FISHING FOR JUSTICE:
AN ETHICAL FRAMEWORK FOR FISHERIES POLICIES IN CANADA

by

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ABSTRACT

Canadian fisheries are in crisis. On both the Pacific and Atlantic coasts, stories abound of fisheries closures or failures and coastal communities in difficulty. A new approach to fisheries policy is required, one which recognises the intrinsic value of all participants in the fisheries ecosystem and is capable of providing guidance on how to make policy decisions. The principles of environmental ethics provide a framework for developing justice-based fisheries policies.

The environmental ethics literature is first explored, with special attention to fisheries issues. From this review, a justice-based framework is identified, in which five types of justice are viewed as pertinent to fisheries concerns. This framework is then translated into an assessment tool, based upon the Rapfish method for rapid appraisal of fisheries and using a set of justice-based ethical criteria. These criteria are evaluated and, through a paired comparison survey, further explored. An assessment of a range of Canadian marine fisheries is conducted using these ethical criteria. Subsequently, a modified Rapfish assessment, using the original criteria supplemented with additional customised criteria, is conducted for Aboriginal fisheries for Pacific salmon in British Columbia. Additionally, a study is conducted which explores preferences regarding the abundance and diversity of fisheries ecosystems.

Finally, the commercial fishery for Pacific salmon in British Columbia is presented as a case study. The Rapfish assessment results are presented, and considerations as to how to operationalise just policies for this fishery are suggested. Recommendations include: balancing the composition of the commercial fleet, based upon ecological impacts of the various gear types; encouragement of local stewardship and community involvement; and inclusion of various forms of knowledge in fisheries management and decision-making.

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University Hill United Church provided a spiritual home for me in Vancouver; although initially my spiritual journey was in parallel with my academic pilgrimage, it would seem that, in some ways, the two have merged.

It may be true that, had I been able to resist the wealth of distractions offered up by Green College and its community of scholars, I would have been finished this thesis years earlier. Yet it is probably more true that I simply would not have made it without the supportive, engaging, and challenging environment. "Ideas and Friendship", indeed. It was a joy to share this journey – and the many detours – with my fellow travellers, and to be reminded that "Any dream will do". Thanks to the self-titled CRTII – Committee to Reduce Thesis-Induced Insanity – for doing just that. I particularly thank Jen Baggs and Chris Spearin for their friendship and doctoral commiseration.

When I first arrived in Vancouver, I knew just one person in the whole city. In mid-August, 1997, Jacquie Moon greeted me at the airport with a welcoming hug and then whisked me away to a fantastic salmon supper with her family. In the ensuing years, the Moons have been my surrogate family in Vancouver – thank you for your kind ways and much appreciated friendship, hospitality, and caring.

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PREFACE

On July 2, 1992, then-Minister of Fisheries and Oceans John Crosbie announced the immediate imposition of a moratorium on Newfoundland's famed Northern Cod fishery. The moment when I heard the announcement – the 11:00 pm news on CBC Radio – is frozen in my memory. Although by then I had lived on 'the mainland' for twelve years, the Newfoundland culture and identity had taken root in my person. Summers playing on the beach in Robin's Cove, Twillingate, while visiting my maternal grandparents – not to mention catching caplin, eating seemingly-never-ending quantities of cod and helping to put up bottles of crab – had cemented my identity as a Newfoundlander, even if I happened to be living 'away'.

When Crosbie made his announcement, I had just completed the first year of my undergraduate studies and was holidaying in Ottawa for Canada Day. I sobbed, conscious of the depth of the loss to my homeland. But that autumn I went back to university and resumed my studies in political science. Fisheries were something that somehow pervaded my understanding of who I was and where I came from, but something which I had never considered as a field of study.

And something funny happened on the way to my BA.

I took an elective course in marine biology in my third year, and in fourth year took a course in the politics of Canadian natural resources – and it clicked. Politics and fisheries were undeniably and firmly linked. And I suddenly saw how my academic interests and my love for my fishery-dependent island fit together.

Before I knew it, I had spurned law school (my long-intended path) and found myself in graduate school. And as I continued along into my PhD, I was introduced to the ideas of environmental ethics and, eventually, eco-theology. Once more, my life and my research interests began to mesh.

This thesis, then, although a scholarly exercise, is a product of who I am, where I come from, and what I believe. While striving to retain an objective and academic approach, the matters with which I have dealt in this research have involved – even relied upon – value judgements, and as such, this work could not help but be personal.

And through the process, I have come to learn that many others, from diverse places and backgrounds, share a similar love for and fascination with our world. What I offer up here is one more possible way of addressing some of the difficult issues that challenge this wonderful creation in which we find ourselves.

A Prayer for the Care of Creation

O God, the only source of life and energy and wealth,
defend our planet earth.
Teach us to conserve and not to squander the riches of nature,
to use aright the heritage of former generations,
and to plan for the welfare of our children's children.
Renew our wonder, awaken our concern,
and make us better stewards and more careful tenants
of the world you lend us as our home.
Hear us, O God, our creator and redeemer,
in the name of Christ. Amen

- Timothy Dudley-Smith, 1982.
(Printed as Number 311, Voices United)

CHAPTER 1:

INTRODUCTION

"Love God's creation, love every atom of it separately, and love it also as a whole; love every green leaf, every ray of God's light; love the animals and the plants and love every inanimate object. If you come to love all things, you will perceive God's mystery inherent in all things; once you have perceived it, you will understand it better and better every day. And finally you will love the whole world with a total, universal love.... Love the animals: God has given them the beginnings of thought and untroubled joy. So do not disturb their joy, do not torment them, do not deprive them of their well-being, do not work against God's intent. Man, do not pride yourself on your superiority to the animals, for they are without sin, while you, with all your greatness, you defile the earth wherever you appear and leave an ignoble trail behind you – and that is true, alas, for almost every one of us!"

- *The Elder Zosima in Fyodor Dostoevsky's* The Brothers Karamazov *(Book 6, Chapter 3, Part G)*

1.1 Preamble

This thesis further implements the ethical framework first developed for and published in *Just Fish: Ethics and Canadian Marine Fisheries* (Coward et al., 2000). The scholars who contributed to the *Just Fish* project defined ethics as being "...concerned with what is morally good and how one ought to live", and further considered the ethical issues inherent in fisheries as being related to justice, defined as "An ethical principle concerned with fairness in the ordering of relationships" (Coward et al., 2000, p. 294). These relationships involve humans and non-humans. Utilitarianism, defined in *The Concise Oxford English Dictionary* as "...the doctrine that the greatest happiness of the greatest number should be the guiding principle of conduct" (Pearsall, 2002, p. 1580), is thus rejected as a theory by which to develop an ethics-based fisheries policy given its anthropocentric tendencies. Pojman (1995, p. 110) indicates that, to utilitarians, "...even justice must serve the human good. The poor were to be helped, women were to be liberated, and criminals were to be rehabilitated if possible, not in the name of justice, but because doing so could bring about more utility..."

The work presented herein thus applies the concept of justice as the framework by which the ethical considerations associated with fisheries may be conceptualised[1], discussed, and assessed.

[1] In the case of variant spellings, British conventions are used throughout this thesis, except in the case of direct quotes, in which instance the spelling used in the original source is maintained.

1.2 Introduction

Over the last decade in particular, ongoing troubles in fisheries, and thus in the communities which depend on fisheries for economic, nutritive, and often cultural sustenance, have in many cases reached a crisis point. Famed commercial marine fisheries on Canada's Pacific and Atlantic coasts – the Pacific salmon and the Northern cod – are notable and even notorious examples of fisheries in crisis. Indeed, even two decades ago, Peter Pearse, Commissioner of the Commission on Pacific Fisheries Policy, found it necessary to warn that "Canada's Pacific fisheries are at a crisis point" (1982, p. vii).

Canadian fisheries policies have tended to be reactionary. The closure of the Northern cod fishery in 1992 followed declining catches during the late 1980s and early 1990s. In British Columbia, increasing though possibly delayed concern over coho conservation, for example, led to drastic restrictions on all salmon fisheries in the late 1990s. And still new fisheries for so-called under-utilised species are opened with minimal planning and understanding of the stocks themselves and ecosystem impacts of the new fisheries. Typically, fisheries policy has been reliant on regulations, often developed in response to worsening conditions.

Reactionary policy is not sufficient. While fisheries policy-making must retain the flexibility necessary to respond to changing conditions or unforeseen developments, a greater emphasis must be given to proactive policy-making. Recent policy efforts, such as those prescribed by the *Canada Oceans Act* (1996) and further described in *Canada's Oceans Strategy* (Canada, 2002a; Canada, 2002b), such as the precautionary principle and integrated management, indicate a recognition of this reality.

Science must continue to be a central consideration in fisheries policy, for it is through scientific enquiry that we will learn about and better understand the ecosystems on which fisheries depend. As Pearse states, "Fisheries policy must begin with the resource base" (1982, p. 9). Healey and Hennessey (1998) assert that "The scientific underpinning of fishery management in the United States and Canada is among the most sophisticated in the world" (p. 109), however they continue, "...major fishery resources in both countries have collapsed or are at the point of collapse..." (p. 109). While fisheries science has not been flawless, it continues to provide one means of better understanding fisheries ecosystems.

Economic and social considerations also continue to be crucial factors in the development of fisheries policy. Yet as evidenced by perceived and actual crises in contemporary commercial fisheries (in Canada and elsewhere), a radical approach to fisheries policy-making is imperative. Lackey (1999) for instance catalogues the declines in wild Pacific salmon in North America, and states plainly that "Public institutions seem to be unable to act in a way to protect or restore wild salmon runs (Lee, 1993). Virtually no one is happy with the present situation..." (p. 369).

In the preface to the report of the Commission on Pacific Fisheries Policy, Pearse wrote:

> ...the economic circumstances of the commercial fisheries are exceptionally bleak. In addition, there is a growing concern about the precarious condition of many of our fish stocks and increasing anxiety among Indians about their traditional fishing rights and among sport fishermen about their recreational opportunities. Although aggravated by current conditions, the economic problems and other concerns are rooted in fundamental deficiencies in fisheries policy. However, within an improved policy framework, we can turn

> what is now a bleak and problematical picture into an exceedingly bright one in the future (1982, p. vii).

Note that Pearse was writing in the early 1980s. More than two decades later, it seems that the issues identified in his opening remarks remain timely in this new century.

A fresh approach is indeed needed, one which will complement and supplement those structures already in existence and address issues of policy in fisheries through a different lens. Indeed, as Scarce (2000) writes, "For all of science's ostensible objectivity and exactness, it can yield terrifying results when control is lost – and even when it is successfully applied and maintained.... science cannot aid society in establishing norms – socially expected and accepted attitudes and behaviors – or in making value-based decisions about nature" (pp. 1-2).

Such a radical new approach may be based on principles of ethics. An ethical framework may guide overarching decisions of fisheries policy, such as not just *who* gets to fish, but *how* that decision ought to be reached, and *what role* do humans (and by extension human needs) have in fisheries ecosystems. Indeed, what are the definitional boundaries of a fisheries ecosystem, and how does the human species fit into that definition? As Early (1979) explains, "Ecology, [is] in the primary sense the science of how organisms relate to their environment; *but in ethical discussion the term is used particularly in relationship to questions of human responsibility for care of the material universe*" (p. 1153) [emphasis added]. It is therefore necessary to consider the nature of relationships within ecosystems, both amongst humans and between humans and other species.

By making explicit the ethical dimensions of fisheries policies, it becomes possible to confront those concerns and then begin to understand not only *how* to address them but also *why*.

The present study thus addressed the ethical dimensions inherent in fisheries. This has been accomplished firstly by reviewing the existing literature to determine the current state of thinking in environmental ethics and eco-theology, particularly regarding fisheries. From this review, a framework for developing ethical fisheries policies was constructed. This framework was subsequently applied using two established quantitative methodologies, the Rapfish methodology for rapid appraisal of fisheries sustainability and the paired comparison survey methodology for detecting aggregate preferences of respondents. The Rapfish methodology was modified and extended to encompass ethical dimensions and thus provided a means to quantifiably address such considerations, while the paired comparison methodology was employed as a way to gauge opinions of various respondent groups on fisheries preferences and to determine a ranking of the identified ethical concerns to guide weighting of those concerns in policy-making.

Following upon these steps, a groundwork for ethical fisheries policy has been developed. This framework was applied to the commercial fishery for Pacific salmon in British Columbia as an example. Recommendations have been made, and suggestions for future work have been put forward.

Aim, Approach and Overview Of Methodology

Through this research, I aimed to address the following question: *What criteria or issues should be considered in developing ethical fisheries policies in Canada?* This was accomplished

through quantitative, qualitative, and participatory methods, and the commercial fishery for Pacific salmon in British Columbia was presented as a case study.

My objectives for the research were as follows:

1. To establish a set of criteria to assist in the development of ethical fisheries policies in Canada.
2. To evaluate these ethical criteria to determine the appropriate emphasis that each ought to be given. This has been accomplished through participatory exercises, notably surveys of fishers, formal experts, and the public, using the paired comparison approach.
3. To integrate these ethical criteria within the framework of the Rapfish method for rapid appraisal as a means to evaluate fisheries. This methodology allowed an assessment of sustainability of the evaluated fisheries. A number of fisheries have been evaluated using the Rapfish ethical criteria, including, generally, a selection of Canadian marine fisheries and, specifically, an assortment of commercial Pacific salmon fisheries in British Columbia.
4. To identify a range of policy options for the British Columbia commercial salmon fishery. This fishery served as a case study in which to further investigate the ethical guidelines developed herein.

These objectives have been met through two complementary approaches or "tracks" (see Figure 1):

1. The "Rapfish" track involved the development, evaluation, and application of the ethical criteria. Firstly, the criteria were developed based on the principle of justice, and have been applied within the quantitative framework of the Rapfish methodology for rapid appraisal of fisheries. The criteria were further evaluated using the paired comparison method to determine aggregate preferences of various respondents regarding the appropriate weighting of the criteria. Finally, the ethical criteria have been applied to a Rapfish assessment of a selection of Canadian fisheries, including fisheries from Canada's east and west coast generally, and the Pacific salmon fisheries specifically.
2. The "Back to the Future" track was based on recent Back to the Future ("BTF") work in the Hecate Strait region of British Columbia and provides further insights into and applications of the five justices identified as associated with ethical fisheries. The overall BTF project, on which this track draws, involves the visualisation, through ecosystem modelling, of the structure of a marine ecosystem in various time periods and hence the impacts through time due to human activities and other influences. An awareness of the potential lost abundance and diversity gives insight into what the fishery may be if that richness could be recaptured, and raises the question of how the fishery would operate in a restored ecosystem. A Rapfish evaluation on British Columbia First Nations' salmon fisheries, using modified criteria, has been conducted as a component of this track. Additional participatory elements have been included, notably a paired comparison survey of

fishers and others participating in the larger BTF project in northern British Columbia to evaluate potential policy options for fisheries in that region.

The two tracks are complementary and not mutually exclusive. In fact, there is a significant degree of interconnectedness and complementarity of approaches. The two tracks involved both quantitative methodologies (mainly Rapfish, but to a lesser degree an application of the outcome of ecosystem modelling in the Hecate Strait region of British Columbia), and participatory approaches (contributions of data for the Rapfish analyses, and the paired comparison studies).

The quantitative Rapfish components have been designed to allow a comparison between various fisheries, such that a clearer perception of what makes a fishery either 'good' or 'bad' may be developed. This provided the means to determine what is an ethical fishery, and hence what policy decisions ought to be made to encourage more ethical fisheries. The participatory components had two goals: first, that the interim steps (the Rapfish criteria) and results could be vetted by those involved with the fisheries; and second, tangible recognition of the importance and inherently appropriate necessity of stakeholder involvement in ethical fishery management.

The dual-track approach was employed as a means to evaluate and compare fisheries across varying time and geographic scales. Through the quantitative and participatory components of both tracks, policy considerations for the British Columbia Pacific salmon fishery have been identified. Figure 1 demonstrates the approaches, time and geographic scales, and components of the two tracks, as well as the final application of ethics.

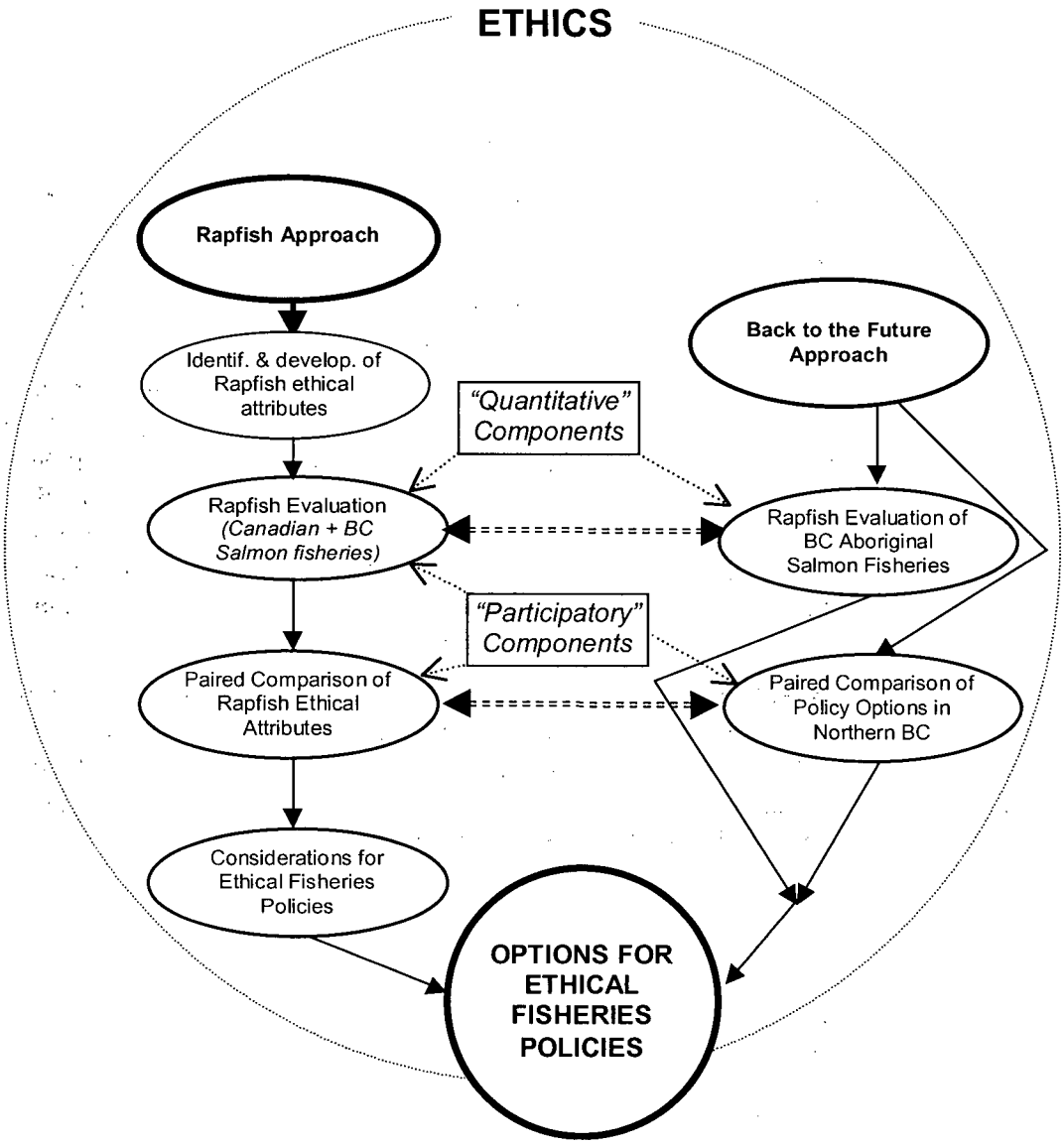

Figure 1: Complementary approaches lead to policy options, which are both informed by and subjected to ethical considerations:

(a) Rapfish Approach: A selection of Canadian fisheries have been assessed against the Rapfish ethical attributes. Assessments included a variety of fisheries from Canada's east and west coasts, and focussed in particular on salmon fisheries in British Columbia. Time series data were included for salmon fisheries. A paired comparison assessment of the Rapfish attributes (i.e., the criteria against which those fisheries are measured) shed additional light on the assessed fisheries, given aggregated expressed preferences. This approach developed a methodology by which ethical fisheries policies may be developed and evaluated, and through which fisheries may be assessed on ethical grounds.

(b) Back to the Future Approach: Consideration of the past can inform present and future policy decisions. Firstly, an assessment of selected Aboriginal fisheries was conducted, applying specially-designed Rapfish attributes. Secondly, through current participatory and ecosystem-based Back to the Future work in the Hecate Strait region of British Columbia, policy considerations were developed. These policy options were further subjected to a paired comparison study, wherein those involved in fisheries and related issues in the Hecate Strait region were asked to make decisions regarding preferred outcomes. This approach represented an application of the principals and tools developed in the Rapfish track, and follows from that primary approach.

From these two approaches, potential policy considerations for British Columbia's Pacific salmon fisheries have been developed and discussed.

Note: Straight arrows indicate flow, dashed arrows indicate commonalities in the two approaches, dotted arrows indicate nature of component (that is, quantitative or participatory).

1.3 Ethics and Fisheries

To start to develop an ethical groundwork for fisheries policy, before beginning to determine the most appropriate role for ethics, it is at the outset necessary to determine a wellspring from which to draw. Individual and societal understandings of ethics arise from myriad sources, ancient and contemporary. One source of ethics, environmental and otherwise, is theology. Interestingly, the growing awareness of ecological harm has led to a re-examination of theological issues, including the "...relation of man to nature, desacralization of nature, sacramentalism, acceptance of poverty as a way of life, etc." (Early, 1979, p. 1153). Theologians have begun to respond to ecological concerns, and hence may offer a unique perspective from which to approach the rehabilitation of our ecosystems and to consider how we as humans should interact with the rest of Creation.

As will be evidenced below, a significant majority of Canadians profess membership in a Christian church. Membership in an organised religion can reasonably be seen to indicate that the beliefs and teachings of that religion would have some formative influence upon one's worldview, and adherence, at least nominally, to those beliefs and teachings. As Gottlieb (2001) states, "Religions necessarily direct us toward particular ways of living with other people and with the world" (p. 18).

Despite divisions within the Christian church, the Holy Bible remains central and common to all. Furthermore, the Hebrew Scriptures are by definition shared with the Jewish faith. As will be shown below, 84% of all Canadians profess to share in the Judeo-Christian tradition.

The application of Judeo-Christian beliefs in issues facing contemporary society is not without precedent. Indeed, in ruling on a recent application before the Provincial Court of British Columbia ((2002), B.C.P.C. 0259), Dhillon J. cited Smith J. in *Vallance* v. *Naaykens* ((2001) B.C.J. No. 959) (citing Wallace J. in Diversified Holdings v. R. ((1982) (35 B.C.L.R. 349 (S.C.))), in which the judge referred to Genesis 1:28. This passage, as will be discussed in greater detail below, refers to the granting of dominion over Creation by God to humankind.

It is therefore reasonable and even appropriate to consider theology as one angle from which to approach environmental ethics. Furthermore, as will be demonstrated, secular sources present parallels to eco-theological teachings, thereby giving broader credibility and applicability to these teachings. Secular environmental ethicists and theologians approaching environmental issues from a religious perspective demonstrate complementarity and a degree of agreement regarding how we *ought* to think about the world in which we live and work and on which we depend. While the words chosen to express the perspectives vary, the ideas are held in common. Exploration of the two perspectives broadens and strengthens the themes of both.

From these two streams of thought – the sacred and the secular – central considerations to environmental ethics *vis-à-vis* public policy will become more clear. The beginnings of a groundwork for ethical fisheries policy will be laid.

Religion in Contemporary Canada

In summarising the findings of the religion component of the 1991 Census, Statistics Canada states that "Canada has been and continues to be predominantly Christian" (1994, p. 105). Although the Census of Canada is conducted every five years, questions on religion are asked only in the decennial census (Statistics Canada, 1997a; Statistics Canada, 1997b); as such, the 1991 Census data are the most recent available. These data are based on a 20% sample of the

total population, excluding institutional residents (Statistics Canada, 1993; Statistics Canada, 1997b). For the 1991 Census, Statistics Canada defined religion as referring "...to specific religious denominations, groups or bodies as well as sects, cults, or other religiously defined communities or systems of belief" (1997b, p. 86), and included seven major groups: Catholic, Protestant, Orthodox, Jewish, Eastern Non-Christian, Para-religious groups, and 'No Religious Affiliation' (Statistics Canada, 1993; Statistics Canada, 1994; Statistics Canada, 1997b). Respondents were asked to "Indicate a specific denomination or religion, even if this person is not currently a practising member of that group" (Statistics Canada, 1997b, p. 82). The 1994 General Social Survey stated that "Church attendance is much lower than affiliation", indicating that while 86% of Canadians reported a religious affiliation, 40% attended church [sic] at least monthly (1994 General Social Survey, cited in Statistics Canada, 1997b, p. 81).

A summary of responses to the 1991 Census of Canada question regarding religion are presented in Table 1.

Table 1: Religions in Canada, 1991, by Major Groups

Major Groups[1]	**Numbers**	**Percentage of total population**
Total Population[2]	26,994,045	100%
Catholic	12,335,255	46%
Protestant	9,780,710	36%
Eastern Orthodox	387,395	1%
Jewish	318,070	1%
Eastern Non-Christian[3]	747,455	3%
Para-Religious	28,155	0.1%
No religious affiliation	3,386,365	13%

(source: Statistics Canada, 1993, Table 1)

Notes:

1. *Major Groups of religions include Catholic, Protestant, Eastern Orthodox, Jewish, Eastern Non-Christian, Para-Religious, and No religious Affiliation (Statistics Canada, 1993). Also included is Total Population of Canada.*
2. *Total Population figure (26,994,045) includes those categorised under Other, not elsewhere classified (10,635) as well as the seven Major Categories.*
3. *Includes Islam.*

Figure 2 presents the breakdown of religious affiliation of those declaring a religion. Eighty-seven percent of Canadians indicated a religious affiliation; of those, a majority (53%) are Catholic.

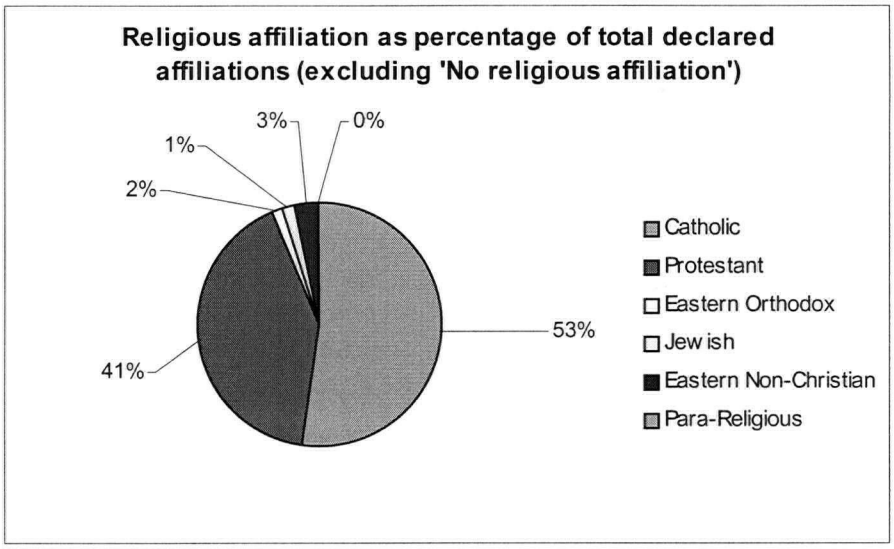

Figure 2: Religious affiliation in Canada as a percentage of total declared affiliations (source: Statistics Canada, 1993, Table 1)

The Judeo-Christian traditions represent nearly all religions in Canada. A clear majority of Canadians (83%) are Christian, while just one percent of Canada's population is Jewish. Of Christians, a majority are Catholic (55%), a significant number (43%) are Protestant, and a small number (2%) are Eastern Orthodox (see Figure 3).

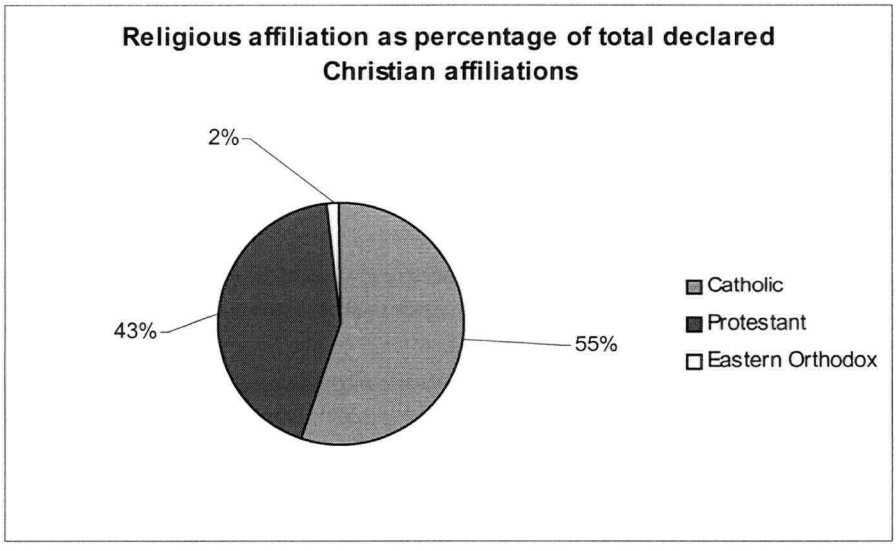

Figure 3: Religious affiliation in Canada as a percentage of total declared Christian affiliations (source: Statistics Canada, 1993, Table 1)

As indicated above, religions provide guidance on how to live with one another and within the world (Gottlieb, 2001). Various systems of belief – whether structured upon established religions or otherwise – may give ethical direction on a range of issues. This may be explicit or implicit. Moreover, implicit beliefs have already shaped collective early perceptions

and continue to influence these on a broader level. The cumulative, historical, and ingrained comprehension of humanity's place in the world has developed over time in the context of a Christian society. For instance, as will be discussed below, Lynn White Jr. (1967) argues that the Western scientific tradition has at its foundation a Christian understanding of nature. While no longer explicitly Christian, early Western science was formed within a Christian context. Similarly, although the dominant culture is no longer openly defined by the Church writ large, Canadian society, though increasingly pluralistic, has nevertheless been infused with the tradition from our early years. At a societal level, the tradition remains implicit.

A strong majority of the Canadian populace professes membership within a religion. It is possible to look to traditional belief systems for guidance on ethical aspects of public policy while maintaining separation of church and state. Indeed, Statistics Canada (1997b) indicates that "...these data [on religion] are used to support formulation, evaluation, and administration of a number of federal programs" (p. 83). Furthermore, given that Canada is at least nominally Christian, it is reasonable to look to the Christian faith for possible guidance on difficult issues of how to live with one another and within this finite world in which we find ourselves.

Eco-theology, as will be discussed below, is one lens through which one may consider the interactions of humankind *vis-à-vis* nature. As one more method of examination, and complementing secular environmental ethics, eco-theology may provide direction towards a foundation for ethical fisheries policies.

Ethics, Eco-theology, and Nature

In the post-war era, the notions of environmental ethics and eco-theology were initially raised by two persuasive writers: ecologist Aldo Leopold and historian Lynn White Jr. These fundamental contributions influenced thinking within these fields and essentially formed the basis for the relevant literature.

Noted ecologist Aldo Leopold, in his classic treatise "The Land Ethic" (published posthumously), establishes the fundamental importance of ethics to regulate humanity's interaction with nature, explaining "That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics. That land yields a cultural harvest is a fact long known, but latterly often forgotten" (1966, p. xix). Although Leopold writes specifically of 'the land', his definition of land is broad and cogent to issues of fisheries in particular and aquatic ecosystems in general, as "The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land" (1966, p. 239). By extension, Leopold's definition includes waters and hence aquatic ecosystems.

To Leopold, the development of a land ethic is a social evolution, an intellectual and social process that continues through time and experience (1966, p. 263). He describes the land ethic as reflecting "...the existence of an ecological conscience, and this in turn reflects a conviction of individual responsibility for the health of the land (Leopold, 1966, p. 258).

Although writing mainly from a secular standpoint, Leopold does remark upon the inter-relatedness of nature and religion. He relates a story of a boy raised as an atheist who experienced a religious conversion through the beauty and wonder of Creation. He concludes, "I dare say this boy's convictions would be harder to shake than those of many inductive theologians" (Leopold, 1966, pp. 230-2).

In his seminal article, "The Historical Roots of Our Ecological Crisis", Lynn White Jr. identifies the significance of religion in human interaction with nature. He claims that modern Western scientific tradition has at its foundation Christianity, which he describes as the most anthropocentric of all religions (White Jr., 1967, p. 1205). From the early thirteenth century through the late nineteenth century, Western scientists treated their investigations as a means to better understand God, that "...the task and the reward of the scientist was 'to think God's thoughts after him'..." (White Jr., 1967, p. 1206). This leads White to conclude that "...Western science was cast in a matrix of Christian theology" (1967, p. 1206). Since that science has given humanity the power and ability to destroy nature, "...Christianity bears a huge burden of guilt" (White Jr., 1967, p. 1206). He further writes that "What people do about their ecology depends on what they think about themselves in relation to things around them. Human ecology is deeply conditioned by beliefs about our nature and destiny – that is, by religion" (White Jr., 1967, p. 1205).

While he does lay much blame on the Christian faith, he also acknowledges the role that religion can play in resolving the crises brought about by apparent human abuses of Creation. White concludes that "Since the roots of our trouble are so largely religious, *the remedy must also be essentially religious*, whether we call it that or not" [emphasis added] (1967, p. 1207).

Following upon these earlier scholars, Christian eco-theologian Sallie McFague raises the issue of justice and makes explicit the connection of ecology and theology:

> The full truth is that we cannot live without the plants and animals and the ecosystem that supports us all. *So the ecological issue is a people issue and, most especially, a justice issue, for the ecology, the environment, the home that we share is a finite one.* If justice means, most basically, fairness, then ecology and justice are inextricably intertwined, for on a finite planet with limited resources to support its many different kinds of beings, both human and nonhuman, sharing fairly is an issue of the highest priority. We human beings are not the only ones who deserve a fair share, but we are among those who do and, in addition, we alone (to our knowledge) have the ability to make decisions about sharing along lines other than 'might makes right,' both for the needy of our own kind as well as other vulnerable species. This issue of justice and fair sharing will be a central one as we consider theology from a ecological context [emphasis added] (1993, p. 5).

Indeed, justice and ecology are intertwined, as the basics of life can only be provided by a healthy natural world (McFague, 1997). Yet, as humans (like all other beings) must live within this finite world, it is inevitable that our presence will have an impact on the ecosystem. The question, then, is how to balance our immediate human needs (for instance, fish to be caught as food or trees to be chopped for fuel or to build shelter) with future human needs which are dependent upon the continued flourishing of the ecosystem. Thus, a question for science is to determine the balance from a biocentric standpoint; one role for ethics is to champion the needs of non-human species.

McFague further suggests that a change in sensibility is needed, one in which humans view nature as subject rather than object (McFague, 1997), noting that, according to Genesis, God saw Creation and said simply that "It is good" – intrinsically so. McFague is clear that, as subjects, other life-forms in nature do not exist solely for human benefit. Crucially, she states

"...that both for ethical and political reasons we should take the earth others seriously: we *ought* to because they are centers of value in themselves and we *need* to because as subjects they can and do alter human goals" [emphasis as in original] (McFague, 1997, p. 111). We do rely on the rest of Creation for our very survival, but "The recognition of intrinsic value means, at the very least, that when we use other creatures for our benefit, we do so with humility, respect, and thanksgiving for these other lives" (McFague, 1993, p. 166).

From the subject-subject approach proposed by McFague, she indicates that an 'ethic of care' emerges, one which:

> ...is based on the model of subjects in relationship, although the subjects are not necessarily all human ones and the burden of ethical responsibility can fall unequally. The language of care – interest, concern, respect, nurture, paying attention, empathy, relationality – seems more appropriate for human interaction with the natural world, for engendering helpful attitudes toward the environment, than does the rights language (1997, p. 40).

This ethic of care is based on respect for others in the community writ large, and involves acknowledging that nature is comprised of a community of subjects (McFague, 1997). McFague proffers that humans need to recognise that each creature is simply acting as it must in its existence, citing as an example the AIDS virus. She explains that the virus is not acting against any person in particular but rather doing what it must to survive and thrive (McFague, 1997). She further explains that the ethic of care is based on relationships rather than individuals, recognising respect as a basis for the interaction:

> Because all of us exist together and we know these others to be subjects, who are more or less like ourselves, the proper way to treat the others is with the care that one extends to community members. This does not mean that we necessarily *like* all the others, or even that we do not eat or kill them. The first dimension of care is simply respect. It is acknowledgement that others exist together with us in a community of subjects, all having desires and goals [italics as in original] (McFague, 1997, p. 151).

Thus, there is a recognition that for one individual to survive, another may suffer. One animal eats another; humans may eat other animals (as well as plants) for necessary nourishment. Under an ethic of care, such needs must be met, but in a respectful manner, meaning that, for example, animals not be slaughtered beyond what is required for sustenance and food should not be wasted. Or, as McFague writes elsewhere, "At least we should do *less harm*" [emphasis as in original] (1993, p. 7).

These three authors, each central to the development of modern environmental ethics and eco-theology, state the importance and inherent value of all members of an ecological community, and the need to consider intrinsic value in addition to economic value of an organism. Moreover, they each speak of the role of conscience, even love of nature or Creation, and make plain the role of religion in ecological issues. If this is indeed God's world, or as McFague (1993) postulates, the universe (and thus this world) is an embodiment of God, then

religious faith has a valuable and inevitable place in taking care of and interacting with Creation. Indeed, "Religions are in the business of recommending counter-cultural visions of the good life; now, more than ever, we need such visions if God and the earth are to be loved" (McFague, 2001, p. 23).

The sentiments expressed by these three primary authors are echoed by others, writing from various perspectives. Similar to Leopold, Suzuki and McConnell (1997) recognise the spirituality of nature, writing that "we can look out and feel spiritually uplifted by the beauty of a forested valley or an ice-coated Arctic mountain, we are overwhelmed with awe at the sight of the star-filled heavens, and we are filled with reverence when we enter a sacred place" (1997, p. 207), and that the spiritual connection helps us to understand where we belong. Like McFague, they also consider the interconnectedness of Creation, writing that that "...love extends beyond those of our own species – we have an innate affinity for other life-forms. If we are to deliberately plot a sustainable future, the opportunity for each of us to experience love, family and other species must be a fundamental component" (Suzuki and McConnell, 1997, p. 182-3).

Where McFague states that religions can provide counter-cultural visions, Barnhill and Gottlieb (2001) report that deep ecology, can do so too, as it in part "...refers to deep questioning about environmental ethics and the causes of environmental problems. Rather than simply adjusting existing policies or amending conventional values, such questioning leads to critical reflection on the fundamental world views that underlie specific attitudes and environmental practices" (p. 5). They further explain the connections between religion and deep ecology, particularly the strength to be found in combining the two, stating that:

> Whether nature is considered valuable in itself or as a part of God's creation, most religious authorities now see it as deserving of care, stewardship, and respect. In this way traditional religions are making (perhaps unconscious) common cause with deep ecologists and their kindred: radical environmentalists, ecofeminists, witches, and various tree-huggers of indeterminate self-description. An alliance between deep ecology (or, more broadly, any serious environmental philosophy) and world religion may thus have some quite significant political effects (Barnhill and Gottlieb, 2001, p. 3).

The spiritual component of humankind in and with nature, the interconnectedness of Creation, can thus be viewed from either a religious perspective or from a more awe-filled, secular viewpoint.

Ethics, Eco-theology, and Fisheries

Although, as noted above, Leopold's definition of 'the land' broadly includes waters and aquatic organisms, neither Leopold nor White Jr. explicitly considered the ethical issues associated with human interaction with marine ecosystems. As fisheries in Canada and elsewhere have come under increasing pressure, sometimes to the point of collapse, the role of ethics in fisheries has garnered attention. Notably, an interdisciplinary group of scholars recognised and subsequently endeavoured to meet the challenge of exploring the ethical issues surrounding fisheries, specifically marine fisheries on Canada's east and west coasts. The research team sought to:

> ...identify and the ethical and other value components of the scientific, economic, and political decisions that affect the marine ecosystem, and to identify the value judgements that lie beneath such decisions. Once made explicit, it would become possible to analyse these *as value judgements*, and therefore make an ethical assessment of these values [emphasis as in original] (Ommer, 2000, p. 11).

The findings of this group were published in *Just Fish: Ethics and Canadian Marine Fisheries* (Coward et al., 2000) and summarised in a booklet of the same title (Ommer, 2000). The theoretical framework of justice developed corporately by this scholarly group is ground-breaking in its form and application, although similar themes have been identified and explored elsewhere, particularly in the eco-theology literature.

While the *Just Fish* project was the first large-scale effort to make explicit and then examine the interaction of ethics and fisheries, in recent years scholars elsewhere have also begun to consider these issues. (See, for instance, Bratton, 2000; McIlgorm, 2000.) The framework applied herein is based upon that developed in *Just Fish*, and complemented by other sources.

Members of the *Just Fish* research team considered the current state of Canadian marine fisheries ecosystems and the human communities which depend on those ecosystems. An understanding of the ecological reality provides an insight into the context in which ethical issues become crucial. Brunk and Dunham (2000) write:

> When a formerly abundant resource base is shattered, it helps people to see that the environment on which it depends is a finite, bounded, and fragile system of interdependent organisms, species, and physical and chemical processes. People come to understand the impact their own activities have upon the system and its ability to function in a manner that sustains the resource. They understand more about how an intervention in one place in the system may reverberate throughout the whole system, with consequences that may or may not be desired or anticipated. They see it as an *ecosystem*. And they come to understand that they, too, can be negatively affected by their interventions in the system [emphasis as in original] (pp. 10-11).

Glavin (1996) gives the following example, demonstrating the shift in technology and human fishing activities with time:

> A stable community enjoys a long-standing relationship with a specific population of fish. A new fleet of boats appears on the horizon, or a new fishing technology is taken up by a handful of community members who can afford it, or an outside interest 'invests' in the production of commodities from the community's traditional preserve, or a new regulatory regime is imposed from afar. This is called progress. Sooner or later, things begin to break down. Old fishing patterns are abandoned. Old skills become redundant. Competition

> intensifies, new rules replace old customs, and before long the fishing isn't so good any more. Newer, bigger and faster boats roar off to the fishing grounds every season while old boats rot on the beach or sink at their moorings. Soon, the fish are gone (p. 32).

Similarly, Pauly (1999, p. 357) notes what he describes as "...active collusion... between governments and large fishing enterprises..." in the form of various subsidies and schemes that have had the effect of marginalising "...otherwise efficient, localized, small-scale or artisanal fisheries...". What could arguably be an otherwise-gradual, natural process of so-called technological improvements, resulting in increased capitalisation and improved ability to fish at distant fishing grounds, has in some instances been expedited through governmental incentives to 'modernise.' Newell and Ommer (1999) reiterate these findings, giving particular attention to Canadian fisheries policies. They further comment that the issue is one of scale, both temporal and spatial, that while industrial fisheries operate on a large and short-term scale, local fisheries are small-scale and long-term. "State policy, which might be a saviour here, has not so far proved willing to take the long-term view and protect both stocks and small-scale fisheries" (Newell and Ommer, 1999, p. 367). Pinkerton makes plain both the strengths of local management (stewardship) and the role of values in fisheries management:

> In the present day, knowledge and the ability of local authorities to make effective rules on resource use reinforce the behavioural norms that produced sound management practices. *Social controls of this kind are strong because they operate at both the level of political rules (secular authority) and at the level of beliefs and values (religious authority).* An individual who breaks the rules is labelled as morally or spiritually bankrupt, in addition to being a rule-breaker [emphasis added] (Pinkerton, 1999, p. 341).

How the various players (managers, decision-makers, fishers, fish, interested others, and so on) interact and treat one another requires careful consideration from an ethical standpoint, particularly when there are apparent shortages which could lead to conflict. Indeed, "Conditions of scarcity are the normal state of human societies in most times and places, and so questions of justice and fairness are almost always in dispute" (Brunk and Dunham, 2000, p. 9). As eco-theologian Sallie McFague explains, "Justice for the oppressed will recede from view when resources become scarce" (1993, p. 4).

Several fisheries in present-day Canada exemplify scarcity. Consider the closure of Newfoundland's famed northern cod fishery when overfishing led to a stock collapse. British Columbia's hallmark salmon fishery, while not yet in the dire condition of the Newfoundland cod, faces shortages and annual anxiety over allocations. For the commercial salmon fishery in British Columbia, this has become particularly apparent in recent years, given "a shift in management of... stocks from mixed to weak stock management" (British Columbia, 2001b, p. 26), such that fishing activity on strong stocks was curtailed to reduce pressure on less abundant stocks in common waters. A justice-based approach becomes ever more desirable and necessary.

Stewardship versus Dominion

In modern fisheries, governmental bodies such as Fisheries and Oceans Canada (commonly referred to as 'DFO', a holdover from a time when the ministry was known as the Department of Fisheries and Oceans) have typically held jurisdiction over fisheries management. Generally, this has involved the stewardship model of interaction, which Roach describes as a three-way interaction:

> The steward is keeper, manager, or caretaker.... Stewardship involves three parties: the steward, that for which the steward cares, and the party at whose behest does the caring. The concept implies both connection and separation in this three-way relationship, and the relation is often conceived along the lines of a hierarchy. All three parties are inextricably connected by their interest in one another, but significant differences of power exist among the three. Humanity – whether as individuals, groups, or as a whole – occupies the middle role of steward.... Our role as steward is to care for a dependent third party perceived to be in need of human protection or management – the 'wards' (2000, p. 69).

In the case of Canadian marine fisheries, the Government of Canada (through Fisheries and Oceans Canada) is the steward, protecting the fish on behalf of those who exploit the fish resource and for all Canadians. Commenting specifically on the British Columbia salmon fishery, Gislason et al. explain that "Where there are many users of a resource, and it is in scarce supply, excessive use can do irreparable damage, to the detriment of all users. This combination of public interest and scarcity justifies government intervention to manage the resource, through restrictions on access and other policy mechanisms" (1996b, p. 1-1). They further state that "Personal values notwithstanding, fundamental to the salmon resource is its 'public' nature. The Government of Canada, through the Department of Fisheries and Oceans (DFO), has the stewardship role to manage the resource for all Canadians of present and future generations" (Gislason et al., 1996b, p. 1-1).

This very management and use of what is typically referred to as a 'fishery resource' raises issues of ethics and fairness. Even the phrase 'fishery resource' exposes a bias towards the utility of the fish for solely human use, lacking recognition of any intrinsic value of the fish themselves. Indeed, "From their earliest appearance on Canada's West Coast, the key players in the commercial fishing industry have regarded fish populations as resources there to be mined like so much ore" (Glavin, 1996, p. 33). As Barnhill and Gottlieb (2001)write, "Every tree and river, large mammal and small fish, now exists in relation to human action, knowledge, commerce, science, technology, governmental decisions to creation national parks, international campaigns to save endangered species, and (God help us) leisure lifestyle choices about mountain bikes, off-road vehicles, and sport fishing" (pp. 1-2). Non-human others are acknowledged only as they may be of value to humans, not as subjects in their own right.

Roach further notes that the stewardship model has endured through time, based upon an "...understanding [of] the human relationship to the natural world. This reference derives from the long history that identifies nature as the ward of human guardians" (2000, p. 69). In fact, Roach (2000) explains that stewardship has its advent in the Old Testament, notably the Book of Genesis: "The Lord God took the man and put him in the garden of Eden to till it and keep it"

(Genesis 2:15, New Revised Standard Version). Bratton explicitly links stewardship with the oceans:

> The earth *and the seas* are the Lord's, and therefore have value to God, regardless of their human uses and ownership. Further, all human property, all exclusive economic zones, and all transferable quotas belong to God, and ultimately remain in divine hands. We are stewards – called to represent God's interests. Further, when we harvest or utilize the Creation, we should not only avoid damaging God's world, we should share God's blessing with other humans [emphasis as in original] (2000).

Stewardship then is closely linked with a local spatial scale and thus with local ecological knowledge (LEK). As will be discussed below, both also combine within the concept of creative justice and are connected to ecosystem justice.

The dominion model, Roach (2000) explains, also comes from Genesis: "God blessed them, and God said to them, 'Be fruitful and multiply, and fill the earth and subdue it; and have dominion over the fish of the sea and over the birds of the air and over every living thing that moves upon the earth'" (Genesis 1:28, New Revised Standard Version). Roach indicates that the dominion model "...is charged with contributing to cultural notions of nature as inferior to humans..." (2000, p. 70), while McFague states that "...domination [dominion], which has been the primary attitude of the West toward nature..." (1997, p. 166) is mentioned in only one of the 31 verses of the first chapter of Genesis. McFague, like many, treats the word domination as interchangeable with dominion. Yet it is instructive to note that the word *dominion* has at its root *Dominus* (Lord), with the implication that God did not make humans superior, but rather placed nature in trust with humans on God's behalf (Rev. T. Harding, pers. com.; Fr. S.G. Henry, pers. com.). The word 'dominion' (as translated from a variety of Hebrew and Greek words (Kooy, 1962; Hasel, 2000)) ultimately means that:

> Because God is the creator of all and his dominion will last forever, he is free to delegate authority over the works of his hand to humankind (Ps. 8:6[7]). Hence, *humans are called to exercise responsibility in their dominion and care over God's creation*... [emphasis added] (Hasel, 2000p. 352)

Perhaps this common misunderstanding is in part to blame for the widespread belief in the apparent 'God-given' superiority of humans over the rest of Creation. In fact, Early (1979) reports that some commentators have argued that teaching regarding Genesis 1:26-28 bears some responsibility for humankind's abuse of Creation. That is, that the notion of detachment from and supremacy over the rest of nature provided a rationalisation for mistreatment of Creation. Jobling (1978) similarly discusses the controversy over the meaning of Genesis 1:28, noting White Jr.'s tale linking a sense of human superiority over nature with resulting harm to creation. He summarises the first chapter of Genesis as presenting "...a dialectical tension between dominion over nature and harmony with it" (Jobling, 1978, p. 247). Furthermore, the passage must be taken in greater context, through which an awareness of "...humanity's supreme dignity over and radical oneness with the rest of creation" (Jobling, 1978, p. 248) becomes evident. Indeed, of ultimate importance, is that "The teaching that the earth is a product

of divine creation carries the implication that man does not own it but stands in the relationship as steward or caretaker (Gen 2.15)" (Early, 1979, p. 1153).

While the stewardship model is much less severe than the dominion model (as typically understood), it nonetheless has limitations. For example, it (like the dominion model) largely excludes the possibility of intrinsic value of the fish (Roach, 2000). However, it does in a limited way recognise that, as humans interact with nature, so too we bear a responsibility for those interactions and the impacts those interactions cause. These impacts involve not just ourselves, but rather extend to others within the fisheries ecosystem and beyond. Thus, stewardship can be very useful on a local scale, when the stewards may have a clear indication of their role and thus feel responsible and accountable for their care of (as well as dependent upon) the resource (Roach, 2000). (See also Newell and Ommer, 1999.) Stewardship is particularly helpful in recognising the long-term nature of the fisheries ecosystem, in that it focuses upon preserving and transferring value into the future and across the broader community (Roach, 2000, p. 80).

Interestingly, Jones and Williams-Davidson (2000) explain that the Haida worldview bears similarities to stewardship as described by Roach (2000):

> Her conclusion is that a stewardship model carried out on a local scale with self-restraint and a long-term view would be most likely to gain popular support. First Nations approaches could have similar advantages, being based on a pre-existing culture with strong connections to place (p. 107).

However, they also note that Haida stewardship focuses on protecting resources for the overall community – for self (broadly defined) rather than other (God, in the Christian model of stewardship) (Jones and Williams-Davidson, 2000). Grim states that "Indigenous traditions refer to actual, dynamic societies whose identities are embedded in land, language, subsistence practices, kinship, narratives and time-honored customs" (2001, p. 39), which are oriented towards the community rather than the individual.

It is important to resist separating humans from Creation, thus avoiding viewing nature solely from a utilitarian perspective. McFague (1993) explains that humans are not superior to the rest of Creation:

> ...other beings do not exist for our benefit – even for our spiritual growth as ways to God. They exist within the vast, intricate web of life in the cosmos, of which they and we are all interdependent parts, and each and every part has both utilitarian and intrinsic value. Within our model of the world as God's body, all of us, human beings included, exist as parts of the whole. Some parts are not merely means for the purposes of other parts, for all parts are valued by God and hence should be valued by us. We do have a distinctive role in this body, but it is not as the ones who use the rest as a ladder to God; rather, it is the ones who have emerged as the caretakers of the rest (p. 185).

Leopold (1966) reminds the reader of the need for respect between elements of Creation, while recognising human dependence on nature:

> A land ethic of course cannot prevent the alteration, management, and use of these 'resources,' but it does affirm their right to continued existence, and, at least in spots, their continued existence in a natural state. In short, a land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such (p. 240).

Leopold and McFague, like Roach, recognise the intrinsic value of elements of the ecological community, and the responsibility of humans, as equals, within that community. Throughout his impassioned writing, Leopold (1966) further reminds the reader that economic value is not sufficient in a land ethic (pp. 245, 246-7), that recognition of often-invisible, intrinsic (non-economic) value and a love of nature is essential, that "It is inconceivable to me that an ethical relation to land can exist without love, respect, and admiration for land, and a high regard for its value. By value, I of course me[a]n something far broader than mere economic value; I mean value in the philosophical sense" (p. 261).

This philosophy is broadly represented in the literature by those of a variety of Judeo-Christian worldviews. For example, from the Jewish worldview, Katz explains, "The world exists because God has created it thus. The value of natural processes lies not in their usefulness for humanity but in their existence as part of the divine plan" (2001, p. 164). From a Protestant perspective, Cobb Jr. writes, "What God appreciates, we should appreciate also" (2001, p. 216). The sentiment is echoed by Carroll, a Roman Catholic, who states "...that all life is interrelated, that all creation is neighbor; we must, therefore, love God's creation, both for God's presence within, and for its role as neighbor" (2001, p. 171). In addressing deep ecology as a form of religion, which he defines as "...organized and overlapping systems of belief, ritual, institutional life, spiritual aspiration, and ethical orientation which are premised on an understanding of human beings as other or more than simply their purely social or physical identities" (Gottlieb, 2001, p. 18), Gottlieb postulates that "The 'neighbor' of the golden rule is now the city, the nation, the world" (p. 29).

It is written in Genesis that "God saw everything that he had made, and indeed, it was very good" (Genesis 1:28, New Revised Standard Version). Creation is not stratified; each part was made by God and pleases God. It is *all* good.

The Five Justices

Social justice and ecology are tightly intertwined. McFague (1993) argues that excessive consumption by some of limited resources leads to oppression of others, human and non-human; in treating Creation with respect, humans act justly. Cobb Jr. (2001) writes "If we are concerned with the future of the natural world, we must be concerned with peace as well as with justice and participation in human affairs, and if we are concerned with peace as well as justice and participation in human affairs, we must be concerned with the health of the natural world" (p. 221). In developing a model of justice as the means by which to examine the ethical aspects of fisheries, the *Just Fish* researchers identified five forms of justice inherent in fisheries:

1. *Creative justice* involves bringing together disparate voices, especially those which have typically been kept apart, to share knowledge and understanding of ecosystems (Haggan, 2000; Ommer, 2000).
2. *Distributive justice* is concerned with sharing – of the resource, and of access to that resource (Ommer, 2000).
3. *Ecosystem justice* recognises the intrinsic value of all members of an ecosystem. The ecosystem is thus a "...'community' of interdependent members, including all those with some dependency on, or legitimate interest in, the functioning of the system." (Ommer, 2000, p. 11)
4. *Productive justice* addresses issues of husbandry of the resource, such that it continues to produce at the desired levels of abundance (Brunk and Dunham, 2000; Ommer, 2000).
5. *Restorative justice* recognises the depletion of the ecosystems over time and is thus concerned with rebuilding the ecosystem to restore lost richness or abundance (Brunk and Dunham, 2000; Ommer, 2000).

Each of these five types of justice will be further described below, with particular attention given to the inter-relatedness of the justices. As well, when appropriate, parallels will be drawn to other sources in the relevant literature.

Creative justice involves "...the deliberate creation of new opportunities to develop a common understanding of the interactions and interdependence within exploited ecosystems and the human communities that interact with them" (Haggan, 2000, p. 85), and is thus closely linked with *ecosystem justice* (Haggan, 2000). There is increasing awareness that people, not just biology or economics, should be considered in the calculus of fisheries decision-making (see, for instance, McGoodwin, 1990), particularly with the improved understanding of the interconnectedness and value of all members of the ecosystem (Leopold, 1966; McFague, 1993; Suzuki and McConnell, 1997). Indeed, "In a sense, nature is everything, including ourselves; hence, trying to define it is like a fish attempting to define the ocean" (McFague, 1997, p. 16). Through greater and broader involvement of those with an interest in the fishery[2] a richer understanding of the many present and future concerns and needs of those participants can encourage more sustainable management. "In this way, it can gain the attention of policy-makers by addressing the politician's dilemma of balancing long-term conservation needs against the demands of today's voters for livelihood and lifestyle..." (Haggan, 2000). Pinkerton (1999) suggests that by bringing together various interests and stakeholders, "...new and unforeseen forms of cooperation can emerge out of the most difficult conflicts" (p. 346). Indeed, as McGoodwin (1990) explains, there is "...an increasing recognition that the fisheries are a human phenomenon – a recognition that, strictly speaking, there is no fishery without a human fishing effort" (p. 3).

Creative justice is strongly influenced by the stewardship model and, to a lesser extent, the dominion model. It, however, has had a limited role in Canadian fisheries decision-making. *Creative justice* raises important issues of governance, in that it becomes necessary to determine who should make policy decisions; should such decisions rest solely with government, solely

[2] For instance, Haggan (2000) suggests combining traditional knowledge with scientific knowledge. The "Back to the Future" ('BTF') approach he describes presents elements of all five types of justice, particularly creative justice, and will be further discussed in Chapter 5 (see Figure 1).

with users, or shared in some manner? (Arnstein (1969) discusses the varying levels of citizen participation in issues of governance.) Inclusion of fishers and other participants in the fisheries ecosystem has typically been limited to such consultative exercises as the recent (2000) Wild Salmon Policy and Salmonid Enhancement Program joint consultations. In such cases, the steward (DFO) enquires of the user-groups what they feel ought to be done with the resource, but continues to reserve the right to make the final decision. Rare examples of true co-management of the resource exist, such as the Area 19 snow crab fishery in Cape Breton, Nova Scotia (see Pitcher and Power, 2000). Both *creative justice* and *ecosystem justice* are best served when DFO moves away from its paternalistic role of overseer, and other participants become actively involved in fisheries decision-making. Stewardship offers much as a model to follow, but can only be strengthened by broader inclusion of fishers and interested others, in line with the tenets of *creative justice*.

Thus the rootedness of people to a specific place (or ecosystem) can encourage good care (stewardship) of that ecosystem. As Suzuki and McConnell (1997) explain:

> The knowledge of every band of human beings, acquired and accumulated through generations of observation, experience and conjecture, was a priceless legacy for survival. All over the world, small family groups of nomadic hunter-gatherers depended on skills and knowledge that were profoundly local, embedded in the flora, fauna, climate and geology of a region (p. 11).

They further write that it is essential that, for the sake of a sustainable future, the diversity of local communities must be protected. Such communities provide a sense of rootedness and commitment to place, and thus encourage responsible life within Creation:

> The local community provides a common history and culture, shared values and a shared future. It is not surprising that when some aboriginal communities have been presented with a 'ten-year logging plan' from a forest company, they have rejected it with the demand that the company 'come back with a 500-year logging plan.' That kind of perspective comes from a community that is profoundly rooted in and committed to a place (Suzuki and McConnell, 1997, p. 213-4).

McFague reminds us that the earth is our home, and that "If we belong here... then it follows that we want to take care..." of our home (McFague, 1993, p. 57). Those with a strong sense of being at home in a certain place or ecosystem may be more inclined to take care of that home. Those who are most dependent upon and committed to a place, and the resources of that place, are believed to be most likely to be good stewards to that place and those resources. Clearly, they would have the most at stake. In fact, "Healthy communities... depend on healthy resources" (Gallaugher and Vodden, 1999, p. 285). McFague notes that what she refers to as postmodern science (meaning twentieth-century post-Newtonian modern science) recognises the interrelationships and interdependence of nature, something that "...people living close to the land and to other animals as well as to the processes that support the health of the land and living creatures have known this from their daily experience" (McFague, 1993, p. 31). Such an awareness is central to *ecosystem justice*, in that it recognises that humans alone, while

possessing the ability to destroy or appropriate what non-human creatures require, remain interconnected with those non-human others. All are interdependent; even from an anthropocentric stance, one must recognise that the damage wrought on others in the ecosystem has the potential to harm the human species. Suzuki and McConnell (1997) describe in great detail the biological and physical interdependence of ecosystems and all who inhabit this world.

Moreover, the doctrine of Creation teaches that humans are simply one component "...the of the created order, a being formed out of the dust of the ground, *and one who will return to dust. Man's spirit makes him something more than dust, but he nonetheless remains a creature*" [emphasis added] (Early, 1979, p. 1153). God has not placed humans apart from nature; humans remain a part of – and dependent upon – the rest of God's Creation.

In bringing together historically disparate voices, *creative justice* allows incorporation of different types of knowledge – scientific knowledge, which is broadly concerned with applicable information on a larger geographic scale, and local knowledge, which generally involves detailed knowledge of a specific local scale. Scientists may perhaps also be comparatively dispassionate about or detached from the resource than the local people, who may have for generations lived in and depended upon that place and its resources.[3]

As discussed in "Ethics, Eco-theology, and Fisheries" above, Pinkerton (1999) made clear the importance of local management as a form of stewardship, notably through the presence of social controls. In their survey of a Pacific salmon fisheries community forum conducted along British Columbia's coast during the mid-1990s in response to troubles in the salmon fishery, Gallaugher and Vodden (1999) described the level of concern of individuals within coastal communities for the fisheries upon which they, as individuals and as communities, were dependent. They report having heard from participants that "...people at a local level, with a stake in the overall well-being of their communities..." (p. 282-3) could address issues of distribution, and indeed that "Participants cared about the state of the stocks" (p. 283). Healey and Hennessy (1998) suggest that community-based management may be effective, provided that the community is able to exercise control over the fishery and that fishers within the community must not only be able to negotiate sharing arrangements but also enforce those agreements.

Jones and Williams-Davidson (2000) direct attention to the fact that, although *ecosystem justice* may appear to be a novel concept, the ethic of the Haida people is very similar and enduring. Indeed, "Conservation of the salmon was a responsibility of leadership in native society. Through a complex and varying system of fishing rights, native groups shared and husbanded the salmon harvest.... Failure of a run meant catastrophe" (Meggs, 1991, p. 6). According to Stewart (1977), "The Indians of the Northwest Coast showed much reverence and caring for the natural resources that were important to their cultures" (p. 161). Furthermore, "If the salmon run failed or was poor, there could be hunger or even starvation in a village" (Stewart, 1977, p. 135). The earliest humans to rely on the salmon had to understand their intimate connection with the fish and the implications of their interaction.

A traditional priority in managing fisheries is, clearly and quite basically, how to extract as much as possible, for as long as possible. Brunk and Dunham (2000) describe *productive justice* as managing the "...ecosystem so that it continues to produce the resource in the desired quantities" (p. 9). This is likely to be an increasing concern; McFague (2001) writes that "Now

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[3] In keeping with creative justice, the research reported in Chapters 2, 3, and 5, includes participatory elements (see Figure 1).

that the earth is full of people...the fish cannot reproduce at the speed we need..." (p. 90). To succeed with *productive justice*, the resource must be treated properly – using sustainable, non-destructive fishing gears and methods, for instance. Additionally, care of the physical environment in which the ecosystem exists, such as protection of habitat and spawning grounds, is an essential justice issue (McFague, 1993).

Yet fisheries resources have often not been treated in a manner compatible with *productive justice*. In such cases, *restorative justice* becomes an issue. *Restorative justice* simply involves issues of "...repairing environmental damage and restoring it [the ecosystem] to earlier, often forgotten conditions of health and diversity" (Brunk and Dunham, 2000, pp. 9-10). On Canada's west coast, lost or diminished salmon habitat is often a focus for restoration efforts, in the hope that, by restoring the habitat, the fish may come back. One effort at addressing the lost awareness of past abundance and diversity, through the Back to the Future approach, will be further described in Chapter 5.

However the justice issue which is likely the most obvious in fisheries, and also of most direct interest to those who rely on the fisheries ecosystem, is *distributive justice*, or 'who gets what'. McFague notes that issues of *distributive justice* become increasingly important as scarcity of resources and space increases (1993), and that "...sustainability is only possible if there is also *distributive justice*" [italics added] (2001, p. 108).

Regarding *distributive justice*, Rawls writes:

> A set of principles is required for choosing among the various social arrangements which determine this division of advantages and for underwriting an agreement on the proper distributive shares. These principles are the principles of social justice: they provide a way of assigning rights and duties in the basic institutions of society and they define the appropriate distribution of the benefits and burdens of social cooperation (1999, p. 4)

Distribution of fisheries resources has long been a major issue in Canada, and in recent years tensions seem to have worsened. On both coasts, fisheries allocation between Aboriginals and non-Aboriginals have triggered disputes, particularly on the east coast where violence erupted when, in autumn 1999, Aboriginal access to the lucrative lobster fishery was reaffirmed through the Supreme Court decision in *R. v. Marshall*. (See, for instance, Cox, 1999a; Cox, 1999b; Cox and Laghi, 1999; Cox and Leblanc, 1999; Ha, 1999; Leblanc, 1999.) After nearly three years of conflict and violence between Aboriginal and non-Aboriginal fishers in Burnt Church following the *Marshall* decision, Fisheries and Oceans Canada and the Burnt Church First Nation reached an agreement in principle in the summer of 2002 (2002, "The fishing rules on Miramichi Bay"). The northern shrimp fishery off the coast of Labrador has also been a focal point, when a relatively small portion of the total allowable catch was assigned to fishers from Prince Edward Island rather than local fishers (see, for example, Cox, 2000; MacDonald, 2000b; MacDonald, 2000a). On the west coast, DFO has presented a framework for allocation within the Pacific salmon fishery between Aboriginals, the commercial fleet, and recreational fishers (Canada, 1998a; Canada, 1999). However, this framework has not prevented disputes between users; also during the summer of 2002, non-Aboriginal commercial salmon fishers (including a Member of Parliament) conducted an illegal fishery in protest of Aboriginal salmon fishery openings along the Fraser River (Kennedy, 2002). Indeed, Healey and Hennessey contend that

part of the anger of non-Native fishers regarding co-management agreements between DFO and First Nations in the Fraser River stems from their exclusion during the negotiation phase (1998).

These five justices are interconnected and best served when considered in conjunction with one another. *Creative justice* and *ecosystem justice* can be helpful in deciding issues of *distributive justice*, and without *restorative justice* and *productive justice*, there will be less of the resource for all, including perhaps what is necessary to ensure the continued functioning of the ecosystem itself. The five justices, and their applicability in evaluating and managing fisheries, will be further discussed in Chapter 3.

John Rawls begins his well-known work *A Theory of Justice* with the statement, "Justice is the first virtue of social institutions, as truth is of systems of thought" (1999, p. 3). In many ways, fisheries are social institutions; justice, then, is a crucial cornerstone for those institutions.

1.4 The Salmon Fishery in British Columbia

Pacific Salmon Biology: An Overview

The Pacific salmon fishery, as prosecuted under federal Fisheries and Oceans Canada (DFO) jurisdiction in British Columbia, targets the five species of salmon (genus *Oncorhynchus*) found in the eastern Pacific ocean: sockeye (*O. nerka*), pink (*O. gorbuscha*), chum (*O. keta*), chinook (*O. tshawytscha*), and coho (*O. kisutch*) (Groot and Margolis, 1991; Lichatowich, 1999; Canada, 2001a). The remaining two species, masu (*O. masou*) and amago (*O. rhodurus*) are found only in the western Pacific Ocean (Groot and Margolis, 1991; Lichatowich, 1999). In fact, more than 9,600 salmon stocks have been identified (and of those nearly 5,500 assessed) in Canadian west coast waters (Canada, 2001a).

Steelhead and cutthroat trout, originally classified as *Salmo gairdneri* and *S. clarki clarki* respectively, have lately been reclassified as *O. mykiss* and *O. clarki* respectively (Groot and Margolis, 1991). However, these species are still known primarily as trout (Groot and Margolis, 1991) and, through a quirk of the Constitution of Canada which grants to provinces jurisdiction over freshwaters, remain under the management jurisdiction of the British Columbia government.

As anadromous and semelparous fish, Pacific salmon generally begin life in freshwater, migrate to sea, and return to their natal waters to spawn and die (Groot and Margolis, 1991; Healey, 1991; Canada, 2001a), although land-locked non-anadromous species, such as kokanee sockeye, live their entire life cycle in freshwater (Burgner, 1991). The length of time each species spends in freshwater before migrating to sea, and again the time spent at sea before the return spawning migration, varies both by species and even in cases by stock (Groot and Margolis, 1991). Sockeye, for example, spend between one and four years in the marine environment (Burgner, 1991). Pink salmon have shorter life cycles, in fact a fixed two-year life span with rare exceptions, with adults returning to spawn after just eighteen months (Heard, 1991). Due to this generally fixed life span, a major run of pink salmon occurs only every second year in many areas (Heard, 1991). Like pinks, chum also have short freshwater stages (Salo, 1991). The time in freshwater and at sea varies in the case of chinook, between the 'stream-type', which spend a year or more in freshwater as juveniles, and the 'ocean-type' (Canada, 2001a), which migrate to sea more quickly (typically within three months of emergence) and are most common north of 56°N on the coast of North America (Healey, 1991). Coho fry remain in freshwater for at least a year, and spend a minimum of eighteen months in ocean waters (Sandercock, 1991).

Sockeye, prized for its deep-red flesh, is the third most abundant of the five species (Burgner, 1991) and weighs in at an average of 2.7 kg (Gislason et al., 1996b). Although the smallest of the Pacific salmon (adults average 1 to 2.5 kg), pink salmon are the most abundant (Heard, 1991). Chinook (or spring) salmon are more than double the size of the second-largest chum, with an adult weight ranging between 6.75 and 25 kg (Canada, 2001a) and reaching up to 45 kg (Healey, 1991), and a world-record weight of 57.27 kg, making chinook "A favourite of the sport fishery..." (Canada, 2001a, p. 20). The weight of coho salmon ranges between 2 kg and 9 kg (Gislason et al., 1996b). Salo (1991, citing Anonymous, 1928) reports that chum salmon are the most widely distributed, and with an average adult weight of 20.8 kg and lengths up to 108.8 cm, are "...second only to chinook salmon (*O. tshawytscha*) in size"(p. 233). However, other sources indicate that the average weight of chum salmon is a more modest 5.5 kg (Gislason et al., 1996b), while a DFO source states that "While some have been known to weigh 15 kilograms, chum salmon average 3.5 to 4.5 kg, and can measure more than 100 cm at maturity" (Canada, 2000d). It therefore appears that, although the average weight of chum salmon is moderate, large individuals are not unknown. Furthermore, according to Pearse (1982), average size of all species but sockeye declined during the twentieth century. Additionally, "Historically... [chum may have] constituted up to 50% of the annual biomass of the seven species of Pacific salmon in the North Pacific Ocean" (Salo, 1991, p. 233).

Sectors in the Commercial Salmon Fishery

The British Columbia salmon fishery involves three commercial sectors: the troll sector (a hook and line fleet), and the gillnet and seine sectors (together referred to as the net fleet). Chinook and coho have traditionally been targeted by the troll fleet (Healey and Hennessey (1998) assert that the growing interest of Vancouver Island trollers in sockeye, chum, and pink salmon in the 1980s was one factor in the implementation of harvest allocations amongst commercial gear types), and are also favourites of the recreational fishing sector (Pearse, 1982; Gislason et al., 1996b). The net fleet (seine and gillnet) has traditionally targeted sockeye, pink, and chum (Pearse, 1982), and "In recent years, the hook and line fleets have increasingly targeted the traditional net species" (Gislason et al., 1996b). Based upon the report of Gislason et al. (1996b), the recent salmon allocation policy of the Department of Fisheries and Oceans assigns primacy of access to coho and chinook to the recreational sector, and sockeye, pink, and chum to the commercial sector, with the possibility of access to the other stocks "...when abundance permits..." (Canada, 1999).

Trollers (8 to 18 m) and gillnetters (8 to 11 m) are smaller than modern seiners (12 to 24 m), although the gillnetters tend to have the smallest crew, at just one or two employed crew members compared with up to five for each of the other vessel types (Gislason et al., 1996b). Prior to the so-called 'Mifflin Plan' for restructuring the Pacific salmon fishery, 'combination boats' using both troll and gillnet technologies were common; the Mifflin Plan forced fishers to choose just one gear type (Gislason et al., 1996b; Pacific Salmon Revitalization Plan Review Panel, 1996; Gregory, 2000). Generally speaking, trollers fish further from shore than do the gillnetters and seiners, and are therefore able to catch fish whose flesh is in better condition (Gislason et al., 1996b). Additionally, the hook and line gear enables trollers to fish in weedy or rocky areas not suitable for net gears (T. Pitcher, pers. com.), and causes less damage to the fish (such as bruising or net marks) than that caused by net gears (Gislason et al., 1996b). As such, troll-caught salmon can be of a greater economic value, commanding a premium at market.

An Abbreviated History of the British Columbia Salmon Fishery

Much of the history and culture of British Columbia is closely tied to Pacific salmon (Walters, 1995). For centuries, the Aboriginal peoples of British Columbia relied heavily upon the Pacific salmon – for food, for trade, for culture and ceremony (Newell, 1993; Glavin, 1996). An astonishing variety of gear and methods were used to catch the salmon, including nets, traps, weirs, harpoons and spears, gaffs, and trolling with baited hooks and lines from canoes, primarily in freshwater (Newell, 1993; Skaret, 2000).[4]

By the mid-1700s, newcomers had begun to arrive along the coast, first the Russians, then the Spanish and the English (Meggs, 1991). In 1871, British Columbia became a province of a young Canada (Newell, 1993). In that same year, the first continuous cannery operations began (Meggs, 1991; Newell, 1993; Meggs, 2000), both situated on the Fraser River near New Westminster. One was owned by Alexander Ewen, Alexander Loggie, James Wise, and David S. Hennessy, while the other was owned and operated by Capt. Edward Stamp and John Sullivan Deas (Meggs, 1991). Aboriginals participated in the commercial fishery, both as fishers (relying on gillnetting for the harvest) and working in the canneries (Meggs, 1991; Newell, 1993; Glavin, 1996). Soon, the ethnic composition of the fishing fleet and the cannery labourers had become more diverse, including immigrants from various European countries as well as from Japan and China (Meggs, 1991). The tinned salmon was destined for Britain where, "By the end of the century, canned salmon had become so basic to the British diet that it formed part of the army ration (Meggs, 1991, p. 20). Indeed, the expanding markets led to ever-increasing demand for salmon for cannery production (Meggs, 1991). Waste, however, was common in the early days of canning, due to an inability with processing facilities to keep pace with harvesting capacity during heavy runs and also because of species preferences (Meggs, 1991; Newell, 1993).

Reports regarding the canneries' species preferences are conflicting. Newell (1993, p. 46) reports that sockeye were the preferred species, and that sockeye was demanded by foreign markets until roughly 1905, when pink and chum also became marketable (p. 72). Meggs, however, states that, before 1876, chinooks were the main salmon to be canned (1991). He further reports that sockeye were retained for canning beginning in 1876, however pinks and chums in particular continued to be wasted for nearly more two decades (Meggs, 1991). According to Pearse (1982), before 1903 only sockeye, chinook, and coho salmon were retained by the canneries, but poor runs that year resulted in the harvest of pinks and chums. The reason for these conflicting reports is unclear, however it may be that the chinook, perhaps because of their large size, were preferred in the first few years of canning until the quality of tinned sockeye became apparent and thus was demanded by foreign markets. As canneries were developed along the coast, the mix of fish canned could conceivably vary depending upon the species available at a given location.

By 1889, conservation concerns reached a level which prompted "...the Tory government of Sir John A. Macdonald... [to announce] sweeping changes to the fisheries regulations, ostensibly to assure the conservation of salmon runs" (Meggs, 1991, p. 32). These regulations brought licensing to the Fraser River salmon fishery, but allocated 350 of the 450 available licenses to the canneries, meaning that "...'free fishermen' would be forced to work under the canners' thumb or quit fishing" (Meggs, 1991, p. 32). Following protests, the regulations were altered before being implemented in 1890, having increased the number of licenses to 500, the extra 50 having been allocated to independent fishers (Meggs, 1991). From

[4] The Aboriginal salmon fishery will be discussed in greater detail in Chapter 4.

June 1, 1892, fishing licences were extended without limit with regard to the total number available; in 1892, the number of licences increased from 500 to 721, while in 1893 1,174 boats fished for salmon on the Fraser River (Meggs, 1991). However, the licences were limited to British subjects (Meggs, 1991; Newell, 1993) who were *bona fide* fishermen, a term which was never clearly defined (Meggs, 1991). The regulations "...confirmed the secondary status of native people" (Meggs, 1991, p. 57).

Conservation concerns have continued since. In 1913, the infamous Hell's Gate slide occurred, when blasting for a railway in the Fraser Canyon resulted in a massive rockslide which blocked the path for migrating salmon (Meggs, 1991) and impeding upstream migration of interior runs of pink and sockeye salmon and thus severely impacting the runs (Newell, 1993; Canada, 2001a). The installation of fishways, beginning in 1945 (Pearse, 1982), improved the health of some stocks (Canada, 2001a).

Throughout the first half of the twentieth century, the fishery continued to develop and expand, incorporating new technologies which allowed motorisation of fishing vessels and mechanisation of gear (Meggs, 1991; Robson, 2000). As the canneries' interest shifted to chum and pink salmon, the number of purse seiners in the cannery fleets increased, as they could travel further and more efficiently catch schools of fish than could the gillnetters (Meggs, 1991). Labour within the fishery began to organise, in the United Fishermen and Allied Workers Union (UFAWU) and the Native Brotherhood (Meggs, 1991). Ethnic tensions continued, particularly in regard to Aboriginals and, following the Second World War and internment, Japanese Canadians (Meggs, 1991).

By the late 1950s, license limitation was under consideration by the federal government. First, economist Sol Sinclair investigated the issue, although a change in government blocked implementation of any of his recommendations (Meggs, 1991). Ten years later fisheries minister Jack Davis revisited this issue. Not only did the resulting 'Davis Plan', announced in 1968 and implemented beginning in 1969, involve the implementation of limited entry through licensing (Gislason et al., 1996b), resulting in a permanent limit to the number of vessel licences available (Gregory, 2000), but also a vessel buy-back scheme which led to the removal of several hundred vessels from the fishery (Meggs, 1991). The salmon fleet totalled 6,104 vessels in 1969 when the Davis Plan was implemented; it was reduced to 4,707 by 1980. Yet the number of seiners actually increased from 286 vessels to 316 and in fact most of the reductions had come from the troll and gillnet fleets (Meggs, 1991). However:

> Most of the boats lost to the fishery were small boats with a history of small landings, and central-coast native communities were hit harder. Elsewhere, fishing licences were doubled up on new boats, and the Davis Plan prompted a frenzy of boat-building on the Lower Fraser and the Lower Skeena. Several vessels bought back with Canadian tax dollars were auctioned off, without their licences, at fire-sale prices, and some vessels were bought by American fishermen who licensed them in Washington and used the boats to catch Fraser-bound salmon in American waters (Glavin, 1996, p. 48).

The actual impact of the reductions on the capacity to fish for British Columbia salmon was therefore dubious at best.

The Pearse Commission (Pearse, 1982) followed in the early 1980s, directed by another economist, Dr Peter Pearse. His conclusions focussed on three issues: overfishing (rather than habitat destruction) as the primary cause for stock declines; the need for property rights; and the need for economic efficiency within the fishery (Meggs, 1991). Regarding excess capacity in the commercial fleet, Pearse recommended licensing changes which would include single-gear and area licensing as well as rules to limit expansion of capacity through vessel upgrades (Pearse, 1982; Gregory, 2000, citing Pearse, 1982). However, "The Commission's recommendations had little support with the industry and were never acted upon" (Gregory, 2000, p. 13).

The mid-1990s brought the Pacific Salmon Revitalization Strategy, another restructuring plan which, in many ways, was foreshadowed by both the Davis Plan and the recommendations of the Pearse commission. In addition to voluntary retirement through licence buy-backs, this so-called 'Mifflin Plan' implemented area licensing, such that fishers could only fish in a limited geographic area (two areas for seiners, three for gillnetters and trollers) without purchasing and 'stacking' additional area licenses (Pacific Salmon Revitalization Plan Review Panel, 1996; Canada, 2000c; Gregory, 2000). Additionally, 'combination' boats were banned, and those who previously used both troll and gillnet gears were forced to choose just one unless licenses were 'stacked' (Pacific Salmon Revitalization Plan Review Panel, 1996; Canada, 2000c; Canada, 2000b; Gregory, 2000).

Licence retirement was effected through a reverse-auction process, whereby bidders provided sealed bids which provided such information as vessel length and gear type, and indicated the price for which a bidder would be willing to relinquish that licence (Gregory, 2000). This process occurred over two rounds within three months and attracted a total of total of 1,722 separate bids (Gregory, 2000, p. 3). In 1995, immediately prior to the Mifflin Plan, the commercial salmon sector was comprised of 2,543 gillnetters, 536 seiners, and 1,288 trollers (Gregory, 2000). Through the buy-back, a total of 798 licences were permanently removed from the commercial salmon fishery (447 gillnetters, 48 seiners, and 303 trollers) while 577 were stacked (371 gillnetters, 119 seiners, and 87 trollers, with the result that by December 1997 there remained 2081 gillnet licences (1703 active vessels), 488 seine licences (365 active vessels), and 992 troll licences (813 active vessels), for a total of 3561 salmon licences and 2881 active vessels (Gislason et al., 1996a; Gregory, 2000, citing Gislason 1996). Although a stated goal of the program was to remove 20% of licences from each of the three gear sectors, this was not the case, and although the program removed an aggregate of 19% of salmon licences, as with the Davis buy-back, those retired were disproportionately from the gillnet and troll fleets (Gregory, 2000). Yet another licence retirement program, the Canadian Fisheries Adjustment and Restructuring Program, announced in 1998, retired another 1,404 licences in three rounds of buybacks (Canada, 2002e). Through the 1990s, the number of commercial salmon licences was reduced from 4,486 (1990) to 2,860 (1999) (British Columbia, 2001a).

The Mifflin Plan was preceded by apparent failures of fisheries scientists in estimating run sizes. In 1992 and 1994, Fraser River sockeye went 'missing' by the hundreds of thousands (0.5 million fish and 1.3 million fish, respectively), when expected numbers did not materialise; by contrast, 1993 brought more fish than anticipated (Walters, 1995; Glavin, 1996, p. 46). (See also Gallaugher and Vodden, 1999.) As described above, the five species of Pacific salmon spend between two and four years in salt water; 'marine survival' rates vary due to a range or reasons, such as ocean conditions, for instance the effects of El Niño events (Canada, 2001a). Furthermore, the great migration distances impedes the ability to effectively monitor the salmon while in marine waters.

More recently, DFO has turned its attention to its "New Direction" series of salmon-related policies. The first framework document, *A New Direction for Canada's Pacific Salmon Fisheries* (Canada, 1998d), outlines the problems facing the Pacific salmon fisheries as well as a number of conservation-minded principles to be followed. Other papers in the series include *An Allocation Policy for Pacific Salmon* (Canada, 1999), and its new *Wild Salmon Policy – Discussion Paper* (Canada, 2000e), which, in conjunction with a review of the Salmonid Enhancement Program, was the focus of stakeholder and public consultations during the spring and summer of 2000. A report on the consultation process, *Final Report on Consultations for the Wild Salmon Policy Discussion Paper and the Salmonid Enhancement Program* (Dovetail Consulting Inc., 2000a) and supporting appendices (Dovetail Consulting Inc., 2000b) were completed and delivered to Fisheries and Oceans Canada soon after the close of the consultation, yet these were only released to the public in June, 2002 – nearly two years following the close of the public consultation. DFO Pacific Region has indicated that the outcome of the Wild Salmon process are planned to be rolled into a new policy forum structure, beginning in autumn, 2002 (J. Hartling, pers. com.). In addition to the above policy efforts, also in 2000, DFO released *A Framework for Improved Decision-Making in the Pacific Salmon Fishery – Discussion Paper* (Canada, 2000a).

Such efforts are demonstrative applications of creative justice as a means to bring into the decision-making process those whose livelihoods, communities, and often cultures, are dependent upon fisheries ecosystems. Following upon the Wild Salmon Policy consultation process, DFO has planned to implement a policy forum for consultation, as well as multistakeholder panels to determine policy priorities for the Pacific Region (J. Hartling, pers. com.). Particularly encouraging is the development of a Consultation Secretariat in the Pacific Region (Canada, 2002c; Canada, 2002d). The establishment of this unit is heartening, in that it indicates a growing awareness on the part of Fisheries and Oceans Canada of the deep need to include fishers, fishing communities, and the public in the broader discourse which may shape policies regarding fisheries, ecosystems, oceans, and human interactions therein. However, it is perhaps telling that, thus far, the Secretariat consists of just one person, and that although other co-management and consultation processes have been conducted in other regions, the Pacific Region is the only branch of DFO to have created such a unit (J. Hartling, pers. com.).

Yet it is essential that the consultation processes be genuine. As Arnstein (1969) declares, "There is a critical difference between going through the empty ritual of participation and having the real power needed to affect the outcome of the process" (p. 216). Arnstein presents a 'ladder of citizen participation', a ladder with eight rungs. Consultation ranks as a variety of tokenism, below partnership (which she classifies as the lowest of the three rungs which represent "increasing degrees of decision-making clout"). Thus, while it is very important that DFO has increasingly taken pains to begin to consult with stakeholders (however defined – and of course the very definition of 'stakeholder' is a common pitfall in consultations), consultations should not be the ultimate goal. As will be discussed in Chapter 2, just management is an essential component of just fisheries policy. It is not sufficient to merely consult with fishers and others; the input and knowledge shared must be carefully considered. Indeed:

> Inviting citizens' opinions, like informing them, can be a legitimate step toward their full participation. But if consulting them is not combined with other modes of participation, this rung of the ladder is still a sham since it

> offers no assurance that citizen concerns and ideas will be taken into account (Arnstein, 1969, p. 219).

Furthermore, when decision-making control is shared, creative justice flourishes. Increasing genuine participation of fishers and others in fisheries management and policy development will similarly allow fulfilment of the other four types of justice. As discussed above, creative justice and ecosystem justice are tightly linked; the sharing of detailed local or traditional ecological knowledge ('T/LEK') through creative justice may enhance understanding of the fisheries ecosystem. This will also contribute to the development of productive justice. Issues surrounding distributive justice may be more difficult to resolve through an open forum due to the contentious nature of any sort of allocation decision; yet, broad principles for sharing of the resource (not just between various user groups, but also in terms of leaving enough for the continued vitality of the resource itself) may be developed through such a forum. Similarly, the difficult decisions associated with restorative justice – of restoring a diminished resource to previous levels of abundance – may be approached broadly through discussion and shared decision-making.

Thus, DFO's recent efforts at consulting with fishers and the public in regard to British Columbia's salmon fisheries represent a useful starting point. Such consultations are essential to ethical fisheries policy-making, but are not in and of themselves sufficient. As will be explored in greater detail throughout this study, just fisheries policies demand additional efforts if fisheries ecosystems (and indeed the people and communities which depend on them) are to recover and begin to thrive.

This historical overview has been necessarily brief. Many significant issues facing the fishery have been excluded, such as: allocation issues between Canada and the United States and the Pacific Salmon Treaty and Pacific Salmon Commission; federal-provincial relations in fisheries management; recent concerns over conservation (particularly coho); and the relationships and interactions between the commercial fishery, the Aboriginal fishery and the Aboriginal Fisheries Strategy, and the sport fishery.

1.5 Research Contributions and Ownership

Portions of the research included in this thesis has been conducted jointly with or built upon the work of others, as follows:

The Rapfish rapid appraisal technique was originally developed by a group of researchers at the UBC Fisheries Centre. Dr Tony Pitcher and David Preikshot spearheaded the development, with contributions from Dr Daniel Pauly, Dr Alida Bundy, and others. (See, for example, Pitcher et al., 1998a; Pitcher et al., 1998b; Preikshot et al., 1998; Preikshot and Pauly, 1998.; Pitcher, 1999; Pitcher and Preikshot, 2001). Subsequent work has included an automation routine by Pat Kavanagh (Kavanagh, 2001), and further statistical testing by Dr Jackie Alder (Alder et al., 2000). Further refinement of the attributes has involved Dr Tony Pitcher, Dr Jackie Alder, Kristin Kaschner, Bridget Ferriss, and myself. Other developments in Rapfish to which I have contributed will be discussed below in the appropriate chapters.

In Chapter 3 I will discuss the development, refinement, and application of the ethical attributes applied in Rapfish. The attributes were developed based on the discussions with and contributions of the team of scholars which contributed to *Just Fish: Ethics and Canadian Marine Fisheries* (Coward et al., 2000), most notably Dr Rosemary Ommer and Scott Dunham.

Based on the team's suggestions, I drafted a set of proposed attributes, which were then refined through discussion with Dr Pitcher and feedback from the team members and initially published by Pitcher and Power (2000).

The paired comparison of the ethical attributes was conducted jointly with Dr Ratana Chuenpagdee. I developed the table describing each of the attributes and together we developed the scenarios and the questionnaire booklet. We also shared the tasks of conducting the survey and compiling the results. The interim results of this work were presented, in poster format, at the Coastal Zone Canada 2000 conference. Further results were presented as an oral paper at the Putting Fishers Knowledge to Work conference in 2001, and submitted for publication in the conference proceedings (Power and Chuenpagdee, 2002).

The main Rapfish analysis included in Chapter 3 was originally published in *Just Fish: Ethics and Canadian Marine Fisheries* (Pitcher and Power, 2000). I compiled the data necessary for the Rapfish analysis, Dr Pitcher conducted the Rapfish analysis, and we both contributed to the interpretation of results and preparation of the book chapter. Here, I have extended the analysis to include Ecosystem Justice. Furthermore, the discussion which follows includes the findings of the paired comparison study.

The Rapfish analysis of British Columbia Aboriginal salmon fisheries, presented in Chapter 4, was conducted jointly with Karen Skaret, and was originally presented by Ms Skaret as an undergraduate honours thesis in the UBC Faculty of Science (Skaret, 2000). We jointly collected and shared the data regarding the various fisheries included in the analysis, and we shared in the task of redesigning the attributes to account for the unique nature of the fisheries and the time period under consideration. The preliminary work was presented as an oral paper at the Coastal Zone Canada 2000 conference. I have subsequently reassessed the fisheries, particularly regarding the five justices.

The paired comparison study presented in Chapter 4 follows upon work conducted by the UBC Fisheries Centre's "Back to the Future" research group, as a contribution to the Coasts Under Stress project. I contributed to the broader project through involvement with the planning and administration of interviews conducted in Prince Rupert, British Columbia, in 2001, as well as participation in the science workshops held in Vancouver and St. John's in 2000. From data provided during these interviews and workshops, the Ecopath models were constructed by Dr Sheila Heymans, Cam Ainsworth, and Dr Tony Pitcher, and economic evaluations were conducted by Dr Rashid Sumaila and Eny Buchary; the questionnaires were based upon the interim results of these analyses. I also participated in the planning and administration of the community workshop held in Prince Rupert in December, 2001 (see Pitcher et al., 2002b), as well as the methods and results symposium hosted by the Fisheries Centre in February, 2002. The paired comparison survey represents one component of the overall team research project, for which I was solely responsible (see Power, 2002a).

CHAPTER 2:

THE RAPFISH METHOD OF RAPID APPRAISAL OF FISHERIES

2.1 The Rapfish Method

The Rapfish method for rapid appraisal of fisheries is a new multidisciplinary technique for assessing the relative sustainability of fisheries according to goals that may be defined from various angles. Further, it enables measurement of how well those sustainability goals are being met.

Moreover, the technique is heuristic, providing a structure which provokes a consideration of *how* one thinks about fisheries. Fisheries necessarily involve elements of human society and culture, biology, ecology, economics, and other factors. It is often difficult to comprehend the various inter-related, and frequently competing, facets associated with fisheries. Rapfish, as will be described below, supplies a framework for systematising these thoughts, for thinking of broadly-defined fields (such as the societal aspects of fisheries) and the constituent components of each of those fields (such as the level of fisheries participation in a defined community or region). The process by which the constituent components (referred to here as attributes or criteria) are developed for each fields (or discipline) requires thoughtful reflection on what is important, why, and how. Once it has been determined what is of broad importance to fisheries, the discipline-defined attributes may be used as a means to evaluate fisheries based upon the determined criteria. Furthermore, the process of considering a given fishery by each individual attribute necessitates a detailed examination of that fishery. Such a fine-scale evaluation of issues rarely considered at such a level of detail encourages one to rethink the broader or generally-accepted opinion regarding the fishery. This further enables a contemplation of the impact small changes within one component may have on the relative sustainability of the fishery according to the defined criteria. The additional step of regrouping the attributes into subsets, in this case by each of the five forms of justice, also promotes consideration of how the attributes inter-relate. As will be seen below, many attributes are representative of more than one type of justice, and as such there is a degree of overlap. However, it becomes apparent from the results presented in Chapter 3 that there is also a degree of tension between the five types of justice; based upon the assessment results, it appears that Creative and Distributive Justice may be grouped together, as may Productive and Restorative Justice, while Ecosystem Justice forms a sort of 'bridge' between these two pairs. In comparing the results between the various sub-evaluations, commonalities and differences between the attribute subsets, and hence the various ethical elements, are made evident.

Sustainability in this application means the relative 'health' of a given fishery and is defined within a number of fields. These fields vary and include, amongst others, ecological and social sustainability. Within each field are a number of criteria or 'attributes' considered by experts in a related research discipline to be crucial to the sustainability of a fishery. It is against these attributes which fisheries are measured. Taken together and using the multidimensional scaling approach to be described below, each fishery considered in a given Rapfish analysis is awarded an overall sustainability score relative to the best and worst possible scores within the field. This overall evaluation gives an overview of the comprehensive health of a fishery, and allows comparison with other fisheries and the traits which define the evaluated fisheries. From

such a comparison, it becomes possible to explore how to improve the status of an individual fishery, thus allowing policy evaluation and development.

It is important to note that Rapfish is not a stock assessment, nor does it aim to replace traditional stock assessments. A Rapfish evaluation will not answer questions of stock size or range, for example, nor will it provide specific guidance regarding the appropriate level of extraction. (In fact, data for certain Rapfish attributes, particularly in the ecological field, including for example range collapse, is typically gleaned from stock assessments.) Instead, the strength of Rapfish lies in first recognising the need for and subsequently providing a mechanism to cope with the diverse and often interconnected issues which influence decisions of fisheries policy. Rapfish provides a means to consider, for example, significant social considerations associated with fisheries; given the historical dependence of fishing communities on fisheries, social factors ought to be weighed in determining the overall status of a given fishery and also fisheries policy more broadly. As another consideration, changes in fisheries are often driven by technological developments; the technological field of attributes permits a comprehensive examination of a variety of technological issues, ranging from boat length to type of gear employed to onboard methods for handling the catch.

Rapfish, then, is a structure by which an holistic and cumulative appraisal of fisheries may be undertaken. From this evaluation, consideration of how to improve the overall health of a fishery may follow.

The inherent flexibility of Rapfish permits examination of fisheries at varying spatial scales and/or along a time trajectory. Fisheries may be defined on a scale from a single boat through a whole fleet in a given region, or subdivided by, for instance, species, or gear type. Furthermore, the technique is useful for comparing the same fishery in various time periods, allowing one to chart that fishery through time (Pitcher and Preikshot, 2001).

Rapfish is primarily used as a technique to assess the relative sustainability of fisheries in a number of discrete fields of attributes. Rapfish analyses enable a comparison of fisheries along a defined scale of sustainability within each of these fields. This measure of sustainability is defined based upon criteria presented in a number of attribute fields. Using constructed 'Good' and 'Bad' fisheries, described as the best and worst possible scores, respectively, for each attribute within a field, the fisheries are ordinated across an axis between the two extremes. These constructed fisheries serve as the limits of the ordination in the sustainability dimension, effectively constraining the results. (As such, any anomalous point which exceeds the limit indicates a problem with the data, such that the value for at least one attribute for that point exceeds the maximum or minimum possible; normally an error associated with data-entry.)

The Rapfish methodology is based on the statistical technique of multidimensional scaling ('MDS'), a non-parametric technique which represents spatially ('ordinates' or 'maps') the evaluated data (Stalans, 1995). In the Rapfish approach, the data are ordinated on an axis between 'Bad' and 'Good'. The attributes, which will be discussed in further detail below, are grouped in fields or categories. Each attribute against which a fishery is measured includes a range of options for responses. As this technique assumes only ordinal level of data (Stalans, 1995), the measurement scales assigned to Rapfish attributes can vary with each attribute as appropriate, rather than, for example, an absolute 10-point scale for all attributes. The convention of the Rapfish technique requires that the MDS be conducted in two dimensions, one (by convention and through rotation of the ordination the X-axis) indicating the range from 'Bad' to 'Good', and the other (again by convention and through rotation of the Y-axis) indicating the variability in the data scaled along the X-axis.

The original Rapfish methodology required the use of the SPSS statistical software package to conduct a multidimensional scaling routine for each separate attribute field. An automation routine for the Microsoft Excel spreadsheet software has recently been created by Pat Kavanagh (2001), which both expedites the process and ensures a degree of consistency in the results as there are fewer opportunities for user error or variation in MDS options.

This purpose-designed software permits, firstly, the basic MDS routine. However, options make possible additional statistical analyses, including a leverage analysis (to test for influence of each attribute on the overall ordination) and a Monte Carlo routine (which applies random error to the data to allow analysis of the effect of data uncertainty). The Monte Carlo option allows either a blanket level of error to be applied to each score (set initially at a 20% level of perturbation (Kavanagh, 2001)), or a user-defined error range. This user-defined option is preferable when there may be variation in the degree of scoring uncertainty by attribute, and furthermore permits asymmetrical error (E_{min} and E_{max}), which is particularly useful in accounting for expected over- or under-estimation of the data in scoring. At present, this error definition is limited to individual attributes; that is, one level of error range for all fishery scores for a single attribute. Ideally, it would be preferable to define the error range for each individual data point, thereby accounting for not just blanket error across an attribute but by fishery as well. As quality of data varies with individual fisheries (particularly those prosecuted in the distant past), the development of a protocol within the Rapfish software package to permit error definition for each individual data point would be desirable.

The results of a Rapfish analysis may be presented graphically on a traditional scatter plot showing only the X-axis, in which case one can easily see the distribution of the fisheries (including any isolation or clumping of fisheries) between the good and bad extremes of the X-axis for a given single attribute field. The Y-axis vertical distribution in such a presentation indicates variance between the fisheries, although certain fisheries may have similar positions on the sustainability axis. Alternatively, kite diagrams may be presented to compare aggregations of fisheries across multiple attribute fields (see, for example, Pitcher, 1999). The score itself may be presented as a percentage sustainability score, with the 'good' fishery scoring 100% and the 'bad' fishery scoring 0%, either graphically or in a table. This has the advantage of quickly presenting a ranking of the assessed fisheries and of being easily translated into prose, but at the expense of information about the variability otherwise shown on the Y-axis.

As noted above, the method is structured on categories of attributes. These attributes are crucial, as they define the questions against which the fisheries are made to answer. Thus, once the attributes have been defined, and the fisheries chosen, a score is assigned for each attribute for each fishery, using a simple spreadsheet. Originally, Rapfish attributes were categorised in four disciplines: Ecological, Economic, Social, and Technological (Pitcher et al., 1998b; Preikshot et al., 1998). The early attributes were determined through literature reviews, and interviews and meetings with experts (Pitcher et al., 1998b). From the beginning, attributes were chosen only if they could clearly be assigned the 'good' and 'bad' extremes in relation to sustainability, were readily and objectively scored, and that, with improved information, scores could be easily updated without disrupting the whole analysis (see Pitcher et al., 1998b; Alder et al., 2000; Pitcher and Power, 2000). Although the attributes should remain constant across analyses to enable comparison of results, they may be altered to suit a given analysis (Pitcher, 1999). For example, the set of ethical attributes was supplemented for the assessment of Aboriginal salmon fisheries (Chapter 4), to capture the complexities arising when tracing a lengthy time trajectory.

The earliest applications of this method included up to 25 attributes in each evaluation field, and were developed following consultations with experts and a review of the relevant literature (Pitcher et al., 1998b). These attributes, indeed all attributes which have been incorporated into Rapfish, were required to represent essential conditions for sustainability as defined within the particular attribute field. Thus, each attribute effectively provided an insight into a single element of a comprehensive sustainability, and together all the attributes in a field represented the core factors for a healthy, sustainable fishery. With testing, it became apparent that not all attributes provided sufficient insight, or were found to be ambiguous, and hence were dropped. Furthermore, as described above, the technique requires that each attribute must be allow a clear definition of 'good' and 'bad' extremes; those that lacked such clarity could not be retained. Moreover, given that it is desirable to include three times as many fisheries as attributes in an analysis (Stalans, 1995; see also Pitcher et al., 1998a; Alder et al., 2000; Pitcher and Power, 2000; Pitcher and Preikshot, 2001), a large number of attributes quickly becomes cumbersome (Pitcher, 1999; Pitcher and Preikshot, 2001). The number of attributes within each field have now been reduced to ten or fewer in most cases.

Over time and with use, the attributes have further evolved[5]. The attributes included have also been refined and changed in many cases, and newer attributes have replaced earlier attributes. For instance, catch per fisher was included in the early Ecological attributes but has since been discarded for various reasons, including that it was often prohibitively difficult to access this data. As well, it became apparent that a post-collapse fishery, such as the Newfoundland cod, would exhibit a low catch per fisher – ostensibly a 'good' score, but masking the fact that an earlier high catch per fisher preceded a collapse of the stock. Also in the Ecological discipline, change in trophic level was added. Such an attribute helps to monitor the ecosystem in which the fishery itself operates, and was thought to be useful for further tracking changes in the broader fishery.

While the attributes are central to the Rapfish methodology, another strength of the approach is found in the flexibility of those attributes. That is, new attributes may be added, others dropped, or existing attributes modified, to customise an analysis. It should be noted that, while this is a useful feature, for individual assessments to be comparable, the same attribute set must be used. Thus if comparability is desired, it is advisable to conduct the general assessment with the existing attributes, in addition to the modified assessment.

Similarly, the Rapfish methodology may be applied to other considerations, either as a unique, one-off study or as a new framework which can be used for evaluation in a number of applications. Gregory (2000) for instance used the Rapfish approach to evaluate the licence buy-back program in British Columbia's commercial salmon fishery. As well, a further set of Rapfish attributes has been developed by Pitcher (1999), based around the Code of Conduct for Responsible Fisheries. These attributes in some ways form a distinct Rapfish analysis, as there are six sub-categories of attributes within the Code category. Thus, at present, there are five main Rapfish disciplinary categories, and six additional Code Rapfish categories, for a total of eleven categories and sub-categories. Recently, Pitcher (in press) has begun to examine the application of Rapfish to sports fisheries.

A range of attributes designed to test the ethical status of Canadian fisheries was developed for "Fish Figures: Quantifying the Ethical Status of Canadian Fisheries, East and West" (Pitcher and Power, 2000), published in *Just Fish: Ethics and Canadian Marine Fisheries* (Coward et al., 2000). The development of these attributes followed a similarly

[5] A listing of current attributes are provided at http://fisheries.ubc.ca/projects/rapfish.php.

iterative evolution as with the four original disciplinary categories, but originated as a contribution to a particular research project. As participants in an interdisciplinary research project intended to investigate Canadian fisheries and concepts of ethics and justice, Pitcher and Power engaged in discussions with the team regarding the nature of ethics. Following initial discussions, a set of proposed attributes were drafted and circulated to team members for comment. The set of proposed attributes expanded, contracted, and was modified based upon the team's comments. Through a number of iterations, the attributes were refined and finalised to those which are discussed in detail below. The final set of nine attributes were applied to a selection of Canadian marine fisheries; the attributes were first described, and the results of the assessment of Canadian fisheries, were subsequently published as a chapter (Pitcher and Power, 2000) in *Just Fish* (Coward et al., 2000).

It must be noted, however, that unlike the original four disciplinary fields, which were designed around no specific fishery or research project, the Ethical attributes were originally created specifically for the *Just Fish* study. Some further research has since been conducted using these attributes (for instance, Alder et al., 2000), but the applicability to non-Canadian fisheries has not yet been thoroughly tested. Further studies need to be conducted to test the applicability of these attributes to fisheries in other parts of the world, and to determine whether any cultural bias exists in the attributes as written.

Note that there is a degree of similarity between attributes in some cases, although the similar attributes appear in different disciplinary categories. For instance, Discards and Wastes (Ethical attribute) may appear similar to Discarded Bycatch (Ecological attribute). These two attributes are in fact related, in that they both focus on wastage of fish, but they consider different aspects of the problem: in the ethical realm, the attribute acknowledges the ethical implications of such waste (occurring for whatever reason), from both a human and environmental perspective. In the ecological discipline, the related attribute considers only the amount of bycatch in a fishery, without exploring or acknowledging any reasons why bycatch discards are to be avoided beyond basic issues of ecological sustainability.

Recognising that the attributes are not of equal importance in consideration, the Rapfish team has conducted a participatory study to identify those which are so immutably important that, should a fishery score poorly in that regard, it should fail in the entire disciplinary category. Two separate surveys using the paired comparison method (following the methods presented by Chuenpagdee, 1998) have permitted a 'ranking' of the attributes. The first study, included in this thesis and presented below, examined only the Ethical attributes, in which 20-30 people were approached in each of three groups: formal experts (such as policy-makers, managers, and researchers), fishers, and others (including those with indirect ties to the fishery, for instance through an organisation, and those with no connection to the fishery). This study was geographically limited to British Columbia. The interim results of this study were presented as a poster paper at Coastal Zone Canada 2000; further results were presented as an oral paper at the Putting Fishers' Knowledge to Work conference in August 2001 (Power and Chuenpagdee, 2002). These results are reported below.[6]

Note that this study was intended to further develop the applicability of the original Ethical attributes, and was designed and conducted following the original publication of the attributes by Pitcher and Power (2000). Thus, the Ethical attributes can be described as having a

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[6] A second study has been conducted following the same methodology, but including all five sets of attributes. This study, however, involved only those familiar with Rapfish, either through participation in the development of Rapfish or through its application, and was not geographically limited. These results are not included here.

two-stage development process: the first, the initial development and application of the attributes, occurred as a component of the *Just Fish* project (Coward et al., 2000), while the second, the paired comparison survey, aimed to extend the attributes through the determination of a relative ranking of the attributes.

Such a ranking is useful for a number of reasons. Firstly, it will enable identification of crucial attributes in each field which are perceived as being of such importance that, if a fishery scores extremely poorly on that attribute, the fishery should 'fail' in the entire field. The mechanism to ensure such a failure would be to automatically give that fishery the worst possible score in each remaining attribute in the field. Secondly, an awareness of perceived importance can provide useful direction for policy-making. That is, when difficult policy decisions must be made, an understanding of policy preferences can act as a framework or guideline in decision-making. Policy considerations are no doubt given unequal weight in decision-making. This ranking can provide guidance on how to weight this particular selection of considerations.

In this study, the fisheries included in the various Rapfish evaluations have capitalised on this flexibility. Marine fisheries from Canada's east and west coasts have been assessed against the Rapfish ethical attributes. Special attention has been given to British Columbia's commercial and Aboriginal salmon fisheries. These analyses will be presented in Chapters 3 (east and west coast fisheries) and 4 (Aboriginal salmon fisheries), with a detailed look at BC's commercial fishery for Pacific salmon included in Chapter 6.

2.2 The Rapfish Ethical Attributes

As discussed above, Rapfish was originally limited to just four attribute fields. With the guidance of the *Just Fish* scholars, Pitcher and Power (2000) developed a fifth field to assess the ethical status of fisheries. Whereas the attributes in the original four fields were unidirectional, some of the ethical attributes measure both positive and negative (Pitcher and Power, 2000). (See Appendix 1 for the full scoring scheme of the for the ethical attributes.)

The Ethical field initially included nine attributes. As with the original attribute fields, sustainability (meaning that the resource and fishing activity are able to continue) was the primary guiding principle, with justice as the defining factor (Pitcher and Power, 2000). These attributes, as well as the rationale for each, are described below:

1. *Adjacency and reliance* – It is believed that those who have a long-term historical reliance on the fish resource (i.e., many generations), and/or those who live in very close proximity of the resource, will act as better stewards of the resource, particularly when the fishers demonstrate both adjacency and reliance. Many traditional, sustainable, fisheries are conducted very close to the communities in which the fishers live, and the families in those communities may have relied on the resource for several generations. (See for instance McFague, 1993; Suzuki and McConnell, 1997; Gallaugher and Vodden, 1999; Pinkerton, 1999.)
2. *Alternatives* – Is the fishery the employer of last resort, or do fishers deliberately choose to enter the fishery to earn a living? When fisheries are the only source of employment, fishers have little choice but to continue to fish, even to the detriment of the long-term viability of the fishery (Rice, 2002). This attribute considers alternative sources of employment outside of the fishery, whether in other resource-

based industries or beyond. Alternatives within the fishing sector – such as fishing for alternative species or working in fish processing plants – are not considered as alternatives to the fishery, as they involve a continued general dependence on the fishery. When fishers have alternatives to the fishery, they may choose to earn their living – and support their families – through the alternative.

3. *Equity in entry* – Many modern fisheries are regulated, particularly in terms of entry. Even traditional fisheries may involve restricted entry, through licensing or other requirements. Such is true for British Columbia's Pacific salmon fisheries, where not only are licences required (Gislason et al., 1996b), but, since the mid-1990s, licences have been tied to a geographical area (Pacific Salmon Revitalization Plan Review Panel, 1996). Such restrictions are, *inter alia*, intended to manage the fishery for long-term sustainability. From an ethical perspective, one must consider how eligibility for entry into the fishery is determined. For fairness, traditional access and/or harvests should be a basis for determining entry, but this is not always the case. Especially positive are cases where a traditional (Aboriginal or otherwise) fishery is permitted to operate within a modern regulatory environment.

4. *Just management* – Those who are most reliant on the fishery resource ought to be included in the management of that resource. Many times, they have a very detailed knowledge of the resource (at least the localised portion in which they are involved), as well as a justified stake in the protection of the resource. As well, participatory governance can increase the credibility of both the decision-making process and the resulting outcomes, thereby encouraging improved compliance with decisions (Rice, 2002). However, the inclusion of participants must be genuine with the fishers' contributions being considered appropriately in management decisions. There is a range of options for inclusion of fishers in management, from the non-existent and cursory (perhaps even 'optical' rather than actual), such as a consultation process wherein fishers are asked for their opinion but those opinions may or may not be weighed in the final management decisions, through to true co-management of the resource in which all concerned parties are actively and equally involved in reaching a management decision. (Consider for example the ladder of citizen participation proposed by Arnstein (1969).) Furthermore, this attribute measures who instigates or leads the process, with higher scores being given to those cases where resource users are the principals rather than a governmental body, and the best score is reserved for instances where all concerned parties are equal.

5. *Influences in ethical formation* – The 'nature versus nurture' debate notwithstanding, we are all subjected to influences which socialise and form us on various levels, including our ethical beliefs. These influences shape our value systems, may be positive or negative, and may even shift between the two paradigms depending on the circumstances. The value systems may be directly related to the fishery (similar, then, to the attribute regarding socialisation of fishing), or more general (such as a sense of fairness or justice, or right and wrong). Such influences include 'structures' such as churches or other religious institutions, elders, families, industry, and unions. Therefore, this attribute is concerned with the 'net' effect of these influences, whether positive or negative, and measures both sides of the equation

6. *Mitigation of habitat destruction* – Whether through fishing or other activities, the habitat of the fish may have been previously, or may continue to be, damaged. Mitigation of the damage may include restoration of polluted waters or rehabilitation of damaged salmon streams. This attribute again considers both the negative and positive issues, that is, whether damage is ongoing through to mitigation of past damage.
7. *Mitigation of ecosystem depletion* – Through fishing activities, the ecosystem may be damaged. An ecological attribute, change in trophic level, helps to measure changes to the ecosystem; this attribute considers the response to the damage, and whether the damage continues.
8. *Illegal fishing* – Fishing can only be illegal if it has been defined as such, making this a particularly thorny ethical issue. Illegal fishing – illegal catching, poaching, transshipments, etc. – is bad for sustainability as it can make stock assessment more difficult and mask the volume of the actual total catch. It can also deprive those who work in supporting industries (such as processing), as well as legal fishers themselves, of income. However, one should also consider the reason why illegal fishing is occurring. It may be due to greed, with an individual or company being dissatisfied with their allocation. Yet it might also be due to – and therefore indicative of – a more basic injustice. For instance, a subsistence fishery may be declared 'illegal', leaving people with the choice of either going hungry or breaking the law. Or, those who have had a long historical reliance on the fishery may have been excluded through limited entry. The aforementioned 1999 case regarding the Atlantic Canadian lobster fishery arose from a court challenge of a poaching charge levelled against an Aboriginal fisher who, it was eventually reaffirmed by the top court, actually had a treaty right to fish. Although it may be difficult to determine the causes and nature of any illegal fishing within a fishery, such activity may be an indicator of deeper ethical issues.
9. *Discards and wastes* – Waste of food – and of the fish resource – can be interpreted as an ethical issue, particularly when hunger is a pervasive problem in much of the world. Furthermore, the unnecessary killing of animals can also be seen to be unjust. Fisheries which result in much discarding and/or wasting of fish will score poorly on this attribute. In addition, wanton waste demonstrates a lack of respect toward and/or awareness of the intrinsic value of the fish, in opposition to some eco-theological values discussed in Chapter 1 (McFague, 1993; McFague, 1997).

Of these nine ethical attributes, eight continue to be applied in Rapfish analyses. 'Influences in ethical formation' has been excluded from analyses subsequent to Pitcher and Power (2000), primarily because it was overly subjective; that is, it was found that what some believed to be a positive influence, others believed to be negative. As noted earlier, a major criterion in determining whether to include an attribute in a Rapfish field is that it must allow for clear definition of 'good' and 'bad' (Pitcher et al., 1998b). This ethical attribute did not allow for definitive determination of 'good' and 'bad', and furthermore may have been subjective across cultures. Additionally, it has been suggested (T. Pitcher, pers. com.) that the attribute would have little discriminating power in less pluralistic societies, for instance a country in which virtually all citizens are at minimum nominal adherents to a single faith (for example, Islam in Indonesia), and that in some countries, such as those in Latin America or Southern Europe, a majority wish to be regarded as belonging to the Roman Catholic Church.

2.3 Ranking the Rapfish Ethical Attributes: A Participatory Vetting

Rapfish permits evaluation of a fishery across a number of criteria within each field of attributes. Initially, these attributes have been treated as equal. Yet it is both possible and desirable to give weight to the attributes so as to reflect preferred policy alternatives. The weighting can be either positive or negative; that is, a policy maker may choose to emphasise a certain attribute for either its desired benefits or its apparent losses. An attribute which reflects the desired outcome may be given additional weight, whereas one which indicates significant negative outcomes may be weighted to significantly decrease the entire analysis of a given fishery within that one field.

It was thus decided that a ranking of the Rapfish Ethical attributes should be developed. Such a ranking can provide guidance in determining fisheries policy; that is, what issues should be given greater or lesser consideration in making policy decisions? Of the nine attributes described in Chapter 1 and applied to the analysis above, the question was asked, what is the relative importance of each.

To determine this ranking, a survey was conducted. Using pairwise comparisons of each attribute (see Chuenpagdee, 1998), each respondent was asked to indicate which attribute in each pair was most important, thus enabling identification of a respondent's preferences among the given set of choices (Peterson and Brown, 1998). From the results, an overall ranking by individual and by groups of respondents (fishers, formal experts, and lay experts) was obtained, providing guidance on the appropriate weighting of the attributes and subsequent results in policy analysis. These results were presented at the Coastal Zone Canada 2000 and Putting Fishers' Knowledge to Work conferences, and published by Power and Chuenpagdee (2002),

In the paired comparison method, each object (in this case, each ethical attribute) is presented in pairwise comparison with each other attribute. The respondent is asked to choose one object in each pair; in this study, respondents were asked to choose which attribute in each pair they felt should be given greater consideration by policy makers in designing fisheries policy. In this particular study, the nine attributes were presented in 36 pairs, employing all possible pairwise comparisons of the ethical attributes, where the total number of n attributes for each respondent equals $[n(n\text{-}1)]/2$ (Chuenpagdee, 1998; Chuenpagdee et al., 2001; Power and Chuenpagdee, 2002). Each respondent was provided with a survey booklet which included all 36 pairs, in random order. Furthermore, individual attributes were assigned the A and B position roughly equally. The front cover of the booklet provided instructions for the survey and included an individual serial number by which respondents could be tracked, and the final page of the booklet included questions regarding demographic information of the respondents and invited comments. Figure 4 presents an example of a page in the paired comparison survey booklet.

Note that the attributes were reworded from how originally described by Pitcher and Power (2000) and discussed in Chapter 1 above. This was done so as to avoid bias in the wording. For instance, 'Illegal Fishing' became 'The existence of fishing practices beyond regulations', as it was felt that the use of the word 'illegal' would bias results. A full listing of the exact wording of each attribute, as originally described and as applied in the paired comparison study, is provided in Table 2.

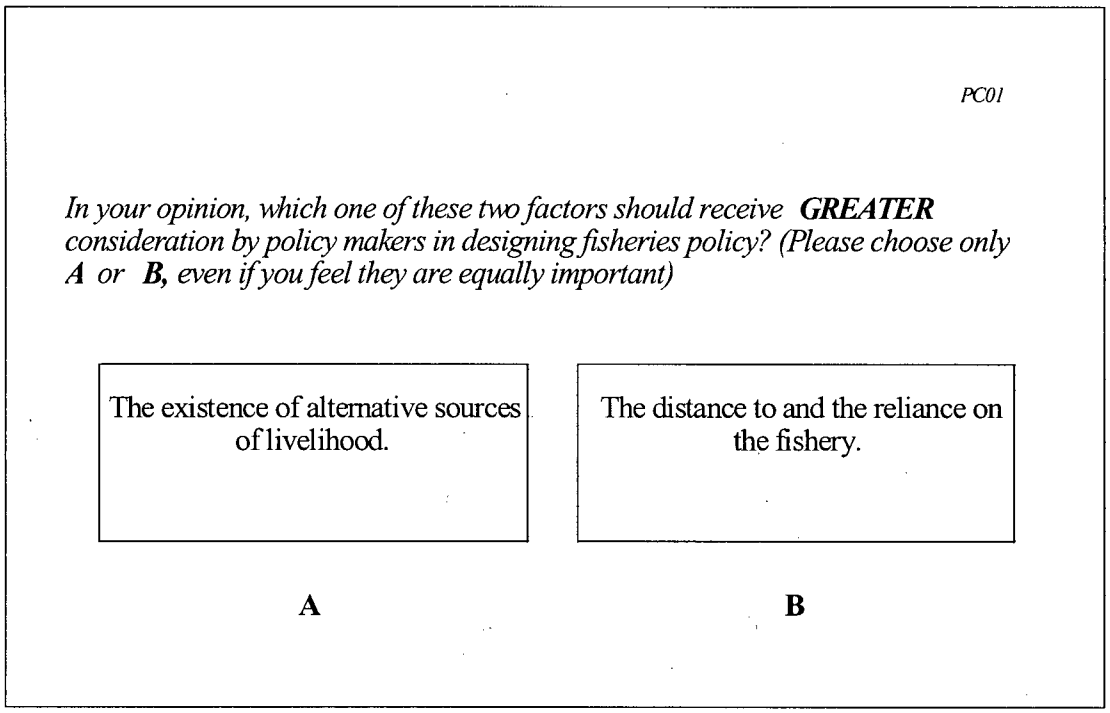

Figure 4: Example of a paired comparison as presented to respondents

Table 2: Ethical Attributes as Used in Paired Comparison Study

Abbreviation	Definition Wording in Survey	Definition Wording in Rapfish
Distance	The distance to and the reliance on the fishery	Adjacency and reliance
Alternatives	The existence of alternative sources of livelihood	Alternatives
Traditional	The existence of traditional or historical fishing access	Equity in entry to fishery
Inclusion	The inclusion of fishers in the management of their fishery	Just management
Structure	The existence of social/political structures influencing fishers' values	Influences in ethical formation
Habitat	The human influences on fish habitats	Mitigation of habitat destruction
Ecosystem	The fishing impacts on the fisheries ecosystem	Mitigation of ecosystem depletion
Unreported	The existence of fishing practices beyond regulations	Illegal fishing
Discard	The level of utilisation of fish which are caught in a fishery	Discards and wastes

A snowball approach was adopted for contacting potential respondents. Initially, individuals already known to the researchers were contacted, and asked participate. Additionally, individuals were approached at fisheries-related meetings and at fish docks. In all cases, respondents were asked to recommend others to be contacted. This varied approach was

considered most appropriate given the limited prior contact in some of the communities and limited time available within those communities during the research study. One inevitable drawback arising from not employing a more random selection of respondents is the potential for over-representing some groups and under-representing others in the responses. To overcome this limitation, as was described above, respondents from various locations within British Columbia and from various backgrounds (for instance, the 'Formal Experts' groups included academics representing a variety of associated disciplinary backgrounds) were invited to participate. As well, the snowball approach encouraged a breadth of respondents, through divergent recommendations from various respondents.

Respondents were stratified into three groups: fishers (n=17), formal experts (n=22), and the public (n=19), for a total 58 respondents. The formal experts group included academics, researchers, and officials with expertise in fisheries, ethics, and related fields, and thus included social and natural scientists among others. The survey booklets were delivered by hand and by mail to those already known; respondents were also asked to recommend others who could be contacted for participation. Fishers were surveyed by mail and in person, mainly at fisheries meetings and fishing docks. All respondents were residents of various regions of British Columbia, including the Lower Mainland, the North Coast (notably Prince Rupert and environs), and Vancouver Island.

The individual surveys were scored to determine a preference ranking for each individual respondent. This was done by entering the respondent's choice for each pair into a matrix, awarding a score of 1 for the chosen attribute and a score of 0 for the attribute not selected. The score for each attribute was summed and the totals for each attribute entered into a Microsoft Excel spreadsheet. For each attribute, these individual totals were then summed across all respondents within the spreadsheet, then divided by the maximum possible number of times that that attribute could have been selected by all respondents. That figure was then multiplied by 100 to normalise the results on a scale of 0-100.

While scoring the survey responses of each respondent, intransitive responses could be noted. Intransitive responses are indicative of a respondent's inconsistency in making choices between paired objects, such that, for example in a paired comparison of three objects, x is preferred to y and y is preferred to z, but z is preferred to x, resulting in a circular triad (Chuenpagdee, 1998; Peterson and Brown, 1998; Power and Chuenpagdee, 2002). A 'Perfect' response indicates no inconsistency. Chuenpagdee (1998) writes, "Individuals are not always perfectly consistent in their choices." Indeed, some choices may in some instances be more preferable, but less so in other circumstances. Table 3 describes the number of respondents in each group and overall, as well as the occurrence of perfect responses within each respondent group and for all respondents.

Table 3: Respondent and Response Data, Ethical Attribute Paired Comparison

	Number of Respondents	Number of Perfect Responses	Percentage of Perfect Responses
Combined	58	10	17%
Fishers	17	4	24%
Formal Experts	22	4	18%
Public	19	2	11%

Using the methodology described by Chuenpagdee (1998), the raw aggregate (by respondent group and overall) scores were normalised on a scale of 0 to 100, such that a score of 0 would indicate that the attribute was never selected in any pairwise comparison and a score of 100 would indicate that the attribute was always selected in every pairwise comparison in which it occurred. Thus, a score of 0 would indicate that the attribute had no importance to respondents, while a score of 100 would indicate ultimate importance. These normalised, aggregate scores are presented in Figure 5 (Combined results, all respondent groups), Figure 6 (Fishers), Figure 7 (Formal experts), and Figure 8 (Public).

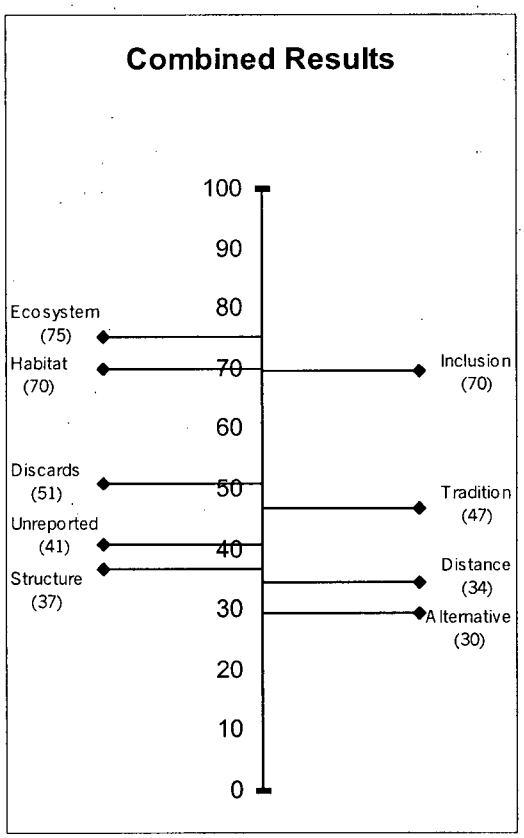

Figure 5: Scaled ranking results, Ethical attributes, combined responses

(Note: Results are distributed on either side of the y-axis only for clarity of presentation.)

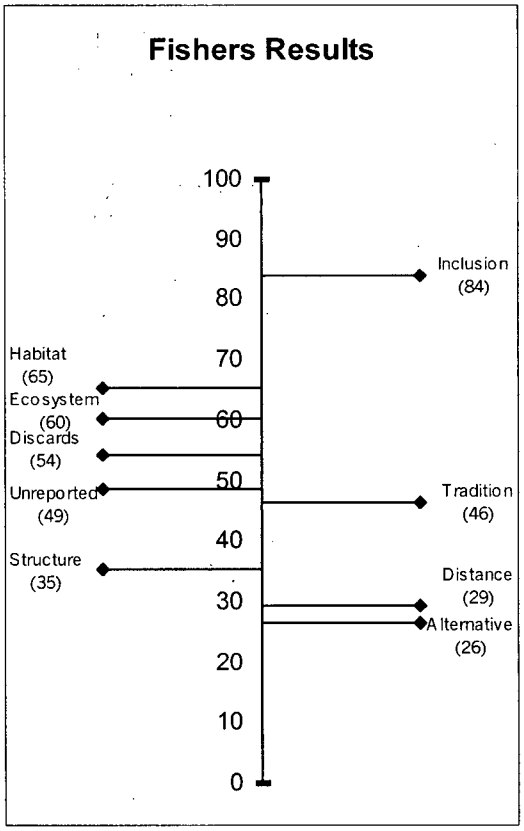

Figure 6: Scaled ranking results, Ethical attributes, responses of fishers

(Note: Results are distributed on either side of the y-axis only for clarity of presentation.)

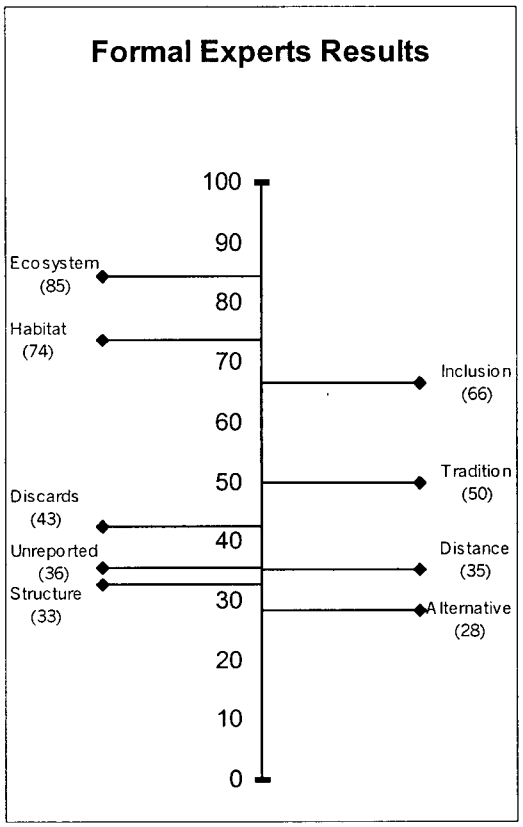

Figure 7: Scaled ranking results, Ethical attributes, responses of formal experts

(Note: Results are distributed on either side of the y-axis only for clarity of presentation.)

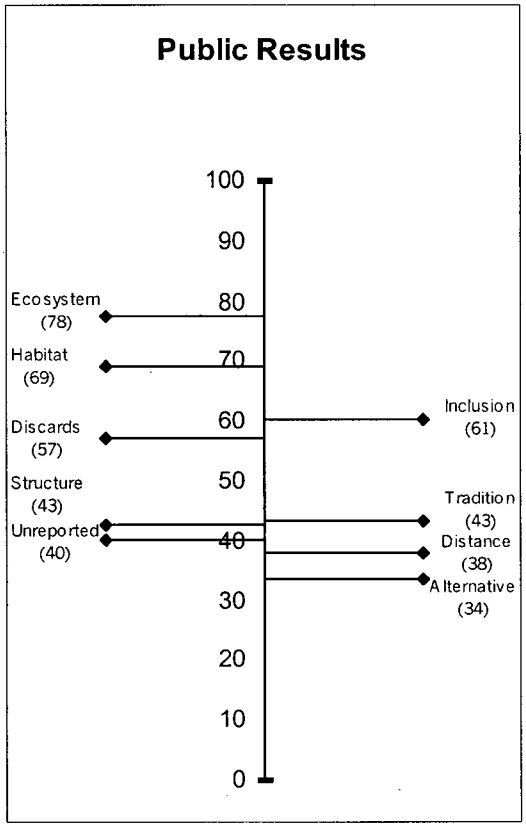

Figure 8: Scaled ranking results, Ethical attributes, responses of the public

(Note: Results are distributed on either side of the y-axis only for clarity of presentation.)

The aggregate rankings, by respondent group and overall, are presented in Table 4. Note that Power and Chuenpagdee (2001) found that the rankings of each respondent group were not significantly different from each of the other respondent groups, and as such the results of the combined grouping, shown in Figure 5, can be taken as the final result by which policy decisions may be guided. Chuenpagdee (pers. com.) has found that, with as few as 20 respondents, correlation of results stabilises, and there is little value to be had by increasing the number of respondents beyond a threshold of 25. Power and Chuenpagdee's rank correlation table is presented in Table 5 below.

Thus, in making policy decisions, the fishing impacts on the fisheries ecosystem should be given priority amongst these nine considerations, followed by human influences on fish habitats. These results, along with a fourth-place ranking for discards, indicate a strong concern for the ecosystem itself. Note that inclusion (just management) ranks third overall, a convincing indicator of the value of *creative justice* and the desire to engage in discussions regarding fisheries – who should fish, how the fishing should occur, and how to live up to our stewardship obligations towards the fish.

It is interesting to consider that the three least-important considerations were alternatives (employment), distance (adjacency and reliance), and structures (influences in ethical formation). Firstly note that structures represents the attribute which has been excluded subsequent to Pitcher and Power (2000). As described above, this attribute was discontinued due

to lack of objectivity and discriminating power; that it generally was held in low regard by respondents further validates the discontinuation of this attribute.

Table 4: Rank summary of Ethical Attribute Paired Comparison results

Rank by Respondent Groups	**Distance**	**Alternatives**	**Traditional**	**Inclusion**	**Structure**	**Habitat**	**Ecosystem**	**Unreported**	**Discards**
Combined	8(34)[1]	9(30)	5(47)	3(70)	7(37)	2(70)	1(75)	6(41)	4(51)
Fishers	8(29)	9(26)	6(46)	1(84)	7(35)	2(65)	3(60)	5(49)	4(54)
Formal Experts	7(35)	9(28)	4(50)	3(66)	8(33)	2(74)	1(85)	6(36)	5(43)
Public	8(38)	9(34)	5(43)	3(61)	6(43)	2(69)	1(78)	7(40)	4(57)

Note:

1. Figures in brackets indicate scaled result (normalised 0-100).

Table 5: Rank correlation table, Paired Comparison study of Rapfish Ethical Attributes

	Formal Experts	Fishers	Public
Formal Experts	1		
Fishers	0.87	1	
Public	0.93	0.88	1

(source: Power and Chuenpagdee, 2001, Table 2)

It is perhaps surprising that distance was considered to be of such low importance. The rationale for this attribute includes a sense that those who fish in home waters and have an inter-generational connection with the fishery will feel deeper concern for the fishery and hence a greater motivation to act as responsible, caring stewards within the fisheries ecosystem. This result raises the question of whether, in our modern industrial society, such a connection could prevail or even persist. For a useful comparison, it would be interesting to see whether this result would hold in other jurisdictions. Similar is true for alternatives, which ranked last in all respondent groups. While in many coastal communities the employment options may be very limited, it may be that in our society the perception of alternatives exceeds the reality. Furthermore, respondents may have considered migration to from rural areas to urban centres as an alternative and thus tempered their evaluation of the attribute accordingly. Finally, the expectation that these factors would be weighted more highly may be an artefact of a romanticisation of traditional fishing cultures.

How this weighting could affect Rapfish assessments and policy decisions is explored in greater detail in Chapter 3.

2.4 The Five Justices and Rapfish Attributes

As discussed in Chapter 1, the *Just Fish* team identified five types of justice at play in fisheries issues (Coward et al., 2000; Ommer, 2000). The five justices provided an initial framework upon which the original nine Rapfish Ethical attributes were developed by Pitcher and Power (2000). In this chapter, four of the five justices were evident; here, the eight enduring attributes will be related to the five types of justice. The five justices, as represented by the eight remaining Ethical attributes, are shown in Table 6 below. Each attribute represents at least two, and up to four, types of justice, demonstrating the degree of interrelatedness of the different justices.

Table 6: Five types of Justice, as represented in the Rapfish Ethical Attributes

Ethical Attribute	Creative Justice	Distributive Justice	Ecosystem Justice	Productive Justice	Restorative Justice
Adjacency and Reliance	✓	✓	✓		
Alternatives		✓			✓
Equity in Entry	✓	✓			
Just management	✓	✓	✓		
Mitigation of habitat destruction			✓	✓	✓
Mitigation of ecosystem depletion			✓	✓	✓
Illegal fishing		✓		✓	✓
Discards and Waste		✓	✓	✓	✓

(adapted from Pitcher and Power, 2000, Table 1, p. 229)

Note: '✓' indicates that the attribute does represent this form of justice.

Creative justice, as discussed in Chapter 1, involves reuniting voices which have typically been kept apart, to encourage sharing of information. *Creative justice* is evident when local knowledge of and participation in the fisheries ecosystem is considered in decisions of fisheries policy and management. Recognition of the role of local people in the fisheries, through the Adjacency and Reliance attribute, contributes to creative justice, as does Just Management (particularly in instances of true co-management), through expectations of stewardship and a rooted desire to maintain the well-being of the resource. Similarly, when Equity in Entry is considered in determining access to the fishery, those with pre-existing legitimate claims to and roles within the ecosystem are included, again contributing to creative justice.

Distributive justice, which considers fundamental issues of sharing of the resource, is the type of justice most comprehensively represented by the Ethical attributes. In fact, all but two of the attributes include elements of distributive justice. As with *creative justice*, *distributive*

justice is well represented by the attributes of Adjacency and Reliance and Equity in Entry, in that both directly relate to how the fishery resource is shared amongst various interests. Both in fact demand consideration of historical fishing activity, as well as geographic proximity in the case of Adjacency and Reliance, indicating that decisions of sharing should pay heed to traditional or historical fishing activity. That is, that those who have a long-term, pan-generational connection to a fishery resource should be given a degree of priority in determining appropriate distribution of limited resources. Just management, in that those with a legitimate claim within the fishery should have a voice in management decisions, also embraces distributive justice – as fisheries participants are involved in management, consensual distributional decisions may be possible and even encouraged. In cases where there are Alternative forms of livelihood beyond the fishery, the fishery is less likely to be employer of last resort; in instances where the fishery is the only source of income, pressure on the resource will peak and distributional conflicts will increase as demand strips supply. Illegal fishing also heightens awareness of distributional justice. As discussed above, illegal fishing may occur for a number of reasons, including that those who have a legitimate claim to or dependence upon the fishery are denied access; thus, this attribute is interrelated with both Adjacency and Reliance and Equity in Entry. In such a case, the legal share does not include a given group or certain individuals for some reason; *distributive justice* demands that investigations be made to determine *why* some may find it necessary to fish illegally, to ascertain that such individuals or groups are excluded from the legal share. Finally, when fish are wasted, as represented by Discards and Waste, they are not available for either the ecosystem or the fishery; the healthy functioning of the ecosystem may be compromised when high levels of wastage occurs, and the fishing community suffers in both the short term (those fish are immediately unavailable for consumption and/or sale) and long term (as the sustainable functioning of the ecosystem is imperilled and may lead to reduced future yields).

Ecosystem justice is represented in five of the eight attributes. Recall that this form of justice recognises the intrinsic value of all members of the fishery ecosystem, a community of interdependent and interrelated interests. Such a perspective necessarily includes those humans who participate in and rely upon the fishery ecosystem. Thus, Adjacency and Reliance as well as Just Management also incorporates elements of *ecosystem justice*, once again in recognition of the need to consider the utility of traditional or local knowledge in management decisions and the role of fishers within the fishery ecosystem. As with *distributive justice*, Discards and Wastes also present issues of ecosystem justice for similar reasons – as discussed above, high levels of wastage can jeopardise the overall health and functioning of the fishery ecosystem, thus threatening both the marine ecosystem and the humans dependent upon it. Similarly, Mitigation of Habitat Destruction and Mitigation of Ecosystem Depletion address issues of physical, quantifiable damage to the ecosystem itself and the environment in which the ecosystem exists. As with wastage of fish, such damage may harm the ecosystem (whether directly or indirectly) and compromise the long-term functioning of the ecosystem and viability of the fishery itself. Should the ecosystem become sufficiently damaged as to no longer function properly, issues of *creative* and *distributive justice* in particular become moot.

Productive justice involves issues of caring for the fishery ecosystem so as to encourage production at the desired levels. Husbandry thus primarily involves physical care for the ecosystem in which the fishery operates. Therefore *productive justice* is represented by the four attributes which consider the physical state and treatment of the ecosystem – Mitigation of Habitat Destruction, Mitigation of Ecosystem Depletion, Illegal Fishing, and Discards and Wastes – for reasons akin to those already discussed under *distributive justice* and *ecosystem justice.*

As described above, *restorative justice* recognises that a fishery ecosystem may have become damaged, by human interaction or otherwise, and that efforts ought to be made to restore the ecosystem to earlier levels of abundance and a healthier state of functioning. This form of justice is represented by five attributes. When people participate in the fishery as a deliberate and considered choice, rather than as the employer of last resort, demands on the fishery will be moderated, both by less than full participation in the fishery and by the presumed desire of participants to protect the fishery in the long term. Thus, the attribute which measures Alternative forms of economic livelihood includes elements of *restorative justice*. As with *productive justice*, the remaining four attributes – Mitigation of habitat destruction, Mitigation of ecosystem depletion, Illegal fishing, and Discards and Wastes – all seek to consider harm already done, or continuing to be done, to the ecosystem. Two of these also weigh efforts to remedy previous damage. Clearly, to be able restore fishery ecosystems to historical levels of abundance, continuing damage must be stopped and pre-existing damage must be repaired.

2.5 The Applicability of Rapfish in an Ethical Analysis of Fisheries

An ethical analysis necessarily requires evaluation by numerous criteria. Rapfish, as discussed above, is useful in comparing fisheries (variously defined) against a defined sustainability axis using multiple criteria, thus producing a quantitative assessment of the fisheries. Thus, although ethical analyses are rarely considered to be conducive to quantitative assessment, the Rapfish methodology lends itself to such an analysis. In fact, only complete attainment of all sustainability goals (as defined by the individual attributes) will result in the awarding to a fishery of a 'perfect' score – equivalent to the fishery defined as 'Good'. Conversely, a total failure *vis-à-vis* sustainability will result in a score equal to that of the 'Bad' fishery. Although objective measures are used to determine the status of a fishery, that very definition of what makes a good or bad fishery is based upon what is judged to be good or bad.

In applying Rapfish as a means to conduct an ethical analysis of fisheries, it is possible to determine the ethical status in a comprehensive, transparent, and rigorous manner, against a defined set of criteria. The criteria, the Ethical attributes described above, allow for shades of variation within each attribute. The technique allows for meaningful aggregation of the various ethical considerations, as defined in the Ethical attributes. Finally, in applying the rankings discerned through the paired comparison study described above, it is possible to weight the attributes in such a manner as to represent relative importance of the individual attributes.

The Rapfish technique enables comparison of the fisheries under assessment both against one another and, most importantly, against the defined sustainability axis (ranging from Bad to Good in the ethical realm). The criteria are precisely defined, and the methodology is consistent, allowing for a clear, transparent, and replicable assessment. This is very useful in determining fisheries policy for a number of reasons. Firstly, one could consider the factors which contributed to a given fishery's Rapfish result, particularly in the case of extreme scores. What factors may have caused a fishery to score extremely well or extremely poorly? What steps could be taken to improve a fishery's score? Such considerations could guide policy decisions. Secondly, as noted above, the attributes may be weighted to reflect policy preferences; the evaluation may then be conducted using the desired weightings and conclusions to guide policy may be discerned. Thirdly, as an evaluation, Rapfish assessments are based upon a number of criteria, just as actual policy-making necessitates the consideration of myriad issues. As noted earlier, Rapfish attributes may even be tailored for a specific scenario; while the Ethical attributes are meant to be applied in a consistent manner, they may nonetheless by altered as needed to reflect certain defined issues in a specific case.

Importantly, Rapfish requires conscious consideration of *how* one thinks about fisheries. The design of the attributes, and the act of assigning scores to each individual attribute for each fishery in an evaluation, compels one to consider what is important and why. Rapfish thus can be used not only as a tool for evaluating fisheries, but as a starting point for broader discussions about fisheries.

It is possible to evaluate the same fishery repeatedly in cases where individual sources of information differ significantly on the appropriate value to assign to each Ethical attribute; this would be accomplished by treating the fishery as several individual fisheries, one per divergent source. Such an evaluation could provide interesting results should the sources vary sufficiently, although in the case of some fisheries assessed by Pitcher and Power (2000), where several sources have been consulted for single fishery, such divergence was not apparent and in fact the sources were generally in agreement on the whole. In Chapter 3, the original dataset used by Pitcher and Power (2000) is supplemented by data on individual fisheries, for which the data provided by each interviewee was treated as a single fishery.

As an objective measure of the ethical status of fisheries, the Rapfish assessment provides useful information on each fishery, as will be demonstrated in Chapter 3.

CHAPTER 3:

RAPFISH ETHICAL ANALYSES OF CANADIAN MARINE FISHERIES

3.1 Canadian Marine Fisheries

The Rapfish Ethical attributes described in Chapter 2 were first formulated and applied to 42 Canadian fisheries by Pitcher and Power (2000). This initial assessment was conducted as a component of the interdisciplinary research project which led to the publication of *Just Fish* (Coward et al., 2000), and in keeping with the scope of the broader research project, included marine fisheries from Canada's Atlantic and Pacific coasts.

The original assessment included a variety of commercial marine fisheries representing a range of gear types, species, and geographic scale. Of the 42 fisheries included in the initial assessment, 24 were Pacific and the remaining 18 were Atlantic. The rationale behind the fisheries selection included: significance, whether economic, social, or ecological, at present or in the past (for instance, Newfoundland cod is historically significant, British Columbia salmon was and remains important, and the Atlantic snow crab fishery is of rising interest); availability of all data; and/or unique circumstances, such as co-management arrangements between the fishers and DFO (such as Nova Scotia's Area 19 snow crab fishery), or a traditional Aboriginal component to the fishery (the BC herring spawn-on-kelp fishery, for example). Furthermore, fisheries were chosen to be geographically representative of both coasts (and regions on each coast) and to include a variety of species and gear types.

The Atlantic fisheries included those prosecuted across provincial boundaries and wholly within a single province. Also included in the Atlantic fisheries were aggregate and individual fisheries for a given species. For instance, two lobster fisheries were included, one for the region as a whole and one for the area of Dingwall, Nova Scotia; likewise for mackerel. In considering both regional and local components of a fishery, the influence of unique characteristics may become apparent. The snow crab fishery is also presented both in aggregate and as a subset; the Area 19 snow crab fishery of Cape Breton is unique due to a co-management arrangement between the Fishers' Association and Fisheries and Oceans Canada, and thus worthy of individual consideration. In considering both regional and local components of a fishery, the influence of unique aspects of each may become apparent. The northern cod fishery is divided by gear type and also as inshore/offshore. For the original set of fisheries, all fisheries except the northern cod were assessed based on mid-1990s data; the northern cod data were immediately pre-moratorium (1991).

The Pacific fisheries were all assessed based on mid-1990s data, save for the Strait of Georgia lingcod which was assessed based on 1989 data, the last year in which that particular fishery occurred. A heavy emphasis was placed upon salmon fisheries, with data disaggregated by gear type and species as far as possible within the often-mixed fishery. A uniquely-Aboriginal fishery was also included in the original dataset; the herring-spawn-on-kelp fishery is a traditional First Nations fishery with extremely limited entry.

For the 42 fisheries originally assessed, myriad sources were consulted.[7] The literature were initially consulted both to ensure a background understanding of each fishery and as a source of data. Then, various individuals were consulted, including fishers, association and union representatives, researchers, and government officials (both federal and provincial). As with the paired comparison survey described in Chapter 2, a 'snowball' approach was employed in contacting individuals for information; each individual was also asked to suggest others who would be able to provide additional information on any of the fisheries to be included in the assessment. This participatory approach not only ensured a complete set of data for each fishery and the inclusion of detailed and specific information in the assessment, but also typically represented the application of traditional or local ecological knowledge as many fishers shared their fishery-specific knowledge. Such sharing of information is also demonstrative of the real presence of creative justice in the assessment.

The original dataset of 42 fisheries has since been supplemented and expanded. Two fisheries have been added to the Atlantic fisheries, specifically the sentinel (that is, test) gillnet fishery for northern cod in Newfoundland and the Newfoundland turbot fishery. The data for these fisheries were provided by a DFO enforcement officer based in Conception Bay, Newfoundland. Several Pacific fisheries have been added, using information shared by fishers and others during interviews conducted by Fisheries Centre researchers in the Hecate Strait region of northern British Columbia. (The Fisheries Centre's work in northern British Columbia is discussed in greater detail in Chapter 5.) Added were a number of salmon and halibut fisheries, as well as fisheries for eulachon, crab, rockfish, Pacific cod, and urchins. Those interviewed were asked to provide information on a fishery with which they were most familiar, and in comparison with the original dataset, the information shared by each interviewee regarding a fishery was treated as an individual fishery. That is, whereas in the case of the many of the original 42 fisheries multiple sources were consulted for each fishery, only a single individual was interviewed for each fishery in the supplemental set.

Data used in the Rapfish assessment of Canadian marine fisheries, including the names of all fisheries and the abbreviations used to identify fisheries in tables and graphs presenting results, are supplied in Appendix 2. A table indicating the sources of data used, by fishery, is provided in Appendix 4a.

As described in Chapter 2, the Rapfish software permits user-defined error ranges to be applied during the Monte Carlo procedure. This procedure allows for uncertainty within the data for each individual attribute. For the Rapfish assessment of Canadian fisheries, unique error ranges were applied for each attribute. Firstly, a base level of 20% was applied, as the default in the blanket error range option in the software (Kavanagh, 2001). From this, the error percentage was either increased or decreased in response to perceived confidence in the data for each particular attribute. Secondly, the range was re-examined to consider asymmetry of error; that is, were the data values likely over-estimated, or under-estimated, or even? Again, this value was assumed to be and therefore treated as symmetrical, and altered when considered necessary.

These two decisions were made based firstly on the nature of the attribute (was the attribute by definition straightforward, or potentially problematic, within the constraints of the criteria for inclusion within Rapfish?), and secondly on the quality and quantity of the sources consulted. Where for instance several sources could be consulted (including published literature and personal communications, for example) and these sources were in general agreement,

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[7] Data were collected for not only the Ethical attributes, but also for the original four Rapfish fields of attributes: Ecological, Economic, Social, and Technological as well. The analyses of these data will be published in the future.

confidence in the data was higher. It is however important to recall that the confidence must be aggregated across scores for all fisheries for a single attribute.

The error ranges applied for this analysis, along with the rationale for those which vary from the assumed 20% baseline level, are presented in Appendix 2f.

3.2 An Overall Ethical Analysis of Canadian Marine Fisheries, Using Rapfish

A standard Rapfish assessment, using the procedures described in Chapter 2, was applied to the fisheries described in 3.1 above. A total of 62 Canadian marine fisheries were included, of which 21 are Atlantic and 41 are Pacific. This assessment included the basic Rapfish assessment, an analysis of the leverage of the attributes within the assessment, and a Monte Carlo simulation to assess scoring uncertainty.

The analysis discussed in this Chapter included all 62 fisheries. However, the dataset included 24 separate salmon fisheries. Eighteen of these were included in the original assessment conducted and published by Pitcher and Power (2000), and were divided into three commercial gear types (gillnet, seine, and troll), by each of the five BC Pacific salmon species and one multispecies fishery which included all five species; thus, six fisheries per each of three gear types. A supplementary dataset was compiled based on interviews with fishers in the Prince Rupert area of northern British Columbia, which resulted in six additional gillnet-based fisheries for Pacific salmon. Please note that, for the purposes of this discussion, the average Rapfish score was taken by gear type, thus reducing the total number of salmon fisheries presented in this chapter to three from 24. These are identified in the following graphs and tables as "BCSalGil" (commercial gillnet fishery for BC salmon), "BCSalSeine" (commercial seine fishery for BC salmon), and "BCSalTroll" (commercial troll fishery for BC salmon). A more complete description and discussion of the BC commercial salmon fisheries, which focuses on the 24 separate fisheries, is presented in Chapter 6.

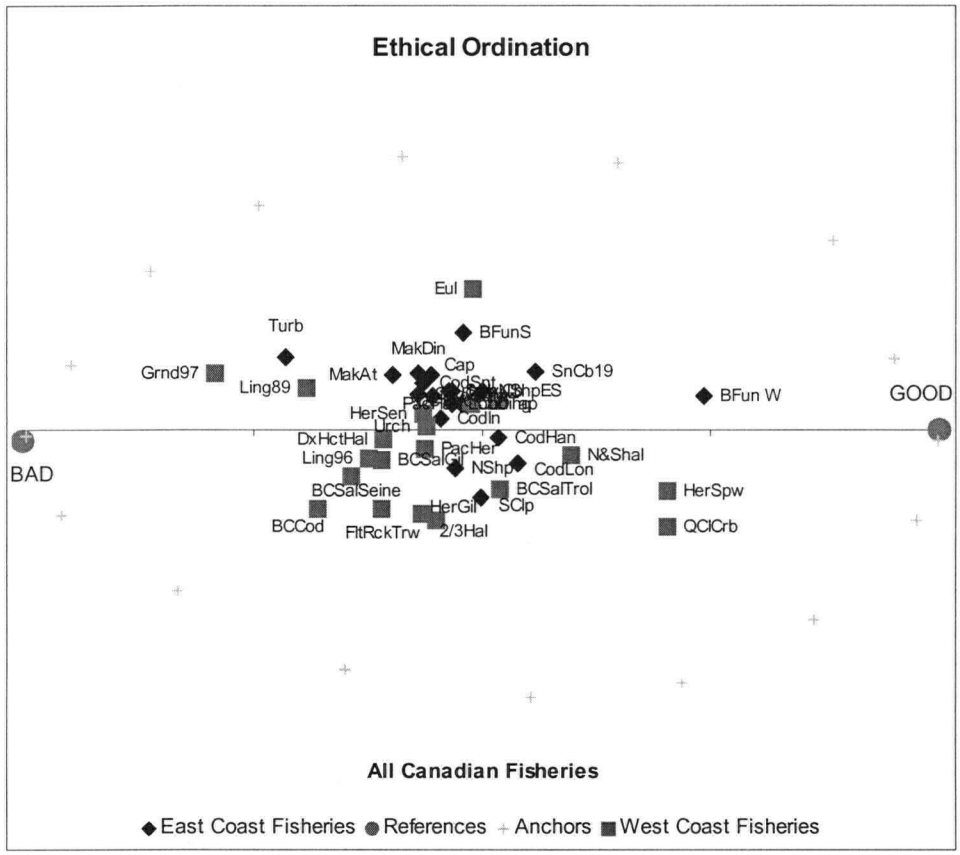

Figure 9: Two-Dimensional Results, overall Rapfish Ethical ordination, Canadian Fisheries

The initial output of the Rapfish software for the basic assessment is presented to the user in the form of a 2-dimensional graph (see Figure 9). On this basic X-Y graph, the X-dimension shows the overall sustainability score, ranging from Bad to Good. The Y-dimension indicates the various combinations of attribute scores which may result in a given position along the X-axis. The points labelled "Anchor" and shown with a "+" delineate the limits of the possible combinations of attribute scores. Unless a fishery has scored in excess of the range allowed for an attribute through an error (in data-entry, for instance), no fishery should ordinate outside the elliptical ring of anchors generated by Rapfish.

An important measure of the credibility of any MDS ordination is the stress score. While Stalans (1995) notes that a stress score of below 0.15 is particularly good, as a general guideline a stress score up to 0.25 is acceptable (Gregory, 2000, citing Pitcher, 1999). This overall ethical evaluation generated an acceptable stress score of 0.24.

Another factor which to consider is the leverage of the attributes in the ordination. Leverage is a measure of the impact each individual attribute has on the Rapfish ordination, and in practice anything below 10 is acceptable. For this ordination, the leverage was very good, with no score exceeding 5, indicating that the ordination is not skewed by any one attribute. Graphs indicating the results of the leverage testing for this and all Rapfish ordinations included in this study are provided in Appendix 5.

Finally, a Monte Carlo simulation was conducted as part of the Rapfish procedure, as described in 3.1 above. As with the leverage results, the Monte Carlo results for all Rapfish evaluations included herein are also presented in Appendix 5.

Given the large number of fisheries evaluated within this assessment, the two-dimensional graph in Figure 9 cannot be clearly read with all fisheries shown. Thus, the two-dimensional results were collapsed into a percentage score, wherein the extreme Bad fishery receives a score of 0% and the extreme Good fishery scores 100%. Thus, this percentage score represents the fishery's location as ordinated along the X-axis in the two-dimensional plot (as in Figure 9). These converted results can then be presented either graphically or textually. The percentage scores for the overall Rapfish assessment of the fisheries described in 3.1 are presented graphically in

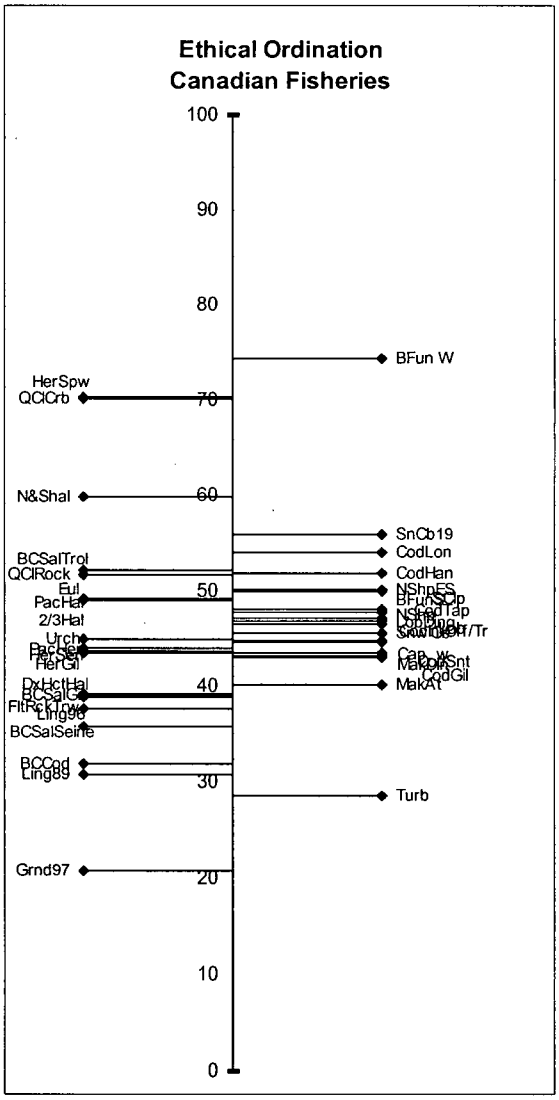

Figure 10: Results, overall Rapfish Ethical ordination, Canadian fisheries

Note: Pacific fisheries are shown on left side of the axis, Atlantic fisheries on the right

Figure 10, in which Pacific fisheries are presented on the left side of the vertical axis and Atlantic fisheries to the right.

Again, as with Figure 9, Figure 10 is unclear with all fisheries shown. Yet from this graph it becomes obvious that the fisheries mainly clustered toward the middle of the possible range. Thus, for greater clarity, the percentage scores of all fisheries, ranked from best to worst, are presented in Table 7; subsequent discussion will focus primarily on these percentage scores. Indeed, the mean score of all the fisheries is 46.2%, ranging from a low score of 20.8% to a high score of 74.3%. Just ten of the 41 fisheries score 50% or better, while 19 score above the mean. As can be seen in the scatter plot of the results of the Monte Carlo simulation in Appendix 5a, there may be overlap between several of these clustered fisheries, and thus the difference between several of these fisheries may not be significant.

Table 7: Percentage scores, Rapfish ethical ordination of Canadian marine fisheries

	Overall Ordination[1]							
	Rank	*%*		*Rank*	*%*		*Rank*	*%*
1.	BFun W	74.3	15.	CodTap	47.8	29.	***HerGil***	***43.5***
2.	***HerSpw***	***70.2***	16.	NShp	47.1	30.	MakDin	43.2
3.	***QCICrb***	***70.2***	17.	LobDing	46.8	31.	CodGil	43.0
4.	***N&Shal***	***59.8***	18.	Lob	46.7	32.	MakAt	40.3
5.	SnCb19	55.9	19.	SnwCb	46.4	33.	***DxHctHal***	***39.3***
6.	CodLon	53.9	20.	CodIn	45.5	34.	***BCSalGil***	***39.1***
7.	***BCSalTrol***	***52.0***	21.	***2/3Hal***	***45.0***	35.	***FltRckTrw***	***39.0***
8.	CodHan	51.8	22.	CodOff	44.7	36.	***Ling96***	***37.7***
9.	***QCIRock***	***51.7***	23.	CodTrw	44.7	37.	***BCSalSeine***	***35.8***
10.	NShpES	50.0	24.	Cap	44.5	38.	***BCCod***	***32.0***
11.	SClp	49.9	25.	***Urch***	***44.0***	39.	***Ling89***	***30.8***
12.	***Eul***	***49.1***	26.	***PacHer***	***43.7***	40.	Turb	28.6
13.	***PacHal***	***48.9***	27.	***HerSen***	***43.6***	41.	***Grnd97***	***20.8***
14.	BFunS	48.0	28.	CodSnt	43.6			

Note:

1. Bold and italicised text indicates Pacific fisheries, plain text indicates Atlantic fisheries.

The top two fisheries are herring fisheries, one from each coast. The Bay of Fundy herring weir fishery scores best, at 74.3%, followed by a Pacific fishery, the herring spawn on kelp fishery. Notable about these fisheries is their smaller-scale nature. The herring spawn on kelp fishery in particular is a traditional Aboriginal fishery which is tightly restricted and limited in scope and based upon traditional activities; as such, it exemplifies many of the characteristics of the "Good" fishery in the ethical evaluation. It is worth noting that, in the initial application of the Rapfish ethical attributes (Pitcher and Power, 2000), this fishery achieved the top score of 91%, while the Bay of Fundy herring weir fishery scored 87%. This variation in score has occurred due to the reduction of the ethical attributes from a total of nine to eight attributes; as described in Chapter 2, one attribute, "Influences in ethical formation", has not been included here. Both of these herring fisheries are selective and have been prosecuted for long periods.

Also of particular note in the top-ten is the Area 19 Snow Crab fishery (scoring 55.9%), which is prosecuted off the shores of Cape Breton Island, Nova Scotia. This fishery is governed through a unique co-management arrangement, by which the responsibility for the fishery is

shared between the fishers' association and Fisheries and Oceans Canada. This shared responsibility includes not only management, but also financial obligations (Canada, 1996).

Other fisheries ordinating within the top-ten include: two northern cod fisheries, the longline ('CodLon', scoring 53.9% and ranking 5th) and the handline ('CodHan', scoring 51.8% and ranking 8th); two fisheries from British Columbia's Queen Charlotte Islands region, a crab fishery ('QCICrb', ranking 3rd and scoring 70.2%), and a rockfish fishery ('QCIRock', scoring 51.7% and ranking 9th); and the averaged BC troll fishery for Pacific salmon ('BCSalTrol', ranking 7th and scoring 52.0%). Note that the characteristics shared by the ten fisheries which ordinate highest are the small-scale nature and local prosecution of the fisheries.

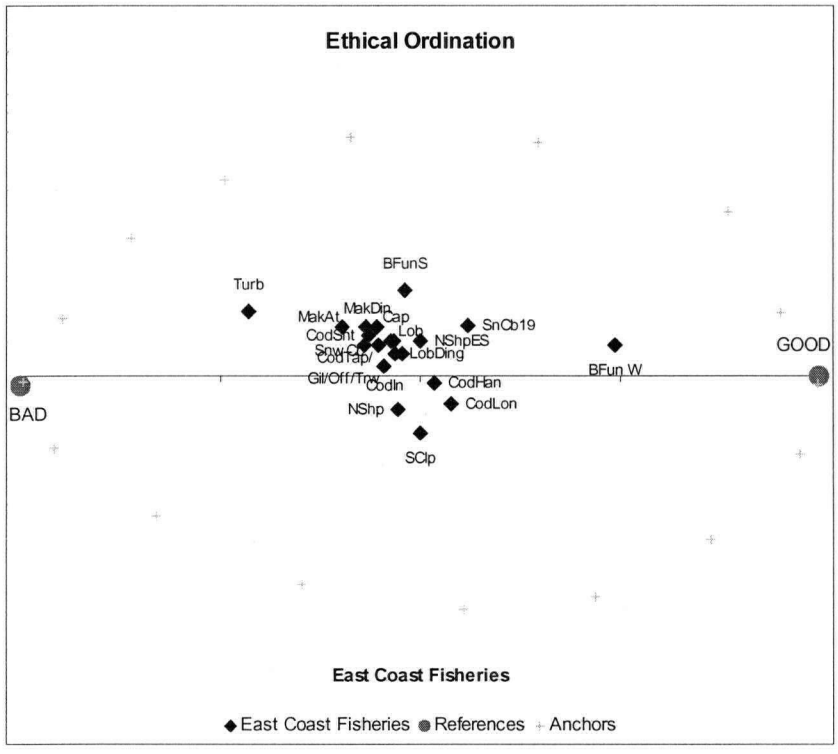

Figure 11: Results, overall Rapfish Ethical ordination, Atlantic Canadian fisheries

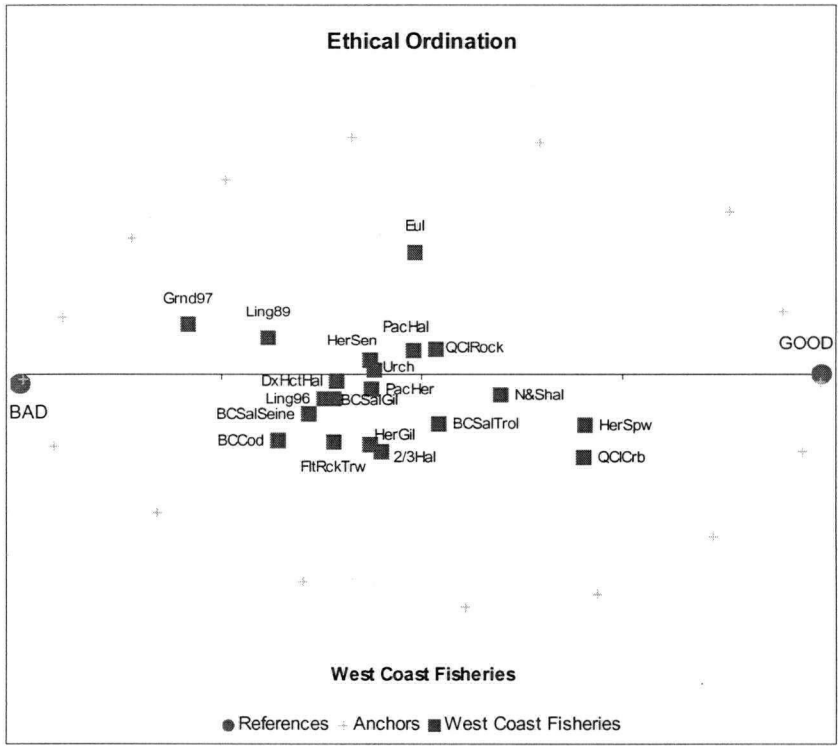

Figure 12: Results, overall Rapfish Ethical ordination, Pacific Canadian fisheries

By comparison, the worst two fisheries in the assessment are intense, highly mechanised fisheries with little historical presence: the BC groundfish fishery ('Grnd97', scoring 20.8% and ranking 41st) and the Newfoundland turbot fishery ('Turb', which ranks second-worst at 40th and scores 28.6%). While the BC salmon troll fishery ordinated within the best-ten fisheries, the gillnet ('BCSalGil') and the seine ('BCSalSeine') fisheries for Pacific salmon ordinate within the worst-ten, scoring 39.1% and 35.8% and ranking 34th and 37th respectively. Two BC lingcod fisheries, in 1989

('Ling89') and in 1996 ('Ling96') are also found amongst the worst fisheries, scoring 30.8% and 37.7% and ranking 39th and 36th respectively. Note that the 1989 Lingcod fishery, prosecuted in the Strait of Georgia, represents a fishery at the brink of collapse, which at the time was prosecuted by just one fisher (S. Martell, pers. com.).

Conventional two-dimensional Rapfish plots are included, presenting the results of the fisheries in various groupings. The results for east coast fisheries are given in Figure 11 (page 55) while the results for all west coast fisheries are presented in Figure 12 (page 55).

The British Columbia commercial salmon fisheries, considered as 24 distinct fisheries, will be examined in greater detail in Chapter 6.

3.3 Weighting the Fisheries Assessment to Reflect Policy Preferences

As discussed in Chapter 2, a paired comparison study was conducted to determine a preference ranking for the ethical attributes. Respondents, who were grouped into three categories, were asked to indicate which attribute should be given greater consideration by policy-makers, through a series of pairwise comparisons. From this, a ranking was developed for each of the three respondent groups. Although the respondents were stratified, it was found that the aggregated responses were not significantly different, and as such the responses were compiled into a final ranking. These results were presented in Chapter 2, in Figure 5 (Combined Results), Figure 6 (Fishers Results), Figure 7 (Formal Experts Results), and Figure 8 (Public Results), and summarised in Figure 9.

The aggregated and combined rankings as shown in Figure 5 were then used to conduct a weighted assessment of the Canadian fisheries subjected to the Rapfish ethical analysis. Note however that, due to the limitations of the multidimensional scaling ('MDS') routine, a weighted MDS was not possible. The original attribute scores for each fishery were thus scaled (0-100) so that all attributes were measured across a standard scale. Furthermore, where necessary the scaling was reoriented so that 0 was bad and 100 was good in all cases. These scaled values are presented in Appendix 2b. For each individual fishery, an average score was then generated based upon the scaled and standardised attribute scores. (Note that this same approach was taken for the Creative Justice evaluation of Canadian fisheries and of Aboriginal salmon fisheries, as discussed below.) These results serve as a proxy for the actual Rapfish scores, but in a format which enables weighting subsequent comparison.

Subsequently, and following on Power and Chuenpagdee (2002), the scaled and standardised scores for each individual attribute were multiplied by a value as derived from the combined results of the paired comparison survey. For instance, the most important attribute according to all respondents was the Mitigation of Ecosystem Depletion, which scored 75.2% (meaning that, out of every 100 times this attribute appeared in a pair, it was selected 75.2 times). Therefore, for all fisheries, the score for this attribute was weighted by multiplying it by 75.2%. By comparison, Alternatives was considered to be least important; all scores within this attribute category were weighted to a value of 29.5%. The weighted scaled values are given in Appendix 2c. Finally, these weighting values were adjusted for comparability with the proxy (scaled and averaged) Rapfish scores. The adjusted weighted scaled values are shown in Appendix 2d. These adjusted values were then averaged for each fishery, to produce an overall weighted score for each fishery. The weighting factors (raw and adjusted) applied to each attribute are provided in Table 8.

Table 8: Weighting factors applied to Ethical attributes for weighted assessment of Canadian fisheries

	Distance	Alternatives	Traditional	Inclusion	Habitat	Ecosystem	Unreported	Discards
Weighting Factor	34.5%	29.5%	46.8%	69.6%	69.8%	75.2%	40.9%	50.9%
Adjusted Weighting Factor	66.6%	56.9%	90.3%	134.3%	134.7%	139.9%	78.9%	98.2%

The results are summarised in Table 9 (page 58). For comparison, Table 9 also includes the actual Rapfish scores, based on the full MDS ordination, for the 41 Canadian fisheries[8]. Again, the scores for the salmon fisheries were averaged by the three commercial gear types (gillnet, seine, and troll). Below, the results of the unweighted and weighted attribute averages for each fishery (the middle and right-hand columns of Table 9) are also presented graphically in Figure 13 (Scaled and averaged but unweighted results) and Figure 14 (Adjusted, scaled, averaged, and weighted results). The discussion which follows will be based primarily on the data presented in the table, with supplementary reference to the graphs.

From Table 9, it is firstly salient to consider the comparability of the Rapfish results (shown in the first column) with the scaled and averaged attribute scores (middle column). While the percentage values vary, it is important to note that the rankings, though exhibiting some discrepancies, are tolerably parallel. There are a few anomalies which bear examination. Consider for instance the British Columbia eulachon fishery ('Eul'), which ranks 12th in the Rapfish Ethical assessment, but climbs to 5th when the attributes are scaled and averaged. This fishery, along with the herring weir fishery in the Bay of Fundy ('BFunW') and the Queen Charlotte Islands crab trap fishery ('QCICrb'), received the best-possible scores for the attributes Illegal Fishing and Discards and Wastes. Other attribute scores for Eul were mainly middling (with the exception of the worst-possible scores for Mitigation of Habitat Destruction and Mitigation of Ecosystem Depletion), whereas for BFunW and QCICrb were more consistently good. Therefore, these two fisheries were already showing results in the top three of the rankings. It may be that the two perfect attribute scores obtained by Eul were sufficient to distort the rankings when scaled and standardised. Other fisheries which change rank by ten or more positions include: the regional Atlantic mackerel fishery ('MakAt') moves from 32nd to 21st; and British Columbia's Area 2/3 halibut fishery ('2/3Hal'), which drops from 21st to 31st position. With the exception of the Eulachon fishery, there is little change in the top-ten fisheries, save that the regional Eastern Scotian Shelf northern shrimp fishery ('NShpES') is pushed to 11th place from 10th.

While the bottom-ten also remain relatively stable, the two fisheries which escape the worst category with the proxy evaluation exhibit quite remarkable changes: as noted above, the regional Atlantic mackerel fishery ('MakAt') soars from 32nd to 21st in rank; as well, the halibut fishery in the Dixon Entrance/Hecate Strait ('DxHctHal') climbs from 33rd to 26th. The gaps are

[8] See Appendix 2e for a comparison between the proxy scores, the unadjusted weighted averaged scores, and the adjusted weighted averaged scores.

filled by the northern cod gillnet fishery ('CodGil'), which slips from 31st to 33rd, and the Newfoundland caplin fishery, which drops from 24th to 31st.

Table 9: Comparison of Ethical results for Canadian fisheries between Rapfish assessment, scaled and averaged Rapfish attribute scores, and scaled, averaged, and weighted Rapfish attribute scores

	Rapfish[1, 2]		**Unweighted Average Scores**		**Adjusted Weighted Average Scores**	
	Rank	*%*	*Rank*	*%*	*Rank*	*%*
1.	BFun W	74.3	1. BFun W	82.8	1. BFun W	77.9
2.	***HerSpw***	***70.2***	2. ***HerSpw***	***75.0***	2. ***HerSpw***	***76.2***
3.	***QCICrb***	***70.2***	3. ***QCICrb***	***70.8***	3. ***QCICrb***	***73.8***
4.	***N&Shal***	***59.8***	4. ***N&Shal***	***63.5***	4. ***N&Shal***	***59.0***
5.	SnCb19	55.9	5. ***Eul***	***61.5***	5. SnCb19	58.2
6.	CodLon	53.9	6. CodLon	59.4	6. CodLon	55.4
7.	***BCSalTrol***	***52.0***	7. SnCb19	58.3	7. ***BCSalTrol***	***54.2***
8.	CodHan	51.8	8. CodHan	56.3	8. ***QCIRock***	***54.2***
9.	***QCIRock***	***51.7***	9. ***QCIRock***	***56.3***	9. CodHan	52.9
10.	NShpES	50.0	10. ***BCSalTrol***	***54.9***	10. ***Eul***	***50.3***
11.	SClp	49.9	11. NShpES	51.0	11. SClp	50.2
12.	***Eul***	***49.1***	12. CodTap	50.0	12. NShpES	48.3
13.	***PacHal***	***48.9***	13. SClp	50.0	13. CodTap	46.8
14.	BFunS	48.0	14. Lob	49.5	14. LobDing	45.3
15.	CodTap	47.8	15. ***PacHal***	***49.5***	15. ***PacHal***	***45.3***
16.	NShp	47.1	16. BFunS	49.0	16. Lob	45.0
17.	LobDing	46.8	17. LobDing	47.9	17. ***Urch***	***44.9***
18.	Lob	46.7	18. SnwCb	47.4	18. CodIn	44.0
19.	SnwCb	46.4	19. CodSnt	46.9	19. SnwCb	43.4
20.	CodIn	45.5	20. CodIn	46.9	20. NShp	43.1
21.	***2/3Hal***	***45.0***	21. MakAt	46.4	21. BFunS	43.1
22.	CodOff	44.7	22. MakDin	46.4	22. ***HerGil***	***42.9***
23.	CodTrw	44.7	23. CodTrw	44.8	23. ***HerSen***	***42.8***
24.	Cap	44.5	24. CodOff	44.8	24. CodSnt	41.4
25.	***Urch***	***44.0***	25. NShp	44.8	25. ***2/3Hal***	***40.9***
26.	***PacHer***	***43.7***	26. ***DxHctHal***	***43.8***	26. ***PacHer***	***40.6***
27.	***HerSen***	***43.6***	27. ***PacHer***	***43.2***	27. MakDin	40.6
28.	CodSnt	43.6	28. ***HerGil***	***42.7***	28. Cap	39.6
29.	***HerGil***	***43.5***	29. ***HerSen***	***41.7***	29. CodTrw	39.4
30.	MakDin	43.2	30. ***Urch***	***41.7***	30. CodOff	39.4
31.	CodGil	43.0	31. ***2/3Hal***	***40.6***	31. ***DxHctHal***	***38.9***
32.	MakAt	40.3	32. Cap	39.6	32. MakAt	38.8
33.	***DxHctHal***	***39.3***	33. CodGil	39.6	33. ***FltRckTrw***	***38.7***
34.	***BCSalGil***	***39.1***	34. ***FltRckTrw***	***39.6***	34. CodGil	37.9
35.	***FltRckTrw***	***39.0***	35. ***BCCod***	***37.5***	35. ***BCSalGil***	***36.3***
36.	***Ling96***	***37.7***	36. ***BCSalGil***	***37.1***	36. ***BCCod***	***35.4***
37.	***BCSalSeine***	***35.8***	37. ***Ling96***	***33.9***	37. ***Ling96***	***31.6***
38.	***BCCod***	***32.0***	38. ***BCSalSeine***	***32.4***	38. ***BCSalSeine***	***30.3***
39.	***Ling89***	***30.8***	39. Turb	28.1	39. ***Ling89***	***24.1***
40.	Turb	28.6	40. ***Ling89***	***27.1***	40. Turb	22.5
41.	***Grnd97***	***20.8***	41. ***Grnd97***	***22.4***	41. ***Grnd97***	***17.9***
	MEAN	**46.2**	**MEAN**	**47.4**	**MEAN**	**44.7**
	MAXIMUM	**74.3**	**MAXIMUM**	**82.8**	**MAXIMUM**	**77.9**
	MINIMUM	**20.8**	**MINIMUM**	**22.4**	**MINIMUM**	**17.9**

Notes:

1. *Bold and italicised text indicates Pacific fisheries, plain text indicates Atlantic fisheries.*
2. *Dotted lines indicate top- and bottom-ten fisheries, dashed lines highlight median score.*

Overall, the mean score changes slightly, from 46.2% (Rapfish MDS ordination) to 47.4% (proxy method). In both cases, BFunW obtains the best score (74.3% with Rapfish and 82.8% when scaled/averaged) and Grnd97 fares worst (20.8%, Rapfish, and 22.4%, scaled/averaged).

Therefore, while the scaled and averaged attribute scores for each fishery are not precisely identical to those generated by a full Rapfish assessment, they provide an acceptable proxy for comparison, particularly as a means of ranking the fisheries. These scaled and averaged attribute scores may now be compared to their weighted forms.

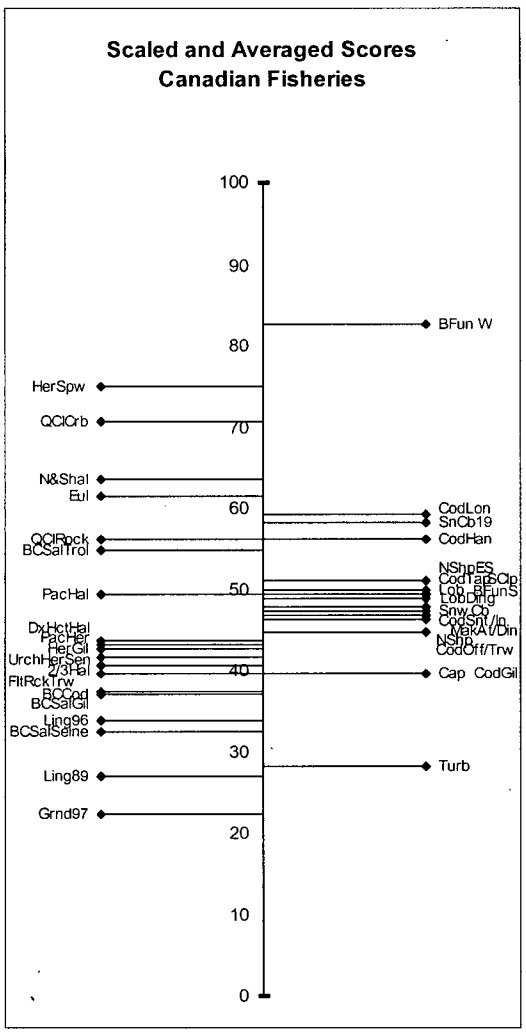

Figure 13: Results of scaled (0-100) and averaged Rapfish scores, Canadian marine fisheries

Note: Pacific fisheries are shown on left side of the axis, Atlantic fisheries on the right.

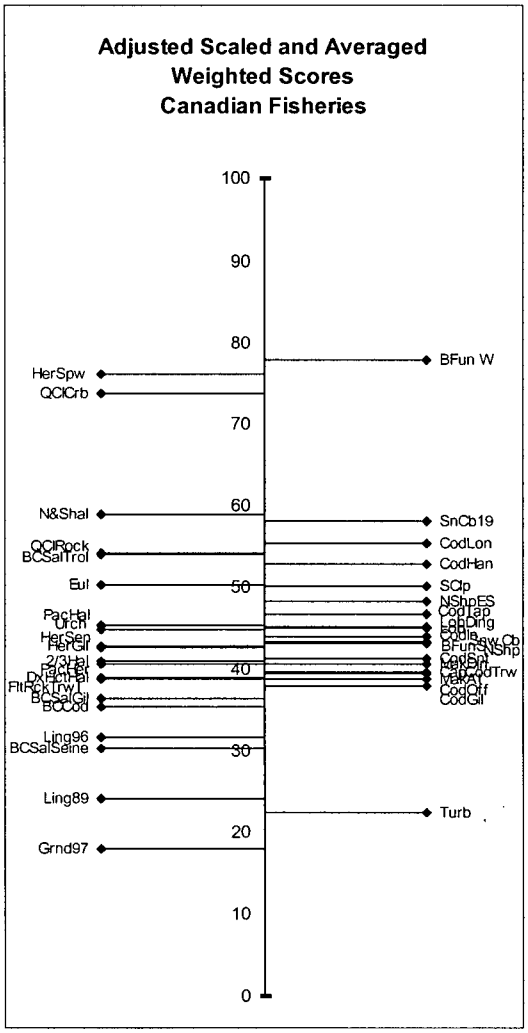

Figure 14: Results of scaled (0-100), adjusted weighted averaged Rapfish scores, Canadian marine fisheries

Note: Pacific fisheries are shown on left side of the axis, Atlantic fisheries on the right.

What is next to be considered, then, is the impact of the weighting on the overall rankings of the fisheries in the weighted assessment, in comparison to the unweighted assessment. It is instructive to note whether the relative rankings have shifted, and if so why and what can be learnt from this. This becomes apparent by comparing Figure 13 and Figure 14.

Firstly, there is little change between the top and bottom-ten fisheries. In fact, there is no change at all amongst the top four fisheries: the herring weir fishery in the Bay of Fundy ('BFunW', which ranks 1st), the herring spawn-on-kelp fishery ('HerSpw', ranking 2nd), the crab fishery in the Queen Charlotte Islands ('QCICrb', ranking 3rd), and the halibut fishery along BC's north and south coasts ('N&Shal', ranking 4th). The northern cod handline ('CodHan') fishery slips from 8th to 9th with the weightings applied, while the longline cod fishery ('CodLon') remains steady at 6th. The Area 19 snow crab fishery ('SnCb19') rises from 7th to 5th, no doubt due to the significant weighting applied to the 'Just Management' attribute, on which SnCb19 receives a perfect attribute score. BCSalTrol also climbs from 7th to 10th, and the Queen Charlotte Islands rockfish fishery ('QCIRock') rises from 8th to 9th.

The eulachon fishery ('Eul'), however, is curious. Eul ranked 5th in the unweighted scaled/averaged assessment, but slides five places to 10th once the attributes are weighted and adjusted. This fishery received the worst-possible scores in Mitigation of Habitat Destruction and Mitigation of Ecosystem Depletion, the two most-important attributes to be considered as determined through the paired comparison survey. Furthermore, it received the best-possible scores for Alternatives and Equity in Entry; while Equity in Entry ranks 4th of the eight attributes in importance, Alternatives was determined by survey respondents to be the least important consideration. As such, the weaknesses of this fishery were magnified by the weighting factors and the strengths were overlooked.

Amongst the ten-worst fisheries as assessed using the scaled/averaged method, nine remained in that category once the attributes were weighted. Only the Newfoundland caplin fishery rose out of this grouping, improving from 32nd to 28th; this fishery obtained good attribute scores for two of the three most-favourably weighted attributes (Just Management and Mitigation of Habitat Destruction), and a poor score on the least-important attribute, Alternatives. The gap left by Cap was filled by the regional Atlantic mackerel fishery, which plummeted from 21st to 32nd; this fishery obtained a very poor score on Mitigation of Ecosystem Depletion (which was weighted as the most important attribute), and a very good score on Adjacency and Reliance (which was second-last in importance).

Three fisheries in the worst-ten category held their relative rankings: the BC Groundfish trawl ('Grnd97') persisted at 41st; the BC salmon seine fishery ('BCSalSeine') held at 38th; and the 1996 BC lingcod fishery ('Ling96') remained at 37th. Six other fisheries simply shuffled positions within the worst-ten grouping: the gillnet fishery for northern cod ('CodGil') slipped from 33rd to 34th; the flatfish/rockfish trawl on BC's northern coast ('FltRckTrw') rose from 34th to 33rd; the BC cod trawl ('BCCod') dropped slightly from 35th to 36th; the gillnet fishery for BC salmon ('BCSalGil') improved slightly from 36th to 35th; the 1989 lingcod fishery ('Ling89') rose from 40th to 39th; and the Newfoundland turbot fishery ('Turb') slipped from 40th to 41st.

However, while there have been relatively few changes at the extremes, there were a few dramatic shifts in the middle section. Most notably, two fisheries shifted more than ten positions. As described above, the regional fishery for Atlantic mackerel ('MakAt') plunged 11 places, from 21st to 32nd. By comparison, the BC urchin dive fishery ('Urch') rose 13 positions from 30th to 17th. While for most attributes the urchin fishery obtained middling scores, it was among the very few to receive a perfect score for Just Management, an attribute which was weighted as third-most important following upon the survey results. As such, the ranking of this fishery is enhanced due to the weighting factors. By comparison, MakAt receives a very good score for Adjacency and Reliance, which was ranked 8th in importance for policy-making, a very poor score for Just Management (ranked 3rd in importance), and the worst-possible score for Mitigation of Ecosystem Depletion (which was considered most important and thus most heavily weighted). As with the eulachon fishery described above, this fishery loses the benefits of its strongest characteristics and is penalised for its weaknesses.

Eleven other fisheries shift five to nine positions in the weighted evaluation, four improving in status and seven declining. The four which improve are: the BC herring gillnet fishery ('HerGil', 28th to 22nd); the BC herring seine fishery ('HerSen', 29th to 23rd); the fishery for halibut in BC's Areas two and three ('2/3Hal', 31st to 25th); and the Atlantic northern shrimp fishery ('NShp', 25th to 21st). The seven which decline in the weighted assessment are: the BC eulachon fishery ('Eul', 5th to 10th); the seine fishery for herring in the Bay of Fundy ('BFunS', 16th to 21st); the gillnet sentinel fishery for northern cod ('CodSnt', 19th to 24th); the local fishery for mackerel in Dingwall, Nova Scotia ('MakDin', 22nd to 27th); the northern cod trawl

('CodTrw', 23rd to 29th); the offshore fishery for northern cod ('CodOff', 24th to 30th); and the Pacific halibut fishery in the Dixon Entrance and Hecate Strait ('DxHctHal', 26th to 31st).

Therefore, the evaluation using weighted attributes seems to confirm what was demonstrated in the unweighted assessment: those fisheries which are either very good or very bad overall generally remained so despite the application of the attribute weightings. Variability was found primarily in the middle of the results distribution. It is worth considering the characteristics (as represented by the attribute scores, which of course are indicative of the nature of each fishery) shared amongst those fisheries at the extremes, and those in the more variable middle section.

To begin, consider the extremes. What is notable at both extremes – good and bad – is the remarkable internal consistency of the attribute scores of the fisheries. Consider the Bay of Fundy herring weir fishery ('BFunW'), which scores best through the overall Rapfish ordination, the scaled/averaged proxy evaluation, and the weighted scaled/averaged proxy evaluation. For simplicity, consider the attribute values once scaled (0-100) and standardised, such that each attribute score can be considered a percentage of possible score. Of the eight attributes, this fishery receives perfect scores on four, and 75% on two more attributes. The remaining two attribute scores are at 63% and 50%, the only noteworthy variations. Thus, the fishery appears to be consistently good as measured by the attributes included in the evaluation. In contrast, consider the BC groundfish trawl ('Grnd97'), which scores worst through all three evaluations discussed above. This fishery presents a near-mirror image of attribute values, receiving 0% scores for four of the attributes, one score of 50%, one of 17% and one of 38%. However, Grnd97 received one score of 75% (for Alternatives). With this one exception, again this fishery demonstrated a relative internal consistency as measured by the attributes. Both extreme fisheries received extreme values for four of the eight attributes – fully half of the attributes.

The BC herring spawn-on-kelp fishery ('HerSpw') achieved a second-place rank in the three evaluations discussed herein. The attribute values obtained by this fishery demonstrate a similar pattern as with BFunW: three attributes received scores of 100% of the possible value, and three at 75%, one score of 50% and one (anomalous) score of 25%. The Newfoundland turbot ('Turb') fishery ranks as second-to-last in two of the evaluations (the Rapfish ethical ordination and the weighted scaled/averaged assessment), and third-to-last in one evaluation (the scaled/averaged assessment). This fishery received 0% of the possible attribute value for three attributes, 50% for four attributes, and 25% for one attribute. While slightly more variable than BFunW and Grnd97, these two runner-up fisheries again demonstrate a degree of consistency as indicated by attribute scores.

In short, of these four extreme-value fisheries, they are either consistently good or consistently bad, as evidenced by their attribute scores. With the exception of one score worth 75% of the potential attribute value, in the case of Grnd97, and one score worth 25% of the attribute value, in the case of HerSpw, these fisheries obtained relatively consistent scores across nearly all attributes.

In comparison, those fisheries which are found toward the middle of the distribution, and which demonstrate greater volatility of results when compared across various evaluations. For the three evaluations discussed thus far, the median score was obtained by a different fishery in each case. British Columbia's Areas 2 and 3 halibut fishery ('2/3Hal') scored at the median in Rapfish ethical ordination. This fishery received scores worth 50% of the potential value for four of the eight attributes. However, it also received one score worth the full value, and two worth 0% of the attribute value. Therefore, the fishery had a plurality of average scores, but a

score distribution which included both extreme good and extreme bad values. The regional Atlantic mackerel fishery ('MakAt') offered the median results in the unweighted scaled/averaged evaluation. MakAt also presents a diverse range of attribute scores, representing from 0% to 83% of the potential attribute value. Of these, two attributes are at 50% of value and two at 75% of value; however, there is no discernable pattern to the attribute scores. Finally, the median score in the weighted scaled/averaged evaluation is obtained by the Bay of Fundy herring purse seine fishery ('BFunS'). Again, the fishery received an array of scores, ranging from 0% of potential value to 100% of value, with only one value (38%) repeated.

Therefore, while the fisheries at the extremes tended to receive generally consistent attribute values, and thus present quite consistent results in each of the evaluations discussed thus far, those fisheries in the middle distribution demonstrate internal inconsistencies and as such present results that are more volatile.

In short, those fisheries which are very good tend to be very good all around, those fisheries which are very bad tend to be very bad all around, those fisheries whose result rankings are more variable demonstrate inconsistency of attribute scores. This is indicative of the reality that such fisheries may be quite good (or quite bad) in some regards, although average (or possibly bad or good) overall. Therefore, as the evaluations consider various aspects of the fisheries, the unique strengths or weaknesses of an individual fishery are exploited. When the attributes were weighted, those fisheries which received consistently good or consistently bad attribute scores remained relatively steady in the rankings, whereas those with inconsistent and/or broad-ranging attribute scores shifted about.

As discussed in Chapter 2, the weightings are of value firstly in setting fisheries policy goals. However, they can also be useful in evaluating fisheries which may be somewhat nondescript in the assessment, those fisheries which may otherwise not be given much consideration in an holistic evaluation. It is interesting to consider why a given fishery may shift about once the attributes are weighted, but also useful to examine the forces behind that shift and how those factors can be modified (to improve the fishery's results) or considered for application to other fisheries – that is, what can be learnt from the shifting values, and how can those insights be applied to the fishery in question and other fisheries to improve the ethical sustainability of the fisheries, as evidenced by the results of the assessments. Therefore, the weightings can be used not only for overall policy guidance, but even as management goals for individual fisheries. If a given fishery plunges in the rankings once the attributes are weighted, why does this happen, and how can it be fixed? What practicable and tangible measures may be taken to strengthen the fishery and improve its ethical sustainability? The application of the weightings to an overall evaluation provides additional insight into individual fisheries, insights which might be lost from considering the fishery from a single perspective.

As will be demonstrated in the section which follows, the results of those fisheries which are inconsistent in attribute scoring will also fluctuate when evaluated based upon only combinations of attributes. Just as happened with the weighted attribute values, sub-evaluations based upon selected attributes will also exploit the strengths and weaknesses of inconsistent fisheries, while leaving relatively untouched those fisheries which are internally consistent (whether good or bad).

3.4 Revisiting the Five Justices: Rapfish and Canadian Marine Fisheries

Subsequent to the basic Rapfish evaluation using the eight ethical attributes, a series of assessments were conducted using subsets of the attributes. These subsets consisted of the

attributes which represented each of the five justices, as described in Table 6 (page 46). Thus, five additional ordinations were conducted, one for each of the five justices: Creative Justice, Distributive Justice, Ecosystem Justice, Productive Justice, and Restorative Justice.

Table 10: Rank and Scores for Rapfish assessments (Ethical and Five Justices), Canadian fisheries

	Overall Ordination[1, 2]		Creative Justice[3]		Distributive Justice		Ecosystem Justice		Productive Justice		Restorative Justice	
	Rank	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*
1.	BFun W	74.3	BFun W	83.3	BFun W	87.7	***QCICrb***	***77.0***	***HerSpw***	***79.1***	BFun W	73.5
2.	***HerSpw***	***70.2***	SnCb19	80.6	***Eul***	***81.1***	***HerSpw***	***75.5***	***QCICrb***	***78.7***	***QCICrb***	***73.0***
3.	***QCICrb***	***70.2***	***HerSpw***	***75.0***	***N&Shal***	***72.6***	BFun W	66.8	BFun W	67.2	***HerSpw***	***72.3***
4.	***N&Shal***	***59.8***	***QCIRock***	***66.7***	***HerSpw***	***70.3***	SnCb19	53.2	***BCSalTrol***	***61.7***	***N&Shal***	***65.2***
5.	SnCb19	55.9	***Eul***	***63.9***	***QCICrb***	68.2	CodHan	52.8	SClp	60.5	***BCSalTrol***	***57.3***
6.	CodLon	53.9	Lob	61.1	SnCb19	66.1	CodLon	52.8	CodLon	58.7	***2/3Hal***	***54.7***
7.	***BCSalTrol***	***52.0***	LobDing	61.1	CodLon	61.1	***BCSalTrol***	***51.5***	***N&Shal***	***57.9***	CodLon	54.6
8.	CodHan	51.8	MakDin	61.1	***PacHal***	***58.5***	***QCIRock***	***50.9***	***2/3Hal***	***56.3***	SClp	53.8
9.	***QCIRock***	***51.7***	NShpES	61.1	CodHan	54.9	***N&Shal***	***46.7***	***HerGil***	***56.0***	***DxHctHal***	***52.6***
10.	NShpES	50.0	***Urch***	***61.1***	***QCIRock***	***53.8***	***HerGil***	***46.3***	CodHan	55.3	NShp	52.2
11.	SClp	49.9	CodSnt	58.3	BFunS	53.7	CodTap	46.3	NShp	54.9	CodHan	51.9
12.	***Eul***	***49.1***	CodHan	58.3	MakAt	53.5	CodIn	46.3	***DxHctHal***	***53.4***	***HerGil***	***51.9***
13.	***PacHal***	***48.9***	CodLon	58.3	***BCSalTrol***	***53.0***	NShpES	46.2	***BCCod***	***53.2***	CodOff	49.5
14.	BFunS	48.0	CodTap	58.3	Lob	52.5	SClp	45.2	***FltRckTrw***	***52.0***	CodTrw	49.5
15.	CodTap	47.8	MakAt	56.9	MakDin	52.5	***Urch***	***44.0***	CodIn	49.0	***QCIRock***	***48.9***
16.	NShp	47.1	SnwCb	55.6	***HerSen***	***52.5***	***HerSen***	***43.9***	CodTap	49.0	***PacHal***	***48.3***
17.	LobDing	46.8	BFunS	55.6	***Urch***	***52.0***	LobDing	43.9	***QCIRock***	***48.8***	***BCCod***	***48.0***
18.	Lob	46.7	***QCICrb***	***55.6***	SnwCb	51.5	Cap	43.7	CodOff	47.4	CodIn	47.8
19.	SnwCb	46.4	Cap	51.4	CodSnt	50.6	***2/3Hal***	***42.2***	CodTrw	47.4	CodTap	47.8
20.	CodIn	45.5	CodIn	50.0	***PacHer***	***50.5***	***FltRckTrw***	***42.1***	NShpES	47.1	NShpES	47.8
21.	***2/3Hal***	***45.0***	SClp	50.0	CodOff	50.5	***PacHal***	***41.8***	***BCSalGil***	***45.2***	***FltRckTrw***	***46.1***
22.	CodOff	44.7	CodGil	47.2	CodTrw	50.5	Lob	41.2	LobDing	45.0	SnCb19	44.8
23.	CodTrw	44.7	***N&Shal***	***44.4***	NShpES	50.5	SnwCb	40.6	***PacHal***	***45.0***	***BCSalSeine***	***44.4***
24.	Cap	44.5	***HerSen***	***44.4***	SClp	50.0	***BCSalGil***	***38.8***	***BCSalSeine***	***44.8***	***PacHer***	***44.0***
25.	***Urch***	***44.0***	***BCSalTrol***	***43.1***	LobDing	49.8	NShp	38.8	***PacHer***	***44.7***	CodGil	43.7
26.	***PacHer***	***43.7***	Turb	41.7	CodTap	45.9	***PacHer***	***38.8***	CodGil	44.4	LobDing	43.5
27.	***HerSen***	***43.6***	CodTrw	36.1	NShp	43.5	***DxHctHal***	***38.7***	SnCb19	43.9	Lob	43.3
28.	CodSnt	43.6	CodOff	36.1	Turb	43.5	CodSnt	38.5	***Ling96***	***43.0***	BFunS	42.8
29.	***HerGil***	***43.5***	NShp	36.1	CodIn	42.3	***BCCod***	***38.5***	Lob	42.8	***BCSalGil***	***42.5***
30.	MakDin	43.2	***PacHal***	***36.1***	***Ling96***	***41.9***	BFunS	37.6	Cap	41.7	Cap	42.0
31.	CodGil	43.0	***DxHctHal***	***33.3***	***2/3Hal***	***41.2***	CodGil	37.1	SnwCb	40.0	SnwCb	41.7
32.	MakAt	40.3	***BCCod***	***33.3***	***Ling89***	***39.5***	MakDin	34.9	***Urch***	***39.9***	***Ling96***	***40.7***
33.	***DxHctHal***	***39.3***	***PacHer***	***31.9***	***BCSalGil***	***38.3***	***Ling96***	***33.0***	***HerSen***	***39.9***	***HerSen***	***40.5***
34.	***BCSalGil***	***39.1***	***Ling89***	***30.6***	***HerGil***	***38.1***	***BCSalSeine***	***31.6***	CodSnt	39.7	CodSnt	40.5
35.	***FltRckTrw***	***39.0***	***HerGil***	***30.6***	***FltRckTrw***	***38.1***	MakAt	27.6	BFunS	39.0	MakDin	36.8
36.	***Ling96***	***37.7***	***FltRckTrw***	***30.6***	CodGil	37.6	CodTrw	26.9	***Eul***	***38.0***	***Eul***	***35.5***
37.	***BCSalSeine***	***35.8***	***BCSalGil***	***29.1***	***BCSalSeine***	***37.6***	CodOff	26.9	MakDin	35.6	MakAt	34.9
38.	***BCCod***	***32.0***	***Ling96***	***23.6***	Cap	36.2	***Eul***	***19.2***	MakAt	34.9	***Urch***	***34.4***
39.	***Ling89***	***30.8***	***Grnd97***	***18.1***	***Grnd97***	***32.6***	***Ling89***	***16.0***	***Ling89***	***23.8***	***Ling89***	***26.6***
40.	Turb	28.6	***BCSalSeine***	***9.7***	***DxHctHal***	***32.6***	Turb	13.6	***Grnd97***	***14.5***	Turb	17.9
41.	***Grnd97***	***20.8***	***2/3Hal***	***8.3***	***BCCod***	***18.5***	***Grnd97***	***10.2***	Turb	14.5	***Grnd97***	***17.6***
	MEAN	**46.2**	**MEAN**	**47.0**	**MEAN**	**50.1**	**MEAN**	**41.2**	**MEAN**	**47.2**	**MEAN**	**46.5**
	MAXIMUM	**74.3**	**MAXIMUM**	**83.3**	**MAXIMUM**	**87.7**	**MAXIMUM**	**77.0**	**MAXIMUM**	**79.1**	**MAXIMUM**	**73.5**
	MINIMUM	**20.8**	**MINIMUM**	**8.3**	**MINIMUM**	**18.5**	**MINIMUM**	**10.2**	**MINIMUM**	**14.5**	**MINIMUM**	**17.6**

Notes:

1. *Bold and italicised text indicates Pacific fisheries, plain text indicates Atlantic fisheries.*
2. *Dotted lines indicate top- and bottom-ten fisheries, dashed lines highlight median score.*
3. *Creative Justice values obtained through scaling and averaging of Rapfish scores, rather than full Rapfish assessment.*

The results for each evaluation by justice type are presented in Figure 15 (Creative Justice), Figure 16 (Distributive Justice), Figure 17 (Ecosystem Justice), Figure 18 (Productive Justice), and Figure 19 (Restorative Justice). These results are further summarised in Table 10, in which the fisheries are shown arranged from best to worst within columns, one for each of the six evaluations. The discussion that follows will be based upon the percentage results as presented in Table 10.

Creative Justice

Problematically, only three attributes (Adjacency and Reliance, Equity in Entry, and Just Management) are considered representative of Creative Justice, and therefore form the basis of this evaluation. As a result, the Rapfish ordination for Creative Justice was unreliable, as demonstrated by extremely high attribute leverages and a stress score of 0.28. Thus, as was done to enable comparison of the overall results with values that had been weighted, the original scores by each individual attribute for each fishery were scaled (0-100) and, where necessary, reversed so that in all cases 0 is Bad and 100 is Good. These values are presented in Appendix 2b. These scores were then averaged to produce a rough percentage-based score for each fishery. Subsequently, a second crude average score for each fishery was generated using the scaled scores for the three Creative Justice attributes. This is presented graphically in Figure 15. (The overall ethical percentage-based proxy score for all fisheries is shown in Table 9, on page 58.)

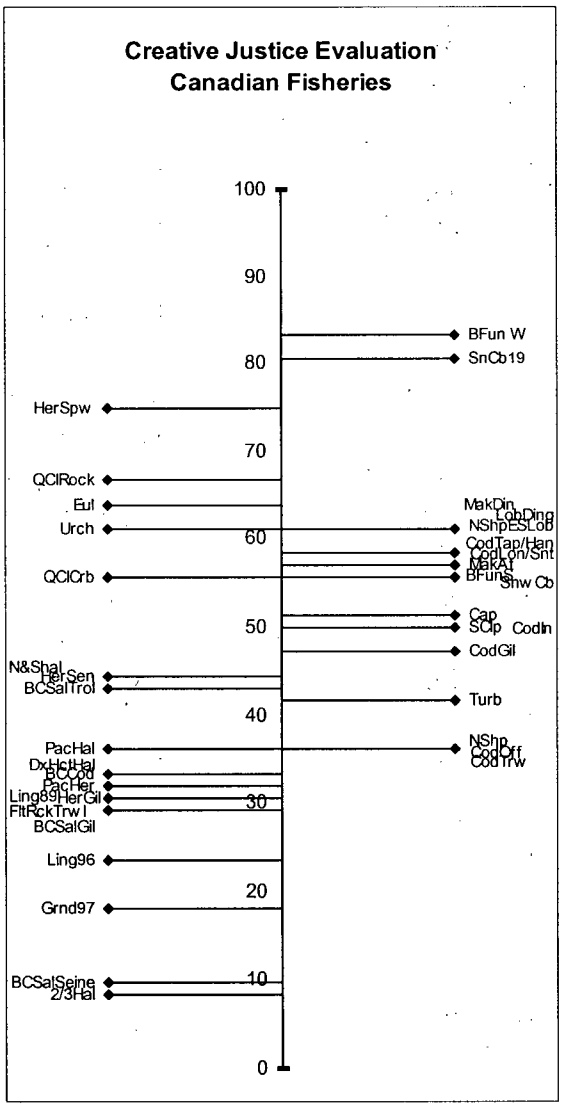

Figure 15: Results, Creative Justice evaluation, Canadian marine fisheries

Note: Pacific fisheries are shown on left side of the axis, Atlantic fisheries on the right.

As shown in Table 10, both the range of scores and the ranking of the fisheries changes quite considerably from the original overall ethical ordination to the evaluation for Creative Justice as based upon only three attributes. The average score for Creative Justice is just 47.0%, compared with 46.2% for the overall ordination. Furthermore, the range is considerably greater, with a maximum score of 83.3% (the herring weir fishery in the Bay of Fundy) and a minimum score of only 8.3% (the halibut fishery in Areas 2/3). The Atlantic fisheries averaged 55%, in comparison to the Pacific fisheries' 33%.

Overall, while there is variability in the top- and bottom-ten fisheries in comparison with those in the overall ethical assessment, only two top-ten fisheries drop below the median score: the halibut fishery along BC's north and south coasts ('N&Shal') falls from 4th to 23rd position (scores of 59.8% and 44.4%, respectively); and

the troll fishery for Pacific salmon ('BCSalTrol') drops from 7th (52.0%) to 25th (43.1%). Three others fall from the top-ten but remain above the median: two cod fisheries, handline ('CodHan') and longline ('CodLon') tie at 58.3% (along with the cod trap fishery and the gillnet sentinel fishery for cod; this tie can be attributed to the minimal number of attributes providing inadequate discriminatory power for this suite of fisheries), just short of the top-ten; and the crab trap fishery in the Queen Charlotte Islands ('QCICrb', falling from 3rd to 18th). Five fisheries remain within the top category: the Bay of Fundy herring weir fishery remains in the first place position; the BC herring spawn-on-kelp fishery slides slightly from 2nd to 3rd (although the score improves from 70.2% to 75.0%); the rockfish fishery in BC's Queen Charlotte Islands ('QCIRock') climbs from 9th to 4th; the fishery for northern shrimp on the Eastern Scotian Shelf ('NShpES') improves slightly from 10th to 9th; and Nova Scotia's Area 19 snow crab fishery climbs from 5th (55.9%) to 2nd (80.6%).

Similar is true for the bottom-ten from the ethical assessment. Seven of the worst-ten scores in Creative Justice are retained by bottom-ten fisheries in the overall assessment: two fisheries for Pacific salmon, the purse seine fishery ('BCSalSeine', scores 9.7% and ranks 40th), and the gillnet fishery ('BCSalGil', which scores 29.1% and ranks 37th); the BC Groundfish fishery ('Grnd97', which ranks 39th and scores 18.1% in the Creative Justice assessment; overall ethical assessment: 61st position and 20.8%); two BC lingcod fisheries, in 1989 ('Ling89', scoring 30.6% and ranking 34th) and in 1996 ('Ling96', scoring 23.6% and ranking 38th); the northern BC trawl for flatfish and rockfish ('FltRckTrw', which ranks 36th and scores 30.6%); and the BC cod trawl (33.3% and ranking 32nd). The remaining three positions are filled by two BC herring fisheries ('PacHer', which drops from 26th to 33rd, and 'HerGil', falling from 29th to 35th) and the Areas 2 and 3 halibut fishery ('2/3Hal', which drops from 21st, scoring 45.0% to 41st, with a score of 8.3%). The remaining three of the ten-worst fisheries from the overall ethical ordination are scattered throughout the Creative Justice evaluation: the regional Atlantic mackerel fishery ('MakAt') fishery scores as high as 56.9% and ranking 15th, a better result than that returned by three of the original ten-best fisheries; the Newfoundland turbot fishery ('Turb') climbs from 40th to 26th; and the Dixon Entrance/Hecate Strait halibut fishery improves somewhat from 33rd to 31st.

Included in the three attributes considered representative of Creative Justice is Just Management. This attribute is designed to capture the various arrangements by which management decisions can be made – at extreme, whether management decisions are made solely by the relevant government ministry, or equally shared by government, fishers, and other communities of interest. The second-ranked fishery, the Area 19 (Cape Breton Island) fishery for snow crab ('SnCb19'), scores 80.6%. This fishery, which placed sixth in the overall ethical evaluation (scoring 55.9%), benefits from the special and exemplary co-management arrangement between the Area 19 Crab Fishermen's Association and Fisheries and Oceans Canada, with good scores for Just Management and Equity in Entry. In fact, as a result of this unique co-management agreement, this fishery scores the only perfect score for Just Management out of the complete dataset of 62 fisheries. Furthermore, as a locally-conducted fishery, it also scores well in Adjacency and Reliance. For comparison, it is useful to note that the regional fishery for snow crab in Atlantic Canada, with no co-management arrangement, scores much-lower at 55.6%. It nevertheless ranks a still-respectable 16th position.

As with the snow crab fisheries, the east coast fisheries for lobster and mackerel provide additional viewpoints on the influence of local fisheries. Both of these fisheries were subdivided: once as a region-wide fishery, and secondly as a community fishery based on locally-specific data provided by a single fisher. These community-based fisheries are for the

community of Dingwall, Nova Scotia. The two lobster fisheries ('Lob' and 'LobDing') both rank in the top-ten and share a score of 61.1%, as does the Dingwall mackerel fishery ('MakDin'). By comparison, the regional mackerel fishery ranks 15th and scores 56.9%.

British Columbia's herring spawn-on-kelp fishery ranks third and scores 75.0%. This is small-scale fishery, conducted in a limited geographic area. Entry to the fishery is tightly limited, but as a traditional Aboriginal fishery, is based on historic activity. The fifth-ranked eulachon fishery (63.9%) is also a traditional Aboriginal fishery, and also benefits from special consideration of these three attributes; the eulachon fishery scores slightly better than average (46.2%) in the overall ethical ordination.

Distributive Justice

The assessment for Distributive Justice included six of the eight ethical attributes: Adjacency and Reliance, Alternatives, Equity in Entry, Just Management, Illegal Fishing, and Discards and Wastes. Note that three of these comprise the Creative Justice suite of attributes indicating the great overlap and complementarity of the forms of justice. A full Rapfish assessment was conducted, using these six attributes, producing an acceptable stress score of 0.24. The results are presented, in one dimension, in Figure 16. Graphs showing the leverage and Monte Carlo results are shown in Appendix 5a.

The range of scores obtained in this assessment is the most extreme of all Rapfish assessments presented in this chapter, with a maximum score of 87.7% and a minimum score of 18.5%. In fact, the 87.7% score obtained by the Bay of Fundy herring weir fishery is the highest score achieved by any fishery in any of these evaluations. In the Distributive Justice ordination, the average score for all fisheries is 50.1%, while the Atlantic fisheries average 51.6% and the Pacific 48.5%.

It will be noted that, of the ten best-ordinating fisheries from the overall ethical Rapfish assessment, eight remain in the top-ten in the Rapfish assessment of Distributive Justice. Only the BC salmon troll fishery ('BCSalTrol'), which falls from 7th to 13th, and the Eastern Scotian Shelf fishery for northern shrimp ('NShpES', which falls from 10th to 23rd) do not remain within the top-ten.

The balance of the best-ten fisheries in the Distributive Justice ordination is held by two Pacific fisheries. The Pacific halibut fishery ('PacHal') ranks 8th and scores 58.5%. This fishery scores poorly for Equity in Entry (0.5 out of a possible good score of 2.0), but this score is comparable with other Pacific fisheries. By comparison, PacHal receives a perfect score for Alternatives, a score obtained only by two other Pacific fisheries, both of which are also in the top-ten of this ordination: the halibut hook and line fishery along BC's north and south coasts ('N&Shal') retains its top-ten ranking from the overall ordination, while the fishery for eulachon ('Eul') ranks second in the Distributive Justice assessment (score: 81.1%). In contrast, the eulachon fishery, a traditional Aboriginal fishery, ranks just 18th in the overall ethical ordination. This small-scale, traditional-use, and non-market fishery receives the best-possible scores for Equity in Entry, as well as Illegal Fishing and Discards and Wastes, indicating the strong community orientation of the fishery.

Of the worst-ten fisheries in regards to the overall ethical ordination, seven ordinate amongst the worst-ten of the Distributive Justice ordination: the BC cod trawl ('BCCod', scoring 18.5% and ranking 41st); the Dixon Entrance/Hecate Strait halibut fishery ('DxHctHal', scoring 32.6% and ranking 40th); the BC groundfish trawl fishery ('Grnd97', scoring 32.6% and

ranking 39th); the purse seine fishery for Pacific salmon ('BCSalSeine', ranking 37th and scoring 37.6%); the northern BC trawl for flatfish and rockfish ('FltRckTrw', scoring 38.1% and ranking 35th); the gillnet fishery for Pacific salmon ('BCSalGil', scoring 38.3% and ranking 33rd); and the 1989 lingcod fishery (ranking 32nd and scoring 39.5%).

Also ordinating within the bottom-ten are: the Newfoundland caplin fishery ('Cap'. which scores 36.2% and ranks 38th); the gillnet fishery for northern cod ('CodGil', scoring 37.6% and ranking 36th); and the BC herring gillnet fishery ('HerGil', which ranks 34th and scores 38.1%). As a purse seine fishery, it is perhaps not surprising to find the caplin fishery obtaining similar results as the salmon seine fisheries, although the herring seine fisheries from both the east and west coasts score much better: the Bay of Fundy herring seine ('BFunS') fishery obtains a 11th-place ranking and scores 53.7%, while the Pacific herring seine ('PacHer') scores 50.5% and ranks 20th. The caplin fishery scores well for Adjacency and Reliance and Equity in Entry, but very poorly in Alternatives, Just Management, Illegal Fishing, and Discards and Wastes. This final attribute is particularly noteworthy, as the fishery is conducted primarily as a roe fishery and thus by its very nature is wasteful.

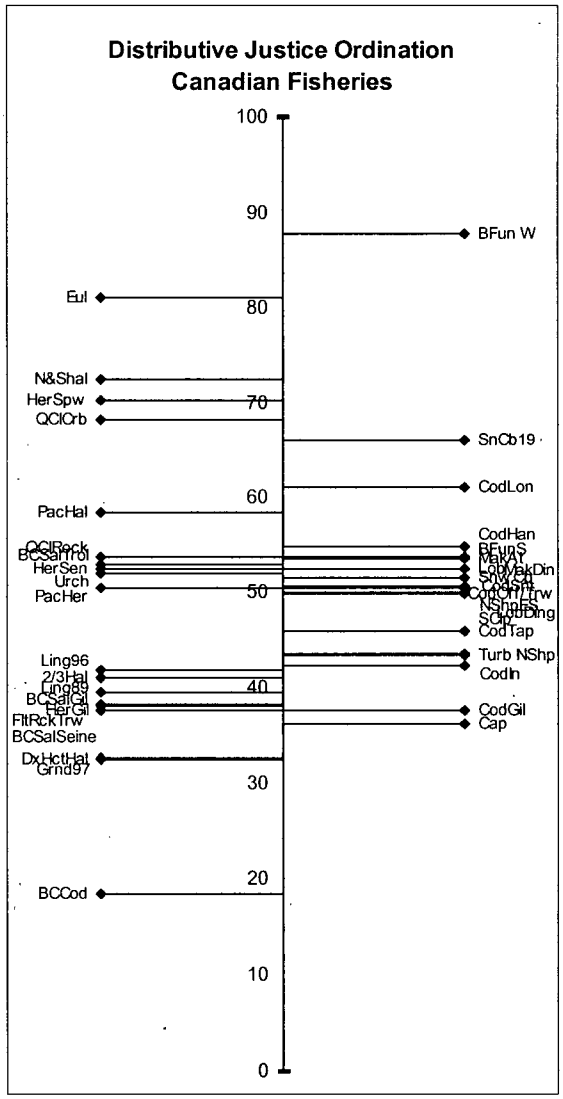

Figure 16: Results, Distributive Justice evaluation, Canadian marine fisheries

Note: Pacific fisheries are shown on left side of the axis, Atlantic fisheries on the right.

Three fisheries which had ordinated amongst the worst-ten in the ethical ordination achieved better scores in the Distributive Justice ordination. The Newfoundland turbot fishery ('Turb') ranks 28th and scores slightly below average at 43.5%. As noted above, this ordination includes six of the eight ethical attributes; Mitigation of Habitat Destruction and Mitigation of Ecosystem Depletion are not considered representative of Distributive Justice. The turbot fishery received the worst-possible scores in these two attributes, and its improved standing in this ordination is due to the exclusion of these attributes from consideration. The 1996 BC lingcod fishery also improves slightly, from 36th to 30th (scoring 37.7% and 41.9%, respectively). The Atlantic mackerel fishery ('MakAt'), however, improves substantially, from a 32nd place rank (score = 40.3%) in the overall ethical ordination to 12th place (53.5%) in the Distributive Justice ordination. This fishery scores reasonably well in the Creative and Distributive Justice assessments, but, as will be seen below, poorly in the other sub-evaluations. As was noted in the discussion above regarding the weighted scores, MakAt receives a wide range of scores across all attributes. As such, it is greatly influenced by the combination of attributes selected as a subset for evaluation. This fishery provides a tidy example of an inconsistent fishery, one which is good in some regards (for instance, Adjacency and Reliance, Equity in Entry, and Illegal Fishing) and bad in others

(notably Mitigation of Ecosystem Depletion, Just Management, and Mitigation of Habitat Destruction). The relative position of this fishery in any assessment then is highly variable and subject to the selection of the attributes for the assessment. As it happens, like many Atlantic fisheries, MakAt scores well in many of the attributes included in the Creative and Distributive Justice evaluations, but poorly in those included in the other sub-evaluations.

Ecosystem Justice

The Rapfish assessment for Ecosystem Justice included five of the eight ethical attributes: Adjacency and Reliance, Just Management, Mitigation of Habitat Destruction, Mitigation of Ecosystem Depletion, and Discards and Wastes. The results are presented in Figure 17. Using these five attributes, the Rapfish assessment resulted in a high stress score of 0.27, but acceptable leverage. Graphs showing the leverage and Monte Carlo results are presented in Appendix 5a. The average result in the Ecosystem Justice ordination is 50%, with a maximum score of 77.0% and a minimum score of 10.2%. While on average the Atlantic fisheries score slightly lower than the Pacific fisheries (41.0%, in comparison with 41.3%), the best- and worst-scoring fisheries are both prosecuted in British Columbia.

Interestingly, nine of the ten best scoring fisheries in the original, overall evaluation remain in the top-ten: the Queen Charlotte Islands crab fishery ('QCICrb') obtains the top score of 77.0%, followed by the traditional BC Aboriginal herring spawn-on-kelp fishery ('HerSpw'), which scores 75.5%. The herring weir fishery in the Bay of Fundy ('BFunW') rounds out the top three, scoring 66.8%. The Area 19 snow crab fishery ('SnCb19') ranks 4th and scores 53.2%, followed by two Newfoundland small-scale cod fisheries, the handline ('CodHan') and the longline ('CodLon'), which tie at 52.8%. The commercial troll fishery for Pacific salmon ('BCSalTroll') scores 51.5% and ranks 7th, the same ranking it enjoys in the overall ordination. Another Queen Charlotte Islands fishery, the fishery for rockfish ('QCIRock'), also ordinates within the top-ten, ranking 8th and scoring 50.9%. British Columbia's north and south coast halibut fishery ('N&Shal') ranks 10th and scores 46.7%, in comparison with its 4th place ranking in the overall ethical evaluation. N&Shal received very good scores in two of the three ethical attributes not included in Ecosystem Justice, Alternatives and Illegal Fishing, and as such loses eleven positions in the ranking. Amongst the best-ten fisheries in the overall evaluation, only the Eastern Scotian Shelf fishery for northern shrimp ('NShpES') falls out of this category in the Ecosystem Justice distribution; nevertheless, it slips only to 13th and scores an above-average 46.2%.

The gap left by NShpES is filled by the BC gillnet fishery for herring ('HerGil'), which climbs from 29th to 10th and scores 46.3%. This fishery was scored based on information shared by a fisher in northern British Columbia, and exhibited a range of attribute scores. As described above, the Rapfish evaluation for Ecosystem Justice included five of the eight attributes. Of the five applied, HerGil received generally nondescript scores, including scores at 50% of the possible attribute value for Mitigation of Habitat Destruction, Mitigation of Ecosystem Depletion, and Discards and Wastes. HerGil received extreme values for the three attributes *not* included in this assessment, including the best-possible score for Illegal Fishing and worst-possible scores for Alternatives and Equity in Entry. Thus, as has been seen in previous assessments, the selection of attributes has exploited the inconsistencies of this fishery. HerGil scores below the average in the overall Rapfish Ethical ordination, no doubt negatively affected by these two worst-possible scores. By removing these two attributes from consideration, the fishery's status is greatly improved. This pattern will also be detected in Productive Justice,

discussed below, as the only other evaluation in which both of these attributes have been excluded.

Six of the ten worst-scoring fisheries in the ethical ordination remain in the worst-ten in this ordination, including two BC lingcod fisheries: the 1989 lingcod fishery ('Ling89') scores 16% and ranks 39th, a ranking even with that it obtains in the ethical ordination; the 1996 lingcod fishery ('Ling96') ranks 33rd and scores 33.0%. The BC groundfish trawl ('Grnd97') retains its last-place rank with a score of 10.2%, and the Newfoundland turbot fishery, which ranks 40th in the overall ordination, again ranks 40th in the Ecosystem Justice ordination, scoring a mere 13.6%. The Atlantic mackerel fishery ('MakAt') ranks 35th and scores 27.6%. While the seine fishery for BC salmon ('BCSalSeine') remains in the least-sustainable category, ranking 34th and scoring 31.6%, the gillnet for Pacific salmon climbs from 34th to 24th and scores 38.8%. Three other fisheries escape from this category in the Ecosystem Justice ordination: the BC cod trawl ('BCCod', ranking 29th and scoring 38.5%); the halibut fishery in the Dixon Entrance/Hecate Strait ('DxHctHal', which scores 38.7% and ranks 33rd); and trawl for flatfish and rockfish on BC's north coast ('FltRckTrw', scoring an above-average 42.1% and ranking 20th).

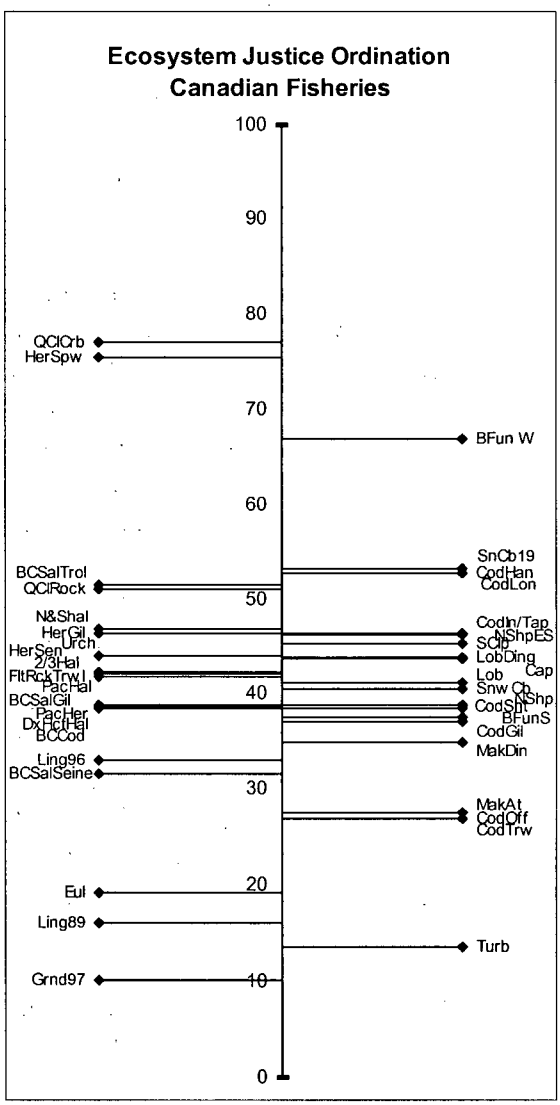

Figure 17: Results, Ecosystem Justice evaluation, Canadian marine fisheries

Note: Pacific fisheries are shown on left side of the axis, Atlantic fisheries on the right.

Four fisheries enter the worst-ten in the Ecosystem Justice ordination. Two Newfoundland cod fisheries, the trawl ('CodTrw') and offshore ('CodOff'), tie at a score of 26.9% . As with the Newfoundland turbot fishery and the BC groundfish fishery, these are large-scale industrial fisheries that have high levels of discards and wastes. The mackerel fishery in Dingwall, Nova Scotia, slips from 30th in the overall Ethical ordination to 32nd and scores 34.9%. Interestingly, the eulachon fishery ('Eul'), which ranked 12th in the overall ordination, plummets to 38th position in the Ecosystem Justice ordination and scores just 19.2%. While this fishery receives the best-possible score for Discards and Wastes, and a good score for Adjacency and Reliance, surprisingly, it obtained the worst-possible score for two attributes representative of Ecosystem Justice: Mitigation of Habitat Destruction and Mitigation of Ecosystem Depletion. Furthermore, it received perfect scores for the three attributes not included in this assessment: Alternatives, Equity and Entry, and Illegal Fishing. As was discussed above, this fishery received a variety of scores for the eight ethical attributes, and as such exhibits variability through each of the sub-evaluations.

Productive Justice

The assessment for Productive Justice included four of the eight ethical attributes: Mitigation of Habitat Destruction, Mitigation of Ecosystem Depletion, Illegal Fishing, and Discards and Wastes. The average score for all fisheries was 47.2%, with scores ranging from a maximum of 79.1% to a minimum of 14.5%. On average, the Pacific fisheries presented slightly better results than the Atlantic, with an average score of 48.8% for west coast fisheries in comparison to an average of 45.6% on the east coast. The Rapfish assessment, the results of which are presented graphically in Figure 18, produced a very high stress score of 0.31, due no doubt to the fact that just four attributes were included in the assessment. The Monte Carlo and leverage results are provided in Appendix 5a.

The results of the Productive Justice ordination present greater volatility than those of the Rapfish ordinations already discussed. Seven of the ten-best fisheries in the Ethical ordination remain in the top-ten of this ordination: BC's indigenous herring spawn-on-kelp fishery ('HerSpw', scores 79.1% and ranks 1st); Queen Charlotte Islands crab fishery ('QCICrb', scores 78.7% and ranks 2nd); the herring weir fishery in the Bay of Fundy ('BFunW', scores 67.2% and ranks 3rd); the troll fishery for Pacific salmon ('BCSalTrol', scores 61.7% and ranks 4th); two northern cod fisheries, the longline ('CodLon', which scores 58.7% and ranks 6th) and the handline ('CodHan', ranking 10th and scoring 55.3%); and the halibut fishery along BC's north and south coasts ('N&Shal', which ranks 7th and scores 57.9%). Note that four of these seven are Pacific coast fisheries.

Three fisheries which ordinated amongst the best ten in the complete Ethical ordination drop out of the top-ten in this ordination: the rockfish fishery in BC's Queen Charlotte Islands ('QCIRock', ranks 28th and scores 49%); the Eastern Scotian Shelf shrimp fishery ('NShpES', which slips from 10th overall to 20th in Productive Justice and scores slightly below average at 47.1%); and Nova Scotia's Area 19 snow crab fishery ('SnCb19', which ranks 6th in the complete Ethical ordination, but plummets to 43rd in the Productive Justice ordination, and scores below average at 43.9%). SnCb19 scores very well in the overall ordination, as well as in the evaluations for Creative, Distributive and Ecosystem Justice, and received the only perfect score for Just Management of all fisheries included in the assessments; this attribute, however, is not included in the evaluations for Productive or (as will be discussed below) Restorative Justice, and as such SnCb19 presents much lower scores in both assessments.

Three fisheries enter the best-ten category: the Atlantic scallop fishery ('Sclp', which ranked 11th overall, ranks 5th and scores 60.5%); BC's Areas 2 and 3 halibut fishery ('2/3Hal', ranks 8th, in comparison to 21st overall, and scores 56.3%); and the gillnet fishery for Pacific herring ('HerGil', which climbs from 29th to 9th and scores 56.0%). As with the sub-evaluation for Ecosystem Justice, Alternatives and Equity in Entry were excluded from this ordination, and as HerGil received the worst-possible scores for these two attributes, its ranking was greatly improved by removing those attributes from consideration.

Those fisheries which ordinate amongst the worst-ten ethically also demonstrate some variability in the Productive Justice ordination. Only four of the original ten remain in the worst-ten in this evaluation: the Newfoundland turbot fishery ('Turb', which scores 14.5% and ranks last); the BC groundfish fishery ('Grnd97', scoring 14.5% and ranking 40th); the BC lingcod fishery in 1989 ('Ling89', ranking 39th and scoring 23.8%); and the regional Atlantic mackerel fishery ('MakAt', which scores 34.9% and ranks 38th). Note then that the three worst fisheries in the Productive Justice ordination are also the three worst fisheries in the overall Ethical evaluation.

Most of the remaining six of the original ten-worst improve considerably, including three which score above average: the Dixon Entrance/Hecate Strait halibut fishery ('DxHctHal', climbs from 33rd to 12th and scores 53.4%); the trawl fishery for flatfish and rockfish in northern BC ('FltRckTrw', rises from 35th to 14th and scores 52.0%); and the BC cod trawl ('BCCod', soars from 38th to 13th and scores 53.2%). BCCod receives middling scores for Mitigation of Habitat Destruction and Mitigation of Ecosystem Depletion, and the worst-possible score for Discards and Wastes. However, it also receives the best-possible score for Illegal fishing, which in part accounts for its significantly-improved standing. Most importantly, however, the BC cod trawl fishery receives the worst-possible scores for Alternatives, Equity in Entry, and Just Management; the exclusion of these three attributes from the Productive Justice ordination results in a much better score than would otherwise occur. The balance consists of: the 1996 lingcod fishery ('Ling96', which ranks 28th and scores 43.0%); and two BC salmon fisheries, the seine, ('BCSalSeine', which ranks 24th and scores 44.8%), and the gillnet ('BCSalGil', which ranks 21st and scores 45.2%). Included in the attribute set for Productive Justice is Mitigation of Habitat Destruction, for which salmon fisheries would be expected benefit due to efforts at habitat restoration, and Discards and Wastes, which would include efforts to reduce bycatch in multispecies salmon fisheries.

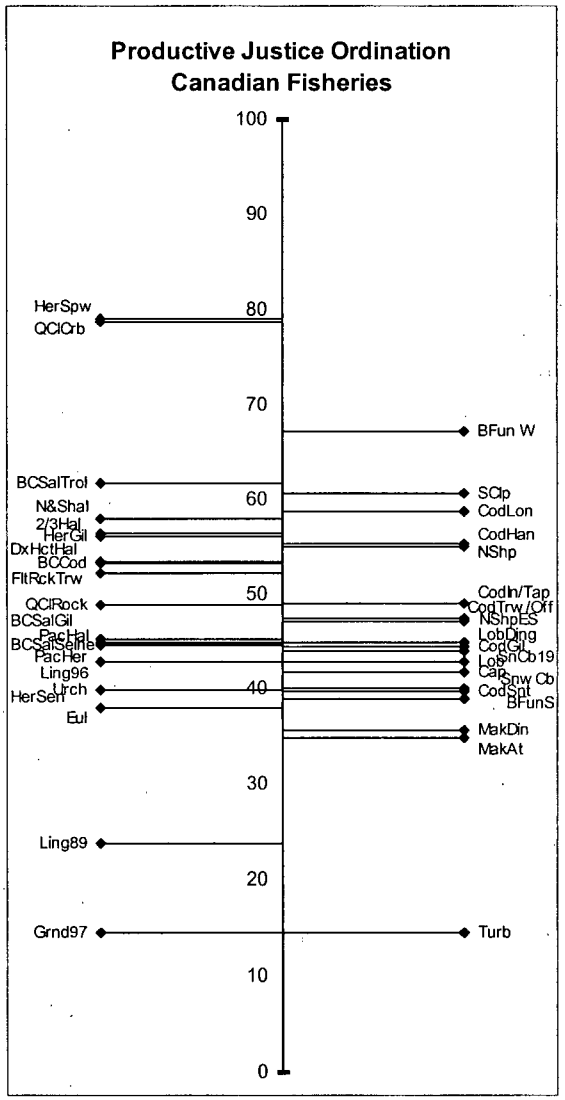

Figure 18: Results, Productive Justice evaluation, Canadian marine fisheries

Note: Pacific fisheries are shown on left side of the axis, Atlantic fisheries on the right

Also interesting are the six fisheries which enter the worst-ten category in Productive Justice. Of these, three are prosecuted in Atlantic Canada and three in British Columbia, and have in some cases presented very good results in previous Justice-based ordinations. For instance, the mackerel fishery in Dingwall, Nova Scotia ('MakDing'), scores reasonably well in the Creative Justice evaluation (8th place) and the Distributive Justice ordination (15th place), but ranks 37th (and scores 35.6%) in Productive Justice, alongside its regional counterpart, MakAt. These two fisheries receive very poor scores for Mitigation of Habitat Destruction and Mitigation of Ecosystem Depletion, both of which are included in the Productive Justice ordination, and good scores in Adjacency and Reliance and Equity in Entry, which are both excluded in this ordination. As such, this ordination exposes the weaknesses of the two fisheries, as much as the evaluations for Creative and Distributive Justice expose their strengths. Similar is true for the BC eulachon fishery ('Eul', scoring 38.0% and ranking 36th), which obtained perfect scores in Alternatives and Equity in Entry and the worst-possible scores for Mitigation of Habitat Destruction and Mitigation of Ecosystem Depletion. Interestingly, however, the

eulachon fishery receives the best-possible scores for Illegal Fishing and Discards and Wastes, and thus the poor result for this fishery in the Productive Justice assessment can largely be ascribed to the exclusion of Alternatives and Adjacency and Reliance in the relevant subset of attributes. The other worst-scoring fisheries consist of: Newfoundland's sentinel gillnet fishery for northern cod ('CodSnt', scoring 39.7% and ranking 34th); one herring purse seine fishery from each coast, in British Columbia ('HerSen', which scores 39.9% and ranks 33rd), and in the Bay of Fundy ('BFunS', which ranks 35th and scores 39%); and the urchin dive fishery in British Columbia ('Urch', which ranks 32nd and scores 39.9%).

Restorative Justice

The assessment for Productive Justice included five of the eight ethical attributes: Alternatives, Mitigation of Habitat Destruction, Mitigation of Ecosystem Depletion, Illegal Fishing, and Discards and Wastes. Note that there is substantial overlap with Productive Justice, as four of the five attributes (all but Alternatives) are common between the two forms of Justice. The Rapfish ordination produced a high stress score of 0.28, but reasonable leverage. The results of the leverage and Monte Carlo assessments are presented in Appendix 5a, while the results of the Rapfish ordination, presented in one dimension, are shown in Figure 19.

The average result for all 41 fisheries was 46.5%, with scores ranging from a minimum of 17.6% to a maximum of 73.5%. Again, as with Productive Justice and Ecosystem Justice, the Pacific fisheries averaged slightly better than the Atlantic fisheries, scoring 47.2% and 45.7% respectively.

The suite of attributes considered representative of Restorative Justice, and therefore included in this assessment, includes all those representative of Productive Justice, but with the addition of Alternatives. As such, similar patterns can be expected in the two evaluations. For one, these two evaluations are unique in that the Pacific fisheries present higher average results than the Atlantic fisheries. Yet, more interestingly, the volatility of the individual fisheries is similar in the two assessments. Again, the Area 19 snow crab fishery ('SnCb19'), which ranked 5th in the overall Ethical ordination, ranked substantially lower in the Restorative Justice ordination (ranking 22nd and scoring below average at 44.8%), as in the Productive Justice evaluation (ranking 27th and scoring 43.9%). The Queen Charlotte Islands rockfish fishery, which ranked 9th in the overall ordination, demonstrates a similar pattern, ranking 15th and scoring 48.9% in the Restorative Justice ordination (in comparison with 17th and 48.8% in Productive Justice). The somewhat-improved scores from Productive Justice to Restorative Justice of these two fisheries may be attributed to the inclusion of the Alternatives attribute, which tempers the generally-poor scores each fishery obtained for most other attributes included in the ordination, as discussed above. Two other fisheries slipped from the top-ten category: the handline fishery for northern cod ('CodHan', which slipped to 11th and scored 51.9%); and the Eastern Scotian Shelf shrimp fishery ('NShpES', which scores 47.8% and, as with Productive Justice, drops from 10th to 20).

Six of the ten-best fisheries overall remain in the upper category in this assessment: the herring weir fishery in the Bay of Fundy ('BFunW', again ranks in 1st place and scores 73.5%); the crab fishery in the Queen Charlotte Islands ('QCICrb', ranking 2nd and scoring 73.0%); the herring spawn-on-kelp fishery ('HerSpw', ranking 3rd and scoring 72.3%); the halibut hook and line fishery on BC's north and south coasts ('N&Shal', scoring 65.2% and ranking 4th); the BC salmon troll fishery ('BCSalTrol', which ranks 5th and scores 57.3%); and the longline fishery for northern cod ('CodLon', scoring 54.6% and ranking 7th). The balance of the top-ten consists

of: the halibut hook and line fishery in BC's Areas 2 and 3 ('2/3Hal), climbing from 21st overall to 6th and scoring 54.7%); the Atlantic scallop fishery ('Sclp', scoring 53.8% and ranking 8th); the Atlantic northern shrimp fishery ('NShp', which scores 52.2% and ranks 10th); and the Pacific halibut fishery in the Dixon Entrance/Hecate Strait region ('DxHctHal', which ranks 9th and scores 52.6%).

DxHctHal is very interesting, as it ordinates as 33rd in the overall Ethical evaluation. This provides the only example from all five sub-evaluations wherein a fishery has swung from one extreme to the other, although as described above DxHctHal climbed to 12th in the Productive Justice assessment. The information for this fishery was shared by a fisher during an interview in Prince Rupert, British Columbia, and was based upon that fisher's experience within the fishery. As with other fisheries which exhibited inconsistent scores from one evaluation to the next, this fishery obtained a wide range of attribute scores. Again considering the attribute scores as percentage of possible value, this attribute received three scores with 0% of value, three at 50% of value, and the remaining two at 100% of value for the eight attributes. In both Productive Justice and Restorative Justice, two of the three attributes for which DxHctHal received 0% of possible value were excluded, namely Equity in Entry and Just Management, as well as Adjacency and Reliance, for which the fishery received 100% of potential attribute value. DxHctHal was one of just two individual fisheries included in the assessments, the BC cod fishery being the other, which received 0% of value for both Equity in Entry and Just Management. (Two salmon gillnet fisheries also achieved 0% of value for these attributes, but as described above, for the assessments described in this chapter the average Rapfish values have been considered.) The fishery obtained 50% of the possible value of the Alternatives attribute, the one attribute added from Productive Justice to the suite of attributes considered representative of Restorative Justice; it therefore seems that this middling score was sufficient to alter the ranking of DxHctHal, relative to the other fisheries.

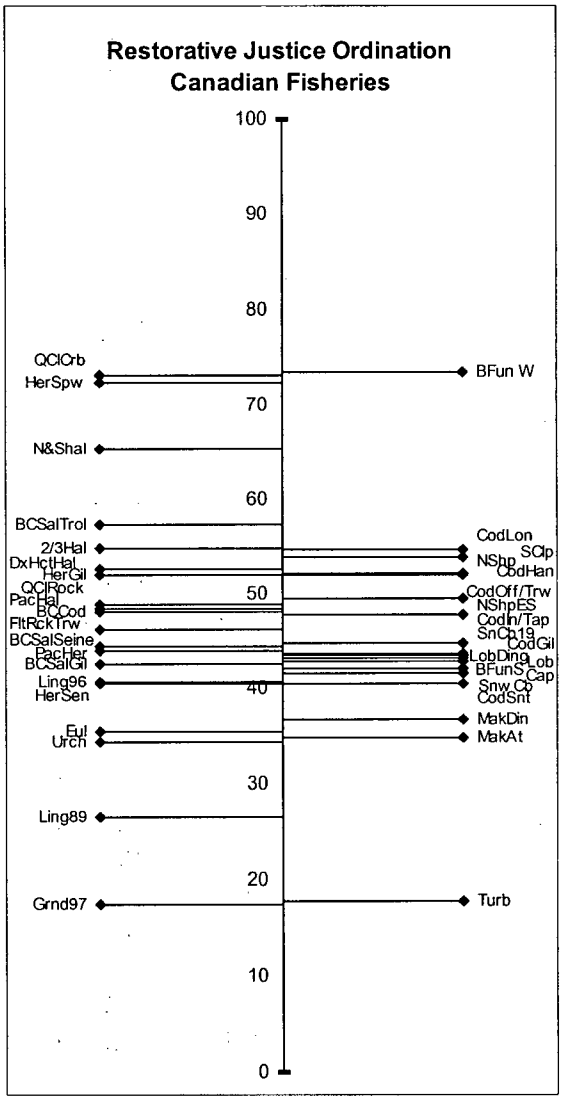

Figure 19: Results, Restorative Justice evaluation, Canadian marine fisheries

Note: Pacific fisheries are shown on left side of the axis, Atlantic fisheries on the right.

The worst-ten fisheries for Restorative Justice are very similar to those in Productive Justice; while the relative positions do shift, nine fisheries are common between the two evaluations: two Atlantic mackerel fisheries, the regional ('MakAt') and the Dingwall, Nova Scotia ('MakDing'), rank 37th and 35th and score 34.9% and 36.8% respectively; two BC lingcod fisheries, the 1989 lingcod fishery ('Ling89') ranks 39th and scores 26.6%, and the 1996 fishery ('Ling96) ranks 32nd and scores 40.7%; the BC herring seine fishery ('HerSen') ties with the sentinel gillnet fishery for northern cod ('CodSnt'), both scoring 40.5%; the eulachon fishery

('Eul') scores 35.5% and ranks 36th; the urchin dive fishery ('Urch') ranks 37th and scores 34.4%; the Newfoundland turbot fishery ('Turb') ranks 40th and scores 17.9%; and the BC groundfish trawl ('Grnd97') scores 17.6% and again ranks 41st.

Of these, five (Ling 96, Ling89, MakAt, Turb, and Grnd97) rank within the worst-ten fisheries in the overall ethical evaluation. The remaining four of the ten-worst fisheries in the ethical ordination demonstrate similar results as with Productive Justice.

3.5 Discussion: Considerations for Ethical Fisheries Policies

What has become evident through these various analyses – the Rapfish assessments for overall ethical sustainability and for Distributive, Ecosystem, Productive, and Restorative Justice, as well as the scaled/averaged proxy method evaluations for overall ethical sustainability (weighted and not) and for Creative Justice – is that while some fisheries always score very well and others always very poorly, the vast majority are quite volatile. At either extreme – Good or Bad – are fisheries which receive generally consistent scores for all or most of the eight Ethical attributes. Thus, those fisheries which are very good are good in all measured ways, while those which are very bad are bad in all measured ways. These extreme fisheries are either uniformly strong or uniformly weak, as the case may be.

In between are found a range of fisheries which are largely inconsistent as per attribute scores. Some may produce an average scores for all attributes, thus exhibiting some level of consistency, however ordinary. But the most interesting fisheries are those which, while nondescript by most measures, may be either very good or very bad in one or two ways. And it is from these fisheries that the most useful information can be gleaned. As has been shown, by examining the same dataset from various perspectives, in the form of different sub-evaluations conducted using various combinations of attributes, specific strengths and weaknesses of a given fishery become evident. The methodology effectively exploits these variations and makes them clearer to see. In examining the variations in results for selected fisheries, one may develop an awareness of characteristics which may be transferable to other fisheries. For example, Cape Breton's Area 19 fishery for snow crab scores well in the overall evaluation, as well as the assessments for Creative, Distributive, and Ecosystem Justice. The most unique characteristic of this fishery is the co-management agreement between the fishers' association and Fisheries and Oceans Canada (Canada, 1996). (Note that this fishery scores below the mean in the evaluations for Productive and Restorative Justice, assessments which excluded the Just Management attribute, wherein the co-management agreement was captured.) From the perspective of these three forms of Justice, this is a significant strength, and one which may be transferable to other Canadian fisheries. No doubt, there is likely to be hesitation on both sides – fishers and government – in many instances, and such an arrangement may not necessarily be desirable and/or practicable in all instances. Yet partial co-management arrangements may represent preliminary steps which could improve the status of a marginal fishery.

The BC eulachon fishery provides another curious example. This fishery ranks 12th in the overall Rapfish Ethical ordination, but ranks within the top-ten for Creative Justice and Distributive Justice, and the bottom-ten for Ecosystem, Productive, and Restorative Justice. A traditional indigenous fishery, the eulachon fishery obtains a range of scores on the eight attributes, including four perfect 'Good' scores and two wholly 'Bad' scores. Thus, overall, the fishery appears reasonably good, as reflected in the assessment results. Yet, in examining the fishery by attribute groupings, weaknesses appear – according to the respondent who shared information on this fishery, the eulachon fishery continues to cause damage to both fisheries habitat and the fisheries ecosystem, as evidenced by the worst-possible attribute scores. These

anomalous scores are sufficient to affect the fishery's results depending upon the attribute groupings. Indeed, the overall strength of the fishery *vis-à-vis* the other attributes masks these two weaknesses.

This leads to another important lesson. The range of evaluations conducted provide for a more complete view of the dataset, particularly such volatile fisheries. As with the Area 19 snow crab fishery, it would be easy to conclude from the overall Ethical evaluation that the eulachon fishery is quite good – above average, and scarcely out of the top-ten rankings. There would be little cause to consider how to improve this fishery when it is evidently so much better than so many others included in the dataset. By considering the same dataset again by different suites of attributes, grouped in this case by forms of justice, the true inconsistency of results for the eulachon fishery becomes evident. In realising that Mitigation of Habitat Destruction and Mitigation of Ecosystem Depletion are included in only the three justice-based evaluations in which the eulachon fishery drops to worst-ten status, the degree of the weakness of the fishery becomes apparent. The attributes in which the eulachon fishery achieved top scores are missing, and the weaknesses are exposed. Therefore, for a complete understanding of a fishery – indeed, of the dataset – it is useful and essential to take a range of approaches.

In effect, the Creative Justice evaluation is comprised of a subset of attributes also representative of Distributive Justice, while Productive Justice is a subset of the Restorative Justice attribute collection. Thus, the tendency for each of these pairs of Justices to present similar overall patterns of results is reasonable and expected. Furthermore, the suite of attributes representing Ecosystem Justice is the most comprehensive of the five subsets by form of Justice, comprised of five of the eight attributes. While the set of attributes for Distributive Justice is the largest at six, the Ecosystem Justice suite forms a sort of 'bridge' between the two pairs of justice, as a compilation of attributes which spread between the two pairs. Thus, at minimum three separate sub-evaluations should be considered – one representing Creative and Distributive Justice, another representing Productive and Restorative Justice, and a third as Ecosystem Justice. Ideally, however, all five should be conducted, in addition to the full Ethical ordination. Given the development of automated Rapfish software, this task should be relatively straightforward, save the need for a proxy method for the attribute-scarce Creative Justice evaluation.

Another interesting consideration is the dichotomy of Atlantic and Pacific fisheries. Whereas the Atlantic fisheries have exhibited a higher average score than the Pacific fisheries in the overall ordination and in the evaluations of Creative and Distributive Justice, it is interesting to note that the Pacific fisheries present a higher average score in the assessments for Ecosystem, Productive, and Restorative Justice. The East-West composition of the top- and bottom-ten fisheries also shifts with the various evaluations: in the overall Ethical evaluation, the top-ten are evenly split between Atlantic and Pacific fisheries, while the bottom-ten consists of eight BC fisheries and two Atlantic fisheries; in the case of Creative Justice, six of the ten best fisheries are Atlantic, and all of the ten worst are Pacific; six of the ten best and eight of the ten worst fisheries in the Distributive Justice ordination are Pacific; in the Ecosystem Justice evaluation, six of the ten best fisheries are Pacific, but the ten worst fisheries are evenly divided; Productive Justice demonstrates a similar pattern as does Ecosystem Justice; and in the case of Restorative Justice, for both the ten best and ten worst, six fisheries are Pacific and four are Atlantic. Note as well that, in all but the sub-evaluations for Ecosystem and Productive Justice, the first-ranked fishery is an Atlantic fishery (in all cases, the weir fishery for herring in the Bay of Fundy), while in all but Productive Justice, the last-ranked fishery is a Pacific fishery (in three instances, the BC groundfish trawl).

A few generalisations differentiates between east and west coast fisheries included in this evaluation:

1. The Atlantic fisheries tend to be more historically and geographically rooted than the Pacific fisheries. This is evidenced in the Creative and Distributive Justice analyses, in which this characteristic was evaluated in the Adjacency and Reliance attribute. Six of the 21 Atlantic fisheries (29%) received the best-possible score for this attribute, while six of the 41 (including all discrete salmon fisheries) Pacific fisheries (15%) obtained this ideal. This may be attributed to the relative 'oldness' of commercial fisheries in Atlantic Canada, at least of those included in the dataset.
2. Atlantic fisheries exhibit greater justness in access to and management of the fisheries than do Pacific fisheries. Both Equity in Entry and Just Management are included in the Creative and Distribute Justice analyses. For Equity in Entry, for instance, no Atlantic fishery obtains a perfect attribute score, but 18 of the 21 obtain a score representing 75% of the potential value, while of the Pacific fisheries, one obtains a perfect score, and a plurality (18 of 41) obtain the worst-possible score. This too may be due to the relatively longer history of the selected commercial fisheries in Atlantic Canada than in British Columbia.
3. According to the Rapfish assessments, the Pacific fisheries perform better than their Atlantic counterparts in the Productive and Restorative forms of Justice. This pair varies from the Creative/Distributive Justice pair in that Mitigation of Habitat Destruction and Mitigation of Ecosystem Depletion, as well as Illegal Fishing and Discards and Wastes. While the Atlantic fisheries do generally score worse on Mitigation of Habitat Destruction and Mitigation of Ecosystem Depletion, this is not necessarily the case with the other two attributes. However, the attributes in which the Atlantic fisheries do excel (as described in points 1 and 2 above) are excluded. Therefore, once more those strengths which boost the Atlantic fisheries in the overall evaluation are excluded, and the weaknesses become apparent. Likewise, the exclusion of these attributes, as well as the inclusion of different attributes, makes plain the general strengths of Pacific fisheries. Consider for instance the emphasis on salmon habitat in British Columbia; the salmon fisheries benefit from efforts to not only prevent further damage to fish habitat, but also from habitat rehabilitation.

Of course, these are generalisations, made for the sake of detecting trends. A bias exists in the selection of fisheries; that is, had other fisheries been included in the dataset (or some excluded from it), the generalisations might not hold true. However, these trends are reasonable based upon the analyses conducted herein.

CHAPTER 4:

GOING BACK TO THE FUTURE: LOOKING TO THE PAST FOR FISHERIES OF THE FUTURE

4.1 Aboriginal Salmon Fisheries in British Columbia: A Brief Historical Overview

The first salmon fisheries in British Columbia were those conducted by the Aboriginal peoples, for food (Canada, 2001a) and for trade, who "...built their economy and culture on salmon" (Meggs, 1991, p. 6). The abundance of salmon as a food source contributed relatively high population densities in the region in comparison with elsewhere on the continent (Canada, n.d.). The importance of Pacific salmon to the Aboriginal people can hardly be overstated:

> Many types of fish, shellfish, and sea mammals were available to coastal peoples, but the staple of diet and trade was the anadromous Pacific salmon. Indians harvested tremendous amounts of salmon in the centuries before the industrial fishery. Their choice of fishing sites and harvesting and processing technologies typically took advantage of micro-environmental conditions and diversified marine resources. Variations in supply and differential distribution helped to link families in a web of production, co-use of sites, and exchanges of goods (Newell, 1993, p. 28).

Newell (1993) further explains that such was the importance of marine resources to First Nations that "...the sea and coastal rivers were at least as important as the land" (p. 3). Indeed, salmon streams and rivers, and the food abundance represented by those waterways, encouraged establishment of permanent villages (Canada, n.d.), and for those Nations in coastal areas and near salmon-bearing streams, salmon was the primary source of both calories and protein (Newell, 1993, citing Hewes, 1947). Barnett (1955) emphasises that "The staple food of coastal British Columbia, and for some distance north and south, was the salmon" (p. 15), and according to Stewart (1977) "...the five species of salmon were, for the majority of the coast cultures, the most important of all the fish... (p. 171).

The species caught and the methods of preservation and preparation for consumption varied (see for example Stewart, 1977). Those Nations closer to the mouths of rivers had access to mixed-stock runs, and therefore greater variety of salmon species, which were also in sea-run condition (Newell, 1993). For example, the Stalo (or Sto:lo), "...with their great wealth of fish resources...", had access to all five species of Pacific salmon, but preferred chinook for consumption and sockeye for oils (Duff, 1952). Salmon were also taken for roe. The Nuu-chah-nulth of Vancouver Island caught chinook salmon "...by trolling with a sharp-angled hook, usually baited with whole herring....These were cooked and eaten fresh" (McMillan, 1999, pp. 17-8), and, later in the summer, sockeye and then chum salmon (McMillan, 1999). Those nations located further upstream, however, found that the "...salmon were scarcer, contained less variety, and were in poorer condition than lower on the main river" (Newell, 1993, pp. 32-3).

Specialisation occurred in terms of methods of preservation of the salmon and roe. This was in large part determined by not only species caught but also quality of the fish and even weather conditions (Stewart, 1977; Newell, 1993). For example, "Sockeye, when taken in saltwater, is the fattest and most flavourful, but it does not keep as long as the leaner ones, such as chum, caught later in the season" (Newell, 1993, p. 39). Methods of preservation included sun- and wind-drying, and smoking of flesh, as well as rendering of carcasses for oil (Newell, 1993, p. 39). Roe was also preserved using a variety of methods. For example, the Stalo treated chinook roe with two very different methods (Duff, 1952): the roe was either simply dried; or buried in a leaf-lined pit to overwinter which allowed the oils to drain off. "When taken out, it had the consistency of cheese. Formerly called 'hum eggs' or 'Fraser River bacon', it could be eaten raw, boiled for soup, or applied to sores as a poultice. The same product could be made in a bag with holes in the bottom" (Duff, 1952, p. 66). Kew (1992) explains that, although there were variations in techniques of fishing and preservation, those used by one group could be adopted and adapted by other groups:

> All of the indigenous fishers were, and are today, users of the same resource since salmon pass through the entire watershed. The fishing of any one culture has some degree of potential effect upon every other culture. Fishing and processing technologies can be expected to have evolved and spread with the area. The products of one area of the [Fraser] River were exchanged with occupants of others (Kew, 1992, p. 178).

Through the mechanism of potlatching, fish could be exchanged within a tribe. "Potlatching was also a system of redistribution and as such was used to deal with periodic shortages of fish and other resources" (Newell, 1993, p. 42). Furthermore, through potlatches, ownership of fishing stations could be transferred and asserted.

Salmon served as a cornerstone to the Aboriginal economy, in effect a form of currency or unit of exchange (Newell, 1993). Indeed, "The fishing economies in aboriginal British Columbia were highly adapted to a diversity of salmon populations spawning at many times and places" (Newell, 1993, p. 42-3). Thus, trade was influenced by variety and availability of salmon species. However, the specialisation of preserved fish products also encouraged trade; that is, unique salmon products would be traded for other items not normally available. For example:

> The Upper Stalo traded up-river with the Thompsons and down-river with the tribes near the mouth. To the Thompson they took dugout canoes, dried salmon, rush mats, and goat-wool blankets. In return they received soopalalie-oil, dried saskatoon-berries, and Indian hemp... For trade with down-river groups, dried salmon was the most important commodity, in return for which they obtained fish, wild potatoes, and sometimes sealskins.... The trade was accomplished during the frequent visits by both up-river and down-river people (Duff, 1952, p. 95).

Arguably, salmon was also instrumental in cultural interchanges between Nations, who travelled both to fish and for trade. For example, salmon runs in the Fraser River attracted

Nations from across the Strait of Georgia, and "This great congregation of Salish provided ample opportunity for cultural interchange, in which the Stalo shared" (Duff, 1952, p. 11). The Cowichan and Nanaimo, for instance, had summer villages on the lower Fraser River, to which they would travel around July 1, moving upriver later in the summer and returning downriver around end of September (Duff, 1952). The lack of good salmon-bearing streams in the area of what is now Victoria meant that Nations in that region had little choice but to travel to fish, and that:

> ...in fact, we know that the West Sanetch and the Cowichans, located on southern Vancouver Island, annually resorted to Boundary Bay and Lulu Island respectively for part of the fishing season. And between March and November there was constant traffic between the winter villages and numerous island resorts that provided food resources in the form of deer, small game, eggs, and the like (Barnett, 1955, p. 12-3).

Within the Fraser Canyon, numerous Stalo and non-Stalo fishers would interact (Duff, 1952). Indeed, "Summer brought an abundance of salmon, and in their wake many hundreds of aggressive salt-water Indians. Willingly or unwillingly, the Stalo had to share their river and its bounty with outsiders" (Duff, 1952, p. 25).

As such, occasional disputes arose over access to the salmon resource. Within a community, access to the resource (in terms of fishing stations) was determined in various ways and hence disputes could be minimised. As noted above, potlatches were one means by which ownership of a fishing station could be established. Newell (1993, citing Prichard, 1977) explains that:

> Groups on the coast operated under different principles of resource-site ownership. These ranged from the rather loose system of the Salish to strict individual ownership among the Nootka and tight kinship-village control among the main Kwakiutl and Tsimshian peoples. Some groups, such as the Haisla, apparently had systems that displayed a little of each type (pp. 40-1).

Within the Nuu-chah-nulth (Nootka), for example, hereditary chiefs gained their status and power through inherited privileges, including ownership of salmon streams (McMillan, 1999). In the Fraser Canyon in particular, those without access to fishing sites could arrange to lease access through an owner of, for instance, a trap or a weir:

> Fishing sites and stagings in canyons using elaborate traps and/or dipnetting technologies were rare and valuable resource sites; they were owned by lineage groups with recognized rights of priority access to the fishery. At the very least, permission to fish at such sites was required from the owners. Owners of sites usually received rewards for their largess (Newell, 1993, p. 41).

Territorial disputes with other groups did occur. Newell (1993) reports that downstream groups could exert pressure (economic and political in nature) on upstream neighbours by maintaining barricade-type fishing structures beyond the time needed to take the amount of fish needed. In doing so, the downstream group effectively monopolised the supply of salmon and denied to those upstream access to the resource. Furthermore, Stewart (1977) indicates that "Downstream villagers owning weirs had first advantage in harvesting the run.... It is said that if the downstream people were tardy in opening the weir, their angry [upstream] neighbours might launch a massive log into the fast flowing waters and smash it open" (p. 100). According to McMillan (1999, p.15), "...wars of conquest..." involving salmon streams occurred on the west coast of Vancouver Island. Salmon, then, were historically of such value as to be a cause of conflict between First Nations.

Clearly, salmon had value as a food source. It has also become evident that salmon were in effect a form of currency and even of power, both within and between tribes. The importance of salmon was well understood, and is demonstrated in the respect and cultural weight ascribed to the resource. In fact, "The ceremony might be simply a prayer – a supplication for success and abundance – and it showed humility, gratitude, and respect on the part of the human" (Stewart, 1977, p. 162). This is particularly apparent in the first salmon ceremonies common to many Nations. Duff (1952) reports that all Upper Stalo, for example, had some form of ceremony in recognition of the return of the chinook salmon each spring. The ceremony however was not universal (Barnett, 1955), and the ceremony was of limited support within individual Nations:

> On the whole the ceremony does not impress one as being very important. It was not vital to the community... Interest in it did not suffuse the whole group and cause the members of the group eagerly to anticipate it as a common and necessary blessing. The requirement of communion and total participation for personal benefit is by no means apparent. Nor does it seem to be essentially a ceremony for the benefit of the group. It partakes rather of the character of a hereditary privilege indulged in mainly for the opportunity of reasserting it (Barnett, 1955, pp. 91-2).

The form of the ceremony varied with each Nation, taking a form based upon "...the ceremonial pattern of each group" (Duff, 1952, pp. 120-1, citing Gunther, 1926). Common across all variations is careful, respectful, even reverential, treatment afforded the fish (Duff, 1952, citing Gunther, 1926; Barnett, 1955). With the exception of the Tsimshian, who burnt the bones of the first salmon, other Nations returned the bones to the water at the conclusion of the ceremony (Stewart, 1977). The first salmon ceremony was also a time of community celebration, "...a time of joy and renewal that brought cohesion to the village" (Stewart, 1977, p. 163).

Beyond the actual first fish ceremony, treatment of the salmon being taken was meant to be respectful. For instance, the Coast Salish peoples returned the salmon bones to the water (Barnett, 1955). There was recognition of the need to fish judiciously:

> Chief Tom (Sliaäm$_a$n) said that Indians did not eat female salmon or their eggs during the first half of the season. The prohibition was to conserve the fish, 'to

> make more', he said. A few other suggestions indicate that aboriginally some attention was paid to fish and game preservation. It was recognized, for example, that some fish had to get upstream, and therefore dams were deliberately made so that they could be cleared by a leap during high water. Wanton destruction of fish and game was frowned upon (Barnett, 1955, pp. 88-9).

Treatment of the fish also involved the supernatural. Stewart (1977) indicates that a variety of beliefs, customs, and taboos were evident, ranging from the reverential to the fearful. Barnett (1955) reports that "Salmon with twisted mouths were ominous and, when caught, had to be exorcised by a ritualist and thrown back into the water; otherwise they brought bad luck" (p. 89). Indeed, Barnett (1955) further reports that even in fishing, an element of spirituality was evident:

> Supernatural helpers were most essential to hunters, fishermen, and canoe makers, whose needs for spirit assistance was proportional to the hazards or uncertainties of success involved in their specialized pursuits.... It was desirable but less essential for success in the more routine and consistently more productive occupations such as salmon fishing... however, even in these activities it was believed that the exceptionally successful person must have some spirit power" (p. 77).

Aboriginal worldviews thus connected spirituality and salmon. The salmon themselves were treated with respect, to please and appease the deity but also to ensure sustainability within the temporal realm.

These traditions and approaches endured through to the time of colonisation by Europeans. It has been reported that even during the early days of European exploration, First Nations were left relatively uninfluenced; Barnett (1955) indicates that the explorer Vancouver, who in 1792 was the first to observe the Coast Salish, found them to be "...practically untouched by our Western civilization..." (p. 1), and that "It was not until the Hudson's Bay Company found it expedient, in 1843, to shift headquarters from Ft. Vancouver on the Columbia to Victoria that the real process of acculturation began. Even the mainland villages north of Vancouver remained isolated" (pp. 1-2). Newell (1993) reports that the traditional Aboriginal fishery continued through the colonial era, yet First Nations were encouraged to fish as well to support the growing needs of traders and settlers.

In particular, with the development of canneries in 1871 (concurrent with British Columbia's entry into Confederation with Canada) (Newell, 1993), the role of Aboriginals in the fish-for-commerce fishery was greatly expanded. Indeed, the early canneries were highly dependent upon First Nations labour, both for catching the fish and processing the harvest, and though minimal, regulations recognised the significant role of Aboriginals in the new sector (Newell, 1993). Yet, tellingly, "From the earliest years of salmon-canning, however, cannery operators saw the traditional fishing practices and requirements of Indians as a major obstacle to profits for the industrial sector" (Newell, 1993, pp. 46-7). While Aboriginal fisheries were officially protected, in reality they were given no priority in the fishery. Indeed, "...by the late 1880's [sic], increased regulations and policies generally unfavourable to the interest of First

Nations resulted in First Nations being isolated from the developing commercial fisheries" (Canada, n.d.).

As the cannery fishery flourished and the commercial fishery developed, traditional First Nations fisheries initially persisted. While Aboriginal workers were the "...labour backbone of the salmon-canning industry during its chaotic rise in the late-nineteenth century..." (Newell, 1993, pp. 53-4), the temporal variations in the cannery fishery and the indigenous fishery meant that the traditional food and ceremonial fishery was able to continue (see, for example, Meggs, 1991; Newell, 1993). In fact, "For Indians, the pioneer salmon-canning industry represented a new economic opportunity compatible with their traditional economic activities" (Newell, 1993, p. 65). This however had the effect of artificially dividing fishing activities by purpose or outcome, whether economic, subsistence or cultural use (Newell, 1993). Furthermore, expansion of the industrial fishery and the development of formal federal fishing regulations (however weak) resulted in the separation of production of the resource from the management of that same resource (Newell, 1993).

Moreover, as other ethnic groups in this highly-stratified industry gained prominence, the role of First Nations in the cannery fisheries declined with time, particularly as the Aboriginal population declined overall. Aboriginal gillnetters, previously the mainstay of the cannery fishing fleet, were further marginalised due firstly to licensing regulations and subsequently with the development of improved, mechanised gear and different fishing methods, notably purse seining but also trolling. The economic priority of the industrial fishery meant that regulations were designed to protect and even cultivate this sector while simultaneously curtailing the traditional indigenous salmon fisheries. Indeed, the traditional fisheries were cited as being contrary to conservation efforts, and perhaps most infamously the fish barricades operated by the Babine were destroyed in the name of conservation (Meggs, 1991; Newell, 1993). The food fishery, officially enshrined in regulations, was seen to be more trouble than it was worth. In the words of Newell (1993), "Indians may have had a right to a portion of the salmon stocks, but [by the early 1900s] that right had become inconvenient; it was time to eliminate Indian food fishing altogether" (pp. 95-6).

Despite having been marginalised, some Native fishers continued to participate in the commercial fishery. In fact, "Although Pacific Coast Indians were no longer major factors in the industrial salmon fishery, fishing and fish-processing continued to be their major commercial activity. Indian fishers devised many strategies for remaining involved. Consequently, they operated some of the most sophisticated and least sophisticated vessels on the coast" (Newell, 1993, p. 123). During the twentieth century, notwithstanding stringent enforcement of regulations restricting traditional fishing activities:

> ...traditional Indian salmon-fishing had persevered, although aspects of it had changed. Home-canning outfits and home freezers revolutionized food preservation in coastal communities in the 1960s. Nevertheless, traditional techniques simply incorporated available technology (Newell, 1993, p. 143).

Newell (1993, citing Hawthorn, Belshaw, and Jamieson, 1960) asserts that in the post-War period, the food fishery became increasingly important, representing the largest component of food supplies not purchased from commercial sources.

In fact, by the 1960s, as the Davis Plan and licence limitation sought to contain growth within the commercial fishery, policy efforts were taken to encourage Aboriginal participation in the fishery (Canada, n.d.). Nevertheless, "The immediate result of the Davis Plan was that BC fishing and fish-processing employed half as many Indians as they had two decades earlier" (Newell, 1993, p. 148). Moreover, those who lost their boats also lost both a means of transport and a means of participating in the food fishery (Newell, 1993). While new markets and an injection of funding from Japanese sources led to some short-term economic improvements in the mid-70s (Newell, 1993), "The late [19]70s and [19]80s were characterized by increasing conflict between First Nations and Fisheries and Oceans Canada based on a lack of agreement about the nature and scope of Aboriginal rights" (Canada, n.d.).

Fisheries continue to be of great importance for many First Nations (Pearse (1982) refers to salmon as the "...touchstone of many f the native Indians' cultural and spiritual traditions..." (p vii)), and these fisheries are constitutionally guaranteed. Indeed, "Once conservation requirements are satisfied, the food, social and ceremonial allocations of west coast First Nations are addressed" (Canada, 2001a, p. 10). The 1990 *R. v. Sparrow* decision (1990) recognised an unextinguished right of First Nations to fish for food, social and ceremonial purposes, and hence led to the development of the Aboriginal Fisheries Strategy (AFS), which, since 1992, has guided federal policies on Aboriginal fisheries (Canada, 2001a; Canada, n.d.). Among other measures, the AFS provides co-management opportunities for First Nations (Canada, 2001a). While AFS governs First Nations-specific fisheries, as well as overall distributional policy *vis-à-vis* allocation between the primary fisheries users, Aboriginal participation is not limited to this sector, and "In fact, a large portion of the commercial fishery employs aboriginal people aboard fishing fleets and in processing operations" (Canada, 2001a, p. 11). Aboriginal fishers in the commercial sector are governed by the same rules and policies as non-Aboriginals within that sector (Canada, 2001a). Yet this relatively recent recognition has been hard-won.

Through the years, Aboriginal fisheries were conducted for sustenance, for ceremonial and spiritual uses, and for economic value. Traditional methods, once threatened to be overtaken by industrial methods, are being reclaimed. While the environment in which these salmon fisheries have been prosecuted has been altered, initially with the arrival of Europeans, subsequently with the development and expansion of large-scale industrial fishing, Aboriginal fisheries have persisted despite implicit and explicit attempts to disenfranchise this sector. Much can be learnt from Aboriginal fisheries, and the Rapfish methodology provides a useful framework for exploring Aboriginal salmon fisheries from the pre-contact era through the present.

4.2 An Ethical Rapfish Assessment of BC Aboriginal Salmon Fisheries

Using modified attributes, a preliminary Rapfish Ethical analysis of selected Aboriginal salmon fisheries (by gear type and by species, as well as by Nation) was conducted, stretching from the period prior to contact with Europeans through to the present; this work was collaborative, and originally presented by Skaret as an undergraduate honours thesis (2000) and subsequently presented by Power as an oral paper at Coastal Zone Canada 2000 in Saint John, New Brunswick. Given the unique nature of the fisheries, particularly when assessed over such a lengthy time period, four supplementary Ethical attributes were initially developed by Power and Skaret:

1. *Protection* – This attribute considers whether treaties or similar, beyond Constitutional provisions, exist which protect the right of First Nations to participate in this fishery.
2. *Food Fisheries* – Are the fish caught in this fishery for consumption, for trade, or for sale?
3. *Traditional design of gear* – Is the gear used in this fishery of modern or traditional design? This attribute is especially useful for tracking changes in a fishery over time.
4. *Externalities/responsibilities* – Do there exist costs borne by those other than the responsible parties, such as pollution or stock collapse?

Although Skaret (2000) used all four additional attributes in her assessment, Externalities/responsibilities has not been included here, as it was found to not sufficiently discriminate between the various fisheries.

The three attributes added for the analysis of Aboriginal salmon fisheries are representative of four of the five types of justice, as shown in Table 11. Note that Table 11 supplements the information provided in Table 6 (page 46).

Table 11: Five types of Justice, as represented in supplementary Rapfish Ethical Attributes

Ethical Attribute	Creative Justice	Distributive Justice	Ecosystem Justice	Productive Justice	Restorative Justice
Protection		✓			
Food Fisheries		✓			
Design of Gear			✓	✓	✓

Note: '✓' indicates that the attribute does represent this form of justice.

Following Skaret (2000), this early analysis uses data published in the literature. Note that, in some instances, certain original attributes did not discriminate between fisheries, but these were nevertheless included in the analysis for comparability across other assessments, so that comparability could be accomplished by using only the data required for the eight main Rapfish Ethical attributes. The scores were determined based upon information found in the relevant literature (see Appendix 4b for the sources consulted for each Nation), following the approach taken to obtain scores for the assessments described in Chapter 3.[9]

The fisheries initially chosen for analysis were selected for representation by Nation and geography as well as fishing methods. Furthermore, as one goal of the study was to trace changes with the Aboriginal salmon fishery through time, the basic time periods selected for the time series were prior to contact with Europeans, the early colonial era, the early industrial

[9] Note that the fisheries were scored jointly by Karen Skaret and Melanie Power, and a basic initial assessment incorporating the five primary Rapfish fields (ecological, economic, social, and technological, as well as ethical) was presented as an undergraduate honours thesis by Skaret (2000), and presented as an oral paper by Power at the Coastal Zone Canada 2000 conference in Saint John, New Brunswick.

fishery, and the modern fishery. The final selection of fisheries for examination was tempered by the availability of data for all attributes from the pre-contact period to the present day.

The Rapfish analysis of Aboriginal fisheries followed the same procedures as those applied in the assessment of Canadian fisheries and described in Chapters 2 and 3. Given the limitations of the sources of data, as well as the lengthy time period included in the assessment, the error ranges applied within the Monte Carlo procedure of Rapfish were determined beginning with an assumed basic value of 25%. From this level, error ranges for each individual attribute were determined using the same approach as that taken with the Rapfish analysis of Canadian fisheries and described in Chapter 3. The error ranges, and the rationale for variations, are presented in Appendix 3b.

A total of 114 fisheries were included in the analysis, representing a range of First Nations, as well as gear types and species. Furthermore, the data cover various time periods, from the pre-contact era through the late twentieth century, at selected snapshots. The full list of fisheries, as well as the scores assigned for each attribute, is presented in Appendix 3a.

The codes used to identify the individual Aboriginal salmon fisheries follow a specific pattern. The first set of characters identify the nation, the middle set the time period (note that 'PC' denotes 'Pre-Contact'; other time periods are identified by a four-digit year identifier), and the last set the gear type and salmon species[10]. Note that, for clarity of presentation, each of the Rapfish graphs which follow show the results for a single Nation.

As a result of the very large number of fisheries included in the analyses, two consequences in particular arose and must be briefly addressed. Firstly, due to the limitations of the Rapfish software, it was necessary to split the dataset into two groups for the assessments. However, the Rapfish output is comparable between assessments, and as such the results can be overlaid or consolidated. Furthermore, given the comparability of the results, the division into groups for assessment could be made arbitrarily; for neatness, the division was made based simply upon geography, dividing the fisheries by (roughly divided) north and south coast Nations. The results for the Monte Carlo and leverage tests, however, have not been overlaid; these are presented in Appendix 5b.

Secondly there are many tied scores between fisheries, both within and amongst Nations. This is evident in the table presented in Appendix 3c, in which the full results from all analyses are presented. These ties are due firstly to the very high number of fisheries; with more than 100 fisheries, ties are inevitable when the results are scaled to a percentage basis. However, it is also due to the nebulous nature of some of the data, particularly those representing the distant past, meaning that it becomes very difficult to draw sufficient differentiation between individual fisheries. As a result, while discussion of the analyses in Chapter 3 focussed on the best- and worst-ten fisheries in each assessment as well as selected fisheries, such an approach is simply not practicable in this instance. Therefore, the discussion which follows centres on trends which have become apparent through the six evaluations, particularly trends regarding gear type and time period, as shown by Nation.

[10] Skaret (2000) conducted Rapfish assessments within the ecological, economic, social, technological and ethical fields. While the species of salmon caught in each fishery evidently has little influence on the ethical assessment, species is a salient and differentiating factor in other fields, notably ecology.

The complete percentage-based results (as with Table 10 in Chapter 3) for each Nation for the overall Rapfish Ethical ordination and the five Justice-based sub-evaluations are presented below: Table 12 (Babine fisheries), Table 13 (Carrier fisheries), Table 14 (Chilcotin fisheries), Table 15 (Haida fisheries), Table 16 (Kwakiutl fisheries), Table 17 (Lower Stalo), Table 18 (Upper Stalo), and Table 19 (Tsimshian). Furthermore, the results of each evaluation for each Nation are presented graphically within the relevant sections.

Table 12: Rank and scores for Rapfish assessments (Ethical and Five Justices), Babine salmon fisheries

Overall Ordination		**Creative Justice**[1]		**Distributive Justice**		**Ecosystem Justice**		**Productive Justice**		**Restorative Justice**	
Rank	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*
B-PC-WS	77	B-PC-WS	100	B-PC-WS	91	B-PC-WS	72	B-PC-WS	71	B-PC-WS	64
B-1820-WS	71	B-1820-WS	78	B-1820-WS	84	B-1820-WS	61	B-1820-WS	68	B-1820-WS	59
B-1900-WS	60	B-1836-WCh	64	B-1900-WS	74	B-1996-LA	53	B-1996-LA	63	B-1996-LA	57
B-1836-WCh	57	B-1836-WS	64	B-1950-WS	69	B-1950-WS	52	B-1950-WS	62	B-1836-WCh	55
B-1950-WS	57	B-1900-WS	64	B-1836-WCh	64	B-1836-WCh	49	B-1900-WS	61	B-1996-GA	54
B-1836-WS	56	B-1950-WS	56	B-1836-WS	62	B-1836-WS	49	B-1996-GA	60	B-1900-WS	53
B-1996-LA	51	B-1900-GS	8	B-1996-LA	45	B-1900-WS	49	B-1836-WCh	59	B-1950-WS	53
B-1996-GA	47	B-1950-GS	8	B-1900-GS	41	B-1996-GA	49	B-1836-WS	59	B-1836-WS	52
B-1900-GS	40	B-1996-GA	8	B-1996-GA	41	B-1996-SA	40	B-1996-SA	55	B-1996-SA	47
B-1996-SA	39	B-1996-LA	8	B-1996-SA	29	B-1900-GS	38	B-1900-GS	46	B-1900-GS	40
B-1950-GS	31	B-1996-SA	8	B-1950-GS	27	B-1950-GS	38	B-1950-GS	46	B-1950-GS	40

Note:

1. Creative Justice values obtained through scaling and averaging of Rapfish scores, rather than full Rapfish assessment.

Table 13: Rank and scores for Rapfish assessments (Ethical and Five Justices), Carrier salmon fisheries

Overall Ordination		**Creative Justice**[1]		**Distributive Justice**		**Ecosystem Justice**		**Productive Justice**		**Restorative Justice**	
Rank	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*
C-1850-HS	73	C-1850-HS	100	C-1950-HA	84	C-1850-HS	72	C-1850-HS	63	C-1950-HA	66
C-1850-TS	73	C-1850-TS	100	C-1950-TA	84	C-1850-TS	72	C-1850-TS	63	C-1950-TA	66
C-1850-WS	73	C-1850-WS	100	C-1950-WA	84	C-1850-WS	72	C-1850-WS	63	C-1950-WA	66
C-PC-HS	73	C-PC-HS	100	C-1850-HS	83	C-PC-HS	72	C-1996-LA	63	C-1850-HS	60
C-PC-TS	73	C-PC-TS	100	C-1850-TS	83	C-PC-TS	72	C-PC-HS	63	C-1850-TS	60
C-PC-WS	73	C-PC-WS	100	C-1850-WS	83	C-PC-WS	72	C-PC-TS	63	C-1850-WS	60
C-1950-HA	65	C-1900-HA	67	C-PC-HS	83	C-1900-HA	55	C-PC-WS	63	C-PC-HS	60
C-1950-TA	65	C-1900-TA	67	C-PC-TS	83	C-1900-TA	55	C-1900-HA	62	C-PC-TS	60
C-1950-WA	65	C-1900-WA	67	C-PC-WS	83	C-1900-WA	55	C-1900-TA	62	C-PC-WS	60
C-1900-HA	55	C-1950-HA	67	C-1900-HA	66	C-1950-HA	55	C-1900-WA	62	C-1900-HA	57
C-1900-TA	55	C-1950-TA	67	C-1900-TA	66	C-1950-TA	55	C-1950-HA	62	C-1900-TA	57
C-1900-WA	55	C-1950-WA	67	C-1900-WA	66	C-1950-WA	55	C-1950-TA	62	C-1900-WA	57
C-1996-LA	51	C-1900-GS	8	C-1996-LA	45	C-1996-LA	53	C-1950-WA	62	C-1996-LA	57
C-1996-GA	47	C-1950-GA	8	C-1900-GS	41	C-1996-GA	49	C-1996-GA	60	C-1996-GA	54
C-1900-GS	40	C-1996-GA	8	C-1996-GA	41	C-1996-SA	40	C-1996-SA	55	C-1996-SA	47
C-1996-SA	39	C-1996-LA	8	C-1996-SA	29	C-1900-GS	38	C-1900-GS	47	C-1900-GS	41
C-1950-GA	31	C-1996-SA	8	C-1950-GA	27	C-1950-GA	38	C-1950-GA	47	C-1950-GA	41

Note:

1. *Creative Justice values obtained through scaling and averaging of Rapfish scores, rather than full Rapfish assessment.*

Table 14: Rank and scores for Rapfish assessments (Ethical and Five Justices), Chilcotin salmon fisheries

Overall Ordination		**Creative Justice**[1]		**Distributive Justice**		**Ecosystem Justice**		**Productive Justice**		**Restorative Justice**	
Rank	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*
Ch-1950-HS	76	Ch-1850-HA	100	Ch-1850-HA	84	Ch-1950-HS	78	Ch-1950-HS	83	Ch-1950-HS	76
Ch-1950-TS	76	Ch-1850-TA	100	Ch-1850-TA	84	Ch-1950-TS	78	Ch-1950-TS	83	Ch-1950-TS	76
Ch-1950-WS	76	Ch-1850-WA	100	Ch-1850-WA	84	Ch-1950-WS	78	Ch-1950-WS	83	Ch-1950-WS	76
Ch-1850-HA	71	Ch-PC-HA	100	Ch-PC-HA	84	Ch-1850-HA	72	Ch-1950-GA	76	Ch-1950-GA	70
Ch-1850-TA	71	Ch-PC-TA	100	Ch-PC-TA	84	Ch-1850-TA	72	Ch-1850-HA	63	Ch-1850-HA	60
Ch-1850-WA	71	Ch-PC-WA	100	Ch-PC-WA	84	Ch-1850-WA	72	Ch-1850-TA	63	Ch-1850-TA	60
Ch-PC-HA	71	Ch-1900-SA	92	Ch-1950-HS	78	Ch-PC-HA	72	Ch-1850-WA	63	Ch-1850-WA	60
Ch-PC-TA	71	Ch-1900-TA	92	Ch-1950-TS	78	Ch-PC-TA	72	Ch-1996-LA	63	Ch-PC-HA	60
Ch-PC-WA	71	Ch-1900-WA	92	Ch-1950-WS	78	Ch-PC-WA	72	Ch-PC-HA	63	Ch-PC-TA	60
Ch-1900-SA	57	Ch-1950-HS	75	Ch-1900-SA	73	Ch-1900-SA	59	Ch-PC-TA	63	Ch-PC-WA	60
Ch-1900-TA	57	Ch-1950-TS	75	Ch-1900-TA	73	Ch-1900-TA	59	Ch-PC-WA	63	Ch-1996-LA	57
Ch-1900-WA	57	Ch-1950-WS	75	Ch-1900-WA	73	Ch-1900-WA	59	Ch-1996-GA	60	Ch-1996-GA	54
Ch-1950-GA	52	Ch-1996-GA	8	Ch-1996-LA	45	Ch-1996-LA	53	Ch-1900-GS	55	Ch-1900-SA	52
Ch-1996-LA	51	Ch-1996-LA	8	Ch-1996-GA	41	Ch-1950-GA	52	Ch-1900-SA	55	Ch-1900-TA	52
Ch-1996-GA	47	Ch-1996-SA	8	Ch-1950-GA	30	Ch-1996-GA	49	Ch-1900-TA	55	Ch-1900-WA	52
Ch-1996-SA	39	Ch-1900-GS	0	Ch-1900-GS	29	Ch-1996-SA	40	Ch-1900-WA	55	Ch-1900-GS	47
Ch-1900-GS	34	Ch-1950-GA	0	Ch-1996-SA	29	Ch-1900-GS	33	Ch-1996-SA	55	Ch-1996-SA	47

Note:

1. Creative Justice values obtained through scaling and averaging of Rapfish scores, rather than full Rapfish assessment.

Table 15: Rank and scores for Rapfish assessments (Ethical and Five Justices), Haida salmon fisheries

Overall Ordination		**Creative Justice**[1]		**Distributive Justice**		**Ecosystem Justice**		**Productive Justice**		**Restorative Justice**	
Rank	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*
H-PC-WA	74	H-1825-WA	89	H-1825-WA	87	H-PC-WA	68	H-PC-WA	71	H-PC-WA	66
H-1825-WA	72	H-1876-WA	89	H-PC-WA	87	H-1825-WA	65	H-1825-WA	66	H-1825-WA	62
H-1876-WA	62	H-PC-WA	89	H-1876-WA	82	H-1876-WA	60	H-1996-LA	63	H-1876-WA	57
H-1960-WA	56	H-1925-WA	47	H-1960-WA	68	H-1996-LA	53	H-1876-WA	61	H-1960-WA	57
H-1996-LA	51	H-1960-WA	47	H-1925-WA	56	H-1925-WA	49	H-1925-WA	61	H-1996-LA	57
H-1996-GA	48	H-1996-GA	17	H-1925-GS	50	H-1960-WA	49	H-1960-WA	61	H-1996-GA	54
H-1925-WA	44	H-1925-LChP	11	H-1925-LChP	48	H-1996-GA	49	H-1996-GA	60	H-1925-WA	53
H-1925-LChP	40	H-1925-GS	8	H-1996-GA	45	H-1996-SA	40	H-1996-SA	55	H-1996-SA	47
H-1996-SA	39	H-1960-SA	8	H-1996-LA	45	H-1925-LChP	36	H-1925-LChP	53	H-1925-LChP	45
H-1925-GS	38	H-1960-TwA	8	H-1960-SA	31	H-1925-GS	31	H-1925-GS	49	H-1925-GS	40
H-1960-SA	29	H-1996-LA	8	H-1960-TwA	31	H-1960-SA	21	H-1960-SA	33	H-1960-SA	33
H-1960-TwA	29	H-1996-SA	8	H-1996-SA	29	H-1960-TwA	21	H-1960-TwA	33	H-1960-TwA	33

Note:

1. *Creative Justice values obtained through scaling and averaging of Rapfish scores, rather than full Rapfish assessment.*

Table 16: Rank and scores for Rapfish assessments (Ethical and Five Justices), Kwakiutl salmon fisheries

Overall Ordination		**Creative Justice**[1]		**Distributive Justice**		**Ecosystem Justice**		**Productive Justice**		**Restorative Justice**	
Rank	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*
K-PC-TCh	70	K-1900-Ch	92	K-1900-TCh	82	K-1900-TCh	72	K-1962-SA	71	K-1962-SA	66
K-PC-WCh	70	K-1900-TCh	92	K-1900-WCh	82	K-1900-WCh	72	K-1962-GCh	70	K-1962-GCh	65
K-1900-TCh	68	K-1900-WCh	92	K-PC-TCh	82	K-PC-TCh	72	K-1996-LA	61	K-PC-TCh	62
K-1900-WCh	68	K-PC-GCh	92	K-PC-WCh	82	K-PC-WCh	72	K-1962-GA	59	K-PC-WCh	62
K-PC-GCh	63	K-PC-TCh	92	K-1900-Ch	71	K-PC-GCh	61	K-PC-TCh	59	K-1996-LA	58
K-1900-Ch	61	K-PC-WCh	92	K-PC-GCh	71	K-1900-Ch	59	K-PC-WCh	59	K-1900-TCh	57
K-1962-GCh	61	K-1962-GCh	56	K-1962-GCh	61	K-1962-GCh	58	K-1996-GA	58	K-1900-WCh	57
K-1962-SA	54	K-1996-GA	17	K-1900-GS	49	K-1996-LA	49	K-1900-TCh	56	K-1962-GA	57
K-1996-LA	51	K-1996-LA	8	K-1962-SA	49	K-1962-GA	47	K-1900-WCh	56	K-1996-GA	55
K-1962-GA	49	K-1996-SA	8	K-1996-GA	47	K-1996-GA	42	K-1900-GS	55	K-PC-GCh	53
K-1996-GA	49	K-1900-GS	0	K-1996-LA	47	K-1962-SA	37	K-PC-GCh	54	K-1900-GS	50
K-1900-GS	46	K-1962-GA	0	K-1962-GA	39	K-1900-GS	36	K-1996-SA	53	K-1900-Ch	48
K-1996-SA	38	K-1962-SA	0	K-1996-SA	31	K-1996-SA	26	K-1900-Ch	51	K-1996-SA	48

Note:

1. Creative Justice values obtained through scaling and averaging of Rapfish scores, rather than full Rapfish assessment.

Table 17: Rank and scores for Rapfish assessments (Ethical and Five Justices), Lower Stalo salmon fisheries

Overall Ordination		**Creative Justice**[1]		**Distributive Justice**		**Ecosystem Justice**		**Productive Justice**		**Restorative Justice**	
Rank	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*
LS-PC-DA	74	LS-PC-DA	89	LS-PC-DA	85	LS-PC-DA	72	LS-1950-TA	83	LS-1950-TA	78
LS-PC-HA	74	LS-PC-HA	89	LS-PC-HA	85	LS-PC-HA	72	LS-1950-WA	83	LS-1950-WA	78
LS-PC-RA	74	LS-PC-RA	89	LS-PC-RA	85	LS-PC-RA	72	LS-PC-DA	71	LS-PC-DA	67
LS-PC-TA	74	LS-PC-TA	89	LS-PC-TA	85	LS-PC-TA	72	LS-PC-HA	71	LS-PC-HA	67
LS-PC-WA	74	LS-PC-WA	89	LS-PC-WA	85	LS-PC-WA	72	LS-PC-RA	71	LS-PC-RA	67
LS-1950-TA	70	LS-1900-TA	56	LS-1900-TA	70	LS-1950-TA	71	LS-PC-TA	71	LS-PC-TA	67
LS-1950-WA	70	LS-1900-WA	56	LS-1900-WA	70	LS-1950-WA	71	LS-PC-WA	71	LS-PC-WA	67
LS-1900-TA	58	LS-1950-TA	56	LS-1950-TA	70	LS-1900-TA	58	LS-1950-GA	70	LS-1950-GA	66
LS-1900-WA	58	LS-1950-WA	56	LS-1950-WA	70	LS-1900-WA	58	LS-1900-TA	63	LS-1900-TA	58
LS-1950-GA	58	LS-1950-GA	19	LS-1950-GA	53	LS-1950-GA	54	LS-1900-WA	63	LS-1900-WA	58
LS-1996-LA	51	LS-1996-GA	17	LS-1996-LA	48	LS-1996-LA	49	LS-1996-LA	62	LS-1996-LA	58
LS-1996-GA	49	LS-1900-GS	11	LS-1996-GA	47	LS-1996-GA	42	LS-1996-GA	59	LS-1996-GA	55
LS-1996-SA	39	LS-1996-LA	8	LS-1996-SA	32	LS-1900-GS	40	LS-1900-GS	55	LS-1900-GS	49
LS-1900-GS	34	LS-1996-SA	8	LS-1900-GS	29	LS-1996-SA	26	LS-1996-SA	53	LS-1996-SA	49

Note:

1. Creative Justice values obtained through scaling and averaging of Rapfish scores, rather than full Rapfish assessment.

Table 18: Rank and scores for Rapfish assessments (Ethical and Five Justices), Upper Stalo salmon fisheries

Overall Ordination		**Creative Justice**[1]		**Distributive Justice**		**Ecosystem Justice**		**Productive Justice**		**Restorative Justice**	
Rank	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*
US-PC-DS	77	US-PC-DS	100	US-PC-DS	90	US-1950-GA	80	US-1950-GA	83	US-1950-GA	78
US-PC-HCh	77	US-PC-HCh	100	US-PC-HCh	90	US-1950-HCh	80	US-1950-HCh	83	US-1950-HCh	78
US-PC-WA	77	US-PC-WA	100	US-PC-WA	90	US-1950-WA	80	US-1950-WA	83	US-1950-WA	78
US-1950-GA	76	US-1900-GA	83	US-1900-HCh	84	US-PC-DS	78	US-PC-DS	71	US-1950-GS	66
US-1950-HCh	76	US-1900-HCh	83	US-1900-WA	84	US-PC-HCh	78	US-PC-HCh	71	US-PC-DS	66
US-1950-WA	76	US-1900-WA	83	US-1950-GA	78	US-PC-WA	78	US-PC-WA	71	US-PC-HCh	66
US-1900-HCh	68	US-1950-GA	75	US-1950-HCh	78	US-1900-HCh	76	US-1950-GS	70	US-PC-WA	66
US-1900-WA	68	US-1950-HCh	75	US-1950-WA	78	US-1900-WA	76	US-1900-HCh	63	US-1996-LA	59
US-1900-GA	58	US-1950-WA	75	US-1900-GA	73	US-1900-GA	61	US-1900-WA	63	US-1900-HCh	56
US-1950-GS	57	US-1996-GA	17	US-1950-GS	52	US-1950-GS	51	US-1996-LA	62	US-1900-WA	56
US-1996-LA	51	US-1900-GS	8	US-1996-LA	48	US-1996-LA	49	US-1996-GA	59	US-1996-GA	55
US-1996-GA	49	US-1950-GS	8	US-1996-GA	47	US-1996-GA	43	US-1900-GA	55	US-1900-GA	49
US-1996-SA	39	US-1996-LA	8	US-1996-SA	32	US-1900-GS	41	US-1900-GS	54	US-1996-SA	49
US-1900-GS	35	US-1996-SA	8	US-1900-GS	31	US-1996-SA	27	US-1996-SA	53	US-1900-GS	48

Note:

1. Creative Justice values obtained through scaling and averaging of Rapfish scores, rather than full Rapfish assessment.

Table 19: Rank and scores for Rapfish assessments (Ethical and Five Justices), Tsimshian salmon fisheries

Overall Ordination		Creative Justice[1]		Distributive Justice		Ecosystem Justice		Productive Justice		Restorative Justice	
Rank	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*
T-1850-DS	76	T-1850-DS	100	T-1850-DS	91	T-1850-DS	72	T-1950-GA	76	T-1950-GA	70
T-1850-HS	76	T-1850-GS	100	T-1850-HS	91	T-1850-HS	72	T-1850-DS	71	T-1850-DS	66
T-1850-TS	76	T-1850-HS	100	T-1850-TS	91	T-1850-TS	72	T-1850-HS	71	T-1850-HS	66
T-PC-DS	76	T-1850-TS	100	T-PC-DS	90	T-PC-DS	72	T-1850-TS	71	T-1850-TS	66
T-PC-HS	76	T-PC-DS	100	T-PC-HS	90	T-PC-HS	72	T-PC-DS	71	T-PC-DS	64
T-PC-TS	76	T-PC-GS	100	T-PC-TS	90	T-PC-TS	72	T-PC-HS	71	T-PC-HS	64
T-1850-GS	69	T-PC-HS	100	T-1850-GS	81	T-1850-GS	65	T-PC-TS	71	T-PC-TS	64
T-PC-GS	69	T-PC-TS	100	T-PC-GS	80	T-PC-GS	65	T-1850-GS	64	T-1850-GS	60
T-1900-DS	63	T-1900-DS	75	T-1900-DS	78	T-1900-DS	59	T-PC-GS	64	T-PC-GS	58
T-1900-HS	63	T-1900-HS	75	T-1900-HS	78	T-1900-HS	59	T-1996-LA	63	T-1900-DS	57
T-1900-TS	63	T-1900-TS	75	T-1900-TS	78	T-1900-TS	59	T-1900-DS	62	T-1900-HS	57
T-1950-GA	60	T-1996-GA	17	T-1950-GA	53	T-1950-GA	57	T-1900-HS	62	T-1900-TS	57
T-1996-LA	51	T-1950-GA	8	T-1996-GA	45	T-1996-LA	53	T-1900-TS	62	T-1996-LA	57
T-1996-GA	48	T-1996-LA	8	T-1996-LA	45	T-1996-GA	49	T-1996-GA	60	T-1996-GA	54
T-1996-SA	39	T-1996-SA	8	T-1900-GS	31	T-1996-SA	41	T-1900-GS	55	T-1900-GS	51
T-1900-GS	35	T-1900-GS	0	T-1996-SA	29	T-1900-GS	33	T-1996-SA	55	T-1996-SA	48

Note:

1. Creative Justice values obtained through scaling and averaging of Rapfish scores, rather than full Rapfish assessment.

Overall Ethical

As with the Canadian marine fisheries evaluated in Chapter 3, the Aboriginal salmon fisheries were first evaluated based upon the whole suite of Ethical attributes, including the eight original ethical attributes and the three additional attributes designed for this assessment. The results are shown by Nation, in Figure 20 (Babine), Figure 21 (Carrier), Figure 22 (Chilcotin), Figure 23 (Haida), Figure 24 (Kwakiutl), Figure 25 (Lower Stalo), Figure 26 (Upper Stalo), and Figure 27 (Tsimshian). The analysis, as has been described above, was divided such that one Rapfish assessment included the (roughly described) north coast Nations (Babine, Carrier, Chilcotin, Haida, and Tsimshian) and the other the south coat Nations (Kwakiutl and Lower and Upper Stalo). Both Rapfish assessments produced excellent stress scores (0.20 and 0.18, respectively), and good attribute leverage results.

While the time periods for each Nation varied, they ranged from Pre-contact through 1996, generally with steps in the 1800s and 1900s. In most cases, the pre-contact and early- to mid-1800s fisheries ordinated with higher sustainability scores, and the mid- and late-1900s presenting lower sustainability scores. This pattern coincides with a shift from traditional fishing methods through to the gears in use in the commercial fisheries for salmon.

The Babine fisheries (Figure 20) follow the pattern: the pre-contact weir fishery for sockeye salmon obtains the best possible score (77%), followed by the 1820 sockeye weir (71%). The worst-scoring fishery was the 1950 gillnet for sockeye (31%), with the 1996 seine for all salmon (39%) and the 1900 sockeye gillnet (40%) ordinating with slightly better results. The Carrier fisheries (Figure 21) follow likewise: the best-ordinating fisheries are pre-contact and 1850 weir, trap, and harpoon fisheries for sockeye (all scoring 73%), while the worst are the 1950 gillnet (31%) and the 1996 seine (39%). Haida fisheries (Figure 23) also follow the same pattern, as do the Kwakiutl fisheries (Figure 24).

The remaining four Nation groups present a modified version of the above pattern. The best of the Chilcotin fisheries (Figure 22) is in fact the 1950s weir, trap, and harpoon fishery (all scoring 76%), followed closely by the pre-contact and 1850 versions of those fisheries (all scoring 71%); note however that these are all traditional fishing methods, and the worst results are again shown by commercial gears, notably the 1900 gillnet (34%) and the 1996 seine (39%). The Tsimshian fisheries (Figure 27) present similar results, with the most-sustainable fisheries being the pre-contact and 1850s harpoon, dipnet, and trap, all scoring 76%, and the least-sustainable being the 1900 gillnet (35%) and the 1996 seine (39%). The most sustainable Lower Stalo fisheries (Figure 25) are the pre-contact weirs, traps, harpoons, dipnets, and reefnets (74%), while the worst fisheries are the 1900 gillnet (34%) and the 1996 seine (39%). Upper Stalo fisheries (Figure 26) showed a similar pattern, with the pre-contact weir, dipnet, and harpoon fisheries scoring 77% (the top score obtained by any of the First Nations salmon fisheries in the overall Ethical ordination), and the lowest-scoring fisheries being the 1900 gillnet (35%) and the 1996 seine (39%).

Therefore, in terms of the overall Ethical evaluation of First Nations salmon fisheries, the earliest fisheries tended to score best; fisheries which used traditional gears and methods, were selective, and represented one component of the sustenance and other activities of the Nations. In comparison, the least-sustainable fisheries included in the dataset were those that were industrial in nature, whether as part of the cannery fishery or the post-cannery commercial fishery. Note that, while the 1996 seine fishery in all cases produced poor results, the early- or mid-1900s gillnet fisheries were invariably somewhat worse; during this time period, the cannery fisheries were in their heyday and subsequent decline, and by the mid-1950s, as was discussed above, Aboriginal fishers were being squeezed out of the commercial fisheries at the same time that alternatives for employment were limited. By the late-1900s, more opportunities were available in some cases, and legal challenges (notably *Sparrow*) had enshrined the right to fish for First Nations, thus improving the situation to some degree.

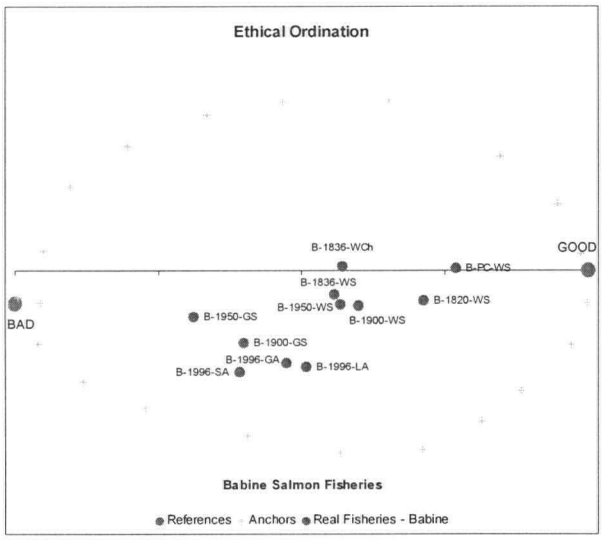

Figure 20: Results, overall Rapfish Ethical ordination, Babine salmon fisheries

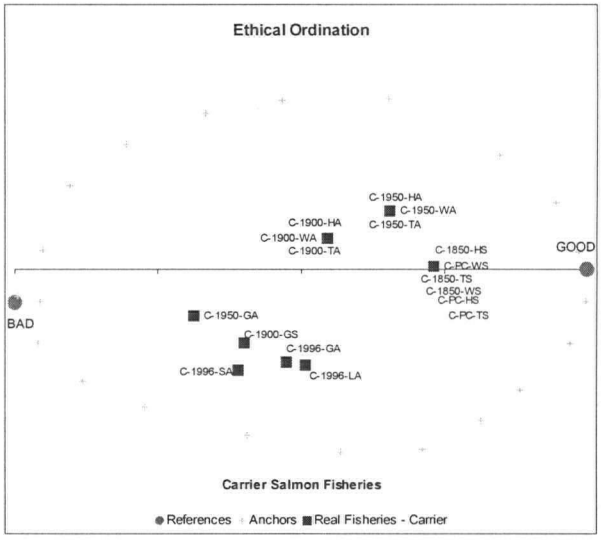

Figure 21: Results, overall Rapfish Ethical ordination, Carrier salmon fisheries

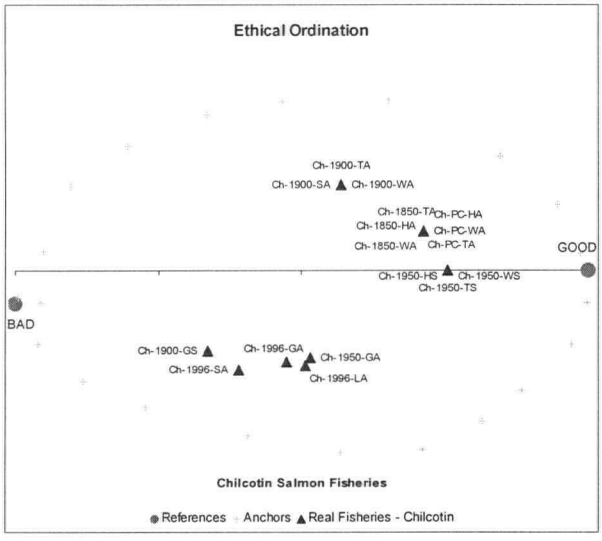

Figure 22: Results, overall Rapfish Ethical ordination, Chilcotin salmon fisheries

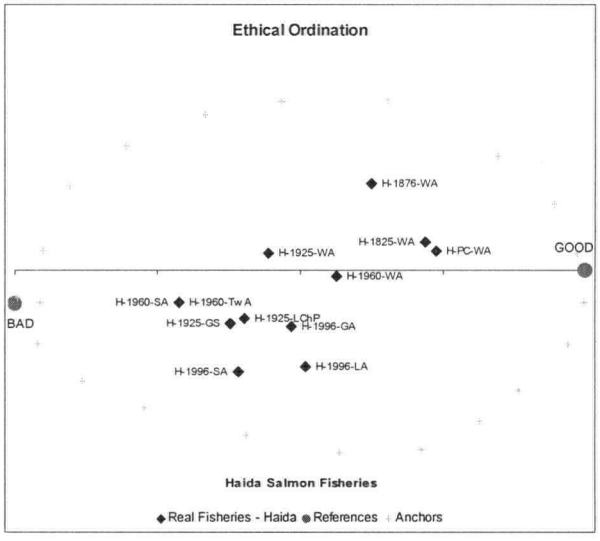

Figure 23: Results, overall Rapfish Ethical ordination, Haida salmon fisheries

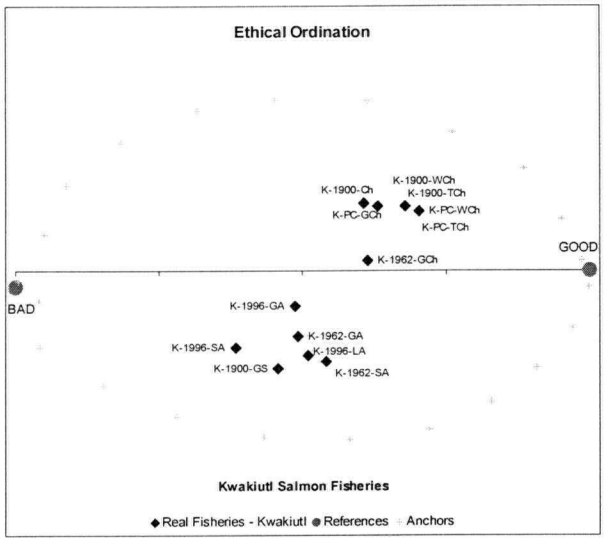

Figure 24: Results, overall Rapfish Ethical ordination, Kwakiutl salmon fisheries

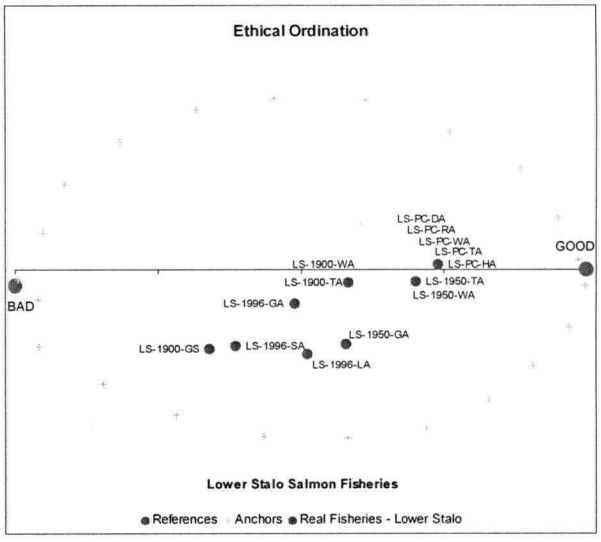

Figure 25: Results, overall Rapfish Ethical ordination, Lower Stalo salmon fisheries

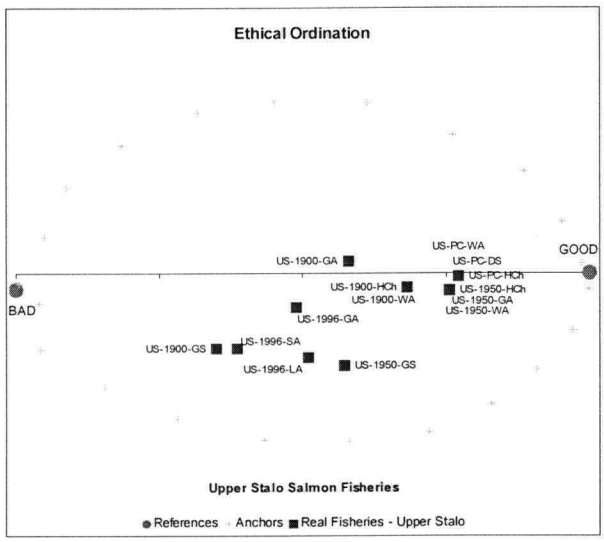

Figure 26: Results, overall Rapfish Ethical ordination, Upper Stalo salmon fisheries

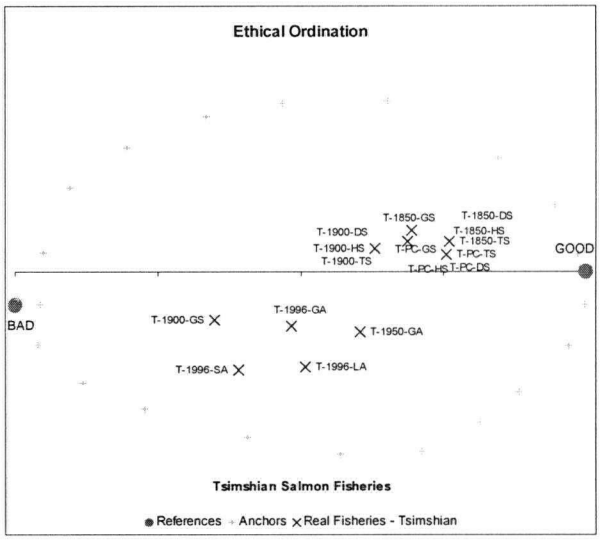

Figure 27: Results, overall Rapfish Ethical ordination, Tsimshian salmon fisheries

Creative Justice

The Creative Justice evaluation consisted of just three of the eleven attributes: Adjacency and Reliance, Equity in Entry, and Just Management (see Table 6, page 46). Of the three attributes added for the assessment of Aboriginal salmon fisheries, none was deemed especially representative of Creative Justice. Therefore, as was the case with the evaluation of Canadian marine fisheries described in Chapter 3, the Rapfish assessment for Creative Justice was unreliable and hence the same proxy method of scaling, standardising and then taking the average attribute score for each fishery was employed. As was demonstrated in Chapter 3, this process provides a reasonable proxy for the Rapfish assessment, and is sufficient for comparing the results in terms of rankings. The figures which follow thus compare the results of the

original Rapfish Ethical assessment with the results of the scaled/averaged proxy method for Creative Justice. Note that, for all graphs showing the results of the Creative Justice assessment, the results of the overall Ethical ordination are also included for ease of comparison; the overall results are presented on the left side of the axis, the Creative Justice results on the right.

Most of the Nations exhibit a degree of variability from the overall evaluation to the assessment for Creative Justice; this again is largely to be expected due to the fact that only three of the possible eleven attributes were included in the analysis. Furthermore, the range of scores is exaggerated, with the extreme scores being emphasised. An interesting trend emerges in the Creative Justice assessment, in that the fisheries of several of the Nations seem to be sorted in a chronological fashion, with the pre-contact fisheries at the upper ranks through the 1996 fisheries at the lower ranks. This generally holds true for the Babine (Figure 28), Carrier (Figure 29), Lower (Figure 33) and Upper (Figure 34) Stalo, and Tsimshian (Figure 35) fisheries, although with slight hiccups in the chronological ordering in all cases.

Other fisheries show more pronounced changes or otherwise counter the chronological trend. In the case of the Chilcotin fisheries (Figure 30), the pre-contact and 1850 harpoon, trap, and weir fisheries tie for the uppermost rank, all scoring 100%. From this point onwards, the chronological trend largely holds (1900s, 1950s, then 1996 fisheries), with the exception of the two fisheries tied for last place; the 1900s and 1950s gillnet fisheries score an even 0% sustainability, based upon the three Creative Justice attributes. Recall that these were cannery fisheries, representing the peak and declining years of the canneries. The Kwakiutl fisheries (Figure 32) demonstrate a similar pattern, with the pre-contact and 1900 fisheries tied for first at 92%, and the 1900 gillnet and 1962 gillnet and seine fisheries tying for last with 0%.

The Haida fisheries (Figure 31) present perhaps the greatest variability from the overall Ethical ordination to the Creative Justice evaluation. The element of chronology remains apparent to a degree, but is influenced by gear-type to a greater extent than is apparent in the other Nation groups. The pre-contact, 1825, and 1876 weir fisheries tie for the top rank at 89%, followed by the 1925 and 1960 weir (47%), the 1996 gillnet (17%), the 1925 troll (11%), and then, all tied at 8%, 1925 gillnet, the 1960 seine and trawl, and the 1996 troll and seine. Thus, the pattern for the Haida fisheries is dominated more by traditional versus industrial gear than by chronology.

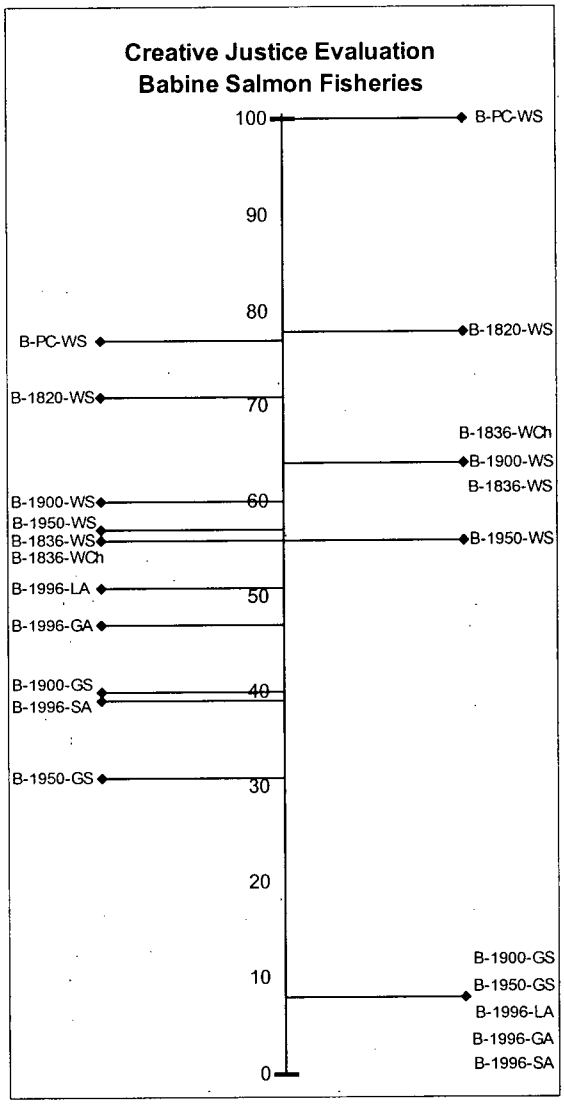

Figure 28: Results, Creative Justice evaluation, Babine salmon fisheries

Note: For comparison, the results of the Rapfish Ethical ordination are distributed along the left side of the axis, while the results of the Creative Justice evaluation are presented on the right side of the axis.

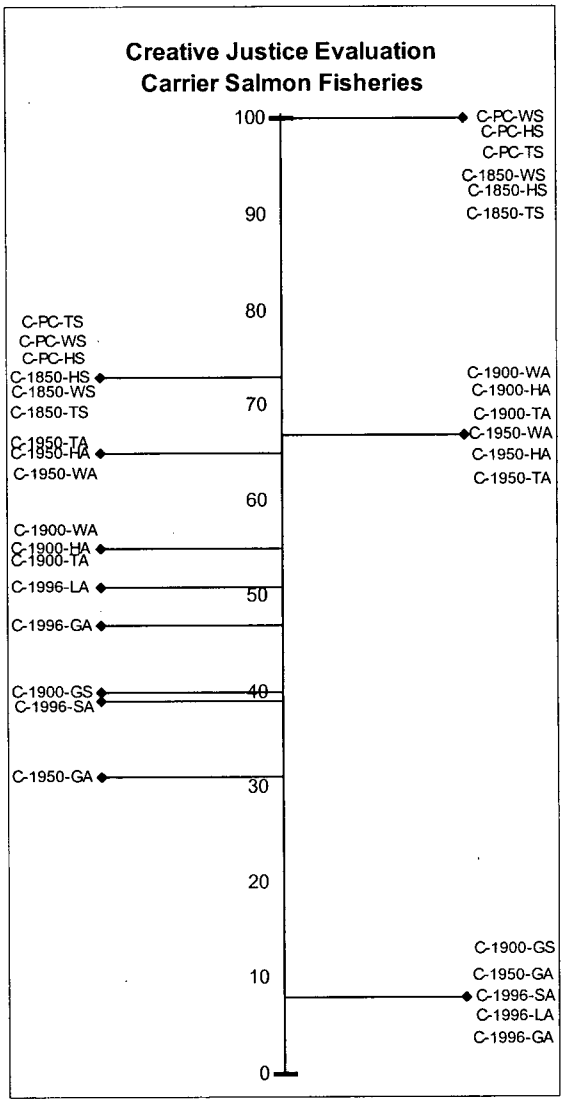

Figure 29: Results, Creative Justice evaluation, Carrier salmon fisheries

Note: For comparison, the results of the Rapfish Ethical ordination are distributed along the left side of the axis, while the results of the Creative Justice evaluation are presented on the right side of the axis.

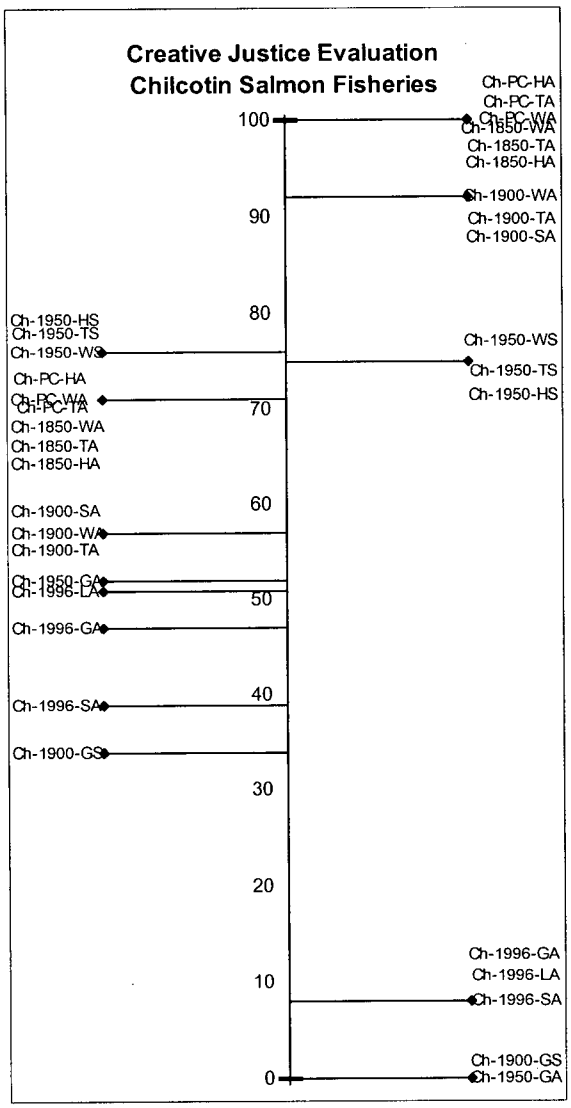

Figure 30: Results, Creative Justice evaluation, Chilcotin salmon fisheries

Note: For comparison, the results of the Rapfish Ethical ordination are distributed along the left side of the axis, while the results of the Creative Justice evaluation are presented on the right side of the axis.

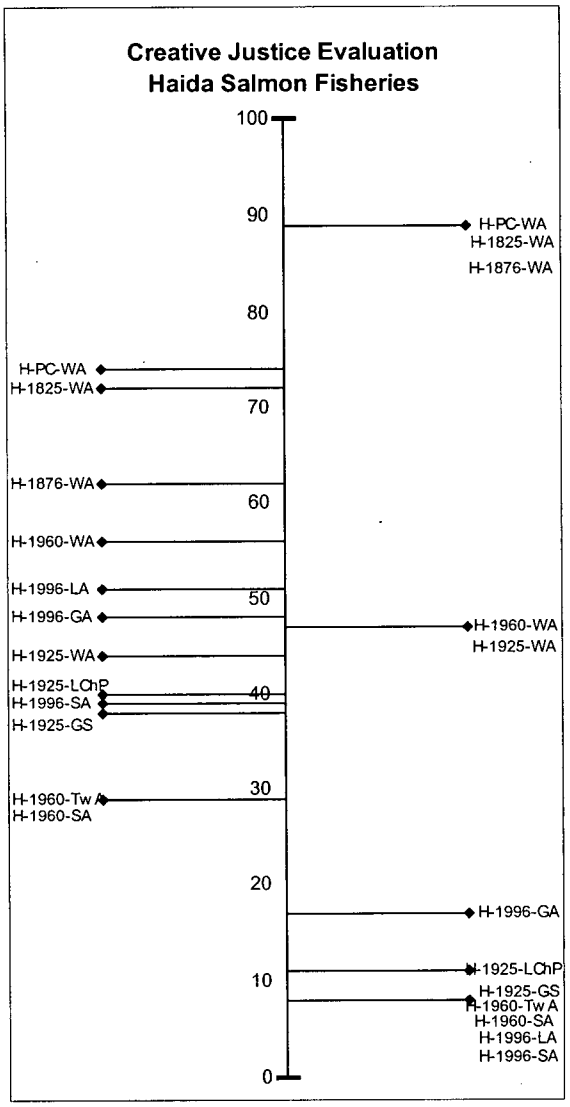

Figure 31: Results, Creative Justice evaluation, Haida salmon fisheries

Note: For comparison, the results of the Rapfish Ethical ordination are distributed along the left side of the axis, while the results of the Creative Justice evaluation are presented on the right side of the axis.

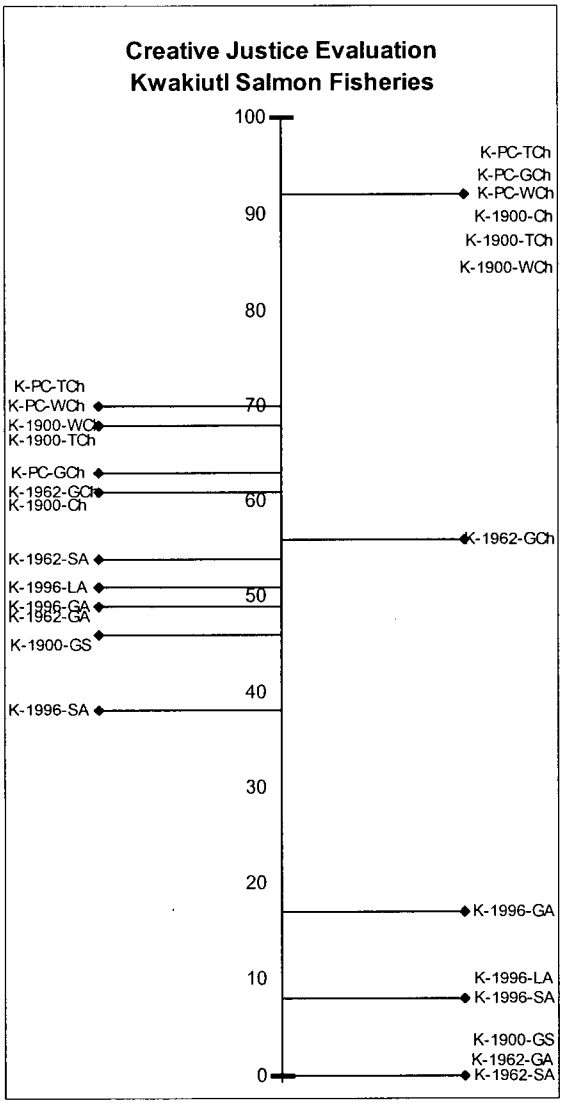

Figure 32: Results, Creative Justice evaluation, Kwakiutl salmon fisheries

Note: For comparison, the results of the Rapfish Ethical ordination are distributed along the left side of the axis, while the results of the Creative Justice evaluation are presented on the right side of the axis.

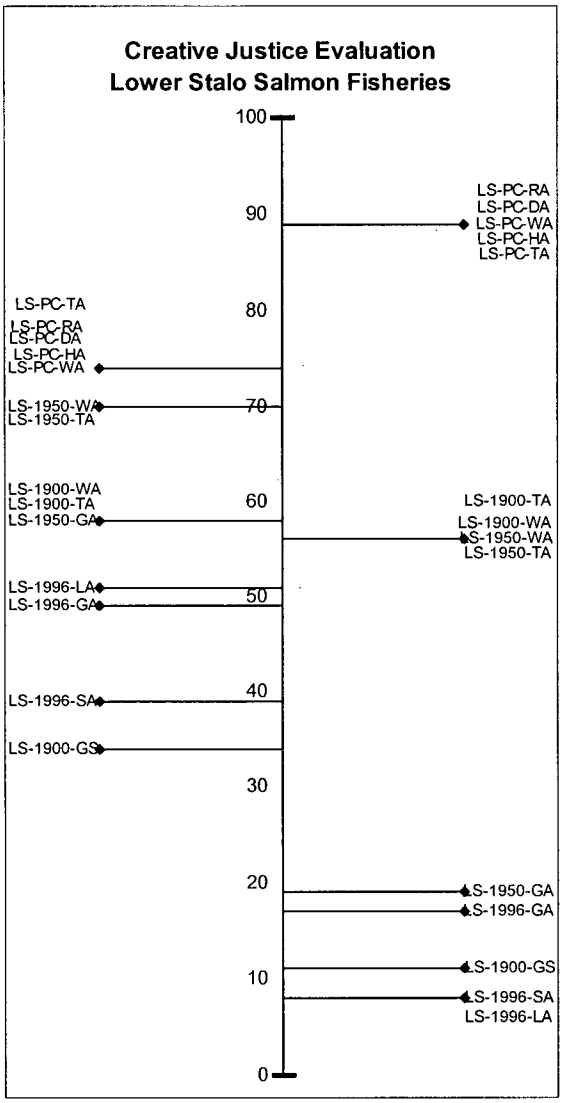

Figure 33: Results, Creative Justice evaluation, Lower Stalo salmon fisheries

Note: For comparison, the results of the Rapfish Ethical ordination are distributed along the left side of the axis, while the results of the Creative Justice evaluation are presented on the right side of the axis.

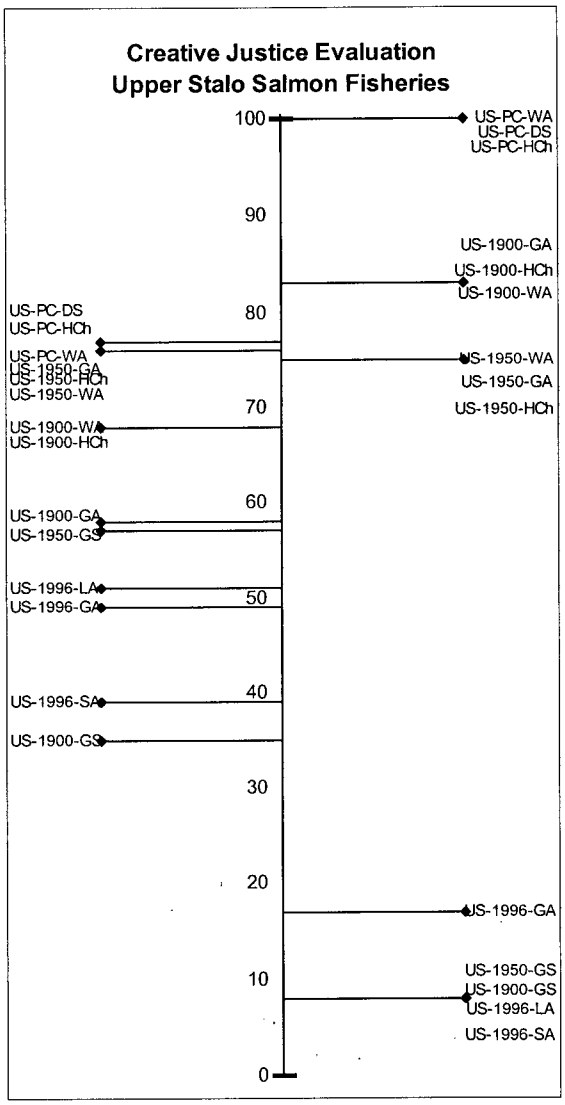

Figure 34: Results, Creative Justice evaluation, Upper Stalo salmon fisheries

Note: For comparison, the results of the Rapfish Ethical ordination are distributed along the left side of the axis, while the results of the Creative Justice evaluation are presented on the right side of the axis.

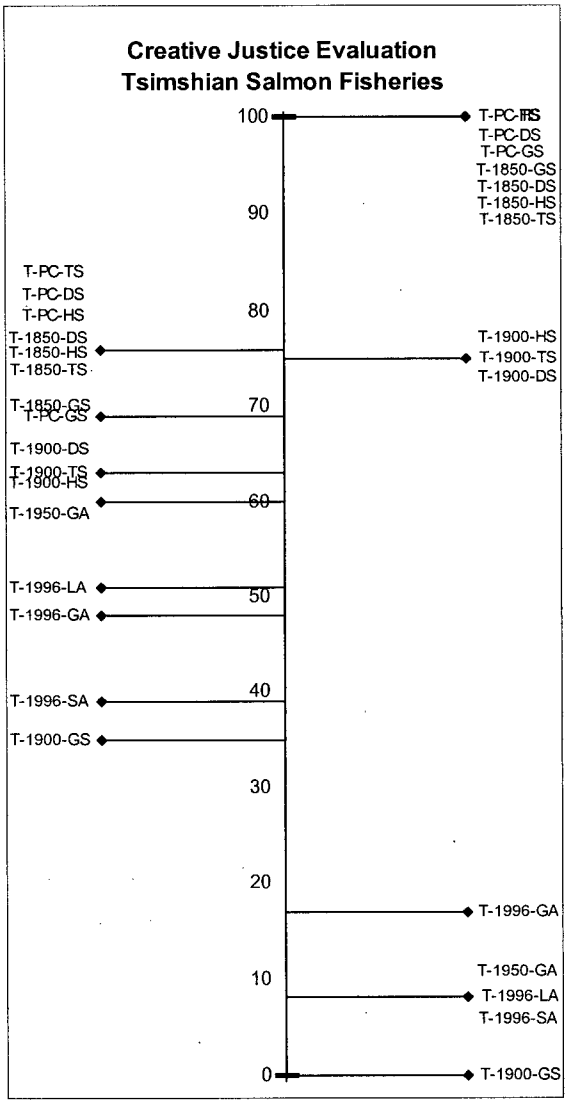

Figure 35: Results, Creative Justice evaluation, Tsimshian salmon fisheries

Note: For comparison, the results of the Rapfish Ethical ordination are distributed along the left side of the axis, while the results of the Creative Justice evaluation are presented on the right side of the axis.

Distributive Justice

The Aboriginal salmon fisheries were also evaluated for Distributive Justice, using eight of the eleven attributes (Adjacency and Reliance, Alternatives, Equity in Entry, Just Management, Illegal Fishing, Discards and Wastes, Protection, and Food Fisheries; see Table 6, page 46, and Table 11, page 85). Again, the stress scores were excellent (0.16 in both cases), and leverage was very low. The results are shown by Nation, in Figure 36 (Babine), Figure 37 (Carrier), Figure 38 (Chilcotin), Figure 39 (Haida), Figure 40 (Kwakiutl), Figure 41 (Lower Stalo), Figure 42 (Upper Stalo), and Figure 43 (Tsimshian).

The patterns observed in the overall ethical ordination persist in the Distributive Justice ordination. The rank of the Babine fisheries is virtually unchanged from that of the overall

ordination, with only minor changes towards the middle of the ordination; the trend remains the same. The same is also true for the Lower Stalo and Upper Stalo fisheries.

There are relatively minor changes within the fisheries rankings of the remaining Nations, in comparing the Distributive Justice results with those of the overall Ethical ordination. The Carrier fisheries shift somewhat at the extremes; whereas the pre-contact and 1850s harpoon, trap, and weir fisheries were best in the overall Ethical evaluation, at 73%, in the Distributive Justice evaluation those three gear types remain at the top of the standings (84%), but in their 1950s variation, followed by the pre-contact and 1850s instalments (which are tied at 83%). At the other extreme, the 1950 gillnet remains worst (27%), with the 1996 seine slightly better (29%). As for the Chilcotin fisheries, in the overall ordination the 1950s harpoon, trap, and weir tied for the top rank (76%), followed by the pre-contact and 1850s harpoon, trap, and weir (71%); in the Distributive Justice evaluation, it is once again these traditional gear types which rank best, but the pre-contact and 1850s variations tie for top position at 84%. In the overall ordination, the two worst-ordinating fisheries were the 1996 seine (39%) and the 1900 gillnet (34%); these tie at 29% in the Distributive Justice ordination. Whereas in the overall ordination the Haida pre-contact weir fishery was best overall at 74%, followed by the 1825 weir fishery (72%), these two tie in the Distributive Justice ordination at 87%. At the opposite extreme, the 1960 trawl and seine tie at 29% in the overall ordination; these two tie at 31% in the Distributive Justice ordination, but the 1996 seine fishery is worse at 29%. For the Kwakiutl fisheries, the pre-contact trap and weir fisheries tie for best at 70%, followed by the 1900 incarnation of those same fisheries at 68%; in the Distributive Justice ordination, these four fisheries tie for best at 82%. The 1996 seine fishery remains last in the Kwakiutl rankings (31% in the Distributive Justice ordination), but it is the 1962 gillnet, rather than the 1900 gillnet, which comes in second-to-last. Regarding the Tsimshian fisheries, the pre-contact and 1850 dipnet, harpoon and trap fisheries tie for the top position (76%) in the overall ordination, and this pattern persists in the Distributive Justice ordination (scoring 91%); however, at the lower extreme, the 1996 seine and the 1900 gillnet fisheries swap positions, with the seine ranking last at 29% in the Distributive Justice evaluation.

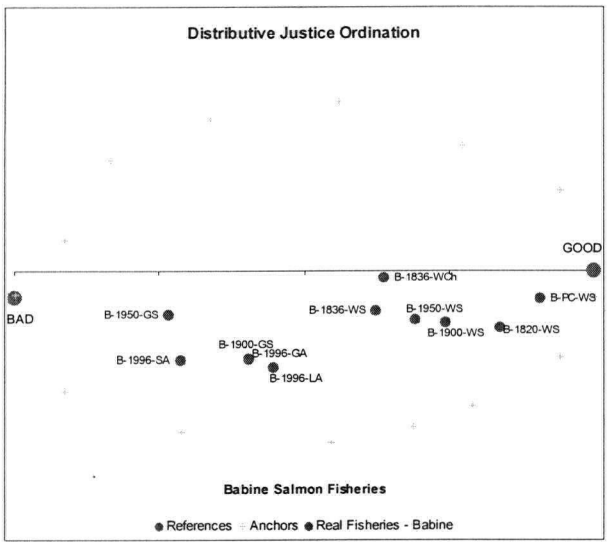

Figure 36: Results, Distributive Justice evaluation, Babine salmon fisheries

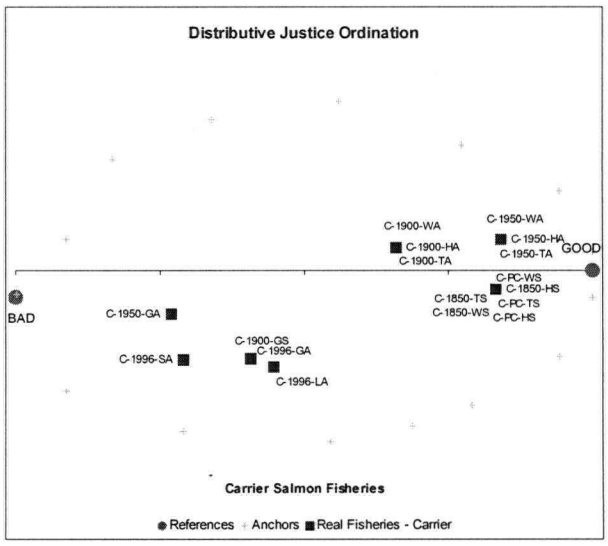

Figure 37: Results, Distributive Justice evaluation, Carrier salmon fisheries

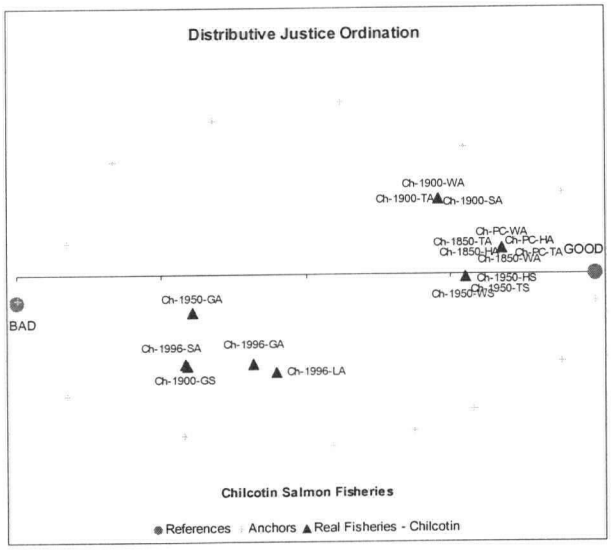

Figure 38: Results, Distributive Justice evaluation, Chilcotin salmon fisheries

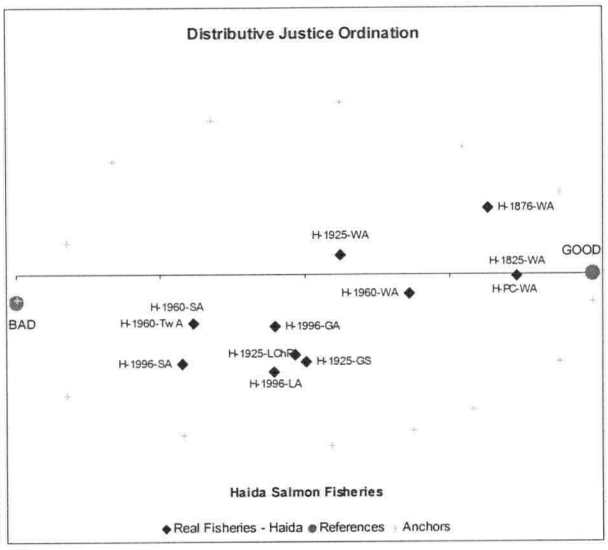

Figure 39: Results, Distributive Justice evaluation, Haida salmon fisheries

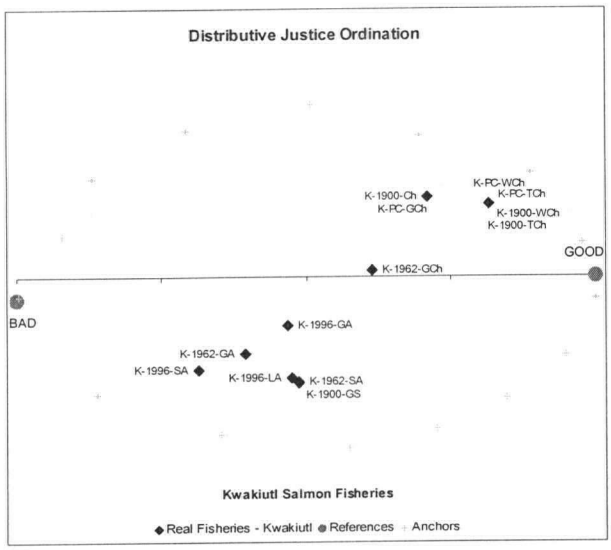

Figure 40: Results, Distributive Justice evaluation, Kwakiutl salmon fisheries

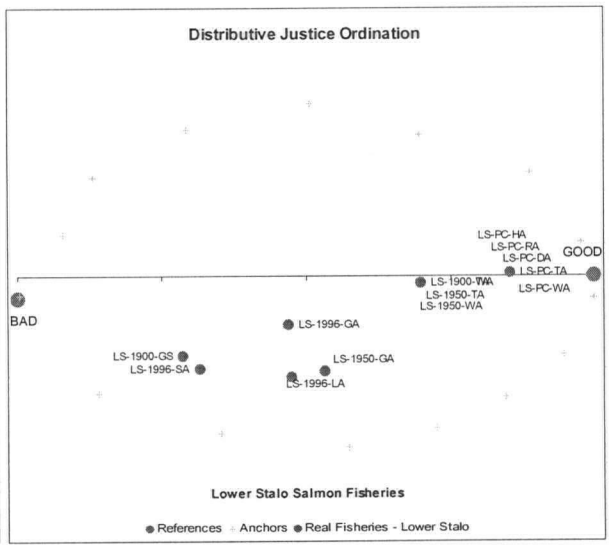

Figure 41: Results, Distributive Justice evaluation, Lower Stalo salmon fisheries

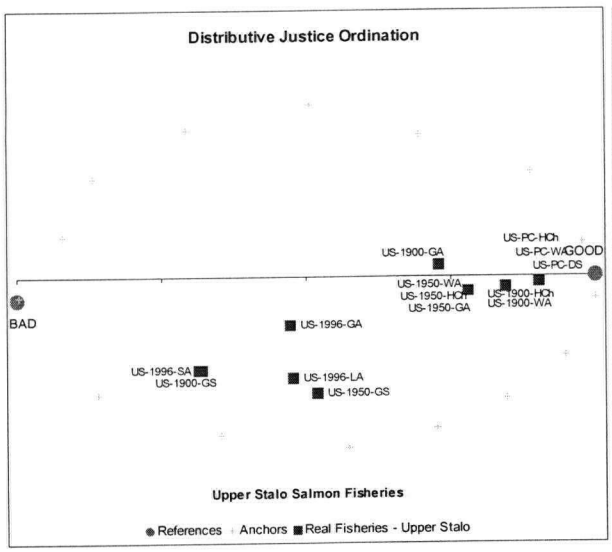

Figure 42: Results, Distributive Justice evaluation, Upper Stalo salmon fisheries

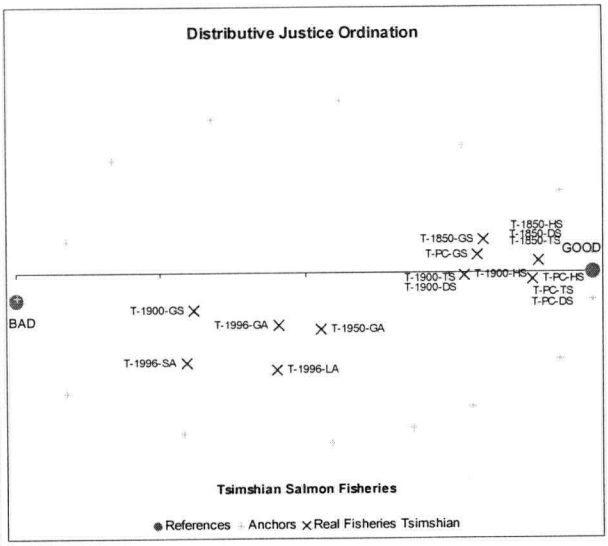

Figure 43: Results, Distributive Justice evaluation, Tsimshian salmon fisheries

Ecosystem Justice

The Ecosystem Justice evaluation included six of the eleven attributes (Adjacency and Reliance, Just Management, Mitigation of Habitat Destruction, Mitigation of Ecosystem Depletion, Discards and Wastes, and Design of Gear; see Table 6, page 46, and Table 11, page 85). The south coast grouping produced reasonable leverage values and a stress score of 0.23. However the north coast grouping proved problematic, as indicated by an unusual pattern of 'anchor' fisheries rather than the expected oval-shaped ring. The fisheries included in the north coast grouping were therefore assessed as individual Nations (thus, five separate Rapfish assessments), and each of these produced the expected results as well as tolerable leverages and stress scores (ranging from 0.21 to 0.24). The results are shown by Nation, in Figure 44 (Babine), Figure 45 (Carrier), Figure 46 (Chilcotin), Figure 47 (Haida), Figure 48 (Kwakiutl), Figure 49 (Lower Stalo), Figure 50 (Upper Stalo), and Figure 51 (Tsimshian).

As with the Distributive Justice evaluations, there are few changes in rankings from the overall Ethical ordination to the Ecosystem Justice ordination. For the Chilcotin, Haida, and Tsimshian fisheries, there is no change at the top and bottom, and in the case of the Chilcotin and Tsimshian, only a few minor shifts within the middle ranks. The rankings of the Lower Stalo fisheries remain constant, other than that the worst-two fisheries trade positions: the 1900 gillnet scores worst in the overall assessment, at 34%, while the 1996 seine is second-last at 39%; these two are inverted in the Ecosystem Justice ordination, with the gillnet ordinating at 40% and the seine at a lowly 26%. There are also only minor shifts at the lowest ranks for the Babine and Carrier fisheries: for the Babine, there is a shuffling of the lowest three fisheries from a descending ordering of 1900 gillnet, 1996 seine, 1950 gillnet in the overall ordination to 1996 seine, 1900 gillnet, and 1950 gillnet in the Distributive Justice ordination; for the Carrier, precisely the same is true.

The Kwakiutl fisheries remain relatively stable, save for the upper ranks: in the overall evaluation, the pre-contact traps and weirs tied for the top position (70%), followed by the 1900 traps and weirs (tied at 68%); in the assessment for Distributive Justice, these four fisheries are

tied for the top position, all scoring 72%. The Upper Stalo fisheries show the most variability, with changes at both the top and bottom of the distribution: in the overall assessment, the pre-contact dipnet, harpoon, and weir tied for the top rank at 77%, followed closely by the 1950 gillnet, harpoon, and weir at 76%; the relative positions of these troikas are inverted in the Ecosystem Justice ordination, with the 1950 fisheries achieving 80% and the pre-contact fisheries scoring 78%. At the opposite extreme, there is an inversion between the two lowest-scoring fisheries. In the overall evaluation, the two rank as follows: the 1996 seine (39%), and the 1900 gillnet (35%); in the Distributive Justice assessment, the gillnet scores 41% and the seine scores 27%.

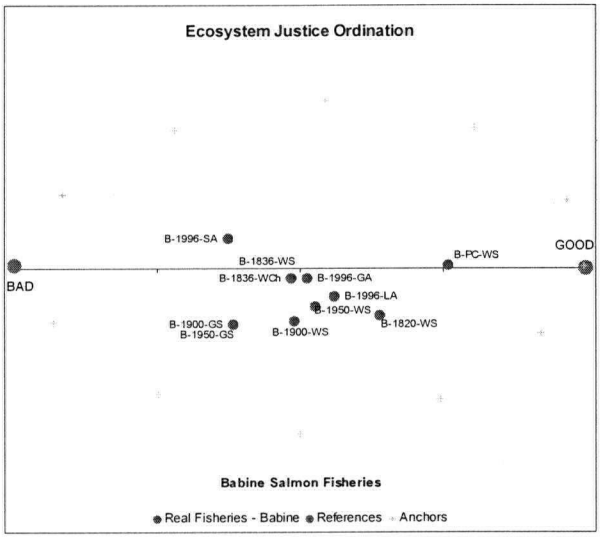

Figure 44: Results, Ecosystem Justice evaluation, Babine salmon fisheries

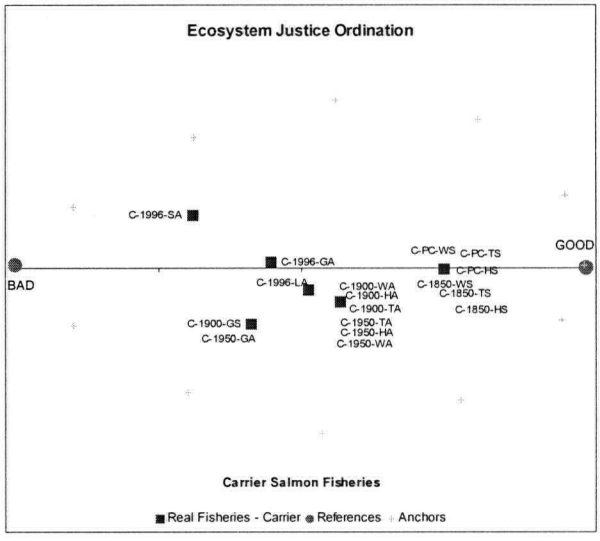

Figure 45: Results, Ecosystem Justice evaluation, Carrier salmon fisheries

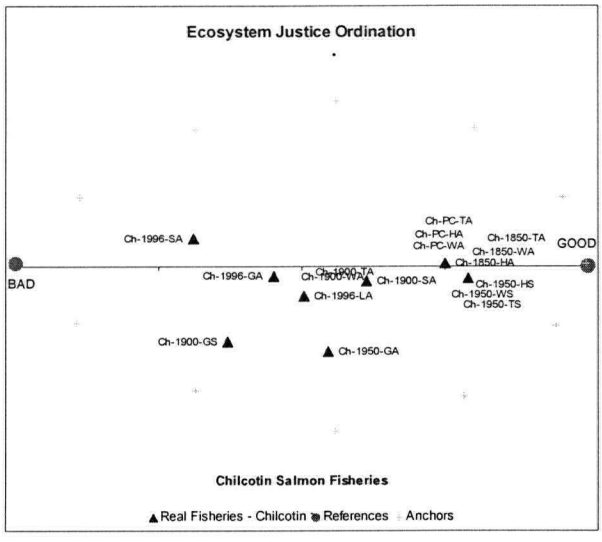

Figure 46: Results, Ecosystem Justice evaluation, Chilcotin salmon fisheries

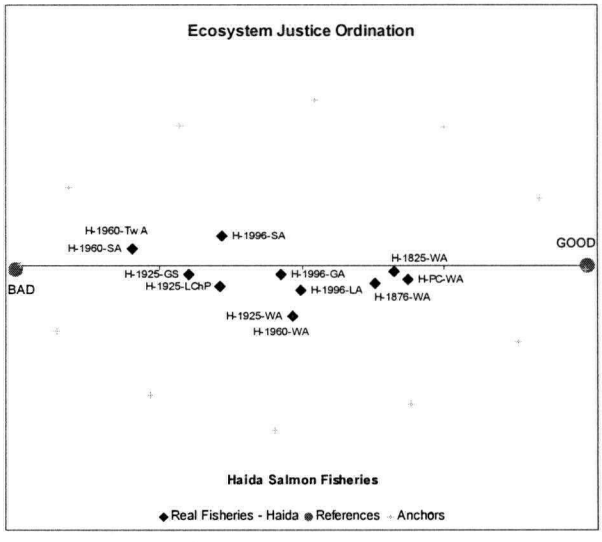

Figure 47: Results, Ecosystem Justice evaluation, Haida salmon fisheries

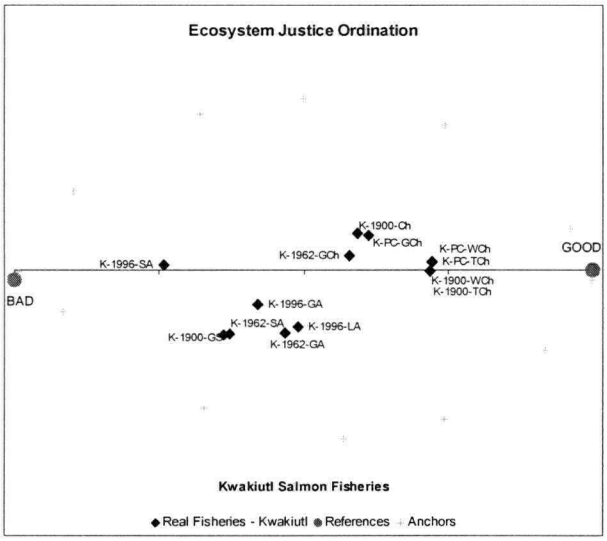

Figure 48: Results, Ecosystem Justice evaluation, Kwakiutl salmon fisheries

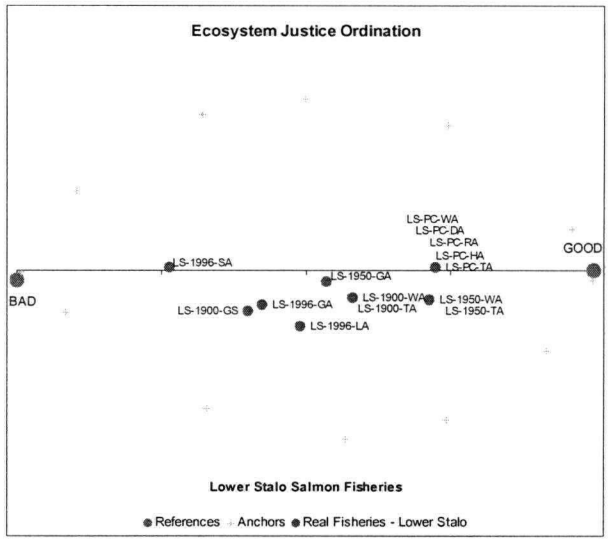

Figure 49: Results, Ecosystem Justice evaluation, Lower Stalo salmon fisheries

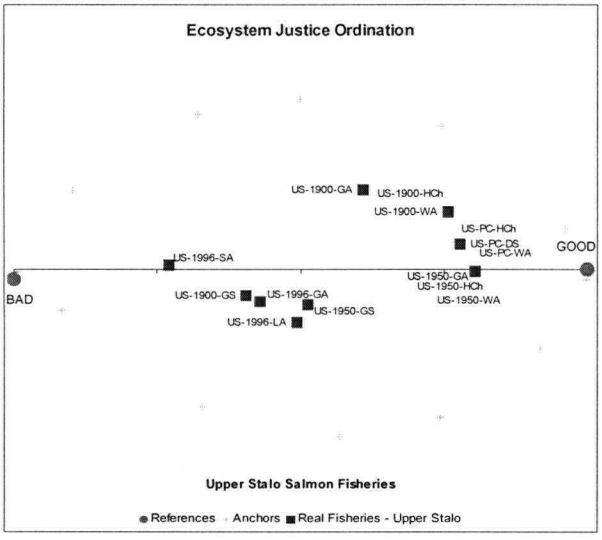

Figure 50: Results, Ecosystem Justice evaluation, Upper Stalo salmon fisheries

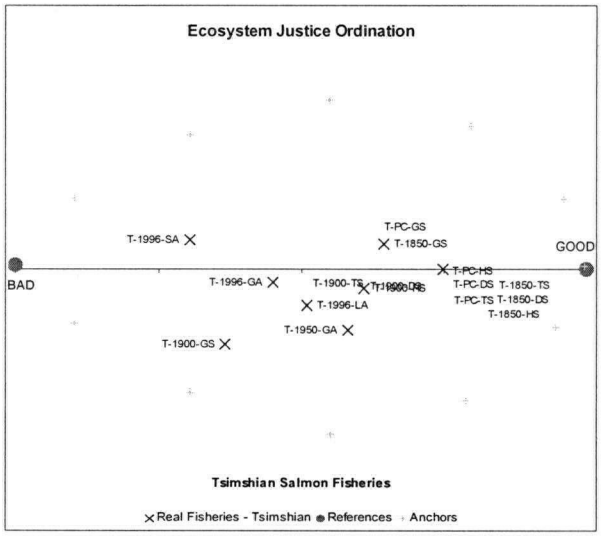

Figure 51: Results, Ecosystem Justice evaluation, Tsimshian salmon fisheries

Productive Justice

Five of the eleven attributes were included in the Productive Justice evaluation (Mitigation of Habitat Destruction, Mitigation of Ecosystem Depletion, Discards and Wastes, and Design of Gear; see Table 6, page 46, and Table 11, page 85). For the both north and south coast fisheries, the leverage and the stress score (0.24) were somewhat high, but tolerable particularly given that only five attributes were included in the evaluation. The results are shown by Nation, in Figure 52 (Babine), Figure 53 (Carrier), Figure 54 (Chilcotin), Figure 55 (Haida), Figure 56 (Kwakiutl), Figure 57 (Lower Stalo), Figure 58 (Upper Stalo), and Figure 59 (Tsimshian).

The results of the Productive Justice ordination show the greatest variability thus far. The rankings of the Haida fisheries are relatively unchanged from that of the overall Ethical evaluation, and the Babine and Carrier fisheries show a very small degree of change amongst the lower ranks. Note that for both the Babine and Carrier 1996 troll fisheries, an improvement in rank is realised from the overall Ethical ordination to the Distributive Justice ordination, with a commensurate improvement of score: for both Nations, from 51% to 63% respectively.

The fisheries for the remaining five Nation groups demonstrate greater variability. The Kwakiutl fisheries are interesting in that, in the Ethical ordination the pre-contact and 1900 fisheries ordinated at the top, yet in the Productive Justice ordination the 1962 fisheries climbed the ranks, as did the 1996 troll fishery. Similar is true for the Lower Stalo fisheries, in that the 1950s trap and weir fisheries displaced the pre-contact fisheries in the Productive Justice ordination. In the case of the Upper Stalo, it is the 1950s gillnet, harpoon, and weir that displaces the pre-contact dipnet, harpoon, and weir fisheries; however, note that the fisheries within these two year-based trios are tied, and the groups merely trade position within the uppermost ranks. The Tsimshian fisheries exhibit the same pattern, but between the fisheries of the pre-contact period and the 1850s.

The Chilcotin fisheries demonstrate great variability, from the Ethical to the Productive Justice ordinations. The 1950s fisheries remain at the top of the rankings, followed by the 1850s fisheries. In the middle of the distribution, however, most 1996 fisheries improve status at the expense of the pre-contact and 1900 fisheries. In fact, while the 1996 seine fishery ranks as least-sustainable of the Chilcotin fisheries in this evaluation, the 1900 weir, trap, seine, and gillnet fisheries round out the worst-five positions. As with the Babine, Carrier, and Kwakiutl fisheries, the 1996 troll fishery improves significantly, in this case from 47% (Ethical) to 63% (Productive Justice).

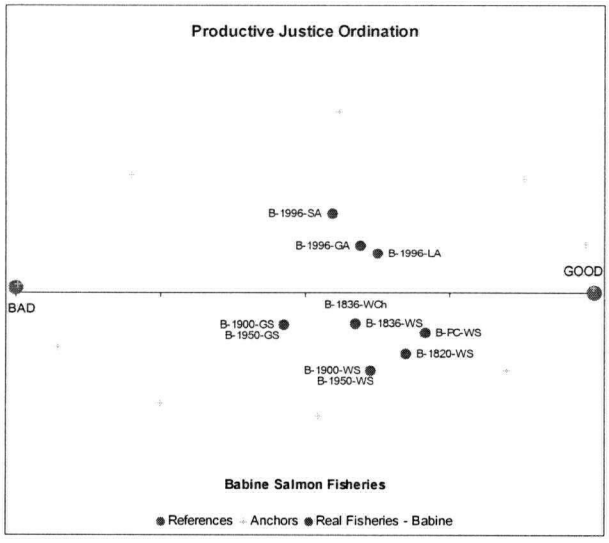

Figure 52: Results, Productive Justice evaluation, Babine salmon fisheries

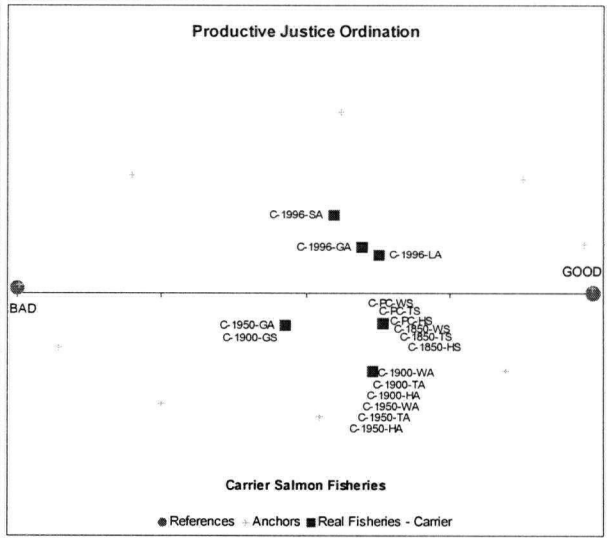

Figure 53: Results, Productive Justice evaluation, Carrier salmon fisheries

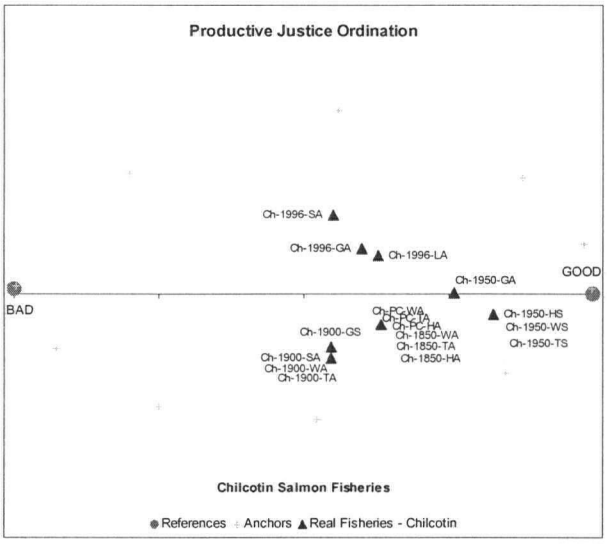

Figure 54: Results, Productive Justice evaluation, Chilcotin salmon fisheries

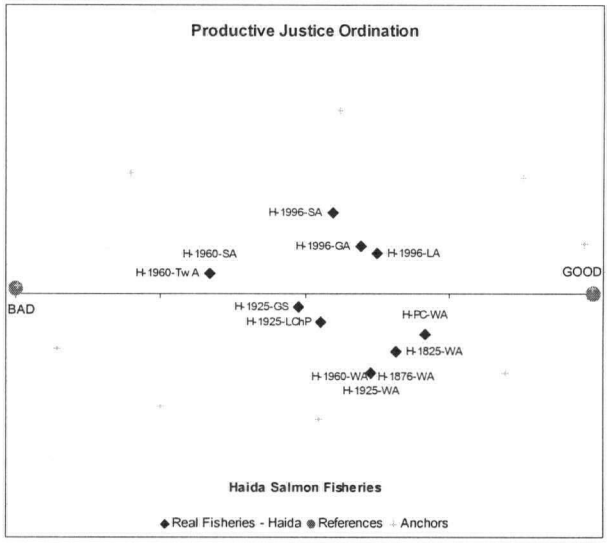

Figure 55: Results, Productive Justice evaluation, Haida salmon fisheries

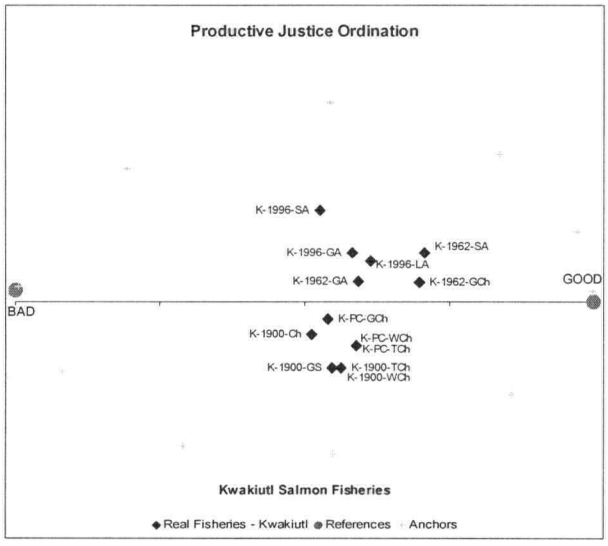

Figure 56: Results, Productive Justice evaluation, Kwakiutl salmon fisheries

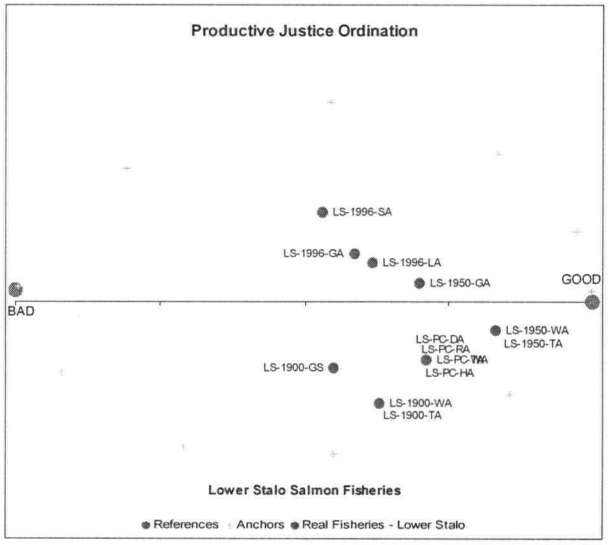

Figure 57: Results, Productive Justice evaluation, Lower Stalo salmon fisheries

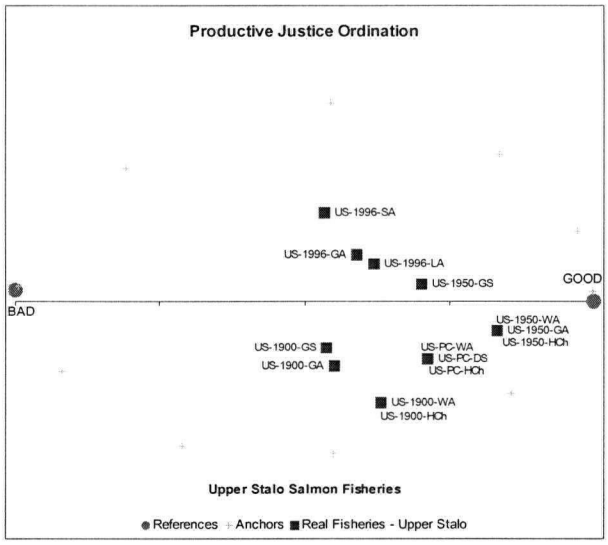

Figure 58: Results, Productive Justice evaluation, Upper Stalo salmon fisheries

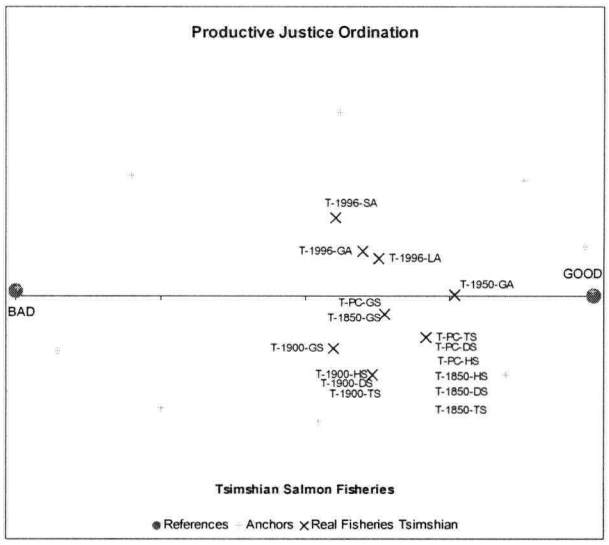

Figure 59: Results, Productive Justice evaluation, Tsimshian salmon fisheries

Restorative Justice

The evaluation for Restorative Justice included six of the eleven attributes (Alternatives, Mitigation of Habitat Destruction, Mitigation of Ecosystem Depletion, Discards and Wastes, and Design of Gear; see Table 6, page 46, and Table 11, page 85). For the both north and south coast fisheries, the leverage was good, as were the stress scores (0.22 and 0.23, respectively). The results are shown by Nation, in Figure 60 (Babine), Figure 61 (Carrier), Figure 62 (Chilcotin), Figure 63 (Haida), Figure 64 (Kwakiutl), Figure 65 (Lower Stalo), Figure 66 (Upper Stalo), and Figure 67 (Tsimshian).

As in the assessments presented in Chapter 3, the Restorative Justice ordination includes the whole suite of Productive Justice attributes, plus one additional attribute. Thus, it can be expected that the patterns evident in the Productive Justice ordination would be confirmed in this analysis. This is in fact the case in many instances. The rankings do not change at all from Productive to Restorative Justice for the Babine, and Lower Stalo fisheries, and very little in the case of the Chilcotin, Haida, Tsimshian, and Upper Stalo fisheries.

The three remaining First Nations groupings demonstrate slightly more variation from the Productive Justice to the Restorative Justice ordinations. At the lower ranks, the Carrier fisheries are unchanged, but at the upper ranks the 1950s fisheries displace the 1850s fisheries (harpoon, trap, and weir in both cases). What is most interesting is that the 1996 troll fishery, which had tied for the top position on the Productive Justice assessment, falls back to its 13th place position (of 17 fisheries) in the overall Ethical evaluation. The 1996 Kwakiutl troll fishery also falls from its 3rd place rank in the Productive Justice ordination to a 5th place position (of 13 fisheries) in the Restorative Justice ordination; furthermore, the pre-contact fisheries regain some lost ground, although not to a full recovery in comparison with the results of the overall Ethical assessment.

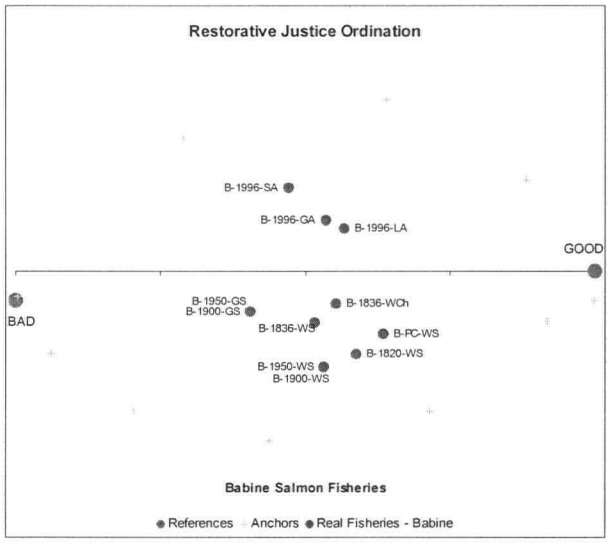

Figure 60: Results, Restorative Justice evaluation, Babine salmon fisheries

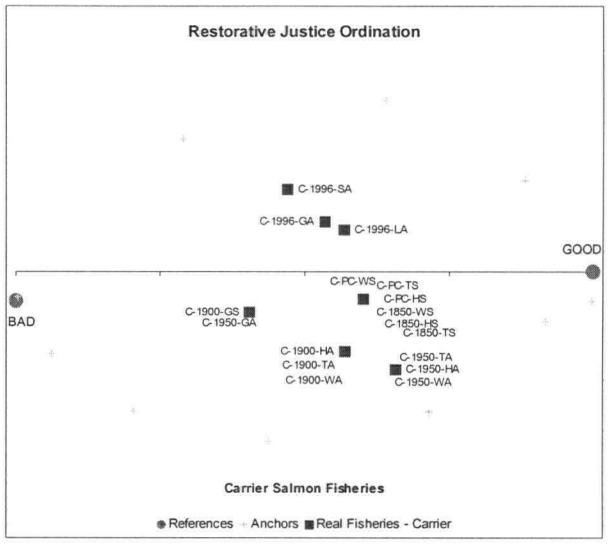

Figure 61: Results, Restorative Justice evaluation, Carrier salmon fisheries

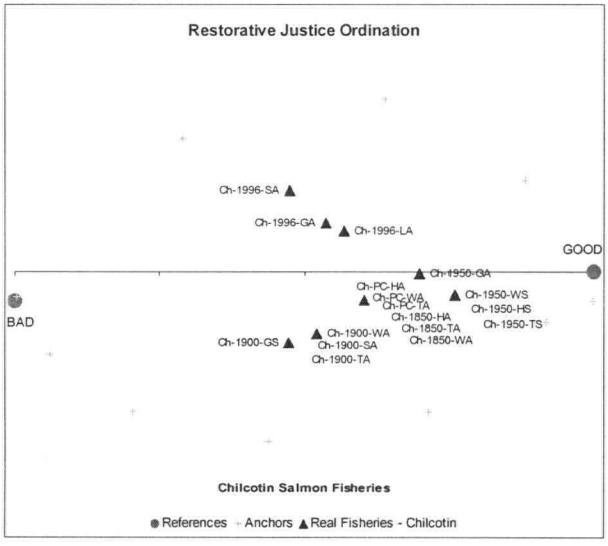

Figure 62: Results, Restorative Justice evaluation, Chilcotin salmon fisheries

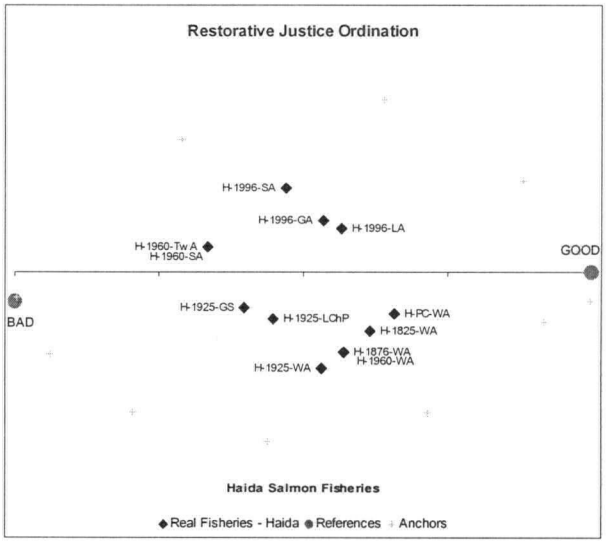

Figure 63: Results, Restorative Justice evaluation, Haida salmon fisheries

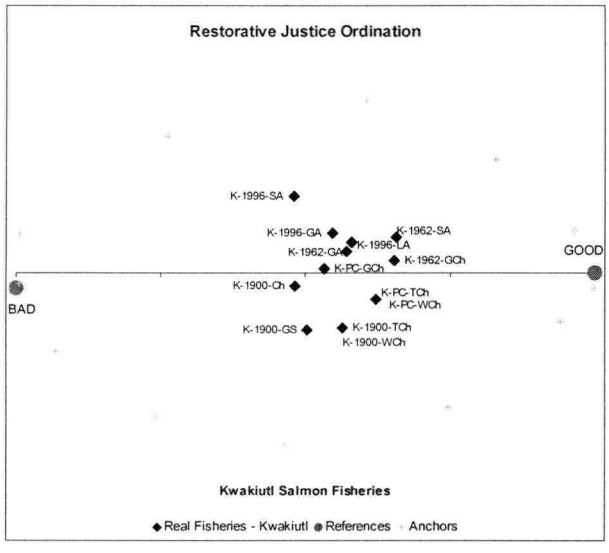

Figure 64: Results, Restorative Justice evaluation, Kwakiutl salmon fisheries

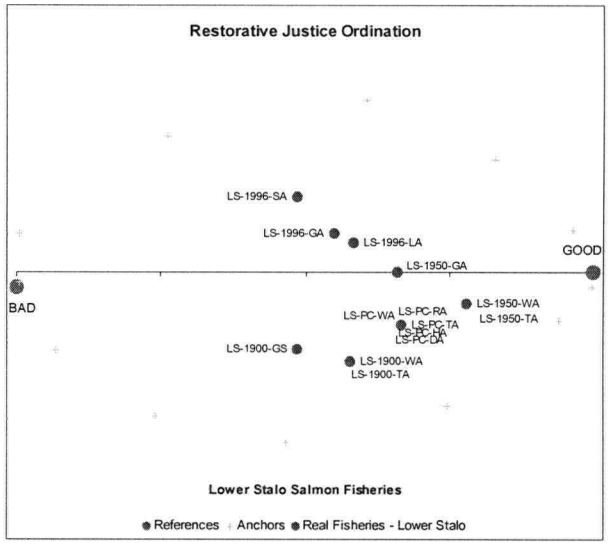

Figure 65: Results, Restorative Justice evaluation, Lower Stalo salmon fisheries

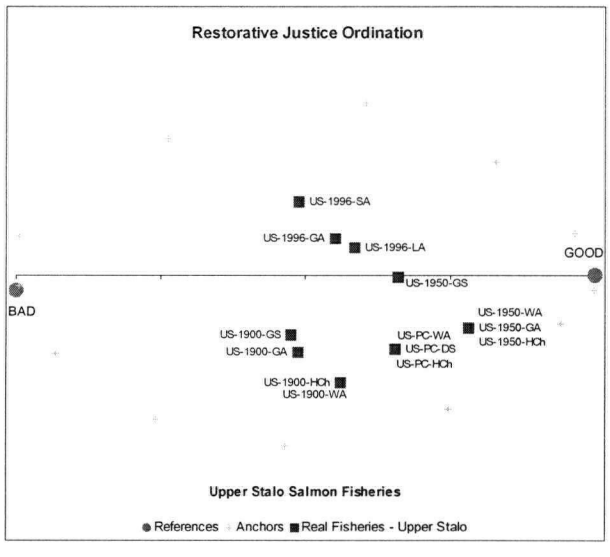

Figure 66: Results, Restorative Justice evaluation, Upper Stalo salmon fisheries

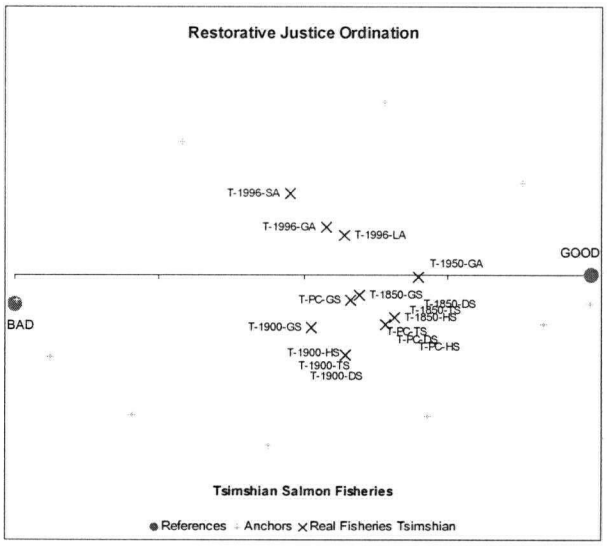

Figure 67: Results, Restorative Justice evaluation, Tsimshian salmon fisheries

4.3 Discussion: Ethics, Rapfish, and BC Aboriginal Salmon Fisheries

Through the overall Ethical evaluation of Aboriginal fisheries for Pacific salmon, a specific trend emerges: traditional fishing methods achieve higher scores for ethical sustainability than do modern fishing methods. A few key points arise regarding the traditional gears and methods, observations which are salient to the consideration of what might constitute a just policy for the BC salmon fishery.

Firstly, the gears are designed to be adaptive to local conditions rather than 'one size fits all'. Indeed, Barnett (1955) writes of the Coast Salish that they "...were familiar with the

techniques of their neighbours but, because of local geographical conditions or cultural inertia, found their own practices better adapted to their requirements" (p. 78-9). For instance, the Coast Salish employed a variety of fishing methods, including weirs and dams in shallow, narrow, moderate-flow streams, but also basketry traps, harpoons, and various types of nets, including dipnets (Duff, 1952; Barnett, 1955). Harpoons, dipnets, and gaffs could be used to collect fish at a weir or dam (Barnett, 1955), but the Stalo also harpooned chinooks "...in early spring when the water was low and clear" (Duff, 1952, p. 67).

Secondly, as was intimated above, these gears allowed a fair degree of selectivity. Those fish blocked by weirs, for instance, were then taken individually. While a large number of salmon could be trapped by a weir, the stakes or latticework components of the weirs could be dismantled to allow passage. Furthermore, any fish not taken could be freed unscathed and allowed to continue their upstream migration. (See Stewart, 1977.)

Finally, most traditional fishing activity was conducted in freshwater or tidal areas and rarely at sea. As such the methods were better able to cope with mixed stock fisheries, in which various species and stocks mingle.[11] This of course was complemented by the selectivity of the gears.

Another interesting trend which becomes apparent through the Rapfish analysis is that, while the 20th century fisheries are generally the least ethically sustainable, the most recent (1996) fisheries are not usually *the* worst. In fact, the 1900 and 1950 fisheries were found to be the worst. During the early 1900s the cannery fishery was still operating at peak, and while by 1950 the canneries had declined the industrial fishery persisted. By the first half of the 20th century, the stocks had already been heavily exploited and no meaningful conservation efforts had been made. Moreover, ecological impacts (such as the Hell's Gate rockslide and subsequent blockage of the Fraser River) were a rising concern. It was only in the second half of the century that significant efforts had been made to mitigate such ecological damage, for instance through habitat restoration.

Furthermore, in specific regard to Aboriginal salmon fisheries, it was in the second half of the 20th century that traditional fishing activities began to be recognised, and indeed it was towards the close of the century that these were enshrined through decisions such as *Sparrow* (1990) and policies such as the Aboriginal Fishing Strategy. The recognised right to fish is reflected in the improved status of the 1996 fisheries.

Finally, it is worth noting that, as with the assessments of Canadian marine fisheries presented and discussed in Chapter 3, there were few significant changes in rankings from the overall Ethical ordination to the sub-evaluations based on the justice typology. As in the previous set of evaluations, those fisheries which were assessed as either very sustainable or not very sustainable remained so in the justice-based evaluations. Only those fisheries which were not consistently good or consistently bad across all attributes, and hence achieved middling results in the overall assessment, presented variability of results with the sub-evaluations.

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[11] Pearse (1982) explains that, when stocks are mixed, less productive stocks may be compromised by fishing for those which are more plentiful; furthermore, "We have reason to believe that this happened with numerous small stocks as the commercial fishery developed throughout this century" (p. 13).

CHAPTER 5:

GOING BACK TO THE FUTURE: COMMUNITY PREFERENCES

5.1 Justice and the Back to the Future Approach

The five forms of justice first identified in *Just Fish* (Coward et al., 2000) and further developed in Chapter 1 include Creative, Distributive, Ecosystem, Restorative, and Productive Justice. A novel, interdisciplinary, collaborative approach, referred to as Back to the Future ('BTF'), encapsulates each of these five forms in varying degrees. As such, when offered the opportunity to participate in a project applying the BTF methodology, this researcher recognised the possibility of further exploring the justice typology from a unique vantage-point.

In brief, the Back to the Future approach is centred on a principle of recapturing lost abundance of marine ecosystems by setting a goal of rebuilding (Pitcher, 2001). The philosophy rests on a basic assumption that, generally, fisheries are being (or, in too many cases, have already been) depleted, and this crisis will only worsen with time unless a conscious decision is made to reverse the trend.

The approach further provides a framework for representing ecosystem structure and the impacts of various management possibilities in keeping with defined fisheries policies. Using the Ecopath suite of ecosystem modelling software as an analytic framework, BTF provides the means to develop an understanding of marine ecosystems, particularly changes of diversity and abundance within those ecosystems through time. In constructing snapshot models representative of times past, a conception of how a given ecosystem has changed: what species have vanished, or what species have become more plentiful, for instance. Such a glimpse of what had been may provide a useful shock, one sufficient to motivate an action towards rebuilding.

It is this goal of rebuilding which is key to the BTF approach. Moreover, BTF prompts the question:

> If through some miracle, stocks were not already depleted – how would we fish? The chances are that most people would be a lot happier with regulations aimed at sustaining fisheries in a world of abundance, than in a depleted ecosystem epitomized by shared misery (Pitcher, 2002, p. 4)

Once models have been constructed representing the composition of an ecosystem at various points in time, a discussion may follow regarding what is an appropriate and acceptable goal for the future. Thus the models provide not only a starting point for discussion, but also potential goals in that the software enables modelling of the impacts of various management options. Therefore, it becomes possible to select a suitable goal for ecosystem rebuilding.

Unique to the BTF approach, however, are the sources of data used to construct the models of ecosystems of the past. Conventional scientific sources are consulted, whether as literature or through discussions with scientists. However, non-conventional sources are also

sought out. Active and retired fishers, for instance, are typically extremely knowledgeable of changes within their fisheries over the course of their careers. Furthermore, in established fishing families, knowledge may be passed down through generations, thus providing insights into long-past fisheries. Aboriginal communities are particularly demonstrative of such multi-generational knowledge, both through fishing activity and through oral traditions. Archaeological or historical records also provide information on past fisheries.

These sources may be consulted individually or as groups. That is, in the Hecate Strait example to be discussed below, scientists were brought together in a workshop format. This enabled discussion between individuals who were experts in their own specific fields, and allowed for compromise decisions on realistic levels of abundance of interdependent species, for example. Others were interviewed, usually individually but on one occasion as a group. This permitted in-depth discussion with the interviewees in a semi-structured interview format, thus recognising the local and often holistic detailed knowledge of fishers active in multi-species fisheries.

It is important to note that the various sources complement one another. Scientific knowledge and the traditional or local ecological knowledge ('T/LEK') of fishers provide observations at different scales. Scientific knowledge tends to be of a broad geographic perspective, while T/LEK is typically more localised and highly detailed within that local area. As well, as already described, T/LEK may span generations; in the case of some historically-significant species, written scientific knowledge may exist for decades or even centuries but in the case of newly-established fisheries, the scientific canon may be inadequate or even lacking. Certainly, historical and archaeological sources may provide useful information for fisheries of the past. In consulting this wide variety of sources, a more complete, holistic understanding of a given fisheries ecosystem may be developed

Furthermore, this approach permits the creation of ecosystem models at various time periods. By incorporating historical knowledge, it becomes possible to develop snapshots of the fisheries ecosystem at desired points in time through separate Ecopath models for each time period. This capacity is at the centre of BTF; reasonable models of the same fisheries ecosystem at different time periods provide demonstrable, quantitative evidence of changes to the fisheries ecosystem. This is particularly important as an indicator of lost richness within an ecosystem, in terms of both species diversity and abundance. Pauly (1995) has referred to the shifting baseline syndrome, wherein one's understanding at the start of a research career (in the case of a research scientist, for example) of the state of an ecosystem is effectively believed to be the original state of that ecosystem. Another example would be the size of a fish; a cod which is now considered large may in fact have once been deemed middling (see for instance Kurlansky, 1997). A discernable reminder of 'what used to be' may be a necessary condition to encourage rebuilding.

This approach thus puts into action the forms of justice. The overall goal of the approach is to provide an insight to lost richness, and hence provide goals for rebuilding. This typifies restorative justice. The Ecopath modelling software accounts for interactions within the fisheries ecosystem, and data used to construct the models includes that shared through those people dependent upon the ecosystem; hence, ecosystem justice. The sharing of knowledge is a prime example of creative justice. And following upon an understanding of the ecosystem and how it may be restored, questions of distributive and productive justice may be addressed. (See, for example, Haggan, 2000.)

The BTF approach is relatively novel. The pilot project involved reconstructions of past and present ecosystems in British Columbia's Strait of Georgia (Pauly et al., 1998). Other work has been conducted in Hong Kong (Buchary et al., 2000) and the English Channel (Stanford,

2002), for example. The project to be described below, and for which the community choice exercise was developed and conducted, is ongoing in the Hecate Strait region of British Columbia. This modelling component of this work (Ainsworth et al., 2002) builds upon an earlier effort (Haggan and Beattie, 1999), and is paralleled by similar efforts in Newfoundland (Pitcher et al., 2002a).

Back to the Future in the Hecate Strait

Restorative Justice, one of the five forms of justice, endeavours to return fishery ecosystems to previous levels of abundance or richness. The Back to the Future ('BTF') project at the Fisheries Centre is strongly representative of Restorative Justice, while also containing elements of the other four forms of justice (see Haggan, 2000.) Using the Ecopath suite of ecosystem modelling software, the BTF team's modellers are able to construct models of a given marine ecosystem in specific time periods. These models are developed using both conventional scientific sources and traditional/local ecological knowledge ('T/LEK'), thus also incorporating Creative Justice to a significant degree. With an aim of recapturing lost abundance, Productive Justice may be served in the future, as could Distributive Justice with a healthier, richer, resource to share. Furthermore, for Restorative Justice to succeed, issues of Ecosystem Justice must also be addressed.

As a component of the bi-coastal Canadian Coasts Under Stress project, the Fisheries Centre has been conducting BTF work in the Hecate Strait region of British Columbia and Newfoundland. The Hecate Strait work is pertinent to the research described herein, as it allows for application and consideration of the five forms of justice as well as opportunities for participatory research with members of the fishing communities of the region. Additionally, the significance of Pacific salmon to the region, both commercially and for First Nations societies, provides an additional degree of relevance.

The Hecate Strait study seeks to develop Ecopath ecosystem models of four separate and broadly defined time periods: 1750 (prior to European contact with First Nations), 1900, 1950, and 2000 (Ainsworth et al., 2002). These models, which continue to be refined, were developed using a variety of sources. In September, 2000, a science workshop was conducted at the University of British Columbia (Pitcher et al., 2002c), during which university and government scientists provided conventional scientific data to improve upon an earlier present-day model of the ecosystem (Haggan and Beattie, 1999). In July, 2001, the BTF group travelled to Prince Rupert, British Columbia, to conduct interviews with fishers, Aboriginals, and others with local or traditional knowledge of the local ecosystem; these data were used to cross-validate the models and to track changes over time. Finally, in December, 2001, the interim models as well as a number of simulations indicating the possible impacts of fishing were presented to the community in Prince Rupert (Pitcher et al., 2002b).

Among the activities conducted at the December, 2001, workshop was a paired comparison study intended to gauge community preferences regarding both the restoration goal which ought to be pursued and the fishing pressures (as represented by fishing fleets) to which the restored ecosystem ought to be subjected. The results of this study are presented in the following section.

5.2 A Community Choice Exercise

The BTF approach provides insights into the structure fisheries ecosystems may be able to take, given certain circumstances, including a human willingness to alter fishing and other demands on those ecosystems. As the Hecate Strait BTF project considers four different time periods which could serve as goals or benchmarks for rebuilding the fisheries ecosystem, and in keeping with the principles of creative justice, those who would be impacted (and served) by the rebuilding efforts ought to be provided with the opportunity to select the most preferred goal.

The Fisheries Centre's BTF group conducted a community workshop in Prince Rupert, British Columbia, in December 2001, during which Ecopath ecosystem models for each of the four time periods were presented to the community. Two Ecosim simulations of the multispecies fisheries were prepared for each time period (for a total of eight simulations) in advance of the meeting and also presented to the community. One Ecosim simulation was entitled "Today's Fleet", which as expected simulated fishing pressure with a fleet as it presently exists; the other was entitled "Team's Choice", comprised of the present fleet but without gillnets or draggers.

Thus, the community was presented with four potential ecosystems and two potential fleet structures, for a total of eight possible combinations. To elicit preferences between these eight possible options, a paired comparison survey similar in design and structure to and following the same methodology as that already described in Chapter 2 was developed and conducted during the course of the workshop. (A full description of this initial study is described by Power (2002a).) Table 20 lists the ecosystem and fleet combinations used in this paired comparison study.

Table 20: Scenario combinations, Hecate Strait Paired Comparison

Scenario Number	Fleet	Ecosystem
1	Today's Fleet	2000
2	Team's Choice	2000
3	Today's Fleet	1950
4	Team's Choice	1950
5	Today's Fleet	1900
6	Team's Choice	1900
7	Today's Fleet	1750
8	Team's Choice	1750

(adapted from Power, 2002a)

The study was initially limited to community participants in the December 2001 workshop. However, a very low participation rate (15 surveys, of which two could not be used because the respondents had not made a choice in each pair (Power, 2002a)) led to the decision to conduct a second round involving those Fisheries Centre members who had also participated in the workshop. It was believed crucial that only those who had participated in the workshop be asked to participate in the survey so that all respondents would have an equal minimum knowledge of the models, and discussions and events occurring during the course of the workshop from which to form their judgements. Ten individuals from the Fisheries Centre participated in the workshop; of those ten, eight completed the study (one having elected to not

participate, the other being the researcher conducting the study). However, due to the low number of participants in each of the two sub-groups, it is not possible to treat each as separate samples (R. Chuenpagdee, pers. com.), and as such the results presented here are preliminary. A descriptive discussion regarding these preliminary results follows below. Table 21 details the respondent groups, as well as the number and percentage of perfect responses within each group.

Table 21: Respondent and Response Data, Hecate Strait Paired Comparison

	Number of Respondents	Number of Perfect Responses	Percentage of Perfect Responses
Combined	21	4	19%
Community	13	1	8%
Fisheries Centre	8	3	38%

It is interesting to note that the number of perfect responses is extremely low for the community group, and very high for the Fisheries Centre group. Chuenpagdee (1998) explains that intransitivity is not uncommon, "...especially when the choices are multidimensional..." as they were in this particular study. There are several possible explanations for the disparity. Firstly, to Fisheries Centre respondents these choices were purely academic and theoretical; to the community members, the choices represented potential impacts on their livelihood and thus were more 'real'. As such, Fisheries Centre respondents were potentially less likely to be biased towards a given option than community respondents who would have a sense of how they, individually and as a community, could be affected (whether positively or negatively) by the outcome. This sense of 'theoretical' or 'actual' outcomes may account for the noticeable variation in responses.

It is also likely that the Fisheries Centre team members were simply more familiar with both the models/simulations under consideration and also with the paired comparison methodology, having had previous exposure to such survey methods. In preparing for the workshop, team members had already become familiar with the models and simulations, whereas the models were presented to community members just hours before the administration of the survey. The workshop was short in duration and therefore the presentation of methodologies, data, and results was intense; it is likely that workshop participants were not provided with adequate time to assimilate all of this information before being asked to complete the survey questionnaire.

Furthermore, as was discussed earlier, the decision to include respondents from the BTF team was made a few months following the workshop. The models introduced at the Prince Rupert workshop were interim, and as such presented irregularities and errors. It was upon these interim models that the questionnaire was based. By the time BTF team members participated in the survey, the models had evolved and improved, but for consistency and comparability with the original set of respondents, the questionnaires were not altered to account for the changes. Indeed, one Fisheries Centre respondent noted in the survey booklet that knowledge of such inconsistencies influenced the judgements made. It is therefore possible that an awareness of the problems with the ecosystem models could have influenced the judgements made by other Fisheries Centre respondents at least.

During the administration of the survey it became apparent that a number of community members were somewhat confused by the options; this confusion was confirmed in the comments written by some respondents in the actual survey booklets (see Power, 2002a). The supplementary materials provided to help explain the impacts of each ecosystem/fleet combination on a number of species were simultaneously overly complicated (too much general information) and overly simplified (not sufficiently detailed), while not providing information which would be of most importance to the community, such as the impact on jobs. Unfortunately, in the extremely limited time available following the completion of the Ecopath models, the indicators provided were the best available; should similar surveys be conducted in the future, it is essential that sufficient time be made available to ensure that the model outputs can be reworked into something less abstract and more obviously meaningful to the community and other interested (but not necessarily model-literate) individuals. Questions were also raised about the validity of catch and value figures for species such as eulachon, for which there is no commercial fishery (Power, 2002a).

With such evident lack of clarity, it is possible that respondents randomly selected one scenario from each pair, rather than making a considered judgement; indeed, of the community respondents, one individual selected the "B" choice only four times out of a possible 28 pairs (Power, 2002a).

Additionally, a controversy erupted during the workshop over the use of the phrase "Team's Choice" to indicate the second fleet simulation. In brief, the simulations upon which the choices were based included two fleet structures in addition to the four ecosystem time periods. One of the fleet structures was based on the current, actual fishing fleet in the area and was labelled "Today's Fleet"; the second excluded all gillnet and dragger gears. The controversy arose because the constructed fleet, that which excluded the gillnet and dragger gears, was labelled as "Team's Choice". This choice of words telegraphed to community members the inadvertent and incorrect impression that the UBC Fisheries Centre was indiscriminately biased against these gear sectors and had predetermined the recommendations for the future fishery. Although not the case, the poor choice of label led many community members to believe that not only was the outcome of the workshop foreordained, but that the Fisheries Centre was out to somehow shut down these sectors entirely and as soon as possible. Some respondents indicated a high degree of concern over making any selection that could potentially lead to a wholesale closure of the gillnet and dragger sectors. This hesitation to ever select the "Team's Choice" ecosystem may have impacted on the overall outcome of the survey. (See also Power, 2002a; Power, 2002b.)

It would therefore appear that the primary factors contributing to the disparity in responses between the two respondent groups involve the design of the specific survey questionnaires. The paired comparison survey reported in Chapter 2 was highly successful. The structure and approach of this survey was based on the earlier survey. In fact, a number of respondents were common to both surveys, and as such some community respondents were already familiar with the approach. Yet, the specific presentation proved problematic. The lack of clear and meaningful differences between the paired choices impeded decision-making by respondents, for example.

The choices were designed based on the outcome of the Ecopath models and economic valuation assessments. As such, the survey was dependent upon all preceding steps of workshop preparation, and could not be produced until all other work by other team members had been completed. Therefore, due to delays in finalising earlier components of the project, insufficient time remained to thoroughly test the survey materials. Testing had been planned, but time did

not allow; had this constraint not arisen, limitations of the survey materials may have been discovered in advance and the materials redesigned as needed. (See Power, 2002a.)

A summary of the rankings (by the two sub-groups and overall) is presented in Table 22. Also provided in brackets is the scaled result for each scenario for the respondent groupings.

Table 22: Rank summary of Prince Rupert paired comparison results

	2000		1950		1900		1750	
	Today's Fleet	Team's Choice	Today's Fleet	Team's Choice	Today's Fleet	Team's Choice	Today's Fleet	Team's Choice
Combined Rank	7 (31)[1]	8 (28)	5 (43)	3 (48)	6 (42)	4 (47)	2 (54)	1 (57)
Community Rank	5 (40)	8 (38)	1 (51)	3 (47)	5 (40)	7 (38)	2 (48)	3 (47)
Fisheries Centre Rank	7 (16)	8 (13)	6 (30)	4 (48)	5 (45)	3 (61)	2 (64)	1 (73)

Note:

1. Figures in brackets indicate scaled result (normalised 0-100).

Given the controversy arising from the use of the phrase "Team's Choice", and the impact this appears to have had on the community response, and furthermore the awareness of weaknesses in the model of Fisheries Centre respondents, it would be wise to focus primarily upon the ecosystem preference rather than the fleet preference. Note that the overall result indicates a preference for the 1750 model, a relatively untouched ecosystem, while the least preferred was the present day. This result is indicative of an awareness of how much abundance and diversity has been lost with time, and a desire to recapture this lost ecosystem richness. However, throughout the workshop, participants were asked to focus on preferences, not on the measures that would need to be taken to achieve those potential goals. At this relatively early stage in the project, participants have not yet had to consider what tough decisions would need to be made to achieve the goal. As such, while the combined respondent groups preferred the earliest ecosystem to that which currently exists, when the time comes to begin to make those tough decisions, the shared dream of reclaiming the lost richness may be tempered by the reality of the personal impacts to be had from the necessary.

Thus, it can be concluded that the results of this paired comparison study would require a follow-up study to be finalised, a study using the final versions of the Ecopath models, with more meaningful indicators of variations between the scenarios under consideration, and with an increased correspondent pool overall and within each sub-group as possible. Furthermore, sufficient time would need to be made available to ensure that the survey materials were properly tested so as to overcome design-related issues. It would also be instructive and interesting to include in the survey scenarios fleet structures suggested by the community members. Finally, as the project progresses, it will become necessary to address *how* the ecosystem rebuilding goals will be achieved; it will be most interesting to see how this would affect participants' preferences.

CHAPTER 6:

PUBLIC POLICY, ETHICS, AND BRITISH COLUMBIA'S COMMERCIAL SALMON FISHERIES

"Grub first, then ethics."

- Bertolt Brecht

6.1 Applying the Lessons Learned: A Case Study

In the preceding chapters, the principles of environmental ethics have been explored and established as a framework for assessing and guiding fisheries policy. These principles subsequently have been restated within and applied to the Rapfish method of rapid appraisal of fisheries, and evaluated and ranked through a public survey. In keeping with the principles of Creative Justice, an additional participatory study was undertaken to investigate preferences for rebuilding the lost richness of a specific marine ecosystem. Finally, a number of fisheries were evaluated using the Rapfish ethical criteria.

It is now appropriate to present as a case study the commercial fishery for Pacific salmon in British Columbia, such that recommendations for just fisheries policy may be considered. Firstly, the results of the Rapfish assessment will be presented and considered. Then, to conclude, appropriate policy measures for this fishery will be explored, with particular attention to the five Justices.

6.2 The Commercial Fishery for Pacific Salmon in British Columbia

The Rapfish assessment of Canadian marine fisheries, described in Chapter 3, included a total of 62 fisheries. However, for clarity, the 24 commercial fisheries for Pacific salmon included in the dataset were collapsed into three gear-based groups for the discussion in Chapter 3. As discussed in 3.2, 18 of these fisheries consisted of each of the three gear types (gillnet, seine, and troll) in combination with each of the five species of Pacific salmon, plus one aggregate fishery in recognition of the multispecies nature of the commercial salmon fishery. These 18 fisheries were included in the analysis published by Pitcher and Power (2000).

The original 18 were supplemented with six additional gillnet fisheries, based upon information shared during interviews conducted under the aegis of the Fisheries Centre's Back to the Future project in the Hecate Strait, as described in Chapter 5. These salmon fisheries are all prosecuted in northern areas of coastal British Columbia. The supplementary dataset did not include trollers or seiners due to the strong participation of gillnetters (as a result of the "Team's Choice controversy": see Chapter 5, and Power (2002b)) in the project's activities. On the graphs which follow, these six fisheries are easily distinguished from the original 18 by a unique pattern of labelling. Whereas the original 18 were coded by a simple pattern (species+gear), these six are identified as area+gear; of course in this case the gear is always gillnet, or 'Gil'.

Three of the six refer to salmon fisheries on the Skeena River, and thus they are additionally numbered from one to three; the abbreviation therefore takes the form of 'SknaGil1' and so on.

It should also be noted that, in the main, the data for the original 18 salmon fisheries were culled from published references, although with some information from fishers. By comparison, the data for the supplemental six were based solely upon information shared by fishers during interviews. These fisheries are thus further identified on Figure 68 (two-dimensional Rapfish plot, Overall Ethical ordination) as "BC Salmon T/LEK", in recognition of the nature of the data as Traditional or Local Ecological Knowledge. (Note that Figure 69 presents the results in a one-dimensional plot; gillnet fisheries are shown on the left side of the axis, trolls and seines on the right.)

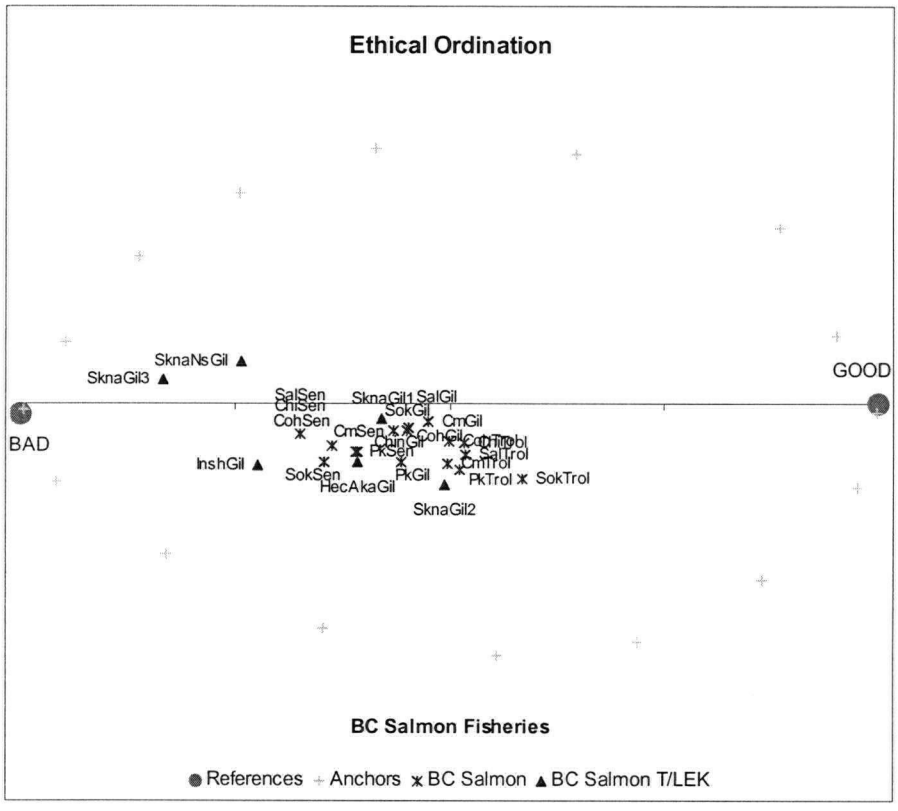

Figure 68: Results, overall Rapfish Ethical ordination, BC commercial salmon fisheries

The complete list of Pacific salmon fisheries is included in Appendix 2a, along with all fisheries included in the assessment of Canadian marine fisheries.

British Columbia salmon fisheries were included in the assessments described in Chapter 3, sections 3.2 through 3.4. What follows, then, is a detailed look at the salmon component of the dataset of Canadian marine fisheries. These are not unique assessments, but rather a subset of results from those assessments already described. As the evaluations considered in Chapter 3 described the average status of the salmon fisheries when grouped by gear type, this examination will focus on the results of the salmon fisheries relative to one another.

Not surprisingly, these six T/LEK fisheries demonstrate greater variability than the original salmon fisheries. In the original dataset, great pains were taken to differentiate between fisheries which were often not clearly delineated in the literature by both species and gear type; the fishers who shared knowledge of their fisheries were able to attest to the subtleties of those fisheries and thus the data reflect the improved discrimination amongst those characteristics. It is also interesting to note that the T/LEK salmon fisheries generally ordinated worse than those included in the original dataset. As described above, three of the four worst fisheries were T/LEK gillnet fisheries: the Northern BC Inshore Gillnet ('InshGil'), the Skeena/Nass Gillnet ('SknaNsGil'), and Skeena Gillnet #3 ('SknaGil3'). While scoring somewhat higher, both Skeena Gillnet #1 ('SknaGil1') and the Hecate/Alaska Gillnet ('HecAkaGil') scored below the overall average score of all fisheries included in the ordination, at 41.9% and 39.2%

respectively. In fact, five of the six T/LEK salmon fisheries presented worse results than all the salmon gillnet fisheries included in the original dataset; only Skeena Gillnet #2 ('SknaGil2') scored better, ordinating at an above-average 49.4%.

The average ethical sustainability score for the BC salmon fisheries was just 41.5%, considerably lower than the overall average for all fisheries included in the evaluation (44.6%). The average for the original 18 salmon fisheries is 44.2%, while the average for the supplementary T/LEK gillnet fisheries is just 33.5%. These somewhat unexpected results may be attributed to two considerations: firstly, the T/LEK data better differentiated between fisheries and accounted for subtle variations in the fisheries; these subtleties would be well-captured and accounted for by the MDS routine. Secondly, the scores obtained through the literature and consultation with formal experts may have been overly optimistic in comparison.

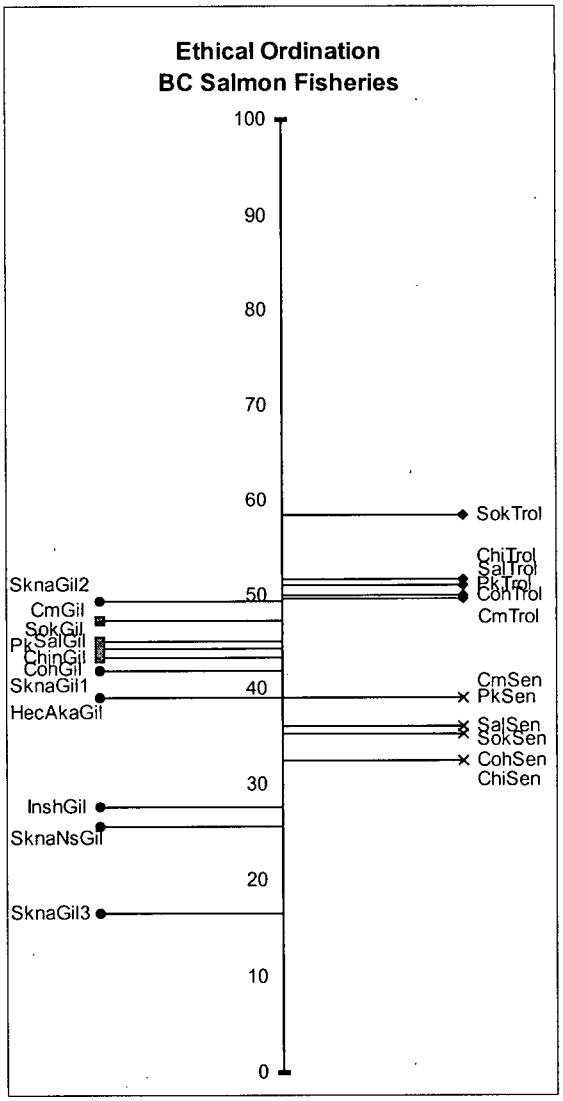

Figure 69: Results, overall Rapfish Ethical ordination, BC commercial salmon fisheries

Note: Gillnet salmon fisheries are shown on left side of the axis, troll and seine fisheries on the right.

The sockeye troll fishery is relatively high-scoring, with a score of 58.4%. As described in Chapter 1, the troll fleet is operated by small boats (8-18 m), crewed by up to five people, and selectively harvests high-quality fish in sea-run condition (Gislason et al., 1996b). At the other end of the scale, one Skeena gillnet fishery #3 ('SknaGil3') scores worst of all, with an ethical sustainability score of just 16.6%. The scores for this fishery were obtained through an interview with a fisher based in northern British Columbia, as described in Chapter 3. Interestingly, three of the five fisheries with the worst Rapfish results for ethical sustainability are gillnet fisheries for Pacific salmon; aside from SknaGil3, the Skeena/Nass Gillnet fishery ('SknaNsGil') and the Inshore Gillnet fishery ('InshGil') also ordinate amongst the worst fisheries with scores of 25.7% and 27.7% respectively. The data for all three of these salmon gillnet fisheries were obtained through interviews in northern British Columbia, in which respondents were asked for information directly pertaining to their participation in a fishery; as will become increasingly apparent below, these 'T/LEK' gillnet fisheries show results quite different from the gillnet fisheries included in the initial assessment by Pitcher and Power (2000).

The 24 salmon fisheries were also included in the sub-evaluations by the five forms of Justice, as described in 3.4. The results of the Pacific salmon fisheries for these assessments are shown in one-dimensional form in Figure 70 (Creative Justice), Figure 71 (Distributive Justice), Figure 72 (Ecosystem Justice), Figure 73 (Productive Justice), and Figure 74 (Restorative

Justice). For the one-dimensional graphs, the gillnet fisheries (the six original plus the six supplementary fisheries) are arrayed on the left side of the axis, while the trollers and seiners (six each) are shown on the right. All results for the overall Ethical ordination and the five sub-evaluations are presented in Table 23.

Table 23: Relative rank and scores for Rapfish assessments (Ethical and Five Justices), British Columbia commercial salmon fisheries

Overall Ordination		**Creative Justice**[1]		**Distributive Justice**		**Ecosystem Justice**		**Productive Justice**		**Restorative Justice**	
Relative Rank	*%*	*Relative Rank*	*%*	*Relative Rank*	*%*	*Relative Rank*	*%*	*Relative Rank*	*%*	*Relative Rank*	*%*
SokTrol	58.4	SknaNsGil	58.3	SokTrol	59.1	SokTrol	62.1	SokTrol	71.7	SknaGil2	65.7
SalTrol	51.7	SokTrol	54.2	ChiTrol	53.4	SknaGil2	53.2	SknaGil2	69.5	SokTrol	65.1
ChiTrol	51.6	ChiTrol	48.6	CohTrol	53.4	ChiTrol	50.6	PkTrol	62.5	PkTrol	58.3
PkTrol	51.1	CohTrol	48.6	SalTrol	52.4	SalTrol	50.5	SalTrol	61.3	SalTrol	57.0
CohTrol	49.9	SalTrol	43.1	CmTrol	49.8	PkTrol	49.6	CmTrol	59.0	CmTrol	55.3
CmTrol	49.6	CmGil	38.9	PkTrol	49.8	CohTrol	48.4	ChiTrol	59.0	ChiTrol	55.3
SknaGil2	49.4	SokGil	38.9	SokGil	47.6	CmTrol	47.8	CohTrol	56.7	CohTrol	52.7
CmGil	47.3	CmTrol	31.9	CmGil	46.0	CmGil	46.6	PkGil	51.6	PkGil	50.1
SokGil	45.1	PkTrol	31.9	SalGil	45.0	HecAkaGil	44.8	CmGil	51.6	CmGil	50.1
SalGil	45.0	SalGil	30.0	ChinGil	44.2	SokGil	44.2	SalGil	49.6	SknaGil1	49.1
PkGil	44.3	ChinGil	27.8	CohGil	44.2	SknaGil1	43.5	SokGil	49.6	SalGil	47.8
ChinGil	43.3	CohGil	27.8	SknaNsGil	42.1	SalGil	43.4	SknaGil1	48.9	PkSen	47.8
CohGil	43.3	SknaGil3	27.8	SknaGil2	41.3	PkGil	42.0	HecAkaGil	48.7	CmSen	47.7
SknaGil1	41.9	SknaGil1	22.2	SokSen	40.7	ChinGil	41.0	PkSen	48.3	SokGil	47.1
HecAkaGil	39.2	SknaGil2	22.2	PkGil	40.0	CohGil	40.9	CmSen	48.3	CohGil	45.8
CmSen	39.1	InshGil	19.4	CmSen	38.6	CmSen	36.3	CohGil	47.7	ChinGil	45.8
PkSen	39.1	HecAkaGil	19.4	PkSen	38.5	PkSen	36.3	ChinGil	47.7	HecAkaGil	45.4
SalSen	36.2	PkGil	16.7	SalSen	38.0	SalSen	32.2	SokSen	45.4	SalSen	44.7
SokSen	35.3	SalSen	9.7	SknaGil1	37.3	SokSen	31.6	SalSen	45.1	SokSen	44.2
ChiSen	32.5	ChiSen	9.7	ChiSen	34.9	InshGil	27.6	CohSen	40.7	CohSen	40.9
CohSen	32.5	CmSen	9.7	CohSen	34.9	ChiSen	26.6	ChiSen	40.7	ChiSen	40.9
InshGil	27.7	CohSen	9.7	HecAkaGil	31.4	CohSen	26.5	InshGil	37.5	InshGil	31.3
SknaNsGil	25.7	PkSen	9.7	InshGil	26.1	SknaNsGil	20.7	SknaNsGil	24.5	SknaNsGil	20.0
SknaGil3	16.6	SokSen	9.7	SknaGil3	14.0	SknaGil3	18.0	SknaGil3	15.1	SknaGil3	11.8

Note:

1. Creative Justice values obtained through scaling and averaging of Rapfish scores, rather than full Rapfish assessment.

As was described in Chapter 3, the Creative Justice evaluation proved problematic. Here again the proxy method of scaling and averaging the attribute scores was employed. While this does permit a comparison amongst most fisheries, all the seine fisheries obtain the same result in the Creative Justice assessment. With just three attributes for consideration (Adjacency and Reliance, Equity in Entry, and Just Management), there was simply not sufficient opportunity to differentiate between these six seine fisheries; as it happened, all six received the same attribute score for each of the three attributes. However, there was sufficient variability in the data for the other sectors, and these present more interesting results.

What becomes most immediately apparent is that the gillnets show a degree of variability, particularly the six supplementary T/LEK gillnet fisheries. Within the Creative Justice evaluation, the coefficient of variance ('CoV') for the T/LEK gillnets was 54%, compared with 27% for the other six gillnet fisheries, and 40% for the trolls. (As noted above, all the seine fisheries presented the same result.) The best fishery in this assessment, with a

sustainability score of 58.3%, was a T/LEK gillnet fishery, conducted in the Skeena and Nass Rivers ('SknaNsGil'). Yet, the remaining T/LEK gillnet fisheries scored lower than all troll fisheries and all original gillnet fisheries save for the pink gillnet, which, other than the seine fisheries, returned the worst score (16.7%). The troll fisheries show a range of results, with a maximum score of 54.2% (the troll for sockeye) and a minimum of 31.9% (the pink troll). Note that for the original gillnets and the troll sector, the fishery for sockeye salmon scores best, and pink the worst.

In the assessment for Distributive Justice, the troll fishery for sockeye salmon obtains the best score, 59.1%. Indeed, all six troll fisheries obtain scores better than any fishery from any other sector or grouping, with an average score of 52.8%; the worst troll score was obtained by the chum and pink fisheries (tied at 49.8%), while the next-highest score was obtained by the sockeye gillnet (47.6%). The differentiation between the seine fisheries (average score of 37.8%) was somewhat improved over the Creative Justice assessment: sockeye fared best of the seine fisheries (40.7%); the chum, at 38.6%, was just slightly ahead of the pink (38.5%) and the multispecies (38.0%) seines; and the chinook and coho seines tied at 34.9%.

Again, the gillnet fisheries were quite variable, especially within the T/LEK fisheries and in comparison between the two groups of gillnet fisheries. All 12 gillnet fisheries had an average score of 38.2%, but while the original gillnetters averaged 44.5% (6% CoV), the T/LEK gillnetters averaged 31.8% (33% CoV), an average below that of the seiners. The T/LEK gillnetters also produced a range of sustainability scores, with a minimum score of 14.0% (Skeena Gillnet #3, 'SknaGil3') and a maximum score of 42.1% (Skeena/Nass Gillnet, 'SknaNsGil'). Thus, as can be seen in Figure 71, the two best-scoring T/LEK gillnetters score better than one of the original gillnetters (for pink salmon), and better than all of the seiners. By comparison, the three worst T/LEK gillnetters score worse than all other salmon fisheries, yet even then over a range of scores.

With the remaining Justice-based sub-evaluations, the developing pattern becomes more pronounced. In all three, the top-scoring Pacific salmon fisheries are the troll fishery for sockeye and the Skeena gillnet fishery #2 ('SknaGil2'); the sockeye troll is first in Ecosystem and Productive Justice, while SknaGil2 is best in the Restorative Justice evaluation. In each of the three assessments, the worst fishery is again (as in the Distributive Justice evaluation), Skeena gillnet fishery #3 ('SknaGil3'), and the second-worst is the Skeena/Nass gillnet ('SknaNsGil'). In all cases, the troll fisheries are the best, and, in the three remaining evaluations, only SknaGil2 approaches the status achieved by the troll fisheries.

Any general variability, then, is between the seiners and the gillnetters, as well as between the original gillnetters and the T/LEK gillnetters. In all six evaluations, the original six gillnetters produce better sustainability results than the six T/LEK gillnetters. For example, in the Overall Ethical ordination, the original gillnetters score an average of 44.5%, while the T/LEK gillnetters averaged 33.5%. Furthermore, in all evaluations, the original gillnetters produce better results, on average, than the seines. It is therefore the T/LEK gillnetters which most influence the relative results, for the possible reasons already described.

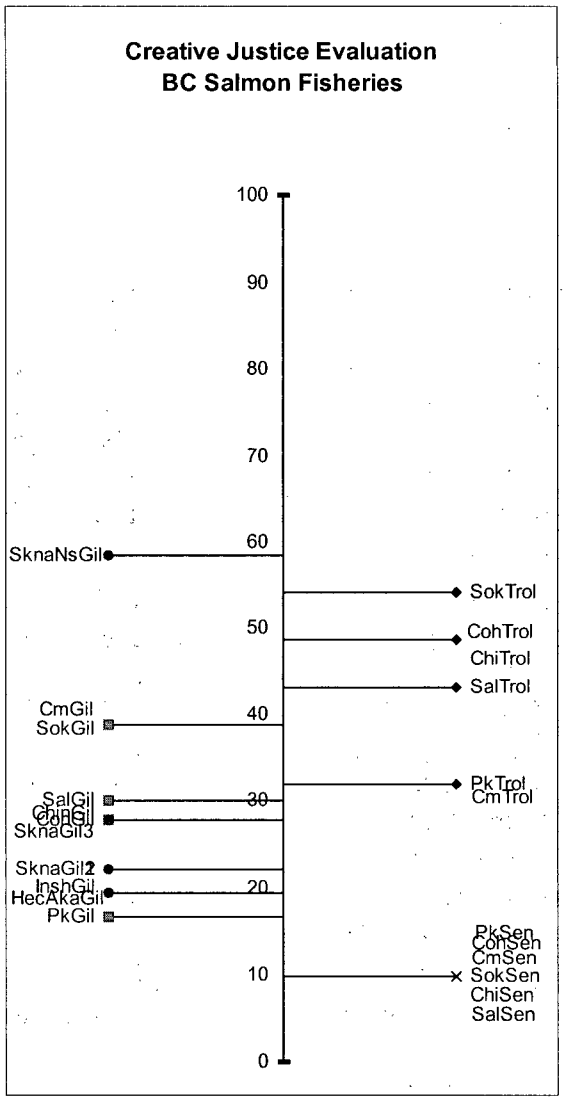

Figure 70: Results, Creative Justice evaluation, BC commercial salmon fisheries

Note: Gillnet fisheries are shown on left side of the axis, seine and troll fisheries on the right.

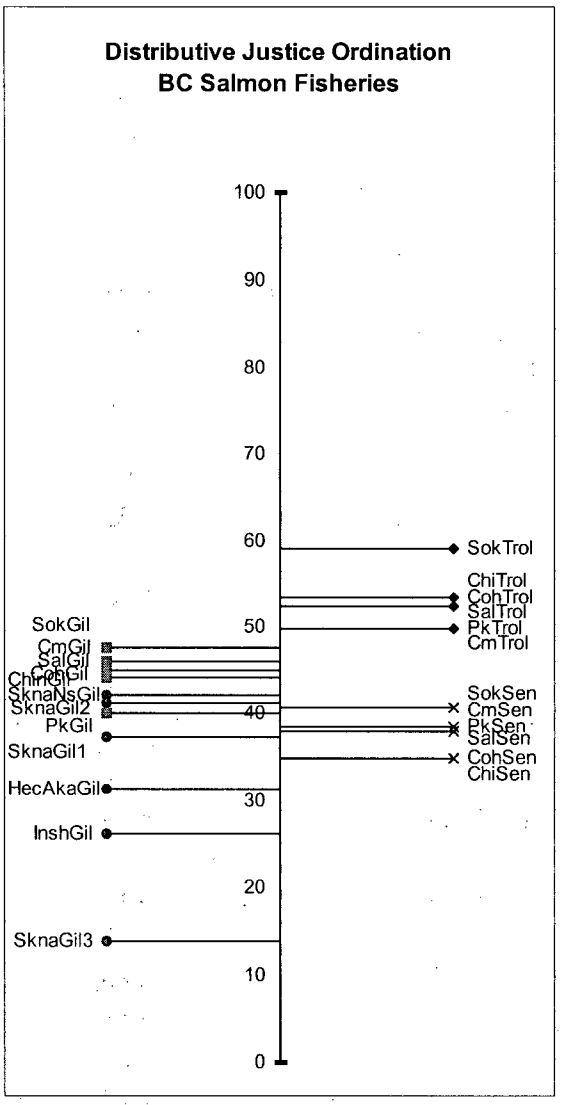

Figure 71: Results, Distributive Justice evaluation, BC commercial salmon fisheries

Note: Gillnet fisheries are shown on left side of the axis, seine and troll fisheries on the right.

In the Ecosystem Justice ordination, the 12 gillnetters produce an average sustainability result of 38.8%, in comparison with an average seine score of 31.6%, while in the Restorative Justice ordination, the seiners rank slightly higher (44.4%) than the gillnetters (42.5%). However, the two sectors are virtually tied in the Productive Justice ordination, with the gillnetters slightly ahead of the seines, scoring 45.2% and 44.8%, respectively. As with the evaluations discussed in Chapter 3, the addition of one more attribute (Alternatives) from Productive Justice to Restorative Justice is sufficient to tip the balance in favour of the seiners, indicating that the availability of other forms of work in the areas in which seiners operate is greater than in those areas favoured by gillnetters.

In all evaluations, the troll fisheries produce better sustainability results, although in the sub-evaluations for Creative and Restorative Justice a T/LEK salmon gillnet fishery (SknaNsGil and SknaGil2, respectively) obtained the top salmon score. Furthermore, in all instances but the

Creative Justice evaluation, six of the top six or seven positions are occupied by troll fisheries; in the case of the Creative Justice assessment, the chum and sockeye gillnets receive better scores than the chum and pink trolls, while in the overall ethical ordination and the assessment for Distributive Justice, the top six fisheries are all troll fisheries.

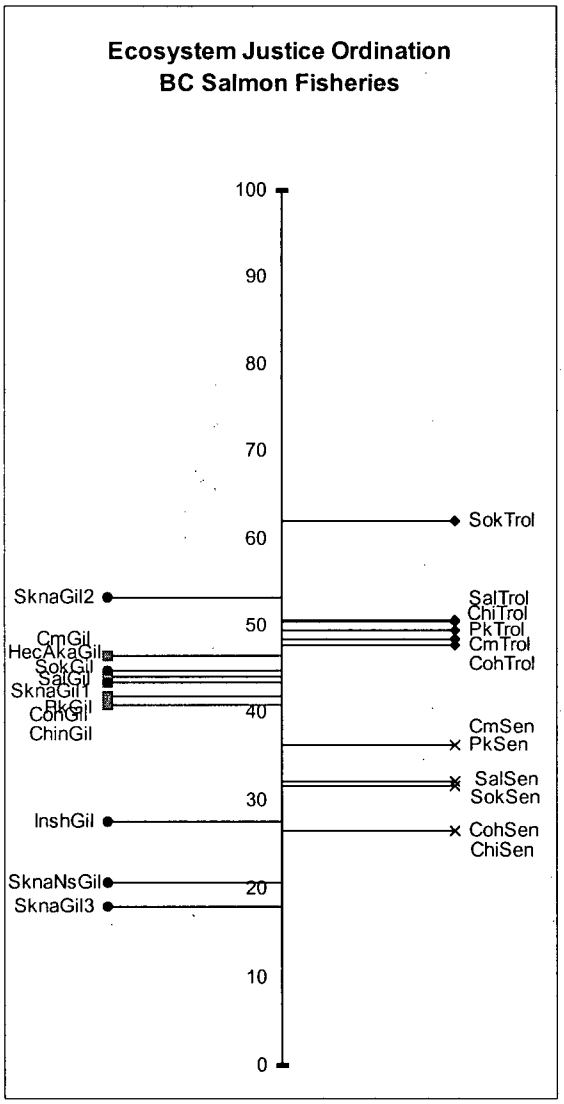

Figure 72: Results, Ecosystem Justice evaluation, BC commercial salmon fisheries

Note: Gillnet fisheries are shown on left side of the axis, seine and troll fisheries on the right.

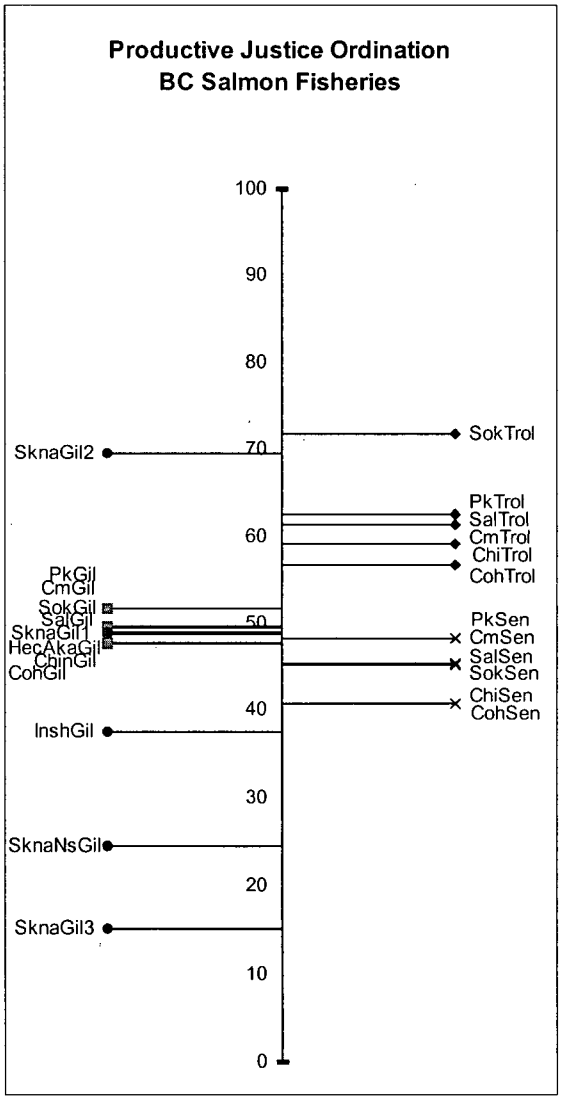

Figure 73: Results, Productive Justice evaluation, BC commercial salmon fisheries

Note: Gillnet fisheries are shown on left side of the axis, seine and troll fisheries on the right.

There is slightly more overlap between the six original gillnets and the seines in terms of relative rankings. In the overall Ethical ordination, as well as the sub-evaluations for Creative and Ecosystem Justice, all six original gillnet fisheries rank higher than the six seine fisheries. In the Distributive Justice ordination, the highest ranking seine (sockeye) is slightly better than the lowest-ranking gillnet (pink). The best seine results in Productive Justice (pink and chum) are just slightly better than the worst results for gillnetters (coho and chinook), while for Restorative Justice again the pink and chum fisheries present the top seine results, but this time best the results presented by three gillnet fisheries (sockeye, coho, and chinook).

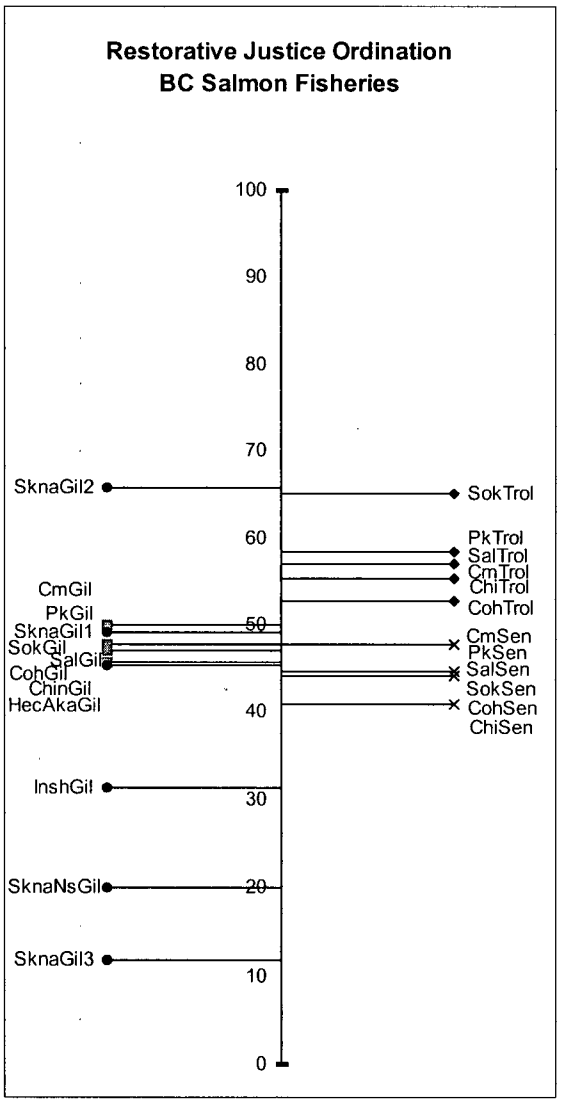

Figure 74: Results, Restorative Justice evaluation, BC commercial salmon fisheries

Note: Gillnet fisheries are shown on left side of the axis, seine and troll fisheries on the right.

As has been discussed above, the results of the six T/LEK gillnet fisheries are highly variable (45.5% CoV across the 5 justice-based evaluations, in comparison with 18.6% for the original gillnetters, 15.6% for the trolls, and 39.4% for the seiners), and demonstrate little pattern. The most notable T/LEK gillnet results include the Skeena/Nass gillnet fishery, which ranks amongst the worst fisheries in the overall Ethical ordination, as well as the sub-evaluations for Ecosystem, Productive, and Restorative Justice. Yet this fishery obtains the best salmon score in the Creative Justice assessment, and the best T/LEK salmon result in the evaluation for Distributive Justice. This fishery received poor to average scores for most attributes, as indicated by the interviewee, but a perfect score on Adjacency and Reliance; as this attribute is included in the assessments for Creative and Distributive Justice, and other attributes on which the fishery received the worst-possible scores were excluded, the fishery's results are impacted. As with the assessments discussed in Chapter 3, this fishery was strong in only one regard and weak by most other measures; the assessment technique exploited these strengths and weaknesses; and by conducting a variety of evaluations with various attribute combinations, a better understanding of the fishery becomes possible. Had this fishery been considered only through the overall evaluation, it would appear to be uniformly 'bad'.

The extreme T/LEK gillnet fisheries remain quite constant through the various assessments. With the exception of Creative Justice and Distributive Justice, in which the Skeena/Nass gillnet fishery ('SknaNsGil') is the top-ranked T/LEK fishery, Skeena gillnetter #2 ('SknaGil2') achieves the top rank in this grouping; furthermore, with the exception of these two assessments, SknaGil2 produces better results than the original six gillnet fisheries. By

comparison, Skeena gillnetter #3 ('SknaGil3') ranks last amongst all salmon fisheries in all evaluations, save for Creative Justice.

Therefore, as was seen in the complete evaluation for Canadian marine fisheries, those fisheries which produce extreme results tend to be either uniformly good or bad. In comparison, those with variable results are characterised by one or two extreme attribute scores and the relative ranking of such fisheries is therefore affected to a significant degree by the attributes applied within an evaluation.

6.3 Recommendations for Just Fisheries Policies

In the preceding pages, the literature discussing environmental ethics and eco-theology have been reviewed. From this, ethical elements associated with fisheries have been identified, and subsequently translated into a set of criteria to be applied within the Rapfish methodology for rapid appraisal of fisheries. This has provided a framework for assessing the ethical health of fisheries. Subsequently, a range of analyses have been conducted to assess the ethical health of a number of Canadian fisheries. The assessments have included a variety of contemporary Canadian marine fisheries, with special attention to the commercial salmon fishery, as well as evaluations of Aboriginal salmon fisheries from prior to contact with Europeans through to the late twentieth century.

From these assessments, a number of observations may be made regarding the fisheries:

1. Those fisheries which are either very good or very bad, according to the defined ethical criteria and using the described Rapfish assessment methodologies, tend to be uniformly good or bad, respectively. The attribute scores for these fisheries are consistently good or bad, as the case may be. The relative sustainability ranking of such fisheries change very little when evaluated using a justice-based subset of attributes.
2. The fisheries which do exhibit volatility tend to have anomalous scores for one, two, or perhaps three of the attributes. The justice-based sub-evaluations exploit and make clear such anomalies. In the assessment presented in Chapter 3, certain fisheries were seen to change rank by five, ten, or more positions. Such significant changes in ranking were effected by the composition of the subset of attributes. This occurred in two directions, for fisheries with generally middling scores but with a few extreme values: when the subset included attributes in which the fishery excelled, its rank could improve significantly; conversely, when the subset included attributes in which the fishery was weak, its rank could plummet.
3. Furthermore, a fishery might present a range of scores across all eight attributes, from extremely poor to extremely good, but with an average result in the overall Ethical assessment. Again, through the justice-based sub-evaluations, the relative ranking of the fishery will shift, depending on the mix of attributes included in the assessment. In this instance also the sub-evaluations will exploit the inconsistent attribute scores and make clear the strengths and weaknesses of a given fishery.
4. When the attributes were weighted, in accordance with the rankings determined through the paired comparison study, similar results ensued. Thus, for those fisheries which were uniformly good or bad, the weighting procedure had little

impact; again, only those with inconsistent attribute scores were influenced by the weighting.

Given these findings, it is now appropriate to highlight the trends evident in the assessment results. In so doing, it is desirable to glean unique characteristics contributing to the trends, to explore whether these may be translated to the commercial Pacific salmon fishery. As the goal is to improve the ethical sustainability of the Pacific salmon fishery, the focus here will be on the strengths of the fisheries from which lessons are to be drawn. Consider the following:

1. On average, Atlantic fisheries are found to be more ethically sustainable than are the Pacific fisheries, in the Overall Ethical, Creative Justice, and Distributive Justice assessments. By comparison, the Pacific fisheries present a higher average score than the Atlantic in the assessments for Ecosystem, Productive, and Restorative Justice. Generally, the Atlantic fisheries have a longer history, are smaller-scale, and are more geographically rooted, than is the case with the Pacific fisheries. Hence, Atlantic fisheries have tended to excel, relative to the Pacific fisheries, in terms of Adjacency and Reliance, Equity in Entry, and Just Management. The Pacific fisheries, however, received better attribute scores than the Atlantic fisheries for Alternatives, Mitigation of Habitat Destruction, and Mitigation of Ecosystem Depletion. While fisheries are of significant economic importance in some areas of British Columbia, the overall contribution of fisheries to the provincial economy is very small, less than 1% of GDP (British Columbia, 2001b); alternative sources of employment exist. Here, the different histories, cultures, and the relative economic importance of fisheries play roles in the ethical sustainability of fisheries.
2. Fisheries which employ selective gears, such as the herring weir fishery in the Bay of Fundy, the handline for northern cod, and the herring spawn-on-kelp fishery, produced higher scores for ethical sustainability. Recall that, in the overall ethical ordination, trawl fisheries such as those for turbot and groundfish, were amongst the worst. Selective gears are in keeping with Ecosystem Justice, as they are by design intended to minimise damage to other elements of the ecosystem and/or the marine environment. In effect, this is a more respectful treatment of nature, and an acknowledgement of the interdependence of ecosystems; as eco-theologian Sallie McFague (1993; 1997) argues, we should at least be respectful of other members of the ecosystem, and to minimise the harm we cause. Leopold (1966) also wrote of the need to ensure the continued existence of an ecosystem. This care further contributes to other elements of justice: when mitigation of past damage is sought, Restorative Justice is served; when the ecosystem is allowed to rebuild and richness restored, Productive Justice is encouraged; Distributive Justice may flourish in a vibrant, functioning fisheries ecosystem, when the ecosystem is sufficiently healthy to thrive and human needs may be respectfully met. Creative Justice is necessary to achieve each of these other four Justices: to encourage all involved with or dependent upon the ecosystem to have a stake, and to make the difficult choices necessary to achieve rebuilding and subsequently share the benefits.
3. Traditional fisheries have fared well in the assessments. The herring spawn-on-kelp fishery, a traditional Aboriginal fishery in British Columbia, ranked amongst the

best-five fisheries in all six evaluations. Again, a hallmark of this fishery is its selectivity. But more than that, this fishery excelled particularly in terms of Adjacency and Reliance and Just Management. On the east coast, the handline fishery for northern cod also achieved top marks for Adjacency and Reliance. As was described in Chapter 1, it is believed that those with both geographical and historical ties to a fishery will have added motivation to steward the fisheries. The detailed local knowledge passed through generations (Suzuki and McConnell, 1997) is one form of understanding that can contribute to responsible fisheries decisions; not only does Creative Justice benefit, but a deeply-held connection to a fishery may also contribute to Ecosystem Justice. In the case of historical fisheries, means of determining how to share may have evolved long in advance of formal regulations, whether berths for cod fishing sites or stations for Aboriginal salmon fisheries; Distributive Justice is enhanced by consideration of earlier means of managing distributional conflicts and finding the means to share access and the resource (see Rawls, 1999). Furthermore, the shared history also dovetails with a shared future, and presumably a desire to allow that future to happen; this may encourage longer-term thinking when dealing with a resource (Suzuki and McConnell, 1997; Gallaugher and Vodden, 1999).

4. Creative Justice is well-served by efforts to bring together disparate voices. The Area 19 snow crab fishery was the only fishery in the full dataset of 62 fisheries to achieve full value for Just Management. This top score was awarded in recognition of the unique co-management arrangement between the fishers' association and Fisheries and Oceans Canada, wherein management responsibility was shared equally between the parties. This is a highly desirable arrangement. As was discussed in point two above, when Creative Justice flourishes, the other forms of Justice may follow. Indeed, Creative Justice may very well be necessary to allow the other four Justices to thrive. While establishing trust between implicitly or explicitly competing parties is exceptionally difficult, it is necessary for Creative Justice to be realised. This begins with realising the interests shared by the parties (Fisher et al., 1991): a desire for the fishery in question to prosper. A focus on common interests is necessary to move beyond entrenched positions and toward a working trust (Fisher et al., 1991). Once that working trust is established, the participation of what are often referred to as 'stakeholders' improves from mere consultation to true co-management (see Arnstein, 1969). This allows the confrontation of difficult issues, such as whether and how to restore the ecosystem, how to care for the ecosystem, and how to share the benefits of these efforts, among fishing and other sectors and while continuing to cultivate and care for the ecosystem.

Therefore, key characteristics to consider include: historical and geographic connection with the fishery; shared decision-making in fisheries management, particularly in recognition of different, complementary, types of knowledge and understanding of the fisheries ecosystem; and not only preventing further harm to the fisheries ecosystem but also repairing past damage. These findings provide interesting parallels to the results of the paired comparison study of the Ethical attributes; top priorities, as evidenced by the study results, include mitigation of damage to the fisheries ecosystem and habitat, and just management (see Figure 5, page 43, and Table 2,

page 41). Hence, the application of these key characteristics to fisheries policy is in keeping with the preferences indicated by the paired comparison survey.

Recall that, on average, the troll fisheries produced the best results amongst the commercial salmon fisheries, ranking within the ten-best Canadian marine fisheries in the Overall Ethical ordination (52.0%) as well as the sub-evaluations for Ecosystem (51.5%), Productive (61.7%), and Restorative (57.3%) Justice. By comparison, the gillnet and seine fisheries scored below the mean in all assessments, and both ranked amongst the ten-worst in the Overall Ethical ordination, scoring 39.1% and 35.8% respectively. (A complete listing of ranking and scores is presented in Table 10, page 64.)

Moreover, the Pacific fisheries bested the Atlantic fisheries in the evaluations for Ecosystem, Productive, and Restorative Justice. In these assessments, the Pacific salmon fisheries benefited from efforts to restore salmon habitat and to undo past damage to the fisheries ecosystem. This strength must be acknowledged.

Further recall that, amongst the Aboriginal salmon fisheries, those fisheries which presented the best results used selective gear types: notably weirs, harpoons, dipnets, and traps. Additionally, when gears common to the commercial fishery were considered, again the troll fisheries were assessed as being more sustainable than the gillnet and seine fisheries.

It is noteworthy that various fisheries-directed national and international instruments and agreements are buttressed by principles demonstrative of issues of justice. Sustainability, for instance, is prescribed in a range of policies and documents. Defined by the Brundtland Commission (as cited in Canada, 2001b, p. 2) as "...development that meets the needs of the present without compromising the ability of future generations to meet their own needs", sustainability is a titularly definitive guiding principle in Fisheries and Oceans Canada's *Sustainable Development Strategy 2001-2003* (Canada, 2001b). The first principle of the *Canadian Code of Conduct for Responsible Fishing Operations* hinges on sustainability, for which the definition parallels that presented by the Brundtland report:

> For the purposes of this Code, sustainability is understood to mean the harvesting of a stock in such a way, and at a rate, that does not threaten the health of the stock, or inhibit its recovery if it has previously been in decline, thereby maintaining its potential to meet the needs and aspirations of present and future generations of fish harvesters (Canada, 1998b).

Sustainability is strongly compatible with not only ecosystem justice, but also distributive, productive, and restorative justice. So too is the precautionary principle (or precautionary approach), which is evident in such national instruments as the *Canada Oceans Act* (1996) and *Canada's Oceans Strategy* (Canada, 2002a; Canada, 2002b). The *United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks* (United Nations General Assembly, 1995) presents principles regarding long-term sustainability and the precautionary approach. Specifically, Article Six of the UN agreement on straddling and highly migratory stocks is subtitled "Application of the Precautionary Approach", and provides specific guidelines for such. This UN agreement further calls upon States Parties to "...take into account the interests of artisanal and subsistence fisheries..." (Article 5(i)), and, in the case of developing nations, to recognise "...the need to avoid adverse impacts on, and ensure access to fisheries by, subsistence, small-scale artisanal fishers... as well as indigenous people..." (Article 24-2(c)).

This prescription is consistent with the Rapfish attribute which evaluates fisheries for adjacency and historical reliance of the fishers in the fisheries ecosystem.

Within the national and international context, justice in fisheries issues is being addressed. It is essential that Canadian fisheries policies, necessarily developed within this context, reflect these issues.

Recommendations

How, then, could the commercial salmon fisheries be made more ethical? Based upon what has been seen in the fisheries evaluated, what steps can be made to improve the ethical sustainability of these salmon fisheries? That is, what would a *just* commercial salmon fishery look like?

Firstly, consider the composition of the sector: troll, gillnet, and seine. According to the assessments presented herein, the troll sector is the most preferable of the three. Yet as was discussed in Chapter 1, the Davis and Mifflin Plans had the effect of removing from the commercial salmon fishery a disproportionate number of trollers. Gillnetters, which ranked between trollers and seiners in the Overall Ethical evaluation, were also disproportionately removed from the fishery. According to figures presented by Gregory (2000), through the two licence retirement rounds of the Mifflin Plan, the troll fleet was reduced by 23%, the gillnet fleet by 18%, and the seine fleet by just 9%, from 1995 (pre-Mifflin) to December 1997 (post-Mifflin), despite a stated goal of removing 20% of licences from each sector.

Furthermore, as Pearse (1982) notes with regard to the 1968 Davis Plan, while the *size* of the commercial salmon fleet was reduced, the *capacity* was not. Capacity actually increased. He reports that the Davis Plan "...has clearly failed in its main purpose, which was to control and reduce excessive fishing *capacity*. Investment in fishing power continued as the value of the catch increased, and the capacity of the fleet, already excessive when the program began, doubled or perhaps trebled" [italics as in original] (Pearse, 1982, p. 79, citing Pearse and Wilen, 1979). This was evident not only in the upgrading of equipment, but also in the converting of trollers and gillnetters to more-efficient seiners[12]. While trollers and gillnetters were retired from the fishery, "The numbers of gillnetters and trollers declined, mainly from their being converted to seine vessels (which involved 'pyramiding' the licensed capacity into fewer, larger vessels)..." (Pearse, 1982, p. 100).

Allocation, too, becomes an issue. DFO's *Allocation Policy for Pacific Salmon* provides a framework for determining distribution amongst the three commercial gear types, having set "Initial coast-wide target allocations of the total allowable catch... [at] 34% gillnet, 42% seine and 24% troll..." (Canada, 1999). Furthermore, the current *Integrated Fisheries Management Plans* for Pacific Salmon (Canada, 2002c; Canada, 2002d), indicate that in 2001 allocation targets were set at 40% seine, 38% gillnet, and 22% troll. Hence, the targets effectively shifted to the benefit of the gillnet sector, but at the expense of the seiners and trollers. In 2001, the mix realised in the actual coast-wide catch was 41% seine, 50% gillnet, and 9% troll (Canada, 2002c; Canada, 2002d).

Given the preferential allocation for seiners and the greater efficiency of this gear type, the more ethically-sustainable gears are effectively being marginalised within the commercial

[12] Glavin (1996) indicates that, "Because seiners are so 'efficient,' a typical seiner, rushing from openings on the north coast to those at Johnstone Strait and Juan de Fuca Strait, might spend less than two weeks of the year actually fishing" (p. 41).

salmon fishery. Notwithstanding the findings of the present study, this marginalisation is also in contravention of DFO's the assertion that, "Over time, allocations by gear (gillnet, seine and troll) may be adjusted to favour those that can demonstrate their ability to fish selectively" (Canada, 1999). The policy framework for rectifying the imbalance exists; it must be applied.

The growing proportion of seiners within the commercial fleet additionally raises the issue of concentration of ownership within the salmon fleet. While trollers and gillnetters tend to be privately owned (although frequently in contractual arrangements with processing companies), seiners are generally directly owned by processing companies (Glavin, 1996). These companies are often vertically integrated, leading to:

> ...a situation in which Canadian salmon, ostensibly a public resource owned by the Crown and 'managed' at a great cost borne by the public treasury, is quite often caught by a company boat, loaded off to a company packer, landed at a company cannery and sold through the company's wholesale and retail networks... and marketed under company-owned brand names. The fish never really enters the realm of 'common property' (p. 42).

Furthermore, those corporations are few in number. In fact, Glavin (1996) reports that, by 1990, four of the 113 salmon processing companies operating along the coast of British Columbia accounted for 60% of industry sales. With shifting fleet composition and catch allocation, resulting in the marginalisation of the small-boat fleet, this concentration of ownership can only worsen.

While it is immediately obvious that catch allocation and fleet composition raise issues of Distributive Justice, the varying selectivity of the different gear types also affects Ecosystem Justice. Productive and Restorative Justice may also be impacted by allocation, when the relative impacts of a gear on the fisheries ecosystem are evaluated. Whereas, as noted in Chapter 1, purse seiners and gillnetters fish closer to shore, and thus nearer to the end of the salmon's spawning migration, than do trollers, all three gear types may have an impact within mixed stock fisheries. That is, different fish stocks may intermingle in the open ocean (where they may be intercepted by trollers), or their river runs may coincide, such that salmon from various natal streams may be taken at once, with the implication that weak or endangered stocks or species may be compromised when coincident with strong, targeted stocks or species. For example, while coho are not targeted by the net fleet, "...a substantial bycatch occurs in gill net and seine fisheries for sockeye, pink and chum salmon.... Coho are also harvested in 'gauntlet' and 'terminal' fisheries directed at other salmon species, such as sockeye, as they return to their natural streams. A typical coho fishery is thus a mixed-stock fishery..." (Canada, 2001a). All three commercial gear types must therefore work to reduce the impact of participation in mixed-stock fisheries.

As has been demonstrated, on these grounds, in issues of catch allocation priority should be given to the troll fleet, while the seine fleet should be least favoured. Note that the initial allocations set for the commercial salmon fleet are in direct opposition to DFO's stated objectives. The *Allocation Policy* clearly favours the seine fleet, with less than a quarter of the catch earmarked for the troll fleet; in the 2001 fishery, the troll fleet, the most ethically-sustainable of the three fleets, harvested just 9% of the commercial catch. In the 2001 fishery, the seine catch was slightly over the target allocation, while the target for the gillnet fleet was exceeded to a significant degree, evidently at the expense of the trollers.

A just policy for the commercial salmon fishery must address this imbalance between gear sectors. During the Mifflin buybacks, the committee evaluating the bids had the opportunity to meet the goal of a uniform 20% reduction across all three gear types. To begin with, this goal was not met. Given the stated goal, a proactive effort should have produced at minimum a more proportionate fleet reduction. However, a *proactive policy* would have addressed the concerns associated with the increasing relative dominance of seiners in the gear mix. For a more ethically-sustainable fishery, the policy goal would involve shifting the mix, so that trollers comprised a greater percentage of the fleet and seiners a smaller percentage. Under a programme such as Mifflin, the number of licences could still have been reduced, while explicitly encouraging the continuation of the more ethically-sustainable components of the fishery.

Secondly, a just policy for the commercial Pacific salmon fisheries would encourage and cultivate Creative Justice. The establishment of a Consultations Secretariat (Canada, 2002c; Canada, 2002d) indicates a beginning in this direction, a continuation of the steps taken in such recent efforts as the consultations on the Wild Salmon Policy (Canada, 2000e; Dovetail Consulting Inc., 2000a; Dovetail Consulting Inc., 2000b), and the *Framework for Improved Decision-Making in the Pacific Salmon Fishery* (Canada, 2000a). It is essential that different voices be heard in decision-making. As described above, the development of a working relationship between hitherto adversarial or competing parties, though painful to start, will strengthen the ability to approach challenging issues. Unless territoriality can be overcome in favour of common ground, the conflicts will continue and the fisheries ecosystem will suffer. A deliberate decision must be made to improve the long-run situation, and face the short-term difficulties which will follow, or else the fishery will continue along its present path.

This may in part be accomplished at a community level. As has been seen, those fisheries with a geographic and historical legacy are more ethically-sustainable. Local stewardship may take many forms. Glavin (1996) writes:

> Small-scale fisheries are far more likely to be sustainable. They tend to be rooted in long-standing, sometimes ancient traditions. They are inclined to employ more appropriate technologies that catch fish much more selectively. They tend to define the character of their communities of origin, and these communities tend to have a direct and demonstrable economic, cultural and social stake in sustainability (p. 37).

Such conditions may encourage community involvement. In the immediate context, the shared interests are more apparent at a local scale: for instance, wishing to maintain a vibrant community, achieving conditions which will reduce out-migration, and attracting new prospects (for instance, tourism) while cultivating the existing opportunities (such as the fishery). Unfortunately, at the local level conflicts may also be magnified and more deeply entrenched. It should nevertheless be acknowledged that the community may be inclined to draw together against what may be perceived as a common enemy – for example, DFO!

Also at the community level, it may be most appropriate to engage in activities which call upon traditional or local ecological knowledge ('T/LEK'), which tends to be at a fine scale, detailed, and over an extended time period. Such knowledge complements scientific knowledge, which may be broader and hence overlook distinct local subtleties. A just policy then would seek to cultivate collaborative efforts between DFO (and other) scientists and local fishers. The

importance of the *collaborative* nature of such work cannot be overstated. It is not enough for DFO scientists to appear to collect the information; such would represent a very low rung on Arnstein's ladder of participation (1969). A dialogue is necessary. Fishers should be encouraged to share their knowledge, but the utility of such an exchange, as well as the respect it requires, must be made plain.

However, for such collaboration to occur – whether the parties involved include the community, DFO scientists or officials, academic researchers or others – terms of reference for respectful interaction ought to be developed. For instance, academic researchers must be mindful of community sensitivity regarding what Menzies (pers. com.) refers to as "hit and run research", wherein researchers descend upon the community, seize whatever data they require, and disappear forever without any follow-up. Instead, collaborative research requires a long-term commitment to cultivation of dialogue, as well as aiming for 'two-way' sharing, rather than one-way 'grabbing' of data.

The British Columbia salmon fishery is exceptionally complex. This study has necessarily been limited to the commercial fishery, with special attention given to Aboriginal salmon fisheries. Future work should be expanded to consider the recreational fishing sector, newly-developed or newly-implemented gear types, transboundary issues (particularly Canada-US matters) as well as salmon aquaculture. Access control, including the potential desirability of Individual Transferable Quotas ('ITQs'), as well as community quotas (Rice, 2002), also demand attention. Each of these could easily comprise an entire study, and it would be useful to pursue such work. Participatory management requires consideration from an operational perspective: how can and should it be done?

The ethical issues associated with fisheries are expansive, and fisheries complex. This study cannot claim to be exhaustive of either. It does, however, represent a groundwork for a justice-based approach to fisheries policy-making. Future work will permit additional development and testing of the approach and more detailed, concrete policy proposals for fisheries.

Glavin (1996) states that, "In the West Coast's salmon fisheries, overcapacity, unsustainability and inequity are perhaps the most significant defining characteristics..." (p. 40). These characteristics, to use Glavin's word, may, and should, be addressed as ethical. They raise issues associated with the five types of Justice: Creative, Distributive, Ecosystem, Productive, and Restorative.

The work presented herein addresses these issues of Justice.. The necessity and desirability of just fisheries has been stated, and the foundations for achieving fair fisheries policies have been laid.

A Prayer For Fisheries

"O Almighty God, who hast made the sea, and all that move therein; Bestow thy blessing on the harvest of the waters, that it may be abundant in its season, and on our sailors and fishermen, that they may be safe in every peril of the deep; so that we all with thankful hearts may acknowledge thee, who art Lord of the sea and of the dry land; through Jesus Christ our Lord. Amen."

- The Book of Common Prayer (Canada), 1962, p. 52.

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Appendix 1 – Scoring Scheme of Ethical Rapfish attributes

Attribute	Scoring	Good	Bad	Notes
Adjacency and reliance	0; 1; 2; 3	3	0	Geographical proximity and historical connection: not adjacent/ no reliance [0]; not adjacent/ some reliance [1]; adjacent/ some reliance [2]; adjacent/ strong reliance [3]
Alternatives	0; 1; 2	2	0	Alternatives to the fishery within community? None [0]; some [1]; lots [2]
Equity in entry to fishery	0; 1; 2	2	0	Is entry based on traditional fishery activity? traditional access is not considered [0]; traditional access is considered [1]; the fishery is a traditional indigenous fishery [2]
Just management	0; 1; 2; 3; 4	4	0	Level of inclusion in fishers in management of fishery: none [0]; consultations [1]; co-management/ government leading [2]; co-management/ community leading [3]; genuine co-management where all parties are equal or N/A [4]
Influences in ethical formation *	0; 1; 2; 3; 4	4	0	Structures which could influence values: strong negative [0]; some negative [1]; neutral [2]; some positive [3]; strong positive [4]
Mitigation of habitat destruction	0; 1; 2; 3; 4	4	0	Damage to fish habitat: much ongoing damage [0]; some ongoing damage [1]; no ongoing damage and no mitigation [2]; some mitigation [3]; much mitigation [4]
Mitigation of ecosystem depletion	0; 1; 2; 3; 4	4	0	Fisheries-induced changes in ecosystem: much ongoing damage [0]; some ongoing damage [1]; no ongoing damage and no mitigation [2]; some mitigation [3]; much mitigation [4]
Illegal fishing	0; 1; 2	0	2	Is there evidence of illegal activity (ex. catching, poaching, transshipments)? none [0]; some [1]; lots [2]
Discards and wastes	0; 1; 2	0	2	Is there discarding or wasting of fish? none [0]; some [1]; lots [2]
Protection *(Used only in assessment of Aboriginal Fisheries)*	0; 1	0	1	Are there treaties, legalities, or other amendments that protect the right to fish? Yes (or N/A) [0]; No [1]
Food Fisheries *(Used only in assessment of Aboriginal Fisheries)*	0; 1; 2	0	2	Is fish primarily for: [0] consumption within family and/or community; [1] trade; [2] sale
Traditional design of gear *(Used only in assessment of Aboriginal Fisheries)*	0; 1; 2	0	2	Is the gear modern or traditional in design? traditional designs [0]; has traditional design but is mass-produced [1]; mass-produced modern [2]
Externalities/ responsibilities ** *(Used only in assessment of Aboriginal Fisheries)*	0; 1; 2	0	2	Costs not borne by one who caused the cost, includes pollution, stock collapse, etc: none [0]; some [1]; lots [2]

Notes:

* *Included in original set of Ethical attributes (Pitcher and Power, 2000), but excluded from subsequent Ethical Rapfish analyses.*

** *Used by Skaret (2000), but excluded from this Rapfish analysis.*

Appendices 2a-2f: Rapfish data, Canadian fisheries analyses

Appendix 2a: Rapfish data applied in the Canadian fisheries analyses

Atlantic Fisheries	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes
Caplin (NF)	Cap	2.0	0.5	1.5	0.5	2.5	2.0	1.5	2.0
Crab (Snow)	SnwCb	2.0	1.0	1.5	1.0	2.0	0.5	1.0	1.0
Crab (Snow), Area 19 (NS)	SnCb19	2.0	1.0	1.5	4.0	2.0	1.0	1.0	1.0
Herring, Zone 4WX, Seine (NS)	BFunS	2.0	2.0	1.5	1.0	1.5	1.5	1.0	2.0
Herring, Zone 4WX, Weir (NS)	BFun W	3.0	2.0	1.5	3.0	2.5	2.0	0.0	0.0
Lobster (Atlantic)	Lob	2.5	1.0	1.5	1.0	1.0	1.5	1.0	1.0
Lobster, Dingwall (NS)	LobDing	2.5	0.5	1.5	1.0	1.5	1.5	1.0	1.0
Mackerel (Atlantic)	MakAt	2.5	1.0	1.5	0.5	1.0	0.0	0.5	1.0
Mackerel, Dingwall (NS)	MakDin	2.5	1.0	1.5	1.0	1.0	0.5	1.0	1.0
Northern Cod Sentinel Fishery, Gillnet	CodSnt	3.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Northern Cod (2J3KL), Gillnet	CodGil	2.0	0.5	1.5	0.0	2.0	2.0	1.0	2.0
Northern Cod (2J3KL), Handlines	CodHan	3.0	0.5	1.5	0.0	2.0	2.0	1.0	0.0
Northern Cod (2J3KL), Longlines	CodLon	3.0	0.5	1.5	0.0	2.0	2.0	0.5	0.0
Northern Cod (2J3KL), Traps	CodTap	3.0	0.5	1.5	0.0	2.0	2.0	1.0	1.0
Northern Cod (2J3KL), Trawls (otter)	CodTrw	1.0	1.5	1.5	0.0	1.0	2.0	0.0	2.0
Northern Cod Inshore	CodIn	3.0	0.5	1.0	0.0	2.0	2.0	1.0	1.0
Northern Cod Offshore	CodOff	1.0	1.5	1.5	0.0	1.0	2.0	0.0	2.0
Turbot	Turb	1.5	1.0	1.0	1.0	0.0	0.0	1.0	2.0
Scallops	SClp	1.5	0.0	1.5	1.0	1.0	3.0	0.0	1.0
Shrimp (northern) (NF)	NShp	1.0	0.5	1.5	0.0	2.0	2.0	0.0	1.5
Shrimp (northern), Eastern Scotian Shelf Trawl	NShpES	2.5	1.0	1.5	1.0	2.0	2.0	1.0	1.5
GOOD	**Good**	**3.0**	**2.0**	**2.0**	**4.0**	**4.0**	**4.0**	**0.0**	**0.0**
BAD	**Bad**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.0**	**2.0**

Pacific Fisheries	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes
Groundfish trawl	Grnd97	0.5	1.5	0.0	1.5	0.0	0.0	1.0	2.0
Halibut	PacHal	1.0	2.0	0.5	2.0	1.5	1.0	0.5	1.0
Halibut, Hook and Line, Dixon/Hecate	DxHctHal	3.0	1.0	0.0	0.0	2.0	2.0	0.0	2.0
Halibut, Hook and Line, Area 2/3	2/3Hal	0.0	1.0	0.0	1.0	2.0	2.0	0.0	1.0
Halibut, Hook and Line, N&S Coasts	N&Shal	1.0	2.0	1.0	2.0	1.0	2.0	0.0	0.0
Herring, 1996	PacHer	1.0	1.0	0.5	1.5	1.0	1.0	0.5	0.5
Herring spawn-on-kelp	HerSpw	3.0	0.5	1.0	3.0	3.0	3.0	0.0	0.0
Lingcod, 1989, SoG	Ling89	0.5	1.0	1.0	1.0	0.0	1.0	1.0	2.0
Lingcod, 1996	Ling96	1.0	0.5	0.5	0.5	1.0	1.0	0.5	1.0
Salmon, Gillnet	SalGil	1.2	0.5	0.5	1.0	1.7	1.7	0.5	0.9
Salmon, Seine	SalSen	0.5	1.0	0.0	0.5	0.7	1.7	0.5	1.1
Salmon, Troll	SalTrol	2.0	0.5	0.5	1.5	1.9	2.3	0.0	0.4
Salmon, Chinook, Gillnet	ChinGil	1.0	0.5	0.5	1.0	1.5	1.5	0.5	1.0
Salmon, Chinook, Seine	ChiSen	0.5	1.0	0.0	0.5	0.5	1.5	0.5	1.5
Salmon, Chinook, Troll	ChiTrol	2.5	0.5	0.5	1.5	2.0	2.0	0.0	0.5
Salmon, Chum, Gillnet	CmGil	2.0	0.5	0.5	1.0	2.0	2.0	0.5	1.0
Salmon, Chum, Seine	CmSen	0.5	1.0	0.0	0.5	1.0	2.0	0.5	1.0
Salmon, Chum, Troll	CmTrol	1.0	0.5	0.5	1.5	2.0	2.0	0.0	0.5
Salmon, Coho, Gillnet	CohGil	1.0	0.5	0.5	1.0	1.5	1.5	0.5	1.0
Salmon, Coho, Seine	CohSen	0.5	1.0	0.0	0.5	0.5	1.5	0.5	1.5
Salmon, Coho, Troll	CohTrol	2.5	0.5	0.5	1.5	1.5	2.0	0.0	0.5
Salmon, Pink, Gillnet	PkGil	0.0	0.5	0.5	1.0	2.0	2.0	0.5	1.0
Salmon, Pink, Seine	PkSen	0.5	1.0	0.0	0.5	1.0	2.0	0.5	1.0
Salmon, Pink, Troll	PkTrol	1.0	0.5	0.5	1.5	2.0	2.5	0.0	0.5
Salmon, Sockeye, Gillnet	SokGil	2.0	0.5	0.5	1.0	1.5	1.5	0.5	0.5
Salmon, Sockeye, Seine	SokSen	0.5	1.0	0.0	0.5	0.5	1.5	0.5	0.5
Salmon, Sockeye, Troll	SokTrol	3.0	0.5	0.5	1.5	2.0	3.0	0.0	0.0
Salmon, Inshore Gillnet, Northern BC	InshGil	1.0	0.0	0.0	1.0	1.0	1.0	0.0	2.0
Salmon, Gillnet, Skeena, #1	SknaGil1	2.0	1.0	0.0	0.0	2.0	2.0	1.0	1.0
Salmon, Gillnet, Skeena, #2	SknaGil2	2.0	1.0	0.0	0.0	4.0	1.0	0.0	1.0
Salmon, Gillnet, Skeena, #3	SknaGil3	1.0	0.0	1.0*	0.0	0.0	2.0	2.0	2.0
Salmon, Gillnet, Skeena/Nass	SknaNsGil	3.0	0.0	1.0	1.0	0.0	0.0	1.0	1.0
Salmon, Gillnet, Hecate/Alaska	HecAkaGil	1.0	0.0	0.0	1.0	2.0	2.0	1.0	1.0
Eulachon Beach Seine	Eul	2.0	2.0	2.0	1.0	0.0	0.0	0.0	0.0
Crab trap QCI	QCICrb	2.0	1.0	0.0	4.0	3.0	3.0	0.0	0.0
Herring Gillnet, Northern BC	HerGil	2.0	0.0	0.0	1.0	2.0	2.0	0.0	1.0
H&L Rockfish QCI	QCIRock	3.0	1.0	1.0	2.0	2.0	2.0	1.0*	1.0
Herring Seine	HerSen	1.0	1.0	0.0	4.0	1.0	1.0	1.0	1.0
Cod Trawl	BCCod	3.0	0.0	0.0	0.0	2.0	2.0	0.0	2.0
Flatfish/Rockfish Trawl, Northern BC	FltRckTrw	2.0	0.0	0.0	1.0	1.0	2.0	0.0	1.0
Urchin Diving	Urch	1.0	0.0	1.0	4.0	1.0	1.0	1.0	1.0
GOOD	**Good**	**3.0**	**2.0**	**2.0**	**4.0**	**4.0**	**4.0**	**0.0**	**0.0**
BAD	**Bad**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.0**	**2.0**

Note:

* *Respondent did not provide data for this attribute; median score assigned.*

Appendix 2b: Scaled and standardised data applied in Scaled/Averaged analysis of Canadian fisheries

Atlantic Fisheries	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes
Caplin (NF)	Cap	67	25	75	13	63	50	25	0
Crab (Snow)	SnwCb	67	50	75	25	50	13	50	50
Crab (Snow), Area 19 (NS)	SnCb19	67	50	75	100	50	25	50	50
Herring, Zone 4WX, Seine (NS)	BFunS	67	100	75	25	38	38	50	0
Herring, Zone 4WX, Weir (NS)	BFun W	100	100	75	75	63	50	100	100
Lobster (Atlantic)	Lob	83	50	75	25	25	38	50	50
Lobster, Dingwall (NS)	LobDing	83	25	75	25	38	38	50	50
Mackerel (Atlantic)	MakAt	83	50	75	13	25	0	75	50
Mackerel, Dingwall (NS)	MakDin	83	50	75	25	25	13	50	50
Northern Cod Sentinel Fishery, Gillnet	CodSnt	100	50	50	25	25	25	50	50
Northern Cod (2J3KL), Gillnet	CodGil	67	25	75	0	50	50	50	0
Northern Cod (2J3KL), Handlines	CodHan	100	25	75	0	50	50	50	100
Northern Cod (2J3KL), Longlines	CodLon	100	25	75	0	50	50	75	100
Northern Cod (2J3KL), Traps	CodTap	100	25	75	0	50	50	50	50
Northern Cod (2J3KL), Trawls (otter)	CodTrw	33	75	75	0	25	50	100	0
Northern Cod Inshore	CodIn	100	25	50	0	50	50	50	50
Northern Cod Offshore	CodOff	33	75	75	0	25	50	100	0
Turbot	Turb	50	50	50	25	0	0	50	0
Scallops	SClp	50	0	75	25	25	75	100	50
Shrimp (northern) (NF)	NShp	33	25	75	0	50	50	100	25
Shrimp (northern), Eastern Scotian Shelf Trawl	NShpES	83	50	75	25	50	50	50	25
GOOD	**Good**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
BAD	**Bad**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Pacific Fisheries	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes
Groundfish trawl	Grnd97	17	75	0	38	0	0	50	0
Halibut	PacHal	33	100	25	50	38	25	75	50
Halibut, Hook and Line, Dixon/Hecate	DxHctHal	100	50	0	0	50	50	100	0
Halibut, Hook and Line, Area 2/3	2/3Hal	0	50	0	25	50	50	100	50
Halibut, Hook and Line, N&S Coasts	N&Shal	33	100	50	50	25	50	100	100
Herring, 1996	PacHer	33	50	25	38	25	25	75	75
Herring spawn-on-kelp	HerSpw	100	25	50	75	75	75	100	100
Lingcod, 1989, SoG	Ling89	17	50	50	25	0	25	50	0
Lingcod, 1996	Ling96	33	25	25	13	25	25	75	50
Salmon, Gillnet	SalGil	40	25	25	25	43	43	75	55
Salmon, Seine	SalSen	17	50	0	13	18	43	75	45
Salmon, Troll	SalTrol	67	25	25	38	48	58	100	80
Salmon, Chinook, Gillnet	ChinGil	33	25	25	25	38	38	75	50
Salmon, Chinook, Seine	ChiSen	17	50	0	13	13	38	75	25
Salmon, Chinook, Troll	ChiTrol	83	25	25	38	50	50	100	75
Salmon, Chum, Gillnet	CmGil	67	25	25	25	50	50	75	50
Salmon, Chum, Seine	CmSen	17	50	0	13	25	50	75	50
Salmon, Chum, Troll	CmTrol	33	25	25	38	50	50	100	75
Salmon, Coho, Gillnet	CohGil	33	25	25	25	38	38	75	50
Salmon, Coho, Seine	CohSen	17	50	0	13	13	38	75	25
Salmon, Coho, Troll	CohTrol	83	25	25	38	38	50	100	75
Salmon, Pink, Gillnet	PkGil	0	25	25	25	50	50	75	50
Salmon, Pink, Seine	PkSen	17	50	0	13	25	50	75	50
Salmon, Pink, Troll	PkTrol	33	25	25	38	50	63	100	75
Salmon, Sockeye, Gillnet	SokGil	67	25	25	25	38	38	75	75
Salmon, Sockeye, Seine	SokSen	17	50	0	13	13	38	75	75
Salmon, Sockeye, Troll	SokTrol	100	25	25	38	50	75	100	100
Salmon, Inshore Gillnet, Northern BC	InshGil	33	0	0	25	25	25	100	0
Salmon, Gillnet, Skeena, #1	SknaGil1	67	50	0	0	50	50	50	50
Salmon, Gillnet, Skeena, #2	SknaGil2	67	50	0	0	100	25	100	50
Salmon, Gillnet, Skeena, #3	SknaGil3	33	0	50*	0	0	50	0	0
Salmon, Gillnet, Skeena/Nass	SknaNsGil	100	0	50	25	0	0	50	50
Salmon, Gillnet, Hecate/Alaska	HecAkaGil	33	0	0	25	50	50	50	50
Eulachon Beach Seine	Eul	67	100	100	25	0	0	100	100
Crab trap QCI	QCICrb	67	50	0	100	75	75	100	100
Herring Gillnet, Northern BC	HerGil	67	0	0	25	50	50	100	50
H&L Rockfish QCI	QCIRock	100	50	50	50	50	50	50*	50
Herring Seine	HerSen	33	50	0	100	25	25	50	50
Cod Trawl	BCCod	100	0	0	0	50	50	100	0
Flatfish/Rockfish Trawl, Northern BC	FltRckTrw	67	0	0	25	25	50	100	50
Urchin Diving	Urch	33	0	50	100	25	25	50	50
GOOD	**Good**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
BAD	**Bad**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note:

* *Respondent did not provide data for this attribute; median score assigned.*

Appendix 2c: Scaled and standardised data applied in Scaled/Averaged and Weighted analysis of Canadian fisheries

Atlantic Fisheries	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes
Caplin (NF)	Cap	23	7	35	9	44	38	10	0
Crab (Snow)	SnwCb	23	15	35	17	35	9	20	25
Crab (Snow), Area 19 (NS)	SnCb19	23	15	35	70	35	19	20	25
Herring, Zone 4WX, Seine (NS)	BFunS	23	30	35	17	26	28	20	0
Herring, Zone 4WX, Weir (NS)	BFun W	35	30	35	52	44	38	41	51
Lobster (Atlantic)	Lob	29	15	35	17	17	28	20	25
Lobster, Dingwall (NS)	LobDing	29	7	35	17	26	28	20	25
Mackerel (Atlantic)	MakAt	29	15	35	9	17	0	31	25
Mackerel, Dingwall (NS)	MakDin	29	15	35	17	17	9	20	25
Northern Cod Sentinel Fishery, Gillnet	CodSnt	35	15	23	17	17	19	20	25
Northern Cod (2J3KL), Gillnet	CodGil	23	7	35	0	35	38	20	0
Northern Cod (2J3KL), Handlines	CodHan	35	7	35	0	35	38	20	51
Northern Cod (2J3KL), Longlines	CodLon	35	7	35	0	35	38	31	51
Northern Cod (2J3KL), Traps	CodTap	35	7	35	0	35	38	20	25
Northern Cod (2J3KL), Trawls (otter)	CodTrw	12	22	35	0	17	38	41	0
Northern Cod Inshore	CodIn	35	7	23	0	35	38	20	25
Northern Cod Offshore	CodOff	12	22	35	0	17	38	41	0
Turbot	Turb	17	15	23	17	0	0	20	0
Scallops	SClp	17	0	35	17	17	56	41	25
Shrimp (northern) (NF)	NShp	12	7	35	0	35	38	41	13
Shrimp (northern), Eastern Scotian Shelf Trawl	NShpES	29	15	35	17	35	38	20	13
WEIGHTING FACTOR (%)		**34.5**	**29.5**	**46.8**	**69.6**	**69.8**	**75.2**	**40.9**	**50.9**

Pacific Fisheries	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes
Groundfish trawl	Grnd97	6	22	0	26	0	0	20	0
Halibut	PacHal	12	30	12	35	26	19	31	25
Halibut, Hook and Line, Dixon/Hecate	DxHctHal	35	15	0	0	35	38	41	0
Halibut, Hook and Line, Area 2/3	2/3Hal	0	15	0	17	35	38	41	25
Halibut, Hook and Line, N&S Coasts	N&Shal	12	30	23	35	17	38	41	51
Herring, 1996	PacHer	12	15	12	26	17	19	31	38
Herring spawn-on-kelp	HerSpw	35	7	23	52	52	56	41	51
Lingcod, 1989, SoG	Ling89	6	15	23	17	0	19	20	0
Lingcod, 1996	Ling96	12	7	12	9	17	19	31	25
Salmon, Gillnet	SalGil	14	7	12	17	30	32	31	28
Salmon, Seine	SalSen	6	15	0	9	12	32	31	23
Salmon, Troll	SalTrol	23	7	12	26	33	43	41	41
Salmon, Chinook, Gillnet	ChinGil	12	7	12	17	26	28	31	25
Salmon, Chinook, Seine	ChiSen	6	15	0	9	9	28	31	13
Salmon, Chinook, Troll	ChiTrol	29	7	12	26	35	38	41	38
Salmon, Chum, Gillnet	CmGil	23	7	12	17	35	38	31	25
Salmon, Chum, Seine	CmSen	6	15	0	9	17	38	31	25
Salmon, Chum, Troll	CmTrol	12	7	12	26	35	38	41	38
Salmon, Coho, Gillnet	CohGil	12	7	12	17	26	28	31	25
Salmon, Coho, Seine	CohSen	6	15	0	9	9	28	31	13
Salmon, Coho, Troll	CohTrol	29	7	12	26	26	38	41	38
Salmon, Pink, Gillnet	PkGil	0	7	12	17	35	38	31	25
Salmon, Pink, Seine	PkSen	6	15	0	9	17	38	31	25
Salmon, Pink, Troll	PkTrol	12	7	12	26	35	47	41	38
Salmon, Sockeye, Gillnet	SokGil	23	7	12	17	26	28	31	38
Salmon, Sockeye, Seine	SokSen	6	15	0	9	9	28	31	38
Salmon, Sockeye, Troll	SokTrol	35	7	12	26	35	56	41	51
Salmon, Inshore Gillnet, Northern BC	InshGil	12	0	0	17	17	19	41	0
Salmon, Gillnet, Skeena, #1	SknaGil1	23	15	0	0	35	38	20	25
Salmon, Gillnet, Skeena, #2	SknaGil2	23	15	0	0	70	19	41	25
Salmon, Gillnet, Skeena, #3	SknaGil3	12	0	23*	0	0	38	0	0
Salmon, Gillnet, Skeena/Nass	SknaNsGil	35	0	23	17	0	0	20	25
Salmon, Gillnet, Hecate/Alaska	HecAkaGil	12	0	0	17	35	38	20	25
Eulachon Beach Seine	Eul	23	30	47	17	0	0	41	51
Crab trap QCI	QCICrb	23	15	0	70	52	56	41	51
Herring Gillnet, Northern BC	HerGil	23	0	0	17	35	38	41	25
H&L Rockfish QCI	QCIRock	35	15	23	35	35	38	20*	25
Herring Seine	HerSen	12	15	0	70	17	19	20	25
Cod Trawl	BCCod	35	0	0	0	35	38	41	0
Flatfish/Rockfish Trawl, Northern BC	FltRckTrw	23	0	0	17	17	38	41	25
Urchin Diving	Urch	12	0	23	70	17	19	20	25
WEIGHTING FACTOR (%)		**34.5**	**29.5**	**46.8**	**69.6**	**69.8**	**75.2**	**40.9**	**50.9**

Note:

* *Respondent did not provide data for this attribute; median score assigned.*

Appendix 2d: Adjusted scaled and standardised data applied in Scaled/Averaged and Weighted analyses of Canadian fisheries

Atlantic Fisheries	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes
Caplin (NF)	Cap	44	14	68	17	84	70	20	0
Crab (Snow)	SnwCb	44	28	68	34	67	17	39	49
Crab (Snow), Area 19 (NS)	SnCb19	44	28	68	134	67	35	39	49
Herring, Zone 4WX, Seine (NS)	BFunS	44	57	68	34	51	52	39	0
Herring, Zone 4WX, Weir (NS)	BFun W	67	57	68	101	84	70	79	98
Lobster (Atlantic)	Lob	56	28	68	34	34	52	39	49
Lobster, Dingwall (NS)	LobDing	56	14	68	34	51	52	39	49
Mackerel (Atlantic)	MakAt	56	28	68	17	34	0	59	49
Mackerel, Dingwall (NS)	MakDin	56	28	68	34	34	17	39	49
Northern Cod Sentinel Fishery, Gillnet	CodSnt	67	28	45	34	34	35	39	49
Northern Cod (2J3KL), Gillnet	CodGil	44	14	68	0	67	70	39	0
Northern Cod (2J3KL), Handlines	CodHan	67	14	68	0	67	70	39	98
Northern Cod (2J3KL), Longlines	CodLon	67	14	68	0	67	70	59	98
Northern Cod (2J3KL), Traps	CodTap	67	14	68	0	67	70	39	49
Northern Cod (2J3KL), Trawls (otter)	CodTrw	22	43	68	0	34	70	79	0
Northern Cod Inshore	CodIn	67	14	45	0	67	70	39	49
Northern Cod Offshore	CodOff	22	43	68	0	34	70	79	0
Turbot	Turb	33	28	45	34	0	0	39	0
Scallops	SClp	33	0	68	34	34	105	79	49
Shrimp (northern) (NF)	NShp	22	14	68	0	67	70	79	25
Shrimp (northern), Eastern Scotian Shelf Trawl	NShpES	56	28	68	34	67	70	39	25
ADJUSTED WEIGHTING FACTOR (%)		**66.6**	**56.9**	**90.3**	**134.3**	**134.7**	**139.9**	**78.9**	**98.2**

Pacific Fisheries	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes
Groundfish trawl	Grnd97	11	43	0	50	0	0	39	0
Halibut	PacHal	22	57	23	67	51	35	59	49
Halibut, Hook and Line, Dixon/Hecate	DxHctHal	67	28	0	0	67	70	79	0
Halibut, Hook and Line, Area 2/3	2/3Hal	0	28	0	34	67	70	79	49
Halibut, Hook and Line, N&S Coasts	N&Shal	22	57	45	67	34	70	79	98
Herring, 1996	PacHer	22	28	23	50	34	35	59	74
Herring spawn-on-kelp	HerSpw	67	14	45	101	101	105	79	98
Lingcod, 1989, SoG	Ling89	11	28	45	34	0	35	39	0
Lingcod, 1996	Ling96	22	14	23	17	34	35	59	49
Salmon, Gillnet	SalGil	27	14	23	34	57	59	59	54
Salmon, Seine	SalSen	11	28	0	17	24	59	59	44
Salmon, Troll	SalTrol	44	14	23	50	64	80	79	79
Salmon, Chinook, Gillnet	ChinGil	22	14	23	34	51	52	59	49
Salmon, Chinook, Seine	ChiSen	11	28	0	17	17	52	59	25
Salmon, Chinook, Troll	ChiTrol	56	14	23	50	67	70	79	74
Salmon, Chum, Gillnet	CmGil	44	14	23	34	67	70	59	49
Salmon, Chum, Seine	CmSen	11	28	0	17	34	70	59	49
Salmon, Chum, Troll	CmTrol	22	14	23	50	67	70	79	74
Salmon, Coho, Gillnet	CohGil	22	14	23	34	51	52	59	49
Salmon, Coho, Seine	CohSen	11	28	0	17	17	52	59	25
Salmon, Coho, Troll	CohTrol	56	14	23	50	51	70	79	74
Salmon, Pink, Gillnet	PkGil	0	14	23	34	67	70	59	49
Salmon, Pink, Seine	PkSen	11	28	0	17	34	70	59	49
Salmon, Pink, Troll	PkTrol	22	14	23	50	67	87	79	74
Salmon, Sockeye, Gillnet	SokGil	44	14	23	34	51	52	59	74
Salmon, Sockeye, Seine	SokSen	11	28	0	17	17	52	59	74
Salmon, Sockeye, Troll	SokTrol	67	14	23	50	67	105	79	98
Salmon, Inshore Gillnet, Northern BC	InshGil	22	0	0	34	34	35	79	0
Salmon, Gillnet, Skeena, #1	SknaGil1	44	28	0	0	67	70	39	49
Salmon, Gillnet, Skeena, #2	SknaGil2	44	28	0	0	135	35	79	49
Salmon, Gillnet, Skeena, #3	SknaGil3	22	0	45*	0	0	70	0	0
Salmon, Gillnet, Skeena/Nass	SknaNsGil	67	0	45	34	0	0	39	49
Salmon, Gillnet, Hecate/Alaska	HecAkaGil	22	0	0	34	67	70	39	49
Eulachon Beach Seine	Eul	44	57	90	34	0	0	79	98
Crab trap QCI	QCICrb	44	28	0	134	101	105	79	98
Herring Gillnet, Northern BC	HerGil	44	0	0	34	67	70	79	49
H&L Rockfish QCI	QCIRock	67	28	45	67	67	70	39	49
Herring Seine	HerSen	22	28	0	134	34	35	39	49
Cod Trawl	BCCod	67	0	0	0	67	70	79	0
Flatfish/Rockfish Trawl, Northern BC	FltRckTrw	44	0	0	34	34	70	79	49
Urchin Diving	Urch	22	0	45	134	34	35	39	49
ADJUSTED WEIGHTING FACTOR (%)		**66.6**	**56.9**	**90.3**	**134.3**	**134.7**	**139.9**	**78.9**	**98.2**

Note:

* *Respondent did not provide data for this attribute; median score assigned.*

Appendix 2e: Comparison between unweighted average scores, weighted averaged scores, and adjusted weighted average scores

Unweighted Average Scores			Weighted Average Scores			Adjusted Weighted Average Scores		
Rank		*%*	*Rank*		*%*	*Rank*		*%*
1.	BFun W	82.8	1.	BFun W	40.5	1.	BFun W	77.9
2.	***HerSpw***	***75.0***	2.	***HerSpw***	***39.8***	2.	***HerSpw***	***76.2***
3.	***QCICrb***	***70.8***	3.	***QCICrb***	***38.5***	3.	***QCICrb***	***73.8***
4.	***N&Shal***	***63.5***	4.	***N&Shal***	***30.8***	4.	***N&Shal***	***59.0***
5.	***Eul***	***61.5***	5.	SnCb19	30.3	5.	SnCb19	58.2
6.	CodLon	59.4	6.	CodLon	28.9	6.	CodLon	55.4
7.	SnCb19	58.3	7.	***BCSalTrol***	***28.3***	7.	***BCSalTrol***	***54.2***
8.	CodHan	56.3	8.	***QCIRock***	***28.2***	8.	***QCIRock***	***54.2***
9.	***QCIRock***	***56.3***	9.	CodHan	27.6	9.	CodHan	52.9
10.	***BCSalTrol***	***54.9***	10.	SClp	26.2	10.	***Eul***	***50.3***
11.	NShpES	51.0	11.	***Eul***	***26.1***	11.	SClp	50.2
12.	CodTap	50.0	12.	NShpES	25.2	12.	NShpES	48.3
13.	SClp	50.0	13.	CodTap	24.4	13.	CodTap	46.8
14.	Lob	49.5	14.	LobDing	23.6	14.	***PacHal***	***45.3***
15.	***PacHal***	***49.5***	15.	***PacHal***	***23.6***	15.	LobDing	45.3
16.	BFunS	49.0	16.	Lob	23.4	16.	Lob	45.0
17.	LobDing	47.9	17.	***Urch***	***23.3***	17.	***Urch***	***44.9***
18.	SnwCb	47.4	18.	CodIn	23.0	18.	CodIn	44.0
19.	CodSnt	46.9	19.	SnwCb	22.6	19.	SnwCb	43.4
20.	CodIn	46.9	20.	NShp	22.5	20.	BFunS	43.1
21.	MakAt	46.4	21.	BFunS	22.5	21.	NShp	43.1
22.	MakDin	46.4	22.	***HerGil***	***22.4***	22.	HerGil	42.9
23.	CodTrw	44.8	23.	***HerSen***	***22.3***	23.	HerSen	42.8
24.	CodOff	44.8	24.	CodSnt	21.5	24.	CodSnt	41.4
25.	NShp	44.8	25.	***2/3Hal***	***21.4***	25.	***2/3Hal***	***40.9***
26.	***DxHctHal***	***43.8***	26.	***PacHer***	***21.1***	26.	***PacHer***	***40.6***
27.	***PacHer***	***43.2***	27.	MakDin	21.1	27.	MakDin	40.6
28.	***HerGil***	***42.7***	28.	Cap	20.7	28.	Cap	39.6
29.	***HerSen***	***41.7***	29.	CodTrw	20.6	29.	CodTrw	39.4
30.	***Urch***	***41.7***	30.	CodOff	20.6	30.	CodOff	39.4
31.	***2/3Hal***	***40.6***	31.	***DxHctHal***	***20.3***	31.	***DxHctHal***	***38.9***
32.	Cap	39.6	32.	***FltRckTrw***	***20.2***	32.	MakAt	38.8
33.	CodGil	39.6	33.	MakAt	20.1	33.	***FltRckTrw***	***38.7***
34.	***FltRckTrw***	***39.6***	34.	CodGil	19.8	34.	CodGil	37.9
35.	***BCCod***	***37.5***	35.	***BCSalGil***	***19.0***	35.	***BCSalGil***	***36.3***
36.	***BCSalGil***	***37.1***	36.	***BCCod***	***18.5***	36.	***BCCod***	***35.4***
37.	***Ling96***	***33.9***	37.	***Ling96***	***16.5***	37.	***Ling96***	***31.6***
38.	***BCSalSeine***	***32.4***	38.	***BCSalSeine***	***15.9***	38.	***BCSalSeine***	***30.3***
39.	Turb	28.1	39.	***Ling89***	***12.6***	39.	***Ling89***	***24.1***
40.	***Ling89***	***27.1***	40.	Turb	11.7	40.	Turb	22.5
41.	***Grnd97***	***22.4***	41.	***Grnd97***	***9.3***	41.	***Grnd97***	***17.9***
	MEAN	**47.4**		**MEAN**	**23.3**		**MEAN**	**44.7**
	MAXIMUM	**82.8**		**MAXIMUM**	**40.5**		**MAXIMUM**	**77.9**
	MINIMUM	**22.4**		**MINIMUM**	**9.3**		**MINIMUM**	**17.9**

Appendix 2f: Error values applied in the Canadian fisheries analyses

Attribute	E_{min}	E_{max}	Rationale
Adjacency and reliance	15%	15%	Easily quantifiable; well-documented; reliable sources
Alternatives	25%	20%	Well-documented; reliable sources; but may overestimate capacity of alternative sectors to survive without fishery
Equity in entry to fishery	20%	20%	
Just management	30%	30%	Higher error limits to account for different perceptions of degree of co-management
Mitigation of habitat destruction	20%	20%	
Mitigation of ecosystem depletion	20%	30%	May underestimate extent of damage to ecosystem due to uncertainty
Illegal fishing	10%	40%	Difficult to quantify with high degree of accuracy
Discards and wastes	25%	30%	Difficult to quantify with high degree of accuracy

Notes:

1. *Assumed baseline error of 20%; adjusted upwards or downwards based on confidence in aggregate data.*
2. *Assumed symmetry of error; adjusted for asymmetry when data were thought to be either over- or under-estimated.*
3. *Rationale given when error differed from above assumptions.*

Appendices 3a-3c: Rapfish data, Aboriginal fisheries analyses

Appendix 3a: Rapfish data applied in the Aboriginal fisheries analyses

	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes	Protection	Food Fisheries	Traditional Design of Gear
Haida: Pre-Contact, Weirs All Spp	H-PC-WA	2.0	1.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	2.0	0.0
Haida: 1825, Weirs All Spp	H-1825-WA	2.0	1.0	2.0	4.0	2.0	1.0	0.0	0.0	0.0	2.0	0.0
Haida: 1876, Weirs, All Spp	H-1876-WA	2.0	1.0	2.0	4.0	1.0	1.0	0.0	0.0	1.0	2.0	0.0
Haida: 1925, Gillnet Commercial, Sockeye	H-1925-GS	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	2.0	2.0
Haida: 1925, Troll Commercial, Chinook, Pink	H-1925-LChP	1.0	0.0	0.0	0.0	1.0	1.0	0.0	1.0	0.0	2.0	1.0
Haida: 1925, Weir, All Spp	H-1925-WA	2.0	0.0	1.0	1.0	1.0	1.0	0.0	0.0	1.0	2.0	0.0
Haida: 1960, Weir, All Spp	H-1960-WA	2.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0
Haida: 1960, Seine Commercial, All Spp	H-1960-SA	0.0	1.0	0.0	1.0	1.0	1.0	1.0	2.0	0.0	0.0	2.0
Haida: 1960, Trawl Commercial, All Spp	H-1960-TwA	0.0	1.0	0.0	1.0	1.0	1.0	1.0	2.0	0.0	0.0	2.0
Haida: 1996, Troll Commercial, no chinook	H-1996-LA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	0.5	0.0	0.0	2.0
Haida: 1996, Gillnet Commercial, no chinook	H-1996-GA	0.0	0.0	0.5	1.0	3.0	3.0	1.0	1.0	0.0	1.0	2.0
Haida: 1996, Seine Commercial no chinook	H-1996-SA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	2.0	0.0	0.0	2.0
Babine: Pre-Contact, Weir, Sockeye	B-PC-WS	3.0	0.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	2.0	0.0
Babine: 1820, Weir, Sockeye	B-1820-WS	1.0	0.0	2.0	4.0	1.0	2.0	0.0	0.0	0.0	2.0	0.0
Babine: 1836, Weir, Sockeye	B-1836-WS	2.0	0.0	2.0	1.0	2.0	1.0	0.0	1.0	0.0	1.0	0.0
Babine: 1836, Weir, Chinook	B-1836-WCh	2.0	1.0	2.0	1.0	2.0	1.0	0.0	1.0	0.0	1.0	0.0
Babine: 1900, Gillnet Commercial, Sockeye	B-1900-GS	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0
Babine: 1900, Weir, Sockeye and Chinook	B-1900-WS	2.0	0.0	2.0	1.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0
Babine: 1950, Gillnet Commercial, sockeye, pink, chinook	B-1950-GS	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0
Babine: 1950, Weir, Sockeye, chinook	B-1950-WS	2.0	0.0	1.0	2.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0

	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes	Protection	Food Fisheries	Traditional Design of Gear
Babine: 1996, Troll, All	B-1996-LA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	0.5	0.0	0.0	2.0
Babine: 1996, Gillnet, All	B-1996-GA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	1.0	0.0	0.0	2.0
Babine: 1996, Seine, All	B-1996-SA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	2.0	0.0	0.0	2.0
Carrier: Pre-Contact, Weir, Sockeye	C-PC-WS	3.0	1.0	2.0	4.0	2.0	2.0	0.5	0.0	0.0	0.0	0.0
Carrier: Pre-Contact, Trap, Sockeye	C-PC-TS	3.0	1.0	2.0	4.0	2.0	2.0	0.5	0.0	0.0	0.0	0.0
Carrier: Pre-Contact, Harpoon, Sockeye	C-PC-HS	3.0	1.0	2.0	4.0	2.0	2.0	0.5	0.0	0.0	0.0	0.0
Carrier: 1850, Weir, Sockeye	C-1850-WS	3.0	1.0	2.0	4.0	2.0	2.0	0.5	0.0	0.0	0.0	0.0
Carrier: 1850, Trap, Sockeye	C-1850-TS	3.0	1.0	2.0	4.0	2.0	2.0	0.5	0.0	0.0	0.0	0.0
Carrier: 1850, Harpoon, Sockeye	C-1850-HS	3.0	1.0	2.0	4.0	2.0	2.0	0.5	0.0	0.0	0.0	0.0
Carrier: 1900, Weir, Sockeye, pink, chinook	C-1900-WA	3.0	1.0	1.0	2.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0
Carrier: 1900, Trap, Sockeye, pink, chinook	C-1900-TA	3.0	1.0	1.0	2.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0
Carrier: 1900, Harpoon, Sockeye, pink, chinook	C-1900-HA	3.0	1.0	1.0	2.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0
Carrier: 1900, Gillnet Commercial, sockeye	C-1900-GS	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0
Carrier: 1950, Gillnet Commercial, sockeye, pink, chinook	C-1950-GA	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0
Carrier: 1950, Weir, All spp	C-1950-WA	3.0	2.0	1.0	2.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0
Carrier: 1950, Trap, All spp	C-1950-TA	3.0	2.0	1.0	2.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0
Carrier: 1950. Harpoon, All spp	C-1950-HA	3.0	2.0	1.0	2.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0
Carrier: 1996, Troll, All	C-1996-LA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	0.5	0.0	0.0	2.0
Carrier: 1996, Gillnet, All	C-1996-GA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	1.0	0.0	0.0	2.0
Carrier: 1996, Seine, All	C-1996-SA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	2.0	0.0	0.0	2.0
Chilcotin: Pre-Contact, Weir, S P Ch	Ch-PC-WA	3.0	1.0	2.0	4.0	2.0	2.0	0.5	0.0	0.0	2.0	0.0
Chilcotin: Pre-Contact, Traps, S P Ch	Ch-PC-TA	3.0	1.0	2.0	4.0	2.0	2.0	0.5	0.0	0.0	2.0	0.0
Chilcotin: Pre-Contact, Spears, S P Ch	Ch-PC-HA	3.0	1.0	2.0	4.0	2.0	2.0	0.5	0.0	0.0	2.0	0.0
Chilcotin: 1850, Weir S P Ch	Ch-1850-WA	3.0	1.0	2.0	4.0	2.0	2.0	0.5	0.0	0.0	2.0	0.0

	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes	Protection	Food Fisheries	Traditional Design of Gear
Chilcotin: 1850, Traps, S P Ch	Ch-1850-TA	3.0	1.0	2.0	4.0	2.0	2.0	0.5	0.0	0.0	2.0	0.0
Chilcotin: 1850, Spears, S P Ch	Ch-1850-HA	3.0	1.0	2.0	4.0	2.0	2.0	0.5	0.0	0.0	2.0	0.0
Chilcotin: 1900, Weir, S P Ch	Ch-1900-WA	3.0	1.0	2.0	3.0	1.0	1.0	0.5	0.0	1.0	2.0	0.0
Chilcotin: 1900, Traps, S P Ch	Ch-1900-TA	3.0	1.0	2.0	3.0	1.0	1.0	0.5	0.0	1.0	2.0	0.0
Chilcotin: 1900, Spears, S P Ch	Ch-1900-SA	3.0	1.0	2.0	3.0	1.0	1.0	0.5	0.0	1.0	2.0	0.0
Chilcotin: 1900, Gillnet Commercial, Sockeye	Ch-1900-GS	0.0	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0
Chilcotin: 1950, Gillnet Commercial, S P Ch	Ch-1950-GA	0.0	1.0	0.0	0.0	3.0	3.0	0.0	1.0	1.0	0.0	0.0
Chilcotin: 1950, Weir, S Ch	Ch-1950-WS	3.0	1.0	1.0	3.0	3.0	3.0	0.0	0.0	0.0	2.0	0.0
Chilcotin: 1950, Traps, S Ch	Ch-1950-TS	3.0	1.0	1.0	3.0	3.0	3.0	0.0	0.0	0.0	2.0	0.0
Chilcotin: 1950, Spears, S Ch	Ch-1950-HS	3.0	1.0	1.0	3.0	3.0	3.0	0.0	0.0	0.0	2.0	0.0
Chilcotin: 1996, Troll, all	Ch-1996-LA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	0.5	0.0	0.0	2.0
Chilcotin: 1996, Gillnet, all	Ch-1996-GA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	1.0	0.0	0.0	2.0
Chilcotin: 1996, Seine, all	Ch-1996-SA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	2.0	0.0	0.0	2.0
Tsimshian: Pre-Contact, Gillnet, Sockeye	T-PC-GS	3.0	0.5	2.0	4.0	2.0	2.0	0.0	1.0	0.0	2.0	0.0
Tsimshian: Pre-Contact, Traps, Sockeye	T-PC-TS	3.0	0.5	2.0	4.0	2.0	2.0	0.0	0.0	0.0	2.0	0.0
Tsimshian: Pre-Contact, Dipnets, Sockeye	T-PC-DS	3.0	0.5	2.0	4.0	2.0	2.0	0.0	0.0	0.0	2.0	0.0
Tsimshian: Pre-Contact, Harpoons, Sockeye	T-PC-HS	3.0	0.5	2.0	4.0	2.0	2.0	0.0	0.0	0.0	2.0	0.0
Tsimshian: 1850, Gillnet, Sockeye	T-1850-GS	3.0	1.0	2.0	4.0	2.0	2.0	0.0	1.0	0.0	2.0	0.0
Tsimshian: 1850, Traps, Sockeye	T-1850-TS	3.0	1.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	2.0	0.0
Tsimshian: 1850, Dipnets, Sockeye	T-1850-DS	3.0	1.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	2.0	0.0
Tsimshian: 1850, Harpoons, Sockeye	T-1850-HS	3.0	1.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	2.0	0.0
Tsimshian: 1900, Gillnet, Sockeye	T-1900-GS	0.0	1.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0
Tsimshian: 1900, Traps, Sockeye	T-1900-TS	3.0	1.0	1.0	3.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0
Tsimshian: 1900, Dipnets, Sockeye	T-1900-DS	3.0	1.0	1.0	3.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0
Tsimshian: 1900, Harpoons, Sockeye	T-1900-HS	3.0	1.0	1.0	3.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0

	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes	Protection	Food Fisheries	Traditional Design of Gear
Tsimshian: 1950, Gillnets S, P, Ch	T-1950-GA	0.0	1.0	0.0	1.0	3.0	3.0	0.0	1.0	0.0	1.0	0.0
Tsimshian: 1996, troll, all	T-1996-LA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	0.5	0.0	0.0	2.0
Tsimshian: 1996, gillnet, all	T-1996-GA	0.0	0.0	0.5	1.0	3.0	3.0	1.0	1.0	0.0	1.0	2.0
Tsimshian: 1996, Seine, all	T-1996-SA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	2.0	0.0	0.0	2.0
Kwakiutl: Pre-Contact, Chinook, Weirs	K-PC-WCh	3.0	2.0	2.0	3.0	2.0	2.0	1.0	0.0	0.0	2.0	0.0
Kwakiutl: Pre-Contact, Chinook, Traps	K-PC-TCh	3.0	2.0	2.0	3.0	2.0	2.0	1.0	0.0	0.0	2.0	0.0
Kwakiutl: Pre-Contact, Chinook, gillnets	K-PC-GCh	3.0	2.0	2.0	3.0	2.0	2.0	1.0	1.0	0.0	2.0	0.0
Kwakiutl: 1900, Gill Net, Sockeye, Comm	K-1900-GS	0.0	1.0	0.0	0.0	1.0	1.0	0.0	1.0	0.0	0.0	0.0
Kwakiutl: 1900, Weirs, Chinook	K-1900-WCh	3.0	2.0	2.0	3.0	1.0	2.0	1.0	0.0	0.0	2.0	0.0
Kwakiutl: 1900, Traps, Chinook	K-1900-TCh	3.0	2.0	2.0	3.0	1.0	2.0	1.0	0.0	0.0	2.0	0.0
Kwakiutl: 1900, gillnets, Chinook	K-1900-Ch	3.0	2.0	2.0	3.0	1.0	2.0	1.0	1.0	0.0	2.0	0.0
Kwakiutl: 1962, Gill Net, Chinook, food	K-1962-GCh	2.0	1.0	1.0	2.0	3.0	3.0	0.0	1.0	0.0	2.0	1.0
Kwakiutl: 1962, Troll, Chinook	K-1962-SA	0.0	1.0	0.0	0.0	3.0	3.0	0.0	1.0	0.0	0.0	2.0
Kwakiutl: 1962, Gill Net, All Spp, commercial	K-1962-GA	0.0	1.0	0.0	0.0	3.0	3.0	1.0	1.0	0.0	0.0	1.0
Kwakiutl: 1996, Troll, All	K-1996-LA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	0.5	0.0	0.0	2.0
Kwakiutl: 1996, Gillnet, All	K-1996-GA	0.0	0.0	0.5	1.0	3.0	3.0	1.0	1.0	0.0	1.0	2.0
Kwakiutl: 1996, Seine, All	K-1996-SA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	2.0	0.0	0.0	2.0
Lower Stalo: Pre-Contact, All spp, Traps	LS-PC-TA	2.0	1.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	1.5	0.0
Lower Stalo: Pre-Contact, All spp, Weirs	LS-PC-WA	2.0	1.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	1.5	0.0
Lower Stalo: Pre-Contact, All spp, Dipnet	LS-PC-DA	2.0	1.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	1.5	0.0
Lower Stalo: Pre-contact, All spp, reefnet	LS-PC-RA	2.0	1.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	1.5	0.0
Lower Stalo: Pre-contact, all spp, harpoon	LS-PC-HA	2.0	1.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	1.5	0.0
Lower Stalo: 1900, Weirs, all spp	LS-1900-WA	2.0	1.0	1.0	2.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0
Lower Stalo: 1900, Traps, all spp	LS-1900-TA	2.0	1.0	1.0	2.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0
Lower Stalo: 1900, Gillnet, Sockeye	LS-1900-GS	1.0	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0

	Abbreviation	Adjacency & Reliance	Alternatives	Equity in Entry	Just Management	Mitigation, Habitat Destruction	Mitigation, Ecosystem Depletion	Illegal Fishing	Discards & wastes	Protection	Food Fisheries	Traditional Design of Gear
Lower Stalo: 1950, Gillnet All spp	LS-1950-GA	1.0	0.0	0.0	1.0	3.0	3.0	0.0	1.0	0.0	0.0	1.0
Lower Stalo: 1950, Weirs, all spp	LS-1950-WA	2.0	1.0	1.0	2.0	3.0	3.0	0.0	0.0	0.0	2.0	0.0
Lower Stalo: 1950, Traps, all spp	LS-1950-TA	2.0	1.0	1.0	2.0	3.0	3.0	0.0	0.0	0.0	2.0	0.0
Lower Stalo: 1996, Troll, All	LS-1996-LA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	0.5	0.0	0.0	2.0
Lower Stalo: 1996, Gillnet, All	LS-1996-GA	0.0	0.0	0.5	1.0	3.0	3.0	1.0	1.0	0.0	1.0	2.0
Lower Stalo: 1996, Seine, All	LS-1996-SA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	2.0	0.0	0.0	2.0
Upper Stalo: Pre-Contact, Dipnets, S Ch	US-PC-DS	3.0	0.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	1.5	0.0
Upper Stalo: Pre-Contact, Weir, All	US-PC-WA	3.0	0.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	1.5	0.0
Upper Stalo: Pre-Contact, Harpoon, Ch	US-PC-HCh	3.0	0.0	2.0	4.0	2.0	2.0	0.0	0.0	0.0	1.5	0.0
Upper Stalo: 1900, Gillnet, S Ch	US-1900-GA	3.0	0.0	1.0	4.0	1.0	1.0	0.0	1.0	0.0	2.0	0.0
Upper Stalo: 1900, Weir, All	US-1900-WA	3.0	0.0	1.0	4.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0
Upper Stalo: 1900, Harpoon, Ch	US-1900-HCh	3.0	0.0	1.0	4.0	1.0	1.0	0.0	0.0	0.0	2.0	0.0
Upper Stalo: 1900, Gillnet, Sockeye Comm	US-1900-GS	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	0.5
Upper Stalo: 1950, Gillnet, S Ch	US-1950-GA	3.0	0.0	1.0	3.0	3.0	3.0	0.0	0.0	0.0	2.0	0.0
Upper Stalo: 1950, Weir, All	US-1950-WA	3.0	0.0	1.0	3.0	3.0	3.0	0.0	0.0	0.0	2.0	0.0
Upper Stalo: 1950, Harpoon, Ch	US-1950-HCh	3.0	0.0	1.0	3.0	3.0	3.0	0.0	0.0	0.0	2.0	0.0
Upper Stalo: 1950 Gillnet, S P Ch Comm	US-1950-GS	0.0	0.0	0.0	1.0	3.0	3.0	0.0	1.0	0.0	0.0	1.0
Upper Stalo: 1996, Troll, All	US-1996-LA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	0.5	0.0	0.0	2.0
Upper Stalo: 1996, Gillnet, All	US-1996-GA	0.0	0.0	0.5	1.0	3.0	3.0	1.0	1.0	0.0	1.0	2.0
Upper Stalo: 1996, Seine, All	US-1996-SA	0.0	0.0	0.0	1.0	3.0	3.0	1.0	2.0	0.0	0.0	2.0
GOOD	**Good**	**3.0**	**2.0**	**2.0**	**4.0**	**4.0**	**4.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
BAD	**Bad**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.0**	**2.0**	**1.0**	**2.0**	**2.0**

Appendix 3b: Error values applied in the Aboriginal fisheries analyses

Attribute	E_{min}	E_{max}	Rationale
Adjacency and reliance	20%	20%	Easily quantifiable; well-documented; reliable sources
Alternatives	25%	25%	
Equity in entry to fishery	20%	20%	Well-documented
Just management	30%	30%	Higher error limits to account for different perceptions of degree of co-management
Mitigation of habitat destruction	30%	30%	Higher error limits to account for varying quality of data through all time periods
Mitigation of ecosystem depletion	35%	30%	Higher error limits to account for varying quality of data through all time periods; may underestimate extent of damage to ecosystem due to uncertainty
Illegal fishing	20%	35%	
Discards and wastes	25%	25%	
Protection	30%	20%	Well-documented; but may overestimate force of agreements
Food Fisheries	25%	25%	
Traditional design of gear	20%	20%	Well-documented

Notes:

1. *Assumed baseline error of 25%; adjusted upwards or downwards based on confidence in aggregate data.*
2. *Assumed symmetry of error; adjusted for asymmetry when data were thought to be either over- or under-estimated.*
3. *Rationale given when error differed from above assumptions.*

Appendix 3c: Table of Rapfish results, British Columbia Aboriginal salmon fisheries

Overall Ordination		Creative Justice[1]		Distributive Justice		Ecosystem Justice		Productive Justice		Restorative Justice	
Rank	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*
US-PC-HCh	77	B-PC-WS	100	B-PC-WS	91	US-1950-HCh	80	US-1950-HCh	83	US-1950-HCh	78
US-PC-WA	77	C-PC-WS	100	T-1850-HS	91	US-1950-WA	80	US-1950-WA	83	US-1950-WA	78
US-PC-DS	77	C-PC-TS	100	T-1850-DS	91	US-1950-GA	80	US-1950-GA	83	US-1950-GA	78
B-PC-WS	77	C-PC-HS	100	T-1850-TS	91	Ch-1950-HS	78	LS-1950-TA	83	LS-1950-TA	78
T-1850-HS	76	C-1850-WS	100	US-PC-HCh	90	Ch-1950-TS	78	LS-1950-WA	83	LS-1950-WA	78
T-1850-DS	76	C-1850-TS	100	US-PC-WA	90	Ch-1950-WS	78	Ch-1950-HS	83	Ch-1950-HS	76
T-1850-TS	76	C-1850-HS	100	US-PC-DS	90	US-PC-HCh	78	Ch-1950-TS	83	Ch-1950-TS	76
T-PC-HS	76	Ch-PC-WA	100	T-PC-HS	90	US-PC-WA	78	Ch-1950-WS	83	Ch-1950-WS	76
T-PC-DS	76	Ch-PC-TA	100	T-PC-DS	90	US-PC-DS	78	T-1950-GA	76	T-1950-GA	70
T-PC-TS	76	Ch-PC-HA	100	T-PC-TS	90	US-1900-HCh	76	Ch-1950-GA	76	Ch-1950-GA	70
US-1950-HCh	76	Ch-1850-WA	100	H-1825-WA	87	US-1900-WA	76	US-PC-HCh	71	LS-PC-HA	67
US-1950-WA	76	Ch-1850-TA	100	H-PC-WA	87	LS-PC-HA	72	US-PC-WA	71	LS-PC-RA	67
US-1950-GA	76	Ch-1850-HA	100	LS-PC-HA	85	LS-PC-RA	72	US-PC-DS	71	LS-PC-DA	67
Ch-1950-HS	76	T-PC-GS	100	LS-PC-RA	85	LS-PC-DA	72	LS-PC-HA	71	LS-PC-WA	67
Ch-1950-TS	76	T-PC-TS	100	LS-PC-DA	85	LS-PC-WA	72	LS-PC-RA	71	LS-PC-TA	67
Ch-1950-WS	76	T-PC-DS	100	LS-PC-WA	85	LS-PC-TA	72	LS-PC-DA	71	US-1950-GS	66
LS-PC-HA	74	T-PC-HS	100	LS-PC-TA	85	B-PC-WS	72	LS-PC-WA	71	LS-1950-GA	66
LS-PC-RA	74	T-1850-GS	100	US-1900-HCh	84	K-PC-TCh	72	LS-PC-TA	71	H-PC-WA	66
LS-PC-DA	74	T-1850-TS	100	US-1900-WA	84	K-PC-WCh	72	T-1850-HS	71	T-1850-HS	66
LS-PC-WA	74	T-1850-DS	100	C-1950-HA	84	C-1850-HS	72	T-1850-DS	71	T-1850-DS	66
LS-PC-TA	74	T-1850-HS	100	C-1950-WA	84	C-1850-TS	72	T-1850-TS	71	T-1850-TS	66
H-PC-WA	74	US-PC-DS	100	C-1950-TA	84	C-1850-WS	72	T-PC-HS	71	C-1950-TA	66
C-1850-HS	73	US-PC-WA	100	Ch-1850-HA	84	C-PC-HS	72	T-PC-DS	71	C-1950-WA	66
C-1850-TS	73	US-PC-HCh	100	Ch-1850-TA	84	C-PC-TS	72	T-PC-TS	71	C-1950-HA	66
C-1850-WS	73	Ch-1900-WA	92	Ch-1850-WA	84	C-PC-WS	72	B-PC-WS	71	K-1962-SA	66
C-PC-HS	73	Ch-1900-TA	92	Ch-PC-HA	84	Ch-1850-HA	72	H-PC-WA	71	US-PC-HCh	66
C-PC-TS	73	Ch-1900-SA	92	Ch-PC-TA	84	Ch-1850-TA	72	K-1962-SA	71	US-PC-WA	66
C-PC-WS	73	K-PC-WCh	92	Ch-PC-WA	84	Ch-1850-WA	72	US-1950-GS	70	US-PC-DS	66
H-1825-WA	72	K-PC-TCh	92	B-1820-WS	84	Ch-PC-HA	72	LS-1950-GA	70	K-1962-GCh	65
Ch-1850-HA	71	K-PC-GCh	92	C-1850-HS	83	Ch-PC-TA	72	K-1962-GCh	70	T-PC-HS	64
Ch-1850-TA	71	K-1900-WCh	92	C-1850-TS	83	Ch-PC-WA	72	B-1820-WS	68	T-PC-DS	64
Ch-1850-WA	71	K-1900-TCh	92	C-1850-WS	83	T-1850-HS	72	H-1825-WA	66	T-PC-TS	64
Ch-PC-HA	71	K-1900-Ch	92	C-PC-HS	83	T-1850-DS	72	T-1850-GS	64	B-PC-WS	64
Ch-PC-TA	71	H-PC-WA	89	C-PC-TS	83	T-1850-TS	72	T-PC-GS	64	K-PC-TCh	62
Ch-PC-WA	71	H-1825-WA	89	C-PC-WS	83	T-PC-HS	72	Ch-1850-HA	63	K-PC-WCh	62
B-1820-WS	71	H-1876-WA	89	K-1900-WCh	82	T-PC-DS	72	Ch-1850-TA	63	H-1825-WA	62
K-PC-TCh	70	LS-PC-TA	89	K-1900-TCh	82	T-PC-TS	72	Ch-1850-WA	63	Ch-1850-HA	60
K-PC-WCh	70	LS-PC-WA	89	K-PC-TCh	82	K-1900-TCh	72	Ch-PC-HA	63	Ch-1850-TA	60
LS-1950-TA	70	LS-PC-DA	89	K-PC-WCh	82	K-1900-WCh	72	Ch-PC-TA	63	Ch-1850-WA	60
LS-1950-WA	70	LS-PC-RA	89	H-1876-WA	82	LS-1950-TA	71	Ch-PC-WA	63	Ch-PC-HA	60
T-1850-GS	69	LS-PC-HA	89	T-1850-GS	81	LS-1950-WA	71	C-1850-HS	63	Ch-PC-TA	60
T-PC-GS	69	US-1900-GA	83	T-PC-GS	80	H-PC-WA	68	C-1850-TS	63	Ch-PC-WA	60
US-1900-HCh	68	US-1900-WA	83	US-1950-HCh	78	H-1825-WA	65	C-1850-WS	63	C-1850-HS	60
US-1900-WA	68	US-1900-HCh	83	US-1950-WA	78	T-1850-GS	65	C-PC-HS	63	C-1850-TS	60
K-1900-TCh	68	B-1820-WS	78	US-1950-GA	78	T-PC-GS	65	C-PC-TS	63	C-1850-WS	60

Overall Ordination		Creative Justice[1]		Distributive Justice		Ecosystem Justice		Productive Justice		Restorative Justice	
Rank	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*
K-1900-WCh	68	Ch-1950-WS	75	Ch-1950-HS	78	K-PC-GCh	61	C-PC-WS	63	C-PC-HS	60
C-1950-HA	65	Ch-1950-TS	75	Ch-1950-TS	78	B-1820-WS	61	US-1900-HCh	63	C-PC-TS	60
C-1950-TA	65	Ch-1950-HS	75	Ch-1950-WS	78	US-1900-GA	61	US-1900-WA	63	C-PC-WS	60
C-1950-WA	65	T-1900-TS	75	T-1900-HS	78	H-1876-WA	60	LS-1900-TA	63	T-1850-GS	60
K-PC-GCh	63	T-1900-DS	75	T-1900-DS	78	K-1900-Ch	59	LS-1900-WA	63	B-1820-WS	59
T-1900-HS	63	T-1900-HS	75	T-1900-TS	78	T-1900-HS	59	T-1996-LA	63	US-1996-LA	59
T-1900-DS	63	US-1950-GA	75	B-1900-WS	74	T-1900-DS	59	Ch-1996-LA	63	LS-1996-LA	58
T-1900-TS	63	US-1950-WA	75	US-1900-GA	73	T-1900-TS	59	C-1996-LA	63	T-PC-GS	58
H-1876-WA	62	US-1950-HCh	75	Ch-1900-TA	73	Ch-1900-SA	59	B-1996-LA	63	K-1996-LA	58
K-1962-GCh	61	C-1900-WA	67	Ch-1900-SA	73	Ch-1900-TA	59	H-1996-LA	63	LS-1900-TA	58
K-1900-Ch	61	C-1900-TA	67	Ch-1900-WA	73	Ch-1900-WA	59	US-1996-LA	62	LS-1900-WA	58
T-1950-GA	60	C-1900-HA	67	K-1900-Ch	71	LS-1900-TA	58	T-1900-HS	62	K-1962-GA	57
B-1900-WS	60	C-1950-WA	67	K-PC-GCh	71	LS-1900-WA	58	T-1900-DS	62	T-1900-HS	57
LS-1900-TA	58	C-1950-TA	67	LS-1900-TA	70	K-1962-GCh	58	T-1900-TS	62	T-1900-DS	57
LS-1900-WA	58	C-1950-HA	67	LS-1900-WA	70	T-1950-GA	57	LS-1996-LA	62	T-1900-TS	57
US-1900-GA	58	B-1836-WS	64	LS-1950-TA	70	C-1950-HA	55	C-1950-HA	62	H-1960-WA	57
LS-1950-GA	58	B-1836-WCh	64	LS-1950-WA	70	C-1950-TA	55	C-1950-TA	62	C-1900-HA	57
US-1950-GS	57	B-1900-WS	64	B-1950-WS	69	C-1950-WA	55	C-1950-WA	62	C-1900-TA	57
B-1836-WCh	57	B-1950-WS	56	H-1960-WA	68	C-1900-HA	55	C-1900-HA	62	C-1900-WA	57
Ch-1900-SA	57	K-1962-GCh	56	C-1900-WA	66	C-1900-TA	55	C-1900-TA	62	H-1876-WA	57
Ch-1900-TA	57	LS-1900-WA	56	C-1900-HA	66	C-1900-WA	55	C-1900-WA	62	T-1996-LA	57
Ch-1900-WA	57	LS-1900-TA	56	C-1900-TA	66	LS-1950-GA	54	B-1950-WS	62	Ch-1996-LA	57
B-1950-WS	57	LS-1950-WA	56	B-1836-WCh	64	T-1996-LA	53	B-1900-WS	61	C-1996-LA	57
H-1960-WA	56	LS-1950-TA	56	B-1836-WS	62	Ch-1996-LA	53	K-1996-LA	61	B-1996-LA	57
B-1836-WS	56	H-1925-WA	47	K-1962-GCh	61	C-1996-LA	53	H-1960-WA	61	H-1996-LA	57
C-1900-HA	55	H-1960-WA	47	H-1925-WA	56	H-1996-LA	53	H-1925-WA	61	K-1900-WCh	57
C-1900-TA	55	LS-1950-GA	19	LS-1950-GA	53	B-1996-LA	53	H-1876-WA	61	K-1900-TCh	57
C-1900-WA	55	H-1996-GA	17	T-1950-GA	53	B-1950-WS	52	T-1996-GA	60	US-1900-HCh	56
K-1962-SA	54	T-1996-GA	17	US-1950-GS	52	Ch-1950-GA	52	Ch-1996-GA	60	US-1900-WA	56
Ch-1950-GA	52	K-1996-GA	17	H-1925-GS	50	US-1950-GS	51	C-1996-GA	60	B-1836-WCh	55
K-1996-LA	51	LS-1996-GA	17	K-1962-SA	49	H-1960-WA	49	B-1996-GA	60	US-1996-GA	55
LS-1996-LA	51	US-1996-GA	17	K-1900-GS	49	H-1925-WA	49	H-1996-GA	60	LS-1996-GA	55
US-1996-LA	51	H-1925-LChP	11	H-1925-LChP	48	US-1996-LA	49	K-1962-GA	59	K-1996-GA	55
H-1996-LA	51	LS-1900-GS	11	US-1996-LA	48	T-1996-GA	49	K-PC-TCh	59	T-1996-GA	54
B-1996-LA	51	H-1925-GS	8	LS-1996-LA	48	B-1900-WS	49	K-PC-WCh	59	Ch-1996-GA	54
C-1996-LA	51	H-1960-SA	8	K-1996-LA	47	Ch-1996-GA	49	US-1996-GA	59	C-1996-GA	54
Ch-1996-LA	51	H-1960-TwA	8	US-1996-GA	47	LS-1996-LA	49	B-1836-WCh	59	H-1996-GA	54
T-1996-LA	51	H-1996-LA	8	LS-1996-GA	47	K-1996-LA	49	B-1836-WS	59	B-1996-GA	54
K-1962-GA	49	H-1996-SA	8	K-1996-GA	47	B-1836-WS	49	LS-1996-GA	59	K-PC-GCh	53
US-1996-GA	49	B-1900-GS	8	T-1996-GA	45	B-1836-WCh	49	K-1996-GA	58	B-1950-WS	53
LS-1996-GA	49	B-1950-GS	8	T-1996-LA	45	C-1996-GA	49	K-1900-TCh	56	B-1900-WS	53
K-1996-GA	49	B-1996-LA	8	Ch-1996-LA	45	H-1996-GA	49	K-1900-WCh	56	H-1925-WA	53
H-1996-GA	48	B-1996-GA	8	H-1996-GA	45	B-1996-GA	49	T-1996-SA	55	Ch-1900-SA	52
T-1996-GA	48	B-1996-SA	8	C-1996-LA	45	K-1962-GA	47	Ch-1996-SA	55	Ch-1900-TA	52

Overall Ordination		Creative Justice[1]		Distributive Justice		Ecosystem Justice		Productive Justice		Restorative Justice	
Rank	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*	*Rank*	*%*
B-1996-GA	47	C-1900-GS	8	B-1996-LA	45	US-1996-GA	43	US-1900-GA	55	Ch-1900-WA	52
C-1996-GA	47	C-1950-GA	8	H-1996-LA	45	LS-1996-GA	42	T-1900-GS	55	B-1836-WS	52
Ch-1996-GA	47	C-1996-LA	8	Ch-1996-GA	41	K-1996-GA	42	LS-1900-GS	55	T-1900-GS	51
K-1900-GS	46	C-1996-GA	8	C-1996-GA	41	T-1996-SA	41	C-1996-SA	55	K-1900-GS	50
H-1925-WA	44	C-1996-SA	8	C-1900-GS	41	US-1900-GS	41	B-1996-SA	55	US-1996-SA	49
H-1925-LChP	40	Ch-1996-LA	8	B-1996-GA	41	Ch-1996-SA	40	K-1900-GS	55	US-1900-GA	49
C-1900-GS	40	Ch-1996-GA	8	B-1900-GS	41	LS-1900-GS	40	Ch-1900-SA	55	LS-1900-GS	49
B-1900-GS	40	Ch-1996-SA	8	K-1962-GA	39	C-1996-SA	40	Ch-1900-TA	55	LS-1996-SA	49
H-1996-SA	39	T-1950-GA	8	US-1996-SA	32	H-1996-SA	40	Ch-1900-WA	55	K-1900-Ch	48
B-1996-SA	39	T-1996-LA	8	LS-1996-SA	32	B-1996-SA	40	H-1996-SA	55	K-1996-SA	48
C-1996-SA	39	T-1996-SA	8	US-1900-GS	31	C-1900-GS	38	Ch-1900-GS	55	T-1996-SA	48
Ch-1996-SA	39	K-1996-LA	8	K-1996-SA	31	C-1950-GA	38	K-PC-GCh	54	US-1900-GS	48
T-1996-SA	39	K-1996-SA	8	T-1900-GS	31	B-1950-GS	38	US-1900-GS	54	Ch-1996-SA	47
US-1996-SA	39	LS-1996-LA	8	H-1960-TwA	31	B-1900-GS	38	US-1996-SA	53	Ch-1900-GS	47
LS-1996-SA	39	LS-1996-SA	8	H-1960-SA	31	K-1962-SA	37	LS-1996-SA	53	C-1996-SA	47
K-1996-SA	38	US-1900-GS	8	Ch-1950-GA	30	K-1900-GS	36	H-1925-LChP	53	H-1996-SA	47
H-1925-GS	38	US-1950-GS	8	Ch-1900-GS	29	H-1925-LChP	36	K-1996-SA	53	B-1996-SA	47
US-1900-GS	35	US-1996-LA	8	T-1996-SA	29	T-1900-GS	33	K-1900-Ch	51	H-1925-LChP	45
T-1900-GS	35	US-1996-SA	8	Ch-1996-SA	29	Ch-1900-GS	33	H-1925-GS	49	C-1900-GS	41
LS-1900-GS	34	Ch-1900-GS	0	C-1996-SA	29	H-1925-GS	31	C-1900-GS	47	C-1950-GA	41
Ch-1900-GS	34	Ch-1950-GA	0	B-1996-SA	29	US-1996-SA	27	C-1950-GA	47	B-1950-GS	40
C-1950-GA	31	T-1900-GS	0	H-1996-SA	29	LS-1996-SA	26	B-1950-GS	46	B-1900-GS	40
B-1950-GS	31	K-1900-GS	0	LS-1900-GS	29	K-1996-SA	26	B-1900-GS	46	H-1925-GS	40
H-1960-TwA	29	K-1962-SA	0	C-1950-GA	27	H-1960-SA	21	H-1960-SA	33	H-1960-SA	33
H-1960-SA	29	K-1962-GA	0	B-1950-GS	27	H-1960-TwA	21	H-1960-TwA	33	H-1960-TwA	33

Note:

1. *Creative Justice values obtained through normalisation and averaging of Rapfish scores, rather than full Rapfish assessment.*

Appendices 4a-b: Sources of Rapfish data

Appendix 4a: Sources of data for Rapfish Ethical analyses of Canadian marine fisheries

Fishery	Abbreviation	Location	Time Period	Source(s)
Caplin	Cap	Newfoundland	Mid-1990s	J. Carscadden; M. Morris; B. Neis; R. Ommer
Crab (Snow)	SnwCb	Atlantic region	Mid-1990s	B. Neis; R. Ommer; J. Tremblay; Taylor and O'Keefe (1997)
Crab (Snow), Area 19	SnCb19	Area 19, Cape Breton, Nova Scotia	Mid-1990s	B. Adams; R. Ommer; Canada (1998g)
Herring, Zone 4WX, Seine	BFunS	Bay of Fundy	Mid-1990s	R. Ommer
Herring, Zone 4WX, Weir	BFun W	Bay of Fundy	Mid-1990s	R. Ommer
Lobster	Lob	Atlantic region	Mid-1990s	R. Ommer; J. Tremblay; Canada (1995)
Lobster, Dingwall	LobDing	Dingwall, Nova Scotia	Mid-1990s	K. Fitzgerald; R. Ommer; Canada (1995)
Mackerel	MakAt	Atlantic region	Mid-1990s	F. Grégoire; R. Ommer
Mackerel, Dingwall	MakDin	Dingwall, Nova Scotia	Mid-1990s	K. Fitzgerald; R. Ommer
Northern Cod Sentinel Fishery, Gillnet	CodSnt	Newfoundland	Late 1990s-2001	J. Francis
Northern Cod (2J3KL), Gillnet	CodGil	Newfoundland	1991	R. Ommer
Northern Cod (2J3KL), Handlines	CodHan	Newfoundland	1991	R. Ommer
Northern Cod (2J3KL), Longlines	CodLon	Newfoundland	1991	R. Ommer
Northern Cod (2J3KL), Traps	CodTap	Newfoundland	1991	R. Ommer
Northern Cod (2J3KL), Trawls	CodTrw	Newfoundland	1991	R. Ommer
Northern Cod Inshore	CodIn	Newfoundland	1991	R. Ommer
Northern Cod Offshore	CodOff	Newfoundland	1991	R. Ommer
Turbot	Turb	Newfoundland and Labrador	Late 1990s-2001	J. Francis
Scallops	SClp	Maritimes	Mid-1990s	G. Roberts; R. Ommer
Shrimp (northern)	NShp	Atlantic region	Mid-1990s	R. Ommer

Fishery	Abbreviation	Location	Time Period	Source(s)
Shrimp (northern), Eastern Scotian Shelf	NShpES	Eastern Scotian Shelf	Mid-1990s	P. Koeller; R. Ommer; (Canada, 1998c)
Groundfish trawl	Grnd97	British Columbia	Mid-1990s	A. Beattie
Halibut	PacHal	British Columbia	Mid-1990s	A. Beattie
Halibut, Hook and Line, Dixon/Hecate	DxHctHal	Dixon Entrance/Hecate Strait, British Columbia	Early-2000s	Anonymous Respondent #7
Halibut, Hook and Line, Area 2/3	2/3Hal	Areas 2 and 3, British Columbia	Early-2000s	Anonymous Respondent #8
Halibut, Hook and Line, N&S Coasts	N&Shal	British Columbia	Early-2000s	F. Husoy
Herring	PacHer	British Columbia	Mid-1990s	S. Mackinson; Canada (1998f)
Herring spawn-on-kelp	HerSpw	British Columbia	Mid-1990s	S. Mackinson; G. Thomas; Canada (1998e)
Lingcod	Ling89	Strait of Georgia, British Columbia	1989	S. Martell
Lingcod	Ling96	British Columbia	Mid-1990s	S. Martell
Salmon, Gillnet	SalGil	British Columbia	Mid-1990s	J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Seine	SalSen	British Columbia	Mid-1990s	J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Troll	SalTrol	British Columbia	Mid-1990s	C. McKee; J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Chinook, Gillnet	ChinGil	British Columbia	Mid-1990s	J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Chinook, Seine	ChiSen	British Columbia	Mid-1990s	J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Chinook, Troll	ChiTrol	British Columbia	Mid-1990s	C. McKee; J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Chum, Gillnet	CmGil	British Columbia	Mid-1990s	J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Chum, Seine	CmSen	British Columbia	Mid-1990s	J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Chum, Troll	CmTrol	British Columbia	Mid-1990s	C. McKee; J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)

Fishery	Abbreviation	Location	Time Period	Source(s)
Salmon, Coho, Gillnet	CohGil	British Columbia	Mid-1990s	J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Coho, Seine	CohSen	British Columbia	Mid-1990s	J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Coho, Troll	CohTrol	British Columbia	Mid-1990s	C. McKee; J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Pink, Gillnet	PkGil	British Columbia	Mid-1990s	J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Pink, Seine	PkSen	British Columbia	Mid-1990s	J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Pink, Troll	PkTrol	British Columbia	Mid-1990s	C. McKee; J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Sockeye, Gillnet	SokGil	British Columbia	Mid-1990s	J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Sockeye, Seine	SokSen	British Columbia	Mid-1990s	J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Sockeye, Troll	SokTrol	British Columbia	Mid-1990s	C. McKee; J. Sutcliffe; C. Young; Gislason et al. (1996a); BC Salmon Marketing Council Website (www.bcsalmon.ca)
Salmon, Inshore Gillnet, Northern BC	InshGil	Northern British Columbia	Early-2000s	Anonymous Respondent #16
Salmon, Gillnet, Skeena, #1	SknaGil1	Skeena River, British Columbia	Early-2000s	W. Thompson Sr.
Salmon, Gillnet, Skeena, #2	SknaGil2	Skeena River, British Columbia	Early-2000s	F. Hawkshaw
Salmon, Gillnet, Skeena, #3	SknaGil3	Skeena River, British Columbia	Early-2000s	R. Warren
Salmon, Gillnet, Skeena/Nass	SknaNsGil	Skeena and Nass Rivers, British Columbia	Early-2000s	Anonymous Respondent #40
Salmon, Gillnet, Hecate/Alaska	HecAkaGil	Hecate Strait, British Columbia, north to Alaska	Early-2000s	Anonymous Respondent #12
Eulachon Beach Seine	Eul	Kemano River, British Columbia	Early-2000s	J. Kelson
Crab trap QCI	QCICrb	Queen Charlotte Islands, British Columbia	Early-2000s	G. Best
Herring Gillnet, Northern BC	HerGil	North coast, British Columbia	Early-2000s	Anonymous Respondent #47

Fishery	Abbreviation	Location	Time Period	Source(s)
H&L Rockfish QCI	QCIRock	Queen Charlotte Islands, British Columbia	Early-2000s	Anonymous Respondent #45
Herring Seine	HerSen	British Columbia	Early-2000s	G. Blythe
Cod Trawl	BCCod	British Columbia	Early-2000s	A. Ritchie
Flatfish/Rockfish Trawl, Northern BC	FltRckTrw	North Coast, British Columbia	Early-2000s	L. Atchison
Urchin Diving	Urch	North Coast, British Columbia	Early-2000s	M. Miles

Personal Communications:

Name	Fishery/Fisheries	Affiliation[1]
Anonymous Respondent #7	Dixon Entrance/Hecate Strait halibut	Fisher
Anonymous Respondent #8	Areas 2/3 halibut	Fisher
Anonymous Respondent #12	Hecate/Alaska salmon gillnet	Fisher
Anonymous Respondent #16	Inshore salmon gillnet	Fisher
Anonymous Respondent #40	Skeena/Nass Rivers salmon gillnet	Fisher
Anonymous Respondent #45	Queen Charlotte Islands rockfish	Fisher
Anonymous Respondent #47	Herring gillnet	Fisher
Brian Adams	Area 19 snow crab	President, Area 19 Snow Crab Fisherman's Association
L. Atchison	North coast halibut trawl	Fisher
A. Beattie	BC groundfish trawl; Pacific halibut	Graduate student, UBC Fisheries Centre; former fishery observer
G. Best	Queen Charlotte Islands crab trap	Fisher
G. Blythe	Herring seine	Fishery
J. Carscadden	Caplin	DFO
K. Fitzgerald	Lobster; Mackerel	Fisher
J. Francis	Northern cod sentinel fishery; turbot	DFO Enforcement
F. Grégoire	Mackerel	DFO
F. Hawkshaw	Skeena River salmon gillnet #2	Fisher
F. Husoy	North and south coast halibut fishery	Retired Fisher
J. Kelson	Eulachon beach seine	Biologist
P. Koeller	Northern shrimp	DFO
S. Mackinson	Herring	Graduate student, UBC Fisheries Centre
S. Martell	Lingcod	Graduate student, UBC Fisheries Centre
C. McKee	Salmon trolls	Fisher
M. Miles	Urchin	Fisher
M. Morris	Caplin	Graduate student, Memorial University of

Name	Fishery/Fisheries	Affiliation[1]
		Newfoundland
B. Neis	Caplin; Snow crab	Memorial University of Newfoundland
R. Ommer	Caplin; Snow crab; Herring; Lobster; Mackerel; Northern cod; Scallops; Shrimp	Memorial University of Newfoundland and University of Victoria
A. Ritchie	BC cod trawl	Fisher
G. Robert	Scallops	DFO
J. Sutcliffe	BC salmon	United Fishermen and Allied Workers' Union
G. Thomas	Herring spawn-on-kelp	DFO
W. Thompson Sr.	Skeena River salmon gillnet #1	Fisher
J. Tremblay	Snow crab	DFO
R. Warren	Skeena River salmon gillnet #3	Fisher
C. Young	BC salmon	Fisher

Note:

1. Affiliation at time of consultation

Appendix 4b: Sources of data for Rapfish analyses of BC Aboriginal salmon fisheries

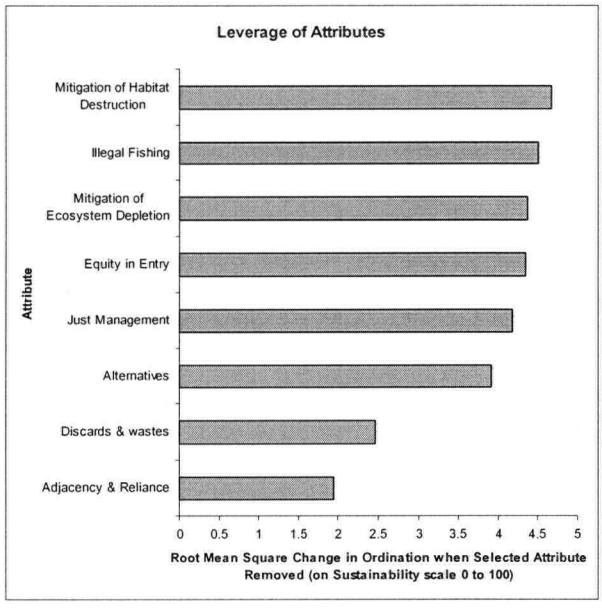
Nation	Sources
Haida	Argue et al. (1990); Dalzell (1968); Dawson (1882); Gislason et al. (1996a); Murdoch (1936); Newton (1973); Poole (1972); Ricker (1987); Shepard and Argue (1989); Stearns (1975); Van der Brink (1974); Wicks (1976)
Babine	Argue et al. (1990); Drucker (1963); Gislason et al. (1996a); Large (1996); Morice (1904); Shepard and Argue (1989); Skogan (1983); The ARA Consulting Group Inc. (1994); Wicks (1976)
Carrier	Argue et al. (1990); Drucker (1963); Gislason et al. (1996a); Large (1996); Morice (1904); Shepard and Argue (1989); Skogan (1983); The ARA Consulting Group Inc. (1994); Wicks (1976)
Chilcotin	Argue et al. (1990); Drucker (1963); Gislason et al. (1996a); Large (1996); Morice (1904); Ricker (1987); Shepard and Argue (1989); Skogan (1983); The ARA Consulting Group Inc. (1994); Wicks (1976)
Tsimshian	Argue et al. (1990); Drucker (1963); Gislason et al. (1996a); Large (1996); Morice (1904); Shepard and Argue (1989); Skogan (1983); The ARA Consulting Group Inc. (1994); Wicks (1976)
Kwaktiutl	Argue et al. (1990); Codere (1966); Gislason et al. (1996a); Goldman (1961); Hutchinson (1950); Kopas (1974); Mackie (1997); Madill (1981); Ricker (1987); Rohner and Rohner (1970); Shepard and Argue (1989); Spradley (1969)
Upper Stalo	Argue et al. (1990); Drucker (1963); Duff (1952); Gislason et al. (1996a); Hutchinson (1950); Mackie (1997); Madill (1981); Ricker (1987); Shepard and Argue (1989); Teit (1900)
Lower Stalo	Argue et al. (1990); Barnett (1955); Drucker (1963); Gislason et al. (1996a); Hutchinson (1950); Mackie (1997); Madill (1981); Ricker (1987); Shepard and Argue (1989)

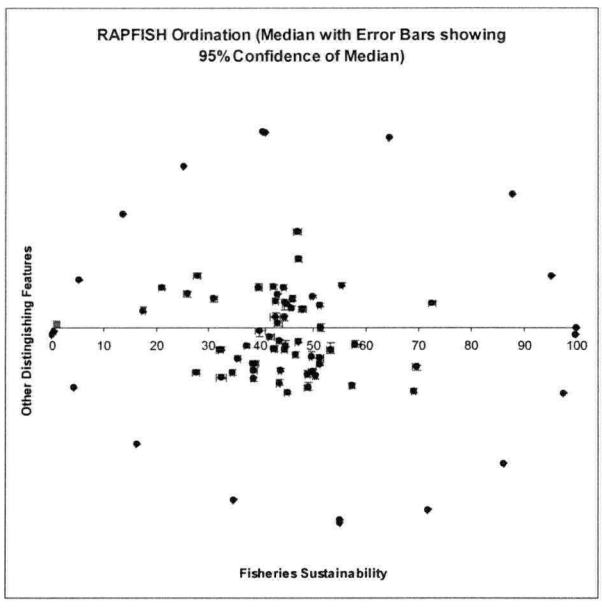
(Source: Skaret, 2000)

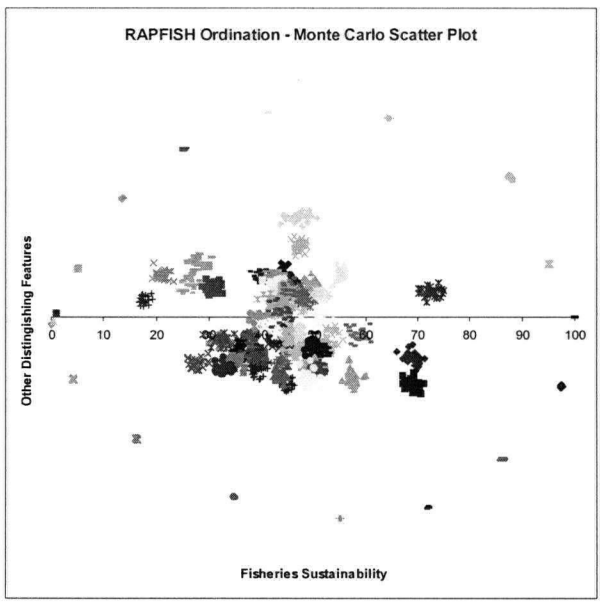
Appendices 5a-b: Rapfish Leverage and Monte Carlo graphs

Appendix 5a: Leverage and Monte Carlo, Rapfish assessment of Canadian Fisheries

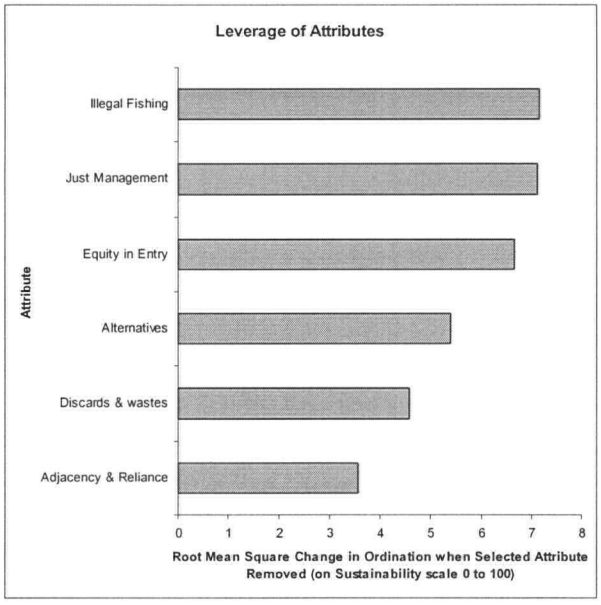
Ethical Ordination:

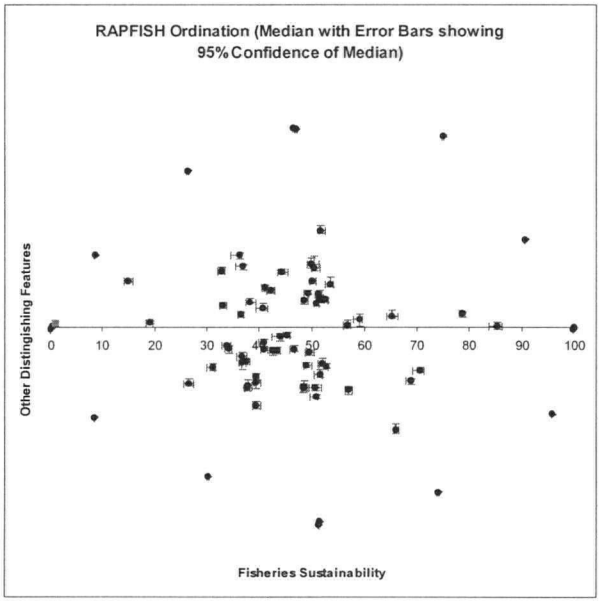


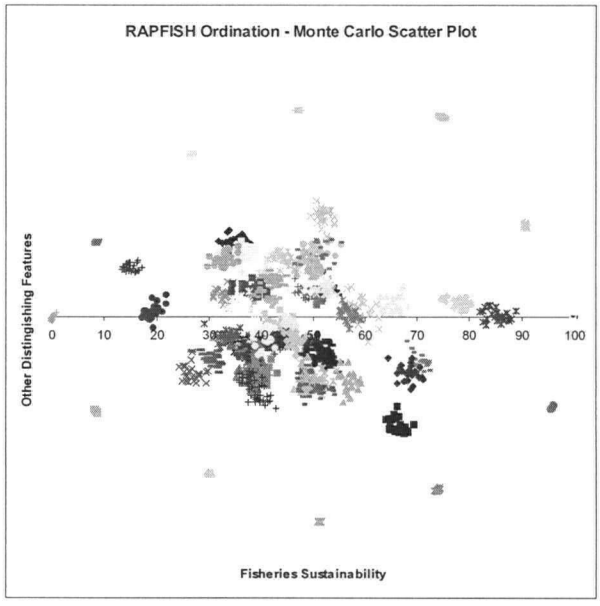




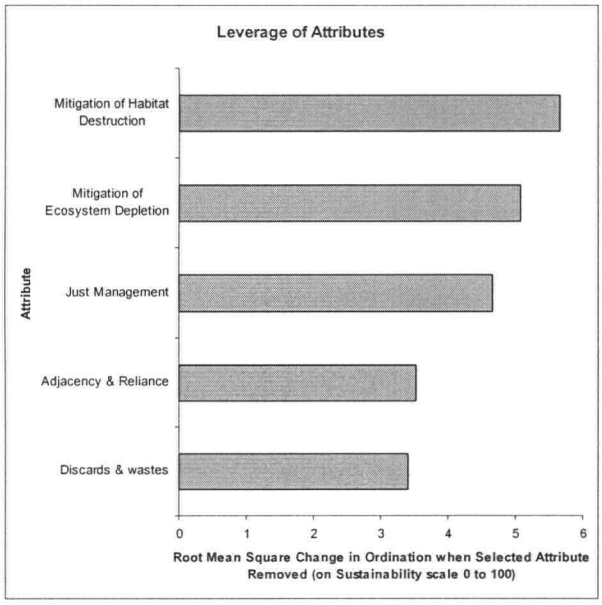
Distributive Justice

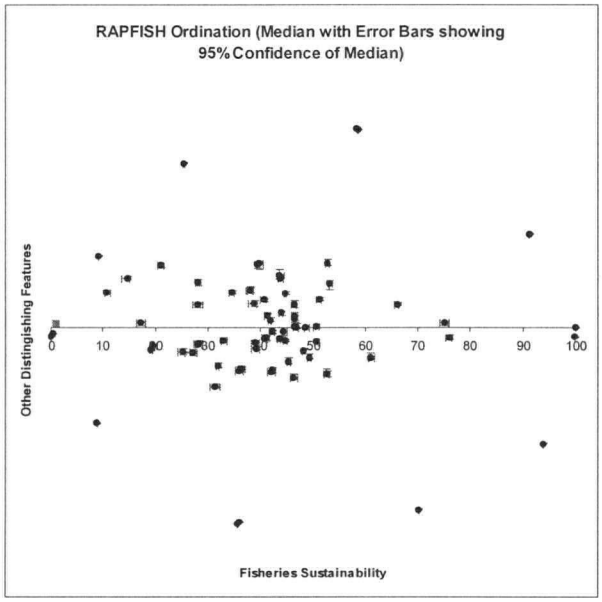


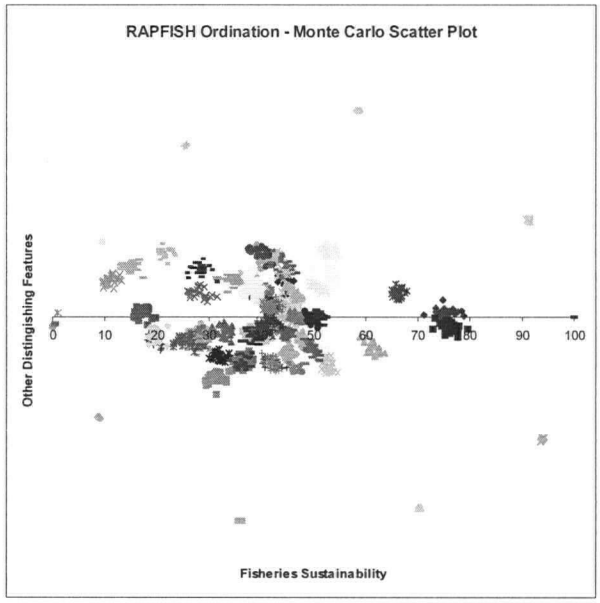




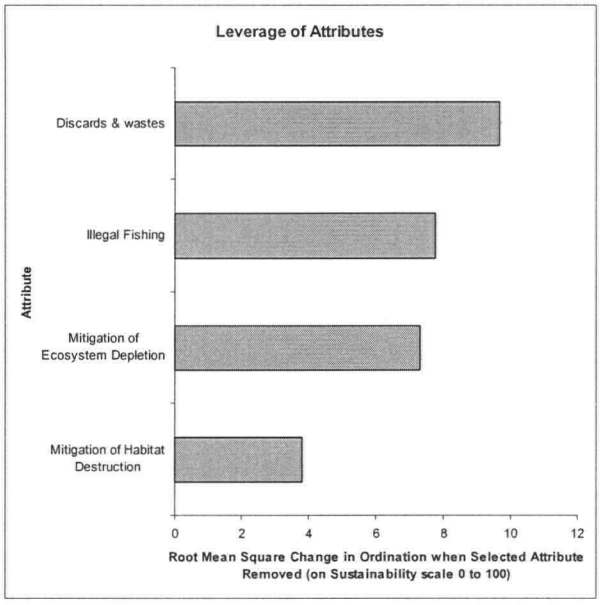
Ecosystem Justice

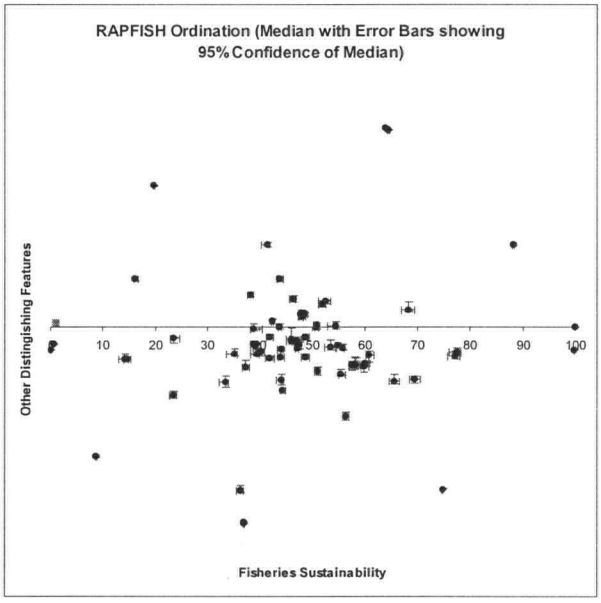


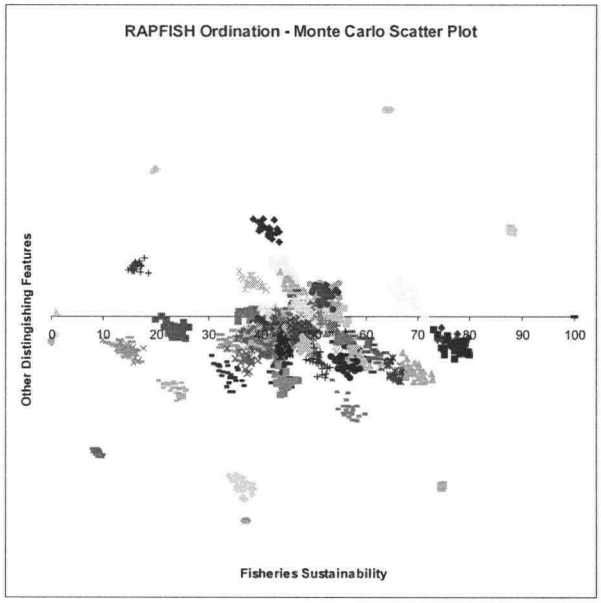




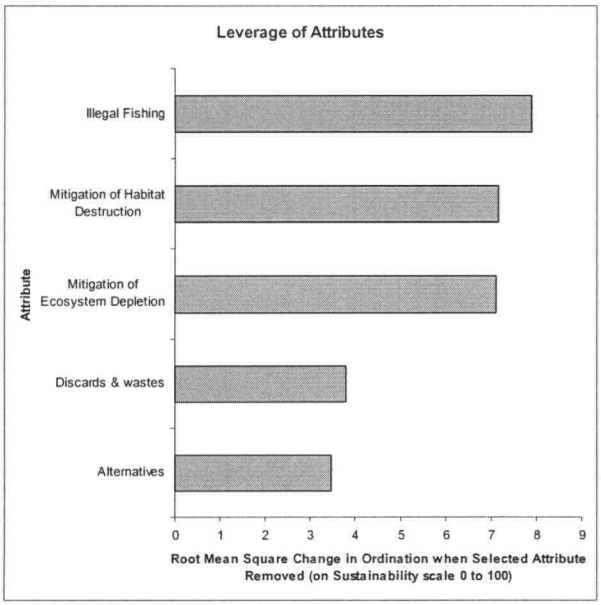
Productive Justice

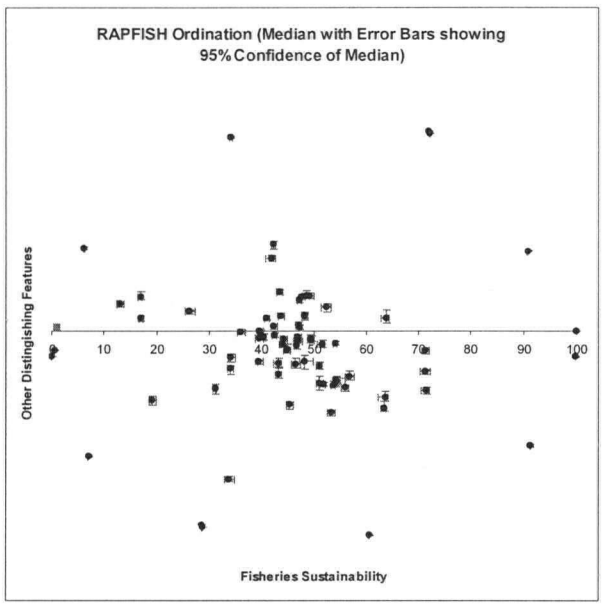


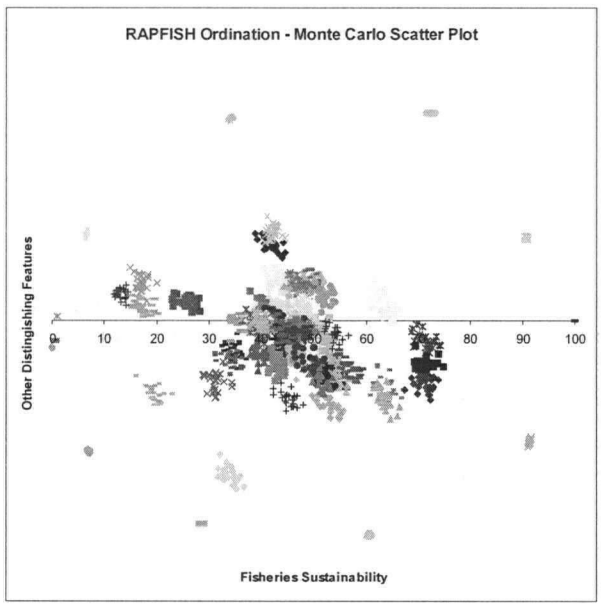




Restorative Justice







Appendix 5b: Leverage and Monte Carlo, Rapfish assessment of Aboriginal fisheries

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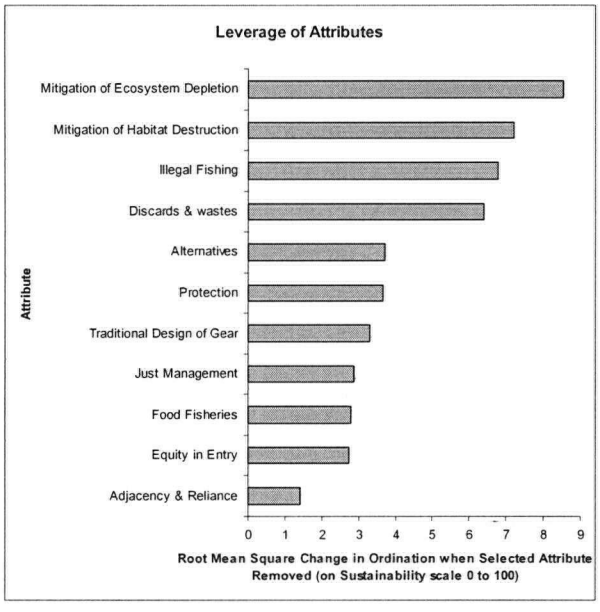
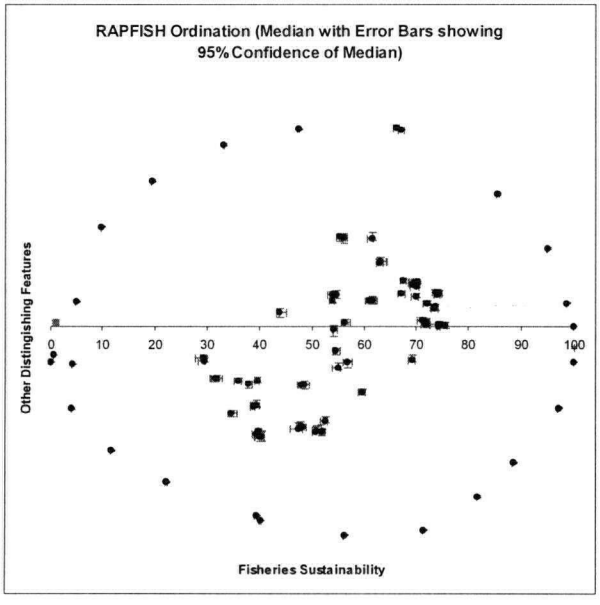
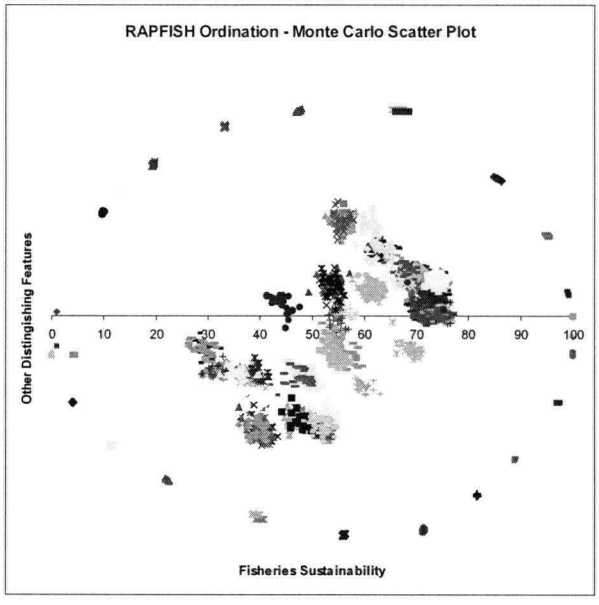
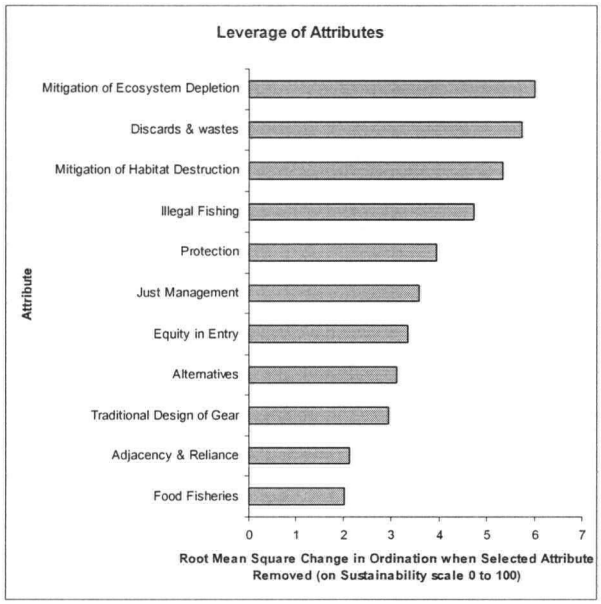
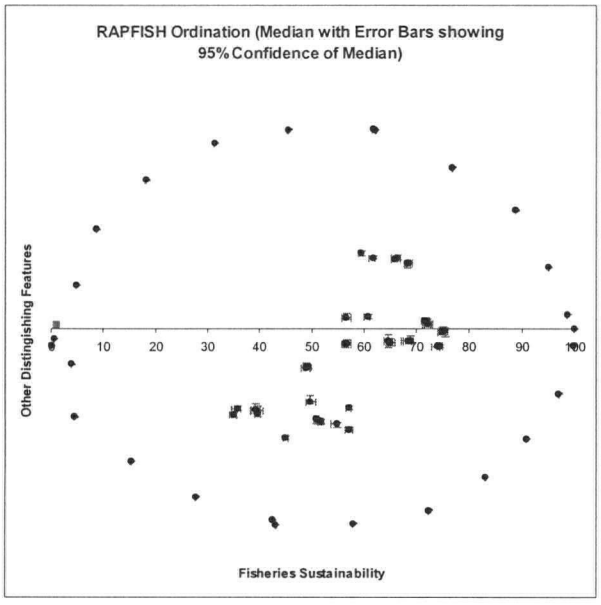


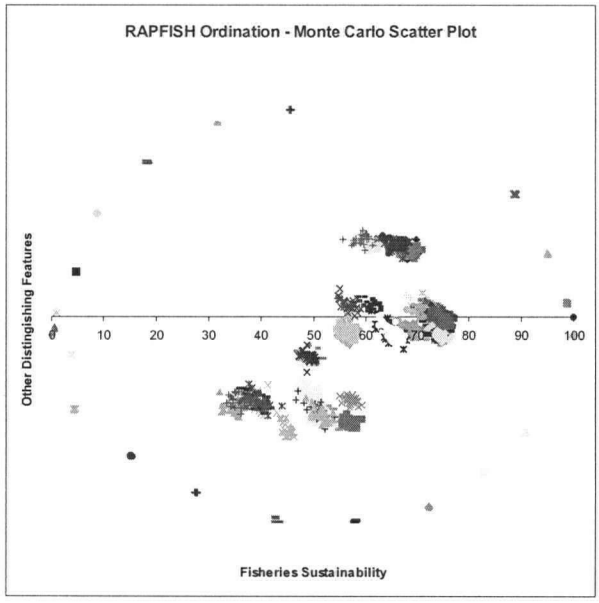




Ethical Ordination – South Coast:







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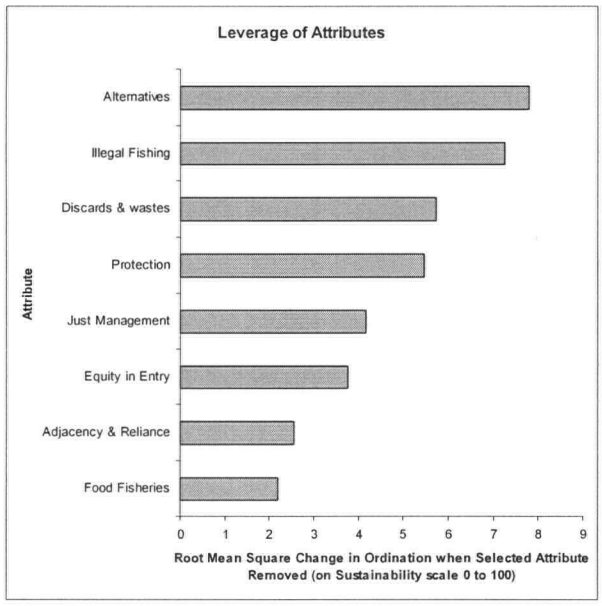

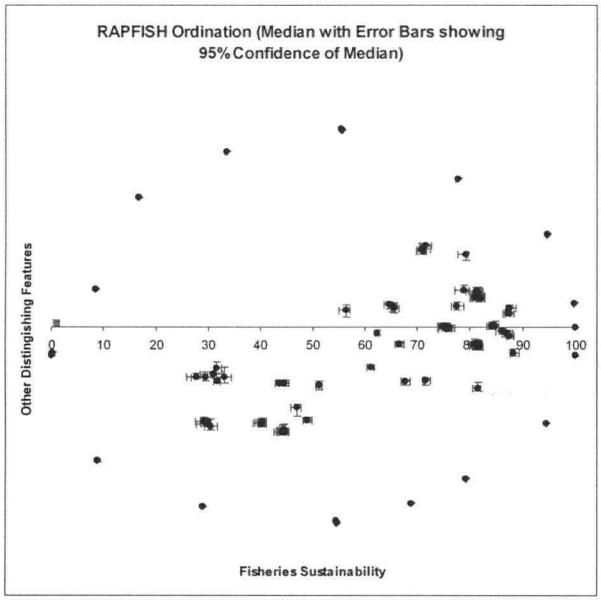

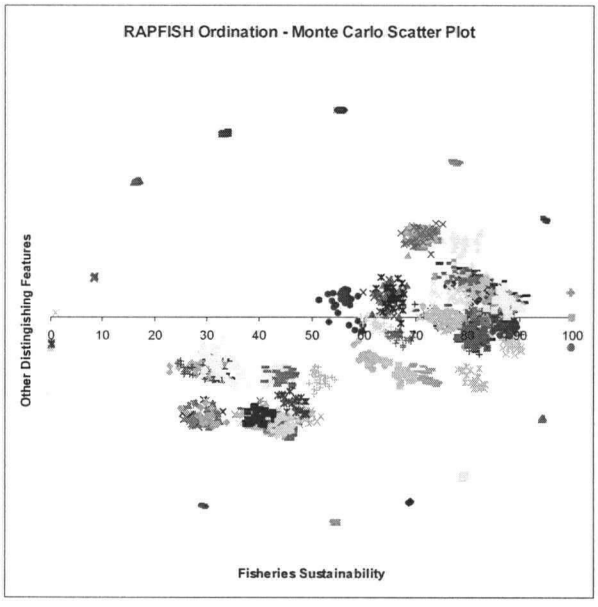

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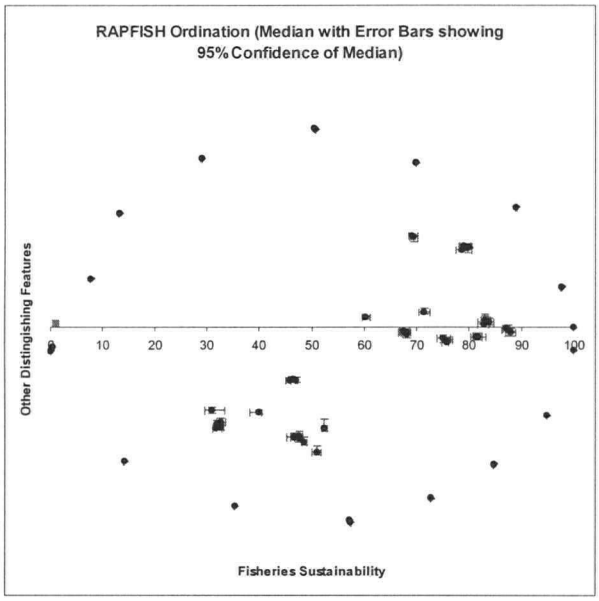

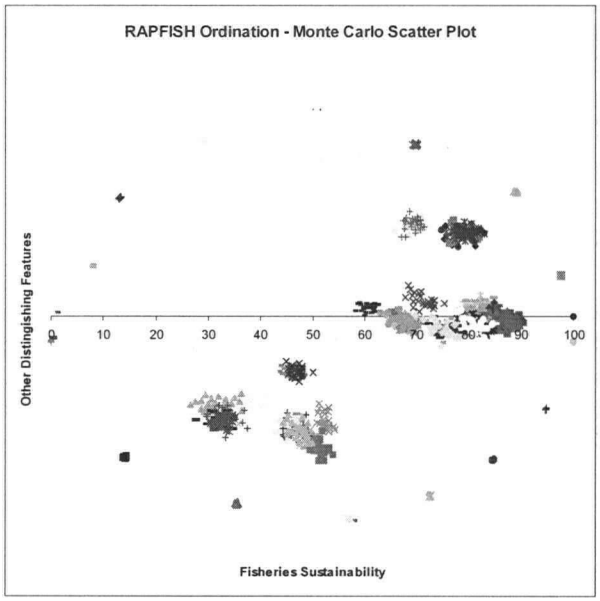

Ecosystem Justice – North Coast (by Nation):

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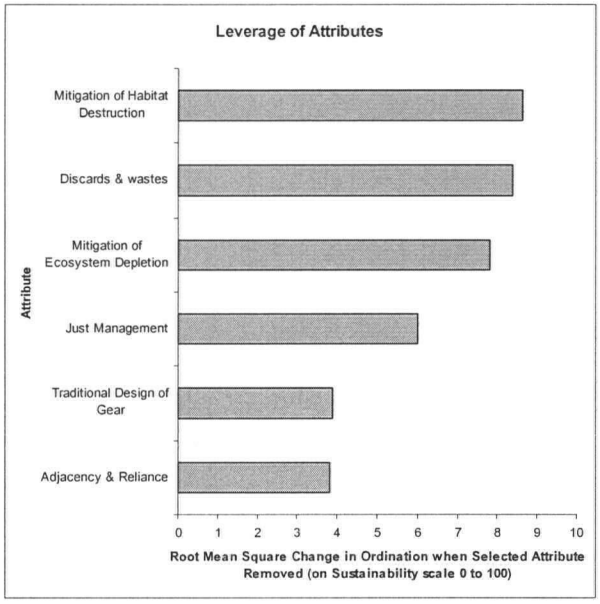

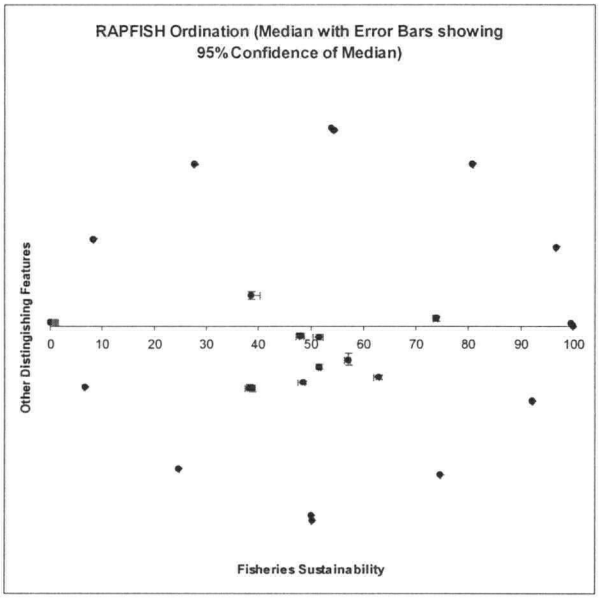

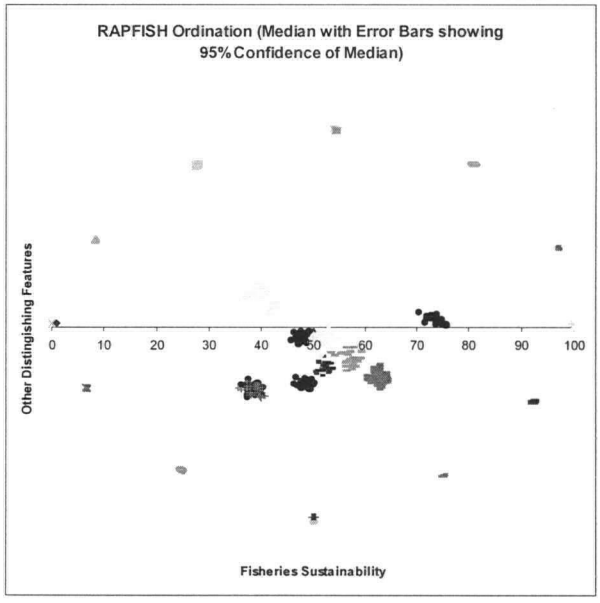

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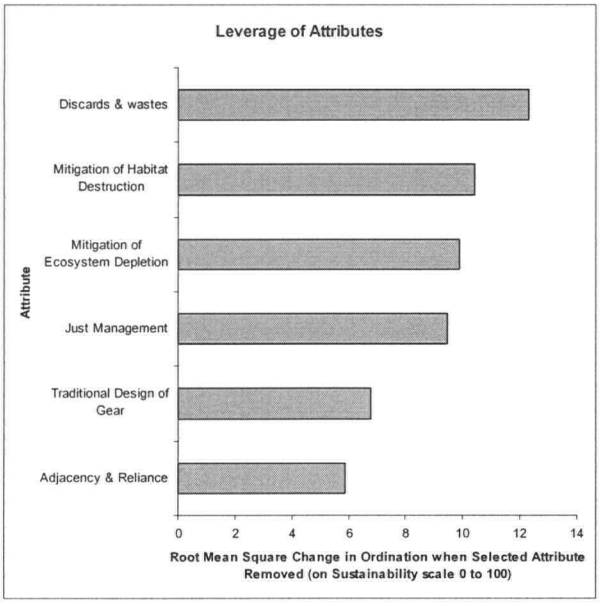
Leverage of Attributes
Discards & wastes
Mitigation of Habitat Destruction
Mitigation of Ecosystem Depletion
Just Management
Traditional Design of Gear
Adjacency & Reliance
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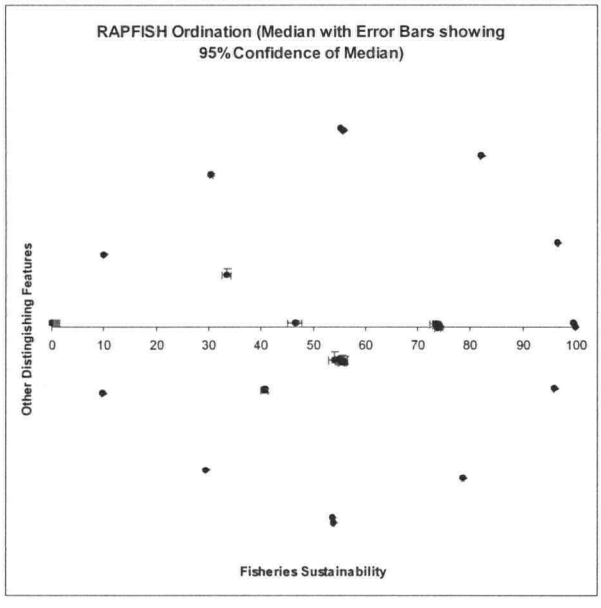
RAPFISH Ordination (Median with Error Bars showing 95% Confidence of Median)
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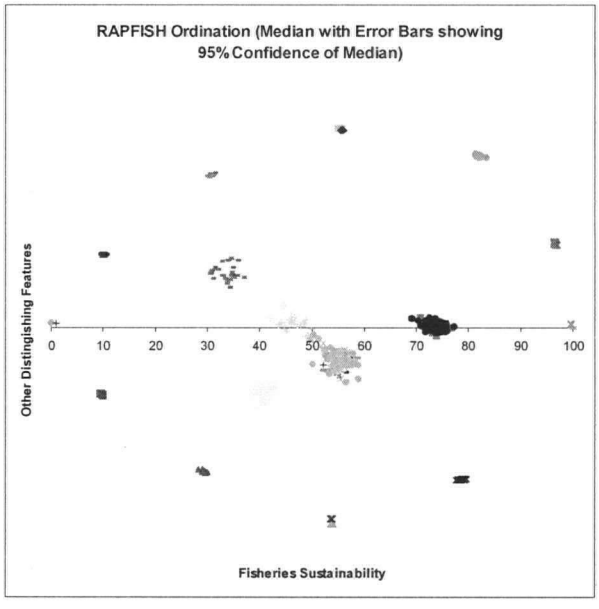
RAPFISH Ordination (Median with Error Bars showing 95% Confidence of Median)
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Fisheries Sustainability

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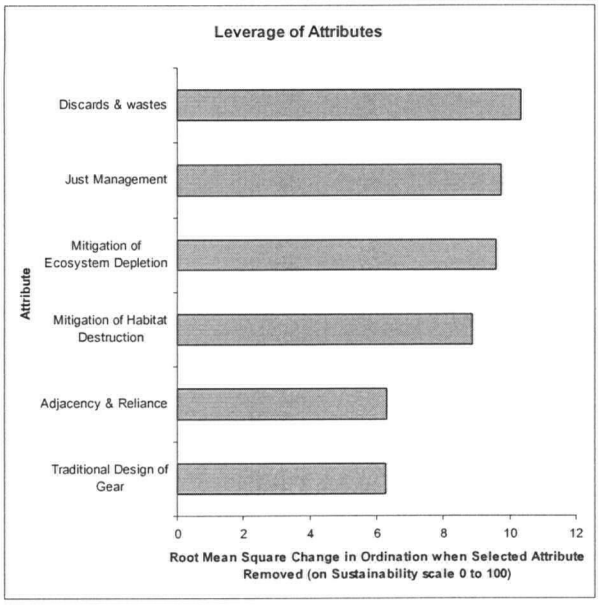
Leverage of Attributes
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Just Management
Mitigation of Ecosystem Depletion
Mitigation of Habitat Destruction
Adjacency & Reliance
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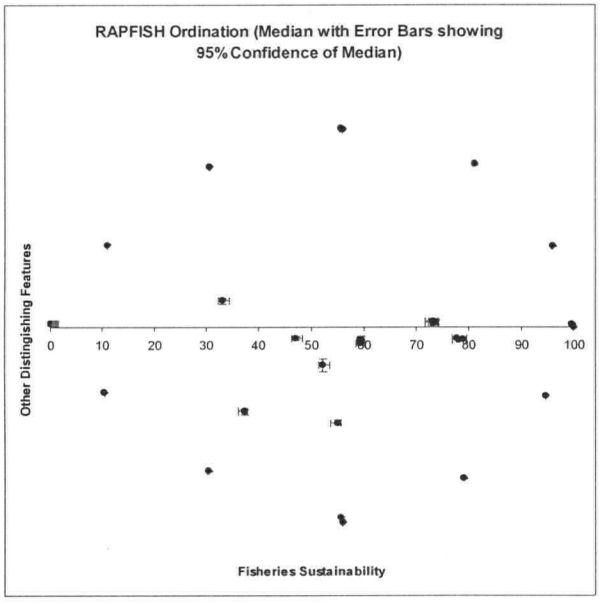
Root Mean Square Change in Ordination when Selected Attribute Removed (on Sustainability scale 0 to 100)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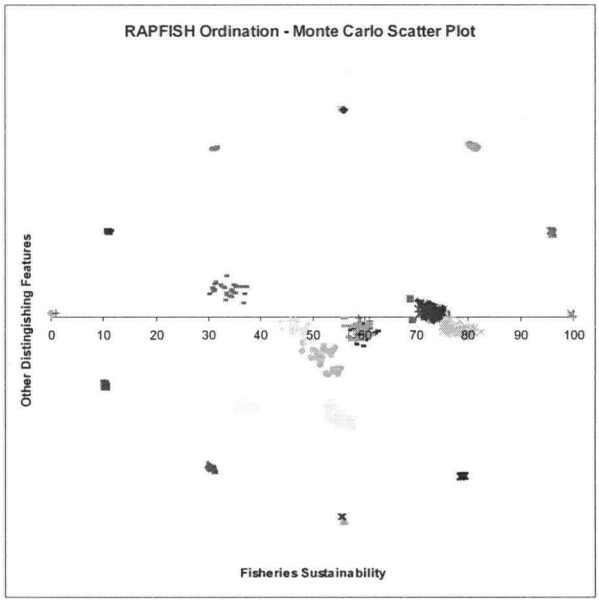
Fisheries Sustainability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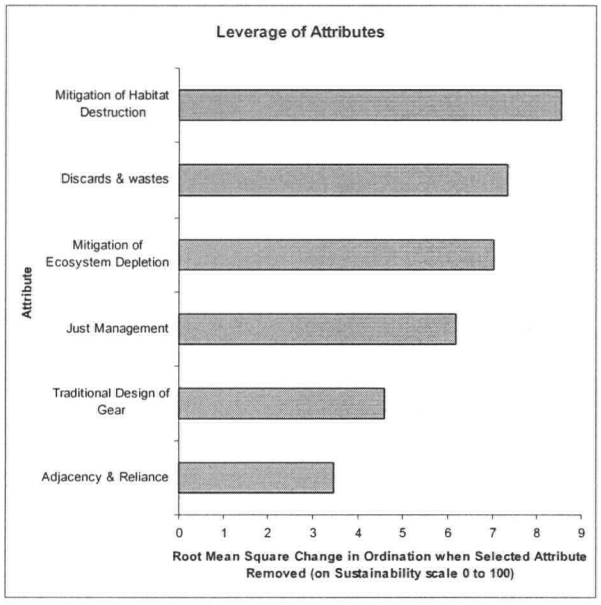
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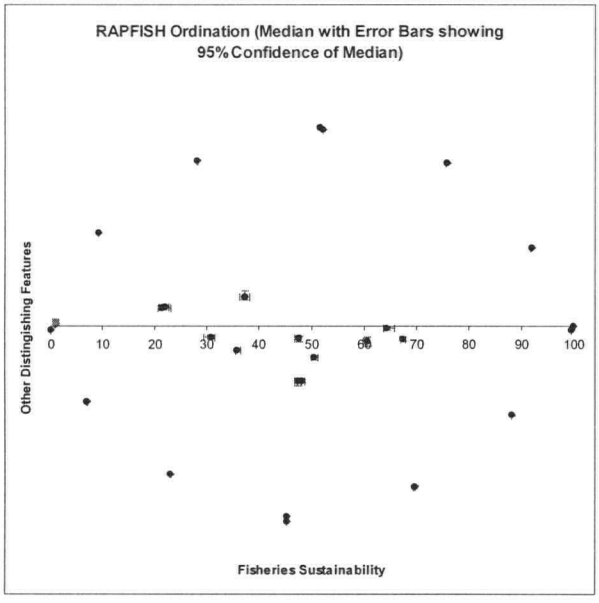
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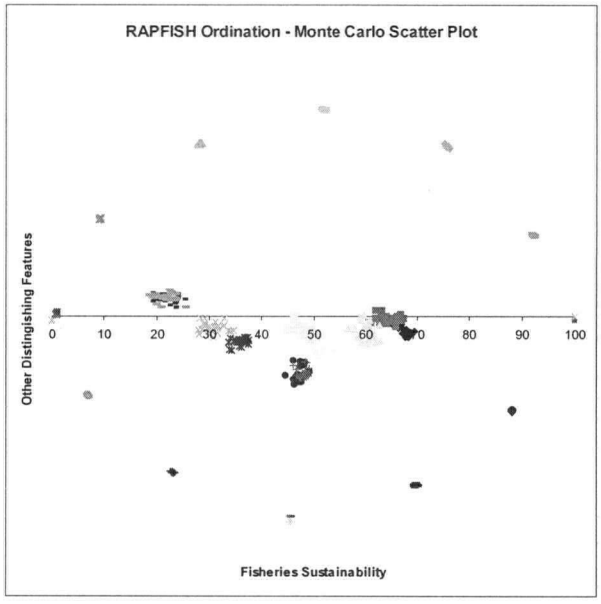
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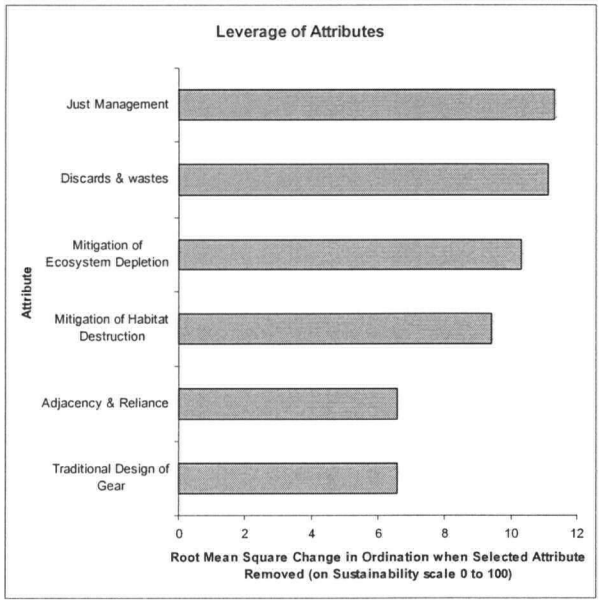
Leverage of Attributes
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Discards & wastes
Mitigation of Ecosystem Depletion
Mitigation of Habitat Destruction
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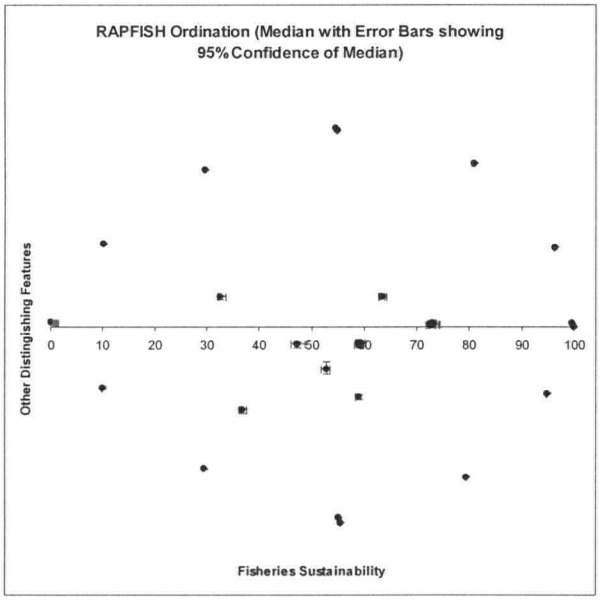
Root Mean Square Change in Ordination when Selected Attribute Removed (on Sustainability scale 0 to 100)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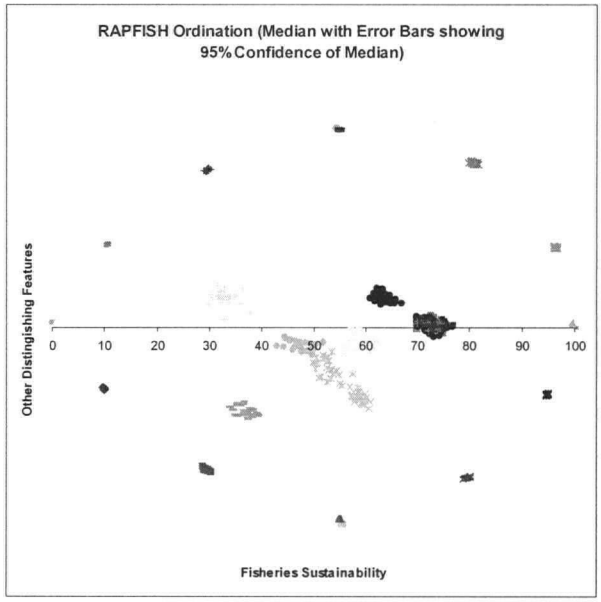
Fisheries Sustainability


RAPFISH Ordination (Median with Error Bars showing 95% Confidence of Median)
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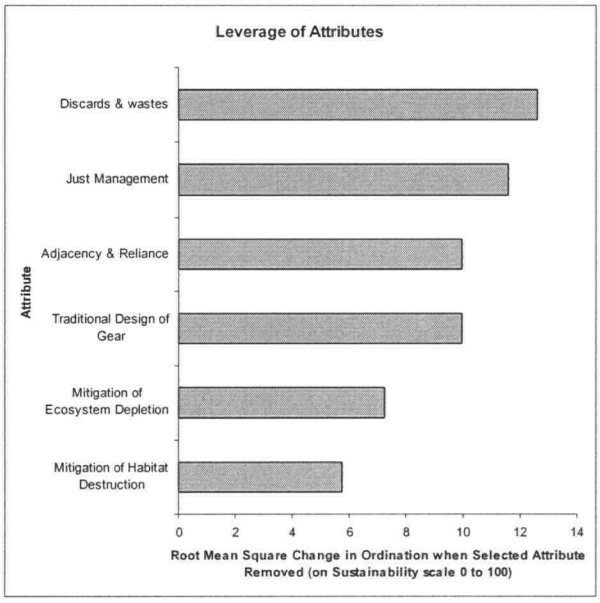
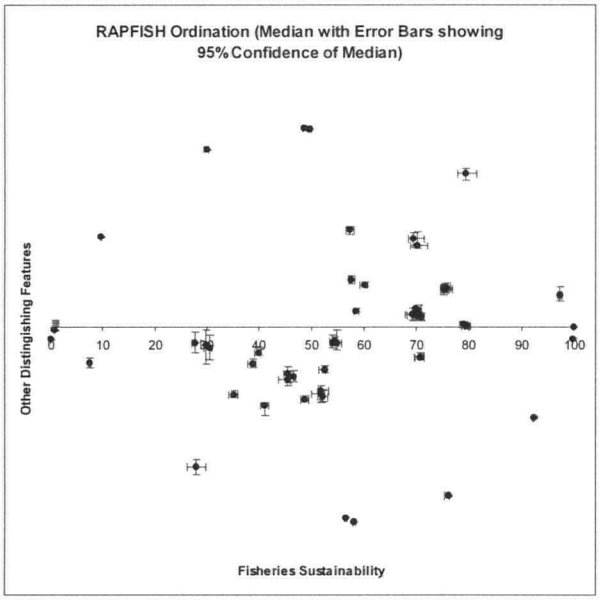
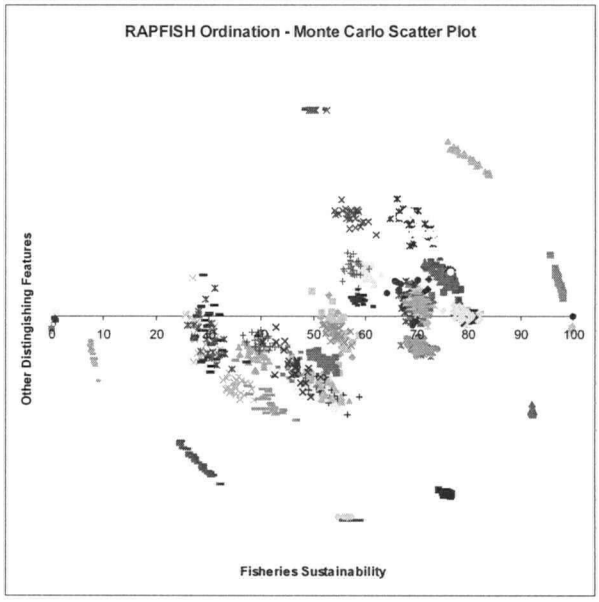
Fisheries Sustainability

Ecosystem Justice – South Coast:







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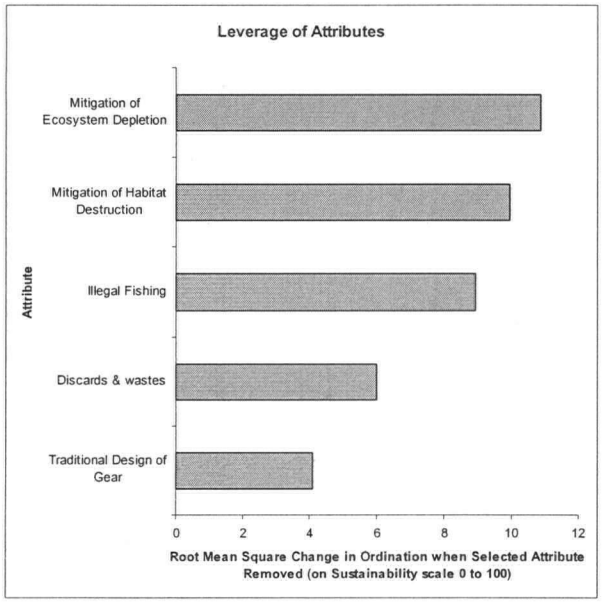

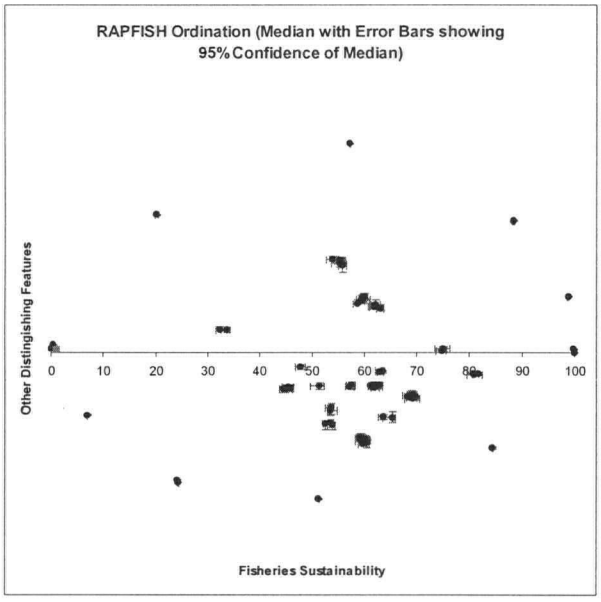

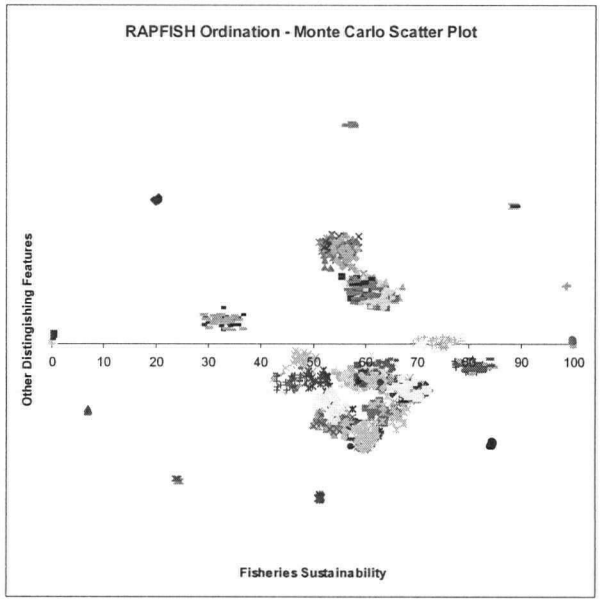

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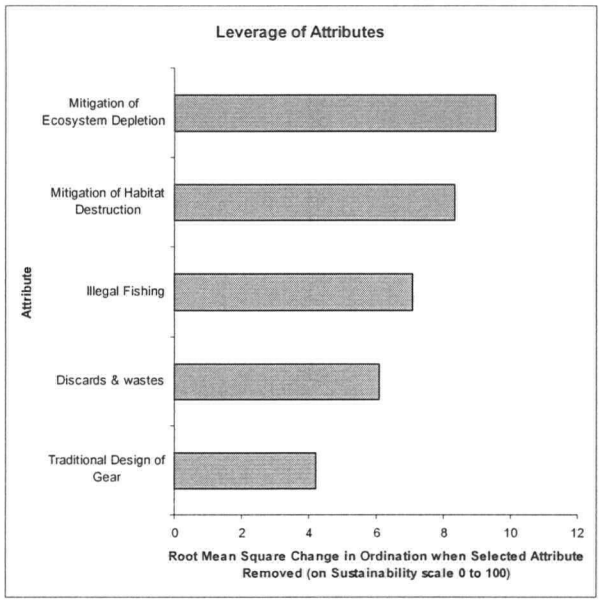

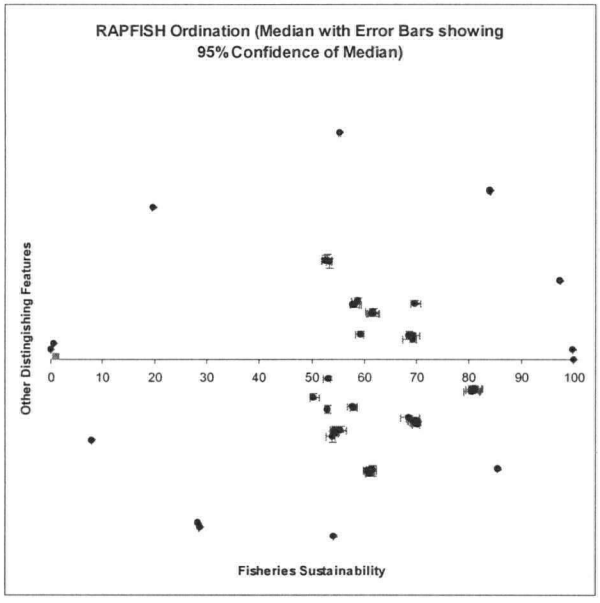

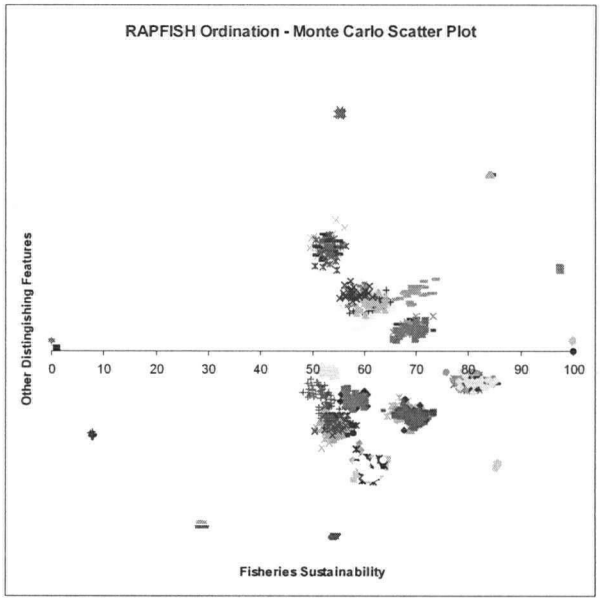

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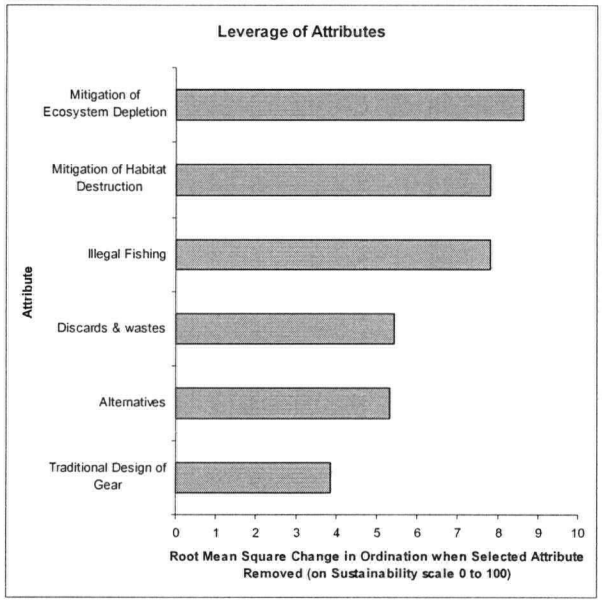

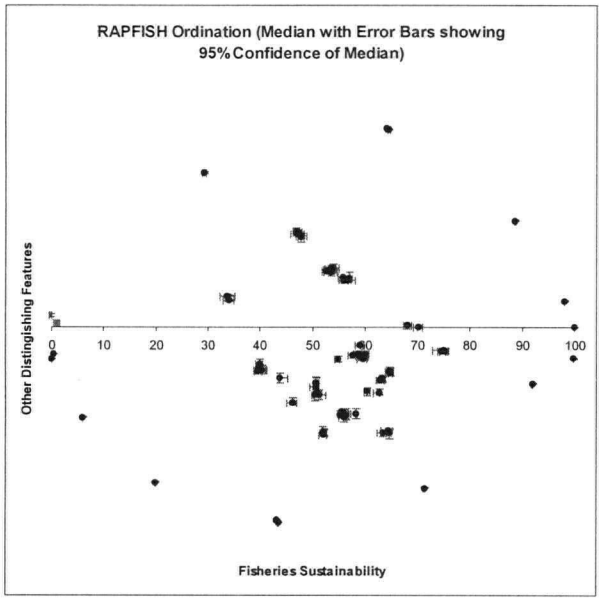

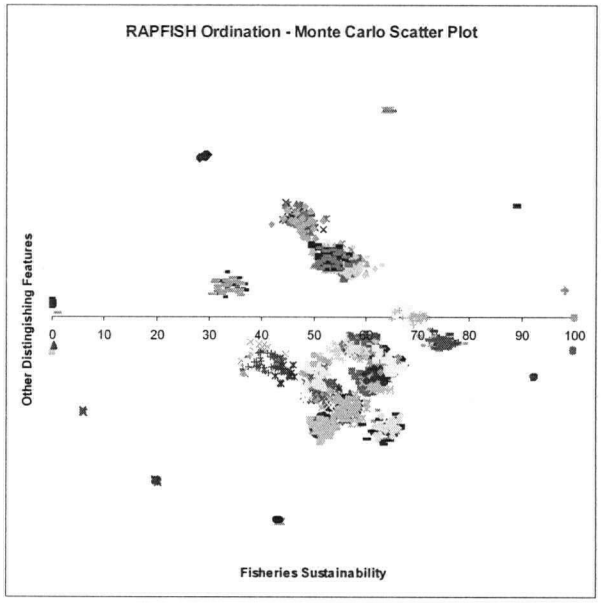

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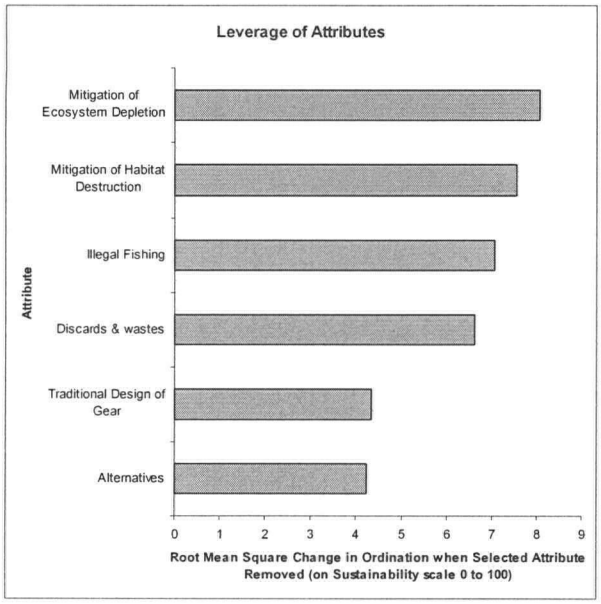

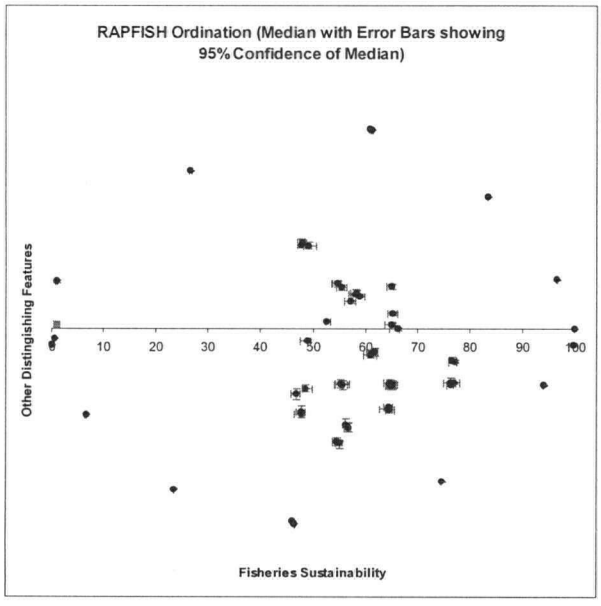

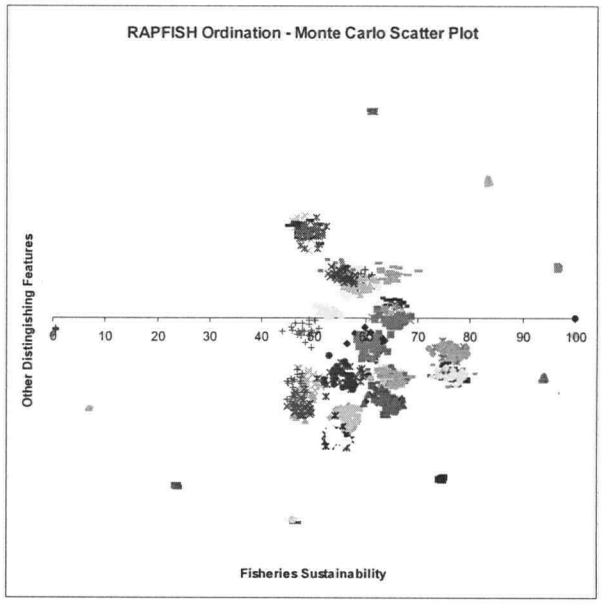

Appendices 6a-b: Paired comparison study of Ethical Attributes

Appendix 6a: Cover of questionnaire booklet, paired comparison of Ethical Attributes

Cover from Ethical questionnaire booklet:

Eth____

Public Survey of Factors Important in Fisheries Policy

The following includes several pairs of factors that policy makers might consider, among many others, when designing ethical fisheries policy. For each of these pairs, please select only **ONE** factor that you think should receive **GREATER** consideration. In forming your judgement, please consider the importance of these factors in the context of fisheries management, in terms of ecosystem, social and economics, and not only those that are related to yourself and your family, but to everyone in your community, both now and in the future.

Please read each pair, and select only A or B, even if you feel that the two factors are equally important. There is no right or wrong answer. We simply want your personal opinion on these issues. Also please make sure that you complete every page in this questionnaire booklet.

The attached table is provided to give you some background information about the factors presented in the questionnaire. ***Before beginning to complete the booklet, please read the attached table*** and refer to it as often as you like while completing the survey.

Thank you for your time and for your kind cooperation.

Appendix 6b: Table of factors used in scenarios

Factors	Social	Ecological	Regulatory
The distance to and the reliance on the fishery. – This attribute considers how close fishers live to the fishery, and how long they and their families have been fishing in that fishery.	Fishers who fish in limited areas close to home and whose families have fished there for many generations are likely to act as 'stewards' (take responsibility for and care of the resource)	Those who live close to their fishing grounds are likely to fish responsibly to prevent collapse, because of limited sources of livelihood	Regulations could include: area licensing and other regulation limiting fishing zones
The existence of alternative sources of livelihood. – Sources of livelihood (employment or income), other than the fishery.	When alternatives to the fishery exist (i.e., other industries not related to fishing), a community is likely to be resilient to poor fishing years	Pressure on fish stocks is reduced when fewer people have to rely on the fishery	
The existence of traditional or historical fishing access. – Are traditional or historical fishing activities considered when determining who can fish?	Careful determination of access, based on historical or traditional fishing activity, may result in fairer decisions and reduce defuse potential conflict	Limited entry, combined with appropriate management measures, may reduce pressure on the fish stocks by restricting the number of fishers targeting a stock	Licensing regulations should consider traditional fishing activity when determining who is allowed to fish in a limited-entry fishery
The inclusion of fishers in the management of their fishery. – Are fishers included in management of their fishery?	Participation by fishers in management of the fishery can help policy-makers to understand the needs and concerns of fishers and communities	Local knowledge in management decisions can complement or supplement knowledge from traditional fisheries science	Regulations (such as management plans) should be developed with the participation of interested stakeholders (fishers, government, communities, etc)
The existence of social/political structures influencing fishers' values. – What structures (such as churches, elders, families, unions, social and community organisations) exist which may influence fishers' beliefs (values)?	Strong positive influences may develop values which encourage responsible behaviour within the fisheries ecosystem and between participants	Lack of positive influences, or presence of negative influences, may result in reckless or destructive activity	
The human influences on fish habitats. – Has the fish habitat been damaged as the result of human activities?	Maintenance (and/or repair) of local fish habitat permits long-term sustainability of the fishery and therefore the local community	Ongoing damage prevents long-term ecological sustainability; repair of damage (and prevention of further damage) encourages long-term sustainability of the fishery	Regulations are required to protect fish habitat and encourage correction of previous damage
The fishing impacts on the fisheries ecosystem. – Has the fisheries ecosystem been changed by fishing-related activity?	A change in target species due to changes in the ecosystem requires new gear, methods, and/or technologies as well as capital investment	The rush to develop the fishery for a new target species can result in overfishing and eventual depletion of one stock after another	As fisheries for new target species are encouraged, new regulations are needed to prevent overfishing and eventual collapse

The existence of fishing practices beyond regulations. – Is there poaching, unreported catch, or transshipment of catch?	Fishing practices beyond regulations affect the sustainability of fishing communities by preventing the correct assessment of the appropriate level of fishing effort	When catches are not fully accounted, total allowable catch cannot be accurately set because the biomass available to the fishery can be overestimated	Enforceable regulations are required to discourage and prevent illegal fishing activity
The level of utilisation of fish which are caught in a fishery. – Are fish (bycatch or target species) discarded before landing, or otherwise wasted?	Wasteful activity affects ecological sustainability and therefore the sustainability of fishing communities	Wasting and discarding of fish, especially when unrecorded, can result in overestimation of biomass and eventual overfishing of the stock	Enforceable regulations are required to discourage and prevent discarding and waste of fish