Atlantic Veterinary College-University of Prince Edward Island laboratory, one of the very few labs certified by the World Organization for Animal Health, OIE, as a reference lab for the study and report of the ISAV. Doctor Nylund is a professor in the department of Biology at the University of Bergen and internationally recognized as an expert in ISAV.

Nevertheless, ISAV is still considered not to be present in British Columbia and not a threat for farmed or wild salmon. This is because the official labs of the Canadian Government did not find the virus (Ministry of Agriculture, 2015). Apparently, nearly every lab without funding or correlations with the government or the salmon farm industry that tested the virus reported ISA, whereas the governmental labs or those with industry affiliations seemed not to be able to find the virus.

The science behind a virus is fairly complicated and it is not expected, in this instance, to fully understand the dynamics of hard science, but to simplify the issue for my purposes, it can be argued that sometimes an experiment can give the results one is looking for. The reason is because viruses change, especially if imported in other countries (Yardley, 2011).

To explain this concept it is necessary to mention that since British Columbia does not have Atlantic salmon species, farm fisheries have to import the eggs from somewhere else, in particular from Europe, where the Atlantic farm fisheries first started. From 2009 British Columbia has imported eggs only for special necessities since it has now its own hatcheries and brood stocks. When eggs are imported farm fisheries are required to report them to the DFO (BC Salmon Farmers Association, n.d.). Up until 2009 though, almost 30 million eggs were imported into the province (Canada Fisheries and Oceans, 2011).

If some stocks were infected then it is possible that ISAV could have spread to wild fish. The virus, as previously mentioned, can be transmitted vertically, from mother to egg, and then horizontally, from fish to fish. Farm fisheries contain fish in nets with a high concentration of animals. The consequences on the environment have been already discussed, but another risk is that the proximity of fish to one another facilitates the spreading of diseases. The situation then, is made more dangerous by the leakages (Alina, John, & Jason, 2014) and by the strategic position of the nets in the routes of migration of the wild salmon (*The Uncertain Future of Fraser River Sockeye. The Sockeye Fishery*, 2012). (images)

Considering this information, it is possible to argue that ISAV might have been imported to BC and might have migrated from farmed to wild fish. This means that the virus might have evolved or changed. This is the whole point of the scientific part of this controversy. The first time Dr. Miller tested the samples, she found a virus which was a minimum of 5 percent divergent from the previously known form. Miller sent 96 samples found to be positive to a DFO lab in Moncton directed by Nellie Gagnè. Gagnè obtained only negative results and stated: “we are not trying to not detect the virus” (Cohen Commission, 2011b) implying that her methods are recognized in the published scientific literature. In 2004 another study on ISAV, by Molly Kibenge, was not published because

the results could not be proven by the Moncton lab. The unpublished draft found positive samples.

There are numerous reasons for which two labs can obtain different results: from the Cohen Commission hearing reports it is arguable that in this case the differences might be associated with different methodologies used by the different labs, different choices in regards to the segments of ISAV to analyze (using previous studies on the European strain or considering the possibility of mutation), and different choices of the development of the research (the study considered ISAV on Pacific salmon tissue therefore previous research done on Atlantic tissues might not be appropriate for a confrontation). In this case, the government labs decided to analyze a different segment of the virus to state the presence of the virus, making the confrontation with the other positive experiments hard or inappropriate (Cohen Commission, 2011b).

DR. KIBENGE: "Well, I wish to comment on the real time RT-PCR assay that is being validated by -- by DFO Moncton, and I looked at that information again based on the documentation that we are supplied with, and that real time RT-PCR assay is actually quite different from Snow and the Plarre, and so on. It is targeting segment 8, but the primers are different, and the probe is different and the fragment length is different. So when we are saying that we can't reproduce the results, it should be clearly understood that actually we are not using the same primers and probes, and that alone can create a difference in the results, particularly when you are using field samples where there is no standard amount of virus. In my view, the best way to compare labs, if that was an issue in terms of repeatability or reproducibility of results, would be to have an experimental sample in which there is a known amount of virus, that sample to be distributed blind, so that each lab can use their methods, and that way that will be a very effective way, a very objective scientific way of comparing the labs. In which case, if they can't have the same results, then there is a problem. But to compare labs based on field samples and particularly in this case where even the virus may be so variable that using real time on two separate segments you can't even pick up the same fish, it becomes a bit difficult to..." (Cohen Commission, 2011c).

Furthermore, there is a distinction between the disease ISA and the virus ISA. The labs found positive results of chains of ISA strains not the presence of the disease inasmuch the ISA disease was never reported or studied for Pacific Salmon. These scientists were finding in their samples parts of the virus in the Pacific salmon admitting the possibility that the virus might adapt to a virulent and dangerous form in the new host.

DR. KIBENGE: “The tests that we did and the positive results we obtained were for the presence of ISA virus sequences and not for the disease ISA. The disease ISA can only be found in farmed Atlantic salmon. We never got any farmed Atlantic salmon samples. We tested wild Pacific salmon samples, and those species are not known to have ISA as far as I know” (Cohen Commission, 2011c).

The possibility of obtaining two different results is opened by the standards defined by the Canadian Food Inspection Agency, CFIA. The agency launched an investigation to collect relevant information (Ministry of Agriculture, 2015) but the way they identify a suspected case may be subjective (Cohen Commission, 2011c).

3.2.2. Attacking the scientists

Doctor Neille Gagné admitted in front of the Commission that her laboratory had no previous experience of dealing with Pacific tissue and that the labs of Dr. Kibenge and Dr. Miller were more qualified and experienced in dealing with the study of the virus in the particular conditions of this issue. Nevertheless, her results were considered more accountable for DFO and CFIA and her career did not receive any negative impact from her findings (Cohen Commission, 2011c).

Dr. Miller, in particular, and Dr. Kibenge had different experiences. During the Commission’s meeting on August 25th, Kristi Miller praised the scientific integrity of the DFO, affirming, nevertheless, that she, as well as other DFO scientists, were denied participation to an SFI think tank on the issue. She stated that she, or other DFO scientists, were never prohibited to publish their research, but that there are examples of suggestions to interrupt or avoid specific research. She could not make a specific example, but she argued that it was comprehensible that an organization such as the DFO has to meet requirements and keep to a specific schedule. She was also denied permission to communicate with journalists and the public because of the ongoing inquiry (Cohen Commission, 2011a).

During the inquiry Miller attacked the media by portraying her situation the wrong way and by decontextualizing her speech, since she argues that she was never prohibited to share her research. Nevertheless, during the inquiry in August she states that she did

not know that there was a specific restriction for her to speak with the media after she published her paper on her genomic findings about salmon (Cohen Commission, 2011a).

“I learned only 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.”

She found herself in a difficult position with a problem of conflict of interest: on one side she was the head of the molecular genetics department lab for DFO, and on the other side she felt the need to go further with her research and to communicate with the media in order to better explain her findings and how to position her research.

A part from being told to not communicate with the media, she was prohibited to communicate with Ottawa too, and to report her findings to the CFIA:

DR. MILLER: “It’s not my job to report to CFIA. I was told that it is his (Stephen Stephen) job to report to CFIA.”

Miller reported her research and her findings to her superior Stephen Stephen. During the public audit of December 25th she discusses the reactions and the consequences inside the DFO. When asked if he was “angry at her” Miller replied indirectly stating that he was clearly unhappy about the fact that “random scientists” could work on reportable diseases without him knowing. She added that scientists were not supposed to talk publicly about those findings and that the only way to contact Ottawa was through Stephen. She was also restricted from sending email about ISA.

Stephen Stephen was the head of Genomics R&D Initiative, GRDI, and Miller declares that she was concerned at the time about the funding for her lab, especially given that GRDI was one of the places she received funding from.

Miller was then questioned about Molly Kibenge’s work, for which her lab sequenced some samples even though she was not aware of the facts until November 2011. She argues that the heads of the DFO were all certainly aware of both her work and Kibenge’s research after the 24th of November (Cohen Commission, 2011b), but on December 2nd the Minister of Fisheries and Oceans Canada releases a statement about

the absence of ISAV in BC. Given the different labs obtaining positive tests for ISA, the statement was a surprise for Miller (Cohen Commission, 2011b).

Q “And so when statements were coming out from DFO after November 24th, and in particular, the statement from the Minister on December 2nd, saying they were not aware of any ISA, that would have been a surprise to you, wasn't it?”

DR. MILLER: “Yes, it was, but nobody was speaking to me at that point.”

The basis for the Minister's statement was the research of Gary Marty, BC Fish Health Veterinary. Miller's research was ignored and she was prohibited to communicate with the Ministry, but Gary Marty's research was considered enough to make a strong and definitive statement from the government to the public.

During the public hearing on December 15th emerged that the chosen research was based on the method developed by a Master's student of Marty's. The method was not published or validated by peer review and Dr. Fred Kibenge found it to not be sensitive enough to detect the virus.

Miller herself stated that after she published the research, everybody in the DFO started to ignore her, nobody would speak to her about ISAV or let her know anything about new possible developments or studies. She felt under extreme pressure and left out (Cohen Commission, 2011b). Nevertheless, she was not prevented from continuing her research and her next step was to study samples directly from farm fisheries. Miller found just one company available to collaborate with her. She praised their methods and their professionalism, but she also declared that her lab found 25 percent of the ISA virus in the collected samples, along with other extremely dangerous viruses. She also contacted BC Salmon Farmers Association after a previous Cohen session to test their Atlantic salmon. After an initial agreement, BCSFA refuses to give the permission for the Atlantic salmon and suggested to Miller to focus again on the Sockeye ignoring the ISA as well, but looking for another typology of virus. All the samples she could have access to were being sent to the provincial lab, the same lab where Gary Marty does his research. She requested through DFO some samples and she received tissues homogenized in water, which allows them to degrade and does not make them usable. She was also not allowed to carry out any ISAV tests on the same samples (Cohen Commission, 2011b).

Between December 15th and 19th the Cohen Commission focused the questioning on the ISAV research carried out by governmental and independent labs and throughout the transcripts there are allegations and proof of a lack of collaboration between Miller, other labs, and the farm fisheries and the provincial labs of the Ministry of Fisheries and Oceans. Dr Miller, as already mentioned, was forbidden to comment on her research, to communicate with the media, to participate into think tanks, to communicate directly with the Ministry, to access to farmed Atlantic salmon and to test them for ISA. She was left alone in the department, she feared loosing funding for her lab and she was ignored by her colleagues and superiors.

In 2015, after Steven Harper's government fell and Justin Trudeau became prime minister, Miller released a first interview with CBC and looking back at the ISA controversy she said: "We [are now] free to speak to the press without contacting media relations", and "when we were banned [...] I really felt like a second-class citizen." ('I felt like a second-class citizen,' says scientist muzzled over salmon study," n.d.).

Dr. Kibenge's lab was recognized by the OIE as a reference lab for the ISA virus. After his positive results on the samples were received from Morton and Routledge, he lost his status. The organization published on their website a press release explaining their reasons.

"After different Member Countries pointed out questionable diagnostic results emanating from an OIE Reference Laboratory for Infectious Salmon Anaemia located at Atlantic Veterinary College (AVC) in Canada, the OIE decided to conduct an audit of the Reference Laboratory with independent OIE experts from 31 July to 2 August 2012.

Conclusions of the audit were unfavourable and showed that a series of weaknesses in the system have a direct impact on the quality of diagnoses conducted by the OIE Reference Laboratory at AVC" (World Organisation for Animal Health, n.d.).

While Miller was muzzled and suffered mobbing and alienation from the DFO, in addition to vague fears of loosing funding, Kibenge had a tangible consequence for sharing his positive results. The OIE does not provide a specific explanation in this press release or specify who are the "different Members", nevertheless these measures against a specific scientist in a highly controversial issue, could be a threatening message for others who might obtain the same lab results.

It is interesting to note, in fact, that Kibenge had already analyzed, back in 2007, other samples for ISAV and obtained negative results. On that occasion, he was not questioned and he was not audited. As he states during the audit of December 16th:

[...]“I remember in 2007 I got a sample from B.C. and I reported it negative. Negative findings are very easy to deal with because those are the default. Once you report a negative, there's no question, people move on. It's the positive findings that are difficult to accept and in this sense, the sort of question that goes forward is very difficult, particularly when you feel that your science is above question as was in this case.”

Kibenge reports having been heavily attacked after the positive results. He appreciates the support of his University, but also admits that he thinks the attacks depend exclusively on the positive nature of his results (Cohen Commission, 2011c)

Kibenge and Miller were not the only scientists who faced consequences for their research. Alexandra Morton is one of the key people in the whole controversy. She is a biologist and an activist and, differently from Miller and Kibenge who are both impartial scientists working in an objective way, she is strongly against farmed fish and farm fisheries in British Columbia.

An interesting article on the CBC features a federal scientist publishing a protest song against Stephen Harper on YouTube (“Harperman case,” 2015). The scientist was sent home on leave with pay pending and a government investigation was started to determine whether the scientist had violated the code of ethics that all public servant must adhere to “be impartial and non- partisan”. On the other hand, public servants are allowed to engage in political activity. How is a scientist supposed to find the balance?

In the case of Alexandra Morton, her positionality and her activism make her a second-class scientist, not reliable, too much partisan. The attacks on her work are not based on her results or scientific methodology, but on her credentials and personality.

Salmonfarmscience.com is a blog owned by an employee for farm fisheries communication. The aim of the blog is to provide the public with the “science behind salmon farming”. On the blog there are often direct attacks to Morton’s work defining her engagement on the issue as “speculations, conspiracy theories and questionable science” (salmonfarmscience.com, 2012). Elsewhere she is directly addressed on her credentials.

On the blog protestingtheprotesters.com, June Sharkley, blogger, points out that Morton holds just a B.Sc and a Honorary degree from SFU, thus, the title of Doctor to refer to her is substantially wrong (Sharkley, 2012). She invites media and sympathizers to “Call [...] an activist nothing more than an activist”.

When Morton first started to draw attention on salmon farm aquaculture the journalist Stephen Hume reported having received a significant number of emails complaining about her lack of an advanced science degree as if a reliable researcher is made by her degrees. Hume notices that Morton does not have a graduate studies degree but she has published “17 peer- reviewed research papers in North America Journal of Fisheries Management, Science, the ICES Journal of Marine Science and the Canadian Journal of Fisheries and Aquatic Science” but most importantly, he underlines that science is a method not a degree (Stephen, 2015). Whether one might identify or not with Hume’s statement is arguable it is significant to note that her credibility is under attack more often than her work.

Recently, Morton, Dr. Molly Kibenge et al. published a new paper on the Journal of Virology on positive ISAV tests in BC (Kibenge et al., 2016). The media coverage seemed to go back to 2011 with titles calling for a possible deadly virus present in BC salmon (“Evidence of a deadly salmon virus found in B.C. waters, says study,” 2016).

This is the first study published that states the presence of the virus in British Columbia. The other studies previously mentioned have never been published, except from the 2011 paper by Dr. Miller which does not clearly connect her genomic findings with the presence of the virus in both farmed and wild fishes in BC. Kibenge and her colleagues used wild samples and farmed ones collected from supermarkets given the unavailability of farm fisheries to provide the scientists with their samples. The result was the same as in 2011: BCSFA and CFIA, industry and government, do not accept the results and state that ISA is not present in BC as a disease or as a virus.

In particular, BCSFA released a response to the study, signed by Dr. Gary Marty in which the veterinary argues that:

ISA has never been detected in fish on the West Coast of North America.
This has been confirmed through thousands of tests by CFIA, as well as

thousands of tests by authorities in Washington State, Oregon, and Alaska. Farm-raised salmon in B.C. are healthy and have never shown signs of sickness from ISA. This report claims to find an ISA sequence, but the researchers admit they were unable to verify it using necessary, globally standard follow-up tests. Their study also confirms they found no evidence of the ISA disease in B.C. fish (BC Salmon Farmers Association, 2016).

In the response Marty calls into question again the methods and the lack of the repeatability of the experiment, reassuring the public that neither BC farmed nor wild salmon have ISA virus in British Columbia.

From 2011 to the current date, there are no studies that prove that the ISA virus is not present in BC. The study by Dr. Gagne does not give negative but inconclusive results given the damaged quality of the tissues she analyzed. All the efforts put together by British Columbia Salmon Farmers Association and by Fisheries and Oceans Canada are intended to undermine the reliability of the studies which show instead the presence of the virus.

Other studies published or funded by the DFO or BCSFA focus on other possible causes for the decline of Pacific salmon in the province. A study by DFO presents as the most likely reasons for the decline including a combination of climate change, overfishing, and freshwater habitat destruction (Noakes, Beamish, & Kent, 2000). Their research purposes seem to draw the attention to other issues than those claimed by their opponents. Dr. Noakes, author of the paper, is also the chair of the Scientific Advisory Council for British Columbia Salmon Farmers Association.

3.2.3. Attacking the science

As stated at the beginning of this issue, there are numerous ways to manipulate science. Under-reporting negative results (Dickersin & Chalmers, 2011) is an example of manipulating science by enhancing positive results and hiding, ignoring and interrupting the research of negative ones with a high social, economic and scientific cost. As an example, many of the DFO scientists have reported some positive cases during their research. Nellie Gagne herself reported to the Cohen Commission to have found a positive sample for the ISA on wild sockeye but ignored the result because of the probability it was an error.

She was questioned on December 16th on a statement by the Ministry of Oceans and Fisheries on the “allegations” of the presence of ISA in BC waters. Minister McRae noted, in the statement, that “reckless allegations based on incomplete science” can severely harm all the communities of the coast that rely on farmed or wild salmon (Fisheries and Oceans Canada, 2011). This statement completely ignores the positive tests, even those internal to DFO, and considers solely the results obtained by the provincial labs.

Gagne was questioned about the legitimacy of the statement as a trustful and complete source of information for the public. Gagne admitted that the statement might be misleading, considering that her own findings were not negative but inconclusive, but she also argues that the statement might have been simplified in order to make it understandable for the general public:

MS. GAGNE: “Unfortunately, there is the scientific community that understand things. Probably it's easy for the public, and I can understand based on all of what was said here, it's easy to get confused in all this” (Cohen Commission, 2011c).

The public statement made available from the ministry, informs the citizens that it is certain and undeniable that there is not the ISA, virus or disease, in BC waters without reporting the positive results of its own labs and describing as “reckless allegations” the finding of other independent labs. Federal scientists then, consider the statement fair in order to not confuse the general public, which is implicitly considered unable to understand scientific issues.

In an internal letter to the DFO members, Joseph Beres claims: “Hey Concentrate on the headlines. That’s often all people read or remember” (Roscovich, 2013). And again, in another communication: “It’s clear that we are turning the PR tide to our favour and this is because of the very successful performance of you spokes at the technical briefing yesterday. You, Steven, Peter and Paul were a terrific team indeed! Congratulations! One battle is won. Now we have nail the surveillance piece and we will win the war also” (Roscovich, 2013).

These two communications state that

- It is not strictly necessary to inform people. The important point is to manipulate their opinion by using media as propaganda and not a tool for a healthy democracy
- The controversy over farm fisheries is a war, presumably not between angry scientists, but a politic war in which one side, or the other, wins through PR and strategic communication. This was quite profusely described by UCS (*Heads they win, tails we loose. How Corporations Corrupt Science at the Public's Expense*, 2012) as a winning practice used by tobacco industries to win the public opinion and avoid policy restrictions. But, also, it is a very basic idea of marketing, branding and communication, which we might agree, are not matter of scientific discussion.

A different way to undermine the independence of science, is putting science in an unstable position, making scientists work in an unsafe environment in which they might loose their position, their jobs, their funding (Kuehn, 2005). When the funding depends heavily on industry (Kleinman & Vallas, 2001) and industry and politics are strongly interconnected, scientists do not feel free to work: there are implicit or explicit rules, results one can share or not, research one can pursue or has to stop. Dr. Miller reported to have being mobbed and completely ignored by her own department after her findings, and to have feared losing funding for her laboratory (Cohen Commission, 2011b).

Other scientists share the industry's or government's point of view, and they publish other research that proposes alternatives. While this might be healthy for a fair scientific debate it is interesting to notice the affiliations. When DFO published Dr. Noates research as a different perspective on the wild salmon species decline, they failed to mention the affiliation of Dr. Noates with the BCSFA. Collaboration between labs and industry are welcomed, but failing to be transparent is failing to provide citizens with the correct information to empower them.

The BCSFA and Fisheries and Oceans Canada missed the opportunity to resolve a scientific controversy, if this is one, with science instead of politics. On both sides there have been attempts to condemn the scientific methodology, results and credibility of the scientists who had positive tests to ISA. The tobacco industry spread doubt and misinformation as a technique to confuse the public and to avoid reaching a conclusion (*Heads they win, tails we loose. How Corporations Corrupt Science at the Public's Expense*, 2012). Focusing on different causes for the decline, avoiding further scientific research to prove their point, or sharing incomplete and fallacious science as something

sure might recall the same practices used already by the oil, tobacco, and asbestos industries.

3.2.4. Where are the First Nations?

During the Cohen Commission's hearing, September 8th, Ms. Gaertner was invited to represent the First Nation's perspective on the ongoing controversy over the presence of farm fisheries in or close to First Nations' lands. She started her intervention as follows:

"As you just heard, I've been given 15 minutes on this perspectives panel. At the beginning of this topic of this small part of the large complex hearing, I raised with you concerns about Policy and Practice Report and how First Nations and First Nations Fisheries Council's efforts on aquaculture were not included in the Policy and Report. And I did my best last week to get to you some of the basic historical facts and I played catch-up most of the week in terms of time and topic. And then secondly, I raised in a letter to Brock Martland after receiving the Policy and Practice Report and obtaining an indication of the topics, that there would be very tight time allocations and there would be unlikely -- there likely be insufficient time for the First Nations Coalition to do their work. And the third issue, which is the issue that was so pressing for my client at the end of the day yesterday in the hearing was that here we have a perspectives panel on management, risks and finfish aquaculture and there is not a First Nations representative here to speak from their perspective. It was offensive and I want to let you know 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. 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. I'm not here for any other dialogue except with you, Mr. Commissioner, on this matter and rest assured on that. 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, it is difficult. It is extremely difficult to operate under this situation and so we needed to 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 of this table and they need to be. And they need to be heard and you need to hear it from them directly. I'm here. I'm doing my best as their legal counsel, but I will not be through this panel educating you on the perspective of First Nations. I am going to ask questions only of industry in these questions. Those are my instructions. I'm hoping that we can have some dialogue here on that. And I'll proceed as best I can. And then I was asked to tell this story because it's a story that's inspired my work for a very long time and it's a story from an elder in the Stl'at'imx territory and she said unless we stop fighting about these

matters and start listening to the fish, this salmon will never return. And we must make our efforts in that way and so I am going to make my efforts in that way today. I am not encouraging a fight with any of you. I am not intending to insult any of you. I regret that this is the first time that I'll have an opportunity to speak to you directly, Mr. Backman. I hope there will be other opportunities and we'll do our best in these 15 minutes" (Cohen Commission, 2011d)

Ms. Gaertener's questioning, for 15 minutes, was focused on the past relations between industry and First Nations and on future promises and possibilities. In particular, she refers to a paper called "Questions and Answers on Salmon Aquaculture in British Columbia" prepared by Dr. Tom Watson for BCSFA. The paper was meant to assist people not involved in the industry to better understand salmon farming in B.C, but, in fact, all the reports and papers prepared by the First Nations Fisheries Council were completely ignored. Just one quote was reported, but in fact, the First Nations Fisheries Council expects to be deeply and substantively consulted on the impact of the farms.

First Nations have been appointed for years as one of the main causes of the decline of the wild Sockeye. In 1992 Peter Pearse and Peter Larkin published *Managing Salmon in the Fraser*, and in 1995 The Fraser River Sockeye Public Review board, published *Fraser River Sockeye 1994: Problems & Discrepancies*. Both the books considered First Nations river fisheries the leading cause for the low spawning numbers of the previous years. In 2005 the question was brought again to the attention of the public with Loyola Hearn, Conservative Fisheries critic, speaking against the lack of measures taken by the government after the two reports were published. This was happening during the liberal government in Canada (Clarkson, 2016).

In 2006, the Calgary Herald published a series of opinion papers against the Federal Aboriginal Fisheries Strategy. The newly elected Prime Minister replied with an open letter to the same journal stating that "In the coming months, we will strike a judicial inquiry into the collapse of the Fraser River salmon fishery and oppose racially divided fisheries programs" ("Harper vows to end 'racially divided fisheries,'" 2006).

The Federal Aboriginal Fisheries Strategies was introduced by the federal government in 1992 in response to the Supreme Court of Canada's decision that First Nations' right to fish was a priority. Harper and the opponents of the program defined it as

racially divided. They claimed that all Canadians should have equal access to fishery and that Aboriginal people should not have the priority to fish for sale (“Aboriginal Fisheries in British Columbia,” n.d.). Harper’s claim, together with non- Indigenous fishers support, is against First Nations rights.

It should be noted, firstly, that before the arrival of European colonizers, Aboriginal peoples of BC had already built a well- developed economy based on salmon. Salmon was fished based on, what today we would call, careful resource management techniques. Europeans imposed their technologies and wage- based labour on the communities changing their traditional practices. Jasanoff’s critic of this idea of development and of technology leapfrogging over other cultures (S. Jasanoff, 2002) is a helpful tool to see things in a different perspective that allows to question the idea of supposed betterment for indigenous population linked with western technologies and economic systems. Nevertheless, the Aboriginal communities saw a possibility in the newly introduced technologies and fishing techniques. Their position in the new fisheries was not independent though, they were considered helpers, and never sellers of their resources, and indigenous fishers were dependent on the canneries (“Aboriginal Fisheries in British Columbia,” n.d.). This fact was significant when fishing regulations were introduced in 1888 for indigenous societies: they could only fish for food, not for commercial purposes. The fishing regulations changed as the non- indigenous interest on fishing changed arriving to oblige Aboriginals to request permission to fish for food. The Department of Fisheries of Canada never even recognized the reserves’ exclusive fisheries.

Almost one hundred years later, in 1984, the Sparrow case occurred. Ron Sparrow was arrested for fishing on the Fraser River with nets longer than those permitted by food fishing licenses but he did not accept the sentence, he claimed Aboriginal Rights and his case was moved to the Supreme Court in 1990.

The Department of Fisheries endorsed the policies because of their conservationist purposes and stated that the Fisheries Act extinguished the aboriginal rights, but the Court decided that conservation could not be an excuse to conserve the fish for other uses. The Aboriginals won, so dramatically recently, the right to have priority to fish for food (“Aboriginal Fisheries in British Columbia,” n.d.).

The fisheries act, since the first Europeans came to the First Nations' territories, was meant to facilitate the appropriation of their salmon resources. This is, in brief, the story that Harper's letter ignored in 2006.

Since the establishment of the aquaculture industry, the First Nations Fisheries Council released several reports and showed concern about their lack of intervention in the resource management in their territories. In particular, Aboriginal groups claim their will to actively participate in the decision making instead of just being informed. The DFO sees First Nations' engagement as simply exchanging information instead (Clarkson, 2016).

Aboriginal peoples participated in the Cohen Commission far more actively than in the almost 30 other inquiries on salmon in British Columbia but their active participation in the management of the resources is still lacking (Clarkson, 2016). In other cases, one can argue that the problem is always the one of sharing resources: economic interests seem incompatible and different groups clash with one each other. The basic difference when talking about First Nations of BC is that they are having taken away their innate rights for the soil they have owned for millennia. This is a perpetuation of colonial practices and oppression. Nevertheless, this is the case study of a scientific controversy and here I would like to explore the racism of science, not economics.

The Cohen Commission went on for almost one year from October 2011 to September 2012 but 3 more days were added in December 2012 to specifically discuss ISAV. In those three days the participation of First Nations was not significant because the scientific issues are to be dealt with among scientists. As well as the undisputed idea of development and economic growth, science is still a Eurocentric monopoly that ignores the knowledge production of First Nations. The paradigm that sees Eurocentric thought progressing but the First Nations knowledge as frozen in time and in need of civilization, is still commonly shared by some Canadians. Indigenous traditions and knowledge were protected, recently, by laws that define them as art not science, because of the oral transmission through ceremonies. Internationally there are movements that are starting to recognize the indigenous knowledge as a fundamental tool in the protection of biodiversity and resource management, but Canada runs behind still struggling to integrate traditional knowledge in the education of and in the dialogue with traditional science (Battiste, 2013).

In the Canadian society, Aboriginal people are still “othered” by settlers as a mean to justify the colonialist politics that oppress indigenous people through stereotypes, violence, and media representation (de Leeuw, Kobayashi, & Cameron, 2011). Not all forms of oppression are violent, but all of them are harmful for the targeted group. This form of racism, not intentional or violent, is defined as “new racism” and it does not suggest that “minorities are biologically inferior, but different” (Cottle, 2000).

Disempowering First Nations is key for the appropriations of their lands and resources. Education and the legal system are the instruments taking away the power by perpetuating Eurocentric ideologies and daily practices, and the media system is the way to implement the disempowerment in the society and normalize the oppression by shaping community practices.

BC First Nations are portrait as “noble ecologists, unwelcome warriors or political victims” (Canada’s Centre for Digital and Media Literacy, n.d.) and the description perfectly describes their participation in the Cohen Commission too and their engagement with salmon health and the ISA virus presence in BC. First Nations are depicted through stereotypes, simplifications, historically inaccurate information or romanticization (Canada’s Centre for Digital and Media Literacy, n.d.). Their traditional way to share their knowledge is considered scientifically inaccurate and not valorized for resource management and policies. They are also required to share their perspectives according to western standards to be considered, but despite their emphatic resource management efforts continue to make decisions without integrating their contribution. Their knowledge is appropriated and transformed into an object for science instead of a form of intelligence that could inform science (Clarkson, 2016).

As stated in the beginning of this paper, capitalistic societies, represented by industry and those who protect their interests, have different values than those shared by First Nations people, and that is not meant in a romantic or unrealistic way. First nations have for sure their own economic interest they have to pursue, and it would be extremely hypocrite to condemn them when they display our same behaviours. Nevertheless, for thousands of years their values, traditions and economic practices were centered on a healthy management of natural resources. Accepting their knowledge and a more holistic

approach to natural resource management, might be the solutions we are all looking for for the worldwide ecologic crisis we are facing (Hendry, 2014).

Chapter 4.

Conclusions

After 133 days and \$26 million dollars the Cohen Commission ended in 2012 and Judge Cohen released 75 recommendations to protect the future of the British Columbia's sockeye. The end of this story, though, is not an end or, a definitive result. Environmental changes, aquaculture, predators, water temperatures, and other factors were mentioned as responsible for the unhealthy status of the fish but the ISA was not mentioned.

I chose ISA in particular, because among all the issues, this was strictly scientific and still without a solution. The implications of such a small problem can be enormous for the economy of British Columbia because an internationally reportable disease, such as ISA, can be a serious issue for exporting the farmed salmon by Canada. It is surprising that science is not able to establish if there is or there is not a virus, and by reading the Cohen Commission transcripts it seems clear to me that science can tell, but politics and industry cannot. Science appears for what it is: a methodology without solutions for our modern worlds. It appears as a tool that one can use as necessary to prove something and get away with it, because it is scientifically proven.

"The rejection of facts, the rejection of reason and science that is the path to decline," said Obama in a recent public speech (Fieldstadt, 2016) and it is fundamental to protect science against corporate or governmental power, to allow a fair independence for scientists and to support academic research. It is, also, time to change the European idea of valid knowledge and the use we make of it.

This research allowed me to prove that the ISA virus, actually fragments of the virus, mobilized scientists, powerful industries, government, politicians, media and the public. Each of the parts had, and still have, a different kind of interest in the issue and different means to pursue their objectives. In particular, government and industry have large access to media and funds with which to manipulate, or even threaten, the other parts. It is interesting, for sure, that the discussion on ISA sank into oblivion. Nobody took measures, no decision was made. Actually, not making a decision was a step that will protect aquaculture, allow farmed fish, and the exporting of fish without mentioning the

possible presence of the disease. Ignoring the virus will help the salmon aquaculture and damage the work and professional position of the counter- parts, scientists, traditional fisheries and First Nations.

Ignoring the positive results of Miller, Kibenge and others means to use the precautionary principle, but in the wrong way. The precautionary principle states that in presence of scientific controversy one should make decisions based on the possible harm. In this case the decisions are made considering the possible harm to the industry and not to the fish, to the public, or to the environment.

This paper might seem a call to action against the politicization of science, but it is really not. Science is political by its own nature considering that it is a method which was chosen among others in history; more or less like the idea of State sovereignty, borders and other European institutions which are considered as the only way or possibility we have. European settlers imposed these institutions on the societies they met in their expansion.

State power and science have been pursuing, at least since the age of Enlightenment, an idea of progress and development based on increased productivity but this concept rarely summarizes the objectives of First Nations peoples in terms of management of natural resources. Scientists prefer to pursue research and projects they can charge fees for or through which they can obtain funds, rather than do research on less remunerative issues (Wilkes, 2012). Alexandra Morton was often accused of pursuing her own interests too. Many allude to her relations with some Alaskan Fisheries, which are in a deep crisis caused by aquaculture (Krause, 2010). If this was a story it would be without heroes. This is the story of broken power relations that will not allow a functioning and convincing idea of development.

The Cohen Commission transcripts, and the hundreds of journal articles written on the Commission and on the ISA virus, underline how empty the dialog was. Every side used their best tools to convince the others of their own point of view and it would be highly hypocritical to accuse Morton of accepting funds from Alaskan Fisheries, because as a scientist, she needs to fund her research too. But all those efforts did not resolve the real issue: the public is still not sure if the virus is present in BC or not, they still do not know if

the fish would be safe to consume, they are still victims of propaganda that promotes aquaculture, and of the claims that tells them how unhealthy and unethical is the farmed fish is.

The way to overcome scientific controversies, like the ISAV, is through a pluralist approach to knowledge production. Scientific methods and lab research are not necessarily the only and right way to go. First Nations have managed healthy salmon returns for thousands of years and their knowledge, if considered scientifically valid and as significant as the western academia's work, could be the key tool to look at the future. In order to reach a more collaborative knowledge production and approach to scientific controversies British Columbia needs to work on the education system, on the judiciary system and on the media to stop pursuing colonialist's approaches to knowledge production. The status of art of indigenous peoples' knowledge might sound romantic but it is just another form of dismissing their power and their influence in policy- making and resource management.

The scientific community itself has to evaluate their decisions and their evolution. Science is looking like a caste, closed on itself, protecting itself, hardly evolving to include different ways to make science. The scientific method contributed to protecting the western societies from bigotry, religious believes, and dangerous beliefs. It might be time for science, to admit that the scientific method being used today, is out-dated and obsolete. Maybe we should go back to basics, to the 'proto-scientific method' as stated by Aristotle, the father of science, the first to realize the importance of empirical measurement, believing that knowledge could only be gained, science could only be built, upon measurement and observation. He proposed the idea of induction as a tool for gaining knowledge, and understood that abstract thought and reasoning must be supported by real world findings. It is worth summarizing the key elements of Aristotle's method, just to underscore that they have not always been used in our case:

1. Study what others have written about the subject.
2. Look for the general consensus about the subject
3. Perform a systematic study of everything even partially related to the topic.

Finally, this thesis wants to be a red flag for the direction we are taking. The path to manipulation of science and information is a dangerous one: using scientific, or pseudo-scientific evidence to influence the public, promote ideology or worse, drive the economy,

might lead to a complete loss of credibility for science in general. People and institutions have trusted science for centuries as the most reliable way to take the right decision; when science becomes a tool to manufacture consent, it will also totally lose credibility. This is already a fact: in Canada polls show the distrust of people in some particular area of science and towards scientists. Governmental scientists are looked at with suspicion. Big companies are accused of influencing the public opinion according to their own interests using scientific information (“Canadians lack trust in some scientists, poll suggests,” 2012).

But when we are alarmed with imaginary dangers in respect of the public, till the cry grows quite stale and threadbare, how can it be expected we should know when to guard ourselves against real ones? (Aesop, 1859)

The major ongoing danger is that in the case of a real crisis, nobody will listen anymore to scientific evidence. This cannot be helpful for the public, the wellbeing of humans, animals, environment and democracy.

In the scientific issue over the ISA virus, Judge Cohen considered the experiments with positive results for ISA and the other facts of the controversy, not sufficient to reach a conclusion. A Judge being appointed to decide on scientific issues is a controversial choice *di per sé*, however the major identified problem concerning some of the experiments (ex. Morton) was that they were hardly repeatable and repeatability is key for the whole scientific method, as we know, since Galileo. The stories that aboriginals pass on from generation to generation are the synthesis of repeated observations over thousands of years. As such, it is undeniably incorrect, to not consider this kind of knowledge scientifically valid. They accumulated information, built a big data set, performed a careful analysis, and improved it through time. The data are collected observing facts, not interpreting them according to a predominant historical method, and time proves their hypothesis.

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