

**SOCIO-ECONOMIC IMPLICATIONS  
OF THE SPECIES-AT-RISK ACT**  
**Sakinaw & Cultus Sockeye**

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# SUMMARY: Socio-Economic Implications of SARA

## 1. Background

- COSEWIC has designated several species, including Cultus Lake sockeye and Sakinaw Lake sockeye, as "endangered" and these species may become listed as such under the federal Species at Risk Act or SARA.
- Socio-economic analysis of impacts comprise one part of the recovery plan process for listed species

## 2. Study Objectives

- Develop socio-economic framework for impacts of SARA-listing
- Illustrate the framework through worked examples for Cultus and Sakinaw sockeye

## 3. The Multiple Account Evaluation (MAE) Framework for SARA

- Compares base case and alternative scenarios of economic, social and environmental activity/well being
- MAE framework has five accounts – environmental, First Nations, business, government and social & community (see attached)

## 4. Impacts from SARA-Listing of Sakinaw and Cultus Sockeye

- Sakinaw and Cultus sockeye stocks have been adversely affected by fishing pressure in Fraser River mixed stock fisheries as well as by habitat and environmental changes and, as a result, are close to extinction
- Management and catch scenarios in 2004 to assist distressed stocks
  - base case: low cycle year and restrictions to protect early run and late run stocks, even in absence of SARA, result in low catch of 1,360,000 fish projected
  - three scenarios: with varying degrees of fishing restrictions and associated catch

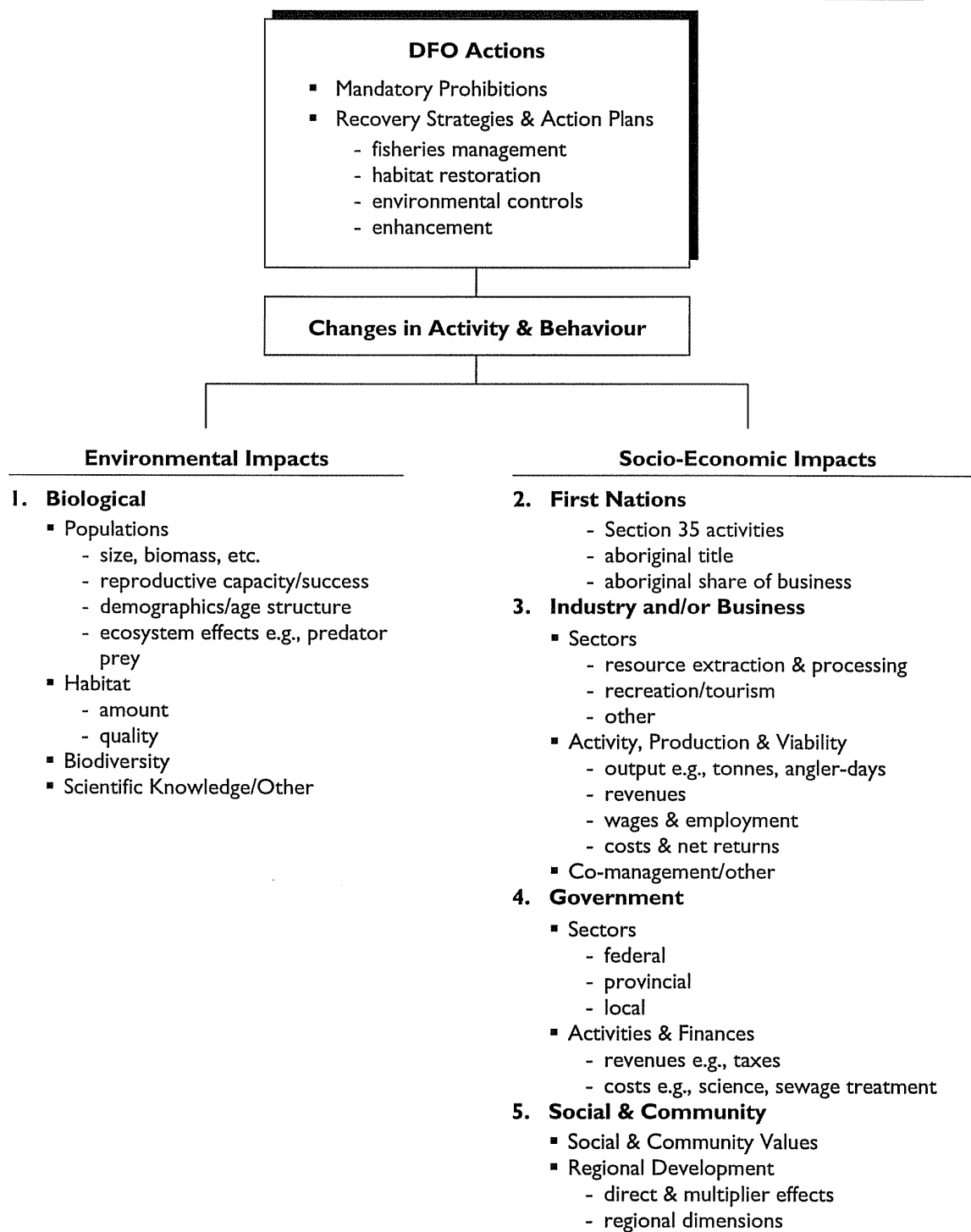
		Options			
		Base Case	#1 Severe	#2 Moderate	#3 Minimal
<b>Harvest</b>					
	First Nations	950,000	500,000	750,000	950,000
	Commercial	353,000	20,000	120,000	300,000
	Recreational	57,000	55,000	56,000	56,500
	All	1,360,000	575,000	926,000	1,306,500
<b>Revenue/Value \$000</b>					
	First Nations	6,409	3,301	5,025	6,409
	Commercial	6,633	376	2,255	5,637
	Recreational	6,300	5,900	6,100	6,200
	All	19,342	9,577	13,380	18,246

- 10 to 20 year projections of total Fraser and Sakinaw and Cultus run sizes, catches and escapements under each scenario are not available; this prevents analysis of post 2004 impacts
- opportunities may exist for additional in-river catches under new fishing arrangements but DFO cannot identify these opportunities at this time
- Environmental impacts
  - even with no special SARA measures, the anticipated number of spawners in 2004 under the base case is low (200 to 250 spawners for Sakinaw from a return of 390 fish, and 140 to 160 spawners for Cultus from a return of 350 fish)

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## SARA Impact Framework

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- option #1 involving severe restrictions on fishing has less than a 1 in 4 chance of meeting its escapement target since the expected return (i.e., with zero fishing mortality and zero Pre Spawn Mortality) is less than the 500 target escapement for each population
- First Nation impacts
  - a number of First Nations bands in Johnstone Strait, the Sechelt Peninsula, and along the Fraser River harvest Fraser stocks for Food Social & Ceremonial (FSC) purposes in mixed stock fisheries
  - reducing or eliminating mixed stock fisheries where Cultus and Sakinaw stocks appear results in declines in FSC catches
  - as well as an important source of food, FSC harvests provide important social and cultural benefits
  - a substantial 25% share of Southern commercial salmon licences are operated by First Nations and, accordingly, reductions in commercial catch result in reduced aboriginal revenue, wages, net returns, and employment
- Business impacts
  - base case financial results for the commercial fleet are poor as the 353,000 commercial catch is less than 1/3 of catches in the 2000 to 2003 period and less than 10% of catches in the 1990s
  - SARA restrictions magnify what is already a very difficult situation
  - the salmon processing sector is fragile economically (the very low sockeye catch in 2004 results in the 10<sup>th</sup> consecutive year that salmon processor returns have been negative or inadequate)
  - recreational sector results are more robust to the SARA scenarios since most angling for Fraser sockeye occurs above the Vedder in the Fraser mainstem
- Government impacts
  - governments have incurred significant costs related to SARA and the recovery planning process e.g., personnel time, special contract services
  - the catch reductions under SARA will result in losses in personal and corporate income taxes resulting from the reduced revenue base to industry
- Social & community impacts
  - the salmon and the people, businesses, and communities that depend on them are a rich part of the cultural heritage and psyche of the province
  - there are several communities, particularly along Johnstone Strait, that depend heavily on Fraser sockeye salmon and the economic benefits generated
  - the reduction in salmon catches and associated revenue result in losses in GDP, wages and employment at the regional, provincial, and national level

## 5. Conclusions

- The MAE approach allows the consistent and transparent treatment of the impacts of SARA on people, businesses, communities, First Nations, and governments
- There is a compelling need for better economic data to support the MAE approach
- Nevertheless, this initial study can provide the foundation for more detailed analysis of SARA and its impacts in the future. In particular, future analysis should entail a longer term view of impacts

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## **PREFACE**

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This report was prepared under contract for Canada Department of Fisheries and Oceans (DFO). The consultant has benefited from discussions with DFO and others. Nevertheless, the consultant has responsibility for the analyses and conclusions of the study.

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## 1.0 INTRODUCTION

### **Background**

- I.1 The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has designated several species as "endangered", including Cultus Lake sockeye and Sakinaw Lake sockeye. These species may become listed under the federal Species At Risk Act or SARA. For those species legally listed, there is an automatic prohibition on harming individuals or their residences, unless a permit has been authorized, and mandatory development of recovery strategies and action plans.
- I.2 Socio-economic analysis of impacts comprises one part of the recovery plan process. There is a need to ensure that the analysis of socio-economic impacts occurs in a consistent and transparent manner.
- I.3 Under SARA, the Minister of Fisheries and Oceans is responsible for aquatic species.

### **Study Objectives**

- I.4 The study has two objectives:
  - To develop a socio-economic framework for analysis of impacts of SARA-listing and associated recovery plans.
  - To illustrate the framework through worked examples for Cultus Lake sockeye and Sakinaw Lake sockeye.
- I.5 The intent is that the framework could be applied in other policy contexts such as the Wild Salmon Policy (WSP) and Marine Protected Areas (MPAs).

### **Work Program**

- I.6 The consultant reviewed the COSEWIC assessment reports and draft DFO recovery strategies for Sakinaw sockeye and Cultus sockeye. The consultant also reviewed previous analysis addressing fishing impacts of alternative management plans as a result of potential SARA-listing of Sakinaw and Cultus sockeye (Greer, 2003).
- I.7 The consultant reviewed and assembled a variety of publications and reports by the federal and provincial governments, consultants, and others (particularly those related to the economic dimensions of the commercial, recreational, and First Nations fisheries).

- I.8 The consultant interviewed approximately ten (10) DFO personnel as to likely impacts of SARA-listing, and received from DFO fisheries managers a range of management and harvest scenarios for Fraser River sockeye in 2004. The consultant also interviewed an individual from the Province of British Columbia. However, the consultant was instructed by DFO not to interview industry representatives or the broad public in this initial study. This study can serve to focus industry and public consultations in the future.

### **Report Outline**

- I.9 The next section presents the socio-economic framework. The remaining sections of the report are:

<b>Section</b>	<b>Type</b>
2	Socio-economic Framework
3	Cultus and Sakinaw Impacts
4	Conclusions

- I.10 Two appendices provide data and analysis for the commercial salmon fleet.



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## 2.0 SOCIO-ECONOMIC ASSESSMENT FRAMEWORK

- 2.1 There are requirements for socio-economic analysis under the Species-at-Risk Act (SARA) or Bill C-5. For example, Section 49 (l) (c) of the Act requires the responsible federal minister to undertake "an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation".
- 2.2 This section presents a Multiple Account Evaluation (MAE) framework for assessing the socio-economic impacts of SARA.

### **Evaluation Framework with Five Accounts**

- 2.3 Multiple Account Evaluation (MAE) is a method for systematically displaying a broad spectrum of impacts associated with development projects or policy initiatives. An MAE framework organizes project information and anticipated impacts under different objectives or "accounts".

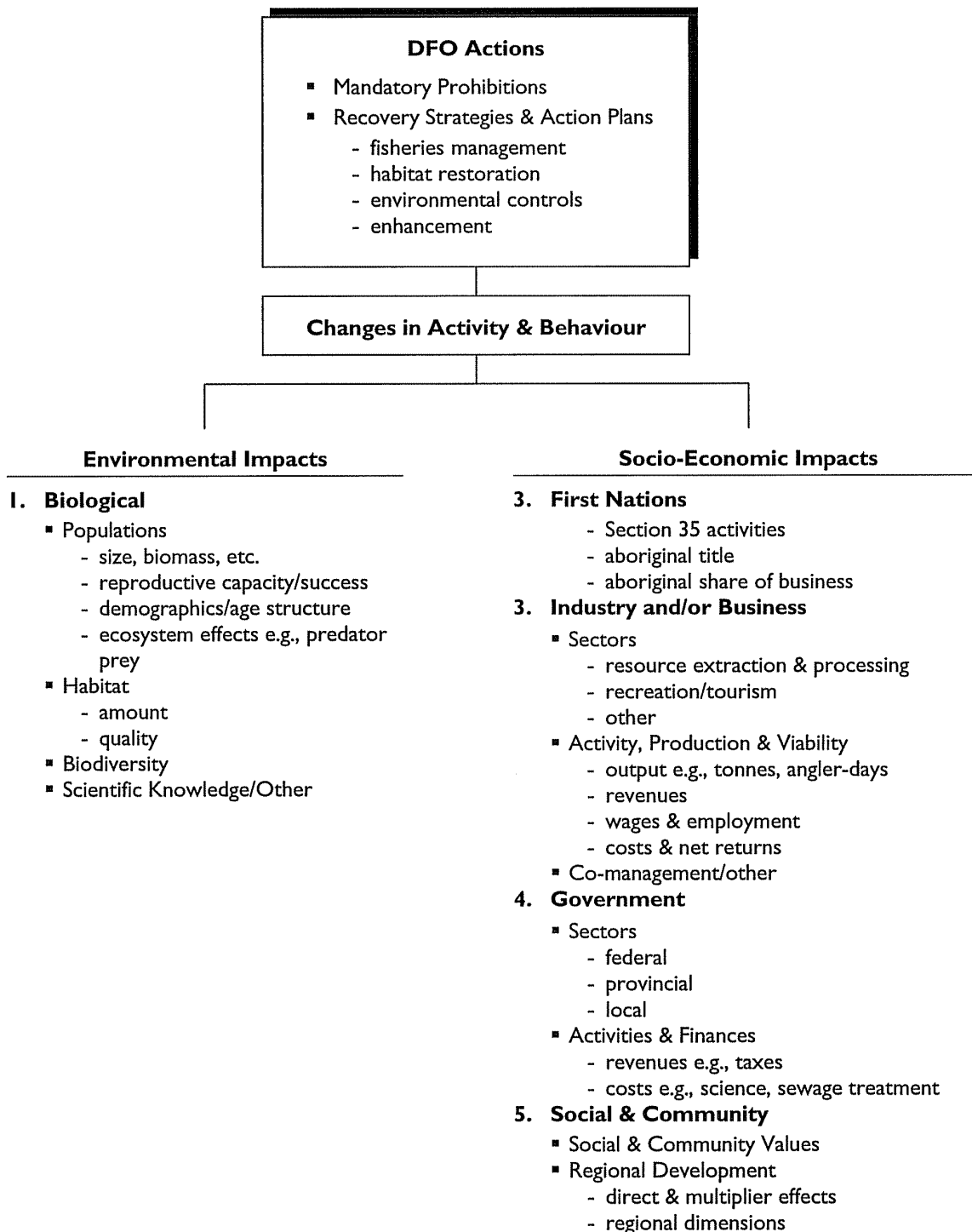
MAE makes the trade-offs between accounts/objectives transparent. But, MAE says nothing about how to arrive at a decision. MAE does not offer a process to choose from competing proposals since MAE does not have any explicit weighting and rating scheme for the various accounts. This is both an advantage and disadvantage.

- 2.4 In impact assessment one develops a base case scenario or assessment of economic, social, and environmental activity/well-being in the absence of the environmental program, regulations or policy, in this case SARA, and then develops the alternative scenario with the initiative. The impacts then are the differences between the "with" and "without" scenarios i.e., impact analysis focuses on incremental effects.
- 2.5 Typically a set of quantitative and qualitative impact indicators are identified. The indicators should focus on the key changes in activity and behaviour as a result of the regulatory action.
- 2.6 If one cannot designate in some detail the differences in activity and behaviour attributable to regulation, it is very difficult if not impossible to assess impacts of the regulations.
- 2.7 The impact framework can be used to assess the impacts of a single regulation. It can also be used to assess the impacts of a variety of potential regulations or measures. In the latter situation, it is unlikely that any one proposed measure will be uniformly superior to all interests for all indicators. However, the value of a formal impact framework is that it makes tradeoffs between interests or indicators transparent.

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**Exhibit 1: SARA Impact Framework**

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- 2.8 The MAE framework for analyzing the impact of SARA has five accounts (see Exhibit 1):
- Environmental
  - First Nations
  - Industry and/or Business
  - Government
  - Social & Community
- 2.9 Four broad types of DFO actions are possible – fisheries management changes, habitat restoration activities, imposition of environmental controls, and enhancement activities – to assist aquatic species at risk to recover.
- 2.10 These DFO actions, as well as affecting the natural environment, can also affect activity and behaviour of business, people, communities, First Nations, and governments. These changes are summarized under each of the accounts.

### ***Environmental Impacts***

- 2.11 The environmental account addresses potential impacts on natural resources and their habitat, including marine mammals, fish and other wildlife. The account can also address biodiversity, preservation, scientific knowledge, and other indicators.
- 2.12 The population and habitat analysis should include impacts on size (such as salmon run size and escapement) and quality (such as reproductive success). The analysis, where applicable, should also address ecosystem effects such as predator-prey relationships.
- 2.13 The environmental analysis should address population, habitat, and ecosystem effects on both SARA-listed and non-listed species.
- 2.14 This approach is consistent with generally-accepted criteria for assessing sustainable fishing practices, namely:
- **Sustainable harvest of target species and stocks** – Harvest rates and techniques should aid in the maintenance or recovery of a stock's health so that present and future generations can benefit from the resource.
  - **Limiting impacts of the fishery on non-target species, habitats, and ecosystems** – Harvests should use techniques to limit the amount of unintended bycatch and impacts on the ecosystem and habitat.
  - **An effective fisheries management system** – A solid management system, emphasizing scientific principles, credible and reliable data gathering systems, co-management principles and transparency, monitoring and surveillance, and adherence to national and international law, is essential to ensure that the first two principles are observed.

### ***First Nations Impacts***

- 2.15 The First Nations account addresses any impacts on food, social, and ceremonial activities and rights guaranteed under the 1982 Constitution Act and confirmed and clarified by the Supreme Court of Canada (so-called "Section 35" rights).
- 2.16 First Nations participation and impacts in the commercial fishery and other business endeavours are also addressed in the First Nation accounts.

### ***Industry and/or Business Impacts***

- 2.17 The business account measures the direct effects on industry output, revenues, wages and employment, costs, and net returns as a result of SARA.
- 2.18 The relevant industry sectors are those such as commercial fishery and fish processing that extract marine resources, as well as those sectors that depend on the marine environment as a medium for recreation, transportation, and operation e.g., ecotourism operations.

### ***Government Impacts***

- 2.19 The government account assesses impacts on government – federal, provincial, local – revenues and costs. These can include the implications on federal and provincial personal and corporation taxes, and on local property taxes.

### ***Social & Community Impacts***

- 2.20 The social & community account identifies the impacts on people and communities, in terms of traditional lifestyles, social disruption, culture and heritage, etc. The particular social and community indicators of interest likely will vary with the Species at Risk, whether the species has direct commercial use, and so on. In many cases, social indicators are descriptive in nature rather than numerical.
- 2.21 One exception are the regional development impacts on the economy. Impacts include key economic indicators such as Gross Domestic Product (GDP), Labour Income (wages and benefits), and employment. Impacts include both direct and indirect suppliers and induced consumer responding impacts (so called "multiplier" impacts).

### **Some Issues**

- 2.22 Ideally the MAE analysis should be forward looking and address likely and potential impacts 10 to 20 years into the future. This is especially important for the environmental account where it likely will take several years for species at risk to recover. As well, stocks such as salmon can be cyclical. It is also important for the business account where economic activity (e.g., commercial fish catches) may need to be curtailed in the short runs to rebuild stocks of concern over time i.e., greater business opportunities may exist in the long term.
- 2.23 The proposed framework in Exhibit I does not include an economic value account (distilling market and non-market benefits less opportunity cost of capital, labour, and resources in their next best alternative use). DFO's interpretation of the requirements of the SARA legislation suggest that such analysis is not required and, in any case, the data or information to support such analysis is not readily available.
- 2.24 The mere possibility of SARA-listing of certain species may cause DFO actions and improvements to the natural environment even if the species are never listed. It is problematic to isolate the impacts of SARA-listing from the broader impacts of the SARA review and assessment process. For example, as discussed in the next section, DFO has taken some action to protect Sakinaw and Cultus sockeye in British Columbia before a formal decision has been made on listing. The basis of DFO actions for 2004 is that these two populations are in poor condition, have been designated by COSEWIC as endangered, and will be considered for legal listing under SARA.
- 2.25 DFO's management of salmon and salmon habitat is guided by a variety of policies and legislation including the 1867 Fisheries Act, the 1982 Constitution Act and subsequent Supreme Court of Canada rulings, the 1986 policy for the Management of Fish Habitat, the Canadian Environmental Assessment Act of 1992, the 1997 Oceans Act, the 1998 New Direction Paper, and the 1999 Salmon Allocation Policy (the current allocation targets within the commercial sector are 40% seine, 38% gillnet, and 22% troll on a coastwide basis). The Department since 1997 has had an increased conservation focus. The Department has obligations and initiatives to protect weak stocks even in the absence of SARA. The result is that, in some cases, it is very difficult to isolate the impacts of SARA initiatives from broad environmental protection measures.
- 2.26 The business account often is more amenable to numerical measurement than are the social, First Nation, environmental accounts. One should strive to quantify as much as possible impacts and effects under all our accounts. However, if impacts under one account cannot be quantified, this does not mean that such impacts necessarily are less significant or important than impacts that can be quantified.

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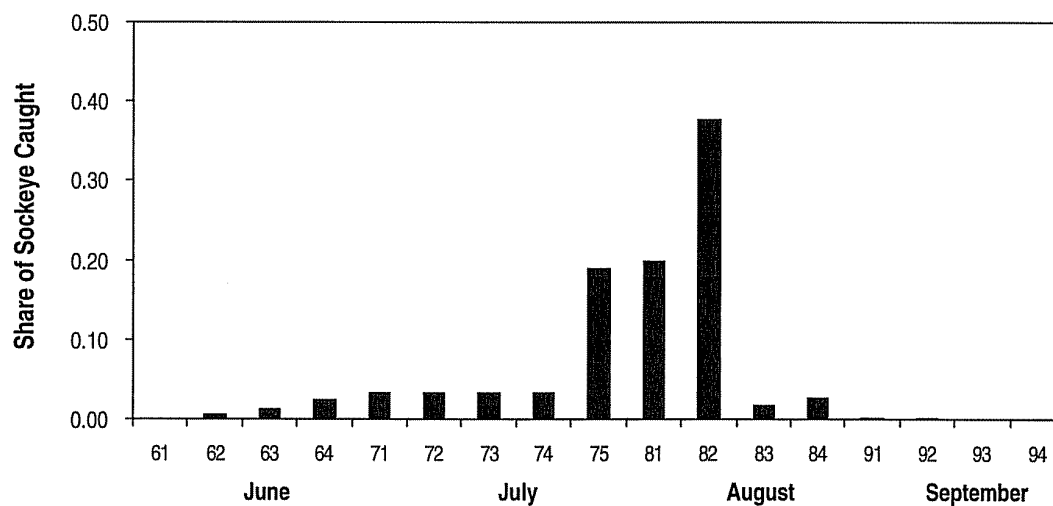
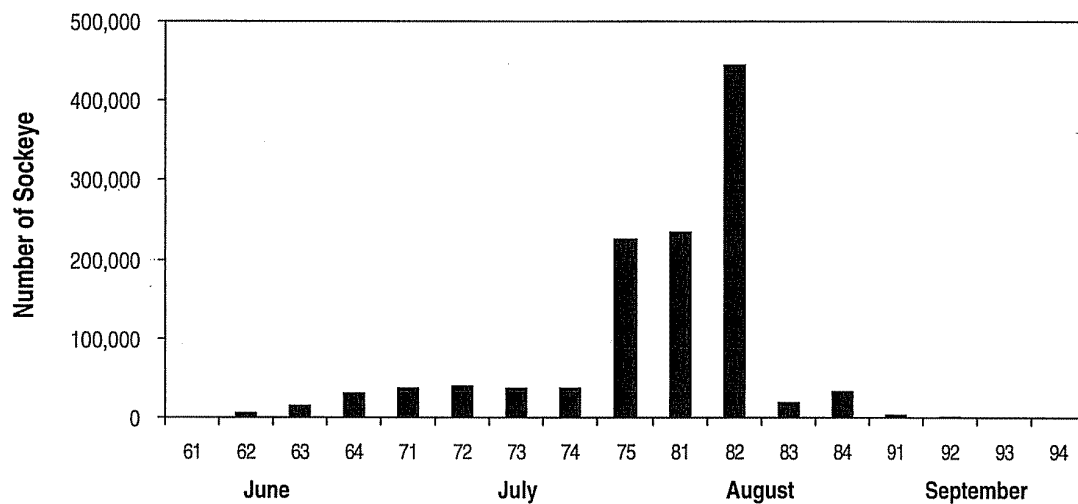
### **3.0 IMPACTS OF SAKINAW & CULTUS LISTING**

- 3.1 The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has recommended to the Minister of Environment that Cultus Lake sockeye and Sakinaw Lake sockeye be listed under SARA as "endangered".
- 3.2 Protection (prohibition) and recovery planning is legally mandated for species listed as Endangered or Threatened. SARA mandates timelines for this process, provides for stakeholder involvement and public comment, and requires socio-economic analysis within the recovery action plan.
- 3.3 If Cultus and Sakinaw sockeye are listed, recovery planning for them could severely impact Fraser River mixed stock salmon fisheries that target stocks other than Cultus and Sakinaw sockeye.
- 3.4 This section illustrates the use of the socio-economic framework of Exhibit I to the case of Cultus and Sakinaw sockeye. The analysis is constrained by lack of data and information in many areas. However, the analysis does demonstrate the utility of using such a formal assessment framework.

#### ***The Fraser River Mixed Stock Fishery Situation***

- 3.5 There are many sockeye salmon stocks that after hatching in the Fraser River and its tributaries, spending two years in a freshwater river and lake environment and two years in the North Pacific, return as adults at age 4 through Johnstone Strait and Juan de Fuca Strait to their natal stream in the Fraser River to spawn. Sockeye salmon over their four year life cycle usually exhibit cyclic dominance with one dominant (strong) cycle and three sub-dominant off-cycles.
- 3.6 The various stocks commingle on their return in the Johnstone Strait and Juan de Fuca Strait approach paths and many are caught by a variety of First Nations, commercial, and recreational interests. Weak stocks may be harvested at exploitation rates more suitable for strong stocks. Sakinaw and Cultus sockeye have been affected by fishing pressure in mixed stock fisheries as well as by habitat and environmental changes.
- 3.7 DFO manages the wide variety of Fraser River stocks under four broad run timing groups (based on timing to entering the Strait of Georgia).
- early – late June to mid July
  - early summer – early July to late July
  - summer – late July to mid August
  - late – mid August to early October

**Exhibit 2: Weekly Pattern of Commercial Sockeye Catch in Southern BC  
2000 to 2003 Average**



Note: June has 4 weeks (61, 62, 63, 64), July has 5 weeks (71, 72, 73, 74, 75), August has 4 weeks (81, 82, 83, 84) and September has 4 weeks (91, 92, 93, 94)

Source: DFO (Appendix A)

- 3.8 In recent years since 1997, due to conservation concerns and the 1998 DFO New Directions Policy, DFO fisheries managers have tried to cut down fishing (exploitation) rates on early and late run stock groupings of concern, and target fishing on more abundant early summer and summer stock groupings. The result has been a drop of overall Fraser River exploitation rates from 60 to 80% to 30 to 40%, and a curtailment of the Fraser River sockeye fishery to the narrow July 20 to mid August period.
- 3.9 Exhibit 2 shows the average commercial sockeye catch in pieces over the four year 2000-2003 period for Southern BC (Southern areas are: seine – Area B, gillnet – Areas D&E, troll – Areas G&H). Three quarters of the total sockeye catch occurs during openings in the last week of July and the first two weeks of August.

### **Context for Sakinaw & Cultus Sockeye MAE**

- 3.10 The analysis for Sakinaw and Cultus sockeye is illustrative only – the intent is to demonstrate the potential and engender understanding of the MAE approach through a concrete example. Moreover, it is important to note:
- the analysis focuses on the year 2004, a low sockeye run year, since projections of catch are not available in the future
  - the base case management and catch scenario reflect concerns over non-Sakinaw and Cultus stocks i.e., concerns for other stocks limit harvest opportunities
  - the base case may not be sustainable over time i.e., the base case may result in stock extinction
  - the analysis does not address potential policy options and adjustment mechanisms that could mitigate adverse impacts e.g., new opportunities could emerge if transfers between commercial salmon areas/interests were feasible, opportunities could exist for new in-river fisheries
  - the distribution of the commercial catch among areas is identical under the base case and all scenarios presented, a simplification
  - it is very difficult to attribute impacts of Fraser River sockeye management options to Sakinaw and Cultus sockeye concerns individually
- 3.11 The intent is that this initial work could provide the foundation for more detailed analysis in the future.

### **Sakinaw Stock Characteristics and Status**

- 3.12 Sakinaw Lake is on the Sechelt Peninsula and does not comprise part of the Fraser River system. However, Sakinaw sockeye share the same migration path and timing as many Fraser River stocks. The peak migration period for Sakinaw sockeye through Johnstone Strait is late July through mid August.



- 3.13 In recent years there has been less than 100 spawners. The 2003 COSEWIC Assessment Report indicates that the population is limited by the availability of suitable spawning and rearing habitat within Sakinaw Lake. The Assessment Report concludes that under present trends the Sakinaw population is likely to go extinct.

#### **Cultus Stock Characteristics and Status**

- 3.14 Cultus Lake is part of the Vedder-Chilliwack system, a tributary to the Fraser River, located in the Eastern Fraser Valley. The peak migration period through Johnstone Strait and Juan de Fuca Strait to the Fraser estuary is early August through early September with a peak in late August. Cultus and other late run sockeye can hold in the Fraser estuary for up to 8 weeks before continuing their migration up-river.
- 3.15 Cultus sockeye is one of the most intensely studied salmon populations in the world (COSEWIC Assessment Summary 2003). Recent adult escapement has ranged from 500 to 5,000 fish.
- 3.16 It appears that, in addition to fishing pressure, human development around Cultus Lake and in some years, elevated pre-spawn mortality (PSM) caused by heavy infestations of the freshwater parasite "Parvicapsula minibicornis" have significantly affected escapement levels (COSEWIC Assessment Report 2003). The Assessment Report concludes that under present trends the Cultus population is likely to go extinct.

#### **DFO Fisheries Management Changes Under SARA**

- 3.17 The year 2004 is an off-year in the cycle of Fraser River sockeye returns. DFO estimates the expected return, based on a probability distribution of run size, to be in the 3 to 4 million range. And the Canadian catch, without any special SARA restrictions, is expected to be 1,360,000 fish. This catch level translates into a 30 to 40% exploitation rate.
- 3.18 DFO has identified three different fisheries management options or scenarios for addressing Sakinaw and Cultus sockeye conservation concerns (Exhibit 4).

	Base Case	Option		
Fraser River Catch*		#1 Severe	#2 Moderate	#3 Minimal
First Nations	950,000	500,000	750,000	950,000
Commercial	353,000	20,000	120,000	300,000
Recreational	57,000	55,000	56,000	56,500
All	1,360,000	575,000	926,000	1,306,500

\* both marine and in-river (DFO did not identify additional in-river harvest opportunities upstream of the Vedder that may exist under each option).

**Exhibit 3: Salmon Fisheries Management and Harvest Scenarios Under SARA 2004**

		Options		
	Base Case	#1 Severe	#2 Moderate	#3 Minimal
Assumptions				
Objective	Achieve aggregate Fraser River sockeye escapement goals	At least 500 Sakinaw and 500 Cultus spawners	At least 250 Sakinaw and 250 Cultus spawners	At least 100 Sakinaw and 100 Cultus spawners
Anticipated Spawner Outcome	200-250 Sakinaw / 140-160 Cultus	340 Sakinaw / 240 Cultus	320 Sakinaw / 220 Cultus	300 Sakinaw / 210 Cultus
Sakinaw/ Cultus Exploitation Rate	30-40%	<5%	10-12%	15-20%
Management Regime				
First Nations FSC	3-4 week marine fishery	Extensive closures	Limited 2-3 week marine fishery	2-3 week marine fishery
Commercial	3-4 week marine fishery	No directed fishery	Limited 2-3 week marine fishery/ gillnets only in Johnstone Strait	2-3 week marine fishery
Recreational	Marine retention	Marine non-retention	Limited 2-3 week marine retention	2-3 week marine retention
Sockeye Harvest				
First Nation FSC - Marine	160,000	50,000	110,000	160,000
- In River	<u>790,000</u>	<u>450,000</u>	<u>640,000</u>	<u>790,000</u>
- Total	950,000	500,000	750,000	950,000
Commercial - Marine	353,000	20,000	120,000	300,000
- In River	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
- Total	353,000	20,000	120,000	300,000
Recreational - Marine	2,000	0	1,000	1,500
- In River	<u>55,000</u>	<u>55,000</u>	<u>55,000</u>	<u>55,000</u>
- Total	57,000	55,000	56,000	56,500
Total - Marine	432,000	70,000	181,000	381,500
- In River	<u>928,000</u>	<u>505,000</u>	<u>745,000</u>	<u>925,000</u>
- Total	1,360,000	575,000	926,000	1,306,500

- Note: 1. Anticipated return prior to pre-spawn mortality (PSM) and harvest mortality is 390 Sakinaw sockeye and 350 Cultus sockeye (based on a probability distribution for returns).
2. PSM assumed to be 10% for Sakinaw and 30% for Cultus.
3. The in-river recreational fishery for sockeye occurs primarily upstream of the confluence of the Fraser and Vedder Rivers and therefore is not materially affected by SARA restrictions.
4. First Nations harvest is Food Social & Ceremonial (FSC).
5. There are annual negotiations regarding the amount of FSC catch. Generally, 950,000 sockeye is sufficient to meet FSC requirements.
6. Under each option there may be additional opportunities for in-river fisheries upstream of the confluence of the Fraser and Vedder Rivers. DFO is unable to quantify such opportunities at the present time.

Source: DFO

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- 3.19 The first is most severe, attempts to achieve 500 spawners of each stock, and involves no directed commercial fishery, extensive First Nation fisheries closures, and non-retention of sockeye by anglers in marine waters. The second is more moderate, allowing some directed fishing but over a shorter season. The last involves minimal additional management measures and catch restrictions (including no decrease in First Nations catch from the base case).
- 3.20 DFO is planning to continue, launch or investigate a variety of habitat improvements and enhancement activities. These include:
- hatchery activities (captive broodstock program),
  - smolt capture (fry and smolt augmentation),
  - predator control (lamprey and otters & seals in Sakinaw Lake, Northern Pikeminnow in Cultus Lake),
  - debris cleanup (wood waste from beaches on Sakinaw),
  - improvements in water flows and levels at Sakinaw Lake,
  - broodstock recapture improvements to the fishway at Sakinaw Lake, and
  - milfoil removal at Cultus Lake.
- 3.21 However these other DFO actions do not vary under each of the scenarios identified above and, as a result, their impacts on returns and escapement are not addressed in this study. In addition the beneficial results of such initiatives would mainly be felt in the long term.

#### ***MAE – Environmental Impacts***

- 3.22 The escapement levels for Sakinaw and Cultus sockeye have approached or fallen below "quasi-extinction thresholds" of 100 effective adult spawners in each lake in off-cycle years. As a result, even with no special SARA measures, the anticipated number of spawners in 2004 under the base case is low – 200 to 250 spawners for Sakinaw from a return of 390 fish, and 140 to 160 spawners for Cultus from a return of 350 fish.
- 3.23 Option #1 involving severe restrictions on fishing has less than a 1 in 4 chance of meeting its escapement target since the expected return (i.e., with zero fishing mortality and zero PSM) is less than the 500 target escapement for each population.
- 3.24 In contrast, Option #3 with a 100 escapement target level has a 90% + chance of being met. However, 100 spawners does not represent significant progress on stock recovery goals.
- 3.25 Option #1 would provide some stock rebuilding benefits to sockeye stocks other than Sakinaw and Cultus since the scenario represents a greater than 50% reduction in catch of Fraser sockeye stocks.
- 3.26 DFO does not have 10-20 year projections of total Fraser and Sakinaw and Cultus run sizes, catches, and escapements under each scenario. This prevents analysis of post 2004 impacts of SARA measures.

## **MAE – First Nation Impacts**

- 3.27 Several First Nations have a direct interest in Sakinaw and Cultus sockeye and have had targeted FSC fisheries for these stocks. The Sechelt Band on the Sechelt Peninsula has Sakinaw Lake as part of its traditional territory. The Band harvests sockeye in Sabine Channel. The Soowahlie Band of the Sto:Lo First Nation occupies the land that borders both sides of Sweltzer Creek, the sole access to Cultus Lake.
- 3.28 In addition, a number of other First Nations harvest Fraser stocks in areas where Cultus and Sakinaw sockeye are taken as part of a mixed stock fishery. The Kwakwiltl Territorial Fisheries Commission representing an amalgm of Bands harvests sockeye in Johnstone Strait. The Musqueam, Matsqui, and other Lower Mainland Bands harvests Fraser sockeye in the Fraser estuary and downstream of the Vedder River on the Fraser mainstem.
- 3.29 These harvests provide an importance source of food to aboriginal people. Such subsistence harvesting also provides very important social and cultural benefits to aboriginal people.
- Distribution – sharing of food among an extended family and the community
  - Cultural expression and continuity – providing linkages to traditional lifestyles and ancestors
  - Socialization – integrating young people into work roles and the community.

These non-economic benefits are substantial and may even exceed the benefits of subsistence as a food source. However, it is better to estimate the replacement food costs of subsistence, and appreciate the limitations as a measure of "value", rather than to not value subsistence at all (Gislason, 2003).

- 3.30 The food value alone of the subsistence harvests under the various scenarios is:

	Base Case	Option		
First Nations Catch		#1 Severe	#2 Moderate	#3 Minimal
Number of Fish	950,000	500,000	750,000	950,000
Food Value \$000*	6,409	3,301	5,025	6,409

\* 2.7 kg per fish, in-river fish valued at \$2.90 per kg, marine fish valued at \$3.85 per kg.

**Exhibit 4: Business Indicators for Harvest Scenarios Under SARA**

	Base Case	Options		
		#1 Severe	#2 Moderate	#3 Minimal
<b>Sockeye Harvest pieces</b>				
First Nations	950,000	500,000	750,000	950,000
Commercial	353,000	20,000	120,000	300,000
Recreational	<u>57,000</u>	<u>55,000</u>	<u>56,000</u>	<u>56,500</u>
All	1,360,000	575,000	926,000	1,306,500
<b>Revenue/Value \$000</b>				
First Nations	6,409	3,301	5,025	6,409
Commercial*	6,633	376	2,255	5,637
Recreational	<u>6,300</u>	<u>5,900</u>	<u>6,100</u>	<u>6,200</u>
All	19,342	9,577	13,380	18,246
<b>Wages \$000</b>				
First Nations	NA	NA	NA	NA
Commercial*	1,979	39	673	1,682
Recreational	<u>1,260</u>	<u>1,180</u>	<u>1,220</u>	<u>1,240</u>
All	3,239	1,219	1,893	2,922
<b>Operating Margin \$000</b>				
First Nations	NA	NA	NA	NA
Commercial*	3,495	198	1,188	2,971
Recreational	<u>1,260</u>	<u>1,180</u>	<u>1,220</u>	<u>1,240</u>
All	4,755	1,378	2,408	4,211
<b>Capital Return** \$000</b>				
First Nations	NA	NA	NA	NA
Commercial*	(3,933)	(6,524)	(5,746)	(4,345)
Recreational	<u>630</u>	<u>590</u>	<u>610</u>	<u>620</u>
All	(3,303)	(5,934)	(5,136)	(3,725)
<b>Employment person-weeks</b>				
First Nations	NA	NA	NA	NA
Commercial	8,976	60	4,858	6,838
Recreational	<u>1,800</u>	<u>1,690</u>	<u>1,740</u>	<u>1,770</u>
All	10,776	1,750	6,598	8,608

\* includes harvesting and processing i.e., revenues for commercial sector is processed value.

\*\* revenues less wages less operating cost less fixed costs i.e., return to interest, depreciation & pre-tax profit.

Source: GSGislason & Associates Ltd. estimates (see Appendix B)

- 3.31 Decreased access to subsistence harvests of sockeye diminish First Nations materially, as estimated above, but also socially and culturally. Recovery efforts for Sakinaw and Cultus sockeye, if successful, would enhance benefits accruing to First Nations from the marine resources of British Columbia.
- 3.32 A substantial 25% share of southern commercial salmon licences are operated by First Nations. And there are many First Nations employed in fish processing plants, especially in Northern Vancouver Island.

	Seine Area B	Gillnet		Troll		Total
		Area D	Area E	Area G	Area H	
<b>Licences</b>						
Native Communal "F"	7	27	16	10	3	63
Native Owned	42	81	52	21	18	214
Native Hired Skipper	28	0	0	0	0	28
Other	<u>90</u>	<u>177</u>	<u>337</u>	<u>203</u>	<u>132</u>	<u>939</u>
Total	167	285	405	234	153	1,244
<b>Native Participation</b>						
% Native Owned	29%	38%	17%	13%	14%	22%
% Native Operated	46%	38%	17%	13%	15%	25%

Source: Michelle James "Native Participation in British Columbia Commercial Fisheries 2003".

As a result, reductions in commercial catch will result in reductions in aboriginal revenue, wages, net returns, and employment.

#### **MAE – Business Impacts**

- 3.33 Exhibit 4 summarizes commercial – fishing plus processing - and recreational sector business activity for the Base Case and the three SARA scenarios for several indicators:
- revenues (processed value for commercial sector, and angler expenditures for recreational sector),
  - wages & benefits (including vessel skippers and plant workers),
  - operating margin (revenues less wages and other operating costs),
  - capital return (residual return to cover interest, depreciation & pre-tax profit), and
  - employment expressed in person-weeks (including vessel skipper and plant workers).
- 3.34 The exhibit contains the food value estimates for First Nations harvests, as given earlier based on imputed landed value, to facilitate gross value comparisons across sectors (however, the First Nation values do not include the important social and cultural values).

- 3.35 The commercial sector estimates include both harvesting and processing activities and are displayed by type of fishery in Appendix B. The allocation among gear types, provided by DFO, and the fish prices are:

			Price \$ per kg round	
			Landed	Processed
Seine	- Area B	40%	3.85	7.00
Gillnet	- Area D	15%	3.85	7.00
	- Area E	30%	3.63	6.60
Troll	- Area G	0%	NA	NA
	- Area H	15%	5.65	7.53

The prices approximate those received in 2003. The average weight of sockeye is assumed to be 2.7 kg.

- 3.36 Commercial sector revenues are reduced by wages, other operating costs (e.g., fuel, food) and fixed costs (e.g., insurance, moorage, gear, repairs) to arrive at estimates of net return to capital to cover interest, depreciation, and before tax profit (often called EBITDA or Earnings Before Interest, Taxes, Depreciation and Amortization).

The cost calculations are based on simple ratios which in turn are based on the consultant's experience with the salmon fishery, fleet costs & earnings surveys, and processor financials over the past 25 years – see Exhibit B.1, Appendix B. The figures reflect estimated cost structures post industry restructuring of the late 1990s.

- 3.37 Recreational sector revenues in the Base Case are based on marine sector expenditures of \$200 per tidal angler-day or \$400 per tidal sockeye caught, and on in-river expenditures of \$100 per freshwater angler-day (also \$100 per freshwater sockeye caught). The freshwater catch and associated angler expenditures do not vary across the scenarios. The tidal expenditures vary only slightly as it assumed that, in the absence of marine sockeye angling opportunities, half of the sockeye effort would get redirected to other marine species.

The marine and freshwater daily expenditures are based on the SWOT Assessment by GSGislason & Associates Ltd. (2004) and the DFO 2000 Survey of Recreational Fishing (2003) respectively.

- 3.38 The results in Exhibit 4 demonstrate the poor financial returns for the commercial sector under the base catch of 353,000 sockeye. (Results for individual fishing areas are given in Appendix B). This is not surprising since the base case catch is only 30% of the 1.2 million average sockeye catch over the 2000 to 2003 period, and is less than 10% of the commercial sockeye catch in the 1990s.

- 3.39 The salmon processing sector in British Columbia is very fragile economically. The poor sockeye catches forecast for 2004 will result in the 10<sup>th</sup> consecutive year that salmon processor returns are negative or inadequate.
- 3.40 The results in Exhibit 4 show that the greatest disparity in revenues and/or values across scenarios occurs for the commercial sector with the recreational sector demonstrating the least variability. The robustness of recreational sector results reflects the fact that most freshwater angling for sockeye occurs above the Vedder on the Fraser mainstem.
- 3.41 The very poor financial results for the commercial sector reflects poor fleet economics, even in the Base Case situation, as a result of the very large fleet of 900 vessels with high fixed costs assumed to be in operation – see Appendix B. The salmon fleet would have to be about 2/3 smaller, with the departing vessels having fixed costs serviced from another income stream, for the remaining 1/3 of vessels to earn essentially zero return on investments. SARA restrictions on fishing and catches magnify what is already a very difficult situation.
- 3.42 Akin to the lack of 10-20 year projections of Fraser sockeye run sizes and associated catches, one cannot investigate post 2004 salmon fleet economics.

#### **MAE – Government Impacts**

- 3.43 DFO has incurred significant costs related to SARA and its associated recovery planning process for Sakinaw and Cultus sockeye. These costs include the value of DFO personnel time and associated personnel expenses e.g., travel.
- 3.44 DFO has spent significant monies on contractors that have worked on hatchery programs, habitat improvement contracts, science investigations, and the like.
- 3.45 The provincial government also has spent professional time and incurred expenditures related to the SARA process. Unfortunately, neither federal nor provincial costs related to SARA are available.
- 3.46 The personal and corporate tax implications of SARA options are illustrated below:

	Base Case	Option		
Tax Revenues \$000		#1 Severe	#2 Moderate	#3 Minimal
Personal Tax*	650	240	380	580
Corporate Tax**	80	15	35	70

\* Assumed to be 20% of wages

\*\* Assumed to be 1% of revenues for recreational and processing sectors (if processing sector meets financial targets, an unlikely occurrence).



The federal-provincial split of personal income taxes depends on the taxable income level but likely is about 70:30 overall in British Columbia. The federal-provincial split of corporate income taxes is approximately 75:25 (although the actual rate/split depends on whether the corporation qualifies for the small business rate).

- 3.47 There are no impacts on DFO licence fee revenue since it is assumed the fleet size stays the same under all scenarios.
- 3.48 SARA could also impact local government revenues and costs through, for example, property tax and sewage treatment impacts e.g., if SARA resulted in improved water quality in Sakinaw and Cultus Lake through municipal sewage treatment requirements for local residents. Again no information on these potential outcomes and associated local government revenues/costs are available.

#### **MAE – Social & Community Impacts**

- 3.49 Salmon are special to the people of British Columbia. Beyond their economic importance, salmon are part of the intrinsic identity of the province, to both those who live here and those who visit from afar. The salmon and the people, businesses, and communities that depend on them are a rich part of our cultural heritage and psyche. Losing this rich endowment seems unthinkable (GSGislason & Associates Ltd. 1998).
- 3.50 There are several communities such as Alert Bay, Sointula, Port Hardy and Quadra Island that depend heavily on Fraser sockeye salmon and the economic benefits generated. However, the actual economic and social dependence of particular communities on Fraser sockeye is not measureable. Nevertheless, significant reductions in salmon runs and harvest from historical levels will have negative repercussions for a wide variety of people and communities in Southern BC.
- 3.51 The information from Exhibit 4 can be used to describe provincial economic activity measures of Gross Domestic Product (GDP), wages, and employment under the SARA scenarios or options.

	Base Case	Option		
Direct Impacts*		#1 Severe	#2 Moderate	#3 Minimal
GDP \$000	(64)	(4,715)	(3,243)	(803)
Wages \$000	3,239	1,219	1,893	2,922
Employment person-weeks	10,776	1,750	6,598	8,608

\* Derived from Exhibit 4.

The GDP impact measure is negative due to the significant losses incurred by the salmon fishing fleet under all scenarios.

- 3.52 The above impacts do not include the indirect supplier impacts and induced consumer responding impacts from reduced catches and fishing activity under the SARA scenarios.

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## 4.0 CONCLUSIONS

- 4.1 A Multiple Account Evaluation (MAE) approach to assessing the impacts – environmental, economic, and social – of the Species at Risk Act (SARA) is useful. It allows the consistent and transparent treatment of the impacts of the Act on people, businesses, communities, First Nations, and governments. The MAE framework developed for assessing impacts of SARA entails five accounts: environmental, First Nations, business, government, and social & community.
- 4.2 As illustrated through the application to Sakinaw and Cultus sockeye, however, the MAE approach can be data and information intensive. What is needed to accurately gauge the socio-economic impacts of SARA are long term projections of environmental parameters or indicators, with vs without SARA. Unfortunately these are not presently available.
- 4.3 The result is a focus of the analysis on the negative short term effects when SARA, in the long term, could create additional opportunities even during the recovery process. The benefits of conservation cannot be realized within one year.
- 4.4 There is a compelling need for basic economic profile data on cost structures and returns, such as Costs & Earnings surveys, for fish harvesting and processing activities. In the absence of such data the consultant had to use considerable professional judgement and ingenuity in illustrating the application of the MAE approach to Sakinaw and Cultus sockeye.
- 4.5 Nevertheless, this initial study can provide the foundation for more detailed analysis of SARA and its impacts in the future. The logical next step would be to extend the analysis of impacts 10 to 20 years into the future to give a broader view of long term impacts.

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## Bibliography

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- BC Ministry of Agriculture, Food & Fisheries, "Seafood Year in Review", Annual.
- BC Ministry of Management Services (BC Stats), "British Columbia's Fisheries and Aquaculture Sector", September 2002.
- BC Ministry of Sustainable Resource Management, "Socio-Economic and Environmental Assessment for Land and Resource Management Planning in British Columbia: Guiding Principles", Final Draft, July 28, 2003.
- Canada Fisheries and Oceans, "Policy for the Management of Fish Habitat", October 1986.
- Canada Fisheries and Oceans, "A New Direction for Canada's Pacific Salmon Fisheries", October 1998.
- Canada Department of Fisheries and Oceans, "2000 Survey of Recreational Fishing in Canada", Economic and Commercial Analysis Report No. 165, March 2003.
- COSEWIC, "COSEWIC Assessment Summary – Sockeye Salmon (Sakinaw population)", May 2003.
- COSEWIC, "COSEWIC Assessment Summary – Sockeye Salmon (Cultus population)", May 2003.
- Gislason, Gordon et al, "The Economic Value of Salmon: Chinook and Coho in British Columbia: Discussion Document", Prepared for Canada Fisheries and Oceans and Province of British Columbia, February 1996.
- Gislason, Gordon, "The BC Salmon Fleet: Financial Returns 1976 to 1995", Prepared for Canada Department of Fisheries and Oceans, October 1997.
- GSGislason & Associates Ltd., "Fishing for Money: Challenges and Opportunities in the BC Salmon Fishery", Prepared for the BC Job Protection Commission, June 1998.
- GSGislason & Associates Ltd., "The 1999 Fraser River Sockeye Fishery: A Lost Year", Prepared for BC Ministry of Agriculture, Food & Fisheries, October 1999.
- GSGislason & Associates Ltd., "A Marine Protected Area for the Beaufort Sea: Multiple Account Evaluation", Prepared for BSIMPI Working Group, DFO Central & Arctic Region, March 2003.
- GSGislason & Associates Ltd., "British Columbia Seafood Sector and Tidal Water Recreational Fishery: A Strengths, Weaknesses, Opportunities and Threats (SWOT) Assessment", Prepared for BC Ministry of Agriculture, Food and Fisheries, February 2004.
- Greer, Alan, "2003 Fraser Sockeye Management Options – Socio-Economic Analysis", Prepared for DFO, 8 pages Mimeographed, March 2003.
- James, Michelle, "Native Participation in BC Commercial Fisheries – 2003", Prepared for BC Agriculture Food & Fisheries, November, 2003.
- Horne, Garry, BC Ministry of Management Services (BC Stats), "British Columbia's Heartland at the Dawn of the 21<sup>st</sup> Century: 2001 Economic Dependencies and Impact Ratios for 63 Local Areas", January 2004

## **Appendix A**

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### *Southern BC Commercial Sockeye Salmon Catches*

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**Exhibit A.1: BC Commercial Sockeye Catch 2000 to 2003 – Area B Seine**

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Month/Period	2000		2001		2002		2003	
	Pieces	kg	Pieces	kg	Pieces	kg	Pieces	kg
June - 061								
- 062								
- 063			2,555	4,750	3,853	9,001	234	455
- 064	1,668	4,063	3,765	6,983	20,983	47,305	16,472	34,677
July - 071	514	1,102	3,124	5,187	36,598	91,138	52,671	109,253
- 072	3,044	6,949			50,497	76,962	33,899	71,873
- 073	1,688	3,610	171	488	82,140	121,760	17,570	35,709
- 074	12,263	32,365	709	2,023	87,243	139,589	10,728	25,157
- 075	5,899	15,154	2,870	7,782	310,370	784,753	13,584	36,937
Aug - 081	8,337	22,139	58,464	156,910	22,956	72,038	401,602	1,114,965
- 082	246,827	711,135	5,712	15,909	303,745	965,215	34,689	90,977
- 083	1,763	4,487	821	2,223	1,731	5,270	2,165	5,455
- 084	11,519	34,745	675	1,856	2,372	7,312	320	990
Sept - 091	280	356	193	497	509	1,546	632	1,811
- 092							718	2,047
- 093								
- 094								
<b>TOTAL</b>	<b>293,802</b>	<b>836,105</b>	<b>79,059</b>	<b>204,608</b>	<b>922,997</b>	<b>2,321,889</b>	<b>585,284</b>	<b>1,530,306</b>

Source: DFO

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**Exhibit A.2: BC Commercial Sockeye Catch 2000 to 2003 – Area D Gillnet**

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Month/Period	2000		2001		2002		2003	
	Pieces	kg	Pieces	kg	Pieces	kg	Pieces	kg
June - 061			165	356				
- 062			503	1,106	10,765	25,501	11,645	27,313
- 063			13,542	29,324	27,966	62,615	7,761	17,991
- 064	7,613	18,032	13,319	27,953	15,626	36,771	21,490	49,176
July - 071	4,994	12,106	13,320	22,688	21	48	30,101	67,700
- 072	622	1,460	243	529	25,848	60,311	28,279	64,121
- 073	163	436	333	986	19,218	40,523	16,569	37,509
- 074	436	1,170	3,283	9,414	10,443	24,218	3,975	9,184
- 075	2,867	8,058	77,198	220,874	69,073	208,300	89,164	252,399
Aug - 081	58,763	163,050	2,625	7,417	43,886	135,390	46,855	126,544
- 082	48,619	135,242	623	1,753	57,832	174,532	4,851	13,361
- 083	26,508	72,721			96	272		
- 084	654	1,917			57,193	176,788		
Sept - 091	1,040	2,378			656	1,975		
- 092	130	326						
- 093	419	1,050						
- 094	1	2						
<b>TOTAL</b>	<b>152,829</b>	<b>417,948</b>	<b>125,154</b>	<b>322,400</b>	<b>338,623</b>	<b>947,244</b>	<b>260,690</b>	<b>665,298</b>

Source: DFO

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**Exhibit A.3: BC Commercial Sockeye Catch 2000 to 2003 – Area E Gillnet**

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Month/Period	2000		2001		2002		2003	
	Pieces	kg	Pieces	kg	Pieces	kg	Pieces	kg
June - 061								
- 062								
- 063			186	610				
- 064	1,091	2,852	250	822	328	885	363	926
July - 071	6,809	17,929	795	2,552	45	126	762	1,967
- 072	6,375	16,717	502	1,425	3,879	37,536	768	1,983
- 073	8,298	22,033	805	2,326	2,681	7,618	417	1,146
- 074	10,037	27,527	484	1,434	6,231	18,658	2,611	7,248
- 075	171,418	471,489	16,732	46,070	38,421	115,572	6,142	16,765
Aug - 081	8,979	25,001	4,242	12,195	37,891	116,448	81,235	217,611
- 082	209,010	571,045	6,629	19,224	634,437	1,905,314	90,242	242,067
- 083	5,234	14,326	5,477	15,748	5,057	15,888	4,485	12,416
- 084	8,737	24,551	3,780	10,621	3,665	11,718	1,748	5,184
Sept - 091	633	1,802	1,105	3,095	5,221	17,355	350	1,102
- 092	26	68	263	718	4,378	14,638	387	1,207
- 093	14	42	31	104	2,567	8,433	162	499
- 094	3	9	3	13	11	39	24	87
<b>TOTAL</b>	<b>436,664</b>	<b>1,195,391</b>	<b>41,284</b>	<b>116,957</b>	<b>744,812</b>	<b>2,270,228</b>	<b>189,696</b>	<b>510,208</b>

Source: DFO

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**Exhibit A.4: BC Commercial Sockeye Catch 2000 to 2003 – Area G Troll**

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Month/Period	2000		2001		2002		2003	
	Pieces	kg	Pieces	kg	Pieces	kg	Pieces	kg
June - 061								
- 062					3,617	8,928		
- 063			5,987	17,395	4,160	9,579		
- 064	2,533	7,200	197	348	18,251	31,394		
July - 071	557	1,570	4,995	14,036				
- 072			110	179	11,728	25,113		
- 073	151	435			6,744	15,041		
- 074	57	166	37	107	2,957	6,733		
- 075	552	1,460	2,185	6,367	43,816	140,652		
Aug - 081			5,434	15,789	94,174	318,783		
- 082			2,384	6,926				
- 083			343	997				
- 084								
Sept - 091								
- 092								
- 093								
- 094			189	548				
<b>TOTAL</b>	<b>3,850</b>	<b>10,831</b>	<b>21,861</b>	<b>62,692</b>	<b>185,447</b>	<b>556,223</b>	<b>0</b>	<b>0</b>

Source: DFO



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**Exhibit A.5: BC Commercial Sockeye Catch 2000 to 2003 – Area H Troll**

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Month/Period	2000		2001		2002		2003	
	Pieces	kg	Pieces	kg	Pieces	kg	Pieces	kg
June - 061								
- 062								
- 063								
- 064								
July - 071								
- 072								
- 073								
- 074			5,753	16,560				
- 075	30	80	38,861	113,231	2,215	7,465	11,471	31,000
Aug - 081	7,806	22,365	5,563	15,834	19,703	60,971	36,767	101,344
- 082	42,595	121,804	589	1,657	43,509	141,796	50,154	146,634
- 083	26,631	76,424			4,850	15,348	182	505
- 084	4,707	13,684			38,464	130,604		
Sept - 091	248	712			3,465	11,973		
- 092	920	2,641						
- 093								
- 094								
<b>TOTAL</b>	<b>82,937</b>	<b>237,710</b>	<b>50,766</b>	<b>147,282</b>	<b>112,206</b>	<b>368,157</b>	<b>98,574</b>	<b>279,483</b>

Source: DFO

## **Appendix B**

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### *Commercial Fishing Indicators Under SARA*

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**Exhibit B.1: Base Case Assumptions for Commercial Operations**

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	Seine Area B	Gillnet		Troll Area H
		Area D	Area E	
<b>Harvesting</b>				
Catch Share	40%	15%	30%	15%
Weight per Fish kg	2.7	2.7	2.7	2.7
Crew Size inc. Skipper	5.0	1.5	1.5	2.0
Weeks per Vessel	4	4	4	4
No. of Vessels	160	250	350	140
<b>Prices</b>				
Landed \$/kg round	\$3.85	\$3.85	\$3.63	\$5.65
Processed \$/kg round	\$7.00	\$7.00	\$6.60	\$7.53
<b>Costs</b>				
Harvesting - % crew share	38.5%	28%	28%	35%
- operating costs \$/kg	\$0.33	\$0.66	\$0.66	\$0.55
- fixed costs \$ per vessel	\$16,000	\$5,000	\$5,000	\$8,000
Processing - wages \$/kg	\$0.77	\$0.77	\$0.77	\$0.44
- operating \$/kg	\$0.77	\$0.77	\$0.77	\$0.33
- % capital return target	10%	10%	10%	5%

- Notes*
1. The number of vessels is about 90% of those licenced in each area.
  2. The average processing wages rate including benefits is \$650 per week (\$20/hr for 32.5 hrs.).
  3. Fixed vessel costs are only those attributable to sockeye fishing.
  4. The capital return target is illustrative and not necessarily achievable under current conditions.

Source: GSGislason & Associates Ltd. illustrative estimates.

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**Exhibit B.2: Commercial Sector Activity Under SARA – Base Case**

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	Seine	Gillnet		Troll	
	Area B	Area D	Area E	Area H	Total
<b>Harvest</b>					
Pieces	141,200	52,950	105,900	52,950	353,000
Weight '000 kg	381.2	143.0	285.9	143.0	953.1
<b>Fleet Participation</b>					
Vessels	160	250	350	140	900
Crew Jobs*	800	375	525	280	1,980
<b>Revenues \$000</b>					
Landed Value	1,468	550	1,038	808	3,864
Processing Margin	<u>1,201</u>	<u>450</u>	<u>849</u>	<u>269</u>	<u>2,769</u>
Processed Value	2,669	1,000	1,887	1,077	6,633
<b>Wages \$000</b>					
Crew Wages*	565	154	291	283	1,293
Plant Wages	<u>294</u>	<u>110</u>	<u>220</u>	<u>63</u>	<u>687</u>
Total	859	264	511	346	1,979
<b>Operating Margin \$000</b>					
Fishing	777	302	559	446	2,084
Processing	<u>614</u>	<u>230</u>	<u>409</u>	<u>159</u>	<u>1,412</u>
Total	1,391	532	967	605	3,495
<b>Capital Return** \$000</b>					
Fishing	(1,783)	(948)	(1,191)	(674)	(4,596)
Processing	<u>267</u>	<u>100</u>	<u>189</u>	<u>108</u>	<u>663</u>
Total	(1,516)	(848)	(1,002)	(566)	(3,933)
<b>Employment person-weeks</b>					
Fishing	3,200	1,500	2,100	1,120	7,920
Processing	<u>452</u>	<u>169</u>	<u>339</u>	<u>97</u>	<u>1,056</u>
Total	3,652	1,669	2,439	1,217	8,976

\* Includes skipper

\*\* Residual return to interest, depreciation, and pre-tax profits

Source: GSGislason & Associates Ltd.

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**Exhibit B.3: Commercial Sector Activity Under SARA – Option #1 Severe**

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	Seine Area B	Gillnet Area D      Area E		Troll Area H	Total
<b>Harvest</b>					
Pieces	8,000	3,000	6,000	3,000	20,000
Weight '000 kg	21.6	8.1	16.2	8.1	54.0
<b>Fleet Participation</b>					
Vessels	160	250	350	140	900
Crew Jobs*	0	0	0	0	0
<b>Revenues \$000</b>					
Landed Value	83	31	59	46	219
Processing Margin	<u>68</u>	<u>26</u>	<u>48</u>	<u>15</u>	<u>157</u>
Processed Value	151	57	107	61	376
<b>Wages \$000</b>					
Crew Wages*	0	0	0	0	0
Plant Wages	<u>17</u>	<u>6</u>	<u>12</u>	<u>4</u>	<u>39</u>
Total	17	6	12	4	39
<b>Operating Margin \$000</b>					
Fishing	44	17	32	25	118
Processing	<u>35</u>	<u>13</u>	<u>23</u>	<u>9</u>	<u>80</u>
Total	79	30	55	34	198
<b>Capital Return** \$000</b>					
Fishing	(2,516)	(1,233)	(1,718)	(1,095)	(6,562)
Processing	<u>15</u>	<u>6</u>	<u>11</u>	<u>6</u>	<u>38</u>
Total	(2,501)	(1,227)	(1,707)	(1,089)	(6,624)
<b>Employment person-weeks</b>					
Fishing	0	0	0	0	0
Processing	<u>26</u>	<u>10</u>	<u>19</u>	<u>5</u>	<u>60</u>
Total	26	10	19	5	60

\* Includes skipper (assumes no directed fishery at sockeye)

\*\* Residual return to interest, depreciation, and pre-tax profits

Source: GSGislason & Associates Ltd.

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**Exhibit B.4: Commercial Sector Activity Under SARA – Option #2 Moderate**

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	Seine	Gillnet		Troll	
	Area B	Area D	Area E	Area H	Total
<b>Harvest</b>					
Pieces	48,000	18,000	36,000	18,000	120,000
Weight '000 kg	129.6	48.6	97.2	48.6	324.0
<b>Fleet Participation</b>					
Vessels	160	250	350	140	900
Crew Jobs*	800	375	525	280	1,980
<b>Revenues \$000</b>					
Landed Value	499	187	353	275	1,313
Processing Margin	<u>408</u>	<u>153</u>	<u>289</u>	<u>91</u>	<u>941</u>
Processed Value	907	340	642	366	2,255
<b>Wages \$000</b>					
Crew Wages*	192	52	99	96	439
Plant Wages	<u>100</u>	<u>37</u>	<u>75</u>	<u>21</u>	<u>233</u>
Total	292	90	174	117	673
<b>Operating Margin \$000</b>					
Fishing	264	103	190	152	708
Processing	<u>209</u>	<u>78</u>	<u>139</u>	<u>54</u>	<u>480</u>
Total	473	181	329	206	1,188
<b>Capital Return** \$000</b>					
Fishing	(2,296)	(1,147)	(1,560)	(968)	(5,972)
Processing	<u>91</u>	<u>34</u>	<u>64</u>	<u>37</u>	<u>226</u>
Total	(2,205)	(1,113)	(1,496)	(931)	(5,746)
<b>Employment person-weeks</b>					
Fishing	1,600	750	1,050	560	3,960
Processing	<u>154</u>	<u>58</u>	<u>115</u>	<u>33</u>	<u>359</u>
Total	1,754	808	1,165	593	4,319

\* Includes skipper

\*\* Residual return to interest, depreciation, and pre-tax profits

Source: GSGislason & Associates Ltd.

**Exhibit B.5: Commercial Sector Activity Under SARA – Option #3 Minimal**

	Seine	Gillnet		Troll	Total
	Area B	Area D	Area E	Area H	
<b>Harvest</b>					
Pieces	120,000	45,000	90,000	45,000	300,000
Weight '000 kg	324.0	121.5	243.0	121.5	810.0
<b>Fleet Participation</b>					
Vessels	160	250	350	140	900
Crew Jobs*	800	375	525	280	1,980
<b>Revenues \$000</b>					
Landed Value	1,247	468	882	686	3,284
Processing Margin	<u>1,021</u>	<u>383</u>	<u>722</u>	<u>228</u>	<u>2,353</u>
Processed Value	2,268	851	1,604	915	5,637
<b>Wages \$000</b>					
Crew Wages*	480	131	247	240	1,098
Plant Wages	<u>249</u>	<u>94</u>	<u>187</u>	<u>53</u>	<u>584</u>
Total	730	225	434	294	1,682
<b>Operating Margin \$000</b>					
Fishing	660	257	475	379	1,771
Processing	<u>522</u>	<u>196</u>	<u>347</u>	<u>135</u>	<u>1,200</u>
Total	1,182	452	822	514	2,971
<b>Capital Return** \$000</b>					
Fishing	(1,900)	(993)	(1,275)	(741)	(4,909)
Processing	<u>227</u>	<u>85</u>	<u>160</u>	<u>92</u>	<u>564</u>
Total	(1,673)	(908)	(1,115)	(649)	(4,345)
<b>Employment person-weeks</b>					
Fishing	2,400	1,125	1,575	840	5,940
Processing	<u>384</u>	<u>144</u>	<u>288</u>	<u>82</u>	<u>898</u>
Total	2,784	1,269	1,863	922	6,838

\* Includes skipper

\*\* Residual return to interest, depreciation, and pre-tax profits

Source: GSGislason & Associates Ltd.