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**Salmon “Framing” in New Zealand: How differing “frames  
of reference” of chinook/quinnat salmon (*Oncorhynchus  
tschawytscha*) influence current management  
approaches**

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A thesis submitted in partial fulfilment  
of the requirement for the Degree of  
Masters of Resource Studies

at  
Lincoln University

by

C. J. Carle

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Lincoln University

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Abstract of a thesis submitted in partial fulfilment of the requirements for the  
Degree of M. R. S.

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C. J. Carle

Chinook/quinnat salmon (*Oncorhynchus tshawytscha*) is unique to New Zealand insofar as it is an introduced species that receives special provisions for conservation and enhancement under the Conservation Act 1987 and habitat protection under the Resource Management Act 1991. In the past, however, the species has held differing statuses. Over 100 years ago, salmon were imported and released into New Zealand rivers to establish a commercial wild fishery, but since then their status has generally shifted between commercial product and recreational resource due to environmental limitations and pressures from various interest groups. More recently, ‘wild’ salmon have been promoted for their significant conservation role for conserving rivers and water. This has added further complexity to assessing their perceived status in wildlife management in New Zealand.

In order to better understand how salmon have arrived at such a unique position in the context of wildlife management in New Zealand, a review of the social, cultural, political, and economic pressures to management are necessary. As the management of this species has become a very topical issue, it is becoming increasingly important to better understand the social dimensions involved in the management of salmon. Thus, it is appropriate to draw on a theoretical position offered by the social sciences.

The momentum in social constructivist work provides a fitting starting point. Increasingly, social constructivists are constructing views of wildlife species and their management to develop understandings and make transparent the influences and interactions between society and wildlife management. This thesis roots itself in social construction theory and attempts to adopt an interdisciplinary approach towards constructing salmon from a “moderate constructivist” position.

By assessing the historical and current literature as well as deploying quantitative surveys in respect to the New Zealand Salmon Anglers Association and qualitative interviews with targeted stakeholder groups, this thesis illustrates the historical and current constructions of salmon in New Zealand. The thesis provides an in-depth understanding of how salmon are currently framed, lending insight to the most recent management movement; Fish & Game New Zealand's proposed salmon management plan. The thesis then makes recommendations and offers an interpretation on the proposed salmon management plan from a moderate constructivist position, suggests areas for further research, and discusses what lies ahead for salmon management in New Zealand. The thesis concludes with a brief commentary on how this thesis may contribute towards social construction theory.

## **Keywords**

Social construction theory, pluralism, post-positivism, moderate constructivism, frames of reference analysis, discourse analysis, understanding, nature, society, management.



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## List of Acronyms

BOD	Biological Oxygen Demand
CBA	Cost Benefit Analysis
CCC	Christchurch City Council
CHRS	Canadian Heritage River System
CRI	Crown Research Institute
CV	Contingent Valuation
DCSA	Dairying and Clean Streams Accord
DDC	Dirty Dairying Campaign
DoC	Department of Conservation
ECan	Environment Canterbury
EIA	Environmental Impact Assessment
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
F&B	Forest and Bird
FGNZ	Fish and Game New Zealand
FoR	Frames of Reference
HBAS	Hawke's Bay Acclimatisation Society
HEC	Human Ethics Committee
MAF	Ministry of Agriculture and Fisheries
MfE	Ministry for Environment
MFish	Ministry of Fisheries
MIA	Ministry of Internal Affairs
NCFG	North Canterbury Fish and Game
NIWA	National Institute of Water and Atmospheric Research
NRRP	Natural Resources Regional Plan
NWCO	National Water Conservation Order
NWSRS	National Wild and Scenic River System
NZD	New Zealand Dollar
NZPFGA	New Zealand Professional Fishing Guides Association
NZFWIM	New Zealand Fish and Wildlife Investigation Movement
NZKS	New Zealand King Salmon
NZMD	New Zealand Marine Department
NZSAA	New Zealand Salmon Anglers Association
NZSFA	New Zealand Salmon Farmers Association
PFG	Professional Fishing Guide
QMS	Quota Management System
RMA	Resource Management Act
SCA	Salmon Conservation Area
SCN	Social Construction of Nature
SCT	Social Construction Theory
SDC	Selwyn District Council
SI	Symbolic Interactionism
SIA	Social Impact Assessment
SISC	South Island Salmon Committee
SMP	Salmon Management Plan
SPSS	Statistical Package for the Social Sciences
SRC	Save the Rivers Campaign
SSA	Salmon at Sea Agreement
TAC	Total Allowable Catch
TACC	Total Allowable Commercial Catch
TVNZ	Television New Zealand
WCO	Water Conservation Order
WFG	Wellington Fish and Game
WSRA	Wild and Scenic Rivers Act

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## Chapter 1: Introduction

In view of the fact that the original object of the Government in acclimatising quinnat salmon was for commercial purposes, it is clear that the anglers, who have been enjoying quite gratuitous benefits from the fishing, have no legitimate grounds for complaint (NZMD 1931: 11).

One of the early aims of the acclimatisation societies was to ship fishes and game birds to New Zealand, and get populations established here for pursuit and pleasure of anglers and shooters (McDowall 1994: 96).

... Tensions are likely to remain about the appropriate management of salmonid and indigenous fish species... but for the foreseeable future at least, freshwater environments will continue to be managed to provide for sports fisheries... (Deans et al. 2004 cited in Harding 2004: 41.13).

Without doubt few issues preoccupied the acclimatisation societies of the South Island more than quinnat salmon, especially during and following the 1960s. There were prolonged arguments about the management of recreational fishing for salmon; debates about development of commercial salmon farming; and concerns about the impacts of commercial fishermen trawling for salmon at sea (McDowall 1994: 260).

The above quotes demonstrate that salmon in New Zealand have had a chequered past. Between 1901 and 1906<sup>1</sup> chinook/quinnat<sup>2</sup> salmon *Oncorhynchus tshawytscha*<sup>3</sup> were successfully established in the Waitaki River, South Island, New Zealand (McDowall 1994). These early introductions of chinook/quinnat were encouraged by Lake Ayson [who was the first salmon farmer at the Hakataramea River], partly instigated by the acclimatisation societies, funded by the Government, and greatly appreciated by the anglers (McDowall 1994). Provincial Governments provided substantial financial assistance to acclimatisation societies, meeting costs and providing rearing facilities in the expectation of establishing a commercially viable salmon fishery (Lamb 1964; McDowall 1994).

While central Government expectations for wild chinook/quinnat salmon were built around commercial opportunities, the wild salmon fishery never fully fulfilled these expectations. Historically the wild salmon fishery appears to have fulfilled a mainly recreational resource role. Today, Fish & Game New Zealand [FGNZ] manage the wild fishery for their stakeholders; the anglers. Despite the above observations, close scrutiny shows that the status of chinook/quinnat

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<sup>1</sup> The exact date of their successful establishment is not well documented (McDowall 1994: 262).

<sup>2</sup> The names 'chinook' and 'quinnat' salmon refer to the same fish; *Oncorhynchus tshawytscha*, and are therefore used interchangeably.

<sup>3</sup> I have chosen this spelling because of greater phonetic fidelity to the original first peoples' dialect. A common variant spelling is "tshawytscha".


salmon has generally shifted back and forth between commercial to recreational resource since their introduction [covered in Chapter 5]. Consequently, this has led to some contested social constructions over their management in New Zealand. These constructions are subject to three important variables i) language and discourse, ii) time and culture, and iii) knowledge and activity [covered in Chapter 2]. This suggests that salmon are constructed according to what people think and say about salmon, the context of the salmon fishery and those involved at the time, and how people think salmon should be managed. Generally speaking, these social constructs of salmon can be categorised into frames of references [FoR] and underpin the interdisciplinary approach employed to explore the research goal in this thesis.

### **1.1 An Interdisciplinary Approach Toward Better Understanding Chinook/Quinnat Salmon in New Zealand.**

There have been numerous ecological studies, economic feasibility investigations, and management related fieldwork conducted on chinook/quinnat salmon in New Zealand with over 60 papers published in scientific literature (Deans et al. 2004 cited in Harding 2004). In addition to this, Smith (1977), McDowall (1990), and Quinn (2005) have contributed significant bodies of literature to the field of biology for chinook/quinnat salmon in New Zealand. These three fields appear to have dominated the way salmon are, and have been, socially constructed in this country.

Historical literature associated with salmon such as the New Zealand acclimatisation movement are well documented by Donne (1924), Lamb (1964), Young (1986), and McDowall (1991; 1994), but this body of knowledge has yet to be integrated with fields such as ecology, economy, and management in order to better understand salmon, and salmon management in New Zealand. Likewise, with environmental case studies, chinook/quinnat salmon have only recently been recognised for their contributions to environmental conservation (Evenden 2004; Netboy 1958). Petrie (1994) and Scarce (2000) have applied social science methods to better understand how society views chinook/quinnat salmon in New Zealand and the United States respectively. Nevertheless, there appear to have been no attempts to integrate these disciplinary fields together in order to understand how salmon have been historically and currently framed in New Zealand from a range of standpoints. Social construction theory [SCT] has been selected for its ability to integrate knowledge from multiple disciplines and deploy tools such as discourse analysis and frames of reference analysis covered in Chapters 2 and 3.

Figure 1 illustrates the interdisciplinary approach for identifying the different standpoints towards salmon. The purpose of the interdisciplinary approach is to determine how these frames

have shaped the way salmon are managed. The research adopts a moderate constructivist position whereby salmon are viewed from multiple perspectives shown by  in Figure 1; evaluating information from fields such as ecology, economics, management, environment, social science, and history.

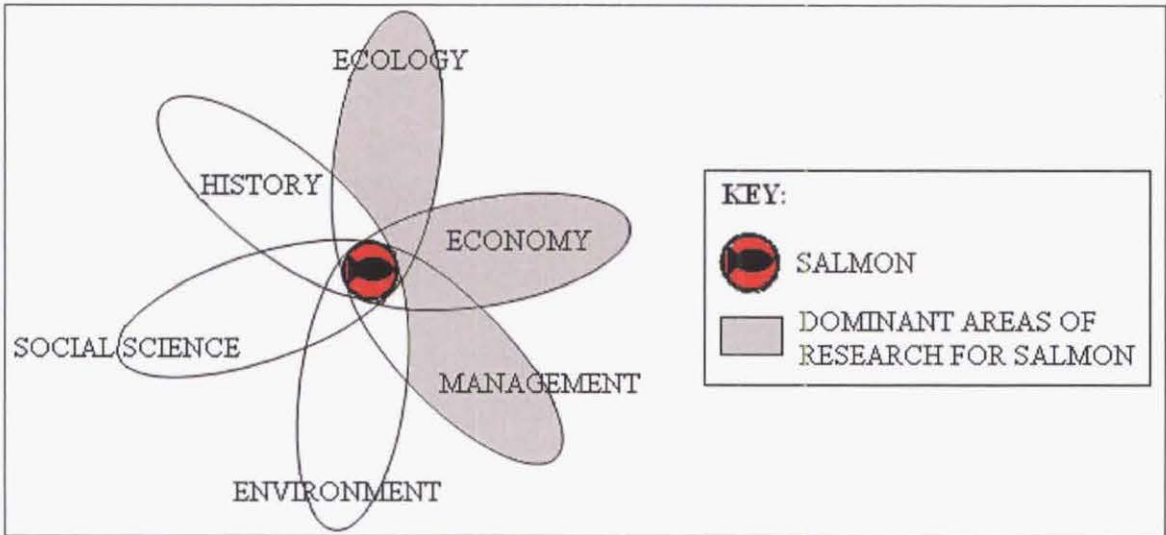


Figure 1: Interdisciplinary approach toward better understanding chinook/quinnat salmon in New Zealand

### 1.2 Research Goal and Hypothesis

It appears that salmon management has been driven strongly by social constructions of nature.<sup>4</sup> These drivers appear to have led to different consequences for salmon management than for other introduced game animals such as red deer (*Cervus elaphus*), Himalayan tahr (*Hemitragus jemlahicus jemlahicus*), or chamois (*Rupicapra rupicapra*) (Fraser 2001). Based on this view the thesis explores the influences of differing frames of reference on the current management approaches to chinook/quinnat salmon in New Zealand. In order to achieve such a research goal, a description of the research questions are presented, followed by the three research objectives. First, however, it is important to identify the research hypothesis: ‘if there is a positive correlation between both historical and current constructions of salmon that explains their apparent special management status in New Zealand’, and given that these constructions are likely to be changing now, then understanding them is important for future management.

<sup>4</sup> Discussed in Chapter 2

### **1.3 Research Questions**

#### **(1) How have chinook/quinnat been socially constructed in New Zealand since their liberation[s]?**

Because knowledge and information are situated both historically and culturally, it is relevant to draw on literature relevant to salmon in New Zealand. The body of literature will represent the way that salmon have been historically constructed throughout their history in New Zealand.

#### **(2) How have these constructions changed over time?**

Because constructions do not exist in a vacuum (Hacking 1999), there are likely to be newer, revised constructions of salmon that have not yet been fully explored. This provides opportunities to employ qualitative and quantitative techniques such as interviews and surveys to obtain current constructions (NRI 1998).

#### **(3) What implications have these construction changes had for salmon management and the stakeholders involved in the fishery?**

Because social constructions of salmon change depending on time, place, and culture, it is reasonable to expect that these changes influenced salmon management. In fact, McDowall (1994) noted that the most significant changes for salmon management in New Zealand occurred post 1960s. These post 1960s changes were affected by stakeholder groups such as acclimatisation societies, the Government, the New Zealand Fish and Wildlife Investigation Movement [NZFWIM], New Zealand Salmon Anglers Association [NZSAA], Fish & Game New Zealand [FGNZ], New Zealand Salmon Farmers Association [NZSFA], and subsequently affected organisations such as the Department of Conservation [DoC], Environment Canterbury [ECan], Ministry of Agriculture and Fisheries [MAF], National Institute of Water and Atmospheric Research [NIWA], angling groups, and various other stakeholders involved in the fishery.

### **1.4 Other Research Questions**

In order to fully explore how chinook/quinnat salmon are constructed and their place in wildlife management, other questions emerged in the research.

#### **(1) Who or what shapes public perceptions of salmon in New Zealand?**

This question attempts to explain how different claims-makers<sup>5</sup> construct and shape an issue to a wider audience. Examples of claims-makers are authorities in science, politics, media, or

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<sup>5</sup> The term claims maker is covered in section 2.4.1

management. Recognising these claims-makers is important for better understanding where constructions originate.

## **(2) Do salmon receive special treatment compared to other introduced game species in New Zealand?**

Salmon<sup>6</sup> make a unique case study when constructing wildlife management because despite being an introduced species, they receive legislative provisions that conserve and protect their wellbeing in the Conservation Act 1987, and Resource Management Act 1991 [RMA]. No other introduced fishes [other than trout] and game animals receive this level of recognition in New Zealand.

## **(3) Do salmon receive special management compared to trout?**

Currently chinook/quinnat salmon appear to receive special treatment compared with trout<sup>7</sup> because of the “neediness” of the salmon fishery. In addition to the Conservation Act and RMA, examples of this are the Wild and Scenic Rivers Act 1981 [WSRA], which arose partly in response to the in-stream and out-of-stream values attributed to salmon in rivers like the Rakaia and more recently the Rangitata River. The WSRA led to the establishment of national water conservation orders [NWCO] now provided for under the RMA, which attempts to regulate and monitor water development. In 1991 the Salmon at Sea Agreement [SSA] designated a Salmon Conservation Area [SCA] adjacent to Banks Peninsula to restrict the marine by-catch from commercial trawlers. Currently FGNZ propose to introduce a salmon management plan [SMP] by 2008 in an attempt to enhance the quality of fishery through improved management.

## **1.5 Research Objectives**

The three research objectives are based around questions (1) and (3). These objectives are to:

- Review the literature on social construction theory;
- Develop an appropriate methodology that uses qualitative and quantitative methods to explore the social construction of salmon in New Zealand; and
- Improve the level of understanding of salmon in New Zealand through the interpretation of SCT findings.

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<sup>6</sup> Salmon were selected (instead of salmon and trout, or just trout) for the research for three reasons: i) because Fish & Game have proposed a salmon management plan (there is nothing like it for trout), ii) access to potential research candidates that are knowledgeable about salmon (given that Canterbury is at heart of salmon country), and iii) because the salmon fishery is currently a topical issue in New Zealand (2006 – 2007).

<sup>7</sup> Special regulations are made for trout in the North Island partly because of the economic value created by tourists.

In order to achieve these three objectives, the following aims and methods are proposed for the rest of the thesis (Table 1). Table 1 also provides the context to Chapters 1 – 8.

Chapter No.	Aim of Chapter	Description and Method for Chapter
Chapters 1 & 2	Develop an interdisciplinary approach to the study	<ul style="list-style-type: none"> <li>Review a wide body of literature from disciplines such as ecology, economics, management, environment, social science, and history</li> <li>Integrate theories and methodologies from the social sciences into the study</li> </ul>
Chapters 2 & 3	Develop a mixed methodology of qualitative and quantitative approaches to the study	<ul style="list-style-type: none"> <li>Literature review of SCT and its origins</li> <li>Evaluate what SCT is, where it has been applied, and why it has been useful</li> <li>Select and incorporate a mixed methodology [moderate constructivism]</li> </ul>
Chapter 4	Provide facts on salmon ecology and evolution	<ul style="list-style-type: none"> <li>Review scientific literature on biology, ecology, and aquaculture</li> </ul>
Chapters 5 & 6 & 7	Investigate how salmon have been framed and improve understanding of salmon management	<ul style="list-style-type: none"> <li>Review historical literature on salmon liberations, management, politics, economic drivers, and recreational interests in New Zealand between 1875 – 2007</li> <li>Review literature for historical frames</li> <li>Carryout legal institutions analysis</li> <li>Carry out qualitative interviews and discourse analysis to determine current frames</li> <li>Conduct a quantitative survey to quantify current frames</li> </ul>
Chapter 8	Contribute towards future management of salmon in New Zealand	<ul style="list-style-type: none"> <li>Determine possible future outcomes for salmon management based on Frames of References [FoRs]</li> <li>Recommend further research</li> <li>Make recommendations for management based on research findings</li> </ul>

**Table 1: Summary of Research Aims and Methods**

New Zealand is a unique case study because many of the sports fish and game are introduced species. Some of these introduced species have been, and still are treated differently in relation to legislative provisions, management objectives, economic incentives, and their perceived status held by society. For this reason chinook/quinnat salmon make the ideal candidate for the research because of the seemingly special status they receive from society, science, politics, economy, and environment. While the core focus of the research is to identify the current FoRs of chinook/quinnat salmon in New Zealand, attention is cast briefly upon other introduced species such as brown and rainbow trout (*Salmo trutta* and *Oncorhynchus mykiss* respectively), wapiti (*Cervus canadensis*), red deer (*Cervus elaphus*), chamois (*Rupicapra rupicapra*), and



Himalayan tahr (*Hemitragus jemlahicus*) in an attempt to illustrate how influential society has been in shaping wildlife management.

## **1.6 Structure of the Thesis**

The thesis structure is outlined as follows:

Chapter 2 consists of three parts aimed at: i) tracing the origins of social construction theory [SCT] and describing how it has evolved from several disciplines; ii) discussing what SCT is, where it has been applied, and why it is a useful tool for wildlife management; and iii) examining the social construction of nature [SCN] in an attempt to arrive at an appropriate methodology for the research.

Chapter 3 builds on social construction theory, discussed in Chapter 2, elaborating on the mixed methodology employed to make sense of the social constructions of chinook/quinnat salmon. This chapter describes the quantitative survey method used to obtain information from members of the NZSAA, and the qualitative interview method used to obtain rich information from selected stakeholders of the salmon fishery. The relevance of deploying discourse analysis and frames of reference analysis to search for findings are described here, followed by the researcher's FoR. Chapter 3 sets the scene for the deployment of a moderate constructivist standpoint throughout the remaining Chapters.

Chapter 4 covers the taxonomy and common names of chinook/quinnat salmon. It then explains the evolutionary origins of salmon and discusses their biological details and requirements. The Chapter moves onto discuss the growth in salmon aquaculture internationally and in New Zealand. This chapter is principally descriptive in content, but it provides a starting point for interpreting salmon acclimatisation and history from a constructivist perspective. Chapter 4 ends with a more philosophical focus on issues relating to Atlantic salmon farming in the Pacific Ocean, campaigns against trout farming in New Zealand, and the perceived indirect impacts of chinook salmon to native fish.

Chapter 5 is also descriptive in that it encompasses what chinook/quinnat salmon are, and when and why they were acclimatised in New Zealand. This chapter provides a description of what, how, and where acclimatisation societies were established, accompanied by an explanation of the perceptions shared by colonists at the time of acclimatisation. Chapter 5 provides a broad chronological commentary on the history of chinook/quinnat salmon in New Zealand between 1875 and 2007 from a constructivist perspective. The purpose of the chapter is to provide a

fuller understanding of the dates, places, activities, attitudes, and stakeholders of the salmon fishery.

Chapter 6 contributes further to the history of the acclimatisation movement [discussed in Chapter 5] by reviewing several legal institutions that have given shape to the way salmon, water, and rivers have been constructed and managed between 1867 and 2007. The Chapter employs an institutional analysis to provide a fuller understanding of the institutions that have affected the management of salmon, as well as the affect that institutions have had to stakeholders such as the acclimatisation societies, Government, NZSAA, and more recently FGNZ. Chapter 6 sets the scene for a review of the proposed salmon management plan [SMP], which upon reviewing the findings from the quantitative surveys and qualitative interviews [in Chapter 7], recommendations are made [in Chapter 8].

Chapter 7 incorporates information obtained from the quantitative surveys and qualitative interviews in an attempt to make sense of the findings and categorise the FoR. This chapter attempts to make connections by weaving together the findings from both methodologies and provide a fuller understanding of salmon and salmon management based on the way people frame them.

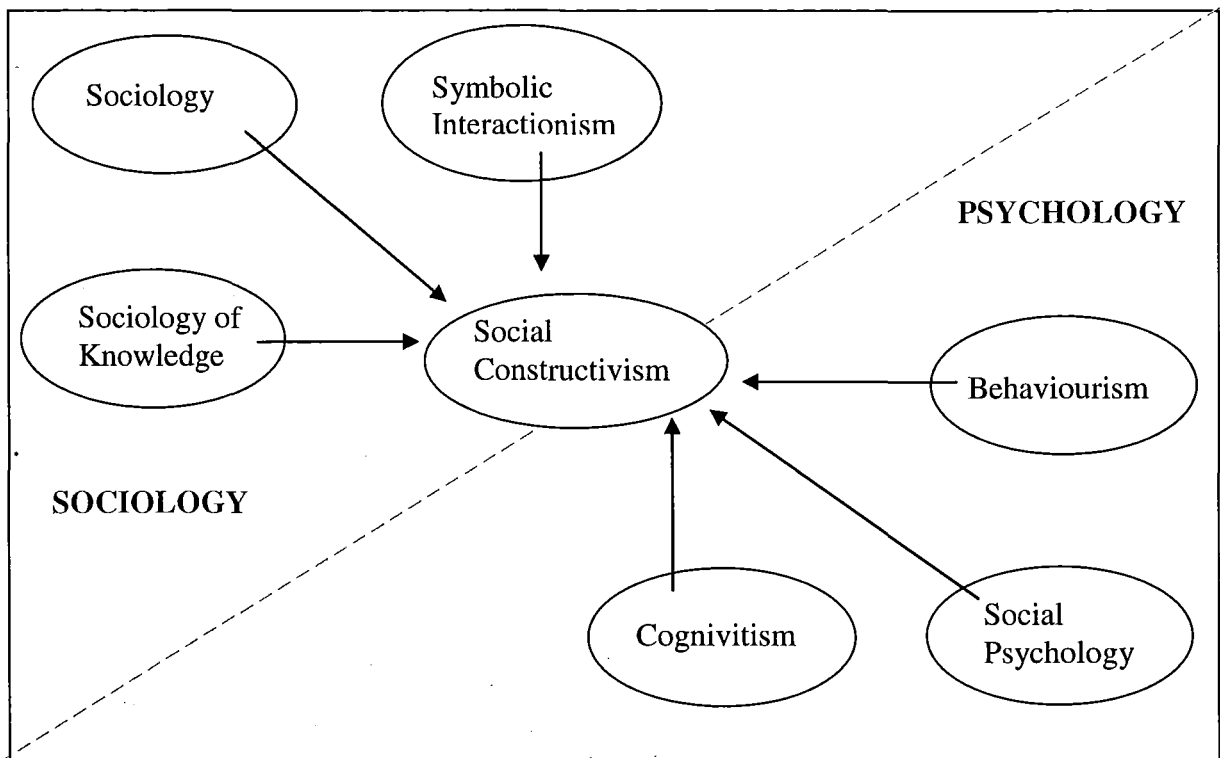
Chapter 8 integrates a summary of the methodology used to obtain the findings from all previous chapters with a summary of several key conclusions drawn from the research. From these conclusions, several recommendations for future management and research are made. In this chapter the objectives of the proposed SMP are revisited. The chapter then finishes with a discussion of how a constructivist position has been useful for wildlife management, outlining three reasons for its appropriateness.

## **Chapter 2: Social Construction Theory**

This chapter is set out in three parts. The first part attempts firstly to trace the origins of social construction theory (SCT), then comments on how SCT has evolved, and then illustrates the interdisciplinary contents of SCT. The second part constitutes what SCT is, where SCT has been applied, and why SCT seems to be a useful tool. Finally, the third part examines the social construction of nature [SCN], the varying degrees of constructivism, the implications for the researcher using SCN for studying salmon, and how to apply a SCN methodology.

### **Part 1. The Origin, Evolution and Interdisciplinary Context of SCT**

Part 1 attempts to provide a general overview of the theoretical movements in the direction of social constructivism. Mindful of the risk of oversimplification, it is nevertheless important to illustrate the different theoretical themes and influences that appear to have shaped social constructivism. To this end it is useful to sketch the different claims-makers involved in shaping several disciplinary fields, as these claims-makers appear to have shaped contemporary thinking. Figure 2 provides a summary of the influential disciplines that have contributed to social constructivism. The summary is demonstrated at the beginning [rather than the end] of the chapter to outline the disciplinary fields that will be discussed in Part 1.



**Figure 2: Summary of the influential disciplines that have contributed to Social Constructivism**

Social Construction Theory has emerged as part of a ‘post-positivist’, if not ‘post-modern’<sup>8</sup>, critique of knowledge systems. The first part of this chapter reviews both modernist and post-modernist thought in an attempt to trace constructivist movements since the 1700s, with the formation of psychology and sociology. Particular focus is therefore given to the theoretical fields of psychology and sociology.

## **2.1 The Critique: *Old Modernism* —————→ *New Postmodernism***

This section does not attempt to describe how modernism evolved, or why. It focuses on the transition from modernism to *post*-modernism. One of the fundamental critiques of modernism is that the *modern* theoretical fields are occasionally seen as individual, separatist means of understanding the world using science, and in need of revision. This critique of modernism forms the foundation for discussing the *post*-modern era, where philosophers began merging and moulding theoretical fields, creating a more comprehensive means of understanding the world.

“Although boasting knowledge free of value, modernist accounts of the world are found replete with androgynous, racist, elitist, materialist, colonialist, and individualist biases. Favoured by this conception of knowledge are forms of relationships that are hierarchical, instrumental, competitive, and manipulative. Literary and rhetorical theorists have

<sup>8</sup> Broadly speaking, post-positivism is a term used in reaction to positivism; post-positivism appears to adopt disciplines from the social sciences to better understand the world, while positivism assumes that scientific methods are useful for understanding the world and tends towards bold, singular claims about reality. Post-positivists are less given to making such claims.

effectively challenged the modernist presumption that knowledge claims can serve as accurate pictures or maps of the world” (Hermans 2002: 4).

Essentially, Hermans (2002) summarises the critiques of modernism held by non-fundamentalists, or pluralists, who are largely responsible for the increasing momentum in postmodernist work since the 1960s. Broadly speaking, the era of “modernism” is suggested to be 1840 - 1930. “Postmodernism” is tentatively argued to have emerged since World-War II, from the 1960s until present day. There are more works appearing today on postmodernism than its parent modernism, despite its younger maturity.

Broadly speaking, postmodernism has resulted in the pluralistic merging of disciplinary fields of knowledge, because it is now thought that the world is too complex to understand using modernist techniques on their own<sup>9</sup> (Patterson & Williams 1998). The next section attempts to illustrate the origins of constructivism.

## **2.2 The Origin of Constructivism; an Overview**

One may trace elements of contemporary constructivism as a source of the post-modern movement, largely attributed to Thomas Kuhn in the 1960s with his pivotal book on *The Structure of Scientific Revolutions* (Kuhn 1962). Postmodernism invited theoretical enquiries such as the sociology of knowledge, creating opportunities to incorporate social sciences such as social psychology, and sociology, into contemporary practices for obtaining and creating information about the world. However, there are strands of thought in this area that can be traced back to as early as the 18<sup>th</sup> and 19<sup>th</sup> centuries. In the social sciences, much pluralist thought has stemmed from more recent trends in psychology and sociology, and it is important to acknowledge that much of these earlier conceptual themes have filtered through and flavoured modern constructivism. The following section does not attempt to cover the transformations of sociology and psychology in scrupulous detail. Rather, what is presented here is merely a way of mapping some of the more significant and influential stages of constructivism. Friedmann (1979) cited in (Mandelbaum 1996) subscribes to the idea that intellectual influences can be mapped out to illustrate how schools of thought have been shaped throughout time by certain individuals, or claims-makers. Friedmann (1979) does this to map out the evolvement of planning theory. An outcome of his work is that it illustrates how planning has evolved to

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<sup>9</sup> For a detailed discussion of modernism and its limitations, see (Gablik 1984; Astraour 1990; Haslam 2002; Sherry 2003; Goldman 2004; Layder 2006) and for the relevance of post-modernism, see (Woodiwiss 1990; Rosenau 1992; Jencks 1996; Butler 2002; Layder 2006). Understanding the concepts of modernism is critical for understanding the links to postmodernism, and its much later influence on constructivism. In fact, for an interpretation of the transition between modernist perspectives and postmodernist accounts, see Kuhn (1962). The important point that Kuhn (1962) raises, is the need to move away from reductionist and separatist approaches brought about by modernism, to integrated and interdisciplinary approaches encouraged by post-modernism for understanding the complex world.

incorporate elements of scientifically based knowledge and socially based knowledge. The relevance of Friedmann's work to this research is that it illustrates how claims-makers have historically shaped contemporary planning theory. I have attempted to adapt Friedmann's chronological 'map' for the roots of constructivism and this is set out in Appendix 1.

### **2.2.1 Psychology: Overview**

Early notions of psychology are often traced back as far as 400BC to Greek philosophers such as Plato and Aristotle (Hergenhahn 2005). It was not until the late 1500s that the term "psychology" was first invented by the German philosopher Rudolf Göckel. At the time, this scholarly concept of studying the mind and behaviour was largely attributed to philosophy. Several philosophers such as Descartes, Newton, Kant, Weber, and Darwin, explored the meaning of "psychology" throughout the 1600s, 1700s and 1800s (Hergenhahn 2005). However, according to Hergenhahn (2005) it was not until 1879 when Wilhelm Wundt 'scientised' psychology through his work on experimental psychology that psychology became a discipline. Further contributions were made to the field of psychology in the late 1800s by William James, Ivan Pavlov, and Sigmund Freud, who contributed to the creation of behaviourism – an Americanised version of psychology; the study and measurement of obvious behaviour as a means to understanding the mind (Mills 1998).

Subsequently, Chomsky contributed to the formation of cognitivism in the mid 1900s, raising the arguments that behaviourism focused too much on metaphysical traits, and therefore was not an accurate-enough measure of the mind (Sperlich 2006). Cognitivism became the term used to describe the practice of examining the internal mental processes such as problem solving, memory, and in particular language, which took psychology from examining the mind through metaphysical observations, to solely examining the mind and how it interprets the world. Essentially there was no middle ground between these two fields at the time [behaviourism and cognitivism]. This led to a revised version of the two fields, creating what is now considered to be a combination of cognitivism and behaviourism; social psychology.

### **2.2.2 Sociology: Overview**

The other contemporaneous and influential genre of thought is sociology, instigated by Auguste Comte in the early 1800s. Comte claimed that society is moulded by Theology, Metaphysics<sup>10</sup>, and Science (Giddens 1996). Comte's vision was to help society better understand the world as

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<sup>10</sup> Metaphysics is the branch of philosophy concerned with explaining the nature of reality, being, and the world (Geisler 1999: 446).

a whole through his theory of sociology. Sociology advocated for the integration of all other sciences with a focus of relating their findings to understanding the world as a cohesive whole.

From under the 'sociology banner' another important claims maker to emerge in the late 1800s was Karl Marx (Joseph 2006; Layder 2006). Marx was responsible for a revolutionary theoretical response and explanation to the social inequities of capitalism caused by modernism (Joseph 2006). Marx's work was greatly influential on Weber in the early 1900s, and Foucault and Harbermas in the mid 1900s (Collins 1986).

Weber, along with Mead, and later Blumer, contributed to the formation of Symbolic Interactionism in the 1930s, which adopts themes of behaviourist psychology (Blumer 1969; Forte 2001). Later, Foucault and Harbermas borrowed from Mannheim's work on *Ideology and Utopia* contributing further to the creation of the sociology of knowledge in the 1960s (Dant 1991). The sociology of knowledge looked at the way society creates knowledge and makes meaning of the world (Pusey 1987; Smart 1988; Mulkay 1992). The sociology of knowledge incorporates veins of thought from symbolic interactionism, behaviourism, and social psychology (Hamilton 1974).

During the late 1960s, Berger and Luckmann coined the term 'social constructivism', encapsulating ideas and methods from symbolic interactionism and sociology of knowledge (Berger 1966). Social constructivism sought further understanding the way in which society uses and interprets information and knowledge and the effect this has on creating "versions" of reality, which are referred to as "frames of reference" in this thesis (Berger 1966; Berger & Luckmann 1990).

### **2.3 Kuhn (1962)**

It is difficult to paint an overview of postmodernist movements and how these movements have influenced ways of obtaining and creating information about the world without reviewing Kuhn's work in depth. Kuhn's (1962) work on *The Structure of Scientific Revolutions* is a landmark in the history of science. It brings to the surface subjectivism within science, how influential humans are in the creation of science, and how it is used for obtaining and creating information (Herbenhahn 2001). For instance, Kuhn raises the point that if science is an incremental process, then why is it increasingly becoming difficult to answer questions like "When was oxygen discovered? Or who first conceived of energy conservation?" (Kuhn 1962: 2).

Kuhn (1962) states that if questions like these are too difficult for science to unravel with any degree of “truth” or “fact”, scientists will manipulate the questions, and ask a different “type” of question. The scientists’ argument for doing so would be that it was the “wrong” type of question, implying that science can only make truth claims about the world when the “right” type of questions are asked. If this is the case, this begs the question as to who ultimately decides what questions are relevant to ask. The answer appears to be the researcher or scientist. Kuhn soon illustrates the nature in which researchers manipulate science in order to achieve scientific information about the world. If we accept Kuhn’s argument, then science cannot be as objective as it claims to be. Thus, it becomes no less appropriate to incorporate social sciences, which in the past have been criticised for their subjective methodologies, as a means to understanding and creating knowledge about the world.

## 2.4 Symbolic Interactionism

Herbert Blumer first coined the term “symbolic interactionism” [SI] in an article written in 1937<sup>11</sup> (Blumer 1969: 1), but because Blumer’s work was largely influenced by George Herbert Mead<sup>12</sup> (Cook 1993), Mead could be said to be the originator of SI. Constructivism appears to have borrowed three fundamental principles from SI (Charon 2007).

Blumer’s (1969: 2) SI rests on the three principles that: i) human beings act toward things on the basis of the meanings that the things have for them in their daily lives, ii) that the meaning of such things is derived from, or arises out of, the social interaction that one has with one’s fellows, and iii) that these meanings are handled in, and modified through, an interpretative process used by the person in dealing with the things he/she encounters.

We can evaluate the three core principles of SI (Blumer 1969: 2), and assess their implicit similarities with the three characteristics of SCT [covered in section 2.9]. The first principle [of SI] is as follows:

“That human beings act towards things on the basis of the meanings that the things have for them in their daily lives... Such things include everything that the human being may note in his world – physical objects, such as trees or chairs; other human beings, such as a mother or a store clerk; categories of human beings, such as friends or enemies; institutions, such as a school or government; and ideals such as honesty or independence; and such situations that an individual encounters in his daily life” (Blumer 1969: 2).

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<sup>11</sup> Article was written in *Man and Society* (Schmidt 1937 cited in Blumer 1969: 1).

<sup>12</sup> Mead is arguably the founding father of symbolic interactionist thought but because Blumer first coined the term, his work is cited.



What links this first principle of SI to SCT is the reference to “daily life”. This entails that a person’s understandings and meanings they have towards things is related to what occurs in their daily lives. This suggests that symbolic interactions are relevant to a time and place; the stage you are at, at that point in your daily life. This is one of the characteristics of constructivism, and is referred to as a ‘contextual snapshot’ in section 2.9.2.

The second premise of SI is not dissimilar from the characteristic of constructivism; that knowledge and activity are intertwined (Nightingale & Cromby 1999; Pinker 2002) (discussed in section 2.9.3.) This essentially means that people will carry out actions or express their opinions according to what they know. Blumer (1962: 2) claims that the meaning of such things is derived from, or arises out of, the social interaction that one has with one’s fellows. According to SCT, the term “social interaction” implies that the act of socially interacting is a result of knowledge and activity. If we accept this connection, then it appears as though SCT resonates closely with the second principle of SI.

The third principle rests on the notion that our meanings and understandings of the world are modified through interpretive processes such as language and discourse. Language and discourse are one of the fundamental characteristics of SCT [section 2.9.1]. The use of language and discourse is what the person uses to interpret and communicate their symbolic interactions with the things they encounter. This characteristic is another example of where one of the principles of SI shows similarity with one of the characteristics of SCT.

### **2.4.1 Nature of objects**

Blumer (1969: 10-12) argues that the position of symbolic interactionism is that the “worlds” or “realities” that exist for human beings and for their social groups are made up of “objects” and that these objects are the product of symbolic interaction. The object in question can be anything that is indicated, pointed to, or referred to. The object could be a lake, a magazine, a convention, a law, a religion, a dream and so forth. Objects can be classified into three categories: i) physical objects, such as salmon, rivers, jet boats, or four wheel drives; ii) social objects, such as salmon anglers, trout anglers, or Fish & Game rangers; and iii) abstract objects, such as catch and release ethics, theories, or achievements.

What is important is that the nature of any object consists of the meaning that it has for the person for whom it is an object. In addition to this, Gergen (1994; 1999; 2001) claims that the terms by which we account for meanings about the world and ourselves are not dictated by the stipulated objects of such accounts. This suggests that there is an inherent social element to the

way we construct meanings of an object. Blumer (1969) maintains that the meaning sets the context in which a person views the object, the way in which they act toward it, and the way in which they talk about it [all fundamental traits of SCT, discussed later in the chapter]. The nature of an object can have quite profound implications with different individuals viewing the same object with different meanings. For instance, a salmon is a different object to an angler, a salmon farmer, a poet, and a restaurant chef.

Each individual associates different meanings to an object from the way it is defined by others with whom they interact. Therefore, people come to learn through the indications of others that, for example, a book is a book, that mechanics are a certain kind of professional person, and that the Resource Management Act is a given kind of legal document. Out of a process of mutual indications, common objects emerge where the object has the same meaning for a given set of people because it is seen in the same manner by each other.

## **2.5 Sociology of Knowledge**

According to Dant (1991), Mannheim's (1936) *Ideology and Utopia* work places Mannheim as one of the leading exemplars for the sociology of knowledge [also see Mannheim (1951; 1952; 1956; 1991)]. Berger (1966), Berger & Luckmann (1990), Foucault (1989a; b), Habermas (1971), and Fleck (1979) also share concerns for the extent to which knowledge claims are lodged within communities of understanding.

Although Mannheim's (1952; 1956) specific interests were to unravel how knowledge and information is created through social conventions of the mind, his work was not dissimilar from Mead's theory of symbolic interactionism (Cook 1993) which probed for meanings through the form of objects and their associated symbology. Mannheim (1956) presents four basic categories of the sociology of knowledge:

- i) The situation, such as a community, a nation, a revolution, or a class;
- ii) The individual who is involved in the situation and accordingly forms an image of it, such as occupational aims, political aspirations, kinship ties, or economic alliances;
- iii) The imagery which individuals or groups adopt; and finally
- iv) The audience to which the image is conveyed, including its peculiar understandings, symbols to which it attaches meaning, and a vocabulary to which it responds (Mannheim 1956: 2)

Put simply, Mannheim's four categories of "meaning making" can be reduced to the following: a) the situation, b) the individual, c) the imagery, and d) the audience. When comparing this to the three characteristics of Social Construction Theory outlined by Bergartt (2004), they appear

to resonate quite closely: i) language and discourse – how we describe or talk about an object lends insight into our discourses about it, ii) contextual snapshot – the notion that the context in which language and discourse is presented about an object rests on time, place and culture, and iii) knowledge and activity are intertwined – that knowledge or “meaning making,” comes out of interacting with the objects.

## **2.6 The Theory Evolves**

In summary then, what initially started as sociology and psychology, has been shaped and moulded through various stages in academic thought, to arrive at what is now referred to as constructivism; a combination of the two disciplines. In other words, sociology [symbolic interactionism], and psychology [behaviourism, social psychology] have all lent their ideas to the sociology of knowledge theory, which has led to the branching of constructivism and moulding of SCT. It should therefore be noted that SCT is constantly being reshaped and refashioned as contributors define, redefine and refine the complex and messy world, and how we make and interpret meanings of it. The process does not stop here; arguably, constructivism as a paradigm has merely been set in motion in the last few decades. It is because of the postmodernist movement that the bulk of social constructivist works have arisen, questioning the ways in which humans perceive ‘reality’.

### **2.6.1 Constructivism**

According to Holstein & Miller (1993), constructivism initially came about as a specific response and alternative to the structural functionalist approach to social problems. Hermans (2002) claims that constructivism has been part of a larger ploy to challenge the modernist presumption that knowledge claims serve as accurate pictures or maps of the world. The main development of constructivist thought is said to have resulted from three different forms of post-1960s critique (Hermans 2002). These are i) an ideological critique in which the moral and political significance of seemingly neutral claims to knowledge became manifestly apparent, ii) a literary/ rhetorical critique that underscored the demands of literary and rhetorical traditions on descriptions and explanations of the world, and iii) a social-historical critique which made apparent the social processes required to legitimate claims to knowledge (Hermans 2002). Each of the three postmodernist critiques asserts that structuralist methods are not sufficient on their own in dealing with complex issues.

Schneider (1985), cited in (Holstein & Miller 1993: 8), claims that his case studies reveal that constructivism has been influential enough to affect a diverse range of theoretical and empirical studies, including those concerned with politics, institutional processing of social problems,

competition between interest groups over the “ownership” of social problems, and claims-making activities by members of the news media. Taken together, these studies point to the pervasiveness of social constructivism and its influence on social problems theory for contemporary Western societies.

## **Part 2 The Utility and Relevance of SCT**

Part 2 is intended to build on the previous part about the theoretical origins and movements of social constructivism, and will focus on what SCT is, how it is useful and why it is a relevant theoretical approach for this study.

### **2.7 Social Construction Theory**

“Ideas do not exist in a vacuum; they inhabit a social setting” (Hacking 1999: 10)

“Nature is not at all – or not simply – “natural” but in fact a human construction... Nature is nothing if it is not social” (Castree & MacMillan 2001: 209)

Social constructivism is a contentious theoretical field, and much like any discipline, draws its share of followers and critics. Attentions are often focused on the criticisms and debates of the theoretical field in general, coupled by the contested meanings of nature and its acknowledged applications to better understanding “our” world. This section will attempt to address these issues and explore the area of social constructivism. However, before investigating this field, it is important to raise one pivotal matter regarding the interpretation of the term “social constructivism”.

The common use of the term “social constructivism” creates a problem because according to Hacking (1999) cited in Berngantt (2004: 10), it is not well defined. Hacking’s work implies that social constructivism is sometimes employed without the sufficient formulation and explanation of the theoretical frameworks in this field (Berngantt 2004). As a result, this leads to confusion in an already contested field. For examples of attempts to clarify this contested field see Barringer (2002); Castree & MacMillan (2001); Fine (1998); Hacking (1999); Herda-Rapp & Goedeke (2005); Scarce (2000); and Pinker (2002).

### **2.8 What is Social Construction Theory?**

It is difficult to agree upon one theoretical approach for social construction work, let alone provide one exact definition of what social construction theory is. As Hacking (1999) noted, the focus should not be to define what it is, but rather understand what it tries to do.

However, an attempt is made here to describe what social construction theory [SCT] is ‘like’, despite Hacking’s (1999) advice to the contrary. SCT is like an explanatory tool for better understanding the complex and messy, real world. It is derived from the social sciences, and attempts to examine the way things are constructed or perceived by society. An analogy referred to in this study, is that social constructions are like optical lenses. Reality can be either focused or obscured by a lens, but without these lenses we are unable to see and understand reality. Everybody looks at the same physical world through their own lenses, but what they see and take from it may be different. The importance in terms of research is that those peoples’ views and interpretations of the world will depend on their lenses. Identifying what these lenses are, and how influential they are, are important for better understanding how salmon have been historically and currently framed. SCT lends itself to better understanding these social phenomena, and it does this through focusing on discourse; providing an ability to analyse themes in what people say. For this reason SCT typically uses qualitative methods of inquiry. However I argue that it is plausible to adopt a combined methodology, using both qualitative and quantitative approaches, as explained and discussed in Chapter 6.

## **2.9 Characteristics of SCT**

According to Berngatt (2004) the theoretical influences of social construction theory are numerous and depend on the claims-maker’s philosophical beliefs. Therefore, Berngatt (2004) argues that the attention should be focused toward identifying the similar characteristics of social construction approaches. These three characteristics are i) language and discourse, ii) contextual snapshot, and iii) that knowledge and activity are intertwined.

### **2.9.1 Language and Discourse**

The first characteristic of social construction approaches is that they highlight the significance of social processes in shaping the world and the people in it (Nightingale & Cromby 1999). In support of this claim, Castree & MacMillan (2001: 210) argue that constructivists and realists<sup>13</sup> share something in common. This is an inability to imagine the human – natural relations in a non-dichotomous way. Thus, society and nature exist in a dynamic, two-way relationship (or dialectic) in which societies remake nature and nature in turn remakes society. Essentially this way of thinking about society and nature alters the awkward “either/or” choice for a “both/and” compromise (Castree & MacMillan 2001: 210). This way of constructing the world as a dialectic two-way process, can be understood through language and discourse.

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<sup>13</sup> The context of a ‘realist’ is used to represent a perspective from the disciplinary field of rational science [realism], as opposed to constructivism [relativism].

Social construction theory identifies that language and discourse can shape the perceptions that individuals hold toward nature. This claim is supported by Scarce (2000), as it is through social interactions that old meanings are reinforced and new ones emerge.

“Meanings are produced and reproduced by and through social action, including conversations we have, organisations we create, and the technologies we use to manipulate the world around us” (Scarce 2000: 7).

Essentially humans construct and give meaning to nature through their cognitions, institutions, and technologies. Furthermore, meanings are dependant on words, and words are only symbols. They are not ‘the real thing’, but rather social realities that we have conceptualised through language (Scarce 2000).

### **2.9.2 Contextual Snapshot**

The second characteristic that social construction approaches share is the notion that social processes are specific to a time and culture (Braun & Wainwright 2001 cited in Berngatt 2004: 11). This is referred to as a contextual snapshot or a frame of reference.

A frame of reference is supposed to capture the views held by an individual or shared by a group, for a specific culture, within a particular time frame. An example of a current frame of reference is the view held by members of the New Zealand public towards pit-bull terriers (Van-Der-Stoep 2007). Pit-bulls are currently framed as “savage” and “dangerous” “beasts” as a result of an attack on an elderly woman in April 2007 (Van-Der-Stoep 2007). This frame of reference is related to the time and place of the attack, formed by those who have socially constructed pit-bulls as a result of the incident. For other examples, see Berngatt (2004) for how Himalayan Tahr are framed and Scarce (2000) for framing salmon as objects of control amongst salmon biologists.

Additionally, works by Swaffield (1998) and Lachapelle et al. (2003) illustrate the usefulness of frames of reference as a conflict resolution tool for complex issues involving society and nature. Swaffield (1998) applied a frames of reference analysis to better understand how the New Zealand high country was framed for management purposes, while Lachapelle et al. (2003) focused on understanding how natural resource planners framed planning frameworks in the United States. Their case-studies justify the application of social science frameworks for resolving contentious issues between society and nature through identifying the commonalities and differences between stakeholder perspectives. It seems reasonable to conclude that

understanding these perspectives can be useful for making better and more informed management decisions.

### **2.9.3 Knowledge and Activity are Intertwined**

The third characteristic that social construction approaches share is the belief that knowledge and activity are intertwined (Nightingale & Cromby 1999; Pinker 2002). Essentially this assumes that people will carry out actions or express their views in accordance to what they know. This research therefore assumes that people's actions or discourses are chosen according to their knowledge and understanding of the issue(s). For this reason the research adopted a targeted interview methodology (see Gillman 1990) whereby candidates were hand picked based on their knowledge and understanding about chinook/quinnat salmon in New Zealand.<sup>14</sup>

### **2.10 The Utility of Social Construction Theory**

As a result of post-positivism in Western societies, the pluralistic merging of social, environmental, economic and cultural boundaries has provided a window of opportunity for Social Constructivist work to emerge across a range of disciplines. SCT has been widely applied to environmental sociology (Hannigan 1995), community-based environmental management (McCallum 2003), human evolution (Ruse 1999), the social construction of ethnicity and youth (Hacking 1999), globalisation (Spaargaren 2000; Friedmann 2005), understanding reality (Berger & Luckmann 1990), genderism and racism (Castree & Braun 2001), medicine (Crompton 2005), societal normality (Olin-Lauritzen 2007), technology systems (Bjiker et al. 1987), science (Latour 1979; Collins 1982; Jagtenberg 1983), forest natures (Marsden et al. 2003), disease (Kim 2007), and wildlife (Scarce 1998; 2000; Dizard 1999; Tovey 2003, Bergartt 2004; Schreiber 2004; Herda-Rapp & Goedeke 2005).

Pivotal examples where social construction theory has been employed to better understand complex issues between society and nature are evident in works by Scarce on wolves (1998) and salmon (2000); McCallum (2003) on community-led initiatives for environmental management; Bergartt (2004) on Himalayan tahr; and Herda-Rapp & Goedeke (2005) on selected United States wildlife (notably otters and manatees). At a broad scale, these authors use SCT in the area of wildlife management to investigate the public perceptions of wildlife species and how these perceptions influence the management of those species.

On a more philosophical note, Hacking (1999) highlights the importance of SCT for better understanding problems before employing realist techniques such as reductionism to define

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<sup>14</sup> See Chapter 3.

them. Hacking (1999: 6) mentions that social constructivism is about raising people's consciousness in two distinct ways; i) overarching, and ii) localised. Much of Hacking's work focuses on societal issues like gender, ethnicity, and youth. Hacking (1999) investigates how humans think about society, rather than how society thinks about wildlife and nature covered by Herda-Rapp & Goedeke (2005).

Hacking (1999) concludes that the first conscientious distinction is that our overarching lived experience of the world we inhabit is conceived of as socially constructed. For instance, we are generally aware that humans are social beings that interact and construct things through our own social lenses, and select particular words to describe our views. The second is that, within our overarching attitudes lie local claims, which raise our consciousness about something in particular. In this case, humans may form localised attitudes toward certain things – whether it is because of their profession or employment, or something in which they share an interest. Hacking (1999) concludes that ideas or perceptions do not exist in a vacuum separate from society, but rather inhabit a social setting.

## **2.11 Why use Social Construction Theory?**

In order to understand the social forces involved in salmon management in New Zealand, it is clearly necessary to utilise theories from the social sciences. Increasingly, theories of the social sciences are being used to deepen our understandings of public perceptions of the natural world (McCallum 2003).

The reasons for the emergence of SCT is derived partly from an inability for science alone, to deal with social problems, cultural differences, socio-economic issues, and 'wicked' environmental problems (Patterson & Williams 1998). SCT helps develop an understanding of contemporary environmental problems. Typically in New Zealand, environmental issues of the past and present are largely dealt with using rational approaches such as cost benefit analysis, environmental impact assessment, and social impact assessment. In each case these are typically examples of reductionist, scientific methods that incorporate some form of quantitative assessment.

In the case of wildlife or specific animal species, constructivists highlights that beyond that specie's physical existence, they exist as symbols to which we attach meaning (Munro 1997). This is consistent with the argument presented by Scarce (2000) and Pinker (2002) that nature is a blank screen, which will reflect everything that society projects onto it. Since meanings are a



result of language and discourse, it becomes apparent that SCT can deepen our understanding of complex issues by studying the way people talk; through language and discourse.

Herda-Rapp & Marotz (2005) cited in (Herda-Rapp & Goedeke 2005: 75) suggest that SCT is useful for understanding the attitudes of, and relationships between, humans and Nature. They argue that:

“Social constructions are important not just as an academic exercise but because they are instructive of human relationships with Nature. Social constructions represent how we think about Nature and shape how others think about Nature. More importantly, they guide how we relate to and with Nature” (Herda-Rapp & Goedeke 2005: 75).

According to Berger & Luckmann (1990) in order to understand how objects have been socially constructed, we must understand that the object in question, like everything around us, is socially constructed. Both objects and facts are given meaning by the people in the culture, both during daily interactions and in interactions with social institutions, thereby creating a “reality”.

Politically and socially powerful claims-makers [discussed next] have the resources to offer more authoritative and hence dominant interpretations of reality. How we come to think about social problems are shaped by claims-makers who are recognised for their authority or persuasiveness on an issue (Hilgartner & Bosk 1998).

SCT is useful for studying the social conflicts in wildlife by focusing on language, because it is through discourse that constructions are made (Herda-Rapp & Marotz 2005, cited in Herda-Rapp & Goedeke 2005). Therefore this research topic adopts a discourse analysis methodology. Not only are words important because they articulate a particular view of the wildlife in question, but they also inscribe a set of relationships. Examples of these relationships can be between the claims-maker and the wildlife in question, the claims-maker and wildlife managers, and the claims-maker and other publics (Evenden 2004). The way in which discourse is presented about a particular object [whether the object is wildlife, the environment, or resources] influences the way people will construct it, and in turn affect their relationships with it, and their relationships with other actors. In short, these relationships affect the way the object is used, and therefore shapes the way it is managed.

### **2.11.1 Claims-maker**

Evenden (2004) provides an excellent example of the influence of claims-makers in the framing of an environmental issue. During the 1950s, scientists played a major role in the fish vs power debate involving the Fraser River, British Columbia (Evenden 2004). Because scientists [in

particular fishery biologists] had authority on issues relating to fish habitat, fish biology, river flows, environmental effects of dams and so forth, they were the dominant claims-makers in the fish vs power debate. Subsequently scientists influenced the general construction of the fish vs power issue, swinging stakeholder views in favour of the scientific claims to oppose hydropower developments. As a result, the relationships between the claims-makers' [scientists] and salmon changed, as did the relationship between scientists and hydropower developers, scientists and wildlife managers, and scientists and members of the public. Essentially, since scientists were the major claims-makers, they had the most influence on the way the fish vs power issue was interpreted, therefore shaping the management outcomes for the Fraser River, and the salmon fishery (Evenden 2004).

Elsewhere, Scarce (2000: 49) lends support to argue that biologists were in the "driver's seat" in terms of controlling salmon, studying them, and writing about them. Because this was the first time in history where salmon were closely studied and reported on, it placed biologists in a powerful position, both scientifically and politically. Part of the SCT methodology to be applied in this thesis will make mention of particular claims-makers in the framing of salmon in Canterbury, New Zealand. Claims-makers from targeted organisations have been selected for their contributions to 'salmon framing' in Canterbury, New Zealand.

### **Part 3 Social Construction of Nature and Implications of its use in Research**

Part 3 is intended to discuss the social construction of nature [SCN], providing a fuller understanding of how constructivism makes sense of the "meaning making" that occurs between society and nature. A discussion of the varying degrees of SCN will be provided, followed by a review of the implications of the researcher using SCN, and how to apply a SCN methodology.

#### **2.12 The Social Construction of Nature**

Social Construction Theory has created a different way to view, understand and interpret the world (Cronon 1995; Pinker 2002; Scarce 2000). According to Bird (1987), Proctor (1998) and Kong et al. (1999) one of the key discussion points that SCT highlights is the philosophical questions of what is "nature", and is the "nature" that I see the same that you see? Sometimes the questions are asked about "reality" (Berger & Luckmann 1990; Braun & Castree 1998), but in essence SCT is recognised for its ability to provide sociological enquiry tools such as discourse analysis and frames of reference analysis to further explore how people interpret nature. Identifying differences between people's construed realities about nature are important for further understanding and resolving social, cultural, environmental, and economic issues (Castree & Braun 2001; Irwin 2001; Symanski 1994). Thus, the research employs theoretical

concepts from SCT in an attempt to mould a SCN approach to better understanding the current management approaches to chinook/quinnat salmon in New Zealand.

### 2.13 Nature with a capital “N”

Emerging from the construction of nature debate, Herda-Rapp & Goedeke (2005) argue that it is important to recognise there are two types of *nature*. There is nature with an “n”, and Nature with an “N”. The first type is nature as it really is. The second type is Nature as we think it is. My understanding is that Nature has been given a capital “N” because it is a “name” attributed by humans to describe what we think of as *nature*. It essentially is a label for a socially constructed concept, and is no different to the process of assigning names to a newborn child.

Gee (1999) offers a similar perspective in relation to *discourse*. Gee (1999) claims that there are two perspectives of *discourse*; discourse with a “d”, and Discourse with a “D”. The first type is discourse which he refers to as “language in use”, which shares similar characteristics as nature in that they each represent what they are: discourse [language in use], and nature [the many versions of how we think the world is].

The second type is Discourse which shares similar attributes as Nature in that each represents the conceptual aspects, or as Gee (1999: 13) would say, “non-language stuff”, of what we think they are. The latter refers to the socially constructed meanings: Discourse [multiple Discourses and perspectives held by many people], and Nature [the world how we think it is].

On both accounts, little “d” and little “n” simply refers to what they are, while big “D” and big “N” refers to our interpretations of what we think they are.

Herda-Rapp & Goedeke (2005: 4) offer an interesting summary that:

“Nature is not nature – it embodies the cultural meanings and connotations created by people within a society or social group to make sense of the natural world”.

In other words, our perceptions of nature [the actual objects] are sifted through our cultural frameworks, experiences, training, and expectations. As a result we form our own peculiar version of Nature. So in this case, Nature appears to be a social representation of physical objects. Herda-Rapp & Goedeke (2005: 4) add that:

“While individual trees and birds exist in nature, Nature as a concept derives from human cognition, cultural activity, and social organisation”.

Along similar lines, Redclift (1994: 55) writes:

“Nature has become imbued with so many virtues that the term “natural” no longer confers unambiguous meaning... We have refashioned nature, in our minds, as well as in the test tubes and fields, transforming ecological processes into political axioms... Differences surrounding “nature” and what is “natural” reflect differences between societies”.

This illustrates the magnitude of the dilemma. There is no one particular way of defining nature because of its complexity, by virtue of its multiple interpretations held by society. The irony is that constructivists have taken the already complex concept of nature and made it more complex. As Redclift (1994) states, our interpretations of nature will differ depending on the diverse values held by certain social groups.

Since there are many impressions of Nature based on culturally embedded values and beliefs, along with shared experiences with things in nature, it is relevant to point out that these impressions influence the way in which people understand – socially constructing things. For instance, people from a purely recreational fishing community will construct salmon differently to those who grew up in a community where salmon were purely the product of commercial enterprise. This highlights the potential for conflict as society becomes more diversified and people hold more varied views about nature.

Another reason why it is argued that Nature is a social product, is that the concept is not static, but changes depending on time and place (Herda-Rapp & Goedeke 2005). The fact that scientists are forever learning new and revising old information about Nature is proof of this. A prime example was the notion of a flat earth until scientific enquiry discovered that it was in fact spherical (Porter 2003). Until this point it was considered normal to believe that the earth was a flat landmass; discovering its spherical shape revolutionised people’s perceptions of Nature. It was not nature that had changed, but rather the people’s perceptions of Nature.

Interestingly, however, Friedman (2005) argues that since the 1990s, technology and globalisation appears to have recreated a global platform, flattening the world to a level playing field, enabling more people to collaborate, compete, communicate, and share knowledge and work. While the world is not physically flat, this does raise an interesting point about the earth becoming a conceptually flat and even-surfaced playing and trading field because of globalisation. Friedman (2005) provides yet another classic example of how claims-makers recast nature into a social Nature.

### 2.13.1 Nature and Society

It is becoming increasingly common in sociology to argue that there no longer exists an ‘unsocialised nature’ (Tovey 2003; Scarce 2000; Herda-Rapp & Goedeke 2005). While Spaargaren et al. (2000) argue that nature is gradually being “dragged into society”; Tovey (2003) argues that nature has been dragged into society for centuries. Braun & Castree (1998) argue that nature is now more of a social nature than ever before; a nature ordered up, manipulated and consequential.

Tester (1991) claims that a fish is only a fish when socially classified as such. This does not mean to say that fish do not physically exist unless society accepts them, but suggests that their representation in the form of discourse ultimately depends upon society’s views. For instance salmon and trout are known taxonomically to be at least two different genus of fish. Yet trout and salmon are genetically from the Salmonidae family; so why is it that society chooses not to classify a trout as a salmon? In my view it is likely that there is greater anchorage<sup>15</sup> with the discourse of “trout”. There appears to be strong social constructions associated to “trout” that differ from the constructions of “salmon”.<sup>16</sup> Once named, the accompanying associations make it difficult to dislodge, even when rational evidence to the contrary is presented.

### 2.14 Degrees of Social Constructivism

There are varying degrees of belief as to how nature is socially constructed within the range of philosophical fields. Proctor (1998) illustrates the many camps that obtain and project knowledge of the world, suggesting that this is the reason why we do not have one way of understanding nature. Proctor (1998) suggests that nature is “polarised” through a range of different lenses such as constructivism, anti constructivism, relativism, nihilism, realism, critical realism, pragmatism, empiricism, and pluralism to name but a few theoretical fields. This raises an interesting point about scientific knowledge as a construction. It is for this reason that “nature” is far less universal than generally assumed. It is complex, wicked and very messy as Patterson & Williams (1998) argue.

#### 2.14.1 Science as a Construction

Bird (1987) argues that scientific knowledge should be regarded as a “representation” of nature, claiming it is a socially constructed interpretation with an already socially constructed science-technical object of inquiry. Livingstone (1995: 371) goes on to mention that:

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<sup>15</sup> The name “trout” has stuck despite its genetic resemblance with “salmon” because of its centuries of use and reputation in common discourse.

<sup>16</sup> Covered in Chapter 7.

“The sciences of nature and environment never simply represent the object of their inquiry in a way that is unaltered by social, moral, cultural, economic, or political concerns. Rather, the knowledge they deliver is to a considerable degree, socially constructed interpretations of the real world... Of course this does not mean to say that environmental science presents us with nothing but social fictions dressed up as scientific jargon: as nature certainly sets limits on what can be said about it”.

While Livingstone argues that even the purer sciences can be subject to relativism, he also recognises that nature has finite boundaries, measurable by rational methods of inquiry. The notion that science is part construction and part actuality leans the research towards adopting a mixed approach between the two spectrums; relativism and realism.

## 2.15 Overview of Constructivism

On one end of the constructivism spectrum there is strong constructivism, the other is weak constructivism. The former is likened to more relativist, interpretivist and epistemological perspectives (employing qualitative methods), while the latter is associated to a more realist, positivist, and ontological outlook (employing quantitative methods). Figure 3 illustrates the three stages along this continuum [moderate constructivism is covered in section 2.15.2]

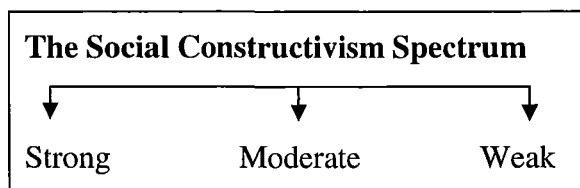


Figure 3: Social Constructivism Spectrum

Proctor (1998: 357) clarifies that there are two necessary points in this debate about nature: i) the knowing subject, and ii) the object of knowledge. The knowing subject refers to the “knowing of”; the social world of ideas, concepts, and values, whereas the object of knowledge refers to the “object”; the existing world - reality. This once again highlights the nexus between society and nature / relativity and reality / qualitative and quantitative.

### 2.15.1 The constructivism spectrum

Strong constructivism – An example of this is to view everything in the world as a social construct. Essentially this means that salmon exist in rivers entirely because of a set of rules or social conventions that society agrees to. Firstly we agree that there are such things as “fish”, and that there are fish taxonomically named “*Oncorhynchus tshawytscha*”. We then agree that there are such things as “rivers”, and that salmon survive in rivers. We then agree that there are causal relationships between rivers and salmon that influence stages of their lifecycle, and so forth. We can understand and explain these things because of a set of social conventions known

as Science. If this Western mode of thinking was done away with, then we would have to find new ways to make sense of and attach meaning to the world. This is not to say that the salmon themselves would not exist in reality without these social conventions; but rather suggests that what we know of as “salmon” would cease to exist if it were not for these social conventions which make up our perceived “reality”.

Strong constructivism argues that Science is not, as the standard view would have it, the only body of knowledge and testable theory concerning the real world. Science is a theoretical construction formulated for one specialised community, created by a complex set of social, political, economic and ideological variables that represent the milieu of the scientist (Gross & Levitt 1998). In short, strong constructivism is highly relativistic, and, as Proctor (1998) would argue, is about the “knowing subject”.

Weak constructivism – Examples of things that are weakly constructed are money, banks, fiscal policies, and tertiary institutions. These objects exist as taken-for-granted realities because society openly agrees to them. At face value, few people contest the reality of institutions such as money or universities, but the origin of these institutions are social constructions created by society as a means of trade, or academic acknowledgement (Pinker 2002).

Weak constructivists are more likely to argue that salmon have evolved over time and therefore existed since their evolution. Part of this reasoning stems from the stronger affiliation with Science, and the “truth claims” that Science makes. Weak constructivism resonates more with actuality in that most objects actually appear to be “real”. This vein of thinking is argued by Proctor (1998) as the “object of knowledge”. It leaves little room for speculation as to what is real, by virtue of being able to test it, touch it, smell it, feel it, taste it, observe it, and listen to it. Discussed next is moderate constructivism.

### **2.15.2 Moderate Constructivism**

‘Moderate constructivism’ is claimed to be a plausible compromise that takes a middle ground between the realism versus relativism debate (Berngartt 2004). Taking this moderate viewpoint is advocated by Scarce (2000) when dealing with the management of wildlife species.

Furthermore, the moderate constructivist approach is evident in the book “Mad about Wildlife”, by Herda-Rapp & Goedeke (2005). This volume provides many contemporary case-studies of the dialectic between society and nature using a moderate constructivist approach in various parts of the United States. The common ground between realism and relativism is the agreement

that there is a ‘real’ world, but that our knowledge of what is ‘real’ is mediated by our thoughts and culture.

Taking this Moderate viewpoint on salmon allows the researcher to draw on constants known about the organism, such as their biological habits and the characteristics of the environment they inhabit. These constants influence the ways in which salmon are socially constructed in nature, which in turn affects their management. It is for this reason that a Moderate constructionist approach is required for the recognition of what is real, and what we think about it. Equally as important, these social constructions have impacts on salmon and the way they are managed in New Zealand. To investigate these social influences, I propose to apply a range of methods mentioned in section 2.17.1, and discussed in Chapter 3.

## **2.16 Analytical Lenses**

An analogy provided by Sayers (1985) likens the phenomenon of a social construct with optical lenses. Reality can be either focused or obscured by a lens, but it remains true that the lens is the only way to see and understand reality. Thus it becomes important to note that “polarisation” of lenses ultimately leads to different interpretations of the world. Everybody looks at the same physical world – but depending on the lens filters they wear, will see different things, and construct reality in different ways. For instance, a trout angler using polarising lenses will see trout that others without such lenses will not see.

Another example is the use of polarised filters for photography to highlight or portray different features or attributes of the landscape [reality]. The same photo could be taken of a landscape using several different lenses, and each photo would likely produce a different impression of reality (Burton pers. comm. 2006). These different impressions consequently affect the viewer’s construction of reality. As a researcher, the importance is to recognise these different lenses, and the subsequent interpretations of reality. One problem with discourse analysis is that the researcher is subject to relativity in that they ultimately choose what discourse to analyse. This places the researcher in a difficult position of observer intrusion.

### **2.16.1 Observer Intrusion – The Implications for Research**

Allen & Starr (1982) argue that in any type of research there is such a thing as observer intrusion or relativity. This occurs when a scientist translates back to a human understanding, which is where the scientist shares moments of creative insight. Our observations tell us what the world is “like”, not what it “is”. Along a similar vein, Rhindler (1969) argues that a physical theory is an amalgamation of invention, definition and laws, which is regarded as a model for a certain



part of nature asserting not so much what nature *is*, but rather what it is *like*. The meaning of the word “like” puts the notion of relativity in perspective. We can only see what nature is *like* because theoretically it is only *like* something because humans have constructed it according to social conventions to make it understandable. If it is not *like* something, then it becomes difficult for humans to understand. The role and usefulness of metaphors in overcoming this difficulty is explored in depth by McCallum (2003).

This type of research provides the researcher with the opportunity to ask a variety of questions and draw on specific discourse to make sense of what people are saying about salmon. This is another form of relativistic, observer intrusion, where the researcher is actively involved in directing, determining and analysing the findings. The task of the researcher should therefore be to ensure a high degree of transparency.

## **2.17 Applying the Social Construction of Nature to the Study of Chinook/Quinnat Salmon**

Dickens (1996; 73) claims that:

“There are real differences between how people construe fishes [relativity]; but this is a wholly different matter from how a fish is physically constructed [reality]”.

Dickens points out that the difference between relativity and reality is that the former is a representation or interpretation of the latter. In simple terms, things exist in reality, but humans can only understand that they exist through our social interpretations of reality. The purpose of the research is to investigate these differences using the methodological framework covered in the next section.

### **2.17.1 The Methodological Framework**

The methodological framework is derived from what has typically been carried out in constructivist work involving society, wildlife, and nature (Berngart 2004; Dizard 1999; Herd-Rapp & Goedeke 2005; Scarce 1998; 2000). The research thus adopts a moderate constructivist approach, involving a mixture of both rational science and social science approaches.

While moderate constructivism agrees that there is a ‘real’ physical world, it also recognises that our knowledge of what is ‘real’ is mediated by our thoughts and culture. Thus, it is interesting to note that despite the Moderate approach advocating for mixtures of scientific rationale and sociological inquiry, most of the work done in this field lends itself almost entirely to the social sciences [qualitative methodologies]. I attempt to show in this thesis, that in order to represent a moderate constructivist framework, it is reasonable and feasible to introduce a mixed approach

of both quantitative and qualitative methods. Essentially this involves a triangulated research design which uses i) literature reviews, ii) quantitative surveys, and iii) qualitative interviews.

## **2.18 Chapter Summary**

Chapter 2 comprised three parts. The first part was essential in providing an overview of SCT in terms of its origins and its borrowings from disciplinary fields such as sociology and psychology, and its momentum as an interdisciplinary theoretical field. This helped deliver the second part which provided a fuller understanding of SCT with a definition of SCT, examples of where SCT has been applied, and reasons why SCT is a relevant theory for this research. Finally the third part further investigated SCT in relation to nature, linking societal influences on nature [and vice versa]. This final part of the chapter was critical in providing an overview of the degrees of SCN, along with a discussion of how to apply a moderate constructivist approach to the study of quinnat / chinook salmon in New Zealand.

Chapter 2 has provided the building blocks for developing a framework aimed at achieving the following objectives a) to review literature on salmon, b) to review literature on social construction theory, and c) to determine the extent to which differing social constructions explain contemporary and changing management of salmon in New Zealand. The importance of these objectives is to identify scenarios for future management of salmon in New Zealand. It will involve a combination of SCT in alignment with the objectives, in order to mould a methodological framework. The next step involves applying the framework to two case study groups [covered in Chapter 6] in order to produce qualitative and quantitative results. The results will be analysed using a moderate constructivist approach as mentioned in this chapter, and outlined in Chapter 6.

Chapter 2 concludes that SCT is a valid approach to better understanding the world in ways that traditional science alone fails to accomplish. For this reason, moderate constructivism is a legitimate and appropriate position to employ, adopting a mixed methodology of qualitative and quantitative techniques.

## **Chapter 3: Operationalising Moderate Constructivism: a Mixture of Quantitative and Qualitative Methodologies**

### **3.1 Introduction**

During the 1980s, qualitative survey methods began to gain prominence amongst social science researchers primarily in response to the drawbacks of quantitative questionnaire-type surveys, which were considered time-consuming, expensive, and not suitable for providing in-depth understanding of an issue (NRI 1998). These drawbacks have led to the deployment of methods to collect and analyse information with ‘formal’ quantitative techniques and employment of ‘informal’ qualitative approaches to collect rich, textual data (Marshland et al. 2001: 1). It was recognised that the two approaches could complement each other by improving the quality of information to further deepen the level of understanding of an issue, and benefit decision-making processes (Marshland et al. 2001).

### **3.2 Methodology**

As indicated in Chapter 2, the research methodology applied to this research topic is based on social construction theory [SCT]. Social constructivists use a range of methodologies depending on where they stand on the constructivism spectrum. This research uses a moderate constructivist approach which applies a mixture of quantitative and qualitative methods to two case study groups. The two methods were a quantitative survey and qualitative interviews. The quantitative method adopted a semi structured survey (Dillman 2007) which was mailed to 400 members of the New Zealand Salmon Anglers Association [NZSAA], while the qualitative method involved open ended interviews (Flick 2006; Liamputtong & Ezzy 2005) which were applied to 14 targeted interview candidates. The data gathering techniques for both methods are described in sections 3.3 and 3.4. The quantitative surveys were analysed using descriptive frequencies created by the program Statistical Package for the Social Sciences [SPSS]. The qualitative interviews were analysed using discourse analysis manually carried out by the researcher, followed by a frames of reference analysis to categorise research findings.

### **3.3 Quantitative Survey Method**

The quantitative survey was analysed using descriptive statistics, otherwise referred to as basic proportional representation or percentages (%) to illustrate what the majority of NZSAA members’ demographics, attitudes, motivations, fishing preferences, management priorities, discourses, and knowledge about the fishery.

The quantitative survey included 71 structured questions designed to obtain information about salmon from salmon anglers [see Appendix 2]. Questions were bracketed in sections, with a response scale provided for a number of questions. Respondents were either instructed to tick boxes, circle words, or provide open ended responses, which were themed and coded to deepen the level of understanding. The survey asked questions from the following section headings: specific questions; knowledge of New Zealand native fish; knowledge of salmon in New Zealand; thoughts on salmon; fishing experience; fishing equipment; catch and release ethics; hatchery vs wild salmon; nature; memberships/subscriptions; photo section; concluding thoughts; and demographics. The aim was to reveal a variety of angler perspectives, opinions of and attitudes toward salmon, and comparatively assess the responses for differing and/or similar frames of reference. In some cases, the quantitative findings from the survey appeared to lend support to the qualitative findings of the interviews. This was used as an attempt to ‘quantify’ some of the qualitative findings.

The next section describes the literature review method used to obtain a fuller understanding about salmon before designing the quantitative survey questions. The literature review also provided opportunities to prepare qualitative interview questions.

### **3.3.1 Literature Review Method**

The NZSAA literature component was drawn from material since 1974, and formed a basis for the questions in the NZSAA quantitative survey. The NZSAA literature was chosen as a starting point for developing an understanding of the NZSAA, and how they might contribute to the research when asked a range of questions. Because the NZSAA was pivotal in orchestrating changes for salmon management in New Zealand post 1970s they were a credible candidate for quantifying some of the constructions toward the salmon fishery.

Although the NZSAA was first formed in 1972 by Dave Hughey as a result of growing public concerns towards the administration and management of the salmon fishery 1974 marked the beginning of the Association’s magazine to mobilise people on salmon issues, published quarterly between 1974 and 1999 (NZSAA 1974 Vol 1(1)). In 2000 the NZSAA publication format changed from quarterly magazines to monthly newsletters. Information relating to quinnat salmon has been gathered from NZSAA publications, and been incorporated into part of Chapter 4 and mostly into Chapters 5 and 6. The research method for reviewing the NZSAA literature is summarised as follows:

**1974 – 1991** every issue reviewed [Vol 1(1) – Vol 18(1)]

**1991 – 1997** every second issue reviewed [Vol 18(3) – 26 (1)]

**1997 – 1999** every third issue reviewed [Oct 1997 – Aug 1999]

**1999 - 2007** every fourth issue reviewed [no 1 1999 – no 84 2006]

More time was spent researching earlier magazine publications, and less time with later magazine and newsletter publications. There were two reasons for this, i) the period between early 1970s and late 1980s appeared to be *the* critical era for mobilising people, politicians, and developers about the importance of the salmon fishery, and ii) the number of publications per annum increased more than twofold in the late 1990s making it a highly time consuming exercise to review all NZSAA literature. The late 1970s and 1980s era were characterised with strong political movements and policy changes that subsequently affected salmon management more than any other era in New Zealand. Commentaries of these political influences are discussed in Chapters 5 and 6.

Other pivotal literature that helped to develop ideas and questions for the NZSAA survey were Bryant (1979), Evenden (2004), Harding (2004), Hardy (1989), Lamb (1964), McDowall (1990, 1994), Scarce (2000), Schreiber (2004), Smith (1970), and Quinn (2005). Many of these references were related to salmon in the New Zealand context; however sources such as Evenden (2004), Scarce (2000), and Schreiber (2004) complemented the literature review process by providing interesting and useful contexts of the Pacific Northwest salmon fisheries.

The structural layout for the survey was further developed from works by Hughey et al. (2004, 2006). Based on the high response rates achieved by Hughey et al. (2004, 2006), components of their survey design were used as guidelines. Once the survey questions were developed, 13 pre-selected candidates pre-tested the survey as recommended by Dillman (2007), providing feedback on their ability to understand the questions and provide appropriate responses. This also enabled the researcher to pre-test how to best represent the data obtained. Changes were made where necessary and the survey was test piloted twice more before approaching the Lincoln University Human Ethics Committee [HEC] for approval. Approval was granted by the Committee on the basis that anonymity was maintained.

### **3.3.2 Distributing the Survey**

The quantitative survey was distributed via the NZSAA newsletter in November of 2006 to 400 subscribed members (Ellis pers. comm. 2006). Due to a limited budget the survey could only be deployed once, and thus it became important to provide an incentive to the participants in order to increase the response rate (Dillman 2007). All respondents were eligible to enter into a draw to win a \$100 voucher to be used at any Hamill's Hunting and Fishing store in New Zealand. Two prepaid envelopes were preaddressed to the researcher; one for the completed survey and

the other for their personal details for the prize draw. These two envelopes were to be sent separately in order to ensure anonymity as outlined by the HEC.

### 3.3.3 Survey Responses

Of the 400 surveys and entry forms that were sent to members of the NZSAA, three were rejected due to incorrect postal addresses, reducing the sample size to 397. Of the 397 surveys and entry forms distributed, 195 surveys [N = 195] and 178 entry forms [N = 178] were completed and returned. This equalled a total response rate of 49% and 45% respectively. Before analysing the results it was interesting to find that more NZSAA members filled in the 71 question survey than the simple entry form asking for name, address, and phone number to win \$100. In fact, one respondent was so enthused at the thought of a young student researching the social dimensions of the salmon fishery that he attached a \$100 bill to the survey and said “I hope this helps towards your research on salmon... all the best”. This phenomenon was the first of many to come out of the NZSAA survey, illustrating a deeply rooted interest and passion towards salmon, and their management in New Zealand. Figure 4 illustrates the distribution of responses over a 10 week period between November 12<sup>th</sup> and December 14<sup>th</sup>, 2006.

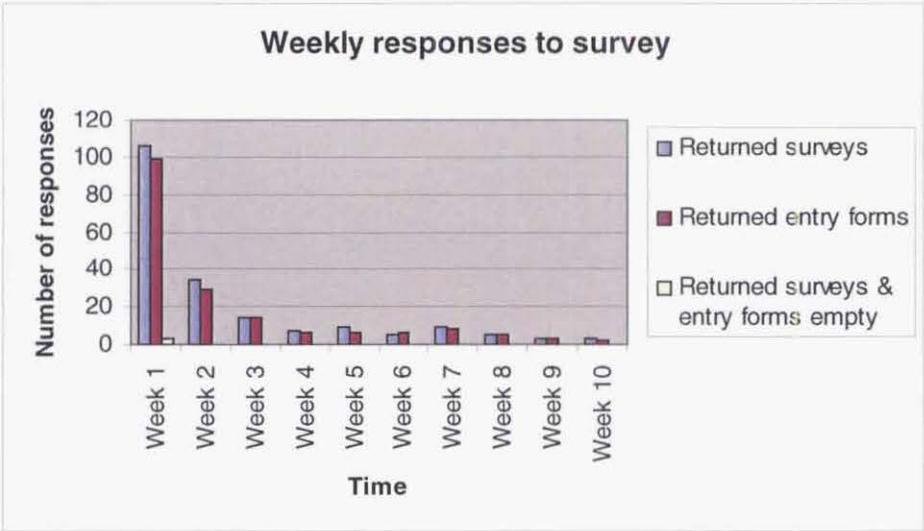


Figure 4: Weekly responses to survey

More than 50% of survey responses were received within the first week of distributing the survey, followed by 16% and 7% for weeks 2 and 3 respectively. Between weeks 4 and 10 the weekly response averaged around 3%. Given that the survey was deployed once, the high response rate was an interesting result in and of itself. More so, it exceeded the target response of N = 150. No follow up surveys, letters or reminders were sent after the deployment of 400 surveys. A ‘thank you’ memo was sent in the NZSAA newsletter 2 months after deployment to inform members that 195 surveys were received and that analysis had begun. No more surveys were received from that point on.

The next section discusses the qualitative approach adopted using interview techniques in an attempt to seek deeper meanings of how society constructs salmon in New Zealand.

### **3.4 Qualitative Interviews**

Sadler (1995: 24) employed a qualitative ethnographic research approach in an attempt to determine some of the socio-cultural factors influencing beliefs, attitudes and water use behaviour. Her data was typically reduced to themes or patterns using discourse analysis and interpreted subjectively. My research study is similar to Sadler's (1995) approach, using discourse analysis for assessing the differing frames of reference of salmon, and how these views influence management.

According to Rudestam & Newton (1992: 35) ethnographic research is concerned with:

“Capturing, interpreting, and explaining the way in which people in a group, organization, community, or society, live, experience, and make sense out of their lives, their world, and their society or group”.

Although often associated with anthropology, ethnographic research is considered to have borrowed from sociology, much like constructivism, but by the same token is not the *sine qua non* of the discipline (Rudestam & Newton 1992). Ethnography is more associated with the study of people in society, rather than their interaction with objects and how they make meaning of reality as in the case with social constructivism. What draws the two topics together is the use of discourse analysis, and the focus on thematic layers in what people say. The following section describes the interview process.

#### **3.4.1 Informational Interviews**

Certain stakeholders were targeted to minimise “inadvertent violations” for obtaining a rich understanding of the way salmon were constructed (Arthur 2006: 25). This approach avoids interviewing candidates that may offer little or no information relevant to the research topic (Flick 2006; Gillman 1990; Liamputtong & Ezzy 2005). Upon reviewing the literature and liaising with various stakeholders of the fishery, the putative stakeholders were identified as:

- Fish and Game New Zealand [FGNZ];
- New Zealand Salmon Anglers Association [NZSAA];
- Department of Conservation [DoC];
- Ministry of Fisheries [MFish];
- National Institute of Water and Atmospheric Research [NIWA];
- Environment Canterbury [ECan];

- Christchurch City Council [CCC];
- Selwyn District Council [SDC];
- New Zealand Salmon Farmers Association [NZSFA];
- Ngai Tahu;
- Television New Zealand – Channel 1 News [TVNZ];
- Recreational anglers;
- Agricultural farmers;
- Commercial fishers;
- Aquaculture farmers [i.e. Isaac Salmon, and New Zealand King Salmon [NZKS]]; and
- New Zealand Professional Fishing Guide Association [NZPFGA].

Of this list, 14 candidates were selected for an interview based on four criteria. The criteria governing their relevance to the research was their i) potential interest in the research, ii) knowledge of the fishery, iii) involvement with the fishery, and iv) place of hierarchy in the organisation. Of the 14 interviewees that agreed to participate in the research, 11 worked at senior levels, one had recently retired from a senior position, while the remaining two candidates were recommended by senior members of the organisation[s]. So, 12 [86%] of the interviewees were deliberately targeted while the remaining two [14%] were obtained using the snowball method (Flick 2006). Each of the 14 candidates expressed an interest in the research by providing useful information and interpretations about the fishery and its management. In fact, the majority of candidates expressed that they had fished or still fish for salmon today, which made it easier to ask a variety of questions about the salmon fishery, and evaluate how they construct salmon.

### **3.4.2 Initial Communication**

Formal qualitative interviews were instigated via email or by phone. The basic layout of initial communication was to gauge whether they met the four criteria outlined earlier<sup>17</sup>, and then i) provide some background of the researcher [me], ii) provide an adequate description of the project, iii) provide reasons why he/she may be of importance for the research, and iv) describe the basic format of the interview. This broad summary of the topic became the template for each initial communication with potential candidates, and was employed 22 times [see Appendix 3].

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<sup>17</sup> Four criteria were to show i) potential interest in the research, ii) knowledge of the fishery, iii) involvement with the fishery, and iv) place of hierarchy in the organisation.



### 3.4.3 Follow up Communication

Those who agreed to participate after the initial communication were followed up by a more detailed description of the proposed question themes. In most cases the time and place for an interview was set by the agreeing participant.<sup>18</sup> I felt it was important to give each participant a clear idea of the proposed question themes without disclosing each question in advance. This way the respondents were aware of what the interview generally entailed so they could prepare, while ensuring that they did not over prepare with “green-wash”<sup>19</sup> type answers.

Fairclough (2003) argues that while it is useful to obtain freely expressed and unprepared responses from interviewees when carrying out qualitative research, it is equally as important to have at least semi-prepared or informed respondents for their answers to be relevant to the research topic. He further adds that qualitative research is a fine art; providing the respondent with too much information can anchor or skew responses (Fairclough 2003). Furthermore, a semi-structured interview leaves little room for the respondent to go ‘off topic’ as the structured questions direct the interview inline with the objectives of the research (Arthur 2006).

Sadler (1995) adds that the advantage of semi-structured interviews is that they allow the researcher the flexibility to further probe behind constructions expressed in response to interview questions, and gather information which might not be elicited in a survey. Furthermore, face-to-face interviews can provide an impression of what people mean in their statements by observing their responses (Sadler 1995). Because interviews usually occur in the “natural setting” of the participant, it is possible to get a feel for the interviewees situation in order to understand the way they view the world. In this type of setting the researcher is more able to view the world through the participant’s lenses. The next section describes the face to face interview process.

### 3.4.4 Face to Face Interviews

Once an interview time was arranged, a reminder email was sent two days before the appointment for confirmation. Upon meeting the interviewee I presented the research information sheet [see Appendix 4] covering the nature of the research project, and a consent form [see Appendix 5] to record the interview for analysis.

Each interview began with six simple tick-box questions to initiate the interview session [see Appendix 6]. This was designed to stimulate each respondent to think about salmon, with the

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<sup>18</sup> One participant who initially agreed to an interview, declined when presented with the proposed question themes.

<sup>19</sup> Green-wash is a term used when someone over prepares their answer[s] by carefully selecting appropriate words and/or politically correct terms. An example of green-wash is an individual that bases their response on what their boss [or employment institution] would want them to say instead of reflecting their individual perspective[s].

sixth question left open ended to begin the free response type questions. Each interview ranged from 10 to 15 set questions, but allowed for impromptu questions where relevant. To ensure anonymity as outlined by the HEC, the names of the interviewees were coded by the acronyms of the organisation they represented. Interviewees were: North Canterbury Fish & Game (NCFG); New Zealand Salmon Anglers Association (NZSAA); Wellington Fish & Game (WFG); Isaac Salmon (Isaac Salmon); Professional Fishing Guide (PFG); Lincoln University Professor (Lincoln University); Department of Conservation (DoC); Environment Canterbury (ECan); Forest & Bird (F&B); Ngai Tahu (Ngai Tahu); National Institute of Water & Atmospheric Research (NIWA); Rakaia Islands Farmer (Farmer); Hamill's Hunting & Fishing Christchurch (Hamill's); and Television New Zealand Channel 1 News (TVNZ).

### **3.5 Discourse Analysis**

There are a variety of ways to record, analyse and interpret discursive communication (Gee 2001; Potter & Wetherell 1987; Schiffrin 1994) as there are many ways of measuring and reporting on water quality (Lenat 1988; Biggs 1983; Smith 1982; Weber 1973). Discourse analysis involves obtaining the richest form of information; incorporating ideas, themes, memories, traditions, attitudes, analogies, anecdotes, values, beliefs, political views and truth claims such as economic and scientific knowledge to name a few (Gee 1999; 2001). These attributes were taken into account when carrying out discourse analysis to identify and describe the various social constructions of salmon.

The purpose of discourse analysis is to further breakdown the discourse inherent in the transcribed interviews and find themes or frames in what people are saying. Beyond the rich discourse are themes that people draw upon through their choice of words. Outlining these themes is what is known as a Frame of Reference [FoR], and it is imperative to use discourse analysis before arriving at any FoRs (Berngartt 2004; McCallum 2003; Swaffield 1998). I have therefore chosen to use these tools because they are necessary for analysing and describing the historical attitudes and views held by individuals toward salmon that may reflect their current FoRs. The ways that salmon are historically and currently framed appears to shape the ways in which they are managed in New Zealand.

### **3.6 Frames of Reference**

Given that many individuals will show a variety of different perspectives on an issue, a FoR analysis simplifies the issue in order to explain it (Swaffield 1998; Berngartt 2004). A crude description of framing is that it “categorises” people’s constructions and reduces what they have said [discourse] to broader themes. It is like looking at the world on a map as opposed to viewing the world as it really is; a map is a social interpretation of the world.

Viewing the real world is like rich text, it is abundant in detail and would take years to look at all the towns, cities, mountain ranges, river valleys, and islands in any great amount of detail, let alone explaining it all. But in doing so, this method would provide a highly comprehensive, in depth, detailed understanding of where everything is, along with the scale, topography, and physical characteristics of the landscapes. On the other hand, looking at a map of the world can still be comprehensive, but it is simpler than viewing it from the ground. The map is therefore a shortcut to representing and understanding the world. This method will not provide as much depth compared with the real world, but it is an excellent reductionist alternative. Therefore, a map represents a frame of the bigger picture; the real world.

#### **3.6.1 Framing a “fishery”**

It could be argued that there are many different constructions of a “fishery”. The term “fishery” generally means the combination of people, vessels, and fishing gear involved in catching a fish species, or a community of different aquatic species, within a certain area using one or more fishing methods. A “fishery” may also include the fishing grounds, the fish [whether residential or migratory], and also the harvested catch (Paul 2000). But there are many different interpretations of a fishery depending on cultural background, place, and time.

In a commercial fishery it may include transportation at sea, lakes and rivers, and on land. It may include fish factories, hatcheries, marketing companies, political power, economic capital, and trade. Whereas a recreational fishery may include travelling and accommodation facilities directly associated with catching fish, or collecting other aquatic animals. It may include the experience, catching big fish, or simply enjoying an activity that is provided to the public.

Thus a “fishery” is not perceived in the same way by all participants. A recreational fisher may have a perspective of challenge, a commercial fisher of profit, an industrial worker of labour, a politician of resource or power, and a Maori fisher of mauri or life force. Along a similar vein, a biologist would likely place emphasis on determining the size and sustainability of the fishery, while a manager balances the requirements of all users within the capacity of the fishery. In

many cases these differences of perception are matters of scale of place and time (Paul 2000). These perceptions illustrate how different people frame a “fishery”, and it is important to be aware that differences of perception can lead to conflicts and misunderstandings. Making people aware of these differences can help society learn to understand the values that people hold toward something. Discussed below is an example of the contested views toward water resource management in Canterbury. The significance of the example is that salmon are manipulated in the debate by one of the claims-makers in an attempt to benefit developers.

### 3.6.2 Framing Example

In The Press, Christchurch (28 June 2006) an interesting debate arose between two engineers about water uses in Canterbury. The engineers were arguing over the management of rivers, but constructed the argument in different ways using different “objects”<sup>20</sup> to argue their point. The first engineer [Engineer 1] was a consulting engineer with experience in hydro and irrigation developments, while the second [Engineer 2] was a hydrological engineer with experience in flood management. Engineer 1 argued that the sports fishery [namely trout and salmon] was mainly responsible for restricting irrigation developments, while Engineer 2 declared that restrictions were partly due to the role that unmodified rivers have in the ecosystem.

While both engineers agreed that surface and subsurface water abstraction were not sustainable, Engineer 1 argued that it was wasteful not to harness the rivers when they were in flood, or very high. His suggestions were to establish storage facilities to transfer excess river flows for irrigation purposes. However, he claimed that:

“The main barriers to developing storages mostly stem from laws which give a high level of protection to the sports fishery – the ‘imported species’, trout and salmon... There needs to be a realistic and wide ranging debate about, and review of, the place of the sports fishery in resource management, balanced against sustainable land use and its place in the nation’s future”.

Engineer 1’s position appeared to be driven strongly by commercial overtones, and the objects “trout and salmon” obstructed development. Engineer 1 added that:

“New Zealand legislation needs to take away absolute protection for the introduced species and put emphasis on the native species. It is ironic that we protect introduced trout and salmon to a high degree, even higher than the native fishery according to my interpretation of the Conservation Act, whereas if it were proposed to introduce trout and salmon today they would struggle to get approval”.

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<sup>20</sup> The objects in this case were i) trout and salmon, and ii) the river itself.

Engineer 1 added that the “protective” attitude towards the sports fishery has been a major contributor towards water conservation orders on the Rakaia and Rangitata rivers. Engineer 2 offered a different perspective, arguing that the “wasted” water from floods play a fundamental role in transporting sediment from mountains to sea. Engineer 2 was concerned more about the river itself reaching equilibrium, claiming that:

“If the medium-high river flows are reduced, the gravel and sand which roll with the current and deposit on the river-bed will cause the height of the bed to increase. If we abstract water during a high flow, we alter the ratio of water to sediment downstream of the abstraction point... This in turn causes increased river-management problems, bank erosion, sedimentation on farmland, and flooding”.

Engineer 2 argued that it is for this reason that the Rakaia WCO was established in the 1980s because at the time it was predicted that the accumulation of sediment would exceed 160,000 tonnes annually.

Engineer 1 believed that the sports fishery is largely responsible for the over “protective” legislation forming WCO to restrict developments, while Engineer 2 believed that developments such as water abstraction have an ecosystem effect on river morphology, and for that reason WCOs protect Canterbury rivers. According to ECan’s proposed Natural Resources Regional Plan [NRRP], if it remains in its present form it will be almost impossible to develop storage in the headwaters of Canterbury rivers. ECan’s NRRP appears to be driven by various environmental considerations, along with the protection of trout and salmon in accordance with the Conservation Act 1987 and RMA 1991. However, some analysts believe that the proposed NRRP will be subject to change from commercial pressures for water use (Hughey & Kerr pers. comm. 2007).

### **3.6.3 Researcher’s FoR**

As a researcher, I too play a pivotal role in framing the FoR analysis. This is seen as a criticism of qualitative research as it provides opportunities for the researcher to be subjective. In this case, my frame of reference towards salmon is largely academic because I came to this research topic as an outsider, with little interest, and virtually no knowledge of salmon apart from them being an introduced fish. At the outset I considered myself to be a suitable candidate for the research; an outsider looking in. However, at a deeper level, I do share strong recreational interests and views towards other introduced species, such as red deer, chamois and Himalayan tahr in New Zealand [see [www.mountainman.co.nz](http://www.mountainman.co.nz)]. This places me in a position of sympathy toward recreational perspectives, potentially skewing the way I construct the debate, but it is to

some extent only logical for a researcher to have some stake in an issue for it to interest him or her in the first place and give them the incentive to carry out their work diligently.<sup>21</sup>

### 3.7 Chapter Summary

Chapter 3 outlined the usefulness of employing a mixed methodology of quantitative semi-structured surveys, with qualitative open ended interviews for identifying the current FoR for salmon in New Zealand. The quantitative data was obtained from postal surveys and analysed using descriptive frequencies, while the qualitative data was obtained from face to face interviews, analysed using discourse analysis and frames of reference analysis.

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<sup>21</sup> There are seemingly countless examples where researchers have chosen topics based on their passion and love, criticisms and dislikes, or even knowledge and understanding towards the object of the topic. Some salmon biologists study salmon because of the temperate climates they live, some vulcanologists enjoy the dangers and thrill in working with active volcanoes, while some statisticians calculate the odds of winning lotto each week to illustrate the many reasons why not to buy lotto. Each of the researchers construct their arguments based on their attitudes, beliefs, knowledge, and experiences toward the topic. This is normal.

# Chapter 4: The Biology, Evolution, Populations, and Aquaculture Production of Chinook Salmon

This Chapter begins by covering factual information about what salmon are, and how the taxonomic and common names of *Oncorhynchus tshawytscha* have come into being. The section on common names is interpreted from a moderate constructivist position in an attempt to link common names to characteristics such as place, culture, and time. The Chapter then explains the evolutionary origins of salmon and some of their associated ecological impacts, followed by a discussion of their biological details and requirements. This leads onto a more factual commentary about salmon aquaculture, and introduces the issues related to capture and captive fisheries. Lastly, Chapter 4 discusses other issues relating to farming Atlantic salmon in the Pacific Ocean; mentions the contentious political issues surrounding trout farming in New Zealand; provides insight to the way salmon are perceived by indigenous peoples' in the Pacific Northwest; and concludes with a discussion on how influential salmon have been in shaping conservation, particularly the Endangered Species Act [ESA] in the United States.

## 4.1 Salmon

There are six species of Pacific salmon belonging to the genus *Oncorhynchus* and one Atlantic species belonging to the genus *Salmo* (Netboy 1974). An exception to the genus *Salmo* is steelhead trout, formerly known as *Salmo gairdneri* but now taxonomically known as *Oncorhynchus mykiss* [since 1989], found only in Pacific Northwest streams. They are all anadromous<sup>22</sup> fishes meaning they are born in freshwater, migrate to sea for their adulthood, and return to the rivers and lakes to spawn (Netboy 1974). However they differ in that all Pacific salmon die after spawning, while many Atlantic salmon and steelhead trout recover, and return to the river or lake to spawn again. Chinook salmon are currently found in the United States, Canada, Japan, Chile and New Zealand. Their acclimatisation accounts in New Zealand are discussed in Chapter 5.

### 4.1.1 Taxonomy of chinook/quinnat salmon

Kingdom:	Animalia
Category:	Fish
Order:	<u>Salmoniformes</u>
Family and Subfamily:	Salmonidae
Genus and Subgenus:	<i>Oncorhynchus</i>
Species:	<i>tshawytscha</i>
Scientific Name:	<i>Oncorhynchus tshawytscha</i>
Authority:	Walbaum
(Taxonomy 1996)	

<sup>22</sup> The term anadromous comes from the Greek term 'ana' to go upwards, 'dromos' running, i.e. upstream running (Answers.com, February 2007).

4.1.2 Common Names

*Oncorhynchus tshawytscha* (pronounced on-coring-kus chawitcha) share a variety of common names: King, Tyee, Spring, Blackmouth, Tule, Chinook, and Quinnat salmon (Anderson pers. comm. 2007; McDowall 1994; Netboy 1974; Scarce 2000). It is interesting to note that not everyone calls them by the same name. It appears that different names are used depending on factors such as place, culture, and time whereas. In the case of Atlantic salmon, they are typically known throughout the world as “Atlantic” salmon, regardless of place, culture and time - with the exception of Tasmania.<sup>23</sup> These are examples of social constructs. According to Netboy (1974: 231) and Anderson (pers. comm. 2007) the common names for *Oncorhynchus tshawytscha* are multiple and regionally organised [Table 2].

Region	Common name
Alaska	King
British Columbia	Chinook, Spring, Tyee <sup>24</sup>
Washington State	King, Chinook, Blackmouth <sup>25</sup> , Tule <sup>26</sup>
Columbia River and Oregon State	Chinook, Spring, Tule
Sacramento River, California State	Quinnat, King
Asia	Chinook
New Zealand	Quinnat, Chinook, King

Table 2: Common names of *Oncorhynchus tshawytscha* by region

Interestingly the name “quinnat” is commonly referred to in Sacramento, California (Netboy 1974) and New Zealand (McDowall 1994) only, whereas in the other regions and countries “chinook” and/or “king” appears to represent the common discourse (Scarce 2000). The term “quinault” appears to have been adopted by Western Europeans’ in Washington and Oregon states in the late nineteenth century and by default has led to one of several common names (quinnat and king) in California (Netboy 1974). This illustrates how the careless use of language can lead to a variety of names and meanings for the same thing.

<sup>23</sup> In Tasmania, Atlantic salmon are known as “Tasmanian-Atlantic” salmon. Another interesting construction of salmon in Australia are the “Australian salmon” which are in fact salt water fish that New Zealanders call “Kahawai”.

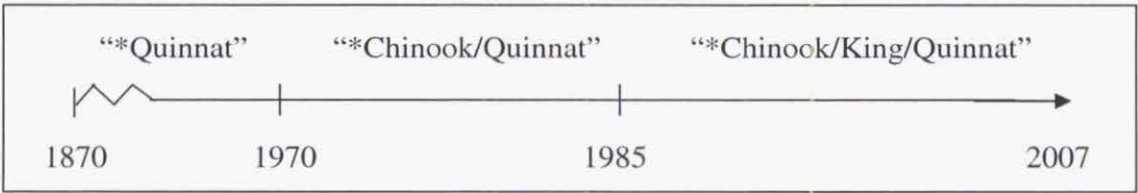
<sup>24</sup> If it was over 25 pounds it was a Tyee salmon

<sup>25</sup> Blackmouth are defined as immature chinook salmon, up to the last year of their lives, at which time they start to sexually mature and develop egg or milt sacks (Anderson pers. comm. 2007).

<sup>26</sup> Tule salmon are native to Spring Creek, Columbia River, Underwood, Washington State (Anderson pers. comm. 2007).



A logical assumption is that the New Zealand discourse [relating to *O. tshawytscha*] as “quinnat” has been strongly influenced because of sourcing quinnat brood-stock from Western settlers of the Sacramento River, California. During the first 100 years of the New Zealand acclimatisation movement between ca. 1870 and 1970, the name “quinnat” appears to have been the most predominantly used name in scientific, political, commercial, industrial, recreational, and public discourse when referring to *O. tshawytscha* in New Zealand. Interestingly however, this discourse has evolved, and is shown in a brief chronology below.



According to NZSAA literature<sup>27</sup> the name “quinnat” dominated New Zealand scientific and public discourse [represented by \*] between the first consignments of ova in 1870 until 1970 (McDowall 1994) e.g.; see Flain’s work pre 1970 on *O. tshawytscha* for examples where salmon were commonly known as “quinnats” [also see (Lamb 1964)].

Between 1970 and 1985, several Pacific salmon fishery experts contributed scholarly articles to American, Canadian, and Atlantic journals, referring to *O. tshawytscha* as “chinooks” (Unwin pers. comm. 2006). In order for New Zealand fishery biologists to connect with Pacific fishery biologists it became important to subscribe to the common discourse “chinook”. This saw New Zealand discourse adopt the name “chinook” alongside or in place of the name “quinnat”.<sup>28</sup> Since the mid 1970s “chinook” has become the most common name when discussing *O. tshawytscha* at a national, international and academic scale. However, at local and regional levels, New Zealand salmon anglers continue to call them “quinnat” salmon.

In more recent years 1985 - 2007, New Zealand discourse [in relation to *O. tshawytscha*] has been influenced by claims-makers such as the NZSAA, and New Zealand “King” Salmon Ltd [NZKS], owners of the Waikoropupu Springs Hatchery at Takaka in Golden Bay, Nelson. In the early to mid 1980s the president of the NZSAA, K. Hughey, introduced the term “King Pins” given to members for services to the quinnat salmon fishery (Hughey pers. comm. 2007). In addition to this, during the mid to late 1980s NZKS introduced and marketed the name “King” salmon into common discourse. This has now led to several common names for *O. tshawytscha*

<sup>27</sup> See literature NZSAA 1974, Vol 1(1) – NZSAA 2007 No. 85  
<sup>28</sup> For a comparison, see Flain’s pre-1970 and Unwin’s post-1970 work for a distinct change from using the name “quinnat” to “chinook”, or a hybridised version “chinook/quinnat” salmon.

in New Zealand: quinnat, chinook, and king salmon. Some of the confusion is due to *O. tshawytscha* being known as “quinnats” by most salmon anglers, “chinooks” by some salmon anglers, managers, academics, and commercial farming operators involved in the fishery, and “king” by the few NZSAA members rewarded for their services to the fishery and by those who purchase and consume any “king” salmon products from supermarkets. The proposed salmon management plan, drafted by FGNZ in August 2006, refers to *O. tshawytscha* as chinook salmon, while the findings from the NZSAA quantitative survey prove the name “quinnat” to dominate current discourse for members of the NZSAA [see Chapter 7].

## 4.2 Origin of the Salmon: Freshwater of Marine?

According to Netboy (1974) the origin of the salmonids’ anadromous life has intrigued scientists since Konrad von Gesner discovered the behavioural phenomenon in the sixteenth century. There have been countless debates as to whether they were originally freshwater fishes, or whether they had evolved from the marine environment (McDowall 2001; Hendry & Stearns 2004; Quinn 2005).

Scientists nowadays lean toward the theory that salmon are freshwater fishes that acquired the habit of going to sea (Macfarlane 1923; Netboy 1974; Hendry & Stearns 2004; Quinn 2005). This line of thinking stems from the German ichthyologist A. Gunther who asserted that salmon originate from freshwater in his book “Catalogue of Fishes” written in 1861 (cited in Netboy 1974: 4). Gunther’s theory was challenged in 1867 by the British ichthyologist F. Day claiming that salmon originated from a marine environment. According to Nikolsky (1963), he argues that the dilution of the seas that occurred about a million years ago in the Northern Hemisphere made the transition for salmon from freshwater to seawater easy.<sup>29</sup>

### 4.2.1 Evolution

There is still much to be learnt about the speciation of fishes (Netboy 1974; McDowall 2001). According to Hendry & Stearns (2004) speciation is not well understood because it takes longer than a human lifetime to complete, and is difficult to observe directly because changes occur across such huge scales of time and space. Hendry & Stearns (2004) add that part of this uncertainty derives from different points of view in evolutionary theory between allopatric scenarios (species originate in different locations) and sympatric scenarios (species originate in the same location).

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<sup>29</sup> See McDowall (2001) and Quinn (2005) for a detailed overview of the different arguments present for both theories.

For many years, the weight of opinion favoured allopatry as the primary mode of speciation (Mayr 1963) cited in (Hendry & Stearns 2004). Recently, however, interest in sympatric speciation has surged because of new data, primarily on insect host races (Bush 1994) and cichlids in tiny crater lakes of Africa (Schliewen et al. 1994), and because of new evolutionary models, primarily by Dieckmann & Doebeli (1999) and Kondrashov & Kondrashov (1999) cited in Hendry & Stearns (2004). Because of the interest in sympatric speciation, there is an increasing appreciation of the role that divergent natural selection can play in the evolution of reproductive isolation. Essentially this views speciation as being driven by adaptation to different environments, competition for resources, and assortative mating (Hendry & Stearns 2004).

#### **4.2.2 Ecological Impacts**

In the past the maintenance of the salmonid fishery in New Zealand supported several actions that caused negative impacts on native biodiversity. For many years, acclimatisation societies paid anglers a bounty to kill native eels (*Anguilla dieffenbachia*) in the misguided belief that it would improve both the salmon and trout fisheries (McDowall 1994). Many former societies also advocated the killing of native shags (*Phalacrocorax sulcirostris*), and the relocation of native seals (*Arctocephalus forsteri*) that preyed on salmon at river mouths (Deans et al. 2004 cited in Harding 2004). In fact, the relocation of seals continues to protect sea-cage operators (Fraser 2001a). This social construction of protecting something of value to humans is not uncommon. A prime example is the way the endemic New Zealand kea (*Nestor notabilis*) was constructed by high country sheep farmers during the mid 1950s. There were bounties placed on kea in an attempt to reduce their impact on livestock, as they were partly responsible for the death of lambs through their opportunistic partial predation, but are now protected (Diamond & Bond 1999).

Although impacts on native species are not a result of salmon colonising native New Zealand systems but rather human intervention; salmon still appear to be the cause of these effects. While salmon are not at fault here [because they were introduced by humans, and humans choose how to value them], it does raise an interesting point about how society's construction of exotic species [i.e. salmon] influences the management of indigenous species [e.g. seals]. Salmon are present in a number of rivers and their management appears to be strongly driven by New Zealand society's perceptions and attitudes towards them as entitled to be there. These attitudes are fundamentally driven by recreational and commercial interests. This implies that the general public (at times) attach more use and value to exotic species such as salmon, trout, and lambs than to native species such as eels, seals, and keas.

Evidence of direct negative interactions between trout [particularly brown trout] and native fish comes from studies of species overlap (Crowl et al. 1992; David et al. 2002; McIntosh et al. 1994). As a result of these exotic/native interactions, many native fish populations have become isolated and fragmentary (David et al. 2002; McIntosh et al. 1994). In fact, in areas such as Otago, FGNZ has supported research into assessing the benefits and losses of removing trout from small streams that hold rare native fish (Deans et al. 2004 cited in Harding 2004).

Salmon, on the other hand, are not responsible for displacing native freshwater fish (Quinn 2005). By the time salmon return to the rivers to spawn they have already gorged themselves on food at sea in preparation for the journey to their spawning grounds. Upon entering the freshwater environment, salmon no longer feed and are regarded as extremely efficient transporters of eggs and sperm (Millichamp pers comm. 2006). There is no time for salmon to feed; their primary focus is to reach the headwaters, spawn, and die. Therefore their impact to native freshwater fish is minimal. However, their impact on native marine fish is something that has not been fully explored (Unwin pers comm. 2006).

### 4.3 Biological Lifecycle of Salmon

There are generally between seven or eight biological stages of Pacific salmon depending on whether you consider the egg stage as one of them (Netboy 1974). The biological stages are illustrated in Figure 5, followed by a brief description.

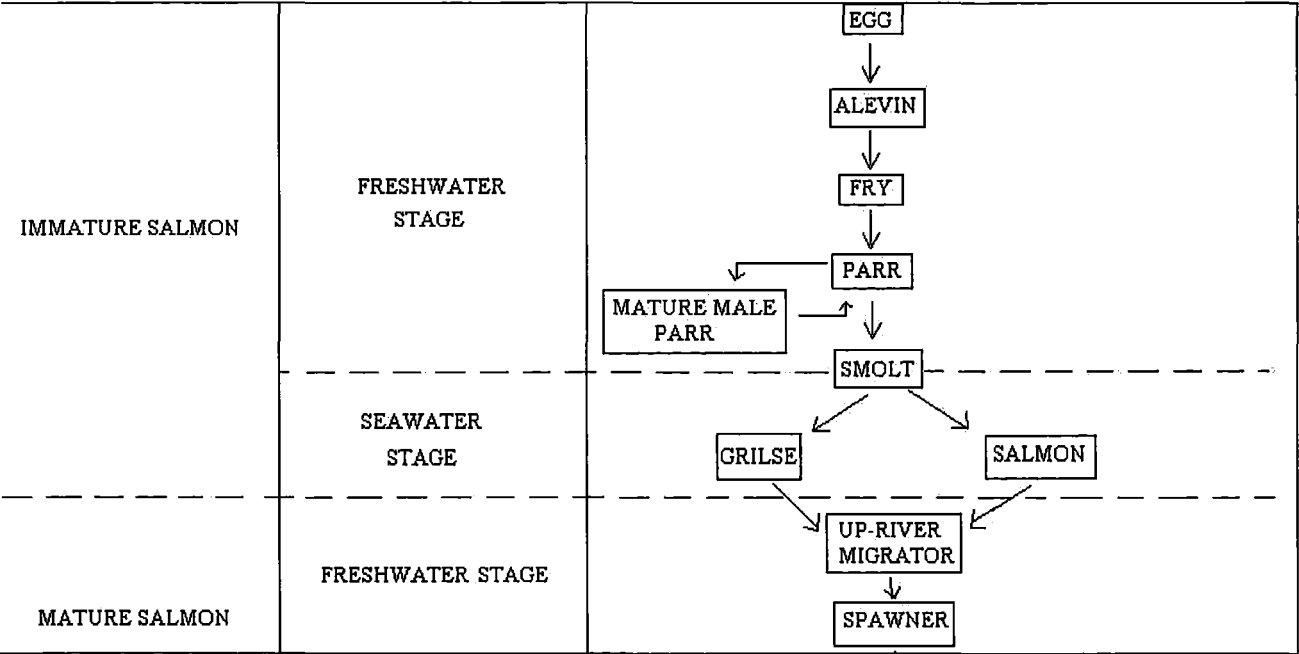


Figure 5: Biological development of salmon (Laird & Needham 1988: 17)

**Egg:** Eggs are laid in large depressions [redds] hollowed out in gravel beds. The embryos hatch following a 3-4 month incubation period.

**Alevins:** Alevins are newly hatched young with an unabsorbed yolk sac, and the alevins [sac-fry] remain in the gravel for another 2-3 weeks.

**Fry:** Fry absorb their yolk sacs, emerge from the gravel, and are ready to feed on aquatic insects.

**Parr:** Parr are older juveniles that display prominent parr marks; otherwise, they are known as fingerlings that live in the river for nearly a year.

**Smolt:** Smolt are young salmon at the transition stage between freshwater and saltwater. They acclimatise at the river mouths before migrating out to sea.

**Grilse:** Grilse are salmon that spend one winter in the sea and have returned to the river to spawn.

**Jack:** Jacks are sexually precocious salmon, usually males, who spend one winter or less in the sea.

**Spawner:** Spawners are mature salmon that return to their natal river usually after spending between 2 – 4 years at sea; the female is called a “hen” and the male a “cock”.

**Kelt:** Kelt are salmon that survive spawning, and return to the ocean to potentially spawn in the rivers again, but this very rarely occurs to chinook/quinnat salmon in New Zealand (Quinn 2005).

#### 4.3.1 Physical Description

Chinook/quinnat salmon are distinguishable from other species of salmonids by the body colouration (Quinn 2005), specifically the spots on the back and tail, and the solid black colour of the lower gum line (Flain 1973). Some reproductively mature females have been observed to retain their ocean colourations [silvery with a green tinge] even during spawning, but otherwise during spawning the flesh colour fades (McDowall 1994; Netboy 1974).

#### 4.3.2 New Zealand Populations

Wild sea-run populations of chinook salmon are present in all six South Island Fish & Game Regions. Table 3 illustrates the estimated population range of chinook salmon in rivers, alongside imputed significance as a fishery. The Waimakariri and Rakaia Rivers are nationally the most significant rivers of the salmon fishery in New Zealand. These are followed by the Rangitata and Waitaki Rivers, which are still considered nationally significant fisheries, but have suffered from low flows due to water abstraction, unscreened abstractions<sup>30</sup>, and instalment of dams.

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<sup>30</sup> Unscreened abstractions refer to points in the river where water is abstracted and there is no mesh screening to prevent salmon from entering the pipes. This can result in death for some salmon smolt.

River	Estimated Population Range 2001-2005	Estimated Maximum Historical Run	Fishery Significance
Wairau	100-300	300	Locally Significant
Clarence	100-500	500	Locally Significant
Waiau (Nth Canty)	200-500	3000	Regionally Significant
Hurunui	100-1000	5000	Regionally Significant
Ashley	20-100	250	Degraded by low flows
Waimakariri	2000-5000	15000	Nationally Significant
Rakaia	1500-5000	23000	Nationally Significant
Ashburton	20-100	5000	Locally Significant, Degraded by low flows & mouth closures
Rangitata	900-2000	13000	Nationally Significant, Degraded by unscreened abstractions
Orari	50-200	1000	Locally Significant
Opihi	350-2000	4500	Regionally Significant
Waitaki	1500-2200	36000	Nationally Significant, Degraded by in-stream dams & unscreened abstractions. Fishery upstream of Waitaki Dam extinct
Moeraki	50-200	200	Locally Significant
Mapourika	125-400	400	Regionally Significant
Paringa	150-350	700	Regionally Significant
Taramakau	50-300	300	Locally Significant
Hokitika	50-300	300	Locally Significant
Haast	50-300	300	Locally Significant
Taieri	50-300	500	Locally Significant
Clutha	50-1000	5000	Regionally Significant, Degraded by in-stream dams. Fishery upstream of Roxborough Dam extinct.
Mataura	20-100	100	Locally Significant
Oreti	50-250	250	Locally Significant
Waiau (Southland)	100-400	400	Locally Significant
Hollyford/Pyke	50-400	400	Locally Significant

**Table 3: Summary of anadromous salmon populations in New Zealand (FGNZ 2006: 6)**

### 4.3.3 Physiology

Chinook/quinnat are born and bred in freshwater and migrate to sea at an early age where they grow for two, three and sometimes four years of age before returning to freshwater to spawn (Quinn 2005). The only real difference for salmon between the two waters is due to a physical process known as osmosis. In the sea, the water has a higher concentration of minerals than the fish's bodily fluids, so water tends to leave the fish. Naturally, the fish's bodily mechanisms work to stop this happening. In freshwater however, the reverse is true. The fish's bodily fluids are of higher concentration than the surrounding water so the water tends to move into the fish, and as above, the fish's bodily mechanisms keep the water out. This is the only significant physical difference that salmon undergo in the two environments.

#### **4.3.4 Size**

The average size of chinook salmon in New Zealand is between 70-90cm in length, and 5-10kg in weight, and may reach up to 30kg in some instances (Quinn & Unwin 1993). Generally, the Pacific Northwest chinook salmon are much bigger in size than New Zealand chinook/quinnat salmon, ranging from 5-60kg. On average, New Zealand salmon spawn every 3rd year while Pacific Northwest salmon spawn every 4th year. It is thought that the extra year of maturity at sea correlates with bigger fish sizes (Quinn 2005).

#### **4.3.5 Habitat**

During the freshwater stages chinook/quinnat salmon in the Northern Hemisphere inhabit gravelly, spring-fed rivers (or snow/rain fed rivers in New Zealand) that ideally range between cool-water temperatures of 11-14 degrees Celsius (Netboy 1974). Temperatures are strongly related to latitudinal distribution, and appear to be how chinook/quinnat salmon have retained a self-sustaining population in New Zealand outside of the Pacific Northwest Ocean (Quinn & Unwin 1993).

#### **4.3.6 Diet**

In North America, chinook/quinnat generally feed on herring, but have been discovered with euphausiids, shrimps, amphipods, copepods, pteropods, and squid in their stomachs (Netboy 1974). In New Zealand there is evidence to suggest that chinook salmon eat red krill in the ocean environment (Unwin & James 1998). In turn, chinook salmon are preyed upon by pollocks, tuna, and seals. In British Columbia colonies of native seals feed on salmon at river mouths where salmon spend time acclimatising to freshwater before returning to spawn (Netboy 1974). During the spawning season in the Northwest Pacific, native seal colonies are hunted by humans at river mouths to reduce their impact on the salmon fishery. In New Zealand, seals are sometimes relocated when they disturb sea cage salmon-rearing operations, as they are often perceived of as 'predators' of salmon (Deans et al. 2004 cited in Harding 2004).

Templeton (1995: 61) provides the following summary of what he derives to be the average biological characteristics of, and environmental needs for, chinook salmon (Table 4).

Temperature for growth [from egg to smolt stage]	13 – 15 Degrees Celsius
Spawning temperature	0 – 8 Degrees Celsius
Spawning season	Autumn
Size of spawning gravel	3 – 16cm
Egg size	5 – 7mm
Number of eggs per kg of body weight	1100 – 2000
Incubation period [at 5 Degree Celsius]	88 days
pH range	5 – 9
Dissolved oxygen requirements	> 5mg/L [best at 9mg/L]

**Table 4: Biological characteristics and environmental needs for salmon (Templeton 1995: 61)**

Provided that these biological parameters, physiological requirements and environmental preferences are met, chinook salmon can be farmed in many places around the world<sup>31</sup> (Templeton 1995). These parameters are well documented by Laird (1988); Netboy (1974, 1980); Quinn (2005); and Templeton (1995) and have been integrated into aquaculture to sustain growing market demands for salmon products since the 1970s (Globefish 2001). Next is a discussion of the global trends of salmon aquaculture.

#### 4.4 The Beginnings of Aquaculture

The ancient art of artificial fish breeding is claimed by Netboy (1980: 45) to have been mastered by the Chinese as long ago as 2000BC. Over the centuries they shared their vast knowledge of fish culturing with the Japanese; who were the world’s foremost fish culturists of chinook salmon in the 1970s (Netboy 1980).

According to Netboy (1980) wild stocks of Pacific salmon have been in decline for the past century or more. As a result, efforts were made to supplement them by artificial propagation. The first Pacific salmon hatchery in North America was built in 1866 on Wilmot Creek, a tributary of Lake Ontario (Netboy 1980). This marked the beginning of intensive efforts to artificially induce wild chinook runs. It was not until 1889 that Japan established their first salmon hatchery on the Ishikari River in Hokkaido (Netboy 1980). This facility was designed to act as the nucleus or central station of the Hokkaido salmon hatchery system, supplying eggs for other hatcheries. It was considered to be a huge success and was regarded as “the world’s largest salmon hatchery system” in 1980 and described as “intensive farming” (Netboy 1980: 47). Now

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<sup>31</sup> Provided there are no predators, waterborne diseases, or other impacts that may affect farming (Templeton 1995)

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there is evidence to suggest that artificially inducing runs leads to genetic weakening of wild stocks and negatively impacts the wild fishery (Unwin & Glova 1997). Given that the bulk of Japanese salmon rivers' have been polluted and ruined, there are some fifty pond farms and eighty egg-collecting stations on the island of Hokkaido and about the same number on Honshu (Netboy 1980: 50).

4.4.1 Worldwide Commercial Salmon Production

There are currently two methods used to commercially produce salmon; i) wild capture fisheries and ii) captive fisheries or aquaculture (which will be discussed further in Chapter 5).<sup>32</sup> The global supply of farmed and wild salmon species has increased almost fourfold between 1980 and 2001 (Globefish 2001; McKinnell et al. 1997). In particular, farmed salmon production has experienced tremendous growth since the 1980s. The explosion in global salmon production has influenced the management of captive salmon in New Zealand [discussed in section 4.6]. Between the mid 1980s to mid 1990s worldwide production of farmed salmon increased almost tenfold, illustrating captive salmon aquaculture as a remarkable growth industry. Figure 6 illustrates the growth of the salmon aquaculture industry. In comparison, wild salmon production has globally shown a general downward trend since 1995. Since 1997 the world production of farmed salmon has exceeded the world production of wild capture [Figure 6]. In fact, by 2001 60% of the world's salmon supply was farmed salmon (Globefish 2001; Noakes et al. 2003). There is a clear trend illustrating the niche opportunities for captive aquaculture, compared to that of capture fisheries for salmon.

World production of farmed and wild salmon 1985 - 2001

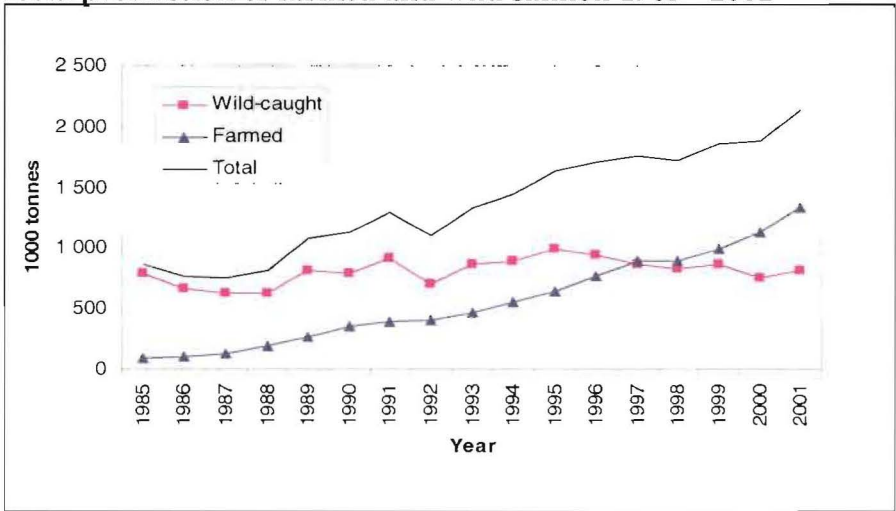
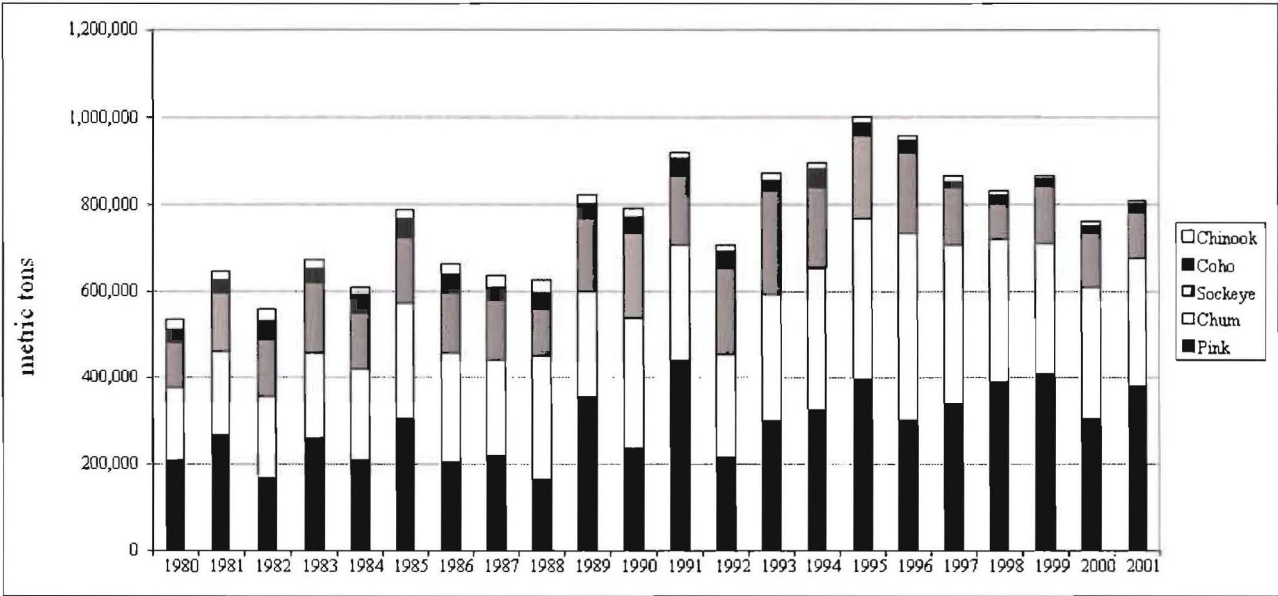


Figure 6: World production of farmed and wild salmon 1985 – 2001 (Globefish 2001).

<sup>32</sup> Section 5.4

Captive fisheries are becoming more common due to the decline in wild stocks (FAO 2002, 2004, 2006; Globefish 2001; Noakes et al. 2003). On the other hand, capture fisheries are becoming less common despite the fact total wild salmon production<sup>33</sup> peaked in 1995. Since 1995, wild salmon production has declined. The order of the five highest commercial harvesters of wild salmon are; pink, chum, sockeye, coho, and chinook salmon [Figure 7]. By comparison, chinook salmon make up a relatively small percentage due to the relatively small size of the wild fishery, coupled with the fact certain chinook runs in certain rivers are recognised and regulated for under the United States Endangered Species Act (Globefish 2001).



**Figure 7:** Worldwide wild harvest by species (Globefish 2001)

#### 4.4.2 Economic FoR

“The salmon family is among the world’s most well regarded and highly priced fish as well as being among the most international” (Shaw & Muir 1987: 1).

It appears that at least some discourses of salmon are embedded within economic narratives such as described above. The phenomenal growth in salmon aquaculture is evidence of this FoR. For instance, CBA studies reveal a wide body of work on the economic feasibility of salmonid aquaculture (Globefish 2001; FAO 2006). In fact, even the recreational values attributed to wild salmon fisheries [for recreational purposes only] are being studied now. A Contingent Valuation [CV] study was conducted by Waikato University researchers illustrating the non-market values of chinook salmon, steelhead trout, and Snake River recreation for the Snake River area, Pacific Northwest. Their findings illustrated that if four hydro dams were removed from the river, people were prepared to pay \$15.72 per day for the added recreational activities (Kaval 2002).

<sup>33</sup> The meaning of ‘production’ includes wild - harvested salmon, and farm - produced salmon.

These are but several examples where salmon have been perceived through economic lenses. A newer more revised version of the Economic FoR is presented in Chapter 7.

**4.5 Tasmanian ‘Atlantic’ Salmon**

The Tasmanian salmon fishery fulfils a niche market, producing 17,600 tonnes of Atlantic salmon in 2005-2006 (Montague pers. comm. 2007). This accounts for ca. 1.6% of total world Atlantic salmon production, and ca. 0.5% of all salmonids farmed worldwide (Montague pers. comm. 2007). Tasmania’s production of farmed salmon has risen forty-fold since 1986 when commercial farming first began. At present there are 14 commercial operators in Tasmania; nine sea cage rearing facilities, and five freshwater hatcheries (A.A.P 2007). By comparison New Zealand has 14 sea cage rearing facilities and 12 freshwater hatcheries, but only managed to produce ca. 7,000 tonnes of [chinook] salmon in 2006 (Gillard pers. comm. 2006). Figure 8 is a growth chart illustrating Tasmania’s production of Tasmanian ‘Atlantic’ salmon since 1986.

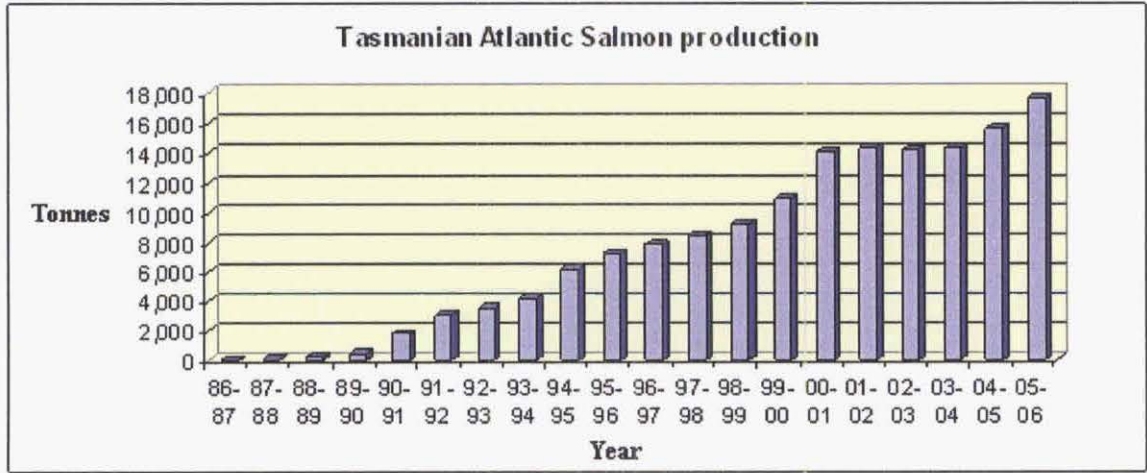


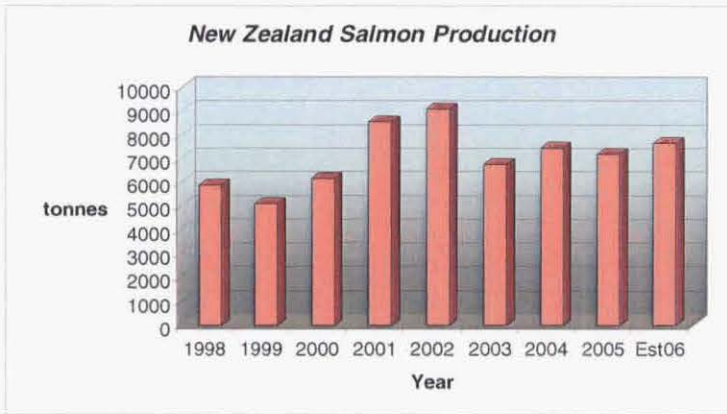
Figure 8: Tasmanian Atlantic salmon production 1986 – 2006 (Montague unpubl. data. 2007).

In addition to Tasmanian Atlantic salmon, South Australia began rearing Atlantic salmon in 1996, and by 2002 reached production levels of 64 tonnes per annum.

**4.6 New Zealand Chinook Salmon Production**

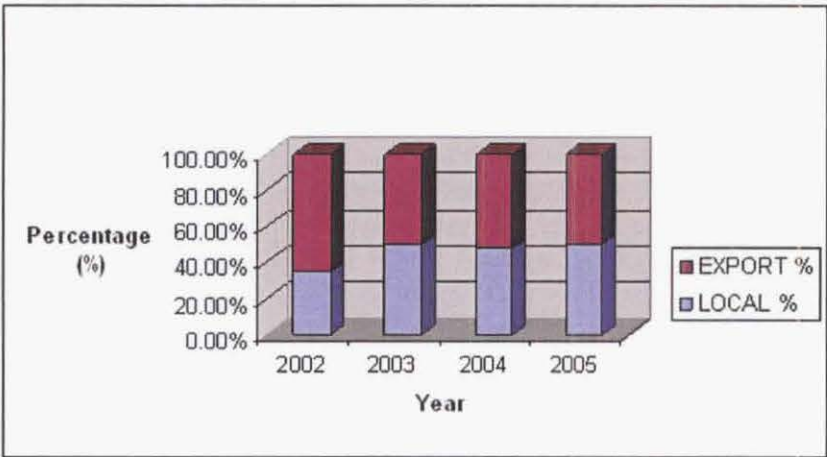
New Zealand fulfils a niche market for producing chinook salmon [Figure 9], contributing approximately 7,000 tonnes to worldwide production in 2005 (Gillard pers. comm. 2007). Aquaculture has been growing rapidly in New Zealand mostly through commercial production of three species; greenshell mussels, ‘king’ or ‘chinook’ salmon, and Pacific oysters (Jeffs 2003).





**Figure 9: New Zealand salmon production** (Gillard unpubl. data 2007)

Since 1998, salmon production has illustrated slow growth trends despite the surge of production in 2001 and 2002, compared to other salmon producing nations. According to Field-Dodgson pers. comm. (2007) and Gillard pers. comm. (2007), the production of salmon in years 2001 and 2002 stood out mainly due to lower exchange rates [see Appendix 7] of the New Zealand Dollar [NZD] (Smyth 2005). A weaker NZD meant that exports were cheaper for overseas buyers, resulting in their ability to buy more salmon, fuelling an increase in production. This is supported by Figure 10 illustrating that over 70% of salmon produced was exported in 2002 compared with 2005 exports (Gillard pers. comm. 2007).



**Figure 10: Percentage of salmon produced in New Zealand for local and international consumption** (Gillard unpubl. data 2007)

Figure 10 illustrates that more than half of salmon produced in New Zealand is exported while the remainder is sold domestically. International demand for aquaculture products is partly driving the growth in the New Zealand captive aquaculture industry (Jeffs 2003).

According to Gillard pers. comm. (2007) 91% of salmon production in 2005 was from the marine environment [sea cage rearing], while 9% came from freshwater farms [pond rearing, and canal rearing]. This appears to be because sea cage rearing incurs less overhead costs compared

with pond and canal rearing because i) the fish live in a semi open system where ocean foods move through the cages, and ii) lower setup costs because there is no need to excavate land and monitor ponds for temperature, pH, and biological oxygen demand levels (Gillard pers. comm. 2007). Table 5 illustrates the breakdown of salmon production by salmon farmers in New Zealand between 2002 and 2007. According to Gillard (pers. comm. 2007) the total production of salmon in New Zealand comes from the following 15 salmon farms, 9 of which are scattered throughout Canterbury, 4 in Nelson, 1 in Marlborough, and 1 in Southland.

New Zealand Salmon Farmers	2002	2003	2004	2005	2006	2007 (est)
New Zealand King Salmon [NZKS] (Nelson)	5411	4420	4981	4782	5042	5670
Big Glory Seafoods (Southland)	2859	1500	1550	1600	1925	2050
Akaroa Salmon (Canterbury)	110	125	130	170	180	180
Benmore Salmon (Canterbury)	198	160	200	165	171	190
Isaac Salmon (Canterbury)	185	195	185	146	138	132
Whiskey Creek Aquaculture (Nelson)	18	8	15	110	-	-
Riverland Salmon (Canterbury)	85	80	98	77	75	88
Mt Cook Salmon (Canterbury)	105	90	120	50	80	110
Leslie Salmon (Nelson)	-	-	-	-	45	65
Winchmore Salmon (Canterbury)	55	55	67	45	67	45
Rakaia Salmon (Canterbury)	-	-	-	30	-	-
Ormond Aquaculture (Marlborough)	7	7	10	10	5	5
Anatoki Salmon (Nelson)	33	33	30	0	30	30
High Country Salmon (Canterbury)	0	50	50	0	50	50
NIWA (Canterbury)	0	0	0	0	0	0
<b>Total Production (tonnes)</b>	<b>9066</b>	<b>6723</b>	<b>7436</b>	<b>7185</b>	<b>7808</b>	<b>8615</b>

**Table 5: Salmon production by New Zealand salmon farmers 2002 - 2007** (Gillard unpubl. data 2007)

New Zealand King Salmon [NZKS] is New Zealand’s largest producer of chinook salmon followed by Big Glory Seafoods. In 2006 89% of total salmon production was produced by two New Zealand salmon farming companies; NZKS [64%] and Big Glory Seafoods [25%]. These two companies continue to dominate the production of chinook salmon in the New Zealand aquaculture industry. It is interesting to note that while the Canterbury region is recognised for being the stronghold of the wild salmon fishery, the region is not the biggest producer of farmed salmon. Could this perhaps be due to public abhorrence towards commercialisation of salmon,

or are the ocean environments in Nelson and Southland where sea cage operations take place more favourable?

#### 4.7 Other Issues

It is interesting to note that while Atlantic salmon are cultured in locations where they are considered exotic [i.e. Australia, Chile, and Pacific Canada] they are also commercially farmed within their endemic range [i.e. Norway and Scotland] (McKinnell et al. 1997). Farming a species in its endemic range raises management questions about sustainable practices, and biodiversity risks. It also raises some ethical concerns about exploitation, and black-market trading of native species. Another issue is the introduction of Atlantic salmon to Pacific Canada for an exotic commercial fishery, as it is now feasible. This poses risks to the endemic chinook fishery with disease, competition and hybridisation (McKinnell et al. 1997). From the perspective of a moderate constructivist, it is interesting to note that much of these biological risks appear to be ‘out-weighted’ by the perceived commercial benefits from farming salmon.

Discourse analysis of the 1970s salmon farming literature reveal that the motives for aquaculture are linked with discourse such as “profit, business, demand, food, product, sales, return on investment, market, opportunity, development, sustainability, growth, and productivity”. These multi-million dollar hatchery enterprises were [and still are] driven strongly by commercial motives of production and profit, and although the dominant view of commercialising salmon is changing (Scarce 2000), I argue that salmon are still generally perceived through commercial “exploitive” lenses. Noakes et al. (2003: 123) supports this argument with:

“There is general agreement among most fisheries scientists and fisheries managers that most fish and shellfish around the world are being fully exploited at their maximum production potential or over-harvested” (Noakes et al. (2003: 123).

This implies that it remains difficult to change our attitudes towards salmon due to the rapidly growing industry, driven by high demand, and reaping high returns (Gillard pers. comm. 2007). It appears that Western society and capitalism have largely contributed to these exploitive pressures on many resources around the world, and salmon are no exception – whether for commercial or recreational purposes. The fact that it is now feasible to commercially farm Atlantic salmon within the endemic Chinook range is proof of these exploitive drivers.

#### **4.7.1 Trout Farming**

According to Jeffs (2003) one anomaly in the New Zealand aquaculture framework is the complete ban on farming trout species, which are one of the most widely farmed aquaculture species in the world. New Zealand is the only country in the world where trout farming is ‘illegal’, while other salmonid species can be farmed and play an important role in New Zealand’s commercial aquaculture (Field-Dodgson pers. comm. 2006). Jeffs (2003) argues that previous Government committees have recommended lifting the ban; however, successive Governments avoid the issue due to political pressures from the recreational trout angling community. Not only is this an example of how powerful society’s views can be toward influencing management, but it proves that recreational views toward wildlife resources can halt or restrict commercial developments of those species/resources. Next is a brief discussion about the indigenous views held towards chinook salmon in the Pacific Northwest.

#### **4.7.2 Indigenous Perspectives**

Native Americans construct chinook salmon as a life force in a similar fashion as they do with the wolf, bear, fox, eagle, raven and especially the coyote (Netboy 1974).

“They consider salmon [sic] to have semi-human characteristics through the belief that they mould into human shapes and mingle with the people on earth as Homeric gods did” (Netboy 1974: 271).

This gives the Native Americans the ability to spiritually communicate with animals from land, water, and sky, as the transition between man and animal is bridged by their spiritual outlook on life. For this reason Native Americans’ generally construct salmon differently to Western cultures.

Common amongst Native American discourse is the reference to “gods” or “superiority” when speaking about salmon. This is partly because the spawning run is seen as a gift from the coyote gods to the Native Americans for food and health (Netboy 1974). In return, Native Americans carryout salmon “ceremonies” in gratitude and acknowledgment of the spiritual world (Netboy 1974: 271). Subsequently their view of salmon shapes the way they manage their local fisheries with non-over-exploitive methods. Interestingly this is similar to the way indigenous Maori sustainably approach fishery management in New Zealand [covered in Chapter 7].

#### **4.7.3 Conservation in the Pacific Northwest**

Research on salmonids has had a substantial impact on conservation biology and conservation genetics (Hendry & Stearns 2004). Arguably, one of the more obvious impacts of salmonid research is its contribution to the United States Endangered Species Act [ESA] passed in 1973 (Czech & Krausman 2001). At present, the ESA mandates full protection of “any distinct

population segment of any species of vertebrate fish or wildlife which interbreeds when mature” (Hendry & Stearns 2004:16). The interpretation of this mandate is critical for salmonids because of their tendency to form thousands of distinct populations that are partially isolated from each other due to differences in natal homing, geographic barriers, and hybridisation. To protect every such population would be impossible in practice and indefensible in the political arena, therefore Waples (1991) cited in (Hendry & Stearns 2004:16) suggested that assigning “distinct population segments” as the more conservative “evolutionarily significant unit” [ESU] would help simplify the complexity. To be an ESU, a population or group of populations (1) must be substantially reproductively isolated from other co specific population units, and (2) must represent an important component in the evolutionary legacy of the species. The ESU definition has contributed to the listing of many populations of vertebrates as endangered under the ESA in the United States and elsewhere (Waples 1995; Ford 2003). This Conservation FoR merely illustrates one example where salmonid research has shaped the development of the ESA. Moreover, this poses questions of whether chinook salmon in New Zealand are considered to be an ESU under the ESA, and if so, are they considered an important component of the evolutionary legacy of the species. For more examples of newer, revised versions of the Conservation FoR, see Chapter 7.

#### **4.8 Chapter Summary**

Chapter 4 found that Pacific salmon [such as chinook salmon] differ from Atlantic salmon because Pacific salmon die after spawning, which was partly why settlers tried in New Zealand to liberate Atlantic instead of chinook salmon. The sections on the taxonomic and common names of *Oncorhynchus tshawytscha* in New Zealand concluded that their common names were dependent on time, place, and culture. In New Zealand’s context, salmon appear to be known as “Quinnat” by anglers, “Chinook” by managers, academics, and tourists, and “King” by certain actors in industry and marketing. Insights into their evolution, biology and physiology were provided to demonstrate physical characteristics, lifecycle stages, and ideal habitat requirements for salmon in New Zealand. This was followed by wide coverage of worldwide salmon aquaculture, illustrating increasing production trends for captive fisheries and downward trends for capture fisheries. This part of the Chapter highlighted the issues and opportunities that face captive fisheries. In terms of New Zealand production, all salmon are produced from captive fisheries with the exception of some salmon caught in the marine environment as by-catch. Two salmon farming companies produce almost 90% of New Zealand’s total salmon production, of which more than half is exported. Interestingly these two companies are not located in the heart of salmon country; Canterbury, but instead at opposite ends of New Zealand’s South Island; Marlborough Sounds and Stewart Island mainly. Lastly, Chapter 4 discussed other issues



relating to farming Atlantic salmon in the Pacific Ocean; mentioned the contentious political issues surrounding trout farming; provided insight to the way salmon are perceived by indigenous peoples' in the Pacific Northwest; and concluded with a discussion on how influential salmon have been in shaping conservation, particular the ESA in the United States.

## **Chapter 5: An Analysis of the acclimatisation and historic management of salmon in New Zealand, from a moderate constructivist perspective**

This Chapter discusses why and how salmon were acclimatised in New Zealand, and describes the functions of acclimatisation societies, where they were established, and colonists' views on the lack of sports fish and game at the time of acclimatisation. The first sections of the Chapter highlight the fact that chinook salmon were not part of the first attempts to acclimatise sports fish in New Zealand, as Atlantic salmon and brown trout were prioritised. Discussion then follows the shift away from the importation attempts of Atlantic salmon between the 1860s and 1890s, and covers the acclimatisation of chinook salmon between the mid 1870s and early 1900s.

### **5.1 Salmon Fishing: Elite Activity Democratised**

British settlers colonising foreign lands were familiar with salmon and trout angling as an elite activity that was available to only a few (Clements 1988). However while this aristocratic culture remained in Britain (Lien 2005), it formed part of the many reasons for British settlers to embark to New Zealand to establish their own governance (Donne 1924; Banwell 1966; 1994 McDowall 1994). As Young & Foster (1986: 7) mentions:

“When Europeans began arriving in greater numbers after 1840, they carried with them attitudes of rivers from another hemisphere, a different geology, and another legal system”.

Subsequently the elite activity that was once available to only a few in England became available to many in New Zealand. Salmon fishing, for example, was seen as a sport that should be democratised and made available to New Zealanders.

Young & Foster (1986) carried out interviews and reviewed anecdotal evidence of ways in which New Zealanders socially engaged with rivers during the past century. He found that:

“By far the majority of New Zealand’s towns and cities stand on the banks or at the mouths of our many rivers... most New Zealanders have a river that runs through their childhood” (Young & Foster 1986: 7).

### **5.2 Acclimatisation Societies**

“One of the early aims of the acclimatisation societies was to ship fishes and game birds to New Zealand, and get populations established here for pursuit and pleasure of anglers and shooters” (McDowall 1994: 96).

An acclimatisation society was an institution established for the specific purpose to import and acclimatise game to foreign lands and waters (Lever 1992; McDowall 1994). Acclimatisation societies were first formed in Paris, France in 1854 and in London, England in 1860 (Lien 2005), and as a result inspired a worldwide movement of acclimatisation societies beyond the British

Empire (Lever 1992). Societies began forming in the United States, South Africa, Australia, and New Zealand throughout the mid to late 1800s (McDowall 1994).

Prior to acclimatisation societies, introduction of animals and plants to New Zealand was largely a result of individual choice and investment (Lamb 1964; McDowall 1994). The introduction of foreign species to New Zealand during the 1840s and 1850s was typically uncoordinated, disorganised, unregulated, and expensive. Inspired by the acclimatisation movement in Britain, the 1860s marked the beginning of an era of New Zealand settlers coordinating the importation and establishment of exotic animals, plants and fish to New Zealand. According to Lever (1992) the stated objectives of the acclimatisation movement were to “facilitate the introduction, acclimatisation, and domestication of foreign animals, birds, fish, insects and vegetables whether useful or ornamental” (cited in Lien 2005: 663). According to Lien (2005), ‘useful’ meant any uses that generated some form of value whether they were commercial values or recreational values, while ‘ornamental’ referred to cosmetic or intrinsic values rather than a useful purpose. It appears that Atlantic salmon fell under the recreational frame between 1870 – 1900 as individuals attempted to introduce the ‘noble’ sports fish for recreational purposes.<sup>34</sup> After failing to introduce Atlantic salmon, chinook/quinnat salmon were targeted for their recreational opportunities, and attempts by various individuals to acclimatise them occurred between 1870 – 1890s. At around the turn of the 20<sup>th</sup> century, the central government became involved with introducing chinook/quinnat salmon, but did so, on the basis of establishing a commercial wild fishery. At this point chinook/quinnat salmon appeared to be constructed as commercial products, which was quite different from other introduced species such as trout, deer, chamois, and Himalayan tahr which were liberated primarily for recreational use (McDowall 1994).

### **5.2.1 The first Acclimatisation Society in New Zealand**

The first New Zealand acclimatisation society was informally agreed upon during an inaugural meeting in Auckland in November of 1861, a mere 12 months after England’s first acclimatisation society was formed (McDowall 1994). By 1862 the name of the society was changed to the Auckland Acclimatisation Society, adopting almost identical rules and regulations to the British Acclimatisation Society (McDowall 1994). The fact that little change occurred to the rules and regulations for acclimatisation societies in New Zealand lends support to Young & Foster’s (1986) claim that European attitudes were transferred to another hemisphere, a different biogeography, and established a new legal system. The establishment of the society in Auckland

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<sup>34</sup> Because this thesis is about chinook salmon, Chapter 5 focuses on acclimatisation history involving chinook salmon.

appears to have instituted the acclimatisation movement in New Zealand, with seven societies rapidly forming between 1863 and 1871, illustrated in Table 6.

Name	Year formed
Wanganui Acclimatisation Society	1863
Nelson Acclimatisation Society	1863
Canterbury Horticulture and Acclimatisation Society	1864
Canterbury Acclimatisation Society	1864
Otago Acclimatisation Society	1864
Hawkes Bay Acclimatisation Society	1867
Wellington Acclimatisation Society	1871

**Table 6: Summary of early formation dates and places of New Zealand acclimatisation societies (McDowall 1994).**

**5.3 The Colonists’ Social Construction of Improving Nature**

“A long and honourable tradition in western culture, dating back at least to the Romans, of tinkering with fish faunas by adding new species, is part of a much broader tradition of tinkering with nature to ‘improve’ it” (Moyle et al. 1986).

Until the twentieth century, at least, New Zealand appears to have followed the tradition described in the quote above in thinking about nature. The formation of acclimatisation societies throughout the 1860s to assist “progress” and “improve” nature to meet human desires is evidence of this. This was [and still is] an anthropocentric attitude of moulding nature to what man perceives it should be (Steiner 2005). James Bidwell, Charles Hursthouse, James Fitzgerald, and Lake Ayson were prominent amongst several claims-makers who strongly advocated the value in introducing (Atlantic) salmon to New Zealand between 1859 and 1900 (McDowall 1994: 217).

By the mid 1860s the societies had made large efforts to establish new species of fish with particular attention on Atlantic salmon and brown trout (McDowall 1994). According to Davidson & Hutchings (1938), this was because of a perceived deficiency of fish and game in New Zealand.

“Just as New Zealand forests are destitute of game, so are its rivers destitute of fish... they boast no single fish worth the anglers’ catching” (Davidson & Hutchings 1938) cited in (McDowall 1994: 216).

During the 1860s, Atlantic salmon appeared to be socially constructed as “the King of sporting fishes” in England (McDowall 1994: 229). However, Atlantic salmon failed to establish self-

sustaining runs with the exception of a land-locked stock in Lake Te Anau, and chinook/quinnat salmon from the Pacific Northwest were substitutes to “improve nature”. Moyle et al. (1986) outlines that this view fits into a larger construction held at the time by settlers that New Zealand was a harsh, isolated and dull landscape that needed something of a homely “touch up”. Salmon and trout, along with common British species such as red deer, rabbit, hare, quail, pheasant, partridge, duck, and goose, in addition to the chamois from Central Europe and Himalayan tahr from Nepal, were no exception to this construction of improving nature in New Zealand. Interestingly, New Zealand anglers’ now perceive chinook salmon as the king of freshwater sports fish (Millichamp 1997; Harding 2004).

### **5.3.1 From Northern Hemisphere to Southern Hemisphere**

The concept of introducing European fishes to New Zealand was propelled in 1852 by James Bidwell, the Commissioner of Crown Lands in New South Wales (McDowall 1994). According to Leitritz (1970: 231), Bidwell stated that:

“The admirable and noble rivers of New Zealand should be scantily stocked with salmon, brown trout and other valuable fish from Europe”.

This reflected the Western view that in order for rivers in New Zealand to be “noble” they should be stocked with European fish. This historical construct partly suggested that the New Zealand rivers and the native fish living in them were inadequate for anglers. Donne (1927) found support in this claim, quoting a member of the Wellington Society, William Spackman who claimed that:

“In the 1860s [sic] not one of these rivers had the least interest for the angler... the rod of the fishermen never cast a shadow on their waters; every one of the thousands of creeks and streams that flow into them... were tenantless and profitless to the sportsman” (Donne 1927: 37).

After numerous, costly attempts to ship trout ova<sup>35</sup> across the world from England in packages of ice, they finally arrived successfully in Hobart, Tasmania in 1864 (Lamb 1964). Tasmania provided a stop off point for brown trout to be acclimatised, before being shipped across the Tasman Sea to New Zealand. During the years between 1864 and 1867, the Otago and Canterbury Acclimatisation Societies were each designing an acclimatisation garden<sup>36</sup> in their respective territories in order to take such shipments. During 1867 brown trout were successfully acclimatised which began the long sequence of introductions (Lamb 1964). “This was historically one of the most enduring and intensive efforts to introduce an exotic species to a new country” (McDowall 1994: 231), so much so, that the next year in 1868, imports of Atlantic

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<sup>35</sup> Female gametes or eggs

<sup>36</sup> The two acclimatisation gardens were two sunken artesian wells, abundant with pure, cool temperate waters for acclimatising trout (Lamb 1964).

salmon from England made it to the shores of New Zealand. The majority of the ova perished during the shipment from Europe partly because of poor technology and understanding of transporting fish eggs, but also as a result of there not being hatcheries in New Zealand to cater for such shipments.

By 1884, the New Zealand Government became involved and gave the Canterbury Acclimatisation Society more direct investment and discipline.<sup>37</sup> The Government provided the support in the form of hatcheries so that “substantial” shipments of ova [Atlantic salmon and brown trout] could be utilised for captive breeding (McDowall 1994: 234).

The Government extended their efforts to establish brown trout using the appropriate regional acclimatisation societies throughout New Zealand, releasing reared fish from hatcheries into multiple rivers (McDowall 1994). Initial salmon importations were of Atlantic salmon, illustrating the Government’s preference at the time for acclimatising salmon from Northern Europe to New Zealand, even though the logistics were more challenging than they need have been compared to imports from the United States for example. Some of the brown trout stocks were released in the Selwyn River for a landlocked stock in Te Waihora, Lake Ellesmere; a culturally significant body of water for Ngai Tahu (Gough & Ward 1996). Efforts to acclimatise Atlantic salmon, on the other hand, were clearly a failure during the latter half of the 19<sup>th</sup> century. Given that Lake Ayson had made a tour of chinook/quinnat hatcheries in the United States in 1899/1900 (McDowall 1994), efforts soon shifted to chinook/quinnat salmon. Chinook/quinnat salmon were successfully introduced between 1901 and 1906 (Lamb 1964; McDowall 1994).

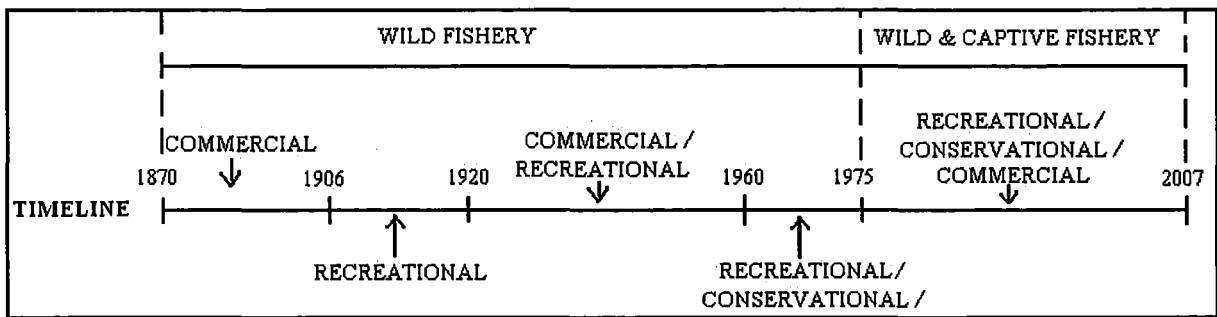
#### **5.4 Overview of Attitudes toward the New Zealand Salmon Fishery 1870 – 2007**

Before providing a chronology of the salmon fishery, it is important to distinguish that there are two types of salmon fishery in New Zealand. The first is a wild salmon fishery, which relates to any salmon born and bred in the natural environment. Generally speaking there has been a wild salmon fishery in New Zealand since 1906. The second is a captive fishery, whereby the salmon are cultivated and reared in large numbers in non-natural environments like a hatchery or fish farm. Captive fisheries have been largely operational since the mid 1970s. Salmon anglers are generally only interested in the wild fishery for recreational purposes, but also express concerns about the potential negative effects of captive fisheries to wild fisheries such as hybridisation (see Unwin & Glova 1993).

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<sup>37</sup> Discipline has been used to describe government intervention, i.e. regulations to assist the importation of ova to New Zealand.

Figure 11 presents a timeline of what appear to be the dominant attitudes held toward the wild and captive fisheries at the time according to Hardy (1989), Young & Foster (1986) and McDowall (1994). While it is difficult to chronologically categorise the fishery, this is an attempt to illustrate the ways in which the fishery has been historically framed.



**Figure 11: Trends in attitudes towards chinook salmon in New Zealand**

The following section provides a general overview of salmon introductions, policies, and management since attempts at their acclimatisation in New Zealand. I have selected what I consider the most important dates in an attempt to provide a historical overview of chinook salmon in New Zealand. The unsuccessful attempts to ship Atlantic salmon are not covered in this section.<sup>38</sup>

### 5.5 Historical Overview of Chinook/Quinnat Salmon in New Zealand

#### 5.5.1 1870 – 1906 Commercial

While the main motive of attempts to acclimatise chinook salmon to New Zealand rivers in 1875 is not explicitly mentioned<sup>39</sup>, there is evidence to suggest that because the Government had a commercial stake in acclimatising chinook salmon, they were deemed suitable for commercial purposes (McDowall 1994: 261). By the turn of the 19<sup>th</sup> century, the intentions for chinook salmon resembled that of a ‘commercial’ status as outlined in McDowall’s (1994) work.

“In itself, this story is not part of the acclimatisation society history, as the societies were little more than spectators of the process and beneficiaries of its success” (McDowall 1994: 261).

McDowall (1994) implies that the Government’s prominent role during the successful establishments of chinook salmon between 1901 and 1906 led to their status as commercial products. However, after the first successful liberations of salmon, the Government’s

<sup>38</sup> Some mention has been made earlier in Chapter 5.  
<sup>39</sup> Because the acclimatisation societies intended chinook salmon for recreational use while central Government intended them for commercial purposes.

expectations of establishing commercial fisheries appeared to be superseded by the angling community's strong recreational interests (Young 1986).

The Auckland Acclimatisation Society was interested in acclimatising salmon from San Francisco as early as 1869 (Sullivan 1998). However, the first shipment of chinook salmon ova from Baird Hatchery [McCloud River, California] did not take place until 1875, arranged by the Hawkes Bay Acclimatisation Society [HBAS] (Bryant 1979; McDowall 1994; Sullivan 1998). This consignment failed due to premature hatching and in quick response the chinook fry were released into unsuitable waters in the Auckland district. Insufficient numbers of fry and an unfavourable marine environment resulted in the failure of the first attempt at acclimatisation (Bryant 1979). It appears that time offshore, poor technology, and lack of knowledge were the contributing factors to their failure.

Nonetheless, attempts did not halt there, as Young & Foster (1986: 35) claim that the New Zealand Government approved commercialisation of salmon due to the fortunes made during the late 1800s from salmon canneries and hatcheries in the Sacramento River, California. Additionally, Young & Foster (1986) added that chinook salmon had one advantage over Atlantic salmon in that they were a Pacific fish. Interestingly chinook salmon favoured the East Coast rivers of the South Island, adjacent to the Pacific Ocean. However, there are wild stocks found in some West Coast rivers of the South Island that flow into the Tasman Sea.

Between 1875 and 1900, the HBAS ordered several consignments of ova to establish a wild chinook stock. According to McDowall (1994) these consignments also proved unsuccessful for the same reasons as mentioned above, however Parsons & Hammond (1989: 105) claimed that "three quinnat salmon weighing 8 lb, 5¼ lb, and 4½ lb respectively, were caught in the Waimakariri River in 1880". Due to an inability to compare the fish caught with a full sized American quinnat, which would have needed to be shipped in spirits or ice, the identification was never made, and thus remains speculative. It was during 1901 when the first successful establishment of salmon ova was recorded in New Zealand (McDowall 1994). The accomplishment was made possible at the turn of the 20<sup>th</sup> century by the establishment of a Government run hatchery on the Hakataramea River, a prominent tributary of the Waitaki River, South Island (Flain 1981). The hatchery was designed with the help of Lake Falconer Ayson (former manager of the Wellington Acclimatisation Society trout hatchery in Masterton) in 1900 to introduce salmon smolt to New Zealand rivers (McDowall 1994: 104).



Initially, Ayson's role was to farm chinook/quinnat as New Zealand's first "salmon farmer".<sup>40</sup> However, over time, Ayson's involvement began to influence government policy (McDowall 1994). By the end of the nineteenth century, the New Zealand government, and a number of sports-fishers had tired of haphazard and only partially successful efforts at acclimatisation of sports and commercial fish species by incorporated societies and private individuals. During this time, Ayson led the campaign for a scientific "fish culture" approach to establish salmon in New Zealand. In 1898, Ayson was appointed inaugural Inspector of Fisheries in the Marine Department.

In June/July 1899, Ayson embarked on a fact-finding tour to Europe, the United States, and Canada. During Ayson's visit to Battle Creek, he established cordial links with manager John P. Babcock<sup>41</sup> and advocated the establishment of a government-regulated commercial salmonid fishery in New Zealand. Chinook/quinnat salmon were nominated as the best initial commercial prospect, even though Atlantic salmon and others were more desirable from a culinary and sporting perspective. Ayson believed that chinook/quinnat salmon would provide food for domestic consumption and benefits for recreational fishing, and that Atlantic salmon should be pursued alongside the chinook/quinnat "initiative" (McDowall 1994).

In 1900/01 Ayson oversaw the construction of a government hatchery on a river flat immediately adjoining the Hakataramea River, a tributary of the Waitaki River. Ayson calculated that the Waitaki River provided the best southern analogue for wild habitat because of the coastal currents that enabled opportunities for natural colonization of rivers further north along the east coast of the South Island (Montgomery, unpublished research 2007). During the same year, an agreement was made between the United States Bureau of Fisheries and New Zealand Marine Department for the former to provide at least one consignment of Californian chinook/quinnat salmon [fertilised] ova from Baird Station, an egg-collecting station on the McCloud River, a tributary of the Sacramento River, at the cost of packing and shipping only.

The agreement was brokered by individual managers [Lake F. Ayson of Hakataramea hatchery, New Zealand, and George H. Lambson of Baird Station, United States] followed by five shipments, the sequence being as follows:

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<sup>40</sup> Ayson was not only an influential salmon "farmer," he was also an influential salmon "framer" in New Zealand during the early 20<sup>th</sup> Century. Dave Hughey and Bob McDowall were also influential salmon "framers" in New Zealand during the latter half of the 20<sup>th</sup> and early 21<sup>st</sup> Centuries respectively.

<sup>41</sup> Babcock privately tours New Zealand years later and advises the Marine Department in a combined "audit" by international visitors.

- 1901 – 500,000 ova arriving in early January in the care of G. H. Lambson, superintendent of the Baird Station.
- 1904 – 300,000 ova arriving in January again with G. H. Lambson.
- 1905 – 300,000 ova accompanied by L. F. Ayson. No date.
- 1906 – 500,000 ova accompanied by L. F. Ayson. No date.
- 1907 – 500,000 ova arriving in February, accompanied by L.F. Ayson.

(Source: McDowall 1994: 4).

Bryant (1979: 10) argues that:

“The Hakataramea hatchery operation proved successful due to the concentration of efforts in one place, rather than broadly across different parts of New Zealand”.

Young & Foster (1986: 37) added that:

“Whether the Hakataramea River was chosen specifically or by accident, the river temperature was within the ideal range (11-14 degrees Celsius) [sic] for quinnat salmon”.

According to Bryant (1979), Young & Foster (1986) and McDowall (1994) the Hakataramea hatchery was established to i) establish and increase salmon numbers in the Waitaki Catchment, ii) create a commercial fishery, and iii) provide salmon smolts to other regions. The hatchery achieved the first and last objective relatively quickly with runs evident in the Waitaki River and adjacent catchments, but the establishment of a viable commercial fishery was not evident until the early 1920s when commercial net and rod licenses were allowed. The difficulties for the Hakataramea hatchery to establish a commercial fishery are discussed in section 5.5.3.

### **5.5.2 1906 – 1920s Recreational**

Despite the Government failing to quickly establish a wild commercial fishery, they provided people with salmon to fish for in the meantime (Young 1986; McDowall 1994). Between 1906 and 1920 the numbers of New Zealand wild chinook salmon increased, and were soon to be regarded as worthy recreational sports fish by freshwater angling communities, particularly salmon anglers (McDowall 1994).

From 1906 spawning runs were successfully established and the progeny from the Hakataramea were used to develop runs in other large river systems such as the Rakaia, Rangitata, and Waimakariri rivers (McDowall 1994). In 1909, the first recordings of salmon in the Rakaia River rewarded acclimatisation societies with feelings of accomplishment (Bryant 1979). Likewise, in 1914, chinook runs were recorded in the Rangitata River, and the Waimakariri and Waiau rivers during 1916 (McDowall 1994). By 1917, the Marine Department imposed the first

set of regulations to govern angling for salmon, setting the catch limit to six per day. It was also during 1917 that chinook fry were first liberated into the Clutha River (Bryant 1979). Reports in 1920 confirmed successful salmon runs in the Hurunui River (Cunningham 1972), and the Clutha River (Smith 1977). McDowall (1994: 226) notes, “1921 was the best year of salmon fishing ever recorded in New Zealand”. Bryant (1979) has commented that during 1922 the distribution of wild salmon were observed as far north as the Wairau River.

By 1923, trout anglers of the Otago Acclimatisation Society were disenchanted with chinook salmon and requested the Government to cease chinook liberations and try Atlantic salmon again (McDowall 1994). It seemed that while salmon of one kind or another were considered to be the king of freshwater sports fish by salmon anglers, trout anglers constructed them differently. This came about partly due to public perceptions of trout anglers claiming that the sudden explosion in chinook salmon populations was negatively affecting the wild trout fishery<sup>42</sup> (McDowall 1994). At this point there appeared, and there continues to appear, divided views on how New Zealand rivers should be stocked and managed. Disagreements were obvious not only among anglers themselves, but between the acclimatisation societies and the Government. Salmon anglers wanted to see salmon managed as a recreational resource, Government wanted them for commercial purposes, while some trout anglers did not want them at all. The following statement from the Government illustrates the position held on chinook salmon [and salmon anglers] during the 1920s:

“In view of the fact that the original object of the Government in acclimatising this fish was for commercial purposes, it is clear that the anglers, who have been enjoying quite gratuitous benefits from the fishing, have no legitimate grounds for complaint” (NZMD 1931: 11).

### **5.5.3 1920s – 1960s Commercial / Recreational**

With signs of a healthy wild fishery and improving salmon runs, the Government as originally intended, began to harness wild salmon as a commercial resource (McDowall 1994). This was met by resistance from salmon anglers who had formed high expectations of the fishery for recreational purposes (McDowall 1994). The profitable returns experienced in the Pacific Northwest during the early 1900s motivated the New Zealand Government to permit netting and rod licenses for wild salmon in the early 1920s (Hardy 1989). Between 1920 and 1960 the growth in the wild fishery was partially stunted by the establishment of dams, industrial developments, and potential overharvesting issues by commercial and recreational bodies. While there were no dams on the Rakaia or Waimakariri, the further decline in the fishery was

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<sup>42</sup> For some reason trout anglers thought that Atlantic salmon did not pose the same threats to trout that chinook salmon did (McDowall 1994).

thought to be a result of ‘unfavourable’ ocean conditions. Subsequently the wild fishery began to suffer commercially and recreationally between 1920 and 1960 (McDowall 1994).

In 1922 it became legal for licensed anglers to sell salmon and trout, so the Hakataramea hatchery became involved in smoking and despatching salmon for sale (Hardy 1989; Young & Foster 1986). Furthermore, a push from Government in 1924 led to a regulation enabling the commercial netting of salmon. This was followed by the issuing of netting and rod licenses in 1925 (Hardy 1989) legalising the commercial activities for the Waimakariri, Rangitata, and Waitaki rivers (McDowall 1994: 267). The rod selling and net fisheries were administered by the New Zealand Marine Department [NZMD], whereas the acclimatisation societies issued the sport fishing licenses for trout and salmon (Cunningham 1972).

While the Hakataramea succeeded biologically, it failed commercially. This appears to be partly due to the Ayson family<sup>43</sup> moving away from the district around 1925, coupled with the first instalments of concrete materials for the Waitaki Dam above the convergence of the Hakataramea River, and the death of Lake Falconer Ayson (Young 1986). It also appeared to be a result of too much commercial harvest too soon.

Meanwhile, the Council of South Island Acclimatisation Societies appealed in 1950 to the Government, requesting responsibility for managing salmon. By this stage, the Government had realised that the salmon fishery was not living up to their expectations of it being a commercial enterprise. In 1951, the Government promptly agreed that salmon were to be treated as a recreational species, handing over [almost by default] the management responsibilities to acclimatisation societies, who later formed the South Island Salmon Committee [SISC] (McDowall 1994: 271).

#### **5.5.4 1960s – 1975 Recreational / Conservational**

As quickly as 1952, commercial netting and rod licenses for salmon were discontinued due to concerns of depleting salmon stocks since commercialisation began (Hardy 1989). This coupled with the ongoing effects to salmon spawning due to the blockage from the Waitaki hydroelectric dam established in October 1934 led to more problems for the fishery (Natusch 1984; Meridian Energy 2005). The obstruction of the Waitaki dam meant that salmon were unable to continue to their natal headwaters to spawn.

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<sup>43</sup> The Ayson family managed the Hakataramea hatchery for 25 years between ca. 1901 – 1926 (Young 1986).

Netting at the tailrace of Highbank Power Station, Rakaia River, began in 1957 and ceased in 1960 and with it the commercial sale of salmon (McDowall 1994: 272). For the first time since their introduction, chinook salmon were regarded as a 'sports fish' by the Government (Cunningham 1972; Hardy 1989). At a similar time the Roxburgh dam was constructed in 1960, 'blocking' the Clutha River and affecting the spawning runs to the headwaters (Young 1986). The status of salmon in New Zealand rivers at this point was of grave concern to salmon anglers, as they feared increased development of rivers would further deteriorate the fishery. Throughout the late 1960s several salmon hatcheries, including Silverstream on the Waimakariri River and Glenarriffe on the Rakaia River were established. Silverstream was established in ca. 1967 to carry out research for potential commercial endeavours (Unwin pers. comm. 2006), and supplement rivers with fry and smolt on behalf of the NZMD until 1975 when it was transferred to Ministry of Agriculture and Fisheries<sup>44</sup> [MAF] and then to the Ministry of Fisheries [MFish] (Hardy 1989: 25). While the fishery was generally run as a recreational fishery during this time, the Government continued to investigate ways to revive the fishery for commercial purposes. The Glenarriffe hatchery played an important role for freshwater research of the wild fishery (Field-Dodgson pers. comm. 2006).

In August of 1966, Dave Hughey helped institute the New Zealand Fish and Wildlife Investigation Movement [NZFWIM] which was a grassroots enquiry to restructure the societies for recreational purposes (McDowall 1994). The NZFWIM expressed concerns about the inefficient management of resources that were divided between six Government departments and 23 acclimatisation societies. According to McDowall 1994: 406) these concerns were: i) the lack of coordination between the Marine Department and the Department of Internal Affairs; ii) difficulties in providing careers for eminent research scientists to support the management responsibilities for fish and wildlife; iii) insufficient fish and wildlife research; iv) inadequate research data to support management decisions; and most importantly v) conflicts of interest between commercial and recreational fisheries. The movement was a step towards improving the salmon fishery for recreational users through advocating for more efficient and effective management.

Soon after the NZFWIM, the Government made an attempt to restructure, and, perhaps, take over acclimatisation societies under the Hunn Commission in 1968 (McDowall 1994). The momentum of the Hunn Commission stemmed from ideas expressed by the NZFWIM and was regarded as the most thorough and substantial investigation of fish and game research and

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<sup>44</sup> The acronym "MAF" has undergone several changes over time from Ministry of Agriculture and Fisheries to the Ministry of Agriculture and Forestry, as have the names of the fishery ministris (MAF 2007).

management in the history of acclimatisation societies (McDowall 1994). Initially the Commission was seen as a broader attempt by Government to capitalise on not only the wild salmon fishery, but all fish and game through the sale of recreational licenses. The Commission proposed that in order to improve wildlife administration, the bureaucracy of six Government departments and 23 acclimatisation societies needed to be reduced to four wildlife conservancies comprising of 16 wildlife districts or “fish and game societies” - with all statutory functions and powers transferred from the societies to the conservancies [i.e. to the Government] (McDowall 1994: 409).

Dave Hughey and others were in favour of the recommendations suggested by the Hunn Commission because they resonated with the objectives of the NZFWIM to improve salmon management in New Zealand, but the inability for societies, Government departments, anglers, and hunters to agree on common ground meant that the recommendations by the Hunn Commission were never instituted by the Government, and by the early 1970s the movement faded.

“...There is strong and organised opposition to the implementation of the Hunn Report in its present form by many thousands of sportsmen, anglers, game shooters and deer stalkers, etc. The Report as a whole is not condemned, but the changes envisaged are highly controversial” (McDowall 1994: 411).

As a response to the exploitation of, and ongoing pressures to the wild salmon fishery, a lobbying movement helped to form the South Island Salmon Committee [SISC] in the early 1970s (Hardy 1989: 35). The Government realised that managing the wild fishery as a commercial enterprise was not sustainable and that wild salmon would be better managed as a recreational resource (Cunningham 1972). Hardy (1989: 13) supports the claim that during the 1970s “the utilisation of the salmon resource was left entirely in the hands of the sports angler”.

Arguably one of New Zealand’s keystone recreational movement began indirectly as a result of the SISC in 1970 when controversy arose regarding the structure of the SISC. Discussions at the time suggested that the committee appoint its own staff and assume control and management of the whole salmon fishery. Essentially this meant that individual societies throughout the South Island would “surrender their autonomy to one body” (McDowall 1994: 273). The indecision and uncertainty for the future of chinook salmon led to a symposium to decide how to manage salmon effectively in New Zealand. In 1971, New Zealand’s largest and most influential symposium on salmon history, biology, research and management was held in Ashburton (McDowall 1994).

Following from the symposium, Dave Hughey initiated the formation of the NZSAA in 1974 and was elected as president. It appeared that Hughey founded the NZSAA in response to his failed attempts to change management attitudes towards chinook salmon through avenues such as the NZFWIM in the late 1960s (K. Hughey pers comm. 2007). The NZSAA was an external, independent association that was established in 1974 with the intention of mobilising the public about salmon fishery issues (NZSAA 1974, Vol 1(1)). During the 1970s the NZSAA grew stronger as people fought the Government over the management and ‘protection’ of the salmon fishery, which subsequently led to other natural resource issues. The NZSAA strongly argued that the salmon fishery was part of their cultural identity as anglers, forming part of their New Zealand heritage.

The movement during this period was largely in favour of conserving recreational activities like recreational salmon fishing, as the NZSAA intentions were explicitly to improve New Zealand’s wild salmon run for anglers. The attitudes at the time also expressed strong themes of conservation. These themes of conservation expressed by the public mood in the 1970s and 1980s attuned to conservation appeared to be taken more seriously in the 1980s and 1990s. These decades saw the establishment of several Acts and Amendments such as the Conservation Act 1987 and RMA 1991 [covered in Chapter 3, section 3.5].

#### **5.5.5 1975 – 2007 Commercial / Recreational / Conservational**

Interestingly, during the mid 1970s and 1980s opportunities arose for commercialising salmon (Beckett 1981; McDowall 1990; 1994) much to the initial opposition of recreationists. However, instead of commercialising wild fisheries, the movement mainly involved the commercialisation of captive fisheries because it was perceived to be more sustainable (Crowe 1985).

During the late 1970s ocean ranching was trialled in Waikoropupu Springs near Takaka, and at the Waitaki hatchery between Waimate and Oamaru. Other ocean ranches were established at Tentburn, Lake Coleridge outlet race, and Silverstream a tributary to the Waimakariri River (Gillard pers. comm. 2007). From 1975 to 1992, Silverstream was owned by the Ministry of Agriculture and Fisheries [MAF] and operated by the Fisheries Department to provide freshwater induced runs [ocean ranching], near Kaiapoi (Hardy 1989; Unwin pers. comm. 2007). However, Silverstream suffered poor economic returns because of a lack of breeding and releasing experience, coupled by industrial pollutants to the Waimakairi River and adjacent waterways (Unwin & Boustead 2001). Like many of the ocean ranches, Silverstream stopped ocean ranching in 1982 and switched to aquaculture research and supplying hatchery reared smolts to

salmon farms around New Zealand (Hardy 1989). When NIWA was established as a Crown Research Institute [CRI] in 1992 Silverstream was transferred from MAF to NIWA (Unwin pers. comm. 2007). Since 1992 NIWA has operated Silverstream as a research facility to produce chinook smolt<sup>45</sup> from specifically selected broodstocks<sup>46</sup> with the aims of stocking South Island salmon farms, improving salmon production, and carrying out independent freshwater research<sup>47</sup> (Unwin pers. comm. 2007). The 1980s saw commercial ventures transform the salmon fishery into a mixed fishery of both wild and captive stocks (Unwin & Glova 1997).

During the 1980s disagreements between recreational interests toward the wild fishery and commercial interests toward the captive fishery were potentially resolvable by reaching a compromise between the two differing standpoints. Recreational anglers feared that the captive fisheries would impinge on their wild fisheries once mixed. While there is now evidence to justify their concerns (Unwin & Glova 1997), scientists at the time knew little about the potential adverse affects of captive stocks to wild fish. Figure 12 briefly illustrates the dichotomy between commercial interests towards captive fisheries and recreational interests towards wild fisheries.

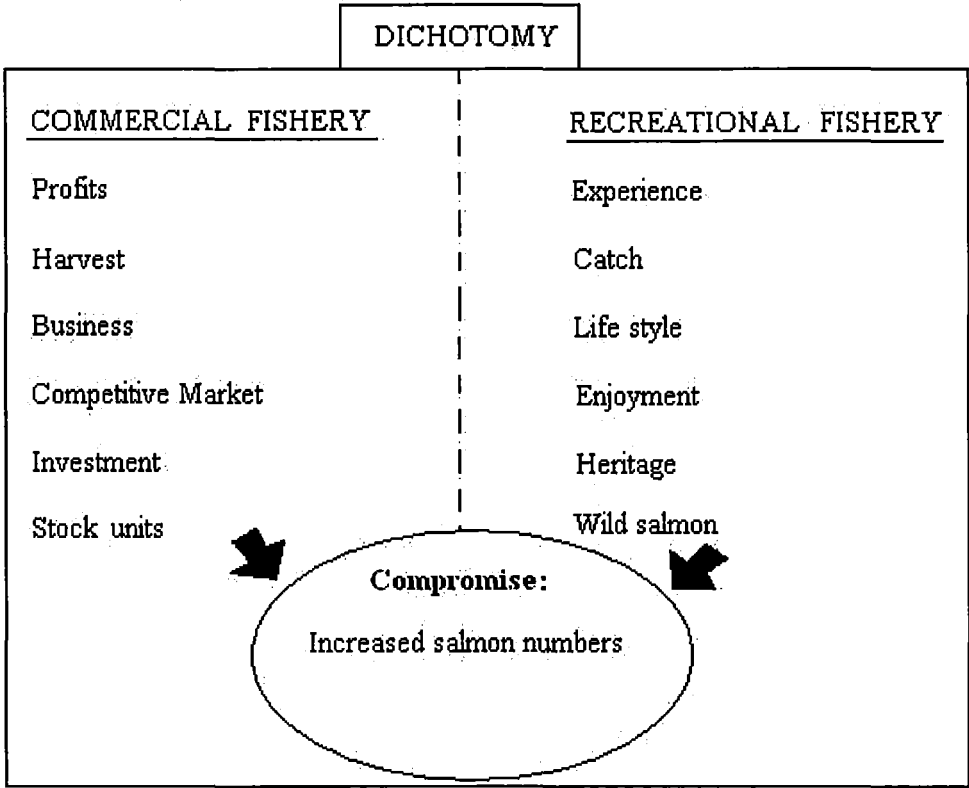


Figure 12: The Dichotomy between commercial and recreational interests

<sup>45</sup> Smolt are juvenile anadromous fishes that are physiologically ready to undergo the transition from fresh to salt water. Smolts typically measure from approximately 60 mm to 80 mm fork length.

<sup>46</sup> Broodstock are specimens or species, either as eggs, juveniles, or adults, from which a first or subsequent generation may be produced in captivity, whether for growing as aquaculture or for release to the wild for stock enhancement.

<sup>47</sup> In this respect, NIWA appears to be in a position of control; not too dissimilar from a monopoly.



Despite the uncertainty about the potential impacts from hatchery stocks to wild fish, recreational anglers thought that the compromise of ‘ocean ranching’ was acceptable because it increased the numbers of salmon in rivers and put an economic value on freshwater to assist with opposing non sustainable water resource developments. The historical frame that ocean ranching was ‘acceptable’ is consistent with current findings from the NZSAA quantitative survey.<sup>48</sup>

Salmon farming and sales of salmon were legalised under the Marine Farming Act in 1971.<sup>49</sup> Between 1975 and 1980, the three techniques deployed to farm salmon were: i) ocean ranching, ii) sea cage rearing, and iii) pond rearing, discussed in section 5.6.

Salmon anglers promoted ocean ranching on the basis that more chinook were made available to recreational anglers at no extra cost to the i) angler, and ii) the environment, while iii) enabling the growth of a commercial salmon fishery, and iv) placing another commercial value on water to help fight potential water developments.

By 1984 there were nine ocean ranches in New Zealand receiving smolts from Silverstream (NZSAA 1984, Vol 11(1): 31). Table 7 outlines the names of these hatcheries, which river they operated on, and whether the hatchery was owned and operated privately or by the Government.

Name of hatcheries	Name of rivers	Type of operator(s)
Bubbling Springs	Takaka	Private
Tasman Salmon	Kaniere	Private
Hurunui Salmon	Hurunui	Private
Silverstream	Waimakariri	M.A.F - Government
New Zealand Salmon Company	Rakaia	Private
Glenariffe hatchery	Rakaia	M.A.F - Government
Newhaven Salmon Ranch	Waitaki	Private
ICI/Watties	Clutha	Private
Owaka hatchery	Owaka	Private

**Table 7: Summary of hatcheries operating in South Island rivers (NZSAA 1984 Vol 11(1):31).**

Table 7 provides some background to the momentum of the fishery between the mid 1970s and 1980s, with nine hatcheries forming within less than 10 years. Unfortunately, the dates for when each hatchery was established do not appear to be well documented and therefore are not

<sup>48</sup> See Chapter 7, section 7.17.1  
<sup>49</sup> Mentioned in Chapter 6, section 6.10

presented. There are currently 14 sea cage rearing sites and 12 freshwater hatchery sites in New Zealand (NZSFA 2006). A map of historical and contemporary hatchery locations in New Zealand is provided in Appendix 8. For a map of all the historical sites where salmon releases have taken place in the South Island, see Appendix 9. Also, Appendix 10 can be read together with Appendix 9, providing a breakdown of the number of hatchery releases in various New Zealand rivers.

In 1987, the Conservation Act<sup>50</sup> was passed, forming the principal legislation governing the activities of FGNZ, which replaced the acclimatisation societies (FGNZ 2006). The other substantial piece of legislation affecting salmon was passed in 1991, namely the RMA 1991.<sup>51</sup> Essentially both of these key statutory documents complement one another regarding the sustainable management of rivers, streams, lakes, and the fish species found there [mentioned in Chapter 6, section 6.6].

Since the establishment of FGNZ in 1990, the status of wild salmon has been directed more towards a recreation/conservation. This has meant that the wild salmon fishery is recognised and managed by FGNZ as a different fishery to the captive fishery.<sup>52</sup> Examples of the movements toward recreation and conservation are the Salmon at Sea Agreement [SSA] 1991 which instituted the Salmon Conservation Area<sup>53</sup> [SCA], and the Dirty Dairying Campaign [DDC] in the mid 1990s which set out to protect the quality of waterways from agricultural degradation.

Currently [May 2007], a proposed Salmon Management Plan<sup>54</sup> [SMP] is at the stage where the final oral submissions have been received and the final amendments have been made (Millichamp pers. comm. 2007). Previously, there has been no such document explicitly outlining the management of chinook salmon in New Zealand. The SMP is currently being drafted by FGNZ<sup>55</sup>, and is to be circulated within FGNZ for approval and then onto the Minister of Conservation, where it will be reviewed by the Minister (Millichamp pers. comm. 2007). It is anticipated that the SMP will be approved and then implemented in 2008.

## **5.6 Commercial Production Methods of Salmon**

There are three methods for commercially harvesting/producing salmon from captive [farming] fisheries, and there are three methods for harvesting salmon from capture [wild] fisheries. The

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<sup>50</sup> Chapter 6, section 6.14

<sup>51</sup> Covered in Chapter 6, section 6.16

<sup>52</sup> See sections 5.6.1, 5.6.2, and 5.6.3 for examples of captive fisheries.

<sup>53</sup> Mentioned in Chapter 6.

<sup>54</sup> Drafted by Fish & Game New Zealand [FGNZ] in August 2006, and discussed further in Chapter 6, section 6.18

<sup>55</sup> The Draft SMP appears to be a FGNZ initiative rather than a Government led initiative.

captive fisheries employ i) ocean ranching, ii) sea cage rearing, and/or iii) pond farming and canal rearing, while the capture fisheries deploy i) gillnetting, ii) purse seining, and/or iii) trolling techniques. Of these six methods, only three [sea cage rearing, and pond and canal cage farming] are carried out in New Zealand for captive fisheries. Ocean ranching is no longer employed for producing salmon in New Zealand. The wild chinook salmon fishery is currently regulated against commercialisation of salmon at sea with the SSA governed within the SCA. These latter capture fishery techniques are not practiced in New Zealand waters due to public antipathy and the vulnerability of the wild fishery (MFish 2006), but are practices in the Pacific Northwest where there are substantially larger capture fisheries available (FAO 2002, 2004; Globefish 2001).

### **5.6.1 Ocean Ranching**

Ocean Ranching produces induced salmon runs by breeding salmon from an egg stage to smolt stage in closed freshwater hatcheries, and releasing them into open rivers to migrate out to sea to mature and then return to freshwater to spawn. Upon their return, anglers have first ‘crack’ at them, but once the salmon reach the freshwater hatchery, they are the property of the hatchery operators. During the 1980s, these induced runs were a compromise between the Government, NZSAA, acclimatisation societies, and commercial parties. However, ocean ranching was not successful, and culturing techniques such as sea cage rearing and pond rearing have dominated the market place for captive fisheries since the 1980s, with the exception of Silverstream which made some attempts for a ‘put and take fishery’ in the early 1990s (Unwin & Boustead 2001).

During the late 1980s the commercial ocean ranching industry began to deteriorate mainly due to insufficient [and decreasing] return rates, and thus increased costs. Insufficient return rates were partly a result of increased angler catches, noted as high as 40 - 50% of returning fish (Millichamp pers. comm. 2007), as well as a combination of pollution, water abstraction, diversion and obstruction, disease, lowered genetic variance from hatchery reared fish, and commercial by-catch at sea (Unwin & Glova 1997). Lower return rates meant higher costs, so ocean ranching ventures began exiting the fishery.

It appears that salmon anglers were opposed to sea cage rearing, pond farming and canal rearing, because they either provided no benefits to the anglers in terms of fish to catch in rivers, or due to the impacts from hybridisation.<sup>56</sup>

### **5.6.2 Sea Cage Rearing**

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<sup>56</sup> See results from NZSAA survey, Chapter 7, section 7.17.1

Sea cage rearing involves salmon cultured in cages in the marine environment, feeding on a combination of salmon chow provided by the operators, and wild krill and other marine life that naturally pass through the cages (Gillard pers. comm. 2007). They are not intended for release into the wild, and are the property of the owners. Sea cage rearing continues to dominate the commercial production of chinook salmon in New Zealand with over 90% produced in sea farms (Gillard pers. comm. 2007).

**5.6.3 Pond and Canal Rearing**

Pond and canal rearing takes place in freshwater ponds or canals where the salmon are cultured from eggs to mature salmon. They are not intended for release into the wild, and are the property of the owners, however escapees do provide recreational fishing opportunities in the canals (Trevor pers. comm. 2006). Freshwater pond and canal farms contribute less than 10% of commercial production of chinook salmon in New Zealand (Gillard pers. comm. 2007).

**5.6.4 New Zealand Salmon Farmers Association**

To further emphasise the growth and momentum in the salmon farming industry since ca. 1976, a list of New Zealand Salmon Farmer’s Association [NZSFA] members as of May 2007, are provided in Table 8. The New Zealand salmon industry is represented by the NZSFA, a voluntary subscription-based organisation comprising of active freshwater and seawater salmon farmers, salmon processors, and service product suppliers to the industry (NZSFA 2007). The NZSFA is a powerful association representing the growers of over 98% of all salmon farmed in New Zealand.

Name of NZSFA members	Website link
Akaroa Salmon Company Ltd	(No link)
Alitec	( <a href="http://www.alitec.cl">www.alitec.cl</a> )
Benmore Station Ltd	(No link)
High Country Salmon Ltd	(No link)
Isaac Salmon Farm Ltd	( <a href="http://www.isaac.co.nz/salmon.html">www.isaac.co.nz/salmon.html</a> )
Mount Cook Salmon Ltd	( <a href="http://www.mtcooksalmon.com">www.mtcooksalmon.com</a> )
National Institute for Water and Atmosphere Research Ltd	( <a href="http://www.niwascience.co.nz">www.niwascience.co.nz</a> )
Reliance Feeds, CRT Society Ltd	(No link)
Ridley Aqua-Feed Pty Ltd	( <a href="http://www.agriproducts.com">www.agriproducts.com</a> )
Riverland salmon Ltd	( <a href="http://www.aquahaven.co.nz/">www.aquahaven.co.nz/</a> )
Sanford South Island Ltd	( <a href="http://www.sanford.co.nz/">www.sanford.co.nz/</a> )
Skretting Australia	( <a href="http://www.scretting.com.au">www.scretting.com.au</a> )
Sunderland Marine Mututal Insurance Company Ltd	( <a href="http://www.smmi.co.uk/">www.smmi.co.uk/</a> )

The New Zealand King Salmon Company Ltd	( <a href="http://www.kingsalmon.co.nz/">www.kingsalmon.co.nz/</a> )
TNL Group	( <a href="http://www.tnl-group.co.nz/">www.tnl-group.co.nz/</a> )
Winchmore Salmon Ltd	(No link)

**Table 8: NZSFA members, 2007**

**5.7 Overview 1870 - 2007**

Since endeavours to introduce wild salmon to New Zealand in the 1870s, salmon [wild and captive] have been broadly perceived in two ways, for: i) commercial or economic, and ii) recreational purposes.<sup>57</sup> These historical positions tie in with the current Economic FoR and Recreational FoR discussed further in Chapter 7.

Whether the Government was aware of it at the time or not, this created a situation where the wild salmon fishery had two parties that were interested in sustaining wild stocks. This created what could be termed as an ‘insurance policy’ approach, which on the surface enabled the public to feel as though wild salmon were a public good provided for recreational purposes, while at a deeper level, the Government was driven by commercial motives.

The Government, along with corporate bodies such as salmon farmers and harvesters, exploited the wild fishery when salmon runs were high, but when catch rates decreased and revenues fell, the fishery transformed from a commercial status to recreational, almost by default (Cunningham 1972). During these lulls in commercial wild harvest, the Government and corporate bodies restricted commercial activities and treated wild stocks as a recreational fishery (Hardy 1989). Having organisations such as the NZFWIM, SISC, and NZSAA who shared interests in maintaining and enhancing wild salmon numbers was perfect for the Government during these ‘change over’ periods. During the 1970s the NZFWIM, SISC, and NZSAA provided the Government with ideas and bought ‘time’ to investigate alternative ways to transform the fishery into a growing profitable enterprise, which they did with the development of captive fisheries in the mid 1970s [discussed earlier]. Essentially the NZFWIM led to the formation of the SISC and the NZSAA, which acted as backstops, ensuring that the wild fishery did not collapse completely due to commercial exploitations experienced prior to and during the 1970s.

Prior to ca. 1975, all commercial harvest from the salmon fishery [both in freshwater and seawater] occurred from wild stocks. This is no longer the case with the exception of Silverstream which source their broodstock from wild stocks. Since the establishment of captive

<sup>57</sup> There has always been some ambiguity around this; chinook salmon have been framed part sports fish, part commercial fish.

fisheries [1980s – 2007], the wild salmon fishery has remained in the recreational category. Therefore it appears that the wild fishery is currently framed as recreational, while the captive fisheries are commercially framed by stakeholders such as the NZSFA. This is consistent with the findings obtained from the qualitative and quantitative datasets where NZSAA members constructed salmon to strongly represent their recreational interests [see Chapter 7].

## 5.8 Chapter Summary

Chapter 5 found that Atlantic salmon were considered to be the ‘king’ of sporting fishes in England (McDowall 1994: 229) contributing to the notion that angling was an elite activity; but when Atlantic salmon failed to acclimatise, chinook salmon took their place and subsequently chinooks have become ‘royalty’ if not the ‘king’ of freshwater sport fish in New Zealand. Part of the rationale of the acclimatisation movement in New Zealand was to avoid the aristocratic culture dominant in England during the 1800s by releasing fish and game in New Zealand for all New Zealanders to enjoy. It was envisaged that releasing fish [and game] in New Zealand would democratise the sport of fishing [and hunting] (Donne 1924; Banwell 1994). The historical chronology of places, stakeholders, political movements, and attitudes toward the salmon fishery between 1875 and 2007 provides a better understanding of fishery management in New Zealand. Chapter 5 discussed the differences between capture and captive fisheries, outlining the dichotomy between recreational and commercial interests that led to the establishment of, and subsequently the downfall for, ocean ranching ventures in New Zealand. Despite the fact that chinook salmon were initially introduced to establish a wild commercial fishery, their status has evolved toward a recreational agenda based on attitude shifts since 1875. Pivotal stakeholders that contributed towards shaping the attitudes of the fishery were identified as the acclimatisation societies, NZFWIM, Government, MAF, Hunn Commission, SISC, NZSAA, FGNZ, NIWA, and the NZSFA. Chapter 5 concluded that the wild salmon fishery is currently framed according to recreational opportunities, while the captive fishery is constructed for commercial aquaculture purposes, as mentioned in Chapter 4.<sup>58</sup>

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<sup>58</sup> Sections 4.4.1 and 4.4.2

## **Chapter 6: Analysis of Legal Institutions**

### **6.1 Introduction**

This Chapter has been written separately from the acclimatisation and historical management content in Chapter 5. The legal context is important to understanding salmon framing in that several legal institutions<sup>59</sup> have given shape to the way salmon, water, and rivers have been constructed and managed since British colonisation (McDowall 1991, 1994). Furthermore, it is important to provide a fuller understanding of the institution functions, how the institutions shaped the management of salmon, and the role that stakeholders such as the acclimatisation societies, Government, NZSAA, and more recently FGNZ played. Therefore, from a moderate constructivist perspective it seems plausible to carryout an institutional analysis between 1867 and 2007 of relevant laws, regulations, agreements, and plans, casting brief insight to several institutions from the Pacific Northwest that appear to have shaped the New Zealand context.

This chapter is intended to introduce the various legal institutions that appear to have shaped the way salmon were viewed and managed in New Zealand between 1867 and 2007. According to McDowall (1991), freshwater fisheries in New Zealand received more momentum in the form of legal processes, acts, projects, and public interests post 1940s than any other time. This explains why the majority of the institutional analysis refers to institutions post 1940. Firstly, though, the Propagation of Salmon and Trout Act 1867 is discussed.

### **6.2 Propagation of Salmon and Trout Act 1867**

The Propagation of Salmon and Trout Act 1867 made provision for “the preservation and propagation of Salmon and Trout in this Colony” (MfE 1997: 9.8). This essentially provided the legal grounds to preserve, breed, and acclimatise salmon and trout in New Zealand rivers. This 1867 Act marked the beginning of acclimatising not only fish species to New Zealand, but of acclimatising game animals such as red deer, Himalayan tahr, and chamois (McDowall 1994).

### **6.3 Fish Protection Act 1877**

The Fish Protection Act 1877 was established to protect fish and fisheries in New Zealand which clarified the Government’s powers to establish regulations covering fish. With such enthusiasm to establish salmon and trout in New Zealand, the policies that followed their introduction in the early 1900s were many and varied (Jansen 1993). According to Jansen (1993: 317), “acclimatisation society laws were passed too quickly without thorough review and forethought”. It appeared as though sportfish such as trout and salmon were introduced into as many

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<sup>59</sup> Legal institutions refer to things like Acts, Regulations, Agreements, Policies, and Plans.

waterways as possible in the hope they would provide opportunities for recreation (Sullivan 1998) [See Appendix 10]. During the late 19<sup>th</sup> century, this “acclimatisation” process did not appear to employ the caution normally attributed to sound scientific practice when compared with practices of the 20<sup>th</sup> century. It was often partially scientific in character, but very few cautions were exercised in science *per se*.

#### **6.4 Fisheries Act 1908**

The Fisheries Act 1908, with amendments, stayed in effect until 1983<sup>60</sup> (McDowall 1994) and has culminated into the Fisheries Act 1996<sup>61</sup> (MfE 1997). The 1908 Act did not spell out any particular functions for acclimatisation societies despite being the statute that provided all powers relating to their management of acclimatised fish. The 1908 Act gazetted Freshwater Fisheries Regulations, and while it did provide certain powers to the societies, their functions were not made explicit (McDowall 1994). As a result of the Freshwater Fisheries Regulations that were gazetted under the 1908 Act, a principal set of regulations were passed in 1936 called the Freshwater Fisheries Regulations.

#### **6.5 The Freshwater Fisheries Regulations 1936 / 1951**

The 1936 Freshwater Fisheries Regulations made it possible to gazette any regulations related to freshwater fisheries under the 1908 Fisheries Act (McDowall 1994). This eventually led to a revised version of the 1936 Regulations in 1951 called The Freshwater Fisheries Regulations 1951. The 1951 Regulations gave the societies the powers to issue and sell angling licenses, but again the 1951 Regulations did not spell out the responsibilities of the society for fishery management in the way that the 1983 Fisheries Act did (McDowall 1994).

According to the literature, it appears that the views attributed to rivers and lakes have ultimately influenced their management, and thus influenced the way salmon and trout are treated in New Zealand. These freshwater bodies play a pivotal role for salmon management, and therefore need to be discussed in at least a little detail. The next sections look at the legislative recognition that rivers have received since the 1940s.

#### **6.6 The Soil Conservation and Rivers Control Act 1941**

According to Poole (1983), the Soil Conservation and Rivers Control Act 1941 established a national system of 21 regional catchment authorities. This delegated the management responsibilities to catchment boards to control flooding, soil, and riverbank erosion (Roche

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<sup>60</sup> Discussed in section 6.12

<sup>61</sup> Discussed in section 6.17



1994). These regional authorities worked with local landowners and communities to provide protection and mitigation measures. Initially the measures dealt with localised problem sites, but eventually extended to whole catchments.

Subsequently the catchment authorities required assistance in the form of technical support and funding subsidies from central Government with oversight from a national board. This appears to be where the Government favoured the benefits of river control and hydro-electric developments.

The 1941 Act was the first Act in New Zealand to attribute values to rivers, such as ‘flood control’, ‘soil erosion’, and ‘riverbank erosion’. These management values were most likely influenced by the strong agricultural sector at the time, and the rural communities who stood to be affected if the rivers were not ‘controlled’ (Young & Foster 1986). This Act does not appear to incorporate any values attributed to salmon management directly. However, this is not to say that salmon were not negatively affected by the legislation, as it provided legal reasoning to dam rivers to alleviate risks of flooding, and establish hydro power stations that were not conducive to sustaining a wild salmon fishery (Young & Foster 1986).

While salmon and trout were not explicitly recognised in the 1941 Act a movement during the 1960s placed more emphasis on water-use values by the increasing number of multiple users. This partly brought about the Water and Soil Conservation Act 1967. The 1967 Act extended the management role of catchment authorities to cover both the quantity and quality of water (MfE 1997).

Discussed next are the implications of the Wildlife Act 1953 to the management of salmon and trout by acclimatisation societies.

## **6.7 The Wildlife Act 1953**

The Wildlife Act 1953 provided for the protection of wildlife by acclimatisation societies, except for certain species named in Schedules of the Act, and provided for the control of wildlife. It allowed game [birds and fish] to be hunted, fished or killed, subject to restrictions imposed by the societies (MfE 1997). The Wildlife Act 1953 explicitly authorised the acclimatisation societies to become involved in freshwater fishery matters. This authority gave societies:

“All such functions and responsibilities in relation to freshwater fisheries as are imposed on societies by the Fisheries Act 1908 or any regulations or notifications there under” (Wildlife Act 1953 cited in McDowall 1994: 59).

This was overturned in 1983 with the establishment of the Fisheries Act 1983 and has culminated into the Fisheries Act 1996 (MfE 1997). Now the functions of the Wildlife Act 1953 are no longer concerned with sports fish as the sports fish are currently overseen by the Conservation Act 1987 (MfE 1997).

## **6.8 The Water and Soil Conservation Act 1967**

Central Government provided scientific and technical support with the establishment of specialist water and soil science research units to conserve water for multiple stakeholders. The management of water had shifted to a multiple use basis, requiring a water right for anyone wanting to take water from a natural body of water, or discharge pollutants into it (MfE 1997). In fact, McDowall (1994) found that during the mid 1970s, the NZSAA applied for a water right for salmon but the local authorities declined the NZSAA application claiming that salmon did not have rights. This arguably led to the formulation of the Wild and Scenic Rivers Act 1981 [WSRA] and helped give momentum to the WSRA legislation push<sup>62</sup> (Hughey pers. comm. 2007). This essentially gave recognition to water users other than just agricultural, and gave rise to utilitarian attitudes to water management.

While the 1967 Act contributed to the dramatic decline in biological oxygen demand [BOD] pollution from point source discharges, it did little to assist with the problem of non point source pollution. This is because the Act did not provide for statutory plans or the ability to constrain land uses to protect water quality or quantity. What made this Act different from the 1941 Act was that it took preliminary steps toward water ‘conservation’, which seemed to be a global trend at the time (Hays 1969; Palmer 1986).

During the late 1960s and early 1970s, more people began realising the intangible values of water, otherwise referred to as non-market values such as intrinsic, aesthetic, spiritual, cultural, and recreational values (Kerr 1988). This growing awareness partly fuelled the restrictions on multiple water users, and restrictions on discharge – as these non-market values for water were taken into consideration by the 1967 Act. The development of utilitarian views towards water helped to shape the 1967 Act to account for multiple perspectives of water use. Water was gradually being seen through the eyes of a diverse range of users, replacing the dominant outlook of sanitation, river control, and hydro electric developments held pre 1960s.

The 1967 Act had profound implications for salmon and trout because it provided for the recognition of the value that salmon and trout provided to recreational anglers. Furthermore, it

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<sup>62</sup> Discussed in section 6.11

enabled a multitude of recreational users to argue for their rights to see water conserved for purposes other than development. At a similar time, the United States Government was beginning to recognise specific rivers for their wild and scenic attributes. Not only were the views towards water changing, but the attitudes towards the river systems that held the water and the aquatic animals and plants living in them were also changing significantly because of Western society's transforming perceptions toward Nature.

## **6.9 United States Wild and Scenic Rivers Act 1968**

Canard (2004) claims that throughout the 1960s and 1970s the United States as a whole began realising the significant values that rivers added to their cultural heritage. In 1968, Frank Church, a United States senator and predominant political and environmental claims-maker who was largely responsible for instigating environmental legislature in the 1960s, stated that:

“In a country where nature has been so lavish and where we have been so spendthrift of indigenous beauty, to set aside a few rivers in their natural state, should be considered an obligation” (cited in Living Rivers 2006).

As a result of this growing awareness the United States Federal Government introduced the Wild and Scenic Rivers Act in 1968 (NWSRS 2007). This Act formed the National Wild and Scenic Rivers System [NWSRS], enabling rivers that met the criteria of a ‘Wild and Scenic River’ to be managed by one or more agencies of the federal or state Government (Haas pers. comm. 2007). The first river recognised under the new Act was the Middle Fork Clearwater [including the Lochsa and Selway Rivers] (NWSRS 2007). Perhaps the most important contribution this legislation has had is to bestow the name ‘Wild and Scenic River’ in political and public discourse. Furthermore, it has provided these river corridors with a status equal with national parks (Canard 2004).

This has had a profound impact on salmon and their management, as those rivers that are considered ‘wild’ and ‘scenic’ that are occupied by salmon, are essentially protected against development. It appears that this North American movement has influenced much of what has happened in New Zealand with river management, in particular, prompting the Wild and Scenic Rivers Act 1981.<sup>63</sup> Subsequently this piece of legislation has provided an avenue for more effective salmon management by virtue of more regulated river and water-resource management policies.

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<sup>63</sup> Discussed in section 6.11

While the focus of this section deals with legislation affecting freshwater environments, the Marine Farming Act 1971 has implications for salmon management in New Zealand, both within the marine and freshwater environments.

### **6.10 Marine Farming Act 1971**

The Marine Farming Act 1971 provided for the establishment and development of an industry for the farming of ocean dwelling fish, shell fish, oysters, and marine vegetation, the leasing or licensing of marine farms, and the marketing of cultivated marine products (Jeffs 2003). New Zealand chinook salmon were covered in the definition of ocean dwelling fish. The industry was born out of the idea of farming native rock oysters in the Bay of Islands in the late 1960s (Jeffs 2003). A push from the Marine Department and the Ministry for Agriculture and Fisheries [MAF] helped develop trials for marine farming sites. MAF built an oyster hatchery in the 1970s to facilitate the development of commercial farming, and by 1971 the Marine Farming Act 1971 was passed (Jeffs 2003). This 1971 Act marked the beginnings of commercial aquaculture in New Zealand. Under the Marine Farming Act 1971, the first commercial salmon ranching venture was established in 1976 at Waikoropupu Springs in Golden Bay, Nelson ([www.salmon.org.nz/aboutsalmon.shtml](http://www.salmon.org.nz/aboutsalmon.shtml), 2006). Here the salmon were released in freshwater, migrated to sea to feed and were harvested upon their return to freshwater. The Marine Farming Act 1971 made it legal to commercially cultivate chinook salmon in both freshwater and ocean water environments by virtue of their anadromous nature.

### **6.11 New Zealand Wild and Scenic Rivers Act 1981**

By 1981, New Zealand had established its own Wild and Scenic Rivers Act [WSRA]. The WSRA 1981 came into fruition through joint efforts from stakeholders such as the New Zealand Salmon Anglers Association [who advocated for the protection of headwater environments for spawning salmon], the New Zealand Jet Boaters Association [which advocated for the protection of river flows for boating requirements], the Save the Rivers Campaign [who advocated for the protection of rivers to provide for social, recreational, aesthetic and cultural values], and other users or stakeholders who pushed for the recognition and protection of unique rivers which were considered 'wild' and 'scenic' (Glennie pers. comm. 2007).

Prior to 1981, water resource management [in relation to rivers] was largely provided for in the Water and Soil Conservation Act 1967. The passing of the WSRA 1981 Act was aimed at improving the management and protection of unique rivers in New Zealand. Some of these rivers were considered unique based on the type of fish living in them, or activities they provided for. For instance, the Rakaia River is considered unique for the largest wild-run chinook salmon

fishery in the southern hemisphere, its high recreational use, and unique birdlife (Unwin & Image 2003). Therefore, due to the river’s uniquely wild and scenic recreational opportunities that it provided, the Rakaia River was considered to be a ‘wild’ and ‘scenic’ river under the 1981 Act.

As a result of the WSRA 1981, the Water and Soil Conservation Act 1967 was amended to the Water and Soil Conservation Amendment Act 1981 (Salmon 2007). This effectively merged the WSRA 1981 into the Water and Soil Conservation Amendment Act 1981. The Water and Soil Conservation Amendment Act provided for the making of national water conservation orders [NWCO] granted under section 20D of the former Water and Soil Conservation Act 1967. Rivers with NWCOs are generally regulated against development, however, in cases like the Rakaia River, a substantial amount of development is allowed for in the NWCO (Hughey pers. comm. 2007). Water conservation orders were [and still are] considered by some to be a major success for river management in New Zealand. Table 9 illustrates the water bodies that have been gazetted with WCOs, and those applications that are pending approval (<http://www.rivers.org.nz/article/WaterConservationOrders>).

Applicants	River	Status
Acclimatisation Society	Motu River	Gazetted 1984
Acclimatisation Society	Rakaia River (salmon)	Gazetted 1988
Acclimatisation Society	Lake Wairarapa	Gazetted 1989
Acclimatisation Society	Manganuiateao River	Gazetted 1989
MIA	Lake Ellesmere	Gazetted 1990
FGNZ & MIA	Ahuriri River	Gazetted 1990
FGNZ	Grey River	Gazetted 1991
FGNZ	Rangitikei River	Gazetted 1993
FGNZ	Kawarau River	Gazetted 1997
FGNZ	Mataura River	Gazetted 1997
FGNZ	Buller River	Gazetted 2001
FGNZ	Motueka / Riwaka Rivers	Gazetted 2004
FGNZ	Mohaka River	Gazetted 2004
FGNZ	Rangitata River (salmon)	Gazetted 2006
FGNZ	Whanganui River	Pending
FGNZ	Oreti River	Pending

**Table 9: Summary of New Zealand WCOs gazetted and pending approval (WCO 2006).**

Of the 23 WCOs sought since the introduction of the WSRA 1981<sup>64</sup> 17 have been sought by FGNZ or its predecessor acclimatisation societies of which 10 have successfully been gazetted. In light of this trend, Deans (2004) cited in Harding (2004) claim that some of these conservation

<sup>64</sup> Acclimatisation societies pushed for the Wild and Scenic Rivers Act 1981 as an amendment to the Water and Soil Conservation Act 1967. This legislation has enabled the recognition of, and provided the protection for, trout and salmon fisheries by resource managers. It has also provided protection for other values such as fishing, hunting, kayaking, wildlife observation, and tramping. The Wild and Scenic Rivers Act no longer exists as it has been incorporated in the Soil and Water Conservation Amendment Act 1981 and has in turn been included in the RMA 1991 (Glennie pers. comm. 2007).

orders are a result of more than 50 years of habitat protection for salmon management. This illustrates the influence that acclimatisation societies and subsequently FGNZ have had towards shaping river management in Canterbury due to the strong recreational interest for salmon [i.e. Rakaia and Rangitata rivers] and in Otago with trout [i.e. Mataura River].

The implications of the 1981 Act helped to improve the health of the salmon fishery. Salmon management stood to gain from this legislation in the following ways: i) increased social consciousness towards salmon, ii) habitat protection against development, iii) minimum flow regimes [quantity of water], and iv) improved water quality. The 1981 Act increased local awareness about the importance of the salmon fishery, and gave weight to the other three factors for decision making for water resource management (Glennie pers. comm. 2007).

From a constructivist perspective, salmon have played a significant role in this legislative process by virtue of the way people frame them at political, managerial, environmental, conservational, cultural, commercial, and recreational levels because of the fact they inhabit freshwater environments. Chinook salmon have added, and continue to add different dimensions to water resource management in New Zealand. For this reason it is fair to assume that water resource management would be quite different without chinook salmon in New Zealand.

## **6.12 Fisheries Act 1983**

The Fisheries Act 1983 replaced the 1908 version and was completely rewritten, with the responsibilities of the acclimatisation societies for fish and fisheries being explicitly stated within the fisheries law as opposed to the former mention in the Wildlife Act 1953 (McDowall 1994). The 1983 Act stated that “Acclimatisation societies shall be responsible for the protection, management, and enhancement of all acclimatised fish species and their habitats, as may occur within their districts of administration” (Fisheries Act 1983 cited in McDowall 1994: 59).

According to McDowall (1994) the Fisheries Act 1983 mainly focused on marine fisheries, however there are provisions made for freshwater fisheries enabling acclimatisation societies to establish fish hatcheries, and fish farms.<sup>65</sup> More specifically this Act provided for the management and conservation of fisheries and fishery resources within New Zealand and New Zealand “fisheries waters”.

According to Section 2 of the Act, the definition of New Zealand “fisheries waters” are:

- All waters in the exclusive economic zone of New Zealand;

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<sup>65</sup> A list of fish farms is provided in Chapter 5, section 5.6.4

- All waters of the territorial sea of New Zealand;
- All internal waters of New Zealand;
- All other fresh or estuarine waters where fish indigenous to, or acclimatised in New Zealand are found.

The Fisheries Act 1983 provided for fishery management plans under Part 1, section 4 of the Act. The purpose of a fishery management plan was to conserve, enhance, protect, allocate, and manage the fishery resources within New Zealand fisheries waters having regard to the need for:

- Planning, management, controlling, and implementing such measures as may be necessary to achieve those purposes;
- Promoting and developing commercial and recreational fishing;
- Providing for optimum yields from any fishery and maintaining the quality of yield without detrimentally affecting the fishery habitat and environment.

The 1983 Act illustrated evidence of a conservation ethic to fisheries management with its purpose to conserve, enhance, protect, allocate and manage the fishery. In order to achieve these purposes, the 1983 Act needed to have effective management plans that were implemental and executable. The Act also aimed to encourage commercial and recreational fisheries while ensuring they met the purposes of the Act. Finally, the Act was geared toward achieving optimum returns without negatively affecting the fishery. Essentially this philosophy is based on sustaining maximum yields, and is well documented in the field of resource economics (Annala 1996; Hilborn et al. 2006; SIMS 1993).

The notion of ‘conserving’ and ‘enhancing’ the fishery is similar to what is now meant by ‘sustainable development’, but these terms came about at a time before ‘sustainability’ was coined. The term ‘sustainability’ gained most of its momentum in legislative discourse post the 1987 Brundtland Report and was strongly incorporated into planning discourse throughout the early 1990s (Clark 2004; Kidd 2003).

Since the Fisheries Act 1983, there have been numerous Amendments made and new Statutes have been passed.<sup>66</sup> In 1996 a new Fisheries Act replaced the former 1908 and 1983 Fisheries Acts, incorporating the term ‘sustainability’ as opposed to the terms to ‘conserve’ and ‘enhance’ as stated in the 1983 Fisheries Act.

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<sup>66</sup> For a list of the Fisheries Acts (1983 – 2002) go to ([www.library.auckland.ac.nz/subjects/bio/legislation.htm](http://www.library.auckland.ac.nz/subjects/bio/legislation.htm), 2006)

The next section should be read in conjunction with sections 6.9 and 6.11 respectively.

### **6.13 Canada Heritage River System 1984**

The movement towards recognising the value of river systems was initiated in the United States in 1968, perpetuated in New Zealand during 1981, and extended to Canada by 1984 and eventually adopted into Australian planning in 1993 (see [www.heritage.gov.au/anlr/wild\\_riv/guide/parta.html](http://www.heritage.gov.au/anlr/wild_riv/guide/parta.html), 2006). In 1984 the Canadian Heritage River System [CHRS] was formed. This is currently a public trust with representation by federal, provincial and local government and private citizens (CHRS 2007). The first Canadian Heritage<sup>67</sup> River was the French River in Ontario, designated in 1986. Today, there are 40 Heritage rivers across Canada, with more being added to the system each year. This is a similar river management system as the United States, and essentially follows the conservation ethic of recognising and protecting some of Nature's unique features.

The relevance of recognising unique, wild and scenic rivers in the United States, New Zealand, and Canada [to name a few] has been pivotal in shaping water resource management in Canterbury because it has reiterated the perceived social value that people attribute to rivers. It has proved that rivers were not only recognised as wild and scenic in North America, but also in New Zealand and Canada. Much of our planning direction has evolved partly through local and regional innovation, but also through learning from international agencies. It is common in the policy and planning field to look abroad and evaluate the techniques and strategies adopted by other countries (Lindblom 1980; Munn et al. 1996). In this case it appears that New Zealand sourced their ideas for the Wild and Scenic Rivers Act 1981 from the United States Wild and Scenic Rivers Act 1968. Likewise, it appears that the CHRS formed in 1984 as a result of this wider international movement.

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<sup>67</sup> Heritage Rivers are given national recognition in the same way that National Water Conservation Orders do with New Zealand rivers like the Rakaia River.



## 6.14 Conservation Act 1987

At present, most freshwater fishing laws [with the exception of those activities related to the commercial fishing of eels] are provided for and enforced under the Conservation Act 1987 and Resource Management Act 1991. The Conservation Act 1987 promotes the conservation of New Zealand's natural and historic resources and has established the Department of Conservation for that purpose. Under Section 6 of the Act, the functions of DoC are to preserve as reasonably practicable all indigenous freshwater fisheries, and protect recreational freshwater fisheries and freshwater fish habitats (Conservation Act 1987). Interestingly, Section 17L of the Act makes provision for 'sports fish and game management plans', which has subsequently provided the grounding for the draft Salmon Management Plan 2007 by FGNZ. The purpose of a sports fish and game management plan is to establish objectives for the management of sports fish and game, within any region or part of any region. The interpretations of game are recognised under Schedule 1 of the Wildlife Act 1953, and are worth noting that they do not include any introduced ungulates. While many hunters consider wild animals such as deer, Himalayan tahr, chamois, and pigs to be 'game' animals, these introduced ungulates have fallen into the 'pest' category under the Wild Animal Control Act 1977 (Fraser 1995; 2001b).

Furthermore, under the Conservation Act 1987 there are regulations for fish passage, which require that adequate passage for both indigenous fish administered by DoC, and salmon and trout administered by FGNZ are provided.

A further provision that offers insight to the management status of salmon and trout, is Section 22 of the Conservation Amendment Act 2005.<sup>68</sup> A breach of Section 22 is that which:

“Disturbs, injures, poisons, kills, or detrimentally affects any freshwater fishery, fish spawning ground, or food of freshwater fish in any river, stream, lake, or any other water, by allowing any substance to enter into any such water or refuses to mitigate or remedy the problem can be fined by a warranted officer no more than \$30,000 and further fined \$3,000 each day the offence continues” (Conservation Amendment Act 2005).

This illustrates the extent to which freshwater fishes are recognised and protected in New Zealand under the Conservation Act. The severe consequence of breaching any of these conditions is quite considerable despite the fact salmon and trout are not indigenous to New Zealand.

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<sup>68</sup> Conservation Amendment Act Passed on the 3<sup>rd</sup> of August 2005

## **6.15 Salmon at Sea Agreement 1991**

In response to the large numbers of chinook salmon caught at sea by large commercial trawlers in the 1980s, recreational anglers demanded that an area along the coast where salmon congregate before spawning, be regulated (MFish 2006). Ongoing debate led to the formation of an agreement named the Salmon at Sea Agreement [SSA] in 1991. The SSA established an area off the coast of Banks Peninsula, Canterbury, labelled as the Salmon Conservation Area [SCA] to restrict access into the SCA exclusively to trawlers that have historically fished the area (MFish 2006). The Agreement currently provides for seven large trawlers.<sup>69</sup>

The agreement aims to minimise the amount of salmon caught as by-catch by trawlers that are targeting fish such as red cod. The Agreement has regulations such as reducing trawling speed and assigning verifiers onboard to help monitor and reduce by-catch in the SCA. This has a direct influence on the salmon fishery by increasing the survivability of mature salmon at sea, and therefore increasing their probability of migrating upriver to spawn.

## **6.16 Resource Management Act 1991**

The Resource Management Act 1991 [RMA] is New Zealand's principal planning statute, replacing the Town and Country Planning Act 1977 and Water and Soil Conservation Act 1967 among many others.

The purpose of the RMA is to promote the sustainable management of natural and physical resources under Section 5 [The Purpose] of the Act. Section 5 is the keystone section that describes the fundamental aim of the RMA. Everything must resonate with the objective of Section 5 to 'promote the sustainable management of natural and physical resources'. Section 2 [Definitions] of the Act defines 'natural and physical resources' to include land, water, air, soil, minerals, and energy, all forms of plants and animals (whether native to New Zealand or introduced), and all structures (Salmon 2007). It is well known that fishes are covered under 'animals' in this definition. Interestingly however, the sustainability of a fishery resource is not a matter to be considered under Section 5, it is to be considered under Section 30(2) of the Act, Functions of Regional Councils (McNab v Marlborough 1994).

For the RMA to function effectively, it delegates legislative powers and duties to Regional Authorities [e.g. Environment Canterbury] under Section 30, to deal with resource management issues at local and regional levels. This essentially provides councils with the lawful right to

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<sup>69</sup> Trawlers permitted to fish within the SCA are: the *Austro Carina*, *Resolution II*, *Galatea II*, *Ocean Pioneer*, *Ikawai*, *Tengawai*, and the *Hans* (MFish 2006: 3).

enforce the RMA within their regional boundary. Environment Canterbury [alongside the MFish] are therefore the deciding authorities on fisheries resources both within the coastal [foreshore or seabed area], and all freshwater environments in Canterbury for the purpose of commercial aquaculture activities only.

The two most important sections of the RMA relating to trout and salmon are Sections 6 and 7. Section 6 [Matters of National Importance] requires that regional councils 'shall recognise and provide for' the natural character of lakes, rivers and their margins, while maintaining and enhancing public access to these resources. The term "shall recognise and provide for" means that planners must recognise, i.e. 'assess' each of the matters of national importance under Section 6. By assessing the matters of national importance, they are being recognised and provided for in order to achieve the purpose of the act, outlined in Section 5. This section has an effect in terms of fishery management with the regional council having to 'recognise' and 'provide' for the natural character and public access for lakes and rivers. This has inherent implications for recreational fishing in terms of maintaining and enhancing water bodies where trout and salmon inhabit, and ensuring adequate access to these waterways are provided.

Under Section 7 [Other Matters – which the title indicates is not as important as Section 6], the Act stipulates that the regional councils 'shall have particular regard to' maintaining and enhancing amenity values, environmental quality, and importantly, protecting trout and salmon habitats. In this case, the decision maker can choose what matters to have particular regard to using their discretion as resource management planners. Therefore, there is not the need to individually acknowledge each of these matters as in Section 6. This section has an effect in terms of fishery management, with the potential to 'protect' trout and salmon habitat through maintaining environmental quality [i.e. protecting soil and water quality, riparian margins, and regulating river flows to name a few]. To 'recognise and provide for' as stated in Section 6 holds more weight in the decision making arena than to 'have particular regard to' as stated in Section 7. In spite of this, these two sections combined are very powerful tools for the sustainable management of the two very important freshwater fisheries in New Zealand (Hughey et al. 2004).

Any breaches of Section 5 [The Purpose] of the Act, can result in an enforcement order made under section 314, requiring the activity to comply with the Act. Failure to comply is an offence under section 338 of the Act and there are three types of penalties:

- i) Imprisonment no longer than 2years or a fine not exceeding \$200,000 and a further fine of \$10,000 each day the offence continues.

- ii) Fine not exceeding \$10,000 and a further fine of \$1,000 each day the offence continues.
- iii) Fine not exceeding \$1,500.

It is fascinating to see how influential lobbyists such as FGNZ, former acclimatisation societies, and recreational clubs such as the NZSAA were in ensuring that salmon and trout are explicitly protected in the RMA. Their placement in the second and fourth most important sections of the RMA suggests that there is a lot of public support behind sustaining the two fisheries for mainly recreational and commercial purposes. Their status in the RMA appears to be a result of socio-cultural, political, and economic pushes more so than from technical, scientific, and environmental factors.

### **6.17 Fisheries Act 1996**

The 1996 Act is essentially a combination of the versions from 1983 – 1995 Fisheries Acts. The purpose of the 1996 Act, stated in Section 8, is to provide for the utilisation of fisheries resources by ensuring ‘sustainability’ is achieved. One of the approaches for sustainable harvest is the Quota Management System [QMS]. The QMS is based on restricting the total quantity of fish taken by commercial fishers. The total quantity of fish that can be taken for each QMS fishery by all fishers is referred to as the Total Allowable Catch [TAC]. Of the TAC, an allowance is made to provide for multiple-uses such as recreational fishing, customary Maori uses, and other sources of fishing-related harvest. The remainder is available to the commercial sector as the Total Allowable Commercial Catch [TACC]. This is the total quantity of each fish stock that the commercial fishing industry can catch for that year (MFish 2007).

This illustrates the movement towards a general management ethic that provides for multiple-users by incorporating objectives of sustainability. Simply because, if sustainability is achieved it provides users ongoing use of the resource. Much like social construction theory borrows from other disciplines; the 1996 Fisheries Act borrows ideas, policies, and discourse from the following Acts:

- Fishing Industry Board Act 1963
- Territorial Sea and Exclusive Economic Zone Act 1977
- Fisheries Act 1983
- Amendment Acts 1983 – 1995
- Commodity Levies Act 1990
- Resource Management Act 1991
- Treaty of Waitangi Settlement Act 1992

The development of the Fisheries Act continues.<sup>70</sup>

This Act has implicit implications for salmon management because the movement of conservation/sustainable attitudes have gradually shaped disciplinary fields such as policy and planning, legislature, and management over time. According to acclimatisation literature, post 1960s has seen salmon management move away from exploitative attitudes of the fishery, towards more of a conservation and preservation mindset (McDowall 1994; Harding 2004). The next section outlines the intentions of the salmon management plan [SMP] prepared by FGNZ.

### **6.18 Draft Salmon Management Plan 2007**

The proposed SMP has been prepared by FGNZ pursuant to Sections 17L and 17M of the Conservation Act 1987. The need to better coordinate salmon management throughout the South Island has led to this initiative by FGNZ. The fact that the SMP will become a statutory document means that it must be taken into account by outside agencies when writing their own management plans. This increases the seriousness of salmon management in New Zealand, providing salmon with statutory recognition at a managerial level (FGNZ 2006). For instance, if an agency were preparing a management plan for water allocation in the upper Hurunui River, it would need to take into account the objectives of the SMP. This is another means for FGNZ to reinforce the status of salmon in the contested field of resource management in New Zealand (Millichamp pers. comm. 2007).

The proposed SMP outlines the following mission statement:

“To have a vibrant salmon fishery that provides for the aspirations of present and future generations of salmon anglers” (FGNZ 2006).

In order to achieve this mission statement, FGNZ carried out an Issues and Options Survey in 2005 where they asked a series of questions<sup>71</sup> of Fish & Game license holders on their views about salmon management. The results from the survey were analysed by NIWA and appear to form part of the logic behind the proposed SMP. At present, the plan proposes a broad layout with seven proposed goals, and proposed issues to consider (Table 10). Table 10 is a summary of the proposed SMP as at August 2006.

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<sup>70</sup> See ([www.library.auckland.ac.nz/subjects/bio/legislation.htm](http://www.library.auckland.ac.nz/subjects/bio/legislation.htm), 2006).

<sup>71</sup> Totalling 15 questions (Millichamp pers. comm. 2007)

<b>Proposed plan layout</b>	<b>Proposed goals</b>	<b>Proposed issues outlined</b>
Species Management	To manage chinook salmon to ensure that their populations are maintained and enhanced for sustainable recreational harvest	By-catch; stocking; fishery restoration; population monitoring; aquaculture; regulations; and research
Habitat management	To protect, maintain, and enhance chinook salmon habitat to ensure their sustainability for the benefit and enjoyment of anglers	Freshwater habitat
Stakeholders	To satisfy the expectations and maximise opportunities for participation of anglers through sustainable and wise management of the salmon resource, and maximise public awareness and support of license holders for the role Fish & Game has in achieving this	Stakeholder participation; effective communication; compliance; access; salmon fishing competitions; public relations;
Relationship with South Island Iwi	To ensure that the relationship with South Island Iwi is maintained through SMP actions	Ngai Tahu Iwi
Funding	To implement a funding system which provides the funds deemed necessary by managers and stakeholders for effective management of the salmon fishery	Funding resources
Governance	To create a governance structure which ensures meaningful stakeholder contribution to the SMP and widespread support of plan outcomes	Governance under the Conservation Act 1987
Planning, reporting and review	To ensure that the SMP meets the criteria set down in Section 17M of the Conservation Act	Planning; reporting; reviewing

**Table 10: Summary of the proposed Salmon Management Plan, August 2006**

There are currently 17 objectives that have been proposed to achieve each of the issues outlined in the right column of Table 10 (see FGNZ 2006). In terms of the effectiveness of each objective, these will be difficult to distinguish bearing in mind that currently the SMP is a ‘proposed’ draft. However, some interpretations have been made [in Chapter 8] from a moderate constructivist perspective with regard to each of the 17 objectives proposed in the SMP. These interpretations were made after reviewing the results from the qualitative interviews and quantitative surveys covered in Chapter 7.

## **6.19 Chapter Summary**

Chapter 6 has highlighted the relevant legal institutions that have helped shape salmon management in New Zealand since 1867. Key legislative initiative such as the Wild & Scenic Rivers Act 1981 were noted for their contributions toward national water conservation orders; a regulatory instrument now employed under the Resource Management Act 1991. Salmon have been dragged into the constructions of water and river management in Canterbury for the last 50 years (Young 2004). Thus, due to freshwater management improvements along with an increasing awareness of the needs of salmon, salmon have resulted with better treatment than other introduced species. The chapter concluded that institutions such as the Conservation Act 1987, RMA 1991, the Salmon at Sea Agreement 1991, and more recently the proposed Salmon Management Plan 2007, are institutional instruments that have attempted to improve the management of the salmon fishery. However, despite the seemingly special treatment that salmon have received, the wild fishery continues to see-saw, spurring the need for an effective management plan.

The next Chapter interprets the results from the qualitative interviews and quantitative surveys in an attempt to further understand how salmon have been constructed, and the outlook for their future management.

## Chapter 7: Results, Analysis, and Interpretations

### 7.1 Introduction

With a frames of reference analysis it is important to put in context the current biological state of the fishery. This will provide the chapter with some contextual background for the way salmon have been socially constructed, as constructions are based on what is happening at a particular time, place, and to which cultural group. The size of the fishery has typically been characterised by good years and bad years, and seasonal variability is common for salmon fisheries management [see Appendix 11]. However, overall there has been a decreasing trend of wild salmon returning to spawn for both New Zealand and worldwide (Quinn 2005). This has raised peoples' awareness about the potential fragility of the fishery, resulting in what I have coined the "Needy Fishery" frame of reference [FoR]. The Needy Fishery frame appears to be one of the driving forces for the orientation of salmon management in New Zealand.

This Chapter takes its shape from the rich data obtained from the interviewee responses, but also incorporates findings from the NZSAA survey to lend quantitative support to the qualitative frames of reference analysis. Thus, Chapter 7 is a mixture of textual findings from the interviews with descriptive frequencies data from the NZSAA survey. Several frames of references emerged from the interviews, many of which are interconnected and difficult to write about in a mutually exclusive manner. However, an attempt has been made to discuss each frame of reference; consisting of multiple constructions that give meaning to the frame.<sup>72</sup> These constructions have been extracted from 14 interviews, forming a total of 14 frames of reference. The number of frames is not related to the number of interviews. The magnitude and complexity of the FoR have been reduced from 17 frames, but cannot be oversimplified to less than 14 frames in order to deepen the level of understanding about salmon in New Zealand.

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<sup>72</sup> Covered in 7.1.1



7.1.1 Making sense of the Frames of References

As outlined in Chapter 3, a frame of reference [FoR] can be made up of one or more constructions. A few of the FoR consist of only one construction, however most FoR consist of multiple constructions. The following Chapter reads like this; FoRs are numbered like 7.2 and the constructions that give meaning to the frame are numbered like 7.2.1 or 7.2.2 etc... The numbering of the constructions can be likened to sub-frames, in which case the following principle applies.

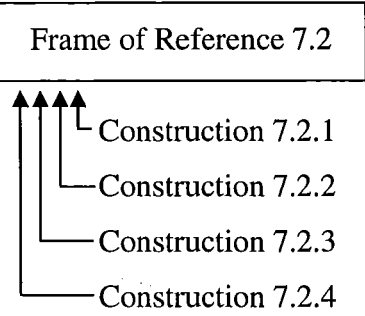


Figure 13 represents an overview of the frames that emerged from the qualitative interviews [and how they link]. The difficulties with diagrammatising a summary of the frames of reference analysis is that the frames were often interconnected, nonlinear, and were shared by more than one interviewee. However Figure 13 attempts to illustrate the interconnectedness of the 14 FoR.

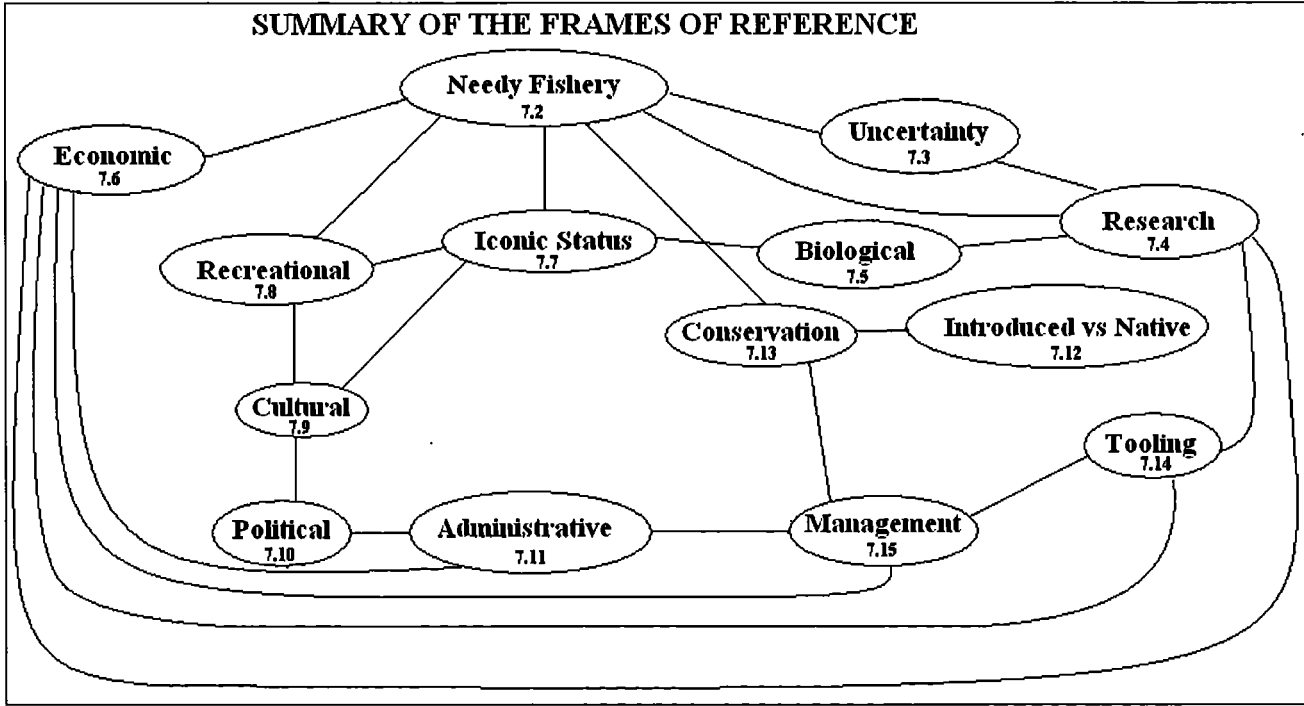


Figure 13: Summary of the Frames of References

For a textual summary of the 14 FoRs, see section 7.16. The following sections [7.2 – 7.15] attempt to explain the 14 FoRs in depth. In terms of reading, the following sections are complex

and thus demanding. However they are full of rich information that contribute towards better understanding how salmon are currently constructed in New Zealand. This ‘enriched’ understanding will help to provide key interpretations and recommendations in Chapter 8.

## 7.2 “Needy” Fishery FoR

The Needy Fishery FoR is related to discourse such as ‘desperation, fragility, fickle returns, weakened genetic stock, frustration, variation, supplementation, husbandry, nursing, and nurturing’ of the salmon fishery. These are metaphorical terms for something in need. Respondents generally illustrated a concern towards the needy state of the fishery. The majority of respondents constructed the Needy Fishery to be a result of water abstraction, intensive agriculture, over harvesting, pollution issues, the uncertainty of the ocean environment, and global warming. Ngai Tahu emphasised the impact that intensive dairy farming has had on river quality and quantity.

From FGNZ’s perspective, it is very important to have water conservation orders [WCO], fish screens, a salmon conservation area [SCA], and most importantly a salmon management plan [SMP] to ameliorate the neediness of the Needy Fishery. Support for this construction was shared by interviewees such as NZSAA, NIWA, TVNZ, DoC, F&B, ECan, Isaac Salmon, and the PFG.

In addition to this, NZSAA constructs supplementation, hatchery releases, and spawning enhancement to be necessary for assisting the Needy Fishery. Ironically many of the other interviewees disagreed with the supplementation construction, with NIWA and the PFG presenting strong arguments towards a genetically weakened wild fishery as a result. NIWA constructed the Needy Fishery according to the four H’s; harvest, hatcheries, hydro-power, and habitat. The first three have played a role in framing the Needy Fishery, and the last is circumstantial.

Harvest is related to the number of fish caught in a season. This is influenced by fishing equipment, fishable days, fish densities, accessibility, and regulated by daily bag limits. FGNZ claim there is evidence to suggest that over-harvest by anglers is occurring in the Rakaia and Waimakariri rivers, adding strain to the already Needy Fishery.

Hatchery releases are carried out at the Montrose hatchery on the Rakaia River, potentially weakening the genetic integrity of the wild stocks, according to NIWA. John Hayes (pers. comm. 2007) shares the view that hatchery releases water down the wild gene pool (Unwin & Glova 1997).

Hydro-power stations are not an issue as frequently as in the past because there is a strong public resistance against damming rivers, and the RMA regulates this type of development.

Habitat is related to the spawning grounds which NZSAA claim remain in pristine condition.

However there is the potential for didymo to infect habitat. Marine habitat was constructed as being another unknown factor with the exception of the SCA.

Within the Needy Fishery frame is the construction held by Isaac Salmon that the salmon farming industry is also very needy. This is attributed to the lack of government subsidies or incentives, high overhead costs of producing chinook salmon, and the fluctuating market price. According to Isaac Salmon the situation is like this:

“Picture a dog chasing a rabbit. The rabbit is running for its life, the dog is running for its lunch. Now you replace the rabbit with the salmon farmer and change the dog with the bureaucrat, then that’s a fair comparison” (Isaac Salmon).

It appears as though the salmon fishery, whether it be for commercial production or recreational purposes, is in great need of support. The PFG fears that the government will ruin things for recreational anglers through their lack of support for the fishery.

### **7.3 Uncertainty FoR**

“We don’t know where they go, we don’t know what they do, we don’t know what they eat, and we don’t know what effect the water temperatures are having on them in the sea... so there are a lot of unknowns that might be helpful in their management” (Hamill’s).

The Uncertainty FoR refers to the fact that little is known about the marine stages of the salmon fishery which may be contributing to the needy fishery. The Uncertainty frame appears to branch out from the Needy Fishery FoR. Throughout the interviews it was common for respondents to sound anxious, pessimistic, and fatalistic about the future of the salmon fishery. Part of this uncertainty arises from the continuing decline of salmon returns despite attempts to enhance the fishery by FGNZ. Concerns related to global warming, rising ocean temperatures, marine environment, over harvest through commercial by-catch and recreational anglers, and didymo also seemed to play into the formation of the Uncertainty frame.

NIWA and NCFG construct the Uncertainty frame in terms of research and management. At present FGNZ manage the fishery in its freshwater environment because that is their area of responsibility and the freshwater environment has been extensively studied. The marine environment has been studied to a limited extent and some monitoring occurs within the

designated SCA. But overall the SCA is a relatively small area adjacent to Banks Peninsula, and there is general agreement among interviewees that the marine environment is a big “unknown” factor. The uncertainties and “unknowns” of the anadromous fishery are making it increasingly more difficult to manage, contributing further to the Needy Fishery FoR.

“Something is happening in the ocean that is largely determining the success or failure of the fishery both in terms of run size, and size of fish... in terms of our work, we largely focus on freshwater aspects because it’s the only part of the lifecycle that we can actually influence” (NCFG).

NCFG claim that salmon spend the bulk of their life at sea in a rather unregulated, understudied marine environment while on the other hand, they are well managed and well studied in the freshwater environment. NIWA, NCFG, ECan, DoC, and the PFG all agree that there is much certainty about the freshwater aspects of the fishery, but the focus needs to shift to the areas of uncertainty. Therefore research and management of the salmon fishery needs to focus more on the marine environment.

NIWA follow the view that the freshwater environment accounts for approximately 25% of a salmon’s lifecycle while the marine environment accounts for the remaining 75%. According to NIWA, management of the fishery should be prioritised according to 25% freshwater, 75% marine. The major problems are that FGNZ do not have the funding available to carryout such research in the marine environment, nor do they have the manpower [or responsibility] to manage salmon in the marine environment. Currently NIWA are beginning to research the production capacity of the ocean for krill and other salmon foods to work out whether there is a relationship between where food species are found, and whether salmon are eating them.

NCFG state that the North American fishery has carried out marine research, but have only found loose relationships from data gathered, and found it to be a very expensive exercise. NIWA pointed out that research needs the backing from commercial industry, as that is where the end users of the research make their money. Unfortunately for New Zealand, our “amateur” fishery is unable to provide corporate industries with enough returns to warrant research in the first place.

Given that salmon runs are so variable, it is difficult for FGNZ to predict and manage the fishery effectively. The uncertainty of what will happen from one year to another makes it difficult to impose a foolproof management plan. The problem that managers face is that, one year can be hugely successful, followed by a seasonal record low the next. This makes it increasingly

difficult to impose basic regulations like bag limits, as it may lead to over-harvest from one year to another.

Under the Uncertainty FoR, a common theme of tentativeness is apparent in the discourse from historical literature, and interviewee responses. In the 1970s and 1980s commercial trawlers were blamed for the decline in the salmon fishery with by-catch issues. In the late 1980s and 1990s pollution and water abstraction were thought to be the problem with the initiation of the dirty dairying campaign. By 2000 the issue revolved around the notion of over-harvesting by recreational anglers and how to forecast bag limits. In 2004 the potential adverse affects of didymo to the salmon fishery were largely unclear, and now the neediness of the fishery is attributed to climate change and its affect on ocean temperatures. This illustrates that no one can pin point the exact cause of the needy fishery. It appears as though there has not been an element of absolute certainty since salmon were permanently acclimatised in New Zealand. New Zealanders have tended to approach salmon fishery management in a rather *ad hoc*, trial and error manner. The major fear remains that this piecemeal method of management is accelerating the demise of the increasingly Needy Fishery.

## **7.4 Research FoR**

The Research FoR is made up of several different themes. These themes are the Quirky New Zealand Fishery, Freshwater / Ocean Research, and Research Motives. There is a vast body of science and information available on salmon, suggesting that salmon are often seen through the lenses of research and science. Scarce (2000) has examined the political, bureaucratic, and economic forces that have directed salmon science in the Pacific Northwest, but no attempt has been made to understand the role that salmon play for research in New Zealand. The Research FoR ties in closely with the “fascination” that humans associate to their biology, explained in the Biology FoR.

### **7.4.1 Quirky New Zealand Fishery**

“Scientists think of the New Zealand salmon fishery as being a unique and quirky case study because we have a genetically distinct population from the North American stocks after only 30 odd generations” (NIWA).

From a research perspective the New Zealand fishery is quirky because of our unique and interesting local adaptations that have occurred within 100 years. New Zealand chinook salmon provide excellent opportunities for scientists to treat chinook salmon in New Zealand as case-studies.

7.4.2 Freshwater / Ocean Research

The field of research has and always will, constantly evolve. Examples of the evolution of research in relation to the salmon fishery since 1970 are briefly illustrated in Table 11.

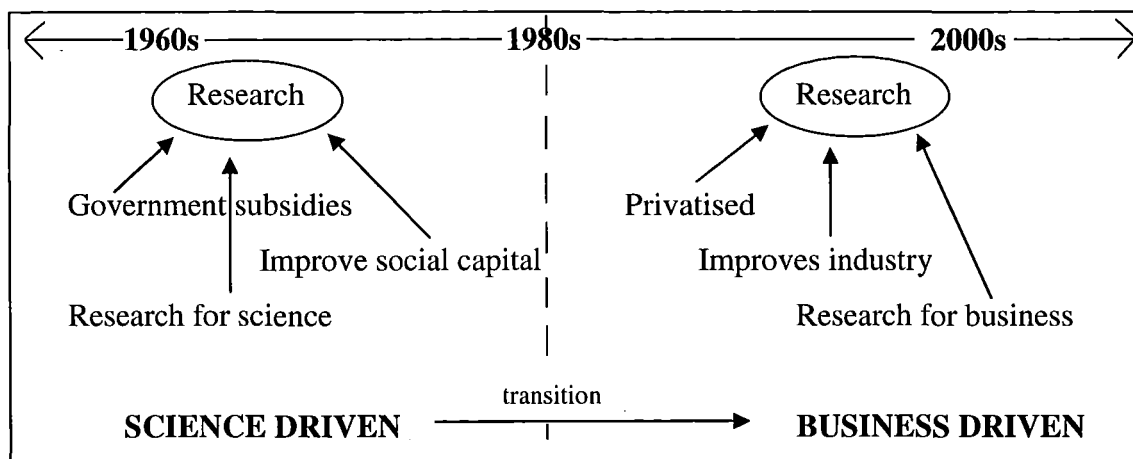
Dates	Research Focus	Research Environment
1970s	Wild and commercial fishery research; ocean ranching, pond rearing, sea cage rearing,	Mainly freshwater, partly ocean
1980s	Impact of hatchery releases to wild stocks, in stream flow needs	Freshwater
1990s	New Zealand case study fishery; local adaptation research,	Freshwater
2000s	Ocean research; marine habitat, migration zones, feeding grounds, population dynamics, and harvest catch.	Ocean

Table 11: The evolution of salmon research

It was not until ca. 2000 that the focus shifted away from freshwater type research, to researching the marine environment. This research focus shift appears to be an attempt to better understand the marine stage of the salmon lifecycle, which up until recently was seldom explored. This has partly contributed to the Uncertainty FoR because there is less research available on salmon in the ocean in comparison to the well documented freshwater stages.

7.4.3 Research Motives

NIWA and Isaac Salmon agreed that before CRIs, research was largely funded by the Government sector. There was still a focus of research for development but there appeared to be a lot of research done for the sake of it because the money was available. When CRIs were introduced, it tightened the purpose of research towards more business focuses. Essentially research underwent a transition from science driven to business driven in the late 1980s. Figure 14 illustrates this transition, providing a brief description of how the changes affected research.



**Figure 14: The research transition**

In support of Figure 14, Isaac Salmon added that:

“When I first starting working, I was growing salmon for the sake of the biology of the fish for research... Now I’m at Isaac salmon I’m doing it to make money using the same principles, same techniques, but for different reasons” (Isaac Salmon).

This change of research focus had inherent implications for the salmon fishery because it placed CRIs in an influential position to commercially shape the management of the fishery. What this has done is helped shift the research focus away from wild fisheries, and place emphasis on captive fisheries.

## 7.5 Biological FoR

The Biological FoR represent the views that people hold towards the biology of salmon.

Interestingly, most interview candidates found the biology of salmon “fascinating”.

“I think chinook have one of the more interesting lifecycles... For instance, a special jargon word that you might use to a technical audience is to say that chinook are phenotypically plastic generalists. Phenotypically plastic refers to their varying external body traits, colour, and shape... And they’re generalists in that they can withstand a wide range of habitats than some of the other species” (NIWA).

Biologically these phenotypically plastic generalists are considered to be very “cool”, particularly for research (NIWA).

In support of this biological construct by NIWA, Hendry & Stearns (2004: 19) state that:

“Salmonids are diverse, intriguing, beautiful— and very well studied. They offer a lot to evolutionary biologists in search of wonderful puzzles to solve, just as evolutionary biology offers a lot to salmonid biologists trying to understand why these magnificent fish live and behave as they do” (Hendry & Stearns 2004: 19).

Perhaps this beauty and fascination partly plays into the Iconic Status FoR for chinook salmon in New Zealand. The Biological FoR is recognised and given fuller meaning through the Lifecycle construct, discussed next.

7.5.1 Lifecycle

Within the Lifecycle construct most people showed a holistic interest in the entire salmon lifecycle, but for those who did not make reference to their whole lifecycle then they often made reference to the mature salmon stage for fishing purposes. Figure 15 complements the interview findings, with results obtained from the NZSAA survey.

Most salmon anglers were interested in the entire lifecycle. This lends support to the Biology FoR which claims that this holistic position towards salmon is partly a result of their unique and interesting biology, coupled by their beauty, rarity, and physical size and power as discussed in the Iconic Status FoR.

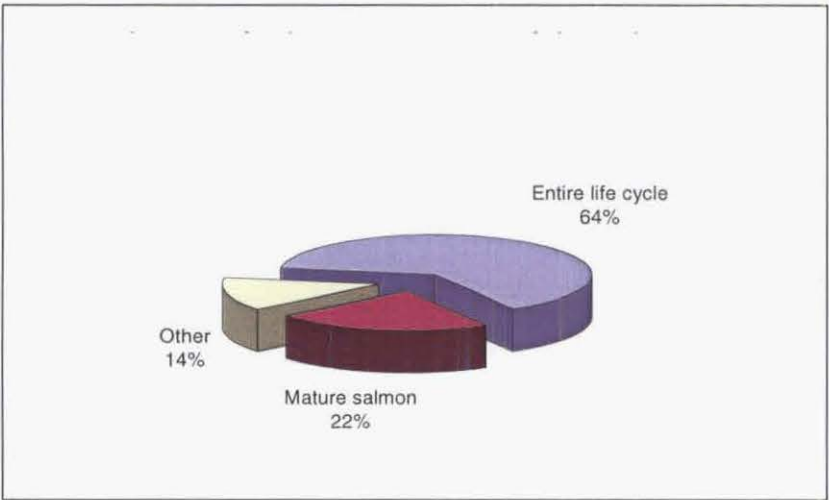


Figure 15: Interest in the components of the salmon lifecycle (N = 186)

The following statements provide more insight into the way several interviewees constructed the lifecycle of salmon.

“I know that you simply can’t only be interested in one stage of it without having a fascination and an interest in the rest of it, because if all the rest is failing then you’re not going to have any salmon at the mature stage” (DoC).

“Salmon die when they spawn and therefore every year is a cycle of rejuvenation, and if you break the cycle, you break the fishery” (ECan).



“The front end obviously is very important because without it, there is no back end... all parts of their lifecycle are connected and it’s not much good being interested in one part without the rest” (PFG).

The biology of salmon appears to have captured peoples’ imaginations by virtue of their uniqueness, rarity, beauty and big physical size as discussed in the Iconic Status FoR. Salmon continue to intrigue and amaze people, and as a result they receive a lot of attention by recreationists, the media, researchers, aquaculture businesses, and a wide range of organisations and institutions. For this reason people tend to show an interest in their entire lifecycle.

## **7.6 Economic FoR**

The Economic FoR was one of the more dominant frames of the research. The frame was given meaning through the following social constructions labelled as: Resource, Tourism, Revenue, Monopoly, Asset vs Liability, Branding, Consumer Generation, Research, North American Leader, Trout Farming, Salmon Farming, Seasonal Variation, and Exploitation.

### **7.6.1 Resource**

When discussing salmon, there were repeated references to the term “resource” whether it was in the context of a recreational resource, commercial resource, or industrial resource (Isaac Salmon, NCFG, WFG, DoC, and F&B). It appeared that the Resource construct represents the value that salmon add to the world. These values were recognised for their recreational, commercial, cultural, spiritual, political, environmental, managerial, and educational benefits that they provided. It was quite clear that these benefits were not necessarily monetary.

### **7.6.2 Tourism**

Salmon were constructed as creating a regional and national tourism industry in Canterbury (NCFG). This respondent stated that:

“North Canterbury Fish and Game rely heavily on the salmon fishery... Salmon are our biggest financial asset. Salmon have been referred to in the past as a “cash-cow” for Fish and Game...” (NCFG).

Salmon not only generate revenue for FGNZ through license sales, but the benefits of salmon spill over into the regional economy through accommodation, food, travel, and equipment purchases by the tourists.

Interestingly, Ngai Tahu constructed introduced species in both negative and positive ways. Species that were regarded negatively were those that largely impacted on indigenous biodiversity and were argued to lack “whakapapa” [i.e. possums], while certain introduced

species which also lacked “whakapapa” were acceptable because they provided commercial opportunities [i.e. salmon and trout].

“We can see the benefits of the interaction of trout and salmon. Our fishery stocks are declining so we can see benefits in having introduced species... Ngai Tahu has commercialised” (Ngai Tahu).

Trout were recognised for their economic benefits to the tourism industry in Taupo and Turangi, while salmon were seen as helping to boost tourism in Canterbury. The Rakaia fishing competition was an example used to describe the positive effect that tourism has had to the Rakaia township, specifically as a result of salmon running up the Rakaia River (Farmer).

It appeared that a certain level of acceptance was granted in circumstances where the overall benefits outweighed the overall costs despite whether the species in question has whakapapa or not. This way of evaluating the world resembles the economic tool; cost benefit analysis [CBA].

### **7.6.3 Revenue**

NCFG construct the salmon fishery from a very managerial standpoint whereby in order to effectively manage the needy fishery, financial revenues need to be generated. A metaphor used by NCFG was that salmon were the “asset”, the fishermen were the “investors”, fishing licenses were the “revenues”, and FGNZ were the “executive director”. The management of the fishery [explained further in the Managerial FoR] appears to be driven by economic returns. FGNZ see salmon as an integral part of their business, knowing full well that their stakeholders, the “investors”, want a return on investment in the form of salmon fishing opportunities.

Salmon fit into this Revenue construct by virtue of their value, because if they were not valuable, they would receive less management focus. Another construct of the value salmon have is presented by the PFG:

“Salmon have huge social and economic impacts. They have a supply chain effect, affecting businesses from producer and manufacturer right through to consumer” (PFG).

This implies that the revenue generated as a result of having salmon in Canterbury has positive flow-on effects for the industry and business sectors. In support of this point, Hamill’s claim that trout and salmon are huge income generators for their business. Along a similar line of thought, Isaac Salmon construct salmon as a valuable production item, referring to terms such as output, targets, sales, revenue, purchase, profit, input, and production when discussing salmon farming.

“We buy smolts from NIWA and then our target is to rear them to mature sellable sizes. The bigger the end product the more money we get” (Isaac Salmon).

### 7.6.4 Monopoly

A metaphorical term used to describe the way salmon are constructed in Canterbury, is a “monopoly” (Hamill’s). This is because Canterbury has a monopoly of salmon in rivers compared with any other region in New Zealand. The best wild-run salmon fishing in New Zealand occurs in Canterbury, and this “exclusivity” is an advantage to the region. The Monopoly fishery benefits local wholesalers, retailers, consumers, accommodation providers, travel agents, and other stakeholders involved affected by the fishery.

### 7.6.5 Asset vs Liability

While salmon are currently constructed as being an “asset” to FGNZ for the revenue they provide, there appears to be a fatalistic attitude that the fishery may become a “liability” due to the neediness, variability, and uncertainty of the fishery. This Asset vs Liability construct creates tension among FGNZ due to the concerns that expenditures may exceed revenues. By the same token the SMP aims to improve the fishery, and maintain the construction of salmon as “assets”, not “liabilities”.

### 7.6.6 Branding

The Branding construct ties in with the Cultural FoR [discussed later]. Salmon are now incorporated into basic math syllabus at schools to introduce wildlife management ethics to the young generation. According to WFG, NCFG, and TVNZ this is a move by FGNZ to naturalise the concept of fishing and hunting, to brand “Fish & Game” to the younger generation, and to expose youth to fishing and hunting opportunities.

“Without the young blood coming into the fishery, the fishery will slowly collapse from the bottom up. You need people coming in at the bottom end” (WFG).

Ultimately this is a form of marketing, and salmon are merely an object of the marketing. Much the same is true in respect to the way the media uses salmon to grab viewers’ attention<sup>73</sup> so they tune in. Salmon are used in this case to introduce the younger generation to the sport, and maintain the public interest in the fishery.

“The aim is really to get the Fish & Game brand out to customers, to normalise fishing and hunting, and generally just promote an environmental psyche” (WFG).

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<sup>73</sup> According to the TVNZ representative, six Channel One news clips involving salmon and/or rivers were covered since he/she began reporting for TVNZ. TVNZ claimed that each clip contained exciting scenes of salmon thrashing through rapids, fishermen fighting their catch, and helicopters carrying out aerial spawning counts with scenic backdrops of river mouths, braided rivers and mountainous landscapes.

The construct of branding emphasises the Economic FoR because it is a form of marketing used to increase license sales, achieve targets, and provide jobs for employees of FGNZ.

### **7.6.7 Consumer Generation**

“People still want their toys, comforts and high profile lifestyles, which unfortunately often comes at the expense of the environment... There’s often a trade off between luxuries like Ipods and necessities such as water... People would rather own an Ipod than pay tax towards water management, or carbon dioxide remission” (WFG).

The consumer generation is a metaphor used by WFG to exemplify some of the attitudes associated with capitalism. People want to enjoy higher standards of living, such as owning a jet boat to help them catch salmon, but at the same time are not willing to pay levies for sustainable water management which may improve the fishery, and increase their chances of catching salmon. It appeared that under this construction, salmon are an accessory to consumerism.

### **7.6.8 Research**

Even research ties in with the Economic FoR, because researchers can sell valuable information to interested parties, providing a means of self employment (NIWA). For instance, NIWA is a freshwater consultancy that carries out research and development for the salmon fishery using facilities like Silverstream.

On a different note, according to NIWA the United States Endangered Species Act 1973 created a “cottage industry” for research work, providing salmon biologists with research opportunities to distinguish stock traits, define areas where they are at risk, and identify distinct stocks to name a few. In the case of New Zealand chinook salmon, they are now considered a genetically distinct variant to the chinook of the Pacific Northwest (Quinn & Unwin 1993; Quinn et al. 1997), providing researchers like Malcom Flain, Bob McDowall, Martin Unwin, Nelson Boustead, and Thomas Quinn much work post 1970s (NIWA). Where this becomes important in relation to the Economic FoR is if New Zealand chinook are genetically distinct from Pacific Northwest chinook, what does this mean in terms of management? Do we have an obligation at an international biodiversity level to conserve such a rare fish? And most importantly would we receive financial support from the Pacific Northwest to sustain a rare chinook fishery?

### **7.6.9 North American Leader**

In terms of economic power, the Pacific Northwest fishery is constructed as being the leader economically and recreationally (DoC and NIWA). The PFG claims that the recreational fishery in North America is “enormous”, and that New Zealand merely provides a “niche” market to

New Zealand, Australia, and some Southeast Asian salmon fishermen. In New Zealand's case, the main economic generator of the salmon fishery is generated by recreation users. Whereas in America there is a huge commercial hierarchy that generates large economic growth, and the growth generated from recreation is dwarfed in comparison (NIWA and NCFG).

#### **7.6.10 Salmon Farming**

“Salmon grow like compound interest... everyday a fish grows, the next day, the meat it grew that previous day, will help the salmon to grow for the next day” (Isaac Salmon).

Interestingly this construct shares similarities with the metaphor of salmon as “assets” and “investment” discussed in the Revenue construct earlier. Within the Salmon Farming construct, discourse such as competition, prices, production capacity, margins, husbandry, and market helped shape what the respondents meant by Salmon Farming. Essentially this construct implied that if salmon were managed effectively using the appropriate tooling<sup>74</sup> methods and business strategies, they were more likely to be a financial success. It appears that salmon are perceived through predominantly commercial lenses unlike trout which are viewed quite strongly as recreational resources [except where they are tied to tourism income in places like Taupo and Tongariro. People are more willing to accept the commercialisation of salmon in New Zealand, but strongly oppose the commercialisation of trout.

#### **7.6.11 Trout Farming**

NIWA, NCFG, ECan, Isaac Salmon, and DoC consider that the deep opposition to trout farming is related to ethical and moral subjectivity rather than the scientific and economic objectivity. In terms of husbandry, trout are easy to farm, they are cheap to feed, and they are not as “demanding” and “needy” as salmon. Therefore trout would be ideal to rear in New Zealand freshwater environments.

The concerns about black markets for poached wild trout and whirling disease from farmed stocks were no different for salmon farming when that was legalised in New Zealand in the 1970s. In fact, rainbow and brown trout have been farmed in the United Kingdom since the 1950s with excellent results using modern technologies (BTA 2007).

ECan and NCFG raised an interesting point about the power of public perception, stating that, trout farming is perceived to taint the image of trout as being a pure recreational sporting icon of the New Zealand outdoors. People want to maintain this social construction of nature where

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<sup>74</sup> Discussed in the Tooling FoR, section 7.14

trout are free to roam unexploited. It seems that this resonates with the Kiwi Culture construct discussed in the Cultural FoR, where kiwis love New Zealand for its pristine, untouched, wild and natural outdoor activities.

**7.6.12 Seasonal Variation**

The uncertainty and variability of the salmon fishery has direct effects on the economy. Hamill’s noted that the fluctuations from season to season impacts the supply chain because:

“Manufacturers like Kilwell and Composite Developments who make rods exclusively for salmon fishing, would lose out [i.e. less rods made means less rod sales], and basically anybody moving or selling goods through their hand would lose out” (Hamill’s).

The variability of the salmon runs not only directly impacts retail sales and revenue, but affects the entire supply chain. This emphasises the extent to which the uncertainty and neediness of the fishery can impact businesses.

**7.6.13 Exploitation**

Within the Economic FoR there is reference to “exploitation” of the salmon fishery, particularly pre 1970s before capture fisheries began and the NZSAA was established (Lincoln University). There was particular reference to commercial netting in the 1950s at High Bank in the Rakaia River. Negative discourse relating to commercial sales of rod licenses, and commercial by-catch at sea between the 1960s and 1980s was also apparent. Commercial rod licenses are no longer permitted, but commercial by-catch at sea is currently permitted although it is managed and restricted according to the SSA, governed within the SCA (Lincoln University, NCFG, and NIWA).

Also forming part of the Exploitation construction is discourse referring to the water from rivers being exploited for hydro development, irrigation takes, damming, and flood water control throughout the 1960s and 1970s. The Exploitation construct was a common theme raised by most respondents in relation to water. Up until the 1980s, recreational and aesthetic values for rivers, streams, and lakes were largely unaccounted for in relation to resource management planning (Lincoln University).

**7.7 Iconic Status FoR**

The Iconic Status FoR was another dominant frame to emerge from the qualitative research. The iconic status of salmon appears to be driven by the fact that they are a big, challenging, popular, visible, and good eating fish that are unique to Canterbury, and well respected for their “survival-

against-the-odds” attribute. Recognising the iconic status of salmon in Canterbury is partly behind the push for a SMP.

The Iconic Status FoR is given meaning through the following constructions: Uniqueness, Regional Iconism, Respect/Mauri, Challenge, Nobility, Charismatic Mega Fauna, High Profile, Supplementation, Common Name, and Escapism.

### **7.7.1 Uniqueness**

Respondents like NCFG, NZSAA, the PFG, F&B, DoC, ECan, Ngai Tahu, and NIWA shared perceptions about the iconic status of salmon using words such as kudos, unique, mana, recognition, challenge, and nobility. The fact that New Zealand, Chile, and Argentina are the only countries to sustain wild chinook fisheries in the southern hemisphere, lends a “kudos” connotation to their status.

Ngai Tahu summarises the Uniqueness construct with:

“You can go anywhere in the North Island and catch a trout, you can go anywhere in the South Island and catch a trout, you can go anywhere in Tasmania and catch a trout, but to catch a salmon you have to come to Canterbury or Otago”.

This uniqueness appears to partly fuel the parochialism held by anglers who form a cultural network of keen, enthusiastic and dedicated followers. Along a similar line of thought, the Fiordland Wapiti Trust Foundation proudly advocates for the management of the only wild elk or wapiti herd in the Southern Hemisphere. Part of what makes something iconic is its uniqueness, and in both cases these species are unique to specific regions of the South Island, New Zealand.

### **7.7.2 Challenge**

Part of the Challenge construct derives from the uniqueness and rarity of having salmon in New Zealand (NCFG and ECan). Because salmon are only caught in a select few rivers in the South Island, they offer a great challenge.

“There’s a challenge to freshwater salmon fishing that doesn’t exist in other forms of fishing, such as the difficulty of it and the skill and technicality of it, all of which motivates people who want a challenge as much as they want an experience” (NCFG).

Salmon appear to be spoken of as symbols of triumph, strength, and perseverance, all of which contribute to the Challenge construct for salmon fishing.

Figure 16 illustrates a distinct finding that emerged from the NZSAA survey in relation to what the highest motivation was that drove anglers to fish for salmon. Of those that responded, 55% thought the challenge of the catch was the 1<sup>st</sup> motivation, while only 10% considered the environmental settings was the next, and 9% selected social interaction as their 3<sup>rd</sup> highest motivation. The fact that salmon are challenging to catch partly derives from the Needy Fishery FoR because salmon are rare, and the Iconic Status FoR because they are unique, big, and powerful fish to try catch. Interestingly the least chosen motivation was to fish for salmon as a source of food.

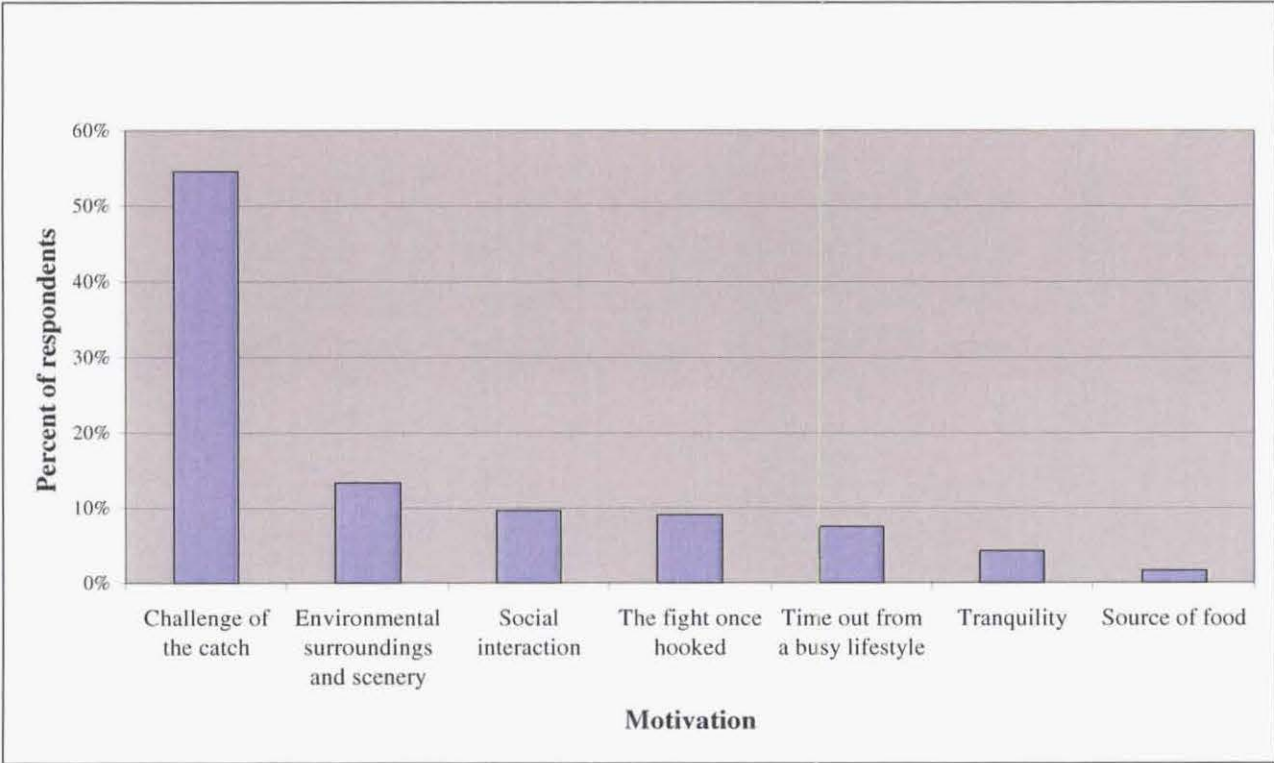
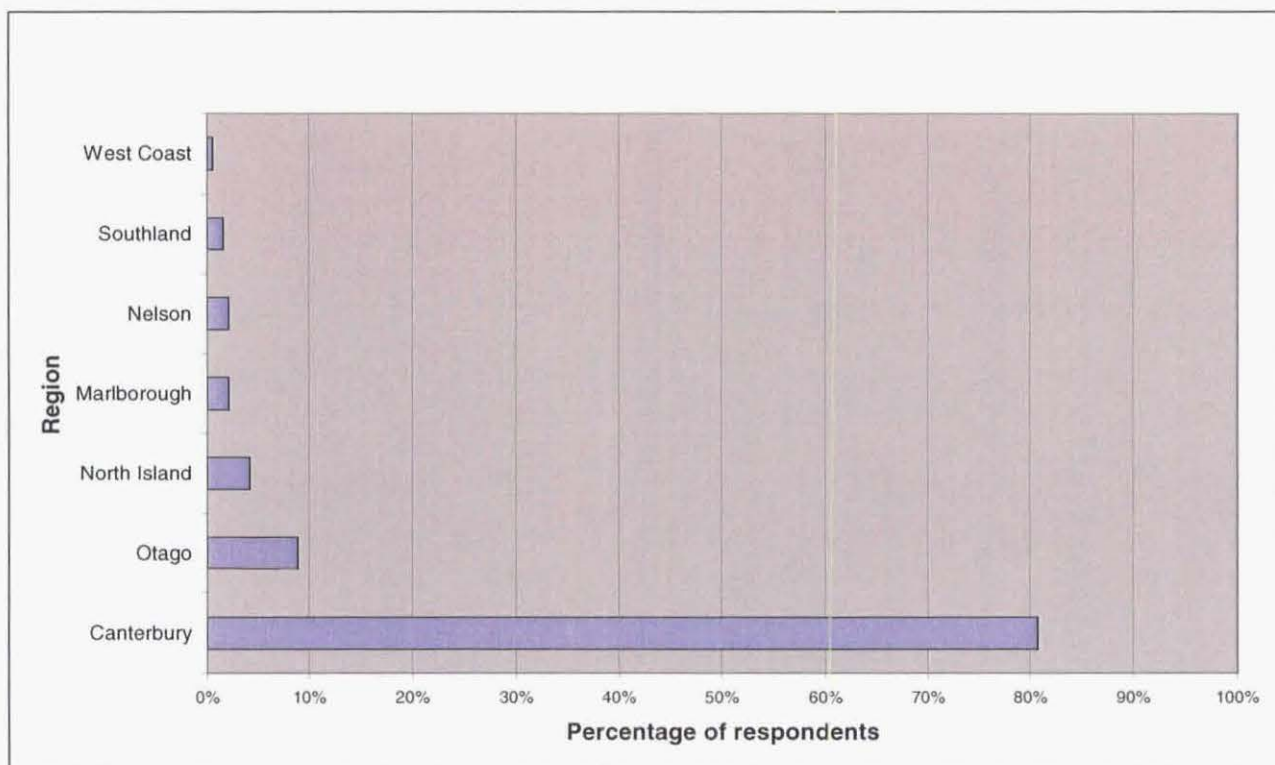


Figure 16: Highest motivations for salmon fishing (N = 187)

### 7.7.3 Regional Icon

Because salmon are unique to Canterbury and Otago as opposed to New Zealand as a whole, they are generally regarded more as regional icons than national or international icons. In support of this, Figure 17 found that of the survey respondents 81% were from Canterbury, followed by 9% from Otago regions.





**Figure 17: Regional locations of NZSAA respondents (N = 192).**

The high response from Canterbury may partly be a result of the NZSAA originally being a Canterbury initiative to improve the local salmon fishery.

TVNZ offered an interesting perspective, claiming that:

“Salmon receive a lot of attention locally, and they receive a lot of media attention nationally as a result. However, there are a lot of people outside of Canterbury that wouldn’t know a thing about salmon in New Zealand, particularly if they were from the North Island and if they’re not fishermen” (TVNZ).

At a local level salmon are highly recognised as iconic symbols. At Rakaia township there is an anatomically dubious and very large fibreglass salmon on State Highway One<sup>75</sup>, and a new restaurant immediately adjacent called “Salmon Tales”. But it appears that the further removed from salmon areas like this, the lesser their iconic status is recognised. So in that sense, the region reinforces the iconic status of the specie. For instance the wapiti monument in Te Anau represents their iconic status to Fiordland; the statue of a Himalayan bull tahr is regionally iconic to Mount Cook, in the same way that the salmon statue at Rakaia is regionally iconic to Canterbury. The Rakaia salmon statue appears to signify the stronghold of the salmon fishery in Canterbury and New Zealand in a similar way as the other symbolic monuments do for their regions.

<sup>75</sup> This has been here for well over a decade and is an example of the branding of rural towns in New Zealand by way of most notable local feature and it adds to “Kiwiana”.

#### **7.7.4 Mauri**

An interesting construct to emerge from the interviews was that salmon have “Mauri” (Ngai Tahu). Salmon appear to have Mauri because they are part of Papatuanuku, mother earth, and Tangaroa, the god of the sea and all things living in it. Salmon start on Papatuanuku, mother earth, migrate out to Tangaroa, the sea god, and return back to Papatuanuku again. According to the Ngai Tahu respondent this is a remarkable attribute, and salmon are therefore respected for their unique ability to interact with both Maori gods, Papatuanuku and Tangaroa, in two different environments.

#### **7.7.5 Nobility**

Within the Iconic Status FoR is the construction that salmon are noble, and worthy of their “status”. NCFG and the PFG offer two complementary constructs of what is meant by nobility.

“The noble thing about salmon is the nature of their lifecycle... It’s so captivating. Even people who don’t fish for salmon are fascinated by the noble fact that they stop feeding and sacrifice themselves to spawn... So for that reason we tend to take our hat off to them” (NCFG).

Along a similar vein of thought, the PFG refers to discourse that resemble noble attributes of honour, respect, and courage with:

“Salmon are a majestic fish that comes from the sea just to spawn, and are a very courageous fish. It runs the gauntlet from the sea to the headwaters of where it spawns, and in a lot of ways it’s rather tragic that they don’t survive... They’re one of God’s creatures” (PFG).

This construction of a noble and majestic fish ties in with an article called “The Incredible Salmon” written in the Christchurch City Press on October 20<sup>th</sup> by Scott et al. (2005). Language referring to bravery and honour shapes this construction.

#### **7.7.6 Charismatic Mega Fauna**

The most dominant construction to give shape to the Iconic Status FoR was the Charismatic Mega Fauna construct. The majority of respondents fell into this category when describing the physical characteristics of salmon. Several quotes have been displayed below to give fuller meaning to the Charismatic Mega Fauna construct.

“Salmon are big and they’re impressive, like giant pandas but the freshwater version... and people tend to think ‘well I don’t care about bullies [sic], but we had better look after that salmon’... which is why they get more protection” (NCFG).

“Salmon portray themselves... you go to a river and you look at a fish one metre long; you’re in awe of it” (NZSAA).

“The classic image of a salmon leaping up waterfalls and rapids is the first thing that I think of when you mention the word salmon... it’s that cliché of them fighting rapids and clearing waterfalls. They also seem to draw our attention by virtue of their bizarre behaviour when spawning” (NIWA).

“Salmon are the biggest freshwater fish in New Zealand... and the thing that intrigues me is their sheer size and power. The novelty is great when you catch a trout, but to catch a salmon is just an absolute buzz. They are like the Holy Grail. They’re bigger, stronger, and harder to catch” (Hamill’s).

“Salmon are a great big fish... massive bloody things... they’re just fantastic animals. There’s nothing like casting out and just letting your spinner drift down and to feel the first thump of a salmon” (Lincoln University).

Seeing as salmon are impressively big, beautifully colourful, and incredibly powerful, they tend to attract peoples’ attention more than other species, and are therefore more likely to be part of discussions for management or protection. This appears to be the case in New Zealand. Salmon conservation is provided for under the Conservation Act 1987, their freshwater habitat is protected under the RMA 1991, their marine habitat is monitored within the SCA in accordance to the SSA, and will soon be more actively managed if the proposed SMP comes to fruition.

In addition to this, TVNZ offers an interesting media perspective of salmon, stating that:

“The salmon fishery is so media-genic because it has all the hallmarks or ingredients of what makes good media. The salmon fishery is firstly very visual; the salmon themselves are captivating, they’re beautiful to watch, and you can hear them chasing and thrashing about in the rapids...” (TVNZ).

The many stages of a salmon’s lifecycle are “entertaining”, “intriguing” and “media-genic”. By virtue of being such captivating fish, TVNZ find that salmon are a useful lead in to other outdoor related issues [see Tooling FoR].

Overall, this construction confirms how judgmental and influential society is of objects in nature. Because salmon are constructed as being big and charismatic fish, it appears that they are more likely to receive special treatment compared to less fortunate species that do not fit this construct. For an elaborate discussion of the judgements that society hold towards particular wildlife species and how these judgements subsequently affect management, see Czech et al. (1998).

### **7.7.7 Special Treatment**

Lincoln University claimed that the first instance where the salmon fishery was considered special was when the Rakaia River was granted a National Water Conservation Order [NWCO] in the 1980s.

“The NWCO [sic] set the precedent... ‘God salmon really are important! They really are an icon sort of species, and here’s an icon river that is associated to them, so let’s do something about it’” (Lincoln University).

Before the Rakaia River NWCO was granted, salmon had been on the receiving end of several developments that impacted the fishery. The Rakaia River NWCO was a turning point for salmon management, and the salmon fishery has been treated with more respect since. It now appears that the salmon fishery receives special treatment in Canterbury.

Salmon tend to have acquired a high profile in Canterbury as a result of being constructed as big, charismatic freshwater fish that have an “X-factor” about them.

“There is just something about them that people cannot fully describe” (PFG).

Not only does the salmon fishery appear to receive special treatment in the form of legislation and management, but also receives special treatment from members of society with their voluntary involvement to improve the fishery (NZSAA). NZSAA raised the point that this special treatment consists of donations of money, labour and time, and enhancement programs. It is uncommon to see members of society [such as the NZSAA] devoting and dedicating their time to such a unique fishery. This partly touches on the Salmon Angler construct [discussed in the Cultural FoR] as being passionate, and dedicated towards their fishery.

WFG pointed out the special exposure that salmon get in the educational “Environmental Game Plan” resource kit for schools. The “Salmon Quest” board game<sup>76</sup> is an implicit example of the efforts from FGNZ to highlight the special needs of salmon in New Zealand. In support of this, NIWA added that the seemingly special treatment of chinook salmon may be a result of the United States Endangered Species Act 1973 which protects chinook salmon in certain areas in the Pacific Northwest.

Even within academia, salmon appear to receive special attention from their scientific observers.

“Some of my American colleagues who are into evolutionary questions all agree that salmon are a pretty cool species to work with” (NIWA).

This suggests that even a scientist who attempts to be entirely objective, makes choices and personal judgements. Some of these judgements may result with the species in question receiving special treatment like receiving more academic exposure resulting with improved understanding, and advanced management systems.

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<sup>76</sup> See Appendix 12

7.7.8 Common Name

In New Zealand it is interesting to discover that salmon are commonly referred to as “quinnat” and/or “chinook” salmon [covered in Chapter 4]. In academic work until the mid 1970s, salmon were referred to as “quinnat”. The North American common name “chinook” came into academic work due to Martin Unwin who used it to resonate with an international audience for academic publications. NIWA provides an example to illustrate some of the confusion with having multiple common names:

“I was at a hearing last week and some of the people giving evidence there were very careful when they referred to salmon, ensuring they always gave the Latin taxonomic name... and that’s because there are so many variations of the common names” (NIWA).

In New Zealand’s case, the name “quinnat” appears to form part of the Iconic Status FoR by virtue of being distinguishable as a uniquely different fish stock to those in the Pacific Northwest with a distinguishably different name. This has seemingly fuelled some of the patriotism for the fishery, as Kiwis’<sup>77</sup> feel the fish is unique to New Zealand, and therefore entitled to a unique name.

Figure 18 demonstrates the findings from the NZSAA survey in relation to the common name for salmon in New Zealand.

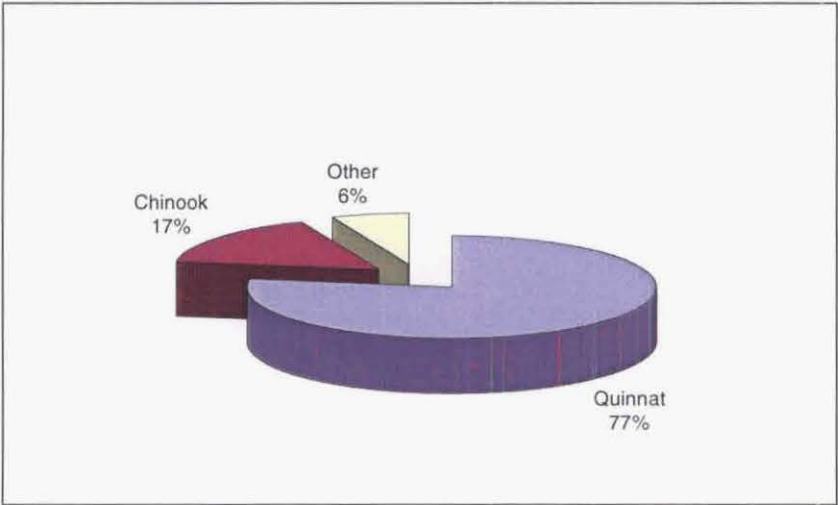


Figure 18: Respondent views on the common name for salmon in New Zealand (N = 193)

The majority of NZSAA members refer to New Zealand salmon as “quinnat”, while 17% call them “chinook” and the remaining 6% call them either “king”, “Pacific”, “Atlantic”, or “sockeye” salmon. When discussing salmon in the qualitative interviews, 8 [57%] of the respondents referred to salmon as “chinook” while 6 [43%] referred to “quinnat”. More specifically, NIWA, NCFG, TVNZ, F&B, Isaac Salmon, DoC, Ngai Tahu, and Farmer called

<sup>77</sup> Kiwis’ is a cultural term used to describe New Zealanders.

them “chinook”, while NZSAA, ECan, WFG, Hamill’s, PFG, and Lincoln University called them “quinnat”. This suggests that there may be a difference between the 77% of NZSAA members that call salmon “quinnat” compared with the 57% of interviewees who at a managerial and scientific level use the name “chinook”.

This suggests that reference to the name “quinnat” may be replaced by “chinook” in the future based on the trend that over 60% of NZSAA respondents were over 60 years of age, and retired. Will there still be reference to “quinnat” salmon once this angling generation has passed on?

### 7.7.9 Escapism

“Salmon fishing is a bit like a religion, it’s something you believe in, it’s something you want to do, something you enjoy and you’re in tune with nature, and part of nature. It’s an intangible thing that’s emotional and spiritual... And it provides escapism” (PFG).

For many people, salmon are more than just salmon; they represent nobility, respect, grace, sportsmanship, strength, belief and perseverance; all of which are remarkable attributes that make salmon so iconic. Many of these reasons appear to be why salmon anglers subscribe to salmon fishing.

## 7.8 Recreational FoR

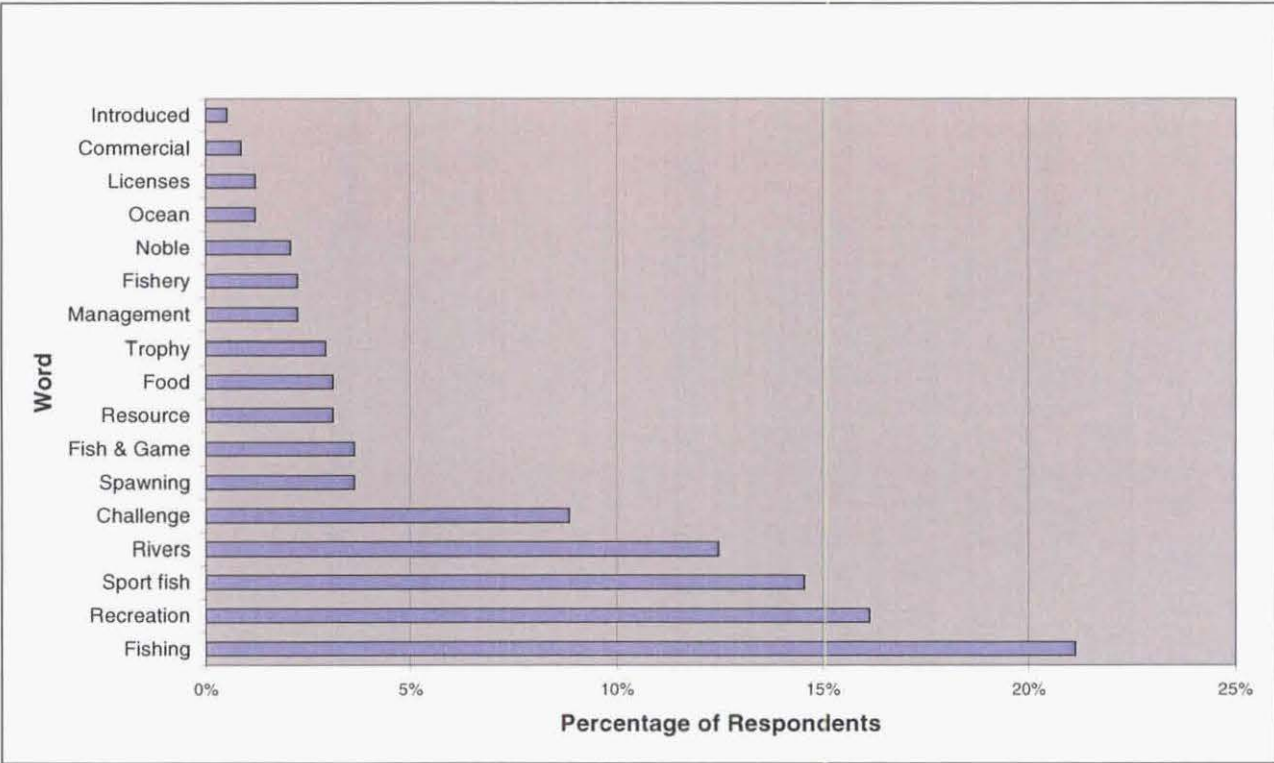
Generally, salmon and trout are constructed as sports-fish because they are bigger and more exciting to catch than some native fish.<sup>78</sup> This line of thought partly derives from the Iconic Status FoR as the fish is often constructed as a “Mega Fauna”. From a recreational perspective, there is a real “thrill” of catching a “big” “powerful” “beautiful” fish. When asking NZSAA members to select any three words they most commonly associate with salmon, the three most common discourses were i) fishing, ii) recreation, and iii) sports-fish [Figure 19].

Of the respondents, 21% associated the word “fishing”, 16% “recreation”, and 15% “sport fish” with chinook salmon in New Zealand. The combination of these responses is 52% and relates strongly with “recreational” activities. This lends support to the current FoR that salmon are perceived as recreational sport fishing items, as opposed to commercial products.

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<sup>78</sup> I cautiously use the word “some” native fish because several interviewees commented on the huge thrill in catching shoals of native whitebait, despite the fact that at an individual level they are tiny compared to salmon. In fact, on their own, whitebait are probably constructed as “Minor Fauna”, but collectively, some may argue that they resemble some of the traits that “Mega Fauna” such as salmon have. This would be an interesting social construction to further investigate.





**Figure 19: Words most associated by NZSAA respondents with salmon (N = 193)**

The majority of NZSAA respondents framed salmon as recreational sport fish, while 28% thought they were a combination of both recreational and commercial fish, and 25% constructed them as being endangered fish.

The Recreational frame is given further meaning by the following social constructs: Iconic, Commitment, Age, Opportunity and Expectation, Introduced vs Native, and Catch and Release.

**7.8.1 Iconic**

Many of the respondents constructed salmon as an Iconic fish because of their sheer size, power, beauty, refined culinary uses, difficulty to catch, excitement to fish for, and environmental settings. They are regarded as a great challenge to catch, giving you a “run for your money” (DoC) because they “fight like hell once hooked” (PFG and Ngai Tahu).

“If you get a big fish on, and they head downstream, they just go for it! It’s bloody exciting! Your rod’s bucking, the line is at full tension, the reel is just screaming, and you’re thinking: ‘Ok, are the knots going to hold... Am I going to have gear failure?’” (PFG).

For an angler, to have these thoughts race through their mind appears to be one of the quintessential elements of salmon fishing. No other freshwater fish in New Zealand makes anglers feel the way salmon do. Millichamp’s (1997) book titled “Salmon Fever” is an

appropriate summary of salmon fishing and the physiological and psychological effects it has on salmon fishermen.

### **7.8.2 Commitment**

An interesting construction that emerged from the discourse was that in order to be considered “good” at salmon fishing, there was the expectation of commitment, drive, dedication, perseverance, local knowledge, and passion. Anglers attaining these attributes may give insight to some of the reasons salmon fishermen make great lobbyists. Broadly speaking lobbyists are passionate about, and committed to, making a difference. Mixing the commitment and dedication of the salmon angler together with the fact the salmon fishery is needy, appears to be a recipe for political lobbying. The dedication and commitment from salmon anglers to salmon fishing appears to run deeper than just the recreation itself.

### **7.8.3 Age**

Several of the respondents considered that salmon fishing as a sport lacks the introduction of younger anglers at a grassroots level. Reasons for this appear to be partly a result of the Needy Fishery FoR where too few fish are caught to satisfy kids’ short attention span. The other reason derives from the Salmon Angler construct [discussed in the Cultural FoR] where interviews revealed that salmon anglers tend to be rather socially “clique-ish”, grumpy, old men who perhaps frighten, discourage, or intimidate new people to the sport.

### **7.8.4 Opportunity and Expectation**

According to NZSAA, salmon have provided anglers the opportunity of enjoying a recreational activity that incorporates elements of challenge and sportsmanship, tranquility and solitude, and equally as importantly, provided for socio-cultural aspects.

“I know a lot of people who have fished for salmon for ten years and never caught a fish. But they grab at the opportunity to go out because they have an expectation to catch a salmon, so it gives them a means of exercising themselves... Going out and enjoying the outdoors, and talking to people. I think it’s the mental attitudes that it creates in people that gives them freedom and allows them to relax and just enjoy the outdoors which they wouldn’t do if there were no salmon” (NZSAA).

Attitudes like this are taken into account by freshwater fisheries resource management planners as they try to incorporate the wide range of user values in their management plans. The drafting of the salmon management plan is a working example where FGNZ have tried to cater for a range of values and expectations of the salmon fishery.



7.8.5 Introduced vs Native

This construction between introduced and native species emerged in relation to their contribution as sport and recreation items in New Zealand. Introduced species like salmon and trout were perceived as bigger, stronger, attractive, and therefore more fun to catch than the supposedly plain, boring, and uglier native fish. DoC summarised this construction with:

“One of the most interesting native fish are tuna or long/short [sic] eel... they’re magnificent animals, and yet because they are slimy and wriggly like snakes, they are quite lowly regarded by most New Zealanders” (DoC).

This statement is supported by Czech et al. (1998) with their sociological study that revealed fish as “advantaged”, plants as “dependants”, reptiles, invertebrates, and micro organisms as “deviants”, and mammals as “contenders”. In this case eels have been stereotyped along with snakes, and therefore construed as “deviants”.

For example, look at the use of discourse extracted from Deans (2004) cited in (Harding 2004: 41.13) and how it constructs fishery management in New Zealand:

“Tensions are likely to remain about the appropriate management of salmonid and indigenous fish species where these species occur in the same environment. Research into the ecological relationship between introduced and native species will continue, but – for the foreseeable future at least – freshwater environments will continue to be managed to provide for sports fisheries as well as for indigenous biodiversity”.

If we assume that the order of wording is important here (Gee 1999), then it becomes apparent that the words “indigenous” fish are overshadowed by “salmonid”, “introduced”, or “sports” fish. It is commonly known that New Zealand freshwater anglers generally attribute more value and interest toward introduced freshwater fish such as salmon and trout than they do with native fish (Lamb 1964; McDowall 1994; Millichamp pers. comm. 2007; Young 1986). Subsequently, this has profound influences on management, with predominantly more focus on sports fish than indigenous fish. In support of this construction are Figures 20 and 21, obtained from the quantitative survey.

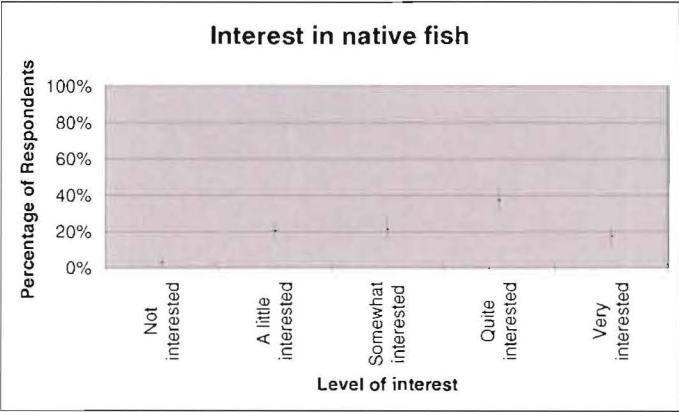


Figure 20: Interest in native fish (N = 187) (SE ± 5%)

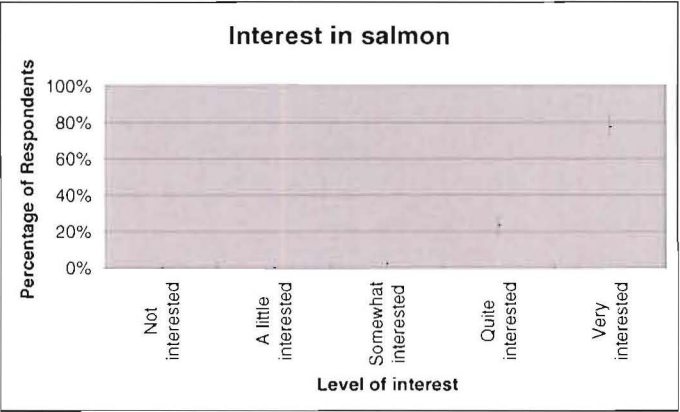


Figure 21: Interest in salmon (N = 193) (SE ± 5%)

When asking the NZSAA members to express their level of interest towards native fish and then with salmon, the results distinctly illustrated more interest in salmon. This is likely to be because 97% of the NZSAA members stated that they fished for salmon. Of the respondents to Figure 20 the majority [37%] expressed that they were “quite interested” in native fish, while Figure 21 illustrated that 75% were “very interested” in salmon. In order to fully quantify the statement that ‘New Zealanders generally attribute more value and interest toward salmon and trout than native fish’, a randomly selected unbiased survey sample is required (see Hughey et al. 2004 for an unbiased sampling methodology). However, the apparent disinterest in native fish by salmon anglers lends support to the construction that introduced fish have been historically perceived to be of more value than native fish.

### **7.8.6 Catch and Release**

When discussing salmon and trout with the respondents, it was common discourse to construct trout with the term “catch and release”, and salmon with the notion of “keeping”. There appears to be three general reasons for this difference in the Catch and Release construct.

The first was that trout are less regarded for culinary cuisine compared with “succulent”, “divine” salmon, which means that salmon are taken home while trout are more likely to be released (NZSAA). Secondly, salmon are not released because of their susceptibility to die from stress of being “hooked and played”, and the fact that they are going to die after spawning anyway (PFG, NCFG, Hamill’s, and Trevor pers. comm. 2006). The assumption, not necessarily scientifically valid, is that when salmon are spawning they are in fragile condition and any stressful knocks and bumps incurred while being caught is likely to kill them, so people take them home if they are legal size. The third reason salmon are not released is because of the competitive “brag rights” that are associated with bringing home a salmon. Salmon are so rare to catch that when an angler gets one they keep it. The fact the fishery is needy appears to fuel that competitive drive of killing and taking home the prized catch. The general consensus among respondents was that showing off photos of a salmon was nothing like showing it off in full flesh.

## **7.9 Cultural FoR**

There is definitely a strong Cultural FoR in relation to salmon in Canterbury. Cantabrians appear to have adopted “quinnat” salmon as an integral part of recreation in Canterbury. The Cultural FoR is given meaning by the following constructions: Glory Days, Whakapapa, Kiwi-Culture, Trout Angler vs Salmon Angler, Age, Indigenous Views, Pacific Northwest, Culinary “Trendyness”, and Farmer vs Angler.

### 7.9.1 Glory Days

“The small number of elite salmon fishermen who caught salmon in the ‘hey day’ have got a lot of local knowledge, have got all the boats, the gear, and the family history and traditions of chasing salmon, so they have an advantage to some extent... but the majority of people nowadays are struggling to catch one salmon – and it’s like chasing the end of a rainbow for a lot of people” (F&B).

This construction rests on the notion that the salmon fishery is not a fraction of what it used to be; partly discussed by the Needy Fishery FoR. The desperation and dedication to revive the fishery is clearly evident among cultural discourse (ECan, NIWA, and NZSAA). The Glory Days construct seems to be a strong driver in improving the management of the salmon fishery.

### 7.9.2 Whakapapa

Within the cultural frame is an interesting construction that people of European extraction have developed the equivalent of Whakapapa with salmon.

“I love the Rakaia because I was born and bred on it from knee height... I think it’s much the same as the Maori connection with the land, it has formed part of who I am” (Lincoln University).

“Some salmon fishermen have siblings, parents, and grand parents that have had a hut at the mouth of the Rakaia, or Rangitata and it’s literally been their life... I think that salmon fishing is much more than just a recreation... It’s a cultural activity entrenched in tradition” (NCFG).

These constructs are essentially the same as what Maori would consider to be Whakapapa, forming an integral part of one’s lifestyle, culture, and tradition.

### 7.9.3 Kiwi Culture

Most of the respondents agreed that the New Zealand culture is integrated with outdoor recreational activities (NCFG, ECan, DoC, F&B, the PFG, NZSAA, WFG, Hamill’s, TVNZ, and Lincoln University).

“Trout fishing is pretty much engrained in our Kiwi culture, we could easily visualise a picture of a trout fishermen and understand what it’s all about. Salmon fishing is similar, but outside the salmon areas there is not that same level of awareness” (WFG).

“Sporting and recreation is a really important component to our Kiwi culture” (Farmer).

“Salmon fishing has created a bit of a bond between me and a lot of my friends. Fishing and hunting is all about enjoying something with one another. It’s that element of social cohesion; it’s a bonding agent to

maintaining great friendships... If you have that social cohesion you are part of a network... And that's very important to my livelihood" (PFG).

Part of the Kiwi Culture construct is to have a lifestyle of fun, recreation, family, friends, and food (Professional Fishing Guide). The Kiwi Culture construct of the Cultural FoR ties in closely with the Recreational FoR, as it appears that the Kiwi Culture has evolved as a result of the fun and enjoyment, and social cohesion that activities like salmon fishing provide.

7.9.4 Salmon Angler vs Trout Angler

These were two of the strongest constructions discussed by the interviewees. Each respondent expressed very similar views when describing the characteristics of the salmon angler and the trout angler. Table 12 provides a summary of the two angler constructs articulated in interviews.

Salmon Angler	Trout Angler
Aggressive, defensive, stubborn	Passive
Highly competitive, results driven	Experience and scenery driven
Mobsters, scrappy, fighters, stirrers, controversial	Elegant
Dedicated, passionate, committed	Enthusiastic
Meat hunters, less angling skills, scrabblers, scratchers, chuck and chance	Catch and release, purists, skilful, artful
Socially clique-ish [clicky], social fishermen, vibrant, energetic	Individualistic, solitude, secretive, tranquil
Desperate, irrational	Calm, composed
Patriotic, parochial, vocal, pushy, lobbyist	Eloquent
Voluntary work, generous with time	Less/no voluntary work
Old, grumpy	-
Wise, well spoken	Highly educated, well spoken

Table 12: Summary of perceived angler characteristics

Generally speaking, the interviewees constructed Salmon Anglers as a social network of dedicated anglers who were strongly driven by the thought of catching salmon, expressing levels of aggression and patriotism towards protecting their needy fishery via political lobbying [Table 12]. Trout Anglers were constructed as more individualistic in their pursuit for solitude and unique fishing experiences, while appearing to be more passive and eloquent about their less needy fishery. Most of the discourses were gross overgeneralisations, as in many cases salmon

anglers were also trout anglers. But, the importance was to illustrate how salmon and trout anglers were socially constructed from the 14 interview candidates. This helps to better understand how the two angling communities are perceived, as these constructs may influence the way in which decision makers respond to issues involving salmon and trout.

7.9.5 Age

Within the Cultural FoR, there is the Age construct that the salmon fishery appeals to the older generation. Most people involved in salmon fishing appear to be over the age of 60 supported by discourse from the qualitative interviews such as “pensioners’ hole” (Ngai Tahu) and quantitative findings from the survey [Figure 22]. Of the responses to the age group question, 63% were over the age of 60, with the majority [37%] falling between 60 – 69 years.

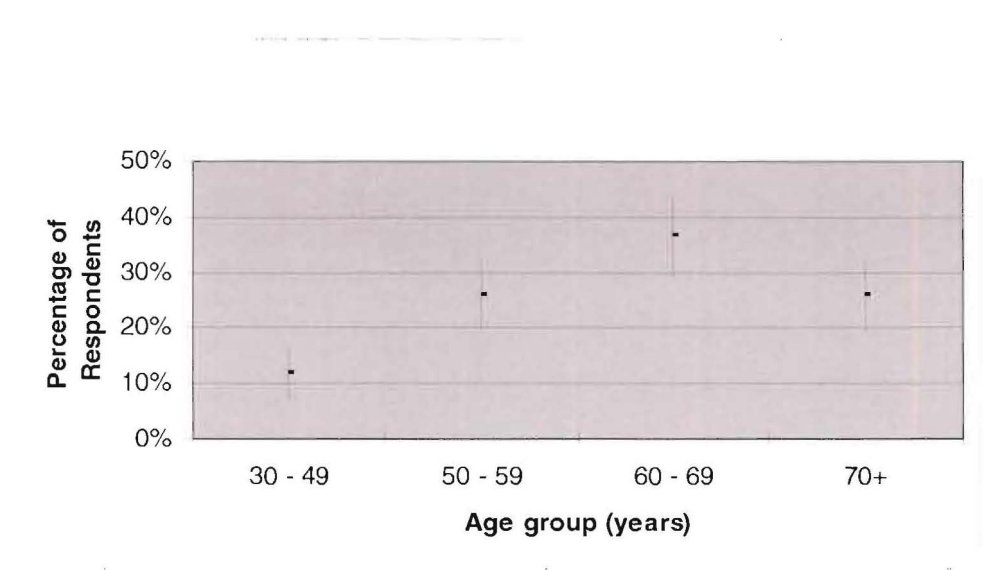


Figure 22: Age groups of the NZSAA (N = 186) (SE ± 5%)

Part of the reason salmon fishing appears to be suited to the older generation is because they have more time, money, and knowledge of the fishery. In response to this, education programs, and take a kid fishing activities are set out to encourage the younger generation to get involved in salmon fishing (WFG, and NIWA).

“Most salmon fishermen are of the older generation; in their 40s or older. There are a lot of guys who have been fishing for a long time and will never give it up. But there doesn’t appear to be as many young guys coming into salmon fishing” (Hamill’s).

“You don’t become a salmon fisherman until you have run out of options” (NZSAA).

There is the general construction that salmon fishing is an activity that people tend to enjoy later in life when things settle down, when you have more time, and you do not want to travel too far (WFG).

#### **7.9.6 Indigenous Views**

NIWA claimed that in the Pacific Northwest salmon are constructed through very cultural and spiritual lenses. Indigenous Indian people have been raised in a setting that culturally appreciates the presence of salmon. The Natives are very respectful, and proud of the salmon, and incorporate salmon into their tribal culture through symbolic imageries, statues, paintings, and stories (NIWA). Salmon are also a very important food source to the Native tribes. Along a similar line of thought Ngai Tahu claims that:

“Pakeha do things for fun... Maori do things for a reason” (Ngai Tahu).

This construction of food is similar to that of the Native Indian tribes who view chinook salmon as a food source, not as sporting items in the European sense (ECan).

#### **7.9.7 Pacific Northwest**

“At the time of the year when salmon are running there are hundreds of people milling around [in the United States], families and children picnicking by the rivers.... And the father would be talking to his kids pointing to the salmon, saying that one is a female that’s a male, that’s a chinook, that’s a sockeye... They really know their salmon. There’s the feeling of a deeply rooted culture there” (NIWA).

In New Zealand our cultural attitudes towards salmon resemble only a fraction of the magnitude of the Pacific Northwest. Understandably this is because of the wider distribution and abundance of chinook salmon in North America and also because they are native to that region. However, salmon are still very much part of the Cultural FoR particularly in Canterbury. So while salmon may be culturally valued by society as a whole in the Pacific Northwest, in New Zealand they form an integral part of the angling culture for regions like Canterbury.

#### **7.9.8 Culinary “Trendiness”**

Within the Cultural FoR, New Zealanders see wild foods as part of our Kiwi Culture construct of “go get it yourself”. For this reason, wild salmon play a role in culinary cuisine (PFG).

However, for those who do not fish for wild salmon and instead buy it from the supermarket, they have a different social construct towards salmon. Salmon have seemingly become trendy as a high class finger food along side vintage cheese and wine. Broadly speaking, this construct of salmon as a “trendy health food” derives from the association to the rich red flesh and bio-omega

oil content marketed strongly by the health industry. For instance, seeing as salmon in farms do not produce the red flesh colour, carotene dye needs to be added to fulfil peoples' expectation.

“When people started eating salmon from the sea it was beautifully red flesh. So people would distinguish that salmon was a red meat... So if you gave someone a salmon fillet steak that was white they'd say 'yuck what the hell is this?'... It comes down to what you're culturally used to” (Isaac Salmon).

This shows the extent to which the cultural construction of salmon flesh can affect salmon farming.

### **7.9.9 Farmer vs Angler**

Another interesting construct to arise was that of the Farmer vs Angler. The following quote illustrates the culturally contested views between farmers and anglers and how their two positions seem to battle over the same resource for opposing reasons:

“... One day a person [sic] will be wearing their 'farmer hat' saying 'bloody drought, I can't irrigate because there is a restriction on the river due to conservation orders... and salmon and trout are partly to blame for that'... Then the next day the same person will be [sic] wearing their 'angler hat' saying 'bloody farmers, I can't catch any fish because there's no water in the river! We need higher flows...' (Farmer).

In this case the farmer was also an angler, and expressed his contested views towards the salmon fishery and farming practices.

### **7.10 Political FoR**

The Political frame is probably the most influential FoR because it is a means by which issues are raised, debated, and decided upon by various stakeholders in the fishery. One of the most politically influential groups are anglers, particularly the NZSAA.

“A lot of guys who are into salmon fishing are locals who run businesses, who have capital and expertise, and are politically savvy in certain areas... Like Dave Hughey who contributed his professional organisational skills to the NZSAA, orchestrating some pretty clear arguments towards salmon conservation” (F&B).

The difficulty with trying to distinguish and explain the Political FoR, is that the Political FoR is interrelated with several of the frames of references discussed in this chapter. Therefore many of the constructions that give meaning to the Political FoR reveal economic, needy fishery, cultural, managerial, conservational, recreational, legal, and educational themes. The Political FoR is shaped by the following constructions: Politicking, RMA Formation, Political Suicide, Political Tooling, Boardroom Politics, and Stakeholders.

### **7.10.1 Politicking**

“Trout anglers are definitely not as passionate as salmon anglers in terms of getting out and advocating for what they believe in, largely because a lot of changes in the trout fishery have been gradually declining. The failure has been happening over 50 years. Whereas with the salmon fishery it’s been a lot more immediate and therefore caused political uproars” (NCFG).

This construction borrows from the Needy Fishery FoR where the salmon fishery has been backed into a corner, with people realising that if nothing is done, they are going to lose out. In this case politicking on salmon issues has largely been a result of time, scale and place. Time – how fast the changes have occurred, scale – the significance of the changes, and place – the place in which the changes took place. In the case of salmon, the anglers began noticing significant changes to the quality of the salmon fishery in Canterbury and Otago between the 1950s and 1970s due to the establishment of dams, commercial rod and netting licenses, commercial by-catch at sea, intensification of agriculture, and increases in discharged pollution. These activities caused sudden changes to the fishery during the 1960s and 1970s, leading to political outcries to stop further degradation of the fishery. Eventually this resulted in the establishment of the NZSAA (NCFG, Lincoln University, and NZSAA).

### **7.10.2 RMA Formation**

The RMA Formation construct is part of the Political FoR because the RMA 1991 represents some of the political pressures from stakeholders “grovelling” to ministers to have salmon and trout included (ECan and NCFG). Claims were made by NCFG and the PFG that it was a political decision to include salmon and trout in the RMA. Science appeared to play little or no role in the process of salmon and trout being recognised and provided for in sections 6 and 7 of the Act.

“In the case of the Rakaia WCO, thousands of salmon anglers joined the voluntary subscription based club NZSAA to protect the rivers for salmon. They’re so bloody passionate about what they do because their fishery is so volatile; there’s years of absolute joy and years of absolute bloody woe. The RMA was their next step in recognising salmon as an important natural resource, and by virtue of this they are stakeholders who must be consulted with and included in the RMA decision process” (NCFG).

Stakeholders such as the NZSAA, acclimatisation societies, angling clubs, and other recreational users, played pivotal roles in pushing salmon and trout to be recognised in the RMA. This shows that their politicking, perseverance and passion for the fishery got salmon and trout put on the agenda.



### **7.10.3 Political Suicide**

According to the interviews, trout farming is met with strong political and ethical opposition, but fairly weak scientific, economic, and management opposition. Several respondents expressed the many potential benefits of farming trout, but stated that the biggest losses would be felt in the political arena. Isaac Salmon reinforced that:

“NZ is the only country in the world where it is illegal to farm trout” (Isaac Salmon).

Terms associated with farming trout were sacrilege, unacceptability, and suicide. This appears to be partly because the trout fishery is constructed purely as a recreational fishery (discussed in Recreational FoR), whereas the salmon fishery is a mixed construction of recreational and commercial values (Lincoln University).

### **7.10.4 Political Tool**

Salmon have become political pawns that are dragged into many debates about water use rights, river flow management, and agricultural practices (NZSAA, ECan, and NIWA). An example of this was the Dirty Dairying Campaign [DDC] which placed salmon and trout in the middle of a political protest to improve dairy farming practices and river quality (NCFG). Salmon [particularly] have become a political metaphor for river protection in Canterbury (ECan).

Interviewees revealed that if it were not for salmon inhabiting the Rakaia and Rangitata Rivers, their status as rivers with WCOs would fail to exist. Enthusiasts that advocate for salmon fishing place another value on the importance of rivers and water in Canterbury. These values are now very important for resource managers to consider.

### **7.10.5 Boardroom Politics**

Salmon angler views percolate right through to the political level, particularly when anglers get voted onto councils, and/or committees where they can directly influence management outcomes. WFG stated that:

“Salmon anglers are an absolute passionate bunch that get themselves on Fish & Game councils and bang the table, insist on that; do this, do that... and it gets a lot of media coverage” (WFG).

Parochialism appears to be something that many salmon anglers share towards their fishery.

### **7.10.6 Stakeholders**

Within the Politics FoR it is important to mention the political influence that stakeholders, particularly lobbyists, have extended on management outcomes. Decision making for management is not based on scientific information alone; it is very political (ECan).

“The NZSAA were really powerful, persuasive people who had good oratory and political skills” (Lincoln University).

Some of the suggestions for salmon management in the 1970s [when the NZSAA established] are now percolating into the SMP in 2007. Subsequently this has meant the role of the NZSAA has lessened. An example of the influence of the NZSAA is supplementation of stocks. The supplementation of chinook salmon is considered by science to be a bad thing because it weakens the genetic diversity of wild fish. However, stakeholders like the NZSAA want to see their license money reinvested in the fishery in the form of more fish. For NCFG this appears to be a political decision to keep their stakeholders happy, rather than a scientific decision to research better management alternatives (ECan, and McCallum 2003).

## **7.11 Administrative FoR**

The Administrative FoR is linked quite closely with the Politics FoR, as many of the administrative roles are fundamentally based upon some form of political or organisational views. This frame emerged from the way in which interviewees identified different organisations with certain administrative roles. The Administrative FoR is given more meaning through understanding the following constructs: NZSAA, FGNZ vs F&B and DoC, and FGNZ vs Federated Farmers.

### **7.11.1 NZSAA**

The NZSAA is constructed as being the body that helped to professionalise the salmon fishery between the 1970s and early 1990s (Lincoln University). Issues such as pollution, water abstraction, damming developments, and stream improvement work were all part of their lobbying agenda. This administrative role was purely voluntary, but it arose as a result of the fishery being so needy at the time. It was common among interviewee discourses to refer to the “NZSAA” when discussing administrative roles toward salmon management prior to FGNZ in 1990.

### **7.11.2 FGNZ vs F&B and DoC**

Historically, FGNZ have been “head-to-head” with F&B and DoC over biodiversity issues because FGNZ promote introduced species, and F&B and DoC promote indigenous species (NCFG). This partly stems from the Native vs Introduced debate, but with a focus on the way in which the organisations in question construct wildlife differently. FGNZ are interested in habitat protection and river flows for salmon, while F&B and DoC have those same priorities but for native biodiversity.

Nowadays these three organisations appear to have a more aligned position towards wildlife management because F&B and DoC have seen the benefits of having salmon and trout for river protection work, through submissions and lobbying against developers and water users (NCFG, F&B, and DoC). All three parties, despite holding different positions toward wildlife management, share an interest in conservation such as habitat protection and river protection. These organisations are powerful in their own right but when aligning together on issues related to water conservation they form a strong administrative role.

### **7.11.3 FGNZ vs Federated Farmers**

The administrative role of FGNZ is to protect the interests of, and manage the fishery in Canterbury through politicking, consulting, media representation, and deploying effective management techniques. These have all been tools used to improve the fishery, and as a result of the DDC agricultural farming has felt the pressures to improve farming practices, and ascertain certain environmental standards. The DDC, administered by FGNZ, shaped the way farmers were publicly viewed.

“We would like Fish & Game to install a bit of credibility in saying ‘you’ve done this, so you’ve come from here to here, which is really positive, but ultimately we would like to see you out there... So keep up the good work’... Rather than having a negative approach because that makes us want to dig our heels in” (Farmer).

Shrewd administrators will aim to achieve a sense of cooperation or team work in order to create win/win scenarios for multiple stakeholders. The Dairying and Clean Streams Accord<sup>79</sup> [DCSA] appears to be a working example of a win/win outcome resulting from the DDC (MfE 2006). However according to the Farmer the DDC has led to some negative stereotypes about farmers which could have been avoided using a different mobilising technique.

## **7.12. Introduced vs Native FoR**

The Introduced vs Native FoR touched on issues such as the impact on crested grebes at Lake Moana/rua [Lake Pearson] from recreational anglers. This construct implied that introduced species like salmon and trout indirectly affect the native fauna of Lake Pearson by virtue of anglers traipsing across fragile nesting sites in pursuit of sport (F&B, and DoC). Game birds were also drawn into this construction because of their perceived indirect impacts to native species.

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<sup>79</sup> DCSA aims to improve the health and quality of waterways, including streams, rivers, groundwater, and wetlands, in dairying regions (MfE 2006).

Several of the respondents (F&B, Farmer, NCFG, and DoC) agreed that trout were more “pest” like than salmon, because of their impacts to native insects, fish, and blue ducks. Of the two most common exotic trout [brown and rainbow], brown trout were more likely to be constructed as “pests” based on the impacts they had to native species. Salmon were not constructed as pests because according to the respondents, they did not eat much in the freshwater environment.

“Salmon are not regarded as a threat or a competitor to native indigenous birds or fish, and therefore they’re not regarded in a negative sense. If anything they are a bio-indicator for a lot of other things... If the salmon fishery is not healthy then many other things will not be healthy either” (DoC).

This construction of salmon being labelled as “bio-indicators” is something that is covered in more detail in the Conservation FoR. But essentially DoC raises the point that salmon are not regarded in a negative sense despite their introduced status, because they provide many positive attributes for environmental management.

Furthermore, the Farmer believed that the reasons that trout and salmon are considered to be “resources” and not “pests” is because they both provide positive effects to society, and the economy. Interestingly none of the respondents mentioned the potential impact of salmon in the marine environment where they grow to maturity. Perhaps this is partly due to the uncertainty of what salmon do at sea. For instance, salmon eat voraciously at sea (MFish 2006; Netboy 1974, 1980; Quinn 2005) and maybe they affect “native” ocean food stocks, but it appears that research on commercial fishing is much more political because of Quota Management Systems. Research could probably resolve the uncertainty about salmon diet and behaviours but other fisheries are in more obvious dire straits, hence a current lack of momentum.

Within the Introduced vs Native FoR there were several social constructions that gave this frame further meaning. These have been summarised as Conservation Paradox, Biodiversity, Salmon vs Trout, and Balance.

### **7.12.1 Conservation Paradox**

“It’s good from Fish & Game’s point of view and for the Joe Bloggs [sic] angler, having a conservation department managing an introduced fish” (TVNZ).

It is an interesting paradox that DoC is managing a multi million dollar trout fishery in Taupo, which is a conflict of interest in terms of the Introduced vs Native FoR. Some people consider trout to be noxious to native macro invertebrates, and thus construct them as competitors with

blue ducks. Therefore one would think that DoC would be opposed to trout in these waterways, but the value of having trout in Taupo appears to be sufficient enough to warrant sustaining the fishery.

The other conservation paradox arising from this construction is the similarities and differences between FGNZ and DoC (ECan). While FGNZ and DoC share quite similar objectives like improving water quality and quantity, and habitat under the Conservation Act 1987, their intentions are for opposing reasons. FGNZ is doing it to sustain exotic species, while DoC is doing it to sustain indigenous species. Despite this apparent paradox, the important point is where their objectives overlap and complement each other.

### 7.12.2 Biodiversity

“I don’t make any distinctions between introduced and native species because I do a lot of photography... to see and photograph wild ferrets still holds some value to me as I’m interested in the whole dynamic... and it’s fascinating to see stoats and ferrets which are regarded as “pests” because they add something. I personally like the dynamic of seeing a diversity of wildlife so I make no distinctions between native and introduced species... to me they’re complementary” (F&B).

Part of the biodiversity construct is that more biodiversity in New Zealand means more sports fish and game to photograph, fish, and animals to hunt, and therefore more food to eat.

Interestingly F&B did not distinguish between introduced and native fauna; thinking that they are all complementary. It appears that the reasons for this position are a result of the respondent’s strong interest in fishing, guiding, and wildlife photography, coupled with his interest in native flora and fauna. Not surprisingly however, didymo, an introduced species of flora, was not constructed as a complementary specimen by any of the respondents. In fact, didymo was categorised as a “pest” and a risk to freshwater environments.

In addition to the Biodiversity construct, the PFG illustrates his concern for the DoC Biodiversity Strategy, claiming that:

“The whole DoC Biodiversity Strategy is a major problem to New Zealand anglers. It’s run by Eco-fascists and it’s driven from the top down... And that worries me because that’s going to put a big damper on fishing, hunting, and outdoor pursuits in general” (PFG).

In essence, the aim of the Biodiversity Strategy 2000 appears to be to establish a database on i) the physical impacts to river characteristics by society, and ii) the biological effects of the species to those rivers. Essentially it will assess the physical impacts to rivers by society, and the effects of introduced species to river environments. The second database will have implications

for the way introduced species are classified and managed within the defined river environments. The PFG constructs the problem to be that DoC's implicit ploy is to get rid of introduced species in New Zealand.

“Just look at the National Parks policy, they don't want trout and salmon; and in New Zealand there are a lot of National Parks, and people love to fish them” (PFG).

**7.12.3 Salmon vs Trout**

Within the Introduced vs Native FoR, a new construction emerged between salmon and trout. According to NCFG and F&B, salmon were constructed as taking the limelight away from the trout fishery in Canterbury, which appears to partly be a result of the iconic status that salmon have. Salmon were perceived as being of “high profile”, whereas trout were generally seen as the “poorer cousin” in Canterbury. TVNZ supports this claim, adding:

“When you look at media coverage during summer we don't really touch on trout fishing as a recreational activity but we will salmon, it makes you wonder doesn't it?” (TVNZ).

On the contrary, trout are a more internationally recognised sports fish for New Zealand when compared with salmon. Salmon are significant at a regional scale whereas trout are significant at a national and international scale. Ngai Tahu construct trout as the higher profile fish because they attract many more tourists [discussed further in the Economic FoR]. In addition to this construct, WFG claims that the average person knows something about trout in New Zealand, but they probably know very little about salmon. This appears to be related to the fact that salmon are locally and regionally significant, whereas trout appear to be nationally and internationally significant.

One respondent claimed trout have an impact on the salmon fishery (NZSAA) stating that:

“When a salmon is spawning in their redd, trout downstream are eating any loose eggs as they come down. So any eggs that drift out of the redd are being scooped down by the trout” (NZSAA).

While another constructed that salmon indirectly contribute to the decline in the Canterbury trout fishery (TVNZ), stating that:

“The decline in the trout fishery in Canterbury is because of salmon anglers and their push for worm fishing and spin fishing on high country lakes” (TVNZ).

In both of the quotes provided above, the tension between managing for salmon and trout in Canterbury is very clear. Even though these two sports fish often coincide in the same rivers, were released in New Zealand at around the same times by the same societies, are covered by the

same legislation, and managed by the same organisation, they are viewed differently by different camps of people. They are both regarded as important recreational fishes and yet there remains conflict among people over which fish they think is more important.

Another interesting construction is the claim that there is currently less research available on trout than salmon in New Zealand. This may be a result of the commercial interests in the salmon fishery, but NIWA claim that is partly because salmon have a “glamour attachment” about them, making them very interesting for research purposes [covered in the Biological and Research FoRs. In support of NIWA’s construction, I carried out the following searches on “Trout, New Zealand<sup>80</sup>” and “Salmon, New Zealand<sup>81</sup>” using the search engine [www.scholar.google.com](http://www.scholar.google.com). The results were ca. 10,800 related articles for trout in New Zealand compared with ca. 19,000 related articles on salmon in New Zealand.

#### **7.12.4 Balance**

Within the Introduced vs Native FoR is the construct of “balance”, to balance the benefits and losses of managing introduced species. In doing this, it appears that the benefits of managing introduced species were constructed as providing “fun” and “leisure” which native species failed to provide (NCFG). However, the discourse highlighted the benefits that native species had for biodiversity, and the clean green image brand for tourism purposes. Overall though, fun activities such as fishing appeared to resonate more with the respondents than their construct of native species, forming part of the reasons why trout and salmon appear to receive so much support from the public. Along this line of thought, DoC’s version of the Balance construct is related to population dynamics of introduced species and how they affect indigenous biodiversity:

“Some of the game species introduced were quite benign and they’ve stayed in the sports category because they’re easy to manage... In fact the management has been more about breeding them up like with Fish and Game at the Montrose Hatchery... because salmon were quite hard to introduce and establish, and they’ve hung on but they have never taken off. Seeing as they never took off, they’re not regarded as a pest species, but rather a game species” (DoC).

According to this construct, species that are kept under control remain in the “sports” or “resource” category, while those that get out of control move into the “pest” category. Discourse analysis highlighted that several examples of these pests were possums, stoats, weasels, rats, and wild cats, while larger mammalian species such as wallaby, deer, and tahr were also referred to

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<sup>80</sup> See <http://scholar.google.com/scholar?q=Trout%2C+New+Zealand&hl=en&lr=&btnG=Search>, June 2007

<sup>81</sup> See <http://scholar.google.com/scholar?q=Salmon%2C+New+Zealand&hl=en&lr=>, June 2007

as pests, but not with the same conviction. This implies that there is a continuum on which an animal is considered a “pest” or “resource”, highlighting grey areas for management.

In achieving the Balance construct for wildlife management, there are many influential aspects to consider such as scientific knowledge, technological development, political decision making, socio-cultural issues, economic drivers, and environmental parameters. In arriving at this Balance it requires somebody to make a judgement call based on the information presented. It is at this decision making point that society influences what that Balance is, based on the range of parameters chosen. Therefore society plays an inherent role in Balancing management issues outlined in the Introduced vs Native FoR.

## **7.13 Conservation FoR**

Emerging from the interview discourses was the Conservation FoR, suggesting that salmon are constructed to have improved water conservation in New Zealand (NCFG, ECan, NIWA, NZSAA, DoC, TVNZ, and F&B). The Conservation FoR is given further meaning through the following social constructs: Bio Indicators, Pest vs Resource, International Biodiversity, and Conservation Management.

### **7.13.1 Bio Indicators**

“I think that the passion that people have for salmon fishing has caused us to probably protect freshwater much better than we would have... examples of that are the Rakaia and Rangitata Conservation Orders... and although others contributed to those processes, they just simply wouldn’t have happened if it weren’t for salmon” (NCFG).

While this appears to be a dualism due to salmon being an exotic fish, they have in fact played pivotal roles with the formation of WCOs, the SCA off Banks Peninsula, and as “bio indicators” for river management (ECan).

“If you satisfy the flow regime needs [sic] of salmon then you will by and large satisfy everything else” (ECan).

Not only are salmon useful indicator species because of their low resistance to degraded waters, they set the flow requirements for many of the Canterbury braided rivers, benefiting other species (DoC and ECan). Ngai Tahu added that by having salmon in rivers, they have helped to maintain New Zealand’s clean green image of water purity. Furthermore, ECan mentioned their useful role to lawyers and planners as a defence mechanism against water developments:

“Lawyers and planners use salmon as a defensive tool against some types of water developments” (ECan).



7.13.2 Pest vs Resource

Within the Conservation FoR, pests were constructed as having negative values to the environment, economy, and society. Freshwater examples were koi karp and rudd, as well as terrestrial examples such as possums and stoats. From this perspective it was apparent that trout and salmon did not fit into the “pest” construct as they were perceived of as “resources” because they added value to the environment, economy, and society. In fact when asking members from the NZSAA to place in order of highest importance from 1 [most important] to 11 [least important] the following freshwater fishes [Figure 23], a clear pattern emerged between sports fish and non sports fish. The bar chart in Figure 23 was derived from the 1st most important category to illustrate the fish of highest importance. The mean ranks in Table 13 were calculated to illustrate their overall ranking from highest to lowest importance.

Being an Association of salmon anglers, it was not surprising to see that the 3 fish of highest importance were recreational sports fish; quinnat salmon [51%], brown trout [22%], and rainbow trout [14%]. Fish such as perch, tench, rudd, and koi karp were not considered to be of highest importance according to NZSAA respondents.

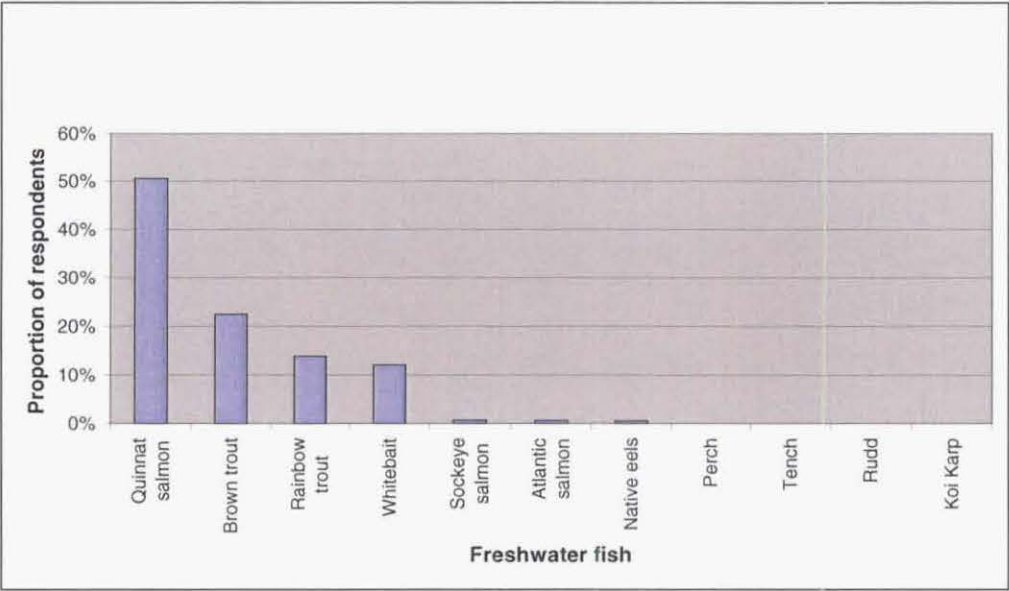


Figure 23: Order of highest importance for 11 common freshwater fishes to anglers (N = 188)

A mean Likert scale [Table 13] was calculated for each of the 11 options. This analysis is the same as Hughey et al. (2006: 68) where they presented the highest to lowest mean ranks. To calculate the mean rank for quinnat salmon, it involved a simple calculation to sum each proportion multiplied by the rank value. i.e. Mean rank = SUM (50.53%\*1, 16.32%\*2, 21.58%\*3, ...etc.... 0.00%\*11).

Species	1st	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	10 <sup>th</sup>	11 <sup>th</sup>	Mean
Quinnat	50.53%	16.32%	21.58%	4.74%	5.79%	0.00%	0.53%	0.00%	0.00%	0.53%	0.00%	2.05

This was carried out for the remaining freshwater fishes to create Table 13.

Freshwater fish	Mean rank
	Highest
Quinnat salmon	2.05
Brown trout	2.61
Rainbow trout	2.77
Whitebait	3.79
Sockeye salmon	5.37
Atlantic salmon	5.65
Native eels	7.17
Perch	7.86
Tench	8.91
Rudd	9.30
	10.46
Koi Karp	Lowest

**Table 13: Likert scale for order of importance for 11 freshwater fish species**

Koi karp were strongly considered to be the least important freshwater fish species in New Zealand. This has implications for management as people perceive them more so as pests than resources. How we view the fishes will have inherent implications for the way they are managed. If they are classified as “pests” then they will be treated with an eradication mindset, if they are classified as “resources” then they will be managed in a sustainable manner. Along a similar line, there is going to be a review of the status of deer in New Zealand to have them removed from the “pest” status to the “resource” status.<sup>82</sup> This is a classic example of the way societal perspectives can influence wildlife management.

### 7.13.3 International Biodiversity

“We’ve got wallabies on Tawa Island up in Auckland, which we want to get rid of, but seeing as they’re now very rare in Australia, we’re exporting them back” (DoC).

This illustrates the role that New Zealand could potentially play in the “International Biodiversity” debate if species like chinook salmon became critically endangered elsewhere in the world. From this perspective it makes chinook salmon an internationally unique feature to New Zealand, much in the same way that Himalayan tahr are internationally unique to New Zealand (Berngartt 2004).

### 7.13.4 Conservation Management

Conservation has partly influenced management, and management has partly influenced conservation. This is where the Conservation Management construct appears to have emerged. Examples of conservation management are WCOs, the SCA and the DDC which have ultimately

<sup>82</sup> See [http://tvnz.co.nz/view/video\\_popup\\_windows\\_skin/1010476](http://tvnz.co.nz/view/video_popup_windows_skin/1010476) (March 2007) where I am one of the claim-makers in the debate.

shaped the salmon fishery. These examples of conservation management appear to be a result of having trout and salmon in New Zealand waters. Conserving and managing trout in New Zealand rivers has been an objective since they were acclimatised over 100 years ago. Conserving and managing salmon in rivers and at sea however, appears to have occurred as a result of organisations such as the NZSAA who advocated strongly for the Save the Rivers Campaign [SRC], WCOs, and the SCA.

This strong history of conservation management for trout and salmon has implicitly led to their position as “guardians” or “saviours” of our rivers (ECan, NCFG, and DoC).

“The WCOs [sic] in the RMA ensure that we are environmentally sound and carryout environmental and sustainable practices... so in that sense salmon and trout are good” (Farmer).

## **7.14 Tooling FoR**

An interesting frame of reference to emerge was the notion of control and intervention or “tools”; the mechanistic uses and affects of technology for manipulating the salmon fishery. This is a term that has been used to encapsulate the non natural processes involving salmon, and is later linked to the Management FoR. Salmon no longer manage themselves because society perceives that we can manage them better by reducing mortality rates and increasing production capacity by tampering with Nature (NIWA and Isaac Salmon). For international trade, chinook salmon are no longer able to supply enough salmon from the wild fishery, therefore tooling has become increasingly important for capture fisheries. The Tooling FoR summarises the way the human dimension influences and manipulates the natural dimension [see Berngart (2004) for a similar perspective for Himalayan tahr]. In addition to this, economic factors, research, and technological development affect tooling. Broadly speaking, economic drivers provide the capital to develop a tooling method, and the research provides the “know how” for how to effectively deploy it. This FoR highlights the many ways in which salmon are tooled in New Zealand. The Tooling FoR is explained further through the following constructs: Technology, Salmon Hatcheries, and Media Tooling.

### **7.14.1 Technology**

With salmon fishing there is the construction that the chances of catching a salmon are so slim that it is imperative to use the most efficient and effective technology available.

“If you’re looking at an average seasonal bag limit of less than one fish per person, and you’re catching on average one salmon in a season on a spinner, why would you use a more challenging technique like fly fishing and lessen

your average catch to one salmon per 5 years... The lack of fish drives the improvement in technology” (NCFG).

This is a “catch 22” situation.<sup>83</sup> The difference in technology leads to some quite interesting debates between the two angling techniques. In this sense, salmon angling is at a different end of the spectrum from trout angling in terms of technique vs technology. Many salmon anglers are accused of being “meat hunters” due to the “primitive” technologies they use for catching salmon [i.e. treble hooks, 20lb line, and heavy duty rods] (NCFG and WFG).

Upon analysing the discourse, the following terminology in the Technology construct was identified as: boats, helicopters, fishing rods, fishing lures, fish ladders, two-way radios, GPS equipment, sonar radar equipment, research facilities, tagging equipment, maps, vehicles, computers, internet, hatcheries, and media (NIWA, PFG, Hamill’s, NCFG, NZSAA, Lincoln University, and Isaac Salmon). The construction of technology was recognised by the interviewees as being important not only to salmon anglers, but FGNZ who manage the salmon fishery.

#### **7.14.2 Salmon Hatcheries**

The “artificial”, “non selective” rearing of salmon forms part of the Tooling FoR. Salmon hatcheries are viewed to be a problem to the wild fishery with manipulation (Isaac Salmon) and hybridisation (NCFG). Hybridisation is considered to have negatively affected the wild genetic diversity, leading to part of the reason the fishery is so needy now (NIWA). Hatcheries were originally considered good for their additive contribution to salmon stocks - like a put and take fishery, but now they are seen as bad for the fishery due to non-selective hybridisation which has weakened the wild fishery (NCFG and NIWA). However, despite these views against salmon hatcheries, the NZSAA claim that there still needs to be “boosts” and “injections” of fish back into the system for fishermen to catch in the short term. Therein lies the problem for FGNZ because they are a “user pays, user says” license based organisation.

#### **7.14.3 Media Tool**

“I know what impact water abstraction can have on the salmon fishery, so I use salmon as a tool to introduce and present a wider issue to the public” (TVNZ).

Salmon have become a political or influential object for the media to portray other issues such as water developments. Using salmon as a lead in to an issue grabs peoples’ attention and

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<sup>83</sup> The “catch” is that the lack of returning salmon drives the improvement in fishing technologies [as people try catch salmon] which in turn leads to more salmon being caught from an already needy stock. Thus, improving fishing technologies will negatively affect the Needy Fishery.

personalises the story, as it affects recreation and peoples' livelihoods. So in that sense, salmon are manipulated and tooled through the media also.

## **7.15 Management FoR**

There were many constructs within the Management FoR depending on the interviewee's background. But essentially they all agreed that the salmon fishery is in decline, or "needy", and that management has a fundamental role to play. Based on the responses the Management FoR is broken into the following four categories: Salmon Management, People Management, River Management, and Environmental Management. One of the common themes in the Management FoR was the reference to warfare and military related discourse when discussing management issues. While there is no actual war over the salmon fishery, the metaphors to "battle", "fight", "win", and "overcome" fishery related issues in Canterbury surfaced throughout the interviews. These battles have implications for the salmon fishery, as the battles represent the protection of the Needy Fishery. The NZSAA for instance, feel that they are involved in a fight to protect their "taonga"; the recreation of salmon fishing.

### **7.15.1 Salmon Management**

The Salmon Management construct rests upon discourse related to the uncertainty of the sea water stage, supplementation issues, protecting spawning grounds, and over harvesting concerns. NCFG provided some insight to the dilemma of the Salmon Management construct stating that:

"The seawater stage is probably the one that appears to be most critical life stage for salmon [sic]... But in terms of our management it's not really something we can manage, our focus lies mainly after the smolt first pop out of habitat and into braided rivers when they are affected by human influences" (NCFG).

Salmon are more manageable in the freshwater environment where there are more certainties about what is happening. However, there are examples where salmon management has extended beyond the freshwater environment, with the establishment of the SSA in 1991 and the SCA (NIWA). DoC outlines that this movement was a result of a debate between:

"The commercial trawlers claiming that salmon are in the sea and that trawlers [sic] have the right to trawl the sea... while the acclimatisation societies claim that it is a freshwater fish that is managed by societies [sic], and as they have ownership stake in it, the salmon are their fish to manage" (DoC).

In terms of managing the freshwater fishery, there were strong historical constructions for "supplementation" (NZSAA) and concerns of "over harvest" by anglers (NCFG and NIWA). Part of the problem is that the freshwater fishery is a user pays user pays system. If anglers and

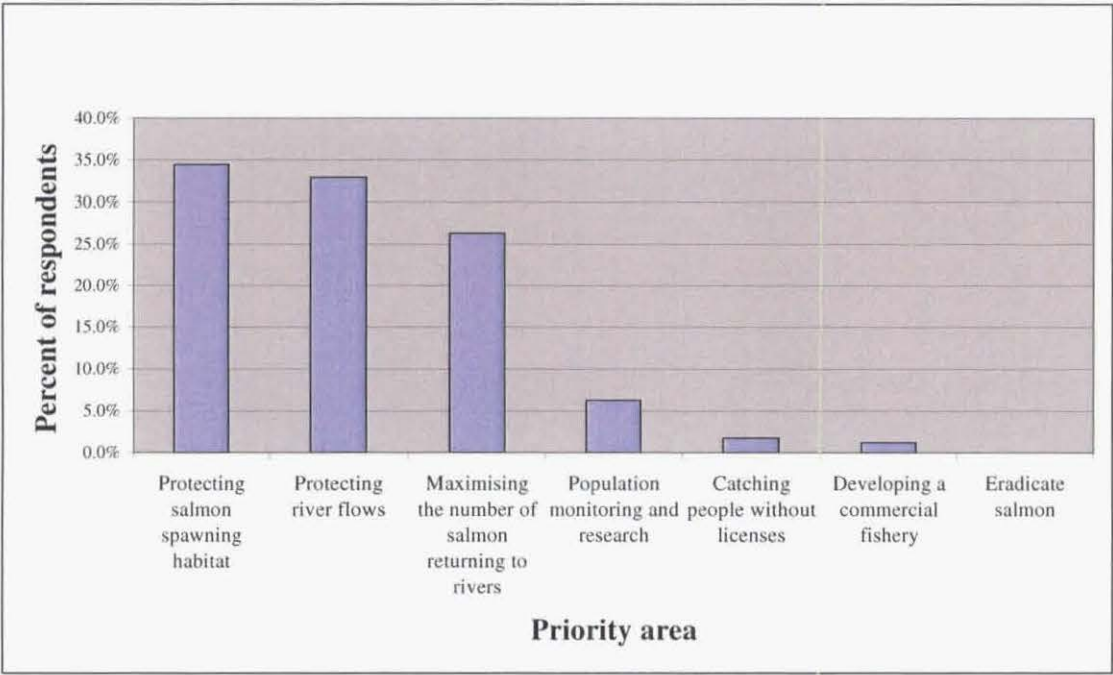
angling groups like the NZSAA demand supplementation of more fish, then FGNZ must make a political decision to supplement or not (NIWA). If they choose to supplement they need to make it clear to the anglers of the potential risk for weakening the genetic diversity of the wild fishery (NIWA and NCFG).

Hamill’s offered a different suggestion, such as imposing a surcharge for non-residents wishing to fish New Zealand waters.

“If we visit another country, we pay a premium or a surcharge for being non-residents. A similar system should be in place for fishing licenses in New Zealand” (Hamill’s).

The extra revenue from the surcharge could be used for research to improve the fishery, and better understand what happens to salmon at sea so as to improve management.

In terms of salmon management, the results in Figure 24 are from the NZSAA survey, illustrating how salmon anglers prioritised salmon management. According to the respondents, protecting salmon spawning habitat was considered the highest priority for management [34%], protecting river flows was the 2<sup>nd</sup> highest priority [33%], and maximising the number of salmon returning to rivers was the 3<sup>rd</sup> highest priority [26%].



**Figure 24: Highest priority for salmon fishery management (N = 186)**

According to the Likert scale [Table 14], protecting spawning habitat, protecting river flows, and maximizing the numbers of salmon returning to rivers was considered to be their number 1 or 2 priority. A very clear pattern emerged illustrating that catching people without licenses and

developing a commercial fishery was their 5<sup>th</sup> and 6<sup>th</sup> priority for management, followed by the strongest pattern where eradicating salmon was their last priority.

Highest priority for salmon management	Mean ranking
	Highest priority
Protecting salmon spawning habitat	1.90
Protecting river flows	2.30
Maximising the number of salmon returning to rivers	2.63
Population monitoring and research	3.43
Catching people without licenses	4.96
Developing a commercial fishery	5.72
	6.93
Eradicate salmon	Lowest priority

Table 14: Likert scale for prioritising salmon management

7.15.2 River Management

The River Management construct involves discourse such as water quality and quantity. This construct mainly focused on issues relating to water abstraction and pollutants. The main actors that were mentioned were the dairy farmers, partly as a result of the DDC in the late 1990s (NCFG and F&B).

The NZSAA approached the topic with strong claims that the Orari, Ashburton, Selwyn, and Rangitata rivers were examples of rivers “stuffed” due to agriculture. They prioritised river protection to be one of the most important management concerns, as illustrated by Figure 24 (above). A metaphor used in the River Management construct was “death by 1000 cuts”, a term to describe cumulative effects to the fishery from development. This term has permeated from the DDC (NCFG). Ngai Tahu and NZSAA support this claim with:

“If you date back to when Canterbury was first settled, it was a dry land farming area. So the need to extract water from the river wasn’t necessary... Now look at it” (Ngai Tahu).

“I would stand on the bridge of the Pareora River as a ten year old and count a thousand trout. You can’t now because there’s no water in summer because the cow cockies [sic] have taken it all” (NZSAA).

In opposition to this, the Farmer constructed that river management should be about striking a balance between different peoples “livelihoods”.

“With the conservation orders, if we were to reduce them or affect them in anyway, you start to affect farmers’ livelihoods. So you’ve got farmers’



livelihoods on one side and then on the other side you’ve got the livelihoods of recreational anglers [sic]” (Farmer).

ECan is the responsible authority for river management in Canterbury. ECan’s proposed Natural Resources Regional Plan [NRRP] attempts to cater for the multiple values and uses that are attributed to water in Canterbury. There will continue to be “battles” over water (ECan). The key to effective management is compromise.

When asking NZSAA members to identify three potential impacts to the salmon fishery, more than two thirds of responses highlighted that water-related management was of concern [Figure 25]. NZSAA respondents perceived that the three most potential impacts to the salmon fishery were water extraction/diversion, pollution and water quality issues, and didymo.

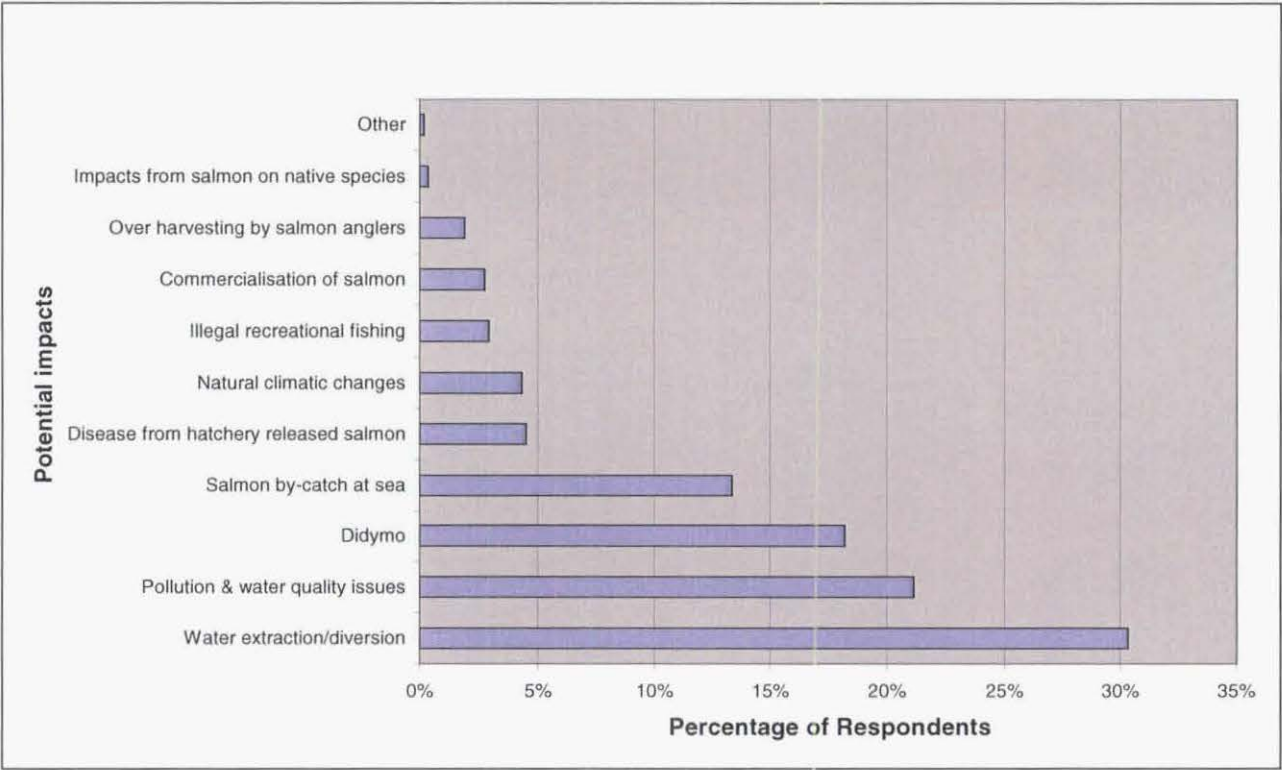


Figure 25: Angler perceptions of potential impacts to the salmon fishery (N = 193)

In terms of management, the survey findings suggest that salmon management should prioritise the freshwater environment [which has generally been the case - see Research FoR] because of the amount of existing knowledge and information available on freshwater environments. Interestingly, however, according to the survey findings, the potential impacts from natural climatic changes were relatively insignificant in comparison to freshwater related concerns. This is different from the interview findings [see Uncertainty FoR] which suggest that salmon management should prioritise the marine environment because that is where salmon spend 75%



of their lifetime and that little is known about the marine environment. The uncertainty of what is happening at sea creates opportunities for research and future management [see Research FoR].

### **7.15.3 Environmental Management**

The Environmental Management construct refers to discourses related to global warming, the marine environment and oceanic food cycles, and the river environment. The majority of respondents perceived global warming to be the biggest issue affecting the fishery, with changes at sea affecting salmon returns. These climatic changes appear to have created the Uncertainty FoR discussed earlier, and form some of the reasons why the fishery is constructed as “Needy”.

Several respondents framed the environmental issue using discourse such as “poisons” and “plundering” to articulate their concerns about exploitation of the river environment, and public health issues (NZSAA, ECan, PFG, and WFG). Ngai Tahu shared similar concerns with the degradation of Lake Ellesmere and Lake Forsyth due to development. DoC further added that the plundering of river flows for agricultural purposes has reduced the role that rivers play in transporting sediment from the headwaters to the sea. Finally, Ecan, Hamill’s, PFG, NIWA, NCFG, and Lincoln University constructed the river environment and salmon spawning grounds to be under threat from the invasive weed didymo.

The Environmental Management FoR reiterates that the fragile environment within which salmon live is driving much of the reasons for why the fishery is “needy”.

### **7.15.4 People Management**

The People Management construct refers to discourse related to public attitudes. The notion of changing attitudes was one of the objectives of the DDC, a technique used to mobilise people over poor agricultural farming practices. The DDC was intended to improve water quality and quantity in the short term, while aiming to install an environmental awareness attitude toward land use and water use in the long term. F&B supported this point with the following statement:

“In some of the smaller salmon rivers like the Ashburton and Orari, Rivers, it is important to keep on average higher river flows [sic] for enhancing the salmon fishery... In order to do so you’re going to have to change the whole infrastructure of the farming and hinterlands, and change the attitudes of farmers towards land use” (F&B).

Unfortunately for FGNZ the former acclimatisation societies did a poor job maintaining the salmon fishery. By the early 1990s environmental damage to rivers, streams, lakes, and wetlands had occurred. The DDC was in response to this degradation, and was perceived by several of the

respondents to be a positive step towards recognising the needs of, and managing for, the Needy Fishery. The next section covers more of the quantitative findings from the NZSAA survey that did not tie in directly with the qualitative findings, but may lend more insight for the way salmon are currently framed.

### **7.16 Summarising the FoR Analysis**

As illustrated earlier<sup>84</sup>, Figure 13 reinforces that the Needy Fishery FoR has been shaped by, and in turn has shaped, the Economic, Recreational, Uncertainty, Iconic Status, Conservation, and Research FoRs. The Economic FoR was considered to have contributed to the Needy Fishery due to pressures from water resource developments, hydro power schemes, and commercial fisheries. The Recreational FoR was considered to contribute to the Needy Fishery by potential over harvesting by anglers, while the Uncertainty FoR related to the uncertainties of global warming and the relatively “unknown” marine environment. Subsequently, the Needy Fishery has partly led to the development of the Iconic Status frame providing difficult challenges to anglers for catching what they consider to be a high profile, rare and unique freshwater fish. Furthermore, the Needy Fishery FoR has contributed to the formation of the Conservation FoR because of the public perception that salmon have a conservation role to play. These frames appear to take shape from the Needy Fishery FoR, providing some of the reasons for how the salmon fishery is viewed, and why it is treated the way it is.

The Iconic Status of salmon shapes the Biological and Recreational FoRs with notions of fascination and excitement. In these three FoRs [Iconic Status, Biological, and Recreational], references were made to the fascination, thrill and intrigue that salmon brought. These fascinating attributes appear to be what make salmon iconic from a biological and recreational perspective. Biologically, salmon were considered fascinating because of their amazing and unique lifecycle traits, luring recreationists and researchers in particular. Recreationally, salmon were considered to be highly important to anglers for fishing, forming an integral cultural activity.

Derived from the Iconic and Recreational FoRs is the Cultural FoR, which was constructed as being a network of older, passionate, vocal, determined, and results driven salmon anglers. These attributes appear to be why salmon anglers make such persuasive, vocal, and politically savvy lobbyists, i.e. NZSAA. Thus, their strong cultural connection with salmon fishing has seemingly led to Political and Administrative themes which were perceived to have helped professionalise the management of the Needy salmon Fishery.

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<sup>84</sup> Section 7.1.1

The Research FoR was considered to form out of the Needy Fishery and Uncertainty FoRs. The Research FoR was seen as an attempt to investigate ways to advance knowledge and understanding of the fishery in order to improve it via Tooling methods. The Tooling FoR appears to be partly shaped by the Economic FoR which was socially constructed for its contribution of finances for tooling. Thus the Economic, Research, and Tooling FoRs were interlinked as respondents thought that economic funding helped to obtain useful research information so as to design and implement adequate tooling methods for effective management of the fishery.

The Management FoR was constructed as the battlefield of the fishery where the military language of “war” was used for metaphors to protect, enhance, sustain, and maintain the salmon fishery. The Management FoR took shape from themes such as Tooling [previously mentioned], Conservation, Administrative [previously mentioned], and Economic FoRs.

The Management FoR was partly shaped by the Conservation FoR which was considered to be linked to the Introduced vs Native debate. Management was considered to be partly about conserving native and introduced species based on their social, economic, and environmental values. Introduced species such as salmon and trout were not only valued for the socio-cultural and recreational opportunities they provided, but also for their important environmental role as bio-indicators for water/river conservation.

Furthermore, the Management FoR appears to incorporate themes from the Administrative FoR in response to political themes from the passionately driven network of anglers, expressed in the Cultural FoR. For instance, the NZSAA are a politically savvy association formed from a group who are passionate about maintaining salmon fishing as an important cultural activity. They have been pivotal in shaping the management of the salmon fishery to date, assisting FGNZ during the 1990s transition period when acclimatisation societies were abolished.

Lastly, the Management FoR is interconnected with Economic themes because managing the Needy Fishery effectively, requires financial revenues. FGNZ sells seasonal licenses to freshwater anglers, and the revenues from license sales are utilised for management purposes. The fishery is like a business: poor management will discourage the stakeholders [anglers] to buy fishing licenses. Not only could poor management contribute to an already Needy Fishery, but FGNZ may lose their economic and political power.

Next is a discussion of other findings from the NZSAA survey that further deepens our understanding of salmon, salmon anglers, and salmon management.

7.17 Other (Quantitative) Findings

The survey revealed that members of the NZSAA fish for both salmon and trout, which makes it difficult to distinguish and separate the constructions held by salmon anglers only. Therefore the quantitative findings assume that when respondents answered the survey, they constructed their answers according to what they knew as salmon anglers. The fact that they may fish for other fish is not important. The importance is that members of the NZSAA are New Zealand’s most informed group about salmon, and matters concerning the salmon fishery.

A total of 92% fished for both salmon and trout [Figure 26]. Of this proportion, 37% fished for salmon more than trout, 33% for trout more than salmon, and 22% fished for both equally as much. This suggests that the NZSAA members are aware of salmon fishery related matters due to the fact that 99% of them have a stake in the fishery because they fish for salmon at some stage during the year.

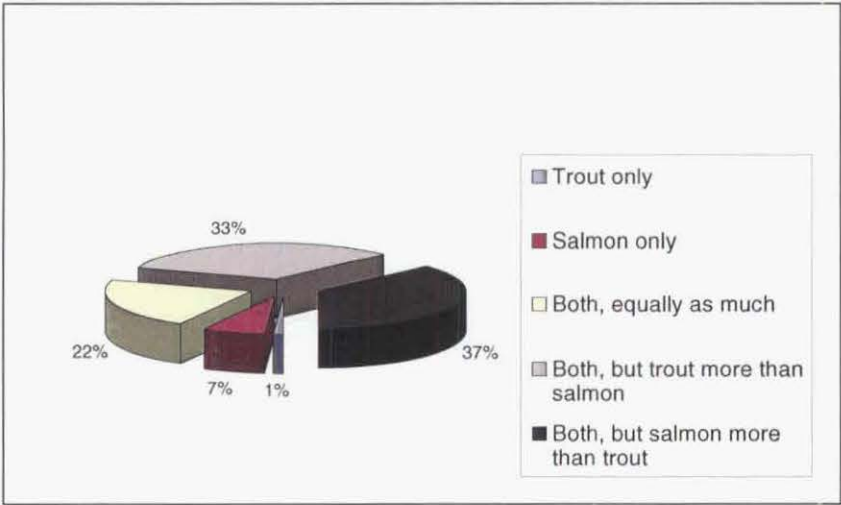


Figure 26: Proportion of what NZSAA respondents fish for (N = 191)

7.17.1 Salmon Angler Thoughts about Salmon Farming

When asking the NZSAA members of their attitudes towards ocean ranching [Figure 27], 55% approved mainly because it benefited the angler with more salmon in rivers, 34% remained neutral mainly because they wanted to be ensured there were no negative effects to the wild fishery, while 11% disapproved mainly due to concerns of disease or genetic effects weakening the wild fishery.

Of the 190 respondents that expressed their views towards sea cage rearing, 47% remained neutral towards sea cage rearing as long as there were no negative impacts towards the wild fishery, 38% approved because it was perceived as a legitimate commercial activity, while 15% disapproved mainly because there were no benefits to anglers fishing in rivers.

Of the 191 respondents to express their attitudes towards pond rearing, 51% held a neutral position toward pond rearing based on whether or not there were any negative effects to the wild fishery, 31% approved mainly because they constructed pond rearing to be a legitimate commercial activity, while 18% disapproved mainly because pond rearing provided no benefits to anglers fishing in rivers.

Figure 27 illustrates a distinct pattern that NZSAA respondents were more likely to approve ocean ranching schemes than sea cage or pond rearing. Out of the three techniques, pond rearing was least approved.

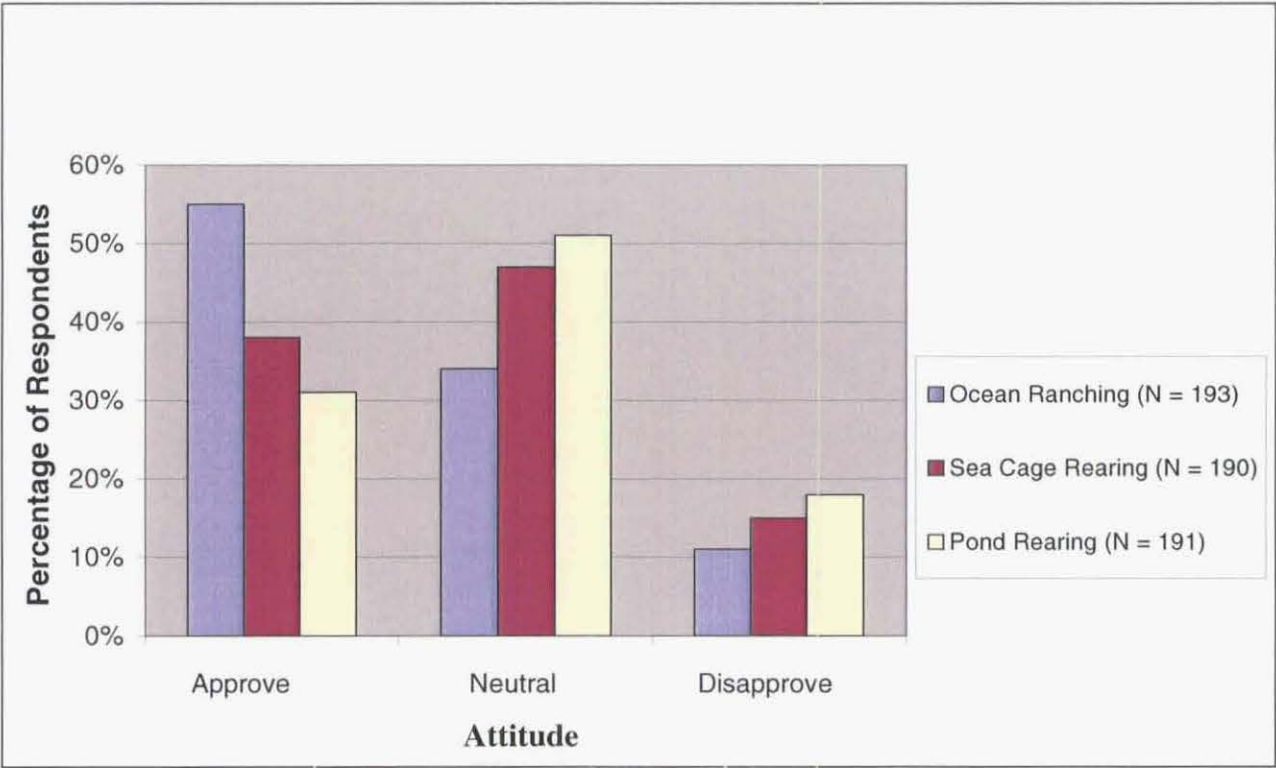


Figure 27: NZSAA responses towards ocean ranching (N = 193), sea cage rearing (N = 190), and pond rearing (N = 191)

7.17.2 Understanding the Angler

The survey helped to deepen the level of understanding of salmon anglers by asking NZSAA respondents to reveal some of their attitudes, preferences, and reasons for where they fished, why they fished there, what a “good” fishing season was, what an “acceptable” fishing distance was,



and what they fished for. The responses to these questions helped further understand the ecology of salmon anglers and how they construct the fishery.

Figure 28 illustrates that [34%] claimed the first factor that influenced where they chose to fish related to the proximity from home/work to the river, 25% said that the quality of water such as flow and clarity was the second factor, while 17% depended on the abundance of fish. This finding supports the fact that the Waimakariri and Rakaia rivers receive the most salmon angler days because they are the two closest salmon rivers within proximity to Christchurch and Ashburton city, and several rural townships such as Amberley, Rangiora, Lincoln, Darfield, Rolleston, Rakaia, and Methven (Unwin & Image 2003).

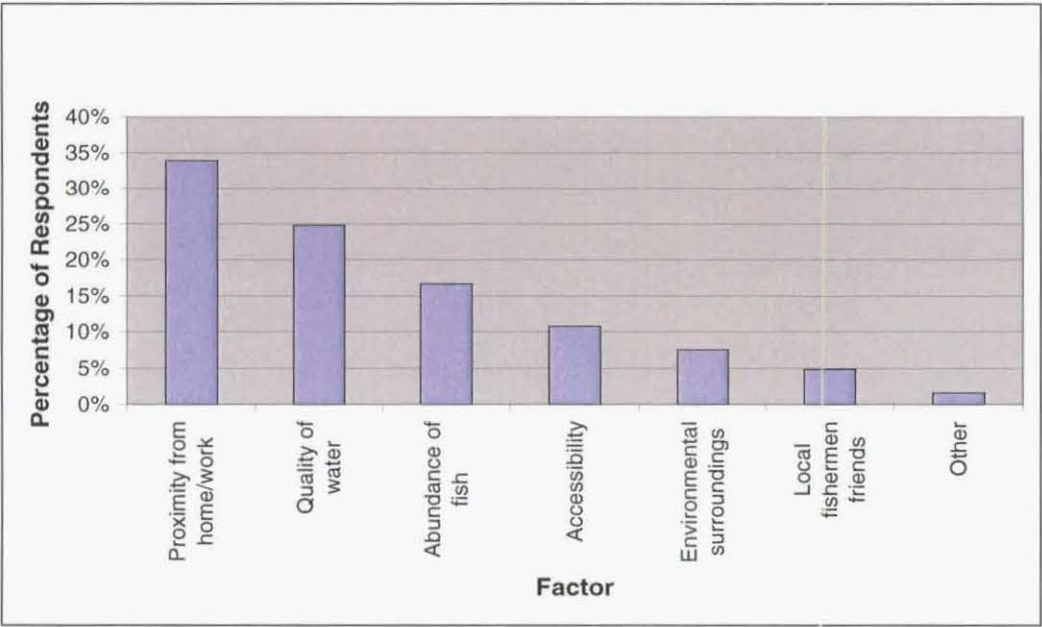
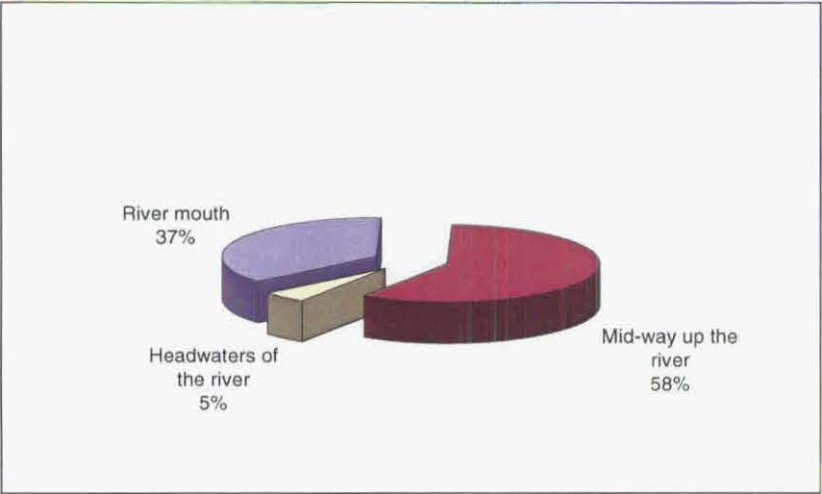


Figure 228: Factors influencing where to fish (N = 186)

According to Figure 29 the majority of respondents’ fish the middle reaches of the river and the river mouth, while only a fraction fish the headwaters. When asked to choose any three reasons why they fished that particular section of the river, a distinct pattern emerged [shown in Figure 30].



**Figure 23: Most fished section of a river (N = 188)**

Of the river-mouth anglers to respond to Figure 30, 24% mainly fished the river mouth because they thought they had an increased chance of catching a salmon, followed by the ease of accessibility [23%], and the thought that salmon were bigger and in better condition [17%]. Mid-river fishermen selected this part of the river mainly [23%] because of the variety of different pools available to fish, followed by environmental surroundings [19%], and tranquillity [18%]. For fishermen that fish the headwaters, 33% said they preferred it because of the environmental surroundings, while 29% fished there because of the multiple pools available, and because they had a better chance of catching a salmon [17%]. This confirms that different sections of the river are perceived differently by anglers based on their different preferences. This suggests that those anglers' who fish at river mouths, prefer to fish there for different reasons than those who fish for salmon mid-way up rivers. This illustrates the complexities with trying to understand the social dimensions of an angler.

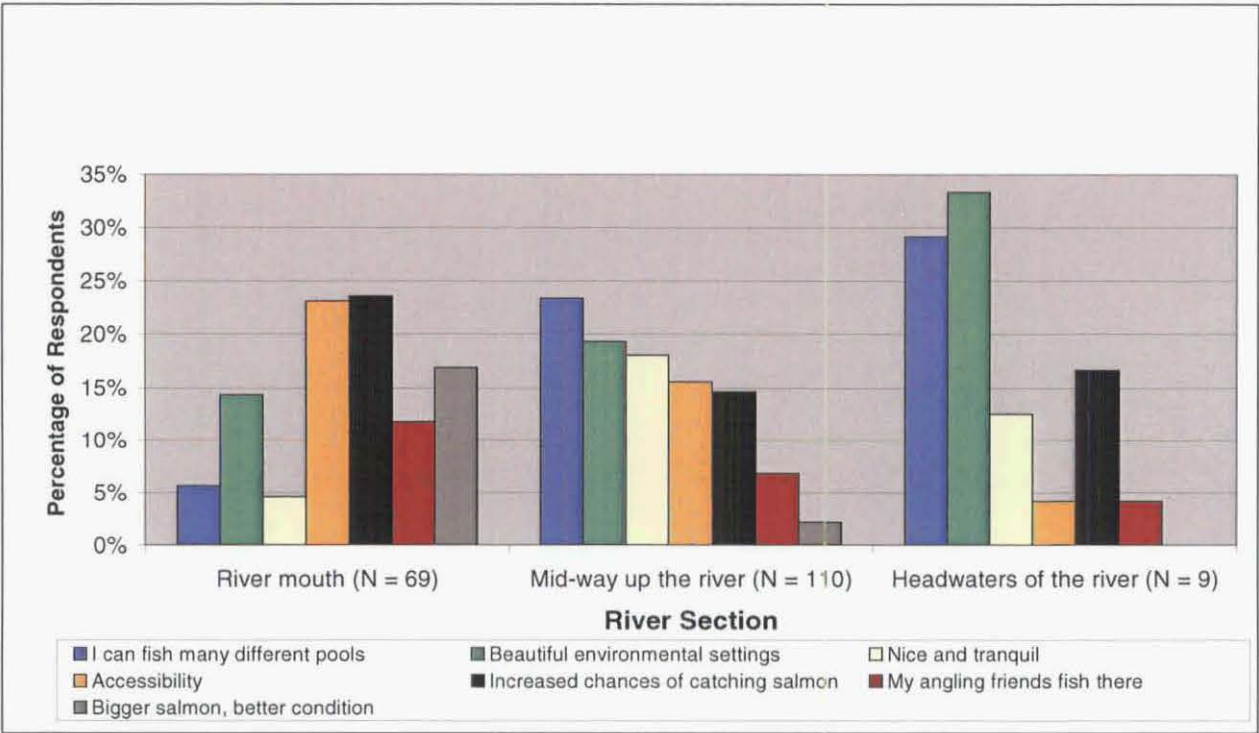


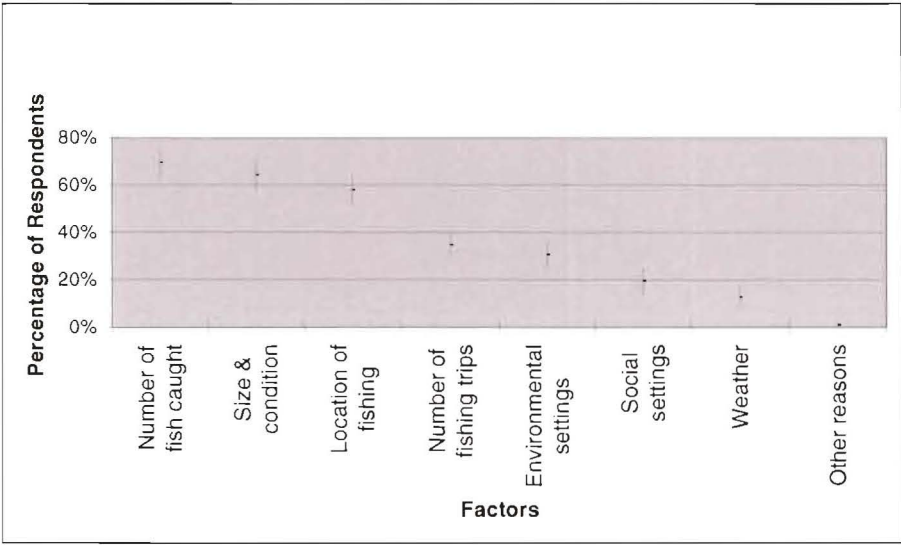
Figure 24: NZSAA fishing preferences for different sections of the river (N = 188)

The findings from Figures 28, 29, and 30 suggest that anglers prefer to fish for salmon within close proximity from home/work, in the middle reaches of a river system [because there are multiple pools available to fish] and at river mouths [because there is an increased chance of catching salmon]. Figure 28 asked respondents to rank in order from 1 to 3 their main factors that influenced where they fished, Figure 29 asked them what river section they fished most, while Figure 30 cross tabulated angler preferences with what section of the river they fished. The importance in terms of FGNZ management is to ensure that anglers have fishing spots within close proximity from home/work. Thus, adequate access points should be provided to enable/increase angling days. Furthermore, seeing as the majority of anglers are fishing mid-river [Figure 29], then FGNZ should prioritise their game officers to patrol the braided river banks of the middle reaches to ensure no illegal fishing activities are taking place. Finally, if the main salmon angling preferences are to fish the mid-river, and river mouth, the findings identified in Figures 28 – 30 should be considered when making management decisions.

The findings from Figure 31 revealed three main factors that helped determine a “good” fishing season. This was an attempt to better understand what anglers mean by a “good” fishing season. This question was not exclusively related to salmon, as most salmon anglers also fish for trout, but it provided more insight to the way anglers construct Nature. A clear pattern of the three main factors that determine a “good” fishing season emerged. Most [69%] of the respondents perceived that one of the main factors was related to the number of fish caught for the season,

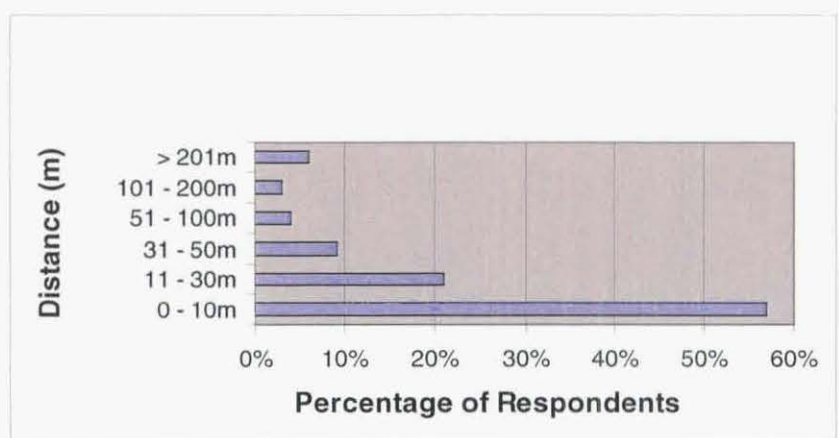


64% claimed that the size and condition of fish caught was very important, while 58% constructed the location of fishing helped determine their best fishing season. These findings have implications for management because it suggests that in order to attain good fishing seasons [according to what NZSAA members construct as being a “good” season], FGNZ should aim to keep the fishery well stocked, the size and condition of fish healthy, and ensure adequate fishing locations and access points are provided within close proximity from where people live and work [as suggested by Figure 31]. However, the problem with stocking the fishery is that supplementation of hatchery reared fish negatively impact the wild fishery.



**Figure 31: Main factors determining a good fishing season (N = 190) (SE ± 5 %)**

Figure 32 illustrates what salmon anglers construct as being an “acceptable” fishing distance from other anglers. The most acceptable distance to fish for salmon was 0 – 10 metres away from the nearest angler. At the outset, this “acceptable” distance is remarkably different from that of trout anglers who are generally perceived as individualistic, experience driven, and in search of solitude. This is thought to be a result of salmon fishermen being more socially engaging, results driven, and less concerned about congestion provided they have good chances of catching salmon. Thus, what trout anglers consider as an “acceptable” fishing distance is likely to be much larger than that of salmon anglers.



**Figure 32: Acceptable distance from nearest angler (N = 186)**

In order to further understand the ecology of the salmon angler, a cross tabulation of the results from Figures 29 and 32 was carried out to determine whether the proportion of river mouth anglers differed in their choice of an “acceptable” fishing distance to that of mid-river anglers.<sup>85</sup> The original question in the survey<sup>86</sup> asked anglers to choose between 11 categories as opposed to only six as shown in Figure 32.<sup>87</sup> Of the 67 salmon anglers that selected the river mouth for their most fished section, 49% chose an acceptable distance of 0 – 5m, 42% considered 6 – 10m, while only 6% thought 11 – 15m was acceptable. More than 90% of river mouth anglers accepted a fishable distance of 10m or less. Of the 107 anglers that selected the mid-river section, 15% thought that 0 – 5m was acceptable, 22% chose 6 – 10m, 12% believed it was 11 – 15m, 17% considered 16 – 30m, while 15% said 31 – 50m was an acceptable distance. More than 80% of mid-river anglers constructed that an acceptable fishable distance was 50m or less.

This confirms that anglers are complex and that they construct the fishery in different ways. While it is difficult to make truth-claims about how anglers’ construct the fishery [due to the many variables that influence their perception], the survey questions have been helpful in further understanding salmon anglers. For instance, from the data obtained I can generalise that those anglers that fish at river mouths are more likely to fish closer together because they are more interested in catching salmon, while mid-river anglers are more likely to fish multiple pools, and fish further apart in an attempt to enjoy the environmental settings. The difficulty with using data from a quantitative survey is that they cannot represent salmon anglers’ rich, complex, and integrated constructions of salmon and salmon fishery-related issues in the same manner that

<sup>85</sup> Head water anglers were relatively insignificant in the survey [5%] so they were not referred to from the cross tabulated results.  
<sup>86</sup> See Appendix 12, question 29.  
<sup>87</sup> I reclassified the findings in Figure 33 to keep the graph simple. Originally there were 11 categories.

qualitative techniques can. However, combined with the findings from the qualitative interviews, the quantitative data has proven to be useful.

### 7.17.3 Angler Constructions of Nature

Several of the survey questions<sup>88</sup> attempted to determine how anglers constructed Nature. This involved asking respondents to reveal some of their attitudes towards wild and hatchery salmon and whether they considered them to be 'natural' and part of 'Nature' [Figure 33].

When asking NZSAA respondents whether they constructed wild salmon to be part of New Zealand's natural fauna the majority [78%] said "yes" mainly because they thought salmon had naturally adapted to New Zealand's ecosystem over the last 100 years, 14% said "no" because introduced species were considered not natural, while 8% "don't know" because they were undecided.

When asking NZSAA about wild salmon being part of nature 91% said "yes", constructing wild salmon to be part of nature mainly because they had adapted to the New Zealand ecosystem over the last 100 years, 5% said "no" as salmon were not natural because they were introduced and therefore not part of nature, while 4% said "it depends" because they had become part of our food chain.

The majority [52%] of NZSAA respondents thought that salmon in hatcheries were "not" natural because they were interfered with and artificially managed by man, 34% thought they were natural because they were extracted from wild origin, while 14% said "it depends" whether they were bred for release or for sale.

The majority [50%] of respondents were not convinced that salmon in hatcheries were part of nature because hatcheries were considered artificial and the salmon were interfered with by man, 34% thought that they were part of nature mainly because salmon in hatcheries were naturally able to reproduce, while 16% thought "it depends" whether they were bred for release or for sale.

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<sup>88</sup> See Appendix 12, questions 45 – 48

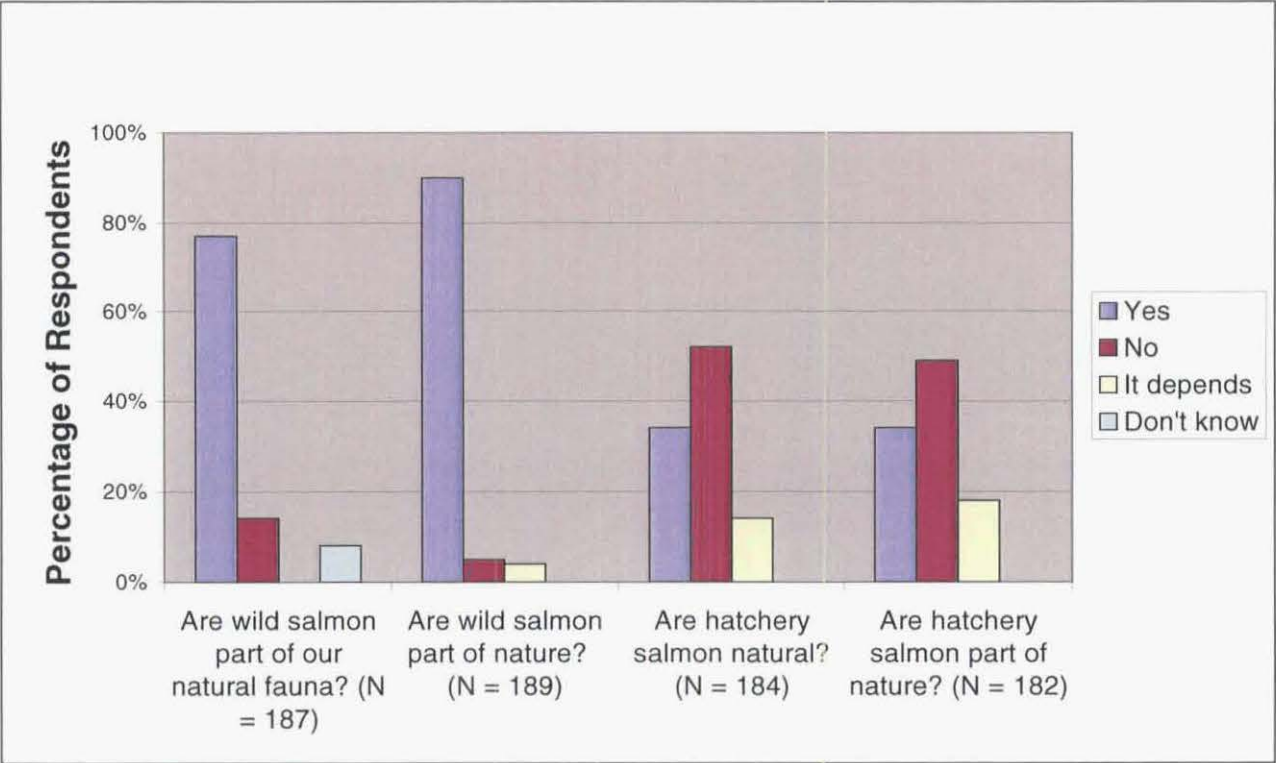


Figure 33: Are salmon natural or part of nature?

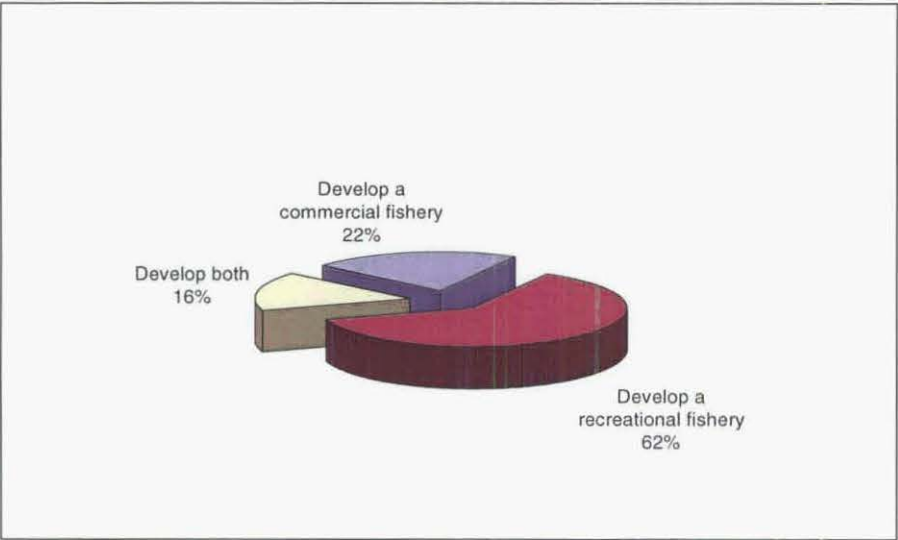
These questions about “Nature” represent how anglers construct wild and hatchery salmon in New Zealand. Wild salmon were more likely to be considered as “natural” fauna in New Zealand and therefore considered to be part of Nature, while hatchery salmon were less natural and therefore less likely to be considered part of Nature. The association with human intervention seemed to prevent hatchery salmon from being viewed as natural and part of nature. The next section briefly mentions other findings from the survey.

#### 7.17.4 Other Findings

Figure 34 represents question 56 of the survey, which asked NZSAA members to select what they thought was the initial intention for introducing salmon to New Zealand.<sup>89</sup> The majority [62%] of respondents believed that chinook salmon were introduced for recreational purposes, 22% felt it was to establish a commercial fishery, while 16% stated both.

<sup>89</sup> See Appendix 12, question 56.





**Figure 34: NZSAA responses to why salmon were originally introduced to New Zealand (N = 188)**

These findings lend support to the findings from Figures 20 and 21<sup>90</sup>, adding emphasis to the strong recreational construct for salmon in New Zealand. However, despite NZSAA strong recreational views, Figure 34 revealed an interesting misconception. It is well documented in acclimatisation literature that salmon were initially introduced to New Zealand to establish a commercial fishery (Lamb 1964; Young 1986), but upon failing to do so, evolved into a recreational fishery (McDowall 1994). The belief held by NZSAA members that salmon were initially introduced for recreational purposes is incorrect. This is perhaps what fed the strong political drive by the NZSAA in the 1970s to see the salmon fishery professionally managed as a recreational resource. In their minds wild salmon were never meant for commercial endeavours.

Figure 35 illustrates that the largest group [28%] of respondents would “accept” a no-fishing zone at river mouths during spawning to ensure more salmon entered the rivers, while 27% “strongly opposed” such a regulation. Overall there were more anglers in opposition [45%] than in favour [37%] to this regulation, while 18% remained neutral. This suggests that regulating fishing at river mouths to ensure more salmon enter the rivers for spawning will be met with great opposition.

<sup>90</sup> See Recreational FoR, section 7.8

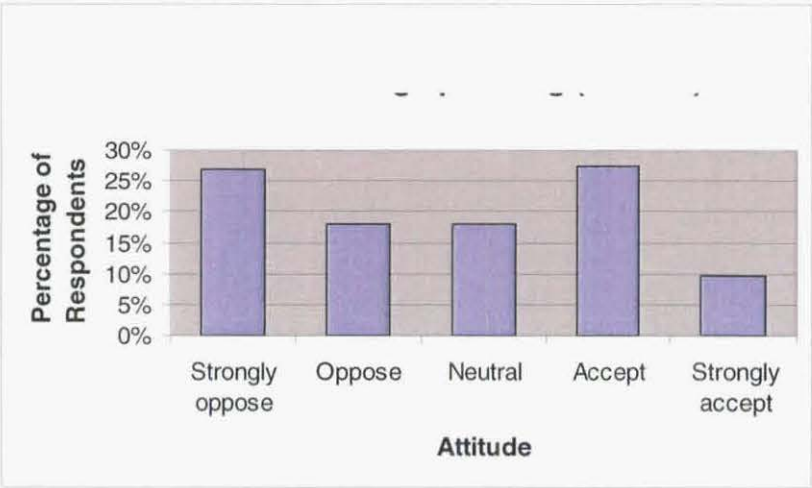


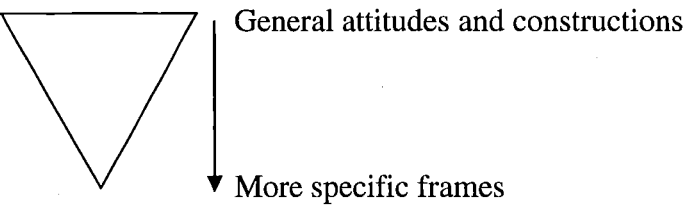
Figure 35: Attitudes towards a “no-fishing zone” at river mouths during spawning (N=189)

7.18 Chapter Summary

Chapter 7 has shown the complexity in trying to understand how salmon, and salmon management are constructed; how anglers’ construct Nature; and the ecology of the angler in New Zealand. This highlights the relevance of adopting a moderate constructivist approach that incorporates qualitative enquiry tools that help deepen understanding, and quantitative techniques that help quantify understanding. Without the qualitative interviews, the research topic would have lacked the rich, descriptive detail required to deepen our understanding of salmon and their management in New Zealand; but without the quantitative survey the research topic would have lacked a practical, more grounded understanding for how salmon are socially framed and how they these frames have shaped contemporary management. The key finding in this Chapter is the Needy Fishery FoR. This in turn has shaped the way in which salmon are currently constructed and managed in New Zealand. Their seemingly special treatment in fields such as management, politics, recreation, conservation, economics, and research and development raises some interesting questions about the influence[s] that cultures in society have towards things in Nature.

## Chapter 8: Discussion, Conclusions, and Recommendations

Swaffield (1998) cautions that when using a frames of reference analysis it is imperative to start with a wide body of literature where frames are seemingly generalised, and work towards specifying the frames of reference. Figure 36 is an attempt to illustrate Swaffield’s (1998) principle with the upside down triangle which resembles a similar methodology adopted in this study to determine the historical and current frames of reference of chinook salmon.



**Figure 36: Frames of Reference principle**

The purpose of using an interdisciplinary approach for reviewing fields such as ecology, economy, management, environment, social science, and history was to better understand how chinook salmon were historically and currently framed in New Zealand. Deploying the interdisciplinary approach shown in Figure 1 required pluralistic paradigms offered by social construction theory. In order to integrate a mixture of quantitative and qualitative techniques, a moderate constructivist position was taken. In developing the moderate constructivist methodology, techniques such as literature reviews, semi-structured [quantitative] surveys, open-ended [qualitative] interviews, discourse analysis, and frames of reference analysis were deployed to search for findings. Integrating the findings from these techniques has been pivotal in determining the historical and current frames of reference of chinook salmon in New Zealand. This Chapter summarises the research findings in an attempt to weave a better, overall understanding of how salmon are framed and managed in New Zealand.

Figure 37 provides a summary of the research framework, illustrating that Chapter 4 outlined the factual information of salmon in the ‘material world’; Chapter 5 discussed the acclimatisation movement and attitudes towards the salmon management since 1875 from a moderate constructivist perspective; Chapter 6 evaluated relevant legal institutions; while Chapter 7 interpreted and discussed the findings from the qualitative interviews and results from the quantitative surveys in a reflexive manner.

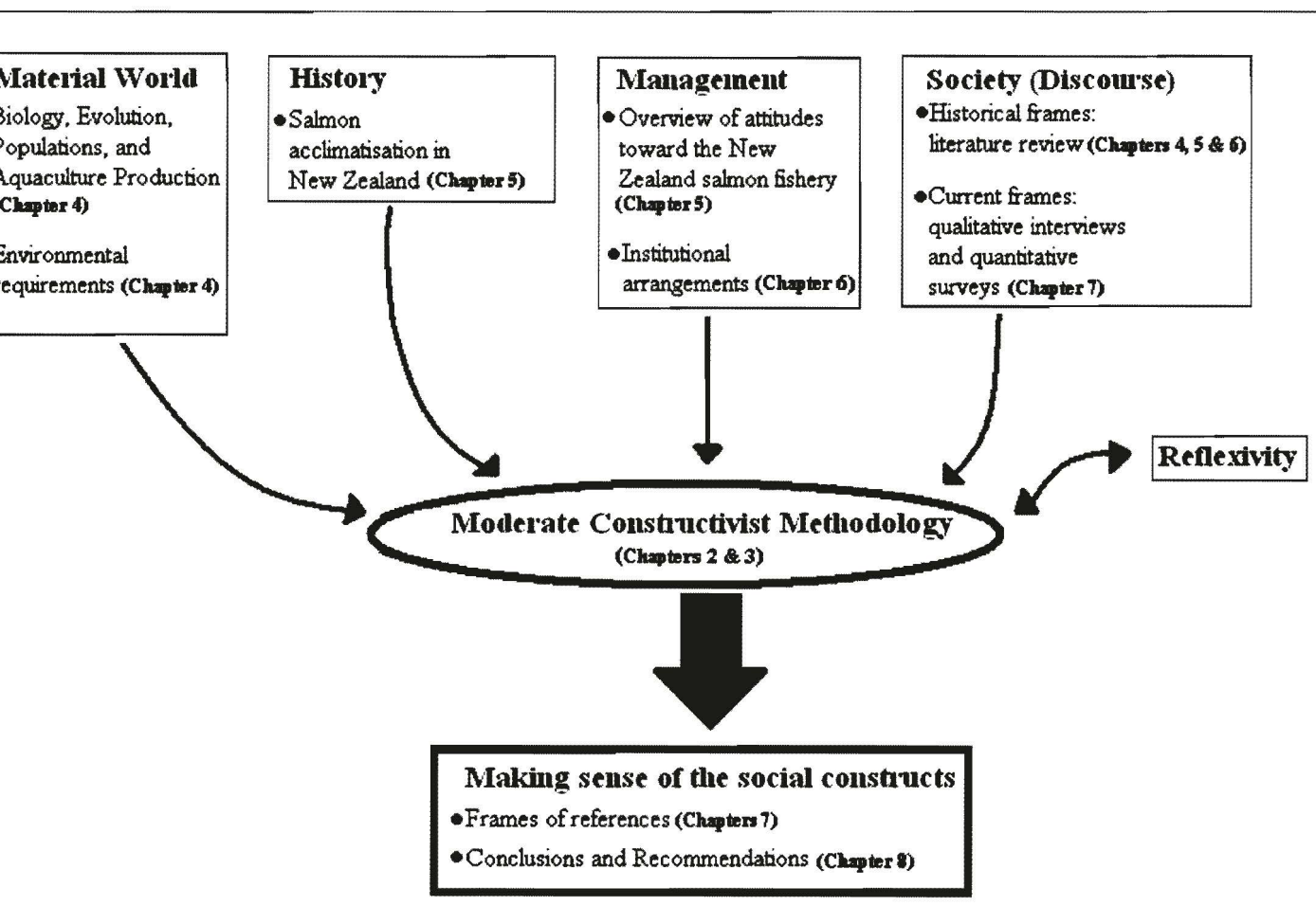


Figure 37: Summary of the research

Before discussing a summary of the findings, the research hypothesis and objectives are briefly revisited.

## 8.1 Revisiting the Hypothesis

In terms of revisiting the research hypothesis to test whether there is a positive correlation between both historical and current constructions of salmon that explains their apparent special management status in New Zealand compared to other introduced species; moderate constructivism has been useful in verifying that there is in fact a positive correlation. In verifying the hypothesis, the following three objectives were instrumental.

## 8.2 Meeting the Research Objectives

The three research objectives were to:

- Review the literature on social construction theory [Chapter 2];
- Develop an appropriate methodology that uses qualitative and quantitative methods to explore the social construction of salmon in New Zealand [Chapters 2 & 3]; and
- Improve the level of understanding about the way salmon are viewed and managed in New Zealand [Chapters 4, 5, 6, 7 & 8].



### 8.3 Summary of Findings

Salmon fishing for early British settlers in the 1800s was constructed as being an elitist, separatist sport for aristocrats in Britain. It appeared to form some of the reasons why people left Britain in search of improved economic and social prospects. New Zealand provided opportunities for change with rich landscapes, pure waterways, and the prospect of new governance. Local Governments and acclimatisation societies played fundamental roles toward facilitating the release[s] of fish and game into New Zealand streams, lakes and mountains to fulfil commercial and recreational interests (Allen 2006).

Currently the key statutory document protecting salmon habitat is the Resource Management Act 1991. The RMA incorporates legislative themes from the Soil Conservation and Rivers Control Act 1941, Water and Soil Conservation Act 1967, and the Wild and Scenic Rivers Act 1981 to name a few. Subsequently these provisions, alongside political pressures from stakeholders such as acclimatisation societies, the New Zealand Fish and Wildlife Investigation Movement, New Zealand Salmon Anglers Association, Fish and Game New Zealand, and recreational anglers, have given shape to the Salmon at Sea Agreement 1991, and more recently the Draft Salmon Management Plan. These institutional provisions are recognised for their contribution[s] toward improving salmon management in New Zealand.

In addition to the stakeholders mentioned above, other stakeholders that are identified for shaping salmon management in New Zealand are the Government, Ministry of Agriculture and Fisheries, Hunn Commission, South Island Salmon Committee, National Institute of Water and Atmospheric Research, and the New Zealand Salmon Farmers Association. While the Government's principal objective for establishing chinook salmon in New Zealand was for commercial purposes, since 1906 the species has been viewed much more as a recreational asset and defended as such. During this time there were battles over the commercial netting and sale of rod licenses to catch salmon, and hydro electric developments. More recently [1975 – 2007] the salmon fishery has seen disputes over further hydro electric developments, irrigation schemes and other water-related developments, salmon farming and the issues of hybridisation, and campaigns against poor agricultural practices. These disputes have helped determine how the fishery has been historically framed and helped identify how these historical frames have shaped the way salmon are currently framed.

At present, the wild salmon fishery is in a “needy” state, which lends insight to the seemingly special treatment they receive as sporting icons for recreational anglers, bio-indicators for river

conservation, economic resources for the tourism industry, and managerial resources for FGNZ. The struggle to sustain the wild salmon fishery is more obvious today than it has ever been. The lack of certainty about climate change and its affect on the salmon fishery leaves room to speculate about what lies ahead in terms of salmon management in New Zealand. Despite some of the fatalistic attitudes that it is all “doom and gloom”, concerted efforts to sustain a viable wild salmon run in New Zealand continues under the auspices of FGNZ, alongside the voluntary contributions from the NZSAA and other aforementioned stakeholders. It is now also a commercial species that depends on the wild fishery to a large extent because of connotations of wilderness and New Zealand Rivers.

It appears that no other introduced fish or game species in New Zealand has received as much attention and assistance in the form of voluntary organisations, government intervention, political lobbying movements, media representation, legislative provisions, research and development, economic and marketing focus, and recreational representation<sup>91</sup> than wild chinook salmon since their introduction to New Zealand more than 100 years ago.

8.4 Recommendations

8.4.1 Management

Wild salmon runs have undergone declining trends since the mid 1990s. Therefore a move towards a SMP is a prudent move. Equally as important though is the need to monitor and report on the SMP’s performance. Deliverables such as returning runs, spawning counts, spawning mortality rates, river flows, and water quality should be monitored and recorded between November and April annually, and entered into a database to analyse yearly trends and forecast future runs. As the lifecycle for chinook salmon in New Zealand is typically between three and four years, a review of the plan’s performance is recommended after four years from when the plan is approved [i.e. 2012] and updated at yearly intervals. Assessing whether the SMP delivers on its set objectives is an important reflexivity tool for improving management where necessary.

Based on my findings from the moderate constructivist approach, there are several areas of strength and weakness for the proposed 17 objectives outlined in the draft SMP [Table 15].

Proposed SMP objectives:	Moderate constructivist interpretations:
To minimise commercial by-catch at sea	Merited, achievable due to the SSA 1991 and the SCA. Necessary because of decreasing trends of salmon retuning from the sea to freshwater environments.
To facilitate salmon stocking programs	Not merited, this has proven to lead to hybridisation and weakened genetic variance of wild stocks (Unwin & Glova 1997)

<sup>91</sup> By FGNZ

To restore degraded and extinct salmon fisheries	Merited, achievable through the processes of WCOs under the RMA 1991, and launching campaigns similar to the DDC.
To undertake population monitoring programs	Merited, achievable as scientific-fisheries research techniques are advancing. This is highly necessary due to the uncertainties of the Needy Fishery.
To ensure that salmon aquaculture does not adversely affect wild salmon stocks or habitat	Merited, achievable as long as aquaculture practices are well monitored and managed. Aquaculture is also good because it may become a viable means for providing simulated fishing experiences if the wild fishery collapses; i.e. Take a Kid Fishing Day at the Groins ponds, Christchurch, or fishing in the canals in Twizel.
To sustainably regulate salmon angling	Merited, but difficult to achieve because of lack of funding and ability to enforce regulations. Over harvesting by anglers was considered to be a salmon fishery issue.
To ensure adequate research is completed	Merited in theory, but in practice there is not enough money and expertise for FGNZ to carryout research due to the introduction of CRIs. FGNZ employs NIWA to carryout adequate research, but it is expensive. Collaborative research is suggested.
To promote the protection, maintenance and enhancement of salmon habitat	Merited, achievable through marketing and branding the Fish & Game name like FGNZ's DDC, Environmental Game Kit [education program for school kids], Take a Kid Fishing Day, and through the encouragement of local initiatives such as Russ Edgar's [Canterbury] "rear a salmon" at school task. <sup>92</sup>
To encourage and provide for volunteers to salmon management	Merited, currently achieved due to the contributions from NZSAA to the Montrose hatchery on the Rakaia River.
To provide an effective communication and information service to salmon anglers	Merited, achievable through surveying angler perspectives every second year to gain grassroots perspectives on fishery related matters. Provide adequate notification about potential public meetings related to the salmon fishery. Notifying the president of the NZSAA is a recommended starting point, as the NZSAA submits monthly newsletters.
To provide sufficient ranging resources to enforce fishing season conditions	Merited, but only achievable pursuant to funding. At present this does not appear to be a realistic objective; this may require FGNZ to prioritise what ranging areas require most management until adequate funding is available.
To maintain and improve opportunity for salmon angling through provision access	Merited, at present the access points to river beds for salmon fishing opportunities are more than adequate. Other proposed objectives require more attention than this one.
To ensure all salmon fishing competitions encourage participation over catch	Merited, but difficult to achieve due to the results driven attitude held by salmon anglers. It appears that for salmon anglers it is more about the catch than the act of participating.
To promote public appreciation of the salmon fishery and protecting the recreational amenity values	Merited, partly achievable through FGNZ Environmental Game Plan and fighting to ensure that WCOs administered under the RMA 1991 are not altered to allow for more development.

<sup>92</sup> Russ Edgar helped launch "rear a salmon" at Shirley Boys High School, Canterbury, which was a 3 month task where students reared the salmon from eggs to smolt size and then released them into the Waimakariri river for part of their school work.

of water	
To ensure that the relationship with South Island Iwi is maintained	Merited, achievable as long as FGNZ can illustrate that there is a win/win situation arising from the interaction of introduced fish in New Zealand. i.e. economic benefits to the local community from recreation and tourism.
To raise additional funds for salmon management	Merited, and certainly critical, but difficult to achieve particularly if salmon runs continue to decrease, contributing to less license sales to an already Needy Fishery.
To create a governance structure for implementing the SMP	Merited, but difficult to achieve. Stakeholders such as the 12 FGNZ councils need to agree on how to implement the SMP. i.e. should FGNZ councils such as Northland Fish & Game contribute towards governing and implementing the salmon management plan if the North and South Canterbury, and Otago Fish & Game regions are the only ones who stand to benefit?
To ensure that the SMP meets the criteria set in Section 17M of the Conservation Act	Merited, but this may take some time before the plan meets all the criteria of Section 17M of the Conservation Act 1987 as legal documents often take years to be perfected, even after they are implemented. This proposal SMP is likely to change before it is finalised in 2008.

**Table 15: Summary of the proposed SMP based on a moderate constructivist perspective**

Table 15 illustrates where the proposed SMP stands at present. The proposed SMP drafted by FGNZ should be acknowledged for its merits as the first step towards dealing with a needy salmon fishery. However, based on the findings from the research there are some recommendations that may help to build a more robust management plan.

**8.4.2 Towards a More Robust SMP**

In the proposed SMP there does not appear to be any explicit mentions of the varying frames of references [with the exception of a ‘needy’ fishery] that the angling public and other stakeholders may have towards salmon and their management in New Zealand. One FoR that the proposed SMP does imply is that the fishery is very needy. The Needy Fishery FoR [explicitly outlined in this thesis] does in fact appear to be the major incentive for FGNZ to establish a formal management plan under the Conservation Act 1987 to help combat salmon fishery issues. Aside from the SMP’s implicit reference to a fishery in ‘need’ of improved management, FGNZ does not seem to have applied the same level of detail when devising a SMP as I have by using moderate constructivism.

In my view a working party [consisting of representatives from FGNZ, NZSAA, NZSFA, NIWA, ECan, DoC, NZPFGA, Federated Farmers, and Ngai Tahu to name a few] would provide the best platform for developing a more robust salmon management plan that incorporates a diverse [and relevant] range of stakeholder values and ideas. It is important to draft a

management plan in consultation with the potentially-affected stakeholders [which Fish & Game has attempted to do, providing for submissions, public meetings and hearings during 2006].

The point I am trying to make is that, perhaps moderate constructivism can be useful for providing an appropriate mixture of qualitative and quantitative approaches to improve society's understanding of salmon and their status in wildlife management. This thesis has attempted to outline a variety of stakeholder perspectives towards salmon in New Zealand in the hope that some of these frames may be useful for management purposes. It is suggested that FGNZ uses these frames of reference to revisit issues and options and to identify stakeholders.

### **8.4.3 Future Research**

In order to contribute towards a more robust SMP, the following key areas that were identified in Chapter 7 for 'further research', may be of some relevance to the proposed SMP:

- Clarify some of the uncertainties in the marine environment

Further research is needed to identify whether changing ocean temperatures affect salmon survivability and migration. Understanding the affect of these climatic changes may contribute toward rectifying the "needy" state of the salmon fishery. Also, the mapping of aquatic species in the marine environment may help distinguish whether there are correlations between where salmon are found, the types of aquatic fish available, and whether salmon eat them. Understanding these relationships may help to improve not only the management of salmon offshore, but other aquatic species such as red cod, flounder, mackerel, and squid.

- Identify the potential impacts of didymo in the freshwater environment

The potential impacts of didymo to the salmon fishery have not been fully investigated in New Zealand. In order to minimise the risks that didymo poses to an already "needy" salmon fishery, more research is required to identify the likeliness of didymo affecting spawning grounds. On a different note, a review of the potential impacts that didymo poses to the recreational activity of salmon [and trout] fishing needs to be assessed. For instance, will didymo affect the angler's construction of a salmon fishing experience - and if so how much will this impact on the management of the fishery being that management is funded by license sales?

- Calculate the value of salmon fishing to the Canterbury region

Non-market valuation methods such as contingent valuation, travel cost, hedonic pricing, and indifference curve mapping, provide accurate measures for calculating the monetary

“value” of a non-market good such as salmon fishing to the Canterbury region of New Zealand. Determining the value of salmon fishing to Canterbury may lend support to several of the points raised in Chapters 4 to 7 with regard to management decisions and legislative provisions. If the benefits of having salmon in Canterbury could be represented by a monetary sum, this would have contributed to the present study by adding a relevant economic dimension for explaining why the salmon fishery receives special treatment.

## **8.5 Future Status of Salmon: Resource or Nuisance**

In terms of the way salmon are currently constructed and managed, wild salmon are strongly perceived as valuable recreational resources and enhanced to sustain angling experiences, while farmed salmon are viewed as commercial products and produced to meet consumer demands. However, these views towards the management of the wild fishery may not necessarily persist in the future.

What will the status of salmon be in 10, 15, or even 20 years time? Will salmon still receive special treatment compared to other introduced game species such as Himalayan tahr or chamois which are contrastingly considered to be pests - or will salmon eventually be managed inline with other non-native species? Also, what are the implications and consequences of favouring one introduced game species over another – and if the values and frames that society holds towards one specie outweigh another, does that justify a difference in management approaches? In the case of chinook salmon [and trout] this appears to be true. But, is it fair that non-native species like salmon [and trout] are managed and somewhat protected for recreational purposes while non-native, red deer [which are highly regarded for their recreational attributes] are not? This topic raises bigger questions in relation to consistency of wildlife management in New Zealand.

Hypothetically<sup>93</sup>, if the wild salmon fishery continues to suffer, the expenditures for FGNZ to sustain a wild salmon run may exceed revenues, leading to serious problems for future management. As discussed in the Economy FoR [Chapter 7], FGNZ currently perceive salmon to be like “assets” because they possess values [social, cultural, environmental and economic] and provide economic returns from license sales much like an investment pays dividends. If the fishery fails to provide a return on investment, salmon become like a “liability” or nuisance, where they burden development. In a situation where salmon create more costs to FGNZ than benefits, the future management of salmon becomes very risky. The key is to therefore

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<sup>93</sup> I have used this example because it is a probable scenario if the already ‘needy’ wild salmon runs continue to decline.

encourage and provide for salmon fishing as an important recreational activity, increase the awareness that the fishery is “needy”, market the fact that salmon play a major cultural role for recreational anglers in New Zealand, and ensure that robust and effective management techniques are employed so as to ensure benefits outweigh the costs.

## **8.6 Contributions to SCT**

One of the objectives of the thesis was to use SCT to develop an appropriate methodology for carrying out a frames of reference analysis of salmon in New Zealand. The choice to adopt a distinctive blend of qualitative and quantitative techniques was unique to this field of research. Some will find the application of moderate constructivism contentious due to the fact that constructivist approaches have typically adopted qualitative techniques. But, what makes this thesis unique is that it adopts enquiry tools from both qualitative and quantitative sciences. This research topic has helped verify the appropriateness of employing social construction theory for issues involving society and nature, and has helped educate a greater number of perspectives on salmon than would otherwise be the case. The thesis contributes to SCT in three ways:

- Outlines a range of constructivist positions that researchers can adopt (weak, moderate, strong);
- Highlights opportunities for blending qualitative and quantitative techniques to complex wildlife management issues (using moderate constructivism);
- Illustrates how effective qualitative (interview) and quantitative (survey) approaches are for collecting and analysing research findings/data.

Further consideration should therefore be given to moderate constructivism as an appropriate position to take for better understanding wildlife issues involving society and nature.

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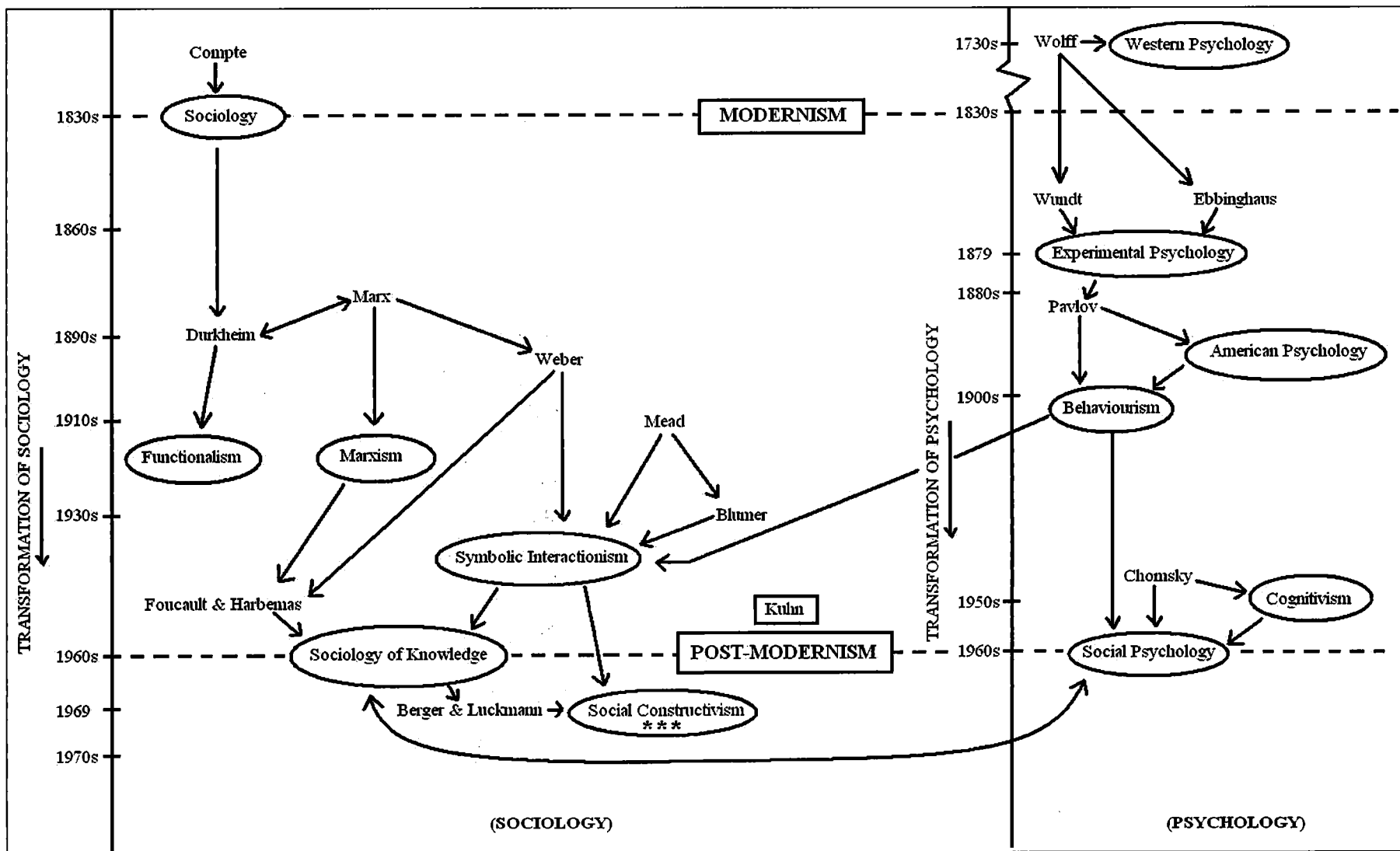
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APPENDIX 1 - Overview of the theoretical movements from Modernism to Postmodernism in sociology and psychology that appear to have influenced Social Constructivism



(Adapted from Friedmann 1979).

# Public perceptions of salmon in New Zealand

**2006 Survey**

**Jamie Carle**  
Lincoln University  
Canterbury, New Zealand

## Section 1: SPECIFIC QUESTIONS

### 1. What region do you live in?

- |                                     |                                      |                                       |
|-------------------------------------|--------------------------------------|---------------------------------------|
| <input type="checkbox"/> Nelson     | <input type="checkbox"/> Marlborough | <input type="checkbox"/> North Island |
| <input type="checkbox"/> Canterbury | <input type="checkbox"/> West Coast  | <input type="checkbox"/> Overseas     |
| <input type="checkbox"/> Otago      | <input type="checkbox"/> Southland   |                                       |

### 2. Do you fish for salmon?

- ☐ Yes ☐ No **IF NO SKIP TO QUESTION 7...**

### 3. Which of these rivers is closest to your home?

- |  |  |
|--|--|
| <input type="checkbox"/> Waiau river       | <input type="checkbox"/> Rangitata river |
| <input type="checkbox"/> Hurunui river     | <input type="checkbox"/> Orari river     |
| <input type="checkbox"/> Ashley river      | <input type="checkbox"/> Opihi river     |
| <input type="checkbox"/> Waimakariri river | <input type="checkbox"/> Waitaki river   |
| <input type="checkbox"/> Rakaia river      | <input type="checkbox"/> Other _____     |
| <input type="checkbox"/> Ashburton river   |  |

### 4. In which river do you most frequently fish for salmon? \_\_\_\_\_

### 5. Place in order, the three most important factors that influence where you fish in order from: 1 = most important; 2 = second important; 3 = third important

- |   |  |
|---|--|
| <input type="checkbox"/> Proximity from home/work                             | <input type="checkbox"/> Accessibility                                     |
| <input type="checkbox"/> Abundance of fish                                    | <input type="checkbox"/> Local fishing friends                             |
| <input type="checkbox"/> Size of fish   | <input type="checkbox"/> Quality of water [water clarity, depth, flow etc] |
| <input type="checkbox"/> Environmental surroundings [beautiful, tranquillity] | <input type="checkbox"/> Other _____                                       |

### 6. Approximately how many different days did you fish for salmon last season [October 1st – April 31<sup>st</sup>]?

- |                                      |                                      |
|--------------------------------------|--------------------------------------|
| <input type="checkbox"/> 0 – 4days   | <input type="checkbox"/> 15 – 19days |
| <input type="checkbox"/> 5 – 9days   | <input type="checkbox"/> 20 – 24days |
| <input type="checkbox"/> 10 – 14days | <input type="checkbox"/> 25+ days    |

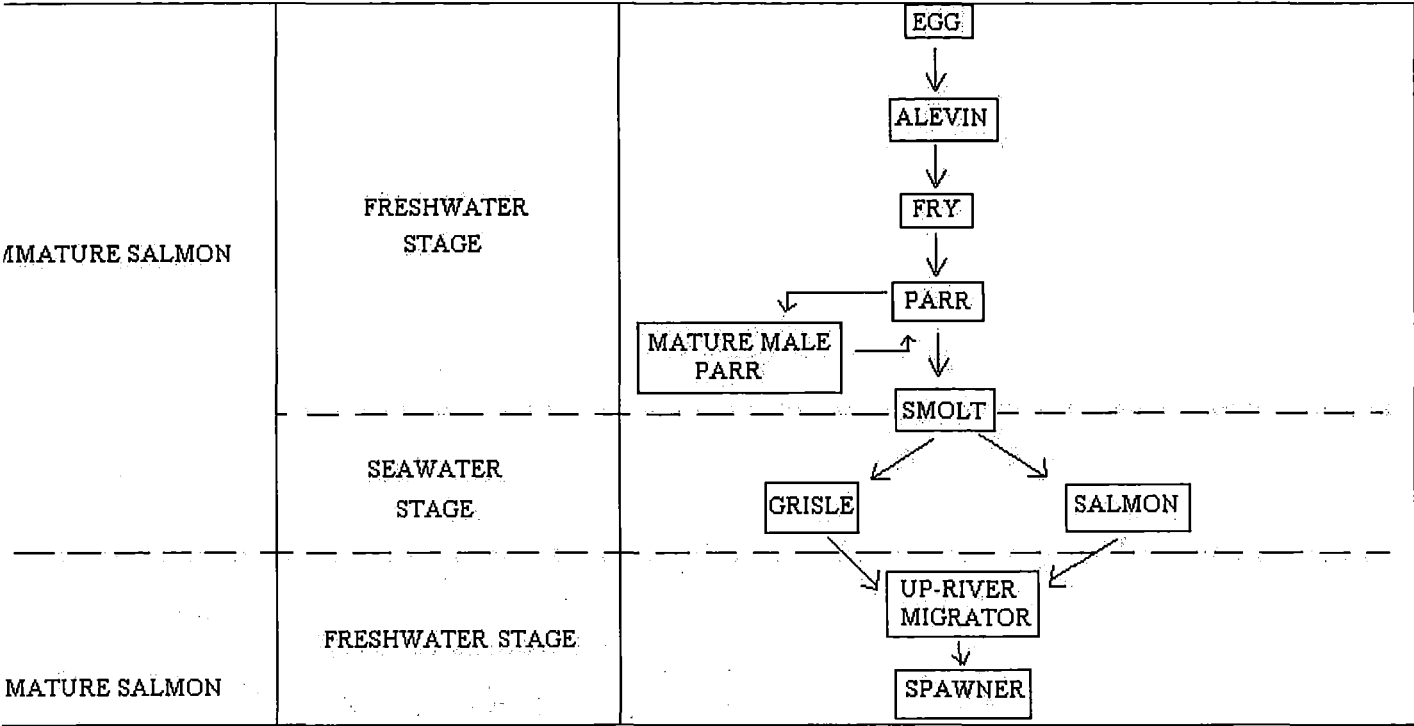
### 7. Are there occasions during the salmon fishing season when you go to the river only to observe salmon?

- ☐ Yes ☐ No

### 8. What do you think about salmon fishing?

- |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Very boring              | A little boring          | Somewhat exciting        | Quite exciting           | Very exciting            |

9. Circle any stages of a wild salmon's life-cycle that is of most interest to you. If you are interested in the entire life-cycle, circle the whole lot.



**Section 2: KNOWLEDGE OF NATIVE FISH**

10. How interested are you in native freshwater fish?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not interested	A little interested	Somewhat interested	Quite interested	Very interested

11. Please name up to 3 native freshwater fish [if possible]:

\_\_\_\_\_

12. How concerned are you that introduced fish might be threatening native species?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not at all Concerned	Not concerned much	Neutral	Quite concerned	Very concerned

### Section 3: KNOWLEDGE OF SALMON IN NZ

13. What name do you most commonly associate with salmon in NZ?

<input type="checkbox"/> King	<input type="checkbox"/> Silver	<input type="checkbox"/> Sockeye
<input type="checkbox"/> Chinook	<input type="checkbox"/> Atlantic	<input type="checkbox"/> Quinnot
<input type="checkbox"/> Pacific		<input type="checkbox"/> Kahawai

14. Where do you think salmon originate?

<input type="checkbox"/> Japan	<input type="checkbox"/> USA
<input type="checkbox"/> USA and Canada	<input type="checkbox"/> Britain
<input type="checkbox"/> Canada	<input type="checkbox"/> USSR
<input type="checkbox"/> New Zealand	<input type="checkbox"/> Don't know
<input type="checkbox"/> Other _____	

15. In what parts of NZ are wild salmon generally found?

<input type="checkbox"/> South Island only	<input type="checkbox"/> North Island & South Island	<input type="checkbox"/> Mostly South Island
<input type="checkbox"/> North Island only	<input type="checkbox"/> Mostly North Island	<input type="checkbox"/> Don't know

### Section 4: WHAT YOU THINK ABOUT SALMON

16. Circle up to three words that you associate most strongly with the word 'salmon':

Resource	Fishing	Commercial
	Trophy	
Rivers	Ocean	Introduced/exotic
		Disease
Pest	Challenge	Sport fish
	Nuisance	
Native	Recreation	Fishery
		Noble
Management	Spawning	
	licenses	Fish and Game
Other _____		Food

**17. How interested are you in salmon in New Zealand?**

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not interested	A little interested	Somewhat interested	Quite interested	Very interested

**18. Please tick one of the following: Do you mostly:**

<input type="checkbox"/> Fish for salmon	<input type="checkbox"/> Read or write about salmon
<input type="checkbox"/> Eat/buy salmon	<input type="checkbox"/> Worry about salmon
<input type="checkbox"/> Work with/manage salmon	<input type="checkbox"/> Have no interest in salmon
<input type="checkbox"/> Other _____.	

***IF YOU ARE NOT A FRESHWATER ANGLER, PLEASE GO TO SECTION 8...***

**19. Answer one from each of the following; Are you a:**

a) <input type="checkbox"/> Trophy angler	OR	<input type="checkbox"/> General angler
b) <input type="checkbox"/> Successful angler	OR	<input type="checkbox"/> Poor angler
c) <input type="checkbox"/> Professional angler	OR	<input type="checkbox"/> Amateur angler
d) <input type="checkbox"/> Dedicated angler	OR	<input type="checkbox"/> Casual angler

**20. Place in order, your three main motivations for salmon fishing from: 1 = first motivation; 2 = second motivation; 3 = third motivation**

<input type="checkbox"/> Social interaction	<input type="checkbox"/> Tranquility
<input type="checkbox"/> Challenge of the catch	<input type="checkbox"/> Time out from busy lifestyle
<input type="checkbox"/> The fight once hooked	<input type="checkbox"/> Source of food
<input type="checkbox"/> Environmental surroundings, and scenery	<input type="checkbox"/> Other _____

**21. What type of water-body do you generally prefer to fish for salmon in?**

<input type="checkbox"/> Rivers	<input type="checkbox"/> Lakes	<input type="checkbox"/> Sea
---------------------------------	--------------------------------	------------------------------

**Please explain why you prefer to fish there:**

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**22. a) What section of the river do you prefer to salmon fish?**

<input type="checkbox"/> The river mouth	<input type="checkbox"/> Mid-way up the river	<input type="checkbox"/> Headwaters of the river
--	---	--



**b). Tick the three main reasons for choosing to fish this section of the river:**

- |  |  |
|--|--|
| <input type="checkbox"/> Increased chances of catching salmon              | <input type="checkbox"/> Nice and tranquil               |
| <input type="checkbox"/> Accessibility                                     | <input type="checkbox"/> I can fish many different pools |
| <input type="checkbox"/> Bigger salmon, better condition                   | <input type="checkbox"/> There's a café/pub nearby       |
| <input type="checkbox"/> Beautiful environmental settings and surroundings | <input type="checkbox"/> My angling friends fish there   |

**23. Tick the one most important aspect of salmon fishing to you:**

- |   |   |
|---|---|
| <input type="checkbox"/> Landscape and scenery                        | <input type="checkbox"/> Catching a lot of salmon |
| <input type="checkbox"/> Social interaction with other salmon anglers | <input type="checkbox"/> Catching big salmon      |
| <input type="checkbox"/> Rest and relaxation                          | <input type="checkbox"/> Other _____              |

**24. How would you prioritise salmon fishery management? Please place in order from: 1 = Most important] to 7 = Least important:**

- |  |   |
|--|---|
| <input type="checkbox"/> Population monitoring and research                  | <input type="checkbox"/> Developing a commercial fishery  |
| <input type="checkbox"/> Protecting salmon spawning habitat                  | <input type="checkbox"/> Eradicating salmon altogether    |
| <input type="checkbox"/> Maximising the number of salmon returning to rivers | <input type="checkbox"/> Catching people without licences |
|  | <input type="checkbox"/> Protecting river flows           |

### **Section 5: FISHING EXPERIENCES**

**25. Do you keep a diary, and/or record your fishing successes? [i.e. photos, notes etc.]**

- ☐ Yes ☐ No

**26. Tick three main factors that determined your best season?**

- |  |  |
|--|--|
| <input type="checkbox"/> Social setting where fishing took place | <input type="checkbox"/> The number of fishing trips that season |
| <input type="checkbox"/> Size and condition of fish caught       | <input type="checkbox"/> Number of fish caught                   |
| <input type="checkbox"/> Location where fishing took place       | <input type="checkbox"/> Environmental setting                   |
| <input type="checkbox"/> Weather                                 | <input type="checkbox"/> Other reasons _____                     |

**27. Do you feel as though other recreational activities negatively affect your fishing experience?**

- ☐ Yes ☐ No **IF NO SKIP TO QUESTION 29...**

**28. Which of the following negatively affect your salmon fishing experience?**

- |  |                                      |
|--|--------------------------------------|
| <input type="checkbox"/> Jet boats or boats with engines | <input type="checkbox"/> Dingy users |
| <input type="checkbox"/> Mountain bikers                 | <input type="checkbox"/> Tourists    |
| <input type="checkbox"/> Hunters or shooters             | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> Other anglers                   | <input type="checkbox"/>             |
| <input type="checkbox"/> 4wd drivers and dirt-bike users | <input type="checkbox"/>             |
| <input type="checkbox"/> Trampers                        |                                      |
| <input type="checkbox"/> Kayakers                        |                                      |

29. What do you think is an acceptable distance to be fishing from other salmon anglers?

<input type="checkbox"/> 0 – 5m	<input type="checkbox"/> 51 – 75m	<input type="checkbox"/> 201 – 500m
<input type="checkbox"/> 6 – 10m	<input type="checkbox"/> 76 – 100m	<input type="checkbox"/> 500m +
<input type="checkbox"/> 11 – 15m	<input type="checkbox"/> 101 – 150m	
<input type="checkbox"/> 16 – 30m	<input type="checkbox"/> 151 – 200m	
<input type="checkbox"/> 31 – 50m		

30. What do you do when another angler enters within “your” stretch of river [as chosen in question 29]?

☐ I will ignore them

☐ I will ask them to move away

☐ I will welcome them

☐ I will move away

Section 6: FISHING EQUIPMENT

31. How often do you use light-weight fishing equipment when fishing for salmon?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	Rarely	Some of the time	Most of the time	Always

Please explain your reason(s):

\_\_\_\_\_.

\_\_\_\_\_.

\_\_\_\_\_.

32. How would you rate the level of skill that is required when spin-fishing for salmon?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No skill	Not much Skill	Some skill	Quite a lot of skill	High level of skill

Please explain your reason(s):

\_\_\_\_\_.

\_\_\_\_\_.

\_\_\_\_\_.

33. Would you still fish for salmon if you were not allowed to use spinning gear?

☐ Yes      ☐ No

Section 7: CATCH AND RELEASE

**Note:** It is compulsory to release foul hooked fish. Catch and release applies when fish are hooked in the mouth, and released voluntarily by the angler.

**34. What do you fish for?**

- ☐ Trout
- ☐ Both, but trout more than salmon
- ☐ Salmon
- ☐ Both, but salmon more than trout
- ☐ Both, equally as much
- ☐ None

**35. Do you practice catch and release when trout fishing?**

- ☐ Yes
- ☐ No

**36. Do you practice catch and release when salmon fishing?**

- ☐ Yes
- ☐ No

**37. What do you do once you have caught your bag limit for salmon?**

- ☐ I have never caught my bag limit
- ☐ I stop salmon fishing
- ☐ I continue to fish and release further salmon caught
- ☐ I continue to catch and retain salmon and hope I don't get caught

**Section 8: HATCHERY SALMON AND WILD SALMON**

**Ocean Ranching Hatcheries:** Ocean Ranching produces induced salmon runs by breeding salmon from an egg stage to smolt stage in closed freshwater hatcheries, and then releasing them into open rivers to migrate out to sea, mature, and then return to spawn. Upon their return anglers have first “crack” at them, but once the salmon reach the hatchery they are the property of the hatchery.

**38. How do you feel about Ocean Ranching of salmon?**

- ☐ I generally disapprove of Ocean Ranching
- ☐ Neutral
- ☐ I generally approve of Ocean Ranching

**Please explain your answer:**

**Pond Rearing:** Pond Rearing takes place in freshwater ponds where the salmon are cultured from eggs to mature salmon. They are not intended for release into the wild, and are the property of the owners.

**39. How do you feel about Pond Rearing of salmon?**

- ☐ I generally disapprove of Pond Rearing
- ☐ Neutral
- ☐ I generally approve of Pond Rearing

**Please explain your answer:**

**Sea Cage Rearing:** Sea Cage Rearing involves salmon cultured in cages in the sea, feeding on a combination of salmon chow [provided by the operation], and wild krill and other marine life that naturally passes through the cages. They are not intended for release into the wild, and are the property of the owners.

**40. How do you feel about Sea-Cage Rearing of salmon?**

- ☐ I generally disapprove of Sea-Cage Rearing
- ☐ Neutral
- ☐ I generally approve of Sea-Cage Rearing

**Please explain your answer:**

**41. Can you tell the difference between a salmon of hatchery origin, and a wild salmon?**

Yes ☐ No

**Please explain how you can tell, and what features you look for?**

**42. Once a hatchery-reared salmon is released into the rivers, tick one name that you would call it:**

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> A chinook salmon | <input type="checkbox"/> A New Zealand salmon | <input type="checkbox"/> A production salmon |
| <input type="checkbox"/> A king salmon    | <input type="checkbox"/> A hatchery salmon    | <input type="checkbox"/> Not a wild salmon   |
| <input type="checkbox"/> A quinnat salmon | <input type="checkbox"/> A farmed salmon      | <input type="checkbox"/> A wild salmon       |
| <input type="checkbox"/> A salmon         | <input type="checkbox"/> A stocked salmon     |  |

**43. What type of salmon do you prefer to catch?**

- ☐ Salmon of wild origin
- ☐ Salmon of hatchery origin
- ☐ I am happy to catch either wild or hatchery salmon

**44. Tick three options that concern you the most about potential impacts on the salmon fishery:**

- |  |  |
|--|--|
| <input type="checkbox"/> Water extraction/diversion        | <input type="checkbox"/> Didymo                                |
| <input type="checkbox"/> Water quality issues              | <input type="checkbox"/> Disease from hatchery released salmon |
| <input type="checkbox"/> Illegal recreational fishing      | <input type="checkbox"/> Impacts from salmon on native species |
| <input type="checkbox"/> Climatic changes                  | <input type="checkbox"/> Commercialisation of salmon           |
| <input type="checkbox"/> Salmon by-catch at sea            | <input type="checkbox"/> Other_____                            |
| <input type="checkbox"/> Over harvesting by salmon anglers |  |

## Section 9: NATURE

45. Wild salmon have been present in New Zealand for 100 years or more. Should salmon now be considered a part of our "natural" fauna?

☐ Yes ☐ No ☐ Don't know

Please explain your reason(s):

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46. Do you consider wild salmon to be part of nature in New Zealand?

☐ Yes ☐ No ☐ It depends

Please explain your reason(s):

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47. Do you consider salmon in hatcheries to be natural in New Zealand?

☐ Yes ☐ No ☐ It depends

Please explain your reason(s):

---

---

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48. Do you consider salmon in hatcheries to be part of nature in New Zealand?

☐ Yes ☐ No ☐ It depends

Please explain your reason(s):

---

---

---

49. What name do you most commonly associate with wild salmon?

<input type="checkbox"/> A salmon	<input type="checkbox"/> Quinntat salmon
<input type="checkbox"/> wild-run salmon	<input type="checkbox"/> King salmon
<input type="checkbox"/> Spring salmon	<input type="checkbox"/> New Zealand salmon
<input type="checkbox"/> Chinook salmon	<input type="checkbox"/> real salmon
<input type="checkbox"/> North-West Pacific salmon	<input type="checkbox"/> wild salmon

50. Do you consider that salmon from hatcheries are part of nature once they are released into the wild?

☐ Yes ☐ No ☐ It depends

Please explain your reason(s):

---

---

---

## Section 10: SUBSCRIPTIONS

**51. How often do you buy a fishing license?**

☐ Every season

☐

☐ Every 2<sup>nd</sup> season

☐

☐ Some seasons

Hardly ever

Never

→ **If some seasons, please state what determines whether you buy a license?**

---

---

---

**52. How often do you read the NZSAA magazine?**

☐ Very often

☐

Hardly ever

☐ Often

☐

Never

☐ Not that often

**53. Please specify where you read the most about salmon**

---

---

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---

**54. a). Do you think Fish & Game allocates enough of your license fee to salmon management?**

☐ Yes

☐

No

☐

Don't know



**b). If "No" why do you think this is the case**

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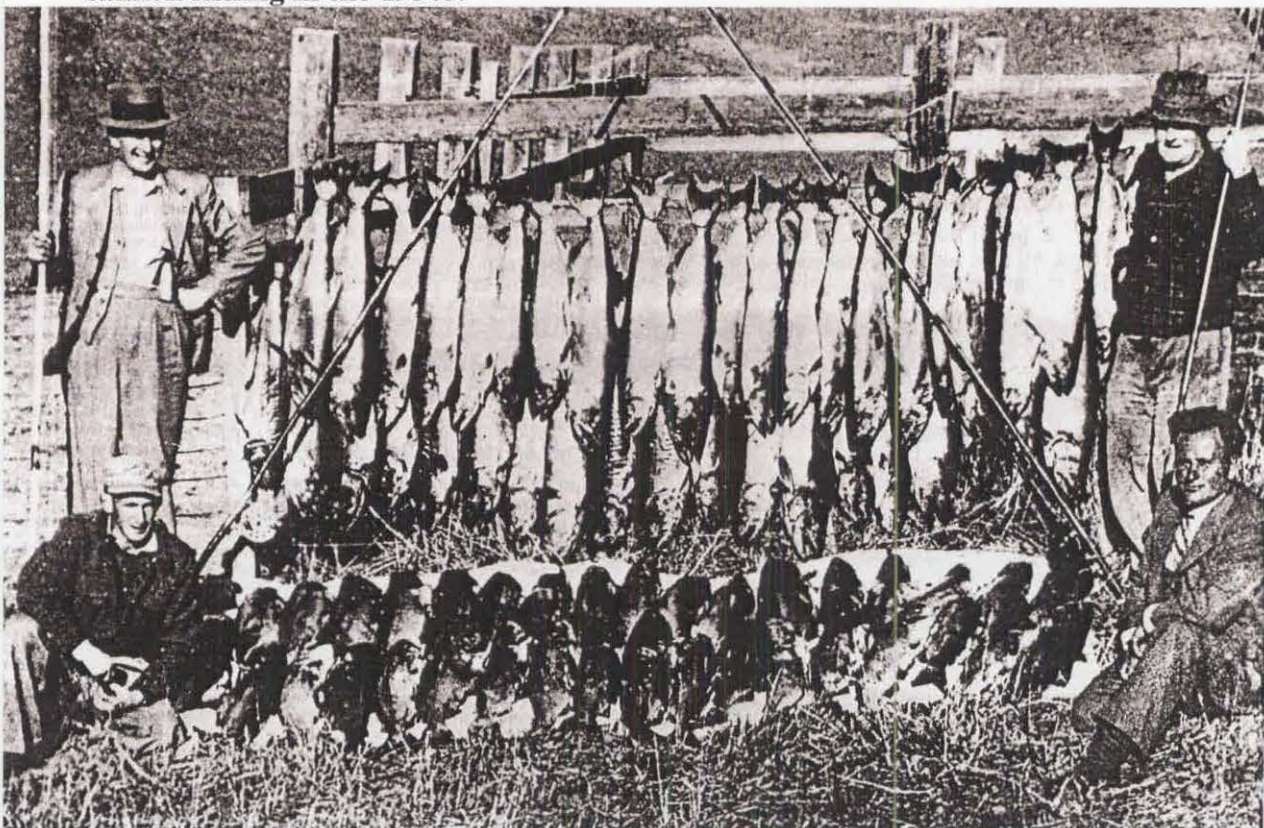
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## Section 11: PHOTO SECTION

54. Circle three words that you would put to this photo of salmon caught from one day salmon fishing in the 1950s:



Wasteful

Selfish

Lucky

Noble sport

Outstanding

Fun

Greedy

Sportsman-like

Dream-catch

Un-sportsman-like

Good old-days

Over-kill

Congratulations

Enjoyment

What a day

Exploitation

Blood sport

I'm jealous

## Section 12: CONCLUDING THOUGHTS

55. Salmon were introduced to New Zealand to [tick one option]:

☐

Develop a recreational fishery

☐

Develop a commercial fishery

☐

Both

56. How would you feel if there was a no-fishing zone at the river-mouth, with the aim to allow more salmon to successfully enter the rivers?

- ☐ I would strongly oppose
- ☐ I would oppose
- ☐ I am neutral
- ☐ I would accept
- ☐ I would strongly accept

57. Place in order of your importance for fishing, the following common freshwater fishes in NZ from 1 [most important] to 11 [least important]:

☐ Whitebait (Inanga)☐ Koi Carp

☐ Brown trout☐ Native eels (Tuna)

☐ Rainbow Trout☐ So ckeye salmon☐ Tench

☐ Quinnat salmon☐ Atlantic salmon

☐ Rudd☐ Perch

58. Please tick one that you think best describes the status of salmon in New Zealand?

- |  |   |
|--|---|
| <input type="checkbox"/> Commercial fish         | <input type="checkbox"/> Recreational/commercial fish |
| <input type="checkbox"/> Recreational sport fish | <input type="checkbox"/> Endangered fish              |
| <input type="checkbox"/> Conservation fish       | <input type="checkbox"/> Introduced fish              |

59. I personally think that salmon are (tick one statement that best represents your opinion):

- |   |  |
|---|--|
| <input type="checkbox"/> An iconic symbol for NZ        | <input type="checkbox"/> A commercial resource           |
| <input type="checkbox"/> An unwanted exotic fish        | <input type="checkbox"/> An integral part of NZ heritage |
| <input type="checkbox"/> An important recreational fish | <input type="checkbox"/> Over studied                    |

60. Do you think that salmon and trout are the vermin of New Zealand rivers?

☐ Strongly disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

Section 13: DEMOGRAPHICS

61. Are you? ☐ Male ☐ Female

62. What year were you born? \_\_\_\_\_



**63. Are you:**  
☐ New Zealand European ☐ Asian  
☐ Maori ☐ Other  
☐ Pacific Islander

**64. What is your personal annual income before tax?**  
☐ Loss ☐ \$20,001 - \$30,000 ☐ \$50,001 - \$70,000  
☐ \$0 - \$10,000 ☐ \$30,001 - \$40,000 ☐ \$70,001 - \$100,000  
☐ \$10,001 - \$20,000 ☐ \$40,001 - \$50,000 ☐ \$100,000+

**65. Are you married or in a defacto relationship?**  
☐ Y ☐ N

**66. How many children do you have?**  
☐ none ☐ 1 ☐ 2 ☐ 3 or more

**67. What is the highest level of formal education (or equivalent outside of New Zealand) you have completed?**  
☐ Primary school (standard 6) ☐ Undergraduate diploma/certificate  
☐ High school, without qualifications ☐ Bachelors degree  
☐ High school, with qualifications ☐ Postgraduate  
☐ Trade/technical qualification or similar

**68. Please tick one of the following that best describes your current situation.**  
☐ Paid employment, working 30 or **more** hours per week ☐ Paid employment, working 30 or **less** hours per week  
☐ Unemployed ☐ Retired ☐ Voluntary worker  
☐ Student ☐ Home duties ☐ Other

**69. What industry do you work in, or if you are not working, what industry did you last work in?**  
☐ Resource based ☐ Health Services  
☐ Manufacturing and transport ☐ Education  
☐ Accommodation, retail and leisure services ☐ Communication and financial services  
☐ Government services and defence ☐ Never been in paid employment  
☐ Construction ☐ Consultancy

**70. How often do you eat the salmon that you catch?**  
☐ Never ☐ Not often ☐ Some of the time ☐ Quite often ☐ Always

71. How do you rate this survey?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not interesting	A little interesting	Somewhat interesting	Quite interesting	Very interesting

**SURVEY COMPLETED**

I appreciate and thank you for the time you have taken to fill out this survey. Please take this opportunity to add anything further that you want to say in the space below.

Please mail the completed survey in the envelope provided. I have already paid the postage ☺

Regards, Jamie Carle

APPENDIX 3 - Qualitative Interview Summary

Organisation	Hierarchy	Initial comm.	Date	Follow up comm.	Date	Organising interview	Interview obtained
MfE rep. <sup>94</sup>	Minister	E-mail	Aug06	X	X	X	X
F&B rep.	Manager	E-mail	Sep06	E-mail	Sep06	X	X
F&B member	Member	E-mail	Sep06	E-mail	Sep06	E-mail	Sep06
NCFG rep.	Manager	E-mail	Sep06	E-mail	Sep06	E-mail	Sep06
TVNZ reporter	Team leader	E-mail	Sep06	E-mail	Sep06	E-mail	Oct06
NZSAA rep.	President	E-mail	Sep06	E-mail	Oct06	E-mail	Oct06
NIWA rep.	Senior Researcher	E-mail	Sep06	X	X	X	X
Selwyn DC rep.	Planner	E-mail	Oct06	X	X	X	X
NIWA rep.	Senior Researcher	E-mail	Oct06	E-mail	Nov06	E-mail	Nov06
CCC	Planner	E-mail	Oct06	X	X	X	X
WFG rep.	Manager	E-mail	Nov06	E-mail	Nov06	E-mail	Nov06
CPW rep.	Manager	E-mail	Nov06	E-mail	Nov06	X	X
Ecan rep.	Manager	E-mail	Nov06	E-mail	Nov06	E-mail	Nov06
DoC rep.	Manager	E-mail	Nov06	E-mail	Nov06	E-mail	Dec06
Isaac Salmon rep.	Manager	E-mail	Dec06	Phone	Dec06	Phone	Dec06
Mfish rep.	Manager	E-mail	Dec06	X	X	X	X
Ngai Tahu rep.	Ex ko- matua	Phone	Jan07	Phone	Jan07	Phone	Jan07
NIWA rep.	Senior Researcher	Phone	Jan07	X	X	X	X
Lincoln Uni rep.	Professor	E-mail	Jan07	face to face	Jan07	face to face	Feb 07
NZPFGA member	Member	E-mail	Jan07	Email	Jan07	Email	Jan07
Hamill's rep.	Manager	Phone	Jan07	Phone	Feb07	Phone	Mar07
Dairy Farmer rep.	Manager	Phone	Mar07	Phone	Mar07	Phone	Mar07

<sup>94</sup> A representative working for the organisation.

**RESEARCH INFORMATION SHEET**

Dear \_\_\_\_\_

My name is Jamie Carle and I am a Masters of Resource Studies student at Lincoln University. My master's research topic is titled: **Assessing the influence of differing frames of reference on current management approaches to quinnat salmon (*Oncorhynchus tshawytscha*) in New Zealand.** I am the principal researcher for this topic.

The aim of this project is to explore the influence of differing frames of reference on the current management approaches to quinnat salmon in New Zealand. I am interested to find out what your views are of quinnat salmon in New Zealand. I would be most grateful if you would agree to being interviewed.

The interview will take approximately between 45 minutes – 90minutes and will be tape recorded. The interview will take place at a venue that is convenient to you. The results of the research may be published, but you may be assured of the complete confidentiality of data gathered in this investigation.

To ensure your anonymity and confidentiality, the following steps will be taken: All identities will be coded, and the code keys will be locked in secured location. Any written material and transcriptions from interviews will be vetted by both supervisors to ensure that anonymity has been preserved where required. Any written material will be locked in a separate filing cabinet from the key codes, and securely stored at the Lincoln University Archive - in the Research and Innovation Office.

You are able to withdraw information up until the time of analysing the results. Analysis of results is expected to begin as of January the 1<sup>st</sup> 2007. Beyond this date it will be impossible to extract the data.

I will be pleased to discuss any concerns or inquiries that you may have about participation in the project. Furthermore if there are any general questions about the research topic, please do not hesitate to contact me on the following:

**Email:** carlec2@lincoln.ac.nz

**Phone:** 03 325 3838 Ext 8746

**Contact details:**

C/- Environmental Management Group,  
Environment Society and Design Division,  
Lincoln University,  
PO Box 84,  
Lincoln University, Canterbury 8150.

Kindest Regards,  
Jamie

**Names and contacts of Supervisor and Associate supervisor:**

Dr Roy Montgomery – email: [montgomr@lincoln.ac.nz](mailto:montgomr@lincoln.ac.nz) – ph: 325 2811 Ext 8175

Professor Ken Hughey - [hugheyk@lincoln.ac.nz](mailto:hugheyk@lincoln.ac.nz) – ph: 325 2811 Ext 8728

The project has been reviewed and approved by Lincoln University Human Ethics Committee.

**Consent Form**

**Name of Project:** Assessing the influence of differing frames of reference on current management approaches to quinnat salmon (*Oncorhynchus tshawytscha*) in New Zealand

I have read and understood the description of the above-named project. On this basis I agree to participate as a subject in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved.

I understand also that I may at any time withdraw from the project, including withdrawal of any information I have provided up until the time the results will be analysed, which will be January the 1<sup>st</sup> 2007. Beyond this date it will not be possible to extract the data.

Name: \_\_\_\_\_

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

APPENDIX 6 - Prep questions for the qualitative open ended questions

1. Select one name that you most commonly associate with salmon in NZ?

☐ King☐ Silver☐ Sockeye

☐ Chinook☐ Atlantic☐ Quinnet

☐ Pacific☐ Kahawai

2. Please tick any of the following: I mostly:

☐ Fish for salmon☐ Read or write about salmon

☐ Eat/buy salmon☐ Worry about salmon

☐ Work with/manage salmon☐ Have no interest in salmon

☐ Other \_\_\_\_\_

3. Please tick one that you think best describes the status of salmon in New Zealand?

☐ Commercial fish☐ Recreational/commercial fish

☐ Recreational sport fish☐ Endangered fish

☐ Conservation fish☐ Introduced fish

4. Place in order of importance to you, the following common freshwater fishes in NZ from 1 [most important] to 11 [least important]:

☐ Whitebait (Inanga)☐ Koi Carp

☐ Brown trout☐ Native eels (Tuna)

☐ Rainbow Trout☐ Sockeye salmon☐ Tench

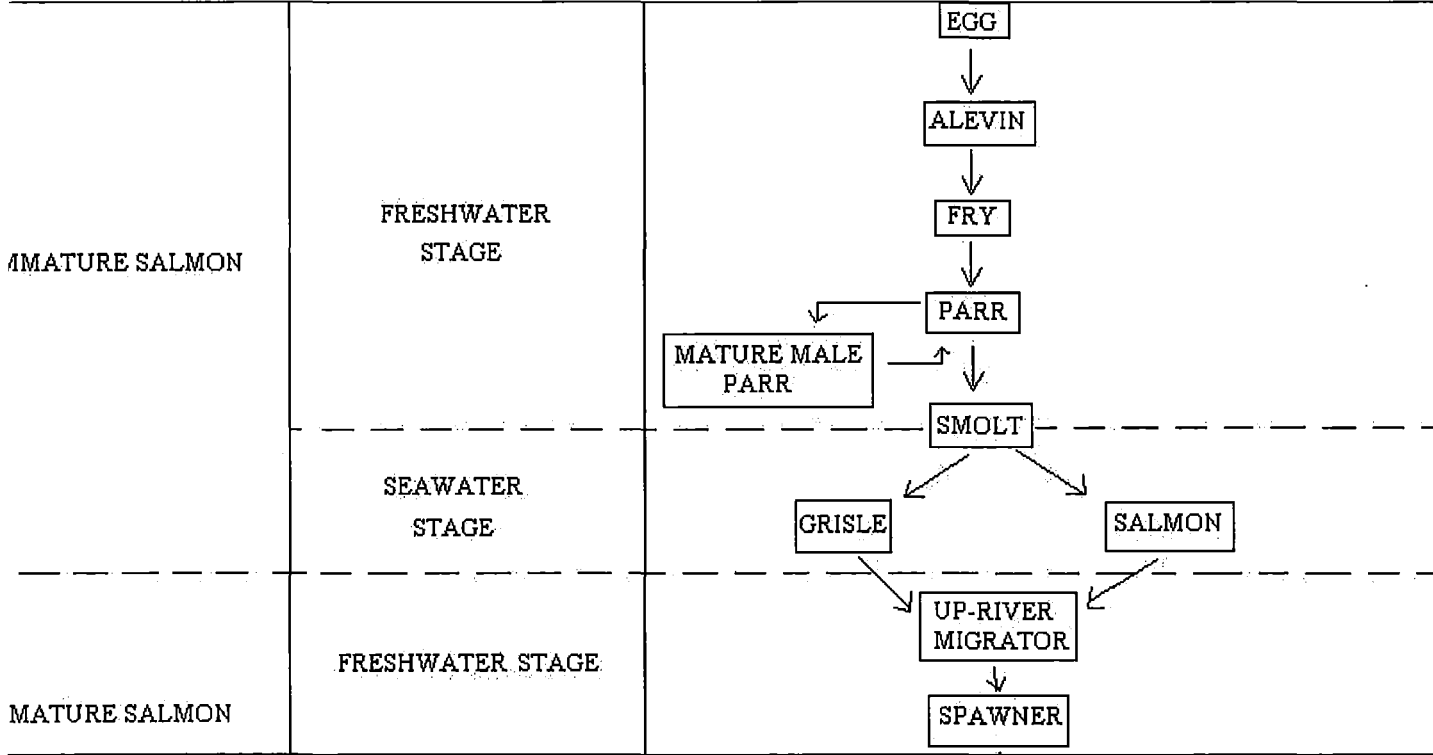
☐ Quinnet salmon☐ Atlantic salmon

☐ Rudd☐ Perch

5. Circle up to three words that you associate most strongly with the word 'salmon':

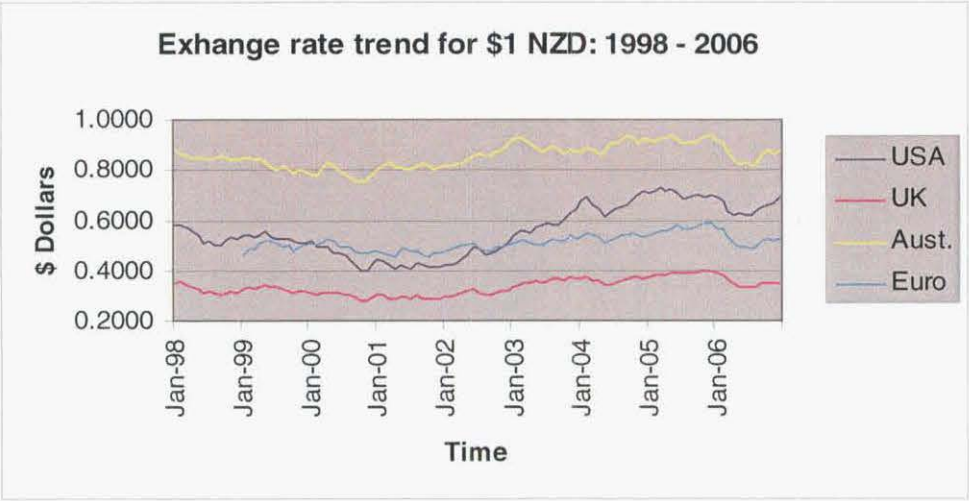
Resource	Fishing	Commercial
	Trophy	
Rivers	Ocean	Introduced/exotic
		Disease
Pest	Challenge	Sport fish
	Nuisance	
Native	Recreation	Fishery
		Noble
Management	Spawning	
		Fish and Game
	licenses	Food
Other _____		

6. Circle any stage of a wild salmon's life-cycle that is of most interest to you. If you are interested in the entire life-cycle, circle the whole lot.

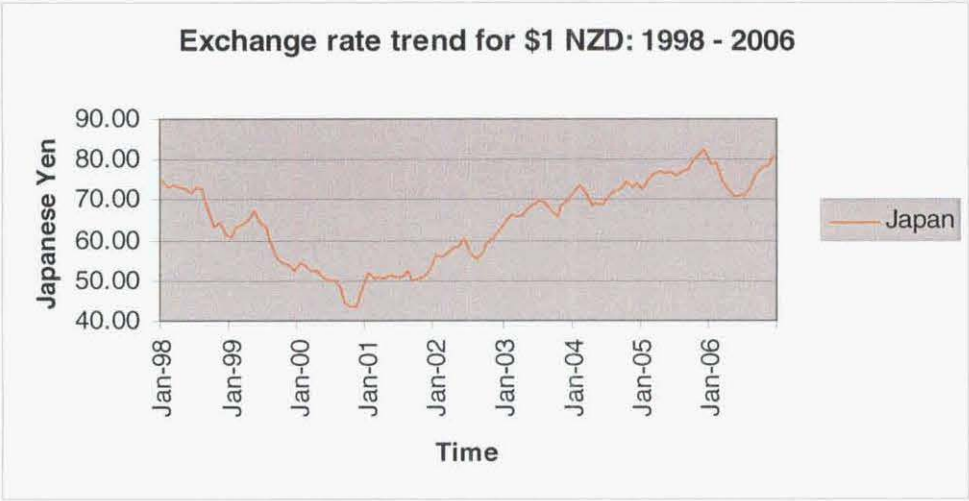


Please explain why you are interested in this stage of a salmon's life cycle... [open ended]

APPENDIX 7 – Exchange rate trends for \$1 NZD: 1998 – 2006



RBNZ (2007)

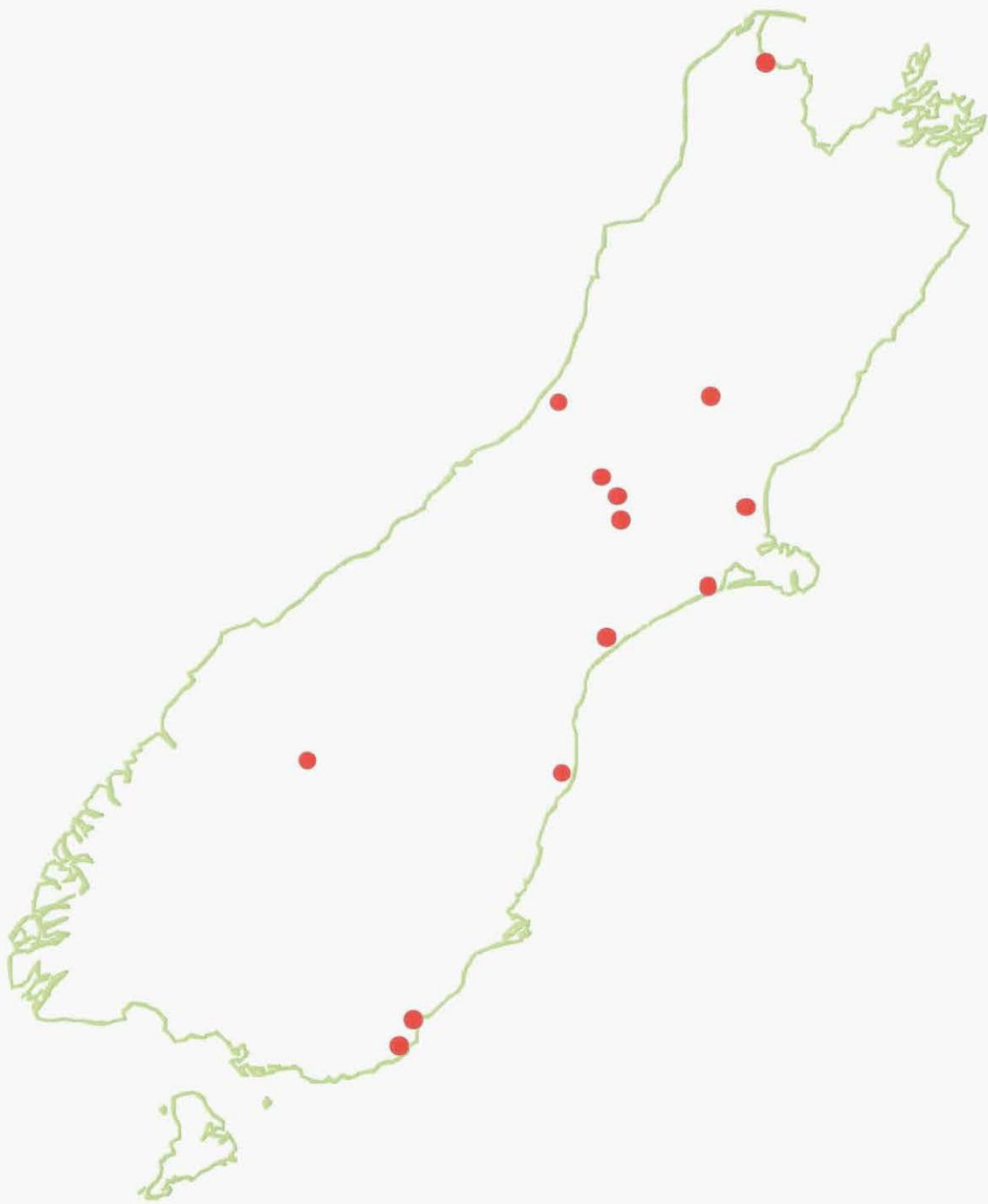


RBNZ (2007)



APPENDIX 8 - Historical map of bona fide hatcheries that reared salmon from egg to fry stage between 1900 and 2007

Historical hatchery sites: 1900 – 2007,  
South Island, New Zealand



Map sourced from (Unwin un pub. data, 2007).

**Historical salmon release sites: 1900 – 2007,**  
**South Island, New Zealand**



Map sourced from (Unwin un pub. data, 2007).

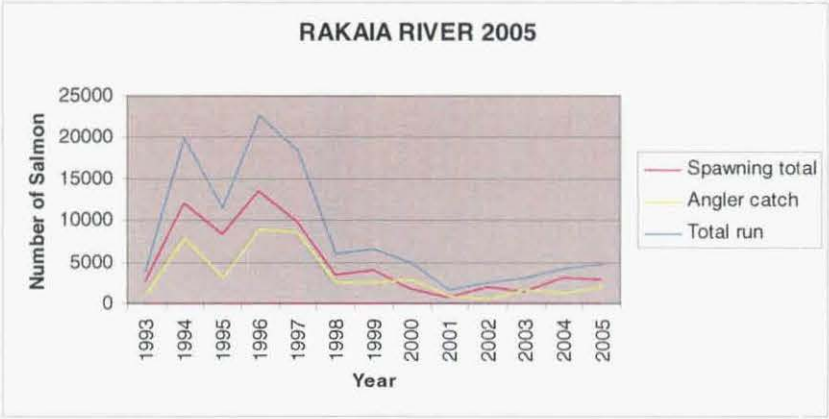
# APPENDIX 10 - Historical summary of hatchery releases between 1900 and 2005

River	Location	Hatchery?	No. Releases	East	North
Ashburton River	Maori Lakes		3	2363190	5735300
Avon River	Avon River		2	2480110	5741390
Avon River	University		1	2476190	5742460
Avon River	Wairarapa Stream		1	2476040	5744350
Catlins River	Newhaven, Owaka	y	16	2257700	5409900
Clutha River	Kaitangata Raceway	y	47	2265790	5429770
Clutha River	Waitahuna River		4	2245410	5448410
Clutha River	Minzion Burn		4	2233060	5495450
Clutha River	Roxburgh		1	2222220	5518970
Clutha River	Benger Burn		1	2226090	5500690
Clutha River	Beaumont		1	2240030	5482010
Clutha River	Matau Mouth		1	2266500	5426250
Clutha River	Lake Wakatipu		1	2144480	5596290
Hokitika River	Tasman Farm, Kaniere	y	7	2357740	5821650
Hurunui River	Longfellow Hatchery	y	11	2454300	5825340
Hurunui River	Landslip Stream		3	2429980	5834420
Hurunui River	Homestead Stream		3	2442550	5823380
Kahutara River	Mahunga Salmon Farm	y	1	2558430	5863490
Lake Coleridge	Ryton Bay		2	2391650	5768930
Lake Coleridge	Harper		1	2385100	5773620
Lake Coleridge	Homestead Beach		1	2395040	5761470
Lake Coleridge	Hennah Stream		1	2391220	5771150
Lyttelton Harbour	Lyttelton wharf		2	2487240	5733350
Okarito River	Lake Mapourika		3	2284060	5760570
Opihi River	Three Springs Creek		4	2331560	5680450
Opihi River	Opihi Mouth		1	2378650	5657450
Otago Harbour	Inner harbour		13	2317240	5478520
Otago Harbour	Port Chalmers/Portobello		5	2327260	5482750
Otago Harbour	Harbour entrance		4	2331890	5489860
Otago Harbour	Leith Stream		2	2316970	5480580
Paringa River	Hall River		7	2221560	5715720
Rakaia River	Glenariffe Hatchery	y	310	2378110	5764930
Rakaia River	Coleridge Hatchery	y	43	2390590	5759090
Rakaia River	Hydro Lakes		9	2372710	5766080
Rakaia River	Blackford Salmon Farm	y	3	2397370	5746290
Rakaia River	Hydra Waters		3	2375090	5770240
Rakaia River	Rakaia Mouth		3	2446580	5700520
Rangitata River	Rangitata Salmon Ranch	y	5	2388420	5671730
Rangitata River	Arundel Bridge		2	2373750	5691270
Rangitata River	S.H. 1 Bridge		1	2382260	5682830
Taiari River	Upper Taiari		1	2286100	5553400
Takaka River	Pupu Springs	y	5	2490530	6040180
Tent Burn	Tent Burn Hatchery	y	113	2452650	5703470

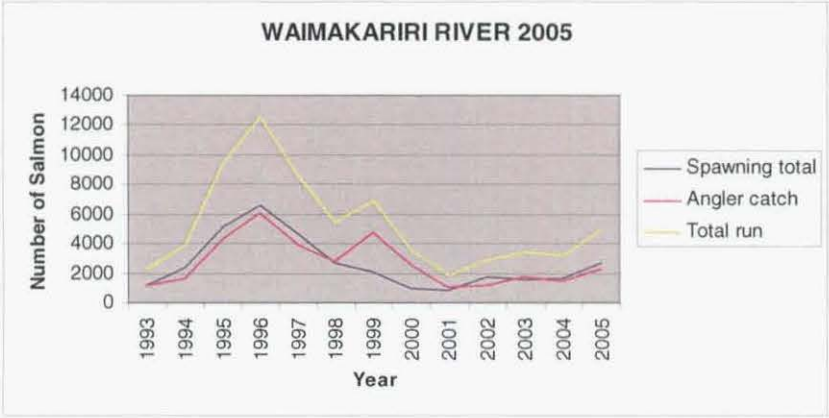
Waiau River	Ada River		2	2473410	5880470
Waiau River	Spotswood		1	2531670	5830400
Waimakariri River	Silverstream Hatchery	y	127	2476440	5754640
Waimakariri River	Winding Creek		6	2413100	5784010
Waimakariri River	Grasmere Stream		6	2410170	5795080
Waimakariri River	Cora Lynn Swamp		6	2402730	5796820
Waimakariri River	McIntosh's Rocks		3	2485200	5757530
Waitaki River	Big Glory Salmon	y	11	2350570	5587800
Waitaki River	Hakataramea River		9	2313420	5609470
Waitaki River	Bell's Pond		8	2350580	5587800
Waitaki River	Location unknown		3	2353800	5586130
Waitaki River	Main Road Bridge		1	2359950	5584820

(Unwin un pub. data, 2007).

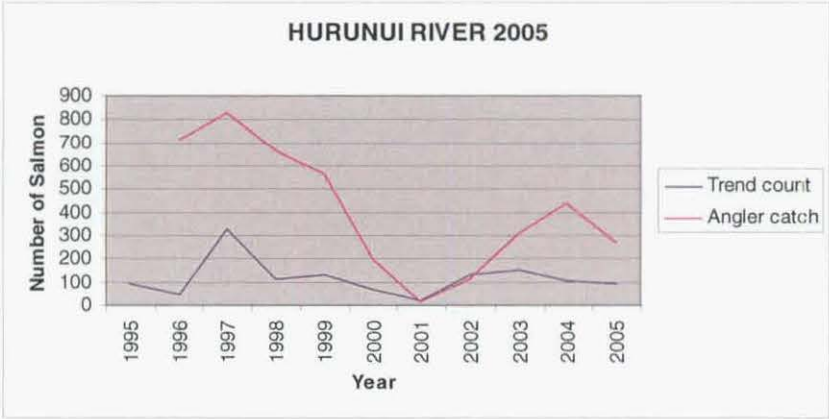
Appendix 10 can be read together with Appendix 9.



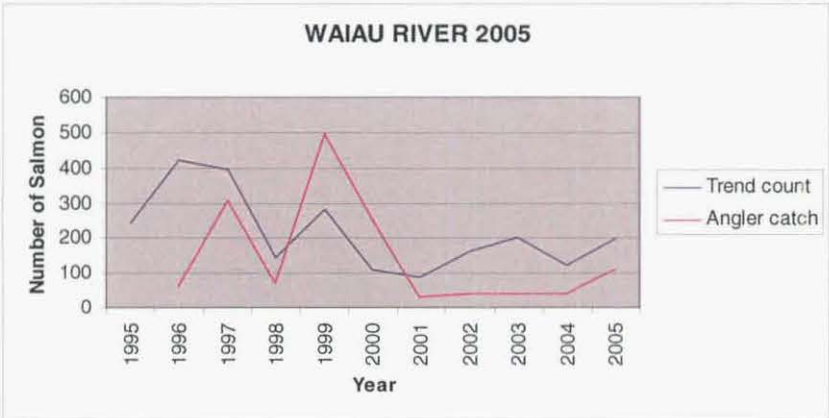
Rakaia River 1993 – 2005 (Millichamp pers. comm. 2007)



Waimakariri River 1993 – 2005 (Millichamp pers. comm. 2007)



Hurunui River 1993 – 2005 (Millichamp pers. comm. 2007)



Waiau River 1993 – 2005 (Millichamp pers. comm. 2007)



# SALMON QUEST

1000 leave the spawning grounds. The highest roll of the dice starts first.

Throw the exact number to finish.

**Start**

**End**

Each player starts with 1000 baby salmon. Roll the dice and make your way through the obstacles and back to the spawning ground. How many adult salmon return?

Bob	Kate
1000	1000
-150	-200
850	800
-50	
800	

Make a chart like this. Subtract the lost fish from your starting number of 1000, as you go.

**HOT SPOTS**

- Jump ahead 3 moves
- FLASHpoint- Free pass. Ignore next penalty
- Disasterzone- Lose half your current stock

**Game Board Details:**

- Start:** 1000 leave the spawning grounds. The highest roll of the dice starts first.
- Obstacles and Events:**
  - Bad start lose 100
  - Dobson larvae fly eats 50
  - Trout eat 200
  - Eels get 150
  - Food shortage lose 50
  - Flood takes 100
  - Kingfisher takes 50
  - Dairy effluent kills 50
  - Earthquake damage kills 150
  - Shag attack lose 100
  - Irrigation channel lose 120
  - Herring eat 200
  - Gannets kill 50
  - Kahawai feeding frenzy lose 50
  - Abundant food supply throw again
  - Seals attack lose 80
  - Currents take away food lose 50
  - Transter nets 250
  - Industrial pollution kills 100
  - Anglers catch 40
  - River braids 50 disappear
  - Good run throw again
  - Poachers catch 50
  - Low water levels go back 4
  - Low levels 50 perish
  - Waterfall claims 80
  - Disease kills 30
  - Poachers nets claim 80
  - Low water levels go back 4
  - Low water levels go back 4
- Hot Spots:**
  - Jump ahead 3 moves
  - FLASHpoint- Free pass. Ignore next penalty
  - Disasterzone- Lose half your current stock

**Artist:** DARYL CRIMP