Employment Impacts of ITQ Fisheries in Pacific Canada

Prepared for:

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March 2008

Preface

Fisheries and Oceans Canada retained GSGislason & Associates Ltd. to assess the employment, wage and community impacts of the move to Individual Transferable Quota (ITQs) for selected fisheries in Pacific Canada.

The consultants have benefited from discussions with industry, government, and others. Notwithstanding this assistance, the authors have final responsibility for the analyses and conclusions of the study.

Summary

1. Introduction

- under Individual Transferable Quota (ITQ) management, licensed individuals are allocated a predetermined share of the aggregate Total Allowable Catch (TAC)
- ITQ management of Pacific fisheries in Canada has been controversial in that, in an attempt to improve economic viability, such programs can reduce the employment base
- however, little empirical analysis of the employment impacts of ITQ fisheries exists; such analysis can aid fisheries policy and engender greater understanding amongst user groups and the public
- this study assesses the employment, wage and community impacts of the move to ITQ fisheries for the following six (6) Case Study fisheries in Pacific Canada:
  - the halibut "L" licensed fishery (longline gear, 435 licences)
  - the sablefish "K" licensed fishery (longline & trap gear, 48 licences)
  - the groundfish trawl "T" licensed fishery (trawl gear, 142 licences)
  - the geoduck "G" licensed fishery (dive fishery, 55 licences)
  - the red sea urchin "ZC" licensed fishery (dive fishery, 110 licences)
  - the Area F Troll Chinook Salmon "ATF" licensed fishery (hook & line gear, 168 licences in 2005)
- the study addresses both fleet and processor level impacts

2. Approach & Methodology

- impact analysis requires explicit recognition as to what is the alternative for comparison purposes i.e., to focus on incremental effects and to compare the employment and wage base of each sector "with" ITQs to the likely employment and wage base "without" ITQs
- this study assumes that in the absence of ITQ management each fishery would be managed as a derby or competitive fishery in which licensed individuals compete for the available catch
- the study focuses on ITQ impacts for the year 2005 since DFO introduced the Pilot Groundfish Integration Program in 2006 and since there have been salmon area reselection processes in 2006 and 2007, very significant fisheries management events.
- impact measures are:
  - employment (expressed in person-years)
  - wages & salaries (including benefits)
  - community impact indicators (e.g., licence holdings by region, community product offloads)

- the study involved two main information collection activities:
  - an interview program with 65 individuals (fisheries scientists, fisheries managers, fishing licence holders, processors, Dockside Monitoring Program service providers, industry associations)
  - secondary information collection from government reports, consultant studies, academic journals etc.
- this information, along with our knowledge of industry sectors, enabled us to make reasonable projections of the current 2005 situation and what the 2005 situation likely would have been if ITQs had not been introduced
- the following general results, conclusions and "lessons learned" refer to all case study fisheries except Area F Troll chinook salmon
- the main reason for excluding Area F Troll is that this fishery does not have the certainty of access integral to a true ITQ program i.e., DFO can shut down the fishery early before the complete TAC is taken, the number of licence holders is not fixed from year to year (limited entry to the Area F fishery does not really exist)

3. Results

- the impetus to moving to ITQs for the case study fisheries generally had several common features:
  - an inability to fish within fleet-wide TACs; overages occurred year after year
  - issues related to compromised crew safety & poor working conditions
  - poor quality product, the inability to serve lucrative year-round markets since TACs were caught or exceeded early in the year.
  - incentives to misreport on logbooks & sales (transaction) slips
  - excessive amount of capital, labour and operating costs e.g., boats, crew, fuel, gear
  - inability to monitor & enforce fisheries regulations
  - an inherently unstable industry
- these symptoms of poor conservation, business and people practices all resulted from the "race for the fish" under the derby fishery management format. A common theme was that the status quo was no longer acceptable.
- the Summary Results in the attached Exhibit show that after projecting changes in catches, active vessels, crew complements, and market products, prices and processing labour:
  - all fisheries show an increase in industry product value under ITQs (in fact, processed value essentially doubles under ITQs for all sectors combined), and
  - most fisheries show an increase in wages and person-year employment under ITQs

- a major reason is that, under the derby fishery situation, lower TACs/catches would occur especially for groundfish trawl, geoduck and red sea urchin; these three fisheries exhibited a severe inability to fish to the TAC limit prior to the introduction of ITQs
- ITQ management has resulted in much better science and data from the Dockside Monitoring Program and other endeavours
- in today's precautionary fisheries management world, a manageable fishing fleet and better science can lead to higher TACs
- ITQ fisheries management also has allowed better quality products to be produced over a much longer season which has enabled higher returns to both fishermen and processors
- the groundfish trawl sector had by far the highest revenues, wage and employment increases under ITQs of all sectors considered
- apart from the red sea urchin fishery, the rural share of commercial fishing licences did not change appreciably under ITQ fisheries management
- for the halibut, sablefish and groundfish trawl fleets there has been a shift in the geographic pattern of fish landings under ITQs - more fish is landed on Vancouver Island, specifically Port Hardy, and less fish is landed in Greater Vancouver; the underlying reasons include:
  - proximity to fishing grounds
  - high fuel costs
  - better product quality

4. Lessons Learned

- ***Lesson #1**: The situation in many fisheries prior to introducing ITQs was untenable. Change was mandated by poor conservation, business, and people practices.*
- ***Lesson #2**: Changes in the economy usually involves the substitution of capital for labour. This is what happened in ITQ fisheries where each active vessel/operating unit caught more fish - but each ITQ crew member worked much longer and generally earned more money over the season.*
- ***Lesson #3**: ITQs create an incentive for fishermen, processors, and buyers to cooperate in identifying market needs and ensuring appropriate catch timing/handling to meet those needs. The change drew the industry closer to business practices of other elements of the food industry such as red meat and poultry.*
- ***Lesson #4**: ITQs allow the production of high value products. Higher quality builds a demand niche that is more insulated from the broad supply and demand trends, macroeconomic changes etc that buffet commodities on world markets.*
- ***Lesson #5**: ITQs have led to better monitoring of port offloads and at-sea activities. ITQs also have led to much better science in most fisheries considered, science for which industry has paid. In today's precautionary world, better monitoring and better science can lead to higher TACs.*
- ***Lesson #6**: The long term benefits of ITQs are generally greater than the short term benefits e.g., it takes time for the fleet to consolidate to an economic size, it takes time for market acceptance of improved quality products.*

- ***Lesson #7**: ITQs shift the balance of power between the licence/vessel owner and the vessel crew and the processar-buyer. The licence/vessel owner appropriates a greater share of the increase in "industry value" than does the processor or crew. We argue, nevertheless, and this study substantiates this, both crew and processor interests are better off in total under ITQs.*
- ***Lesson #8**: Certainty of access is a necessary condition to the success of an ITQ program. The ITQ level per licence needs to be set well in advance of the season, the threat that the fishery will be closed down early due to conservation concerns needs to be minimized, and the number of licence holders from year-to-year needs to be fixed to facilitate business planning.*
- ***Lesson #9**: Commercial fishing licences under ITQ fisheries management do not necessarily gravitate to interests in large urban centres at the expense of rural interests.*
- ***Lesson #10**: It is difficult to analyze the employment, wage, and community impacts of ITQs in isolation of resource conservation, fisheries management, market/revenue, and cost impacts. Future analysis of the employment impacts of ITQ fisheries should comprise one component of a more broad-based, integrated review of ITQ programs.*

5. Final Comments

- it is hoped that our analysis, with its empirical focus, offers a fresh perspective on the enduring debate as to the employment impacts of ITQs fisheries.
- by conducting the analysis in a dynamic setting, and taking into account the precautionary approach and the need to reduce TACs in problem derby situations, the impacts of ITQs on worker interests in aggregate in many cases are positive.
- however, there are job losses for some individual crew members under ITQ fisheries management.
- nevertheless, some people will still argue that employment associated with the fishing industry is a benefit, whereas others will still argue that employment associated with the fishing industry is a cost.
- perhaps the interests of the resource are paramount - and this study as well as others demonstrate that the resource and conservation objectives can be well-served by ITQ fisheries management.

Exhibit: Summary of Employment-Related Impacts of Case Study ITQ Fisheries in BC

Management/Indicator	Case Studies					
	Halibut	Sablefish	GF Trawl*	Geoduck	Red Urchin	Area F Chinook
A. FISHERY DESCRIPITON						
Fishing Technology	longline	longline & trap	trawl	dive	dive	hook & line
Number of Licences	435	48	142	55	110	168
IQ Implementation Year	1991	1990	1997	1989	1995	2005
B. ITQ IMPACT ANALYSIS						
2005 Situation w ITQs						
Catch tonnes	5,566	3,815	47,600	1,560	3,873	1,350
Processed Value $000	62,620	30,800	83,780	34,790	16,850	10,460
Wages $000	13,470	6,980	34,930	9,180	7,860	3,820
Employment PYs	232	109	690	84	223	110
Other - Active Vessels	221	35	52	40	44	138
- Crew Jobs	775	280	208	120	132	276
- % Rural Licences	60%	31%	31%	65%	54%	71%
2005 Projection w/o ITQs**						
Catch tonnes	5,400	3,150	23,800	780	2,443	1,350
Processed Value $000	42,930	20,750	34,030	8,700	8,550	9,110
Wages $000	14,250	6,780	18,990	3,590	4,590	3,960
Employment PYs	204	73	410	65	145	87
Other - Active Vessels	360	40	40	55	30	138
- Crew Jobs	1,440	480	160	220	120	304
- % Rural Licences****	62%	25%	30%	58%	78%	70%
2005 ITQ Impacts***						
Catch tonnes	+166	+665	+23,800	+780	+1,430	0
Processed Value $000	+19,690	+10,050	+49,750	+26,090	+8,300	+1,350
Wages $000	-780	+200	+15,940	+5,590	+3,270	-140
Employment PYs	+28	+36	+280	+19	+78	+23
Other - Active Vessels	-139	-5	+12	-15	+14	0
- Crew Jobs	-665	-200	+48	-100	+12	-28
- % Rural Licences	-2%	+6%	+1%	+7%	-24%	+1%

* *GF Trawl excludes hake and Option B operations*

** *The "Without ITQ" scenario is the derby or competitive fishing scenario*

*** *Impact is "With ITQ" scenario less "Without ITQ" scenario*

**** *% rural licences without ITQs is % immediately prior to introduction of IQs ("rural" is the area other than Lower Mainland plus Victoria & Area)*

Source: Sections 3 through 8

Notes: 1. Dressed, head-off weight for halibut & round weight for all others

2. Wages and employment figures are sums of vessel plus plant-level figures

3. Assumptions - 25 person weeks fished equals 1 person-year (PY)

- 1 PY per $40,000 plant-level wages & benefits (including allowance for administrative positions)

Acronyms

BC	-	British Columbia
CGRCS	-	Canadian Groundfish Research & Conservation Society
CFIA	-	Canadian Food Inspection Agency
DFO	-	Canada Department of Fisheries & Oceans
ENGO	-	Environmental Non-Government Organization
FAO	-	Food and Agriculture Organization (of the United Nations)
FAS	-	Frozen-at-Sea
FZ	-	Frozen
GDA	-	Groundfish Development Authority
GF	-	groundfish
GSIC	-	Groundfish Special Industry Committee
GTAC	-	Groundfish Trawl Advisory Committee
GVRD	-	Greater Vancouver Regional District
HAB	-	Halibut Advisory Board
IPHC	-	International Pacific Halibut Commission
IQ	-	Individual Quota
ITQ	-	Individual Transferable Quota
IVQ	-	Individual Vessel Quota
JV	-	Joint Venture (for hake)
MOE	-	British Columbia Ministry of Environment
PBS	-	Pacific Biological Station (a science arm of DFO)
PHMA	-	Pacific Halibut Management Association
PUHA	-	Pacific Urchin Harvesters Association (for red sea urchin)
PY	-	person-year
QCI	-	Queen Charlotte Islands
RD	-	Round
SF	-	Sablefish
SWOT	-	Strengths, Weaknesses, Opportunities, Threats
SYIR	-	Seafood Year in Review
TAC	-	Total Allowable Catch
UFAWU	-	United Fishermen & Allied Workers Union
UHA	-	Underwater Harvesters Association (for geoducks)
WCVI	-	West Coast of Vancouver Island
WCB	-	Workers' Compensation Board

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1.0 Introduction

The introduction of individual quota (IQ) fisheries management into the Pacific fisheries of Canada has been controversial. Although IQ programs can increase economic viability of fishing enterprises, such programs also can reduce the amount of fishing effort and the associated employment base of the industry.

Typically fisheries management policy in Canada has three pillars:

- biological sustainability and/or conservation
- economic viability and benefits
- social considerations and benefits e.g., employment

Often it is not possible to maximize economic returns and employment at the same time. In essence, the "economic pillar" treats wages associated with fisheries employment as a cost whereas the "social pillar" treats employment associated with the fishery as a benefit. These disparate views of the role of employment underscore much of the tension in fisheries policy across Canada today.

And this tension is heightened in the case of IQ fisheries. IQ fisheries management involves allocating licensed individuals a predetermined share of the TAC to fish. In Pacific Canada today, essentially all individual quota fisheries have provisions for transferring licences so that the term individual transferable quota (ITQ) is more applicable. ITQ fisheries confer stronger, but not absolute, access privileges than do competitive fisheries in which licensed individuals compete for the available catch.

There is a need to dispassionately assess the impacts on employment of introducing ITQ fisheries management in Pacific Region fisheries. This need encompasses more than just assessing harvesting sector impacts as the introduction of ITQs has had important repercussions for the processing sector e.g., the shift from frozen to fresh product form in some sectors.

The analysis can aid in the development of improved fisheries policy and engender greater understanding amongst user groups and the public. In our opinion, there is much confusion about the true employment impacts of ITQs.

1.1 Study Objectives

For each of six (6) case study fisheries in Pacific Canada, this study:

- assesses the employment and wage impacts of the move to ITQ fisheries
- assesses the impacts on communities of the move to ITQ fisheries

The study addresses both fleet and processor level impacts.

Even without the introduction of ITQs, substantial changes to the employment base of fisheries may have occurred due to an increased focus on conservation/precautionary fisheries management, globalization, technological change and so on. The analysis must address the incremental employment impacts "attributable" to ITQs, and not just document employment changes since the introduction of ITQs.

The focus of the study are employment, wages and community impacts and not the full range of important impacts of ITQs (e.g., conservation, science, fleet viability, co-management, administration & enforcement). This narrow focus reflects our Terms of Reference.

1.2 Six (6) Candidate Fisheries

We chose the following six (6) ITQ fisheries, with a combined 2005 landed (ex-vessel) value of close to $200 million, for analysis:

Case Study Fisheries

Fishery	Gear	ITQ Date	2005 No. of Licences	2005 millions Landed Value
1. Halibut "L"	longline	1991	435	52
2. Sablefish "K"	longline & trap	1990	48	27
3. GF Trawl "T"	trawl	1997	142	70
4. Geoduck "G"	dive	1989	55	33
5. Red Sea Urchin "ZC"	dive	1995*	110	6
6. Area F Troll "ATF"**	hook & line	2005	168	8**

** went to IQs partway through 1994*

*** chinook only*

The rationale for the choice of these six sectors is:

- a large sector focus - these are the six largest ITQ sectors in terms of landed value
- species/product variety - includes groundfish, shellfish, and salmon sectors; includes sectors for which there has been a dramatic shift in processed product mix under ITQs e.g., geoduck, halibut
- a variety of catch technologies - includes trawl, trap, longline and dive fisheries
- data/information availability - reviews have been conducted of the geoduck, halibut, sablefish, and Area F salmon troll fisheries; all sectors except red urchins are included in the 1991 and 1994 DFO Costs & Earnings Survey results; all sectors are members of the BC Seafood Alliance; all sectors have functional industry associations
- sufficiently long exposure period to ITQs - all sectors except Area F salmon troll have had 10+ years experience with ITQs (it is important to identify "lessons learned" from the Area F troll ITQ demonstration program as active discussions are underway as to the pros and cons of moving to ITQs for all salmon sectors)

Although the Area F troll fishery is only a demonstration ITQ fishery, the demonstration fishery has been underway for the last 3 years and can provide important insights. In addition, the ITQ allocations for this sector are less certain than ITQ allocations for the other sectors since the Area F chinook Total Allowable Catch or TAC can change in the middle of the season. This lack of certainty has ramifications for ITQ benefits and impacts realized.

1.3 Study Approach

The study involved two main information collection activities:

- an interview program with industry, government and others
- secondary information collection from government reports, consultant studies, academic journals etc

In particular, we interviewed at least one DFO fisheries scientist, one DFO fisheries manager, one commercial fishing licence holder, one processor, one Dockside Monitoring Program (DMP) service provider, and one industry association leader for each of the six fisheries sectors. We also interviewed some broad-based interests such as the main fisheries union, an environmental organization and the provincial government.

	No. of Interviews
DFO Fisheries Scientists	6
DFO Fisheries Managers	10
Licence Holders/Fishermen	23
Processors	10
Industry Associations	6
DMP Service Providers*	3
Other	7
	65

** One company supplies DMP services to 4 fleets, the other 2 companies service a single fleet each.*

We interviewed 65 distinct people - some interviews covered more than one category e.g., a commercial fisherman may also be the Executive Director of the industry association, a commercial fisherman may fish both halibut and sablefish.

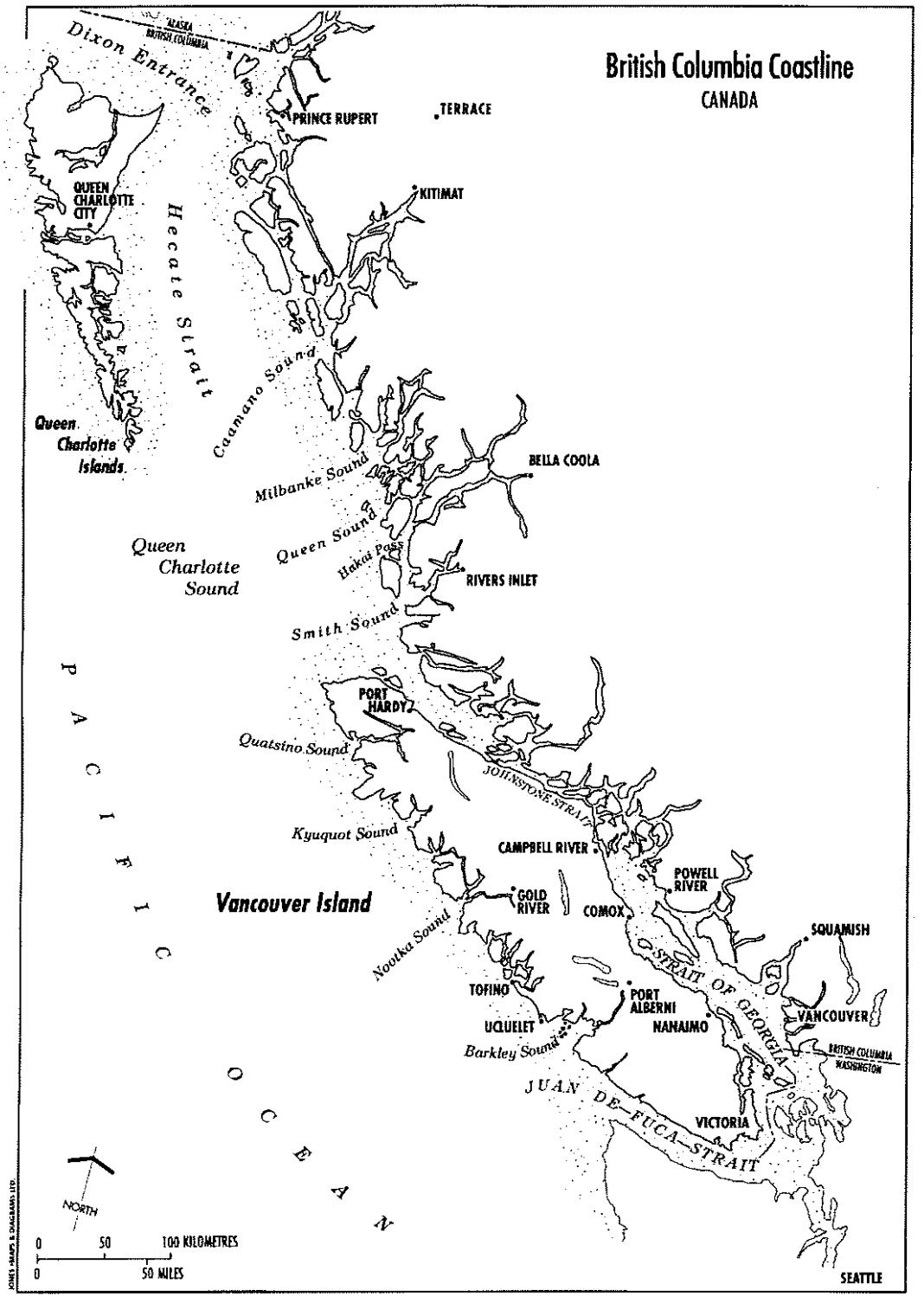
1.4 Report Outline

The next section describes the analysis approach for assessing ITQ impacts. Thereafter, impacts for each fishery are analyzed in a separate section.

Section	Subject
2	Analysis Framework
3	Case Study - Halibut
4	Case Study - Sablefish
5	Case Study - Groundfish Trawl
6	Case Study - Geoduck
7	Case Study - Red Sea Urchin
8	Case Study - Area F Salmon Troll
9	Conclusions & Discussion

Tabular material is presented at the end of each section, and assumptions are displayed to make the calculations transparent. The Map on the next page displays coastal British Columbia and its major cities or communities.

MAP of BC Coastline



2.0 Analysis Framework

This section describes our analysis framework, indicators, and approach for analyzing employment impacts.

2.1 The "With vs Without" Principle

Impact analysis of a fisheries management initiative requires explicit recognition as to what is the alternative for comparison purposes i.e., to focus on incremental effects and to compare the employment and wage base of the industry "with" ITQs to the likely employment and wage base "without" the ITQs.

That is, one needs to develop an alternative scenario of how the fishery would have developed if it still operated under a competitive or derby fishery format.

This scenario encompasses three major components:

- fleet management/regulation e.g., TAC, season length
- fleet activity e.g., active vessels, crew size, weeks fished, price to fishermen
- processor activity e.g., product mix & prices, labour content

And this scenario could be quite different than the actual situation immediately prior to the introduction to ITQs. For example, over the past 10 to 15 years, there has been an increasing focus in Pacific Canada and worldwide on conservation, the precautionary approach to management, sustainable fishing practices and so on. There could have been substantial changes to fisheries, including reduction in TACs and closed seasons/areas, if they had not gone to ITQs.

Another example are market changes. At the time the groundfish trawl fleet went to ITQs in 1997, there was only a small price difference between fresh and frozen fillets. But today that gap has widened, with fresh fillets receiving a substantial price premium over frozen fillets, due to the emergence of frozen basa and tilapia fillets on world markets. These market changes had nothing to do with the introduction of ITQs.

Another market example is the significant increase in chinook fresh and frozen prices since the ITQ program for Area F troll chinook was introduced in 2005. But some of this price increase is attributable to shortfalls in Lower 48 US troll chinook catches in recent years and not necessarily the improved quality of the Canadian product.

2.2 Year 2005 Impact Analysis

We focus on the year 2005 as the post ITQ analysis year since significant fisheries management changes, unrelated to ITQs, were introduced in 2006 for several fisheries.

The five groundfish fleets - halibut, sablefish, GF Trawl, rockfish and lingcod-dogfish - were brought under Integrated Fisheries management in April 2006. Each fisherman became responsible for all their catch, kept or discarded, and had to have a portfolio of ITQ catch entitlements to cover both directed catch and bycatch (previously the ITQ halibut and sablefish programs did not cover bycatch and the rockfish and lingcod-dogfish fleets still operated under a competitive fishery format).

In addition, the area licence reselection process for salmon licences in the spring of 2006 resulted in a greatly increased number of Area F troll fishing licences in 2006 i.e., licence holders moved from other, non ITQ-managed areas (and a further increase in Area F licences occurred in the fall of 2007 under another area reselection process).

Our qualitative analysis of employment impacts under ITQs focuses on the year 2005. But we do comment on any important developments since that time.

The Pilot Groundfish Integration Program

The 2006 Pilot Groundfish Integration Program bought all five groundfish fleets - halibut, sablefish, groundfish trawl, rockfish and lingcod/dogfish - under several common management principles:

- ITQs for all sectors (previously rockfish and lingcod/dogfish were competitive fisheries),
- 100% monitoring of all landings & discards (100% on-board observers for groundfish trawl, choice of an on-board observer or on-board electronic monitoring/camera system for others),
- a "cap and trade" system of temporary transfers between willing participants to address bycatch concerns,
- mandatory retention of rockfish (a main species group of concern), and
- a mortality "hit" against the individual's ITQ for discards.

Prior to the integration program, the five groups essentially operated independently. One fleet's directed catch could be another fleet's discards, there was no discard accounting program across all fleets, and mortality from discards was not considered in setting TACs.

The Groundfish Integration Program makes the individual licence holder responsible for their catch regardless of disposition, retained or discarded. The Integration Program could never have happened without all fleets being under ITQ management.

Source: Gordon Gislason "The BC Groundfish Fishery in Canada - Evolution to Sustainability", Presentation to Australian Fisheries Management Authority, Canberra, Australia September 2007.

2.3 Impact Indicators

Employment Measures. To facilitate comparisons to other sectors of the economy, we will express employment measures in person-year (PY) equivalents, one person working the equivalent of one year.

Work on fishing vessels is seasonal, is intensive and often involves much more than 8 working hours per day. In addition, vessel owner-operators can spend substantial time on vessel repairs, business planning etc. in addition to time spent on the vessel. For this study, we assume that 25 person-weeks fishing is equivalent to one person-year of employment.

For processing plant workers, we assume that the average wage including employer-paid benefits, or "payroll burden" is $40,000 per PY. This includes allowance for the higher costs of administrative or overhead employees (the $40,000 figure is consistent with the average processing plant wage in the GSGislason "SWOT" Study 2004). That is, we can convert processing wages to processing employment.

Our focus on person-years of employment notwithstanding, for the fleet we do address the number of distinct fishing jobs under the various scenarios (the counting of "jobs" at the plant level is much more problematic since workers handle several species over the course of a year).

Wages & Benefits Measures. For the fleet, most workers or deckhands are paid on a "share of catch (value)" basis after deductions for certain expense items e.g., groundfish trawl fishermen typically get 50% of the catch value after fuel, monitoring fees and other expenses are deducted. Therefore, assessing the fleet crew shares in the absence of ITQs requires projecting fleet revenues in the absence of ITQs. Fleet prices in turn are derived from market prices that processors earn on product sales i.e., the price to the vessel-licence owner is a netback from market prices.

Assessing the configuration of the fleet and market prices in the absence of ITQs is problematic, not only because of the hypothetical nature of the exercise but also because of the dearth of financial information on current fleet and processor activity e.g., DFO has not successfully completed a Costs & Earnings Survey of fishing enterprises since the 1994 fishing year (DFO conducted a Costs & Earnings Survey for the 2004 fishing year but the returns were too low to provide meaningful results).

The targeted interviews concluded for the study, in tandem with available work or reports, allows us to make reasonable inferences. In most cases, we have estimated crew shares as a multiple of 5 percentage points e.g., 25% or 30%.

Community Impact Measures. The analysis of community impacts is more qualitative. It encompasses one or more of:

- community licence holdings analysis - comparing the regional distribution of pre-ITQ licence holdings by region to past ITQ licence holdings.
- community product offload analysis - comparing the regional distribution of fish offloads pre ITQs to post ITQs
- other issues - e.g., plant closures/consolidation, broader industry trends

Rural vs Urban. The analysis of licence holdings by community utilizes the geographic template developed in previous work by the consultant e.g., Gislason et al "Fishing for Answers" 1996.

Furthermore, we amalgamate the broad regions into two categories - "urban" comprised of the Greater Vancouver and Victoria & Area regions, and "rural" comprised of all other regions. Admittedly this is somewhat arbitrary and alternate definitions of "rural" exist.

For example, Statistics Canada has developed several alternate definitions including "rural and small town", the population living in towns and municipalities outside the commuting zone of centres with populations of 10,000 or more - according to this definition only about 15% of the provincial population in BC lives in a "rural" area (Du Plessis et al 2001). Ecotrust used this definition and, as a result, designate a very small share of commercial fishing licences as rural-based (Ecotrust 2004, Edwards et al 2005).

However, in our opinion, this definition of "rural" is not useful for our analysis. There are several communities in BC, such as Prince Rupert and Port Alberni, which meet the 10,000 population threshold but should not be lumped in with the very large urban centres of Vancouver and Victoria for rural-urban impact analysis of fishery management measures such as ITQs.

Exhibit 1 summarizes our analysis approach. Exhibit 2 gives selected comments from our interview program. Note that we do not necessarily agree with each of the comments - the intent is to display the diversity of opinion. Individuals interviewed were promised anonymity.

Exhibit 1: Analysis Approach

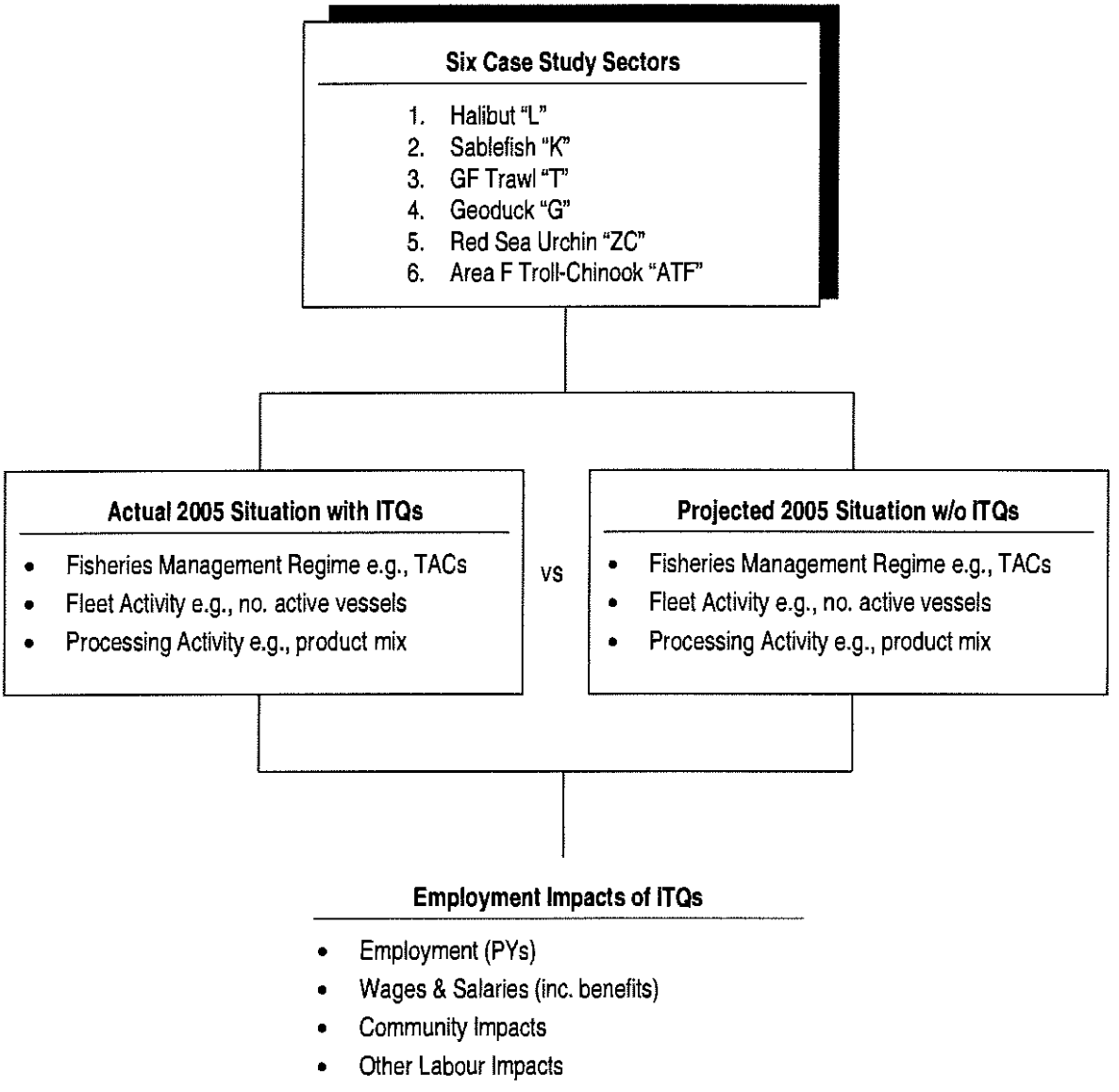


Exhibit 2: Selected Interview Comments

1. "pre ITQs we tried to maximize poundage, we threw away rockfish to make room in the hold"
2. "halibut has become a white tablecloth fish - this was not possible under the derby format"
3. "ITQs give continuity of supply throughout the year, a feature which every fresh market needs"
4. "without the improved science under ITQs, we would be even more precautionary - good science means narrower confidence bounds"
5. "the problem with Area F troll is that DFO is trying to implement ITQs without having limited entry - the area reselection process has created havoc"
6. "ITQs generate more science, science that industry pays for"
7. "anytime you spread out a fresh fish fishery over several more weeks you will get a price bump - but ITQs are not the only way to spread out the season"
8. "the bargaining power of vessel owners increased under ITQs"
9. "ITQs changed the mindset of fishermen, they became more like other businessmen - what is the appropriate balance between short term annual returns and long term asset value?"
10. "the design of groundfish trawl ITQs took into consideration community and distribution issues more than the designs of the halibut and sablefish ITQ programs"
11. "there were many management regimes that could have been put in place instead of ITQs - ITQ with owner operator, IQ without transferability, CDQs"
12. "the price volatility in a derby was ridiculous"
13. "under ITQs you don't get penalized, in terms of lower catches, from running a safer boat"
14. "without the ITQ system for trawl, we would not be in business today"
15. "it would be complete chaos today without ITQs"
16. "industry has put a lot into geoduck science, and science affects the TAC"
17. "ITQs give those that do not fish a revenue source through leasing at the expense of those who do fish"
18. "the norm is to have the quota lease cost come off the top before calculating crew shares so the percentage going to the crew is lower under ITQs - but those crew still working are better off as the price is higher and each active boat is catching more fish"
19. "our trawl crew has some say regarding crew size, whether to lease fish this year - it is more a democracy than a dictatorship"
20. "under the derby fishery we spent part of every season rescuing people"
21. "the trawl fishery is different - it is labour intensive, it operates for many weeks, a higher degree of expertise in crew is needed, you need to treat the crew well to avoid turnover"
22. "more groundfish is being landed in outports under ITQs - proximity to fishery grounds and fuel costs are driving this"

3.0 Case Study - Halibut

This case study analyzes the employment, wage and community impacts of the Individual Transferable Quota (ITQ) management system implemented for Pacific halibut in 1991.

The analysis of employment-related impacts draws on a variety of previous studies (EB Economics 1992a, Turris & Sporer 1994a, Casey et al 1995, Macgillivray 1996, Gislason 2000, Sporer 2001, Jones 2003, Clark & Munro 2007). This body of work was augmented by several industry interviews, specifically addressing labour deployment and remuneration at the fleet and plant levels.

The impact analysis requires projecting fleet management, fleet industry and processor activity in the absence of the ITQ program i.e., if the fleet had still been managed as a derby fishery. This admittedly is subjective and requires professional judgment.

Nevertheless, the analysis should be considered a reasonable approximation of impacts. Three Exhibits at the end of this section support the analysis - Industry Profile, Impact Projections, and Community Licence Holdings.

3.1 Fishery Development with ITQs

The Pacific halibut is a large flatfish that inhabits the continental shelf of the US and Canada ranging from California north to the Bering Sea. The commercial fishery uses longline gear. Halibut within Canadian waters is considered a single stock.

Management Responsibility. Since 1923, the fishery has been managed by the International Pacific Halibut Commission (IPHC) based in Seattle. The IPHC sets an overall Total Allowable Catch (TAC) and allocations for Canada and the US, conducts stock assessments, and enacts other regulatory measures. The US, primarily Alaska, catches 80% to 90% of the combined harvest. DFO manages the Canadian portion of the fishery within IPHC parameters.

The Move to IQs. The Canadian fishery adopted limited entry licensing in 1979 and an individual vessel quota (IVQ) system in 1991 for the 435 "L" category licence holders. The US fishery went to a system of individual quotas (IQs) in 1995.

The impetus for moving to individual quotas in 1991 in Canada had several facets:

- an inability to fish within a fleet-wide TAC
- issues related to compromised crew safety & poor working conditions
- poor quality product, inability to serve the premium fresh market year-round
- excessive amounts of capital, labour and operating costs e.g., boats, crew, fuel, lost gear
- inability to monitor & enforce fishery regulations
- an inherently unstable industry

These symptoms of poor conservation, business, and people practices all resulted from the "race for the fish" under the derby fishery management format (Turris & Sporer 1994a, Casey et al 1995, Macgillivray 1996, Gislason 2000, Sporer 2001, Jones 2003).

The Response was ITQs. In 1991 each licence holder received an Individual Vessel Quota where the quota level comprised a percentage of the TAC. DFO based the IVQ formula on a combination of recent vessel catch history and vessel length (70% catch history and 30% vessel length).

In Canada, the halibut industry engages in co-management with DFO through an industry association and since 1991 has paid for a variety of activities including a Dockside Monitoring Program (DMP) for all product offloads, tagging of all fish landed, a dedicated enforcement presence, and fishery management staff.

Transferability. For an initial two-year trial period, quota consolidation or "stacking" of more than one quota on a single vessel was not permitted (but a new industry entrant could buy a licence and quota from an existing licence holder).

DFO made IVQs stackable, on a temporary basis, for the 1993 halibut fishery. At the end of the season, any transferred IVQ reverted back to the original licence holder. To guard against the possible concentration of quotas in a few hands: 1) each initial halibut quota was split into two equal shares, and 2) quota shares could transfer freely so long as no more than four shares were held or fished by any one licensed halibut vessel. These rules persisted over the 1993 to 1998 period.

Starting in 1999, both permanent and temporary transfers were allowed so long as no one vessel had more than 1% of the TAC (unless it had fished greater than this amount from 1993 to 1998). At the same time, ITQ transfers moved from quota block shares as discussed above to percentages of the TAC (the minimum quantity that could be transferred was the percentage that corresponds to one pound).

Markets, Products & Prices. Prior to the introduction of IQs, the season for the halibut commercial fishery was getting shorter and shorter - in 1990 the season was only 6 days long (licence holders had the choice of fishing 1 of 2 4-day openings in the spring plus a 2-day opening in the fall). Since the introduction of Individual Quotas, the halibut fishery has been open for approximately 10 months a year from early/mid March to mid November. In 2005, the halibut fishery was open for 261 days, from February 27 to November 15.

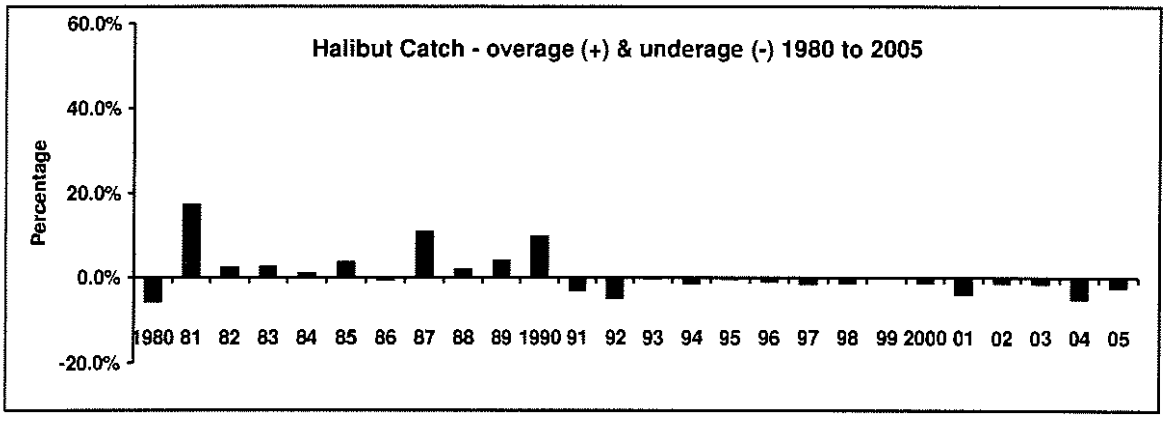
The longer season and a slower harvest have resulted in a much greater proportion of halibut being directed towards the fresh market where the fish commands a price premium over frozen product. Today, about 95% of the Canadian catch is sold by processors in fresh form. The vast majority of BC halibut is sold in the lower 48 US.

Prices vary from year to year depending on supply, inventory levels, exchange rates and other factors. In 2005 the Canadian wholesale price for dressed halibut was an estimated $11.20 per kg dressed, head-off equivalent of which $9.35 represented the price to fishermen (the wholesale price is an average of whole fish, fillets etc.).

3.2 Fishery Management Today Without ITQs

We assume that the BC fishery would still be managed as a derby or competitive fishery if ITQs had not been implemented.

Chronic TAC Overages. In the 1980 to 1990 period the halibut fleet was consistently over its TAC each year (by an average amount of 6% over the period) - see chart below. This chronic problem could be even worse today and put downward pressure on the setting of TACs.



No DMP. It is unlikely that the Dockside Monitoring Program (DMP) for all vessel offloads that was implemented with the introduction of Individual Quotas in 1991 would be in place today - the DMP program has led to better catch statistics data.

IPHC Still Responsible for Science. The IPHC would still be responsible for halibut science and the vast majority of research programs in place today would still have occurred in the absence of ITQs. We note however that the BC halibut fleet has been paying for an extra observer on IPHC setline survey boats to count bycatch, mainly rockfish. This would be unlikely if the fishery was still a derby fishery.

The Precautionary Approach and TAC-setting. Today's fishery management environment is characterized by the precautionary approach to setting TACs, an influential environmental movement, increasing public awareness of fisheries issues, selective fishing practices and so on.

It is likely that the IPHC would be somewhat more cautious in setting the overall TAC and the Canadian portion thereof if the derby situation persisted. We suggest that the TAC would decrease by 5 to 10% and use the lower 5% figure in our projections (5,400 tonne TAC under derby fishery vs actual 5,688 tonne TAC in 2005).

Staggered Openings. We suggest that DFO would use a system of staggered openings for different fleet segments somewhat akin to what occurred in 1990. For projection purposes, we assume that DFO would impose four 2-day openings of which a licence holder would be allowed to fish two only i.e., 4 days fishing per licence holder (each licence holder had a possible 6 days fishing in 1990).

3.3 ITQ Impacts - Employment & Wages

Exhibit 4 presents a profile of halibut industry activity in 2005 and a projection of 2005 activity if the industry had not gone to ITQs i.e., the fishery was still managed as a derby or competitive fishery.

Under the ITQ format, the pace of fishing has slowed, there is a steady supply of fish to the processing plants throughout the long season, and the fish is handled much better on the boats and at the plants. Today halibut almost exclusively flows to the premium fresh market (fresh processed halibut may be worth $1 more per kg than frozen processed halibut but fresh halibut involves less processing costs including labour).

The key parameters underlying our projections of changes in industry structure under ITQs include:

- a product price increase - of $3.30 per kg at the wholesale level and $2.75 per kg at the ex-vessel level (based on our interviews and previous analysis EB Economics 1992a, Casey et al 1995, Herrmann 2000, assuming Alaska did not go to ITQs)
- a decrease in the active fleet - from about 360 vessels to the 221 in 2005 with the smaller active fleet fishing more weeks per vessel
- a decrease in the average crew size - from about 4.0 to 3.5 (this is consistent with our interviews and previous analysis e.g., EB Economics 1992a, Casey et al 2005)
- a decrease in average crew share - from about 30% of landed value to 20% of landed value reflecting the fact that charges for leased quota and quota purchased since 1991 typically are deducting from gross stock before determining crew shares under ITQs
- a lower labour processing content - fresh product does not require as much processing as does frozen product (and the share of fresh product increased dramatically under ITQs)

We assume that 25 weeks fished equals one person-year (PY) of employment and that the average plant position, including administration positions, pays $40,000 per year including benefits.

	2005 Projections		
	w ITQs (a)	w/o ITQs (b)	ITQ Impact (c) = (a) - (b)
Revenues $000			
Fleet	52,040	35,640	+16,400
Processing Margin	10,580	7,290	+3,290
Processed Value	62,620	42,930	+19,690
Wages $000			
Fleet	10,410	10,690	-280
Plant	3,060	3,560	-500
	13,470	14,250	-780
Employment PYs			
Fleet	155	115	+40
Plant	77	89	-12
	232	304	+28
Other			
Active Vessels	221	360	-139
Crew Jobs	775	1,440	-665

Source: Exhibit 4

Wages overall have decreased under ITQs whereas employment on a year-round equivalent basis has increased. The changes are relatively modest.

ITQs have resulted in fewer crew jobs but those remaining in the industry have more steady employment throughout the year.

3.4 ITQ Impacts - Communities

The ITQ management regime also has affected communities and community interests.

Community Licence Holdings. Today the urban areas of the Lower Mainland and Greater Victoria are the residence of 173 or 40% of the 435 commercial halibut licence holders - see Exhibit 5. This is 2% higher than in 1990. There has been a decline in licence holdings in the North Coast and an increase on Vancouver Island.

Community Distribution of Offloads. Prior to the introduction of IQs in the 1980s, the Lower Mainland and the Prince Rupert areas accounted for close to 90% of halibut offloads. These two locations had the vast majority of freezing facilities along the coast.

	% Share of Offloads		
	Pre ITQs 1983-90	IQs 1991-92	ITQs 2005
Lower Mainland	53%	41%	7%
North Coast	35%	25%	43%
Vancouver Island - North Coast	2%	19%	41%
- West Coast	3%	7%	9%
- Other	7%	8%	<1%
	100%	100%	100%

Source: EB Economics 1992a, DFO "2005 Halibut Post-Season Summary"

There has been a dramatic reduction in landings to the Vancouver area since the introduction of IQs (although the fish is processed in Vancouver). The bulk of the fish is landed in communities such as Prince Rupert on the North Coast, Port Hardy on North Vancouver Island, and Ucluelet on the WCVI and then trucked to Vancouver. In particular, Port Hardy has become the main offload port for the halibut fleet. Proximity to fishing grounds and high fuel costs are the main drivers behind this regional shift in delivery patterns.

3.5 ITQ Impacts - Other Labour Issues

There are several other labour impacts from the move to ITQs for halibut.

Increased Safety. Crew safety has improved under ITQ management. Vessels are no longer forced to "race for the fish" and fish 24 hours a day, have a sleep-deprived crew and compromise safety. In addition, on bad weather days the vessel operator can decide not to fish without incurring a revenue penalty.

Better Working Conditions. Working conditions are much improved with shorter working days and beds for all crew. Pre ITQs it was common on some boats to "hot bunk" as there were more crew members than beds and crew had to sleep in rotations.

Other Jobs Lost & Created. Some jobs have disappeared because of Individual Quota management. For example, packer vessels that received offloaded halibut at-sea and delivered the product to port are no longer needed (the slower pace of fishing today made the packer function and their crew redundant).

But some new jobs have been created as well. For example, the DMP function for halibut has created new jobs in port validation. Based on discussions with the service provider, we estimate the wage and employment base of port validations to be approximately $250,000 and 5 person-years of employment (including provision for overhead labour).

Less Plant Overtime. Plant operators report that with the longer season and the ability to schedule deliveries there is much less need for overtime labour. The share of the plant workforce that is full-time has increased with a decrease in the number of part-time workers.

Exhibit 3: Profile of BC Commercial Fishery - Halibut "L"

Year	Regulations**			Activity		Vessel Landings			Processed Product	
	TAC tonnes (1)	Season Length (2)	Licences (3)	Active Vessels (4)	Deliveries (5)	Tonnes* (6)	$ millions Value (7)	$ per kg* (8) = (7)/(6)	% Dressed Fresh (9)	$ per kg* (10)
1980	2,715	65 days	435	333		2,563	7.0	2.75		
81	2,190	58 "	435	337		2,565	7.6	2.95		
82	2,453	61 "	435	301		2,506	7.0	2.79	20%	3.90
83	2,409	24 "	435	332		2,466	8.4	3.42	22%	4.70
84	4,073	22 "	435	305		4,107	9.5	2.32	32%	3.60
85	4,554	22 "	435	334		4,712	13.8	2.93	45%	4.10
86	5,124	15 "	435	363		5,092	22.7	4.46	37%	5.85
87	5,255	16 "	435	417		5,555	28.9	5.20	44%	5.95
88	5,737	14 "	435	424		5,832	23.1	3.96	50%	5.15
89	4,554	11 "	435	435		4,731	19.0	4.01	62%	5.05
1990	3,548	6 "	435	435		3,889	21.7	5.57	54%	6.80
91	3,357	214 "	435	433	1,173	3,262	21.6	6.65	71%	7.35
92	3,629	238 "	435	431	1,150	3,459	21.7	6.27	93%	6.20
93	4,826	245 "	435	351	1,255	4,821	30.2	6.26	94%	7.15
94	4,554	260 "	435	313	1,148	4,496	37.4	8.32	94%	9.25
95	4,378	246 "	435	294	1,177	4,366	34.0	7.79	95%	8.75
96	4,370	246 "	435	281	1,094	4,335	34.1	7.87	96%	9.25
97	5,707	246 "	435	279	1,211	5,634	41.6	7.38	95%	9.05
98	5,912	246 "	435	288	1,335	5,847	30.9	5.28	93%	7.15
99	5,543	246 "	435	265	1,284	5,540	38.7	6.99	92%	9.15
2000	4,874	246 "	435	238	1,048	4,822	42.5	8.82	93%	10.75
01	4,809	246 "	435	234	989	4,629	37.3	8.05	95%	11.25
02	5,498	246 "	435	214	1,028	5,437	48.0	8.82	94%	10.60
03	5,386	260 "	435	225	1,072	5,317	49.2	9.25	95%	10.15
04	5,756	261 "	435	218	1,072	5,482	51.4	9.38	95%	11.15
05	5,688	261 "	435	221	1,123	5,566	52.0	9.35	95%	11.25

* *Dressed Head-off weight equivalents*

** *Fisheries Management Regimes - limited entry pre 1991, IQs 1991 to 1992 (no transferability), ITQs with limited transferability 1994 to 1998, ITQs with less restrictive transferability 1999 onwards*

Source: GSGislason 2003, Clark & Munro 2007, BC Environment Annual, DFO "Halibut Season Summary" Annual, GSGislason & Associates Ltd. estimates

Exhibit 4: Projections with vs without ITQs - Halibut "L"

			2005		
			Actual w ITQs (a)	Projected w/o ITQs (b)	Difference /ITQ Impact (c) = (a) - (b)
A.	**FLEET REGULATION**				
(1)	TAC tonnes*		5,688	5,400	+288
(2)	Season Length (days)		261	4	+257
(3)	No. of Licences		435	435	0
B.	**FLEET ACTIVITY**				
(4)	No. of Active Vessels		221	360	-139
(5)	Harvest tonnes*		5,566	5,400	+166
(6)	Average	- Landed Price $ per kg*	9.35	6.60	+2.75
(7)		- Crew Size inc Skipper	3.5	4.0	-0.5
(8)		- Weeks Fished	5	2	+3
(9)		- Crew Share %	20%	30%	-10%
(10)	Total	- Landed Value $000	52,040	35,640	+16,400
(11)		- Crew Jobs	775	1,440	-665
(12)		- Crew Weeks	3,875	2,880	+995
(13)		- Crew PYs	155	115	+40
(14)		- Crew Wages $000	10,410	10,690	-280
C.	**PROCESSOR ACTIVITY**				
(15)	Product Mix	- % Dressed Fresh	95%	45%	+50%
(16)	Average	- Product Price $ per kg*	11.25	7.95	+3.30
(17)		- Labour $/kg*	.55	.66	-0.11
(18)		- Labour Rate $/PY	40,000	40,000	0
(19)	Total	- Processed Value $000	62,620	42,930	+19,690
(20)		- Plant PYs	77	89	-12
(21)		- Plant Wages $000	3,060	3,560	-500

* *Weight is dressed head-off equivalents*

Source: Exhibit 3 and GSGislason & Associates Ltd. estimates

Note: *(10) = (5) x (6)* *(19) = (16) x (5)*
(11) = (4) x (7) *(20) = (21) ÷ 40*
(12) = (11) x (8) *(21) = (17) x (5)*
(13) = (12) ÷ 25
(14) = (10) x (9)

Exhibit 5: Regional Distribution of Commercial Fishing Licence Holders - Halibut "L"

Region	Year 1990*	2005
QCI	8	9
North Coast	73	48
Central Coast	7	5
North Vancouver Island	20	24
Mid Vancouver Island	74	82
South Vancouver Island	32	34
WCVI	7	15
Victoria - Sooke	43	48
Sunshine Coast	34	33
Lower Mainland	122	125
Other BC	12	10
Outside BC	3	2
TOTAL	435	435

** Year before Individual Quota management was introduced*

Source: Derived from special tabulation from DFO Licensing

4.0 Case Study - Sablefish

This case study analyzes the employment, wage and community impacts of the Individual Transferable Quota (ITQ) management system implemented for Pacific sablefish in 1990.

The analysis of employment-related impacts draws on a variety of previous studies (EB Economics 1992b, Turris & Sporer 1994, Turris 2000, Sporer 2001, Jones 2003, Clark & Munro 2007). This body of work was augmented by several industry interviews, specifically addressing labour deployment and remuneration at the fleet and plant levels.

The impact analysis requires projecting fleet management, fleet industry and processor activity in the absence of the ITQ program i.e., if the fleet had still been managed as a derby fishery. This admittedly is subjective and requires professional judgment.

Nevertheless, the analysis should be considered a reasonable approximation of impacts. Three Exhibits at the end of this section support the analysis - Industry Profile, Impact Projections, and Community Licence Holdings.

4.1 Fishery Development with ITQs

Sablefish is a finfish that is widely distributed along the continental shelf of the North Pacific Ocean ranging from California north to Alaska and the Bering Sea. The directed commercial fishery in BC uses trap and longline gear. Sablefish within Canadian waters is considered a single stock.

Management Responsibility. Canada Department of Fisheries & Oceans (DFO) is responsible for management and sets an overall TAC, conducts stock assessment work, and enacts other regulatory measures.

The Move to ITQs. The BC fishery adopted limited entry licences in 1981 and an individual vessel quota (IVQ) system in 1990 for the 48 "K" category licence holders.

The impetus for moving to individual quotas in 1990 had several facets:

- an inability to fish within a fleet-wide TAC
- issues related to compromised crew safety & poor working conditions
- poor quality product, inability to serve the market year-round
- excessive amounts of capital, labour and operating costs e.g., boats, crew, fuel, lost gear
- inability to monitor & enforce fishery regulations
- an inherently unstable industry

These symptoms of poor conservation, business, and people practices all resulted from the "race for the fish" under the derby fishery management format (Turris 2000, Sporer 2001, Jones 2003).

The Response was ITQs. In 1990 each licence holder received an Individual Vessel Quota where the quota level comprised a percentage of the TAC. DFO based the IVQ formula on a combination of recent vessel catch history and vessel length (70% catch history and 30% vessel length).

In Canada, the sablefish industry engages in co-management with DFO through an industry association and since 1990 has paid for a variety of activities including a Dockside Monitoring Program (DMP) for all product offloads, stock assessment work, a dedicated enforcement presence, and fishery management staff.

Transferability. Unlimited transfers between "K" licensed vessels are allowed on a temporary or permanent basis.

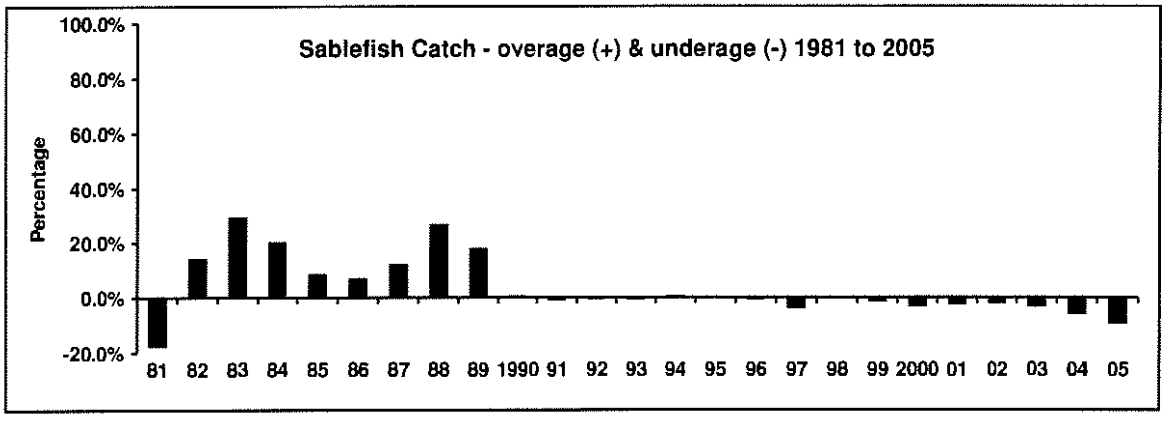
Markets, Products & Prices. Prior to the introduction of IQs, the season for the sablefish commercial fishery was getting shorter and shorter - in 1989 the season was only 14 days long (licence holders had the choice of fishing one of eight 14-day openings). Today the fishery is open year-round.

Unlike the halibut situation, the ITQ system did not result in a change in product form - frozen whole fish has been the primary market product since the late 1980s. But the ITQ system has resulted in a slower harvest and better on-board handling practices including freezing. The vast majority of BC sablefish is sold as frozen dressed head off "Jcut" to Japan. The Japanese market for sablefish is narrow and very supply sensitive so that spreading out supply can confer large market benefits (GSGislason 2001).

4.2 Fishery Management Today Without ITQs

We assume that the BC fishery would still be managed as a derby or competitive fishery if ITQs had not been implemented. Management considerations include:

Chronic TAC Overages. In the 1982 to 1989 period pre IQs, the sablefish fleet exceeded its TAC in every year (by an average amount of 17%) - see chart below. This chronic problem could be even worse today, and put downward pressure on the setting of TACs.



No DMP. It is unlikely that the Dockside Monitoring Program (DMP) for all vessel offloads that was implemented with the introduction of Individual Quotas in 1990 would be in place today - the DMP program has led to better catch statistics data.

Much Less Science. The sablefish fleet pays for the bulk of science conducted on sablefish and fisheries management targeted to sablefish (Turris 2000). The science research budget exceeds $0.5 million annually (Jones 2003), and includes scientific research for stock assessment, a tagging system and a biological sampling program. It is very unlikely that the current level of science would be maintained if the derby fisheries format still persisted.

The Precautionary Approach and TAC-setting. Today's fishery management environment is characterized by the precautionary approach to setting TACs, an influential environmental movement, increasing public awareness of fisheries issues, selective fishing practices and so on.

With the lack of science under the derby format, our discussions with scientists and fisheries managers suggest that better science can lead to higher TACs since the fishery manager can be less conservative and can justify this stance (the corollary is that poorer science leads to lower TACs). We suggest that the TAC would decrease by 10% to 50% and use a 25% figure in our projections (3,150 tonne TAC under derby fishery vs actual 4,204 tonne TAC in 2005).

Staggered Openings. We suggest that DFO would use a system of staggered openings for different fleet segments somewhat akin to what occurred in 1989. For projection purposes, we assume that DFO would impose eight 5-day openings of which a licence holder would be allowed to fish two only i.e., 10 days fishing per licence holder (each licence holder had a possible 14 days fishing in 1989).

4.3 ITQ Impacts - Employment & Wages

Exhibit 7 presents a profile of sablefish industry activity in 2005 and a projection of 2005 activity if the industry had not gone to ITQs i.e., the fishery was still managed as a derby or competitive fishery.

Under the ITQ format, the pace of fishing has slowed, there is a steady supply of fish to the market throughout the long season, and the fish is handled much better on the boats and at the plants. Today sablefish almost exclusively flows to the premium Japanese market although a niche white tablecloth market in North American is emerging.

The key parameters underlying our projections of changes in industry structure under ITQs include:

- a product price increase - of $2.20 per kg Jcut at the wholesale level and $1.85 per kg Jcut or $1.25 per kg RD at the ex-vessel level (based on our interviews and previous analysis EB Economics 1992a, Matulich and Clark 2003, Huppert and Best 2004)
- a decrease in the active fleet - from about 40 vessels to the 35 in 2005 with the smaller active ITQ fleet fishing more weeks per vessel (the 35 active vessel count for 2005 is much higher than the fleet size in the late 1990s, the price drop in recent years has caused more licence holders to fish their ITQ rather than lease it to others - see Exhibit 6)
- a significant decrease in the average crew size - from about 12.0 to 6.0 (this is consistent with our interviews and previous analysis e.g., EB Economics 1992b)
- a decrease in average crew share - from about 30% of landed value to 20% of landed value reflecting the fact that charges for leased quota and quota purchased since 1990 typically are deducting from gross stock before determining crew shares under ITQs
- no change in labour processing content - the product comes frozen off the boat so plant activities are minimal (unloading, grading, boxing)

We assume that 25 weeks fished equals one person-year (PY) of employment and that the average plant position, including administration positions, pays $40,000 per year including benefits.

	2005 Projections		
	w ITQs (a)	w/o ITQs (b)	ITQ Impact (c) = (a) - (b)
Revenues $000			
Fleet	26,510	17,960	+8,550
Processing Margin	4,290	2,790	+1,500
Processed Value	30,800	20,750	+10,050
Wages $000			
Fleet	5,300	5,390	-90
Plant	1,680	1,390	+290
	6,980	6,780	+200
Employment PYs			
Fleet	67	38	+29
Plant	42	35	+7
	109	73	+36
Other			
Active Vessels	35	40	-5
Crew Jobs	280	480	-200

Source: Exhibit 7

ITQs have resulted in fewer crew jobs but those remaining in the industry have more steady employment.

Wages and employment in year-round equivalents have increased under ITQs - but the wage increase is minimal.

4.4 ITQ Impacts - Communities

The ITQ management regime also has affected communities and community interests.

Community Licence Holdings. Today the urban areas of the Lower Mainland and Greater Victoria are the residence of 33 or 69% of the 48 commercial sablefish licence holders. These two urban areas comprised 75% of the total licences in 1989 - see Exhibit 8.

Community Distribution of Offloads. Prior to the introduction of IQs in 1990, the Lower Mainland accounted for over 75% of sablefish offloads.

	% Share of Offloads		
	Pre ITQs 1983-89	ITQs 1991-93	ITQs 2005
Lower Mainland	77%	45%	37%
North Coast	4%	19%	13%
Vancouver Island - North	<1%	18%	29%
- West Coast	18%	16%	20%
- Other	1%	2%	1%
	100%	100%	100%

Source: EB Economics 1992b, DFO "2005 2005/06 Sablefish Season Summary"

There has been a dramatic reduction in landings to the Vancouver area since the introduction of IQs. The bulk of the fish is landed in communities such as Prince Rupert on the North Coast, Port Hardy on North Vancouver Island, and Ucluelet on the WCVI and then trucked to Vancouver. In particular, Port Hardy has become an important offload port for the sablefish fleet. Proximity to fishing grounds and high fuel costs are the main drivers behind this regional shift in delivery patterns.

4.5 ITQ Impacts - Other Labour Issues

There are several other labour impacts from the move to ITQs for sablefish.

Increased Safety. Crew safety has improved under ITQ management. Vessels are no longer forced to "race for the fish" and fish 24 hours a day, have a sleep-deprived crew and compromise safety. In addition, on bad weather days the vessel operator can decide not to fish without incurring a revenue penalty.

Better Working Conditions. Working conditions are much improved with shorter working days and beds for all crew. Pre ITQs it was common on some boats to "hot bunk" as there were more crew members than beds and crew had to sleep in rotations.

Other Jobs Lost & Created. Some jobs have disappeared because of Individual Quota management. For example, packer vessels that received offloaded sablefish at-sea and delivered the product to port are no longer needed (the slower pace of fishing today made the packer function and their crew redundant).

But some new jobs have been created as well. For example, the DMP function for sablefish has created new jobs in port validation. Based on discussions with the service provider - Archipelago Marine Research (AMR) Ltd. of Victoria - we estimate the wage and employment base of port validations to be approximately $100,000 and 2 person-years of employment (including provision for overhead labour).

Exhibit 6: Profile of BC Commercial Fishery - Sablefish "K"

Year	Regulations***			Activity		Vessel Landings			Processed Price
	TAC tonnes RD (1)	Season Length (2)	Licences (3)	Active Vessels (4)	Deliveries (5)	Tonnes RD (6)	$ millions Value (7)	$ per kg RD* (8) = (7)/(6)	FZ J Cut $ per kg* (9)
1981	3,190	245 days	48			2,636			
82	3,190	202 "	48			3,628			3.35
83	3,190	148 "	48	23		4,123			2.45
84	3,190	181 "	48	20		3,824			3.45
85	3,650	95 "	48	27		3,951			5.15
86	3,650	63 "	48	41		3,900			4.80
87	3,740	45 "	48	43		4,178			5.70
88	4,015	20 "	48	45		5,075	17.7	3.50	6.00
89	4,015	14 "	48	47		4,722	13.0	2.75	5.00
1990	4,260	245 "	48	30	221	4,275	21.6	5.05	8.45
91	4,560	365 "	48	26	198	4,532	24.7	5.45	9.20
92	4,560	366 "	48	25	168	4,557	21.0	4.60	7.95
93	4,560	365 "	48	21	146	4,546	20.9	4.60	8.00
94	4,521	365 "	48	22	197	4,533	30.6	6.75	11.25
95	3,709	365 "	48	24	173	3,709	27.3	7.35	12.20
96	3,181	366 "	48	21	113	3,168	22.7	7.15	11.95
97	4,034	365 "	48	24	147	3,893	30.4	7.80	12.95
98	4,164	365 "	48	24	125	4,164	28.7	6.90	11.65
99/00**	6,394	578 "	48	29	240	6,310	40.7	6.45	11.05
2000/01	3,639	366 "	48	32	155	3,525	30.0	8.50	14.15
01/02	2,806	365 "	48	29	136	2,748	22.3	8.10	13.60
02/03	1,924	365 "	48	27	100	1,890	14.7	7.80	13.20
03/04	2,669	365 "	48	30	131	2,585	20.2	7.80	13.20
04/05	4,080	366 "	48	32	198	3,851	26.2	6.80	11.75
05/06	4,204	365 "	48	35	181	3,815	26.5	6.95	11.95

* *1 kg FZ J Cut Dressed Headloff weight = 1.48 kg round weight*

** *19 month transition year Jan/99 to July /00 as fishing year converted from month calendar year to 12 month Aug to July period*

*** *Fisheries Management Regimes - limited entry pre 1990, ITQs 1990 onwards*

Source: Clark & Munro 2007, BC Environment Annual, DFO "Sablefish Season Summary" Annual, GSGislason & Associates Ltd. estimates

Exhibit 7: Projections with vs without ITQs - Sablefish "K"

			2005		
			Actual w ITQs (a)	Projected w/o ITQs (b)	Difference /ITQ Impact (c) = (a) - (b)
A.	**FLEET REGULATION**				
(1)	TAC tonnes*		4,204	3,150	+1,054
(2)	Season Length (days)		365	10	+355
(3)	No. of Licences		48	48	0
B.	**FLEET ACTIVITY**				
(4)	No. of Active Vessels		35	40	-5
(5)	Harvest RD tonnes		3,815	3,150	+665
(6)	Average	- Landed Price $ per kg RD	6.95	5.70	+1.25
(7)		- Crew Size inc Skipper	6.0	12.0	-6.0
(8)		- Weeks Fished	8	2	+6
(9)		- Crew Share %	20%	30%	-10%
(10)	Total	- Landed Value $000	26,510	17,960	+8,550
(11)		- Crew Jobs	280	480	-200
(12)		- Crew Weeks	1,680	960	+720
(13)		- Crew PYs	67	38	+29
(14)		- Crew Wages $000	5,300	5,390	-90
C.	**PROCESSOR ACTIVITY**				
(15)	Average	- Product Price $ per kg Jcut*	11.95	9.75	+2.20
(16)		- Labour $/kg Jcut	.44	.44	0
(17)		- Labour Rate $/PY	40,000	40,000	0
(18)	Total	- Processed Value $000	30,800	20,750	+10,050
(19)		- Plant PYs	42	35	+7
(20)		- Plant Wages $000	1,680	1,390	+290

* *Weight is dressed head-off equivalents Jcut (1 kg Jcut = 1.48 kg round)*

Source: Exhibit 5 and GSGislason & Associates Ltd. estimates

Note: *(10) = (5) x (6)* *(18) = (5) x (15) / 1.48*
(11) = (4) x (7) *(19) = (20) ÷ 40*
(12) = (11) x (8) *(20) = (5) x (16) ÷ 1.48*
(13) = (12) ÷ 25
(14) = (10) x (9)

Exhibit 8: Regional Distribution of Commercial Fishing Licence Holders - Sablefish "K"

Region	Year 1989*	2005
QCI	0	0
North Coast	3	1
Central Coast	0	0
North Vancouver Island	0	1
Mid Vancouver Island	3	5
South Vancouver Island	1	3
WCVI	1	0
Victoria - Sooke	9	12
Sunshine Coast	2	4
Lower Mainland	27	21
Other BC	0	1
Outside BC	2	0
TOTAL	48	48

** Year before Individual Quota management was introduced.*

Source: Derived from special tabulation from DFO Licensing.

5.0 Case Study - Groundfish Trawl

This case study analyzes the employment, wage and community impacts of the Individual Transferable Quota (ITQ) management system implemented for groundfish trawl in 1997.

The analysis of employment-related impacts draws on a variety of previous studies (Turris 2000, Sporer 2001, Jones 2003, Clark & Munro 2007). This body of work was augmented by several industry interviews, specifically addressing labour deployment and remuneration at the fleet and plant levels.

The impact analysis requires projecting fleet management, fleet industry and processor activity in the absence of the ITQ program i.e., if the fleet had still been managed as a derby fishery. This admittedly is subjective and requires professional judgment.

Nevertheless, the analysis should be considered a reasonable approximation of impacts. Three Exhibits at the end of this section support the analysis - Industry Profile, Impact Projections, and Community Licence Holdings.

5.1 Fishery Development with ITQs

The groundfish trawl fishery is a multi-species fishery that harvests over 50 different groundfish species. Species harvested include cods, soles, other flatfish, lingcod, dogfish (a shark), hake, arrowtooth, flounder (turbot) and a small amount of sablefish - but halibut is excluded. The commercial fishery uses bottom trawl and midwater trawl. Hake is the main species caught by midwater trawl gear.

The hake fishery has two main parts - a "Joint Venture (JV)" component in which Canadian vessels deliver fish to foreign factory ships and a "Shoreside" component in which Canadian vessels deliver fish to coastal processing plants.

Management Responsibility. Canada Department of Fisheries & Oceans (DFO) has sole responsibility for management of all species except hake and sets an overall TAC, conducts stock assessment work, and enacts other regulatory measures.

Hake is a transboundary stock. There is an international hake treaty with the US under which an overall TAC, and allocations for Canada and the US, is set. DFO manages the Canadian portion of the fishery. Canada and the US jointly sponsor stock assessment work and other scientific research on hake.

The Move to IQs. The Canadian fishery adopted limited entry licensing in 1976 and an individual vessel quota (IVQ) system in 1997 for the 142 "T" category licence holders.

The impetus for moving to individual quotas in 1997 had several facets:

- a complex multi-species fishery - many species without TACs, many TACs set without sound science foundation
- an inability to fish within fleet-wide, coastwide TACs
- trip limits getting smaller, discards getting higher in attempts not to exceed TACs
- incentives to misreport on logbooks & sales (transaction) slips increasing
- inability to meet quality needs of market, instability in prices
- excessive amounts of capital, labour, and operating costs e.g., boats, crew, fuel, gear

- Canada promoting conservation on world stage, the collapse of the cod stocks on the East Coast fresh in people's minds

In September 1995, the groundfish trawl fishery was closed as over half the species TACs for the year had been exceeded. A special industry advisory process was launched to come to a "solution" - the year 1996 was a transition year with significant closed areas and fishing periods and very restrictive trip hours. All bottom trawlers in 1996 needed to have an on-board observer.

The Response was ITQs. In 1997 each licence holder received an Individual Vessel Quota where the quota level comprised a percentage of the TAC. DFO based the IVQ formula on a combination of recent vessel catch history and vessel length (70% catch history and 30% vessel length). The formula was applied separately to hake and an aggregate of several non-hake species (some species such as turbot were not managed under a IQ - turbot went to IVQ in the fall of 2005).

The commercial TAC for each species group then is allocated to three different parcels - vessel owner ITQ (80%), Groundfish Development Quota or GDQ (10%), and Code of Conduct of Quota (10%). The 70:30 rule above applies to the first 80% ITQ quota. The second 10% is allocated to joint processor - vessel owner groups who submit worthy proposals ranked on the basis of regional development, employment, sustainable fishery practices and other criteria i.e., largely "social" objectives. The final 10% is allocated to vessel owners in the same proportion as the first 80% unless there is evidence of unfair and inequitable treatment of crews (the intent is to protect crews from excessive leasing charges). The Groundfish Development Authority (GDA) makes recommendations on GDQ applications and any Code of Conduct complaints.

Each year the 142 "T" licence holders are required to choose a fishing option:

- Option A - permitted to fish midwater trawl coastwide and bottom trawl in all areas except the Strait of Georgia (subject to IVQ holdings); subject to 100% observer coverage for all fishing except midwater trawling for hake in certain areas; 100% Dockside Monitoring Program coverage
- Option B - permitted to fish midwater trawl coastwide but bottom trawl only in the Strait of Georgia; limited to maximum of 15 landings per calendar month; subject to 6,800 tonnes (15,000 lbs) catch limit per month for all species other than dogfish, lingcod and rockfish; 100% Dockside Monitoring Program coverage; subject to observer coverage

Option B vessels typically are much smaller than option A vessels and have only 2 crew (Option A vessels typically have a crew of 4).

There are only 10-15 Option B vessels active each year with their total catch being less than 200 tonnes or less than half of one percent of the total groundfish trawl catch.

The groundfish trawl industry engages in co-management with DFO through an industry association and pays for a variety of activities including a Dockside Monitoring Program (DMP) for all product offloads, and 100% observer coverage on all bottom trawl vessels. Industry created the Canadian Groundfish Research & Conservation Society (CGRCS) to conduct groundfish stock assessment work in collaboration with DFO.

Transferability. Initially only permanent transfers of ITQs were allowed subject to ITQ vessel holdings caps and species caps - the intent was to limit quota concentration and fleet rationalization (Turris 2000). Since the year 2000 both temporary and permanent transfers have been allowed.

Markets, Products & Prices. The hake market always has been a specialized market. First, there was essentially only the JV fishery with a very small on-shore industry in the early 1980s. Then in the late 1980s, two plants in Ucluelet on the WCVI started to produce surimi for the Asian market from shoreside deliveries of hake. The surimi market collapsed after the turn of the millennium with the "Mad Cow" scare and the boycott of an animal additive essential to the surimi production process. In the past 5 years the market product has changed to headed & gutted (H&G) frozen whole fish. In addition, recently two large Canadian factory freezer trawlers have started to H&G and freeze hake at sea.

The primary processed product from other groundfish species such as rockfish, Pacific cod, and soles is fillets. Originally an appreciable share of these fillets were frozen fillets due to supply gluts during the season and the inability to schedule boat deliveries to market requirements. Today under ITQs more of the fillets produced are sold to the premium fresh fillet market. Some other trawl-caught fish that used to be filleted now can meet the higher quality standards of the whole fresh market.

The majority of fresh fillets are sold in the US although a significant Canadian market does exist. With the recent strengthening of the Canadian dollar to a parity position with the US dollar, prices to Canadian processors and fishermen have declined.

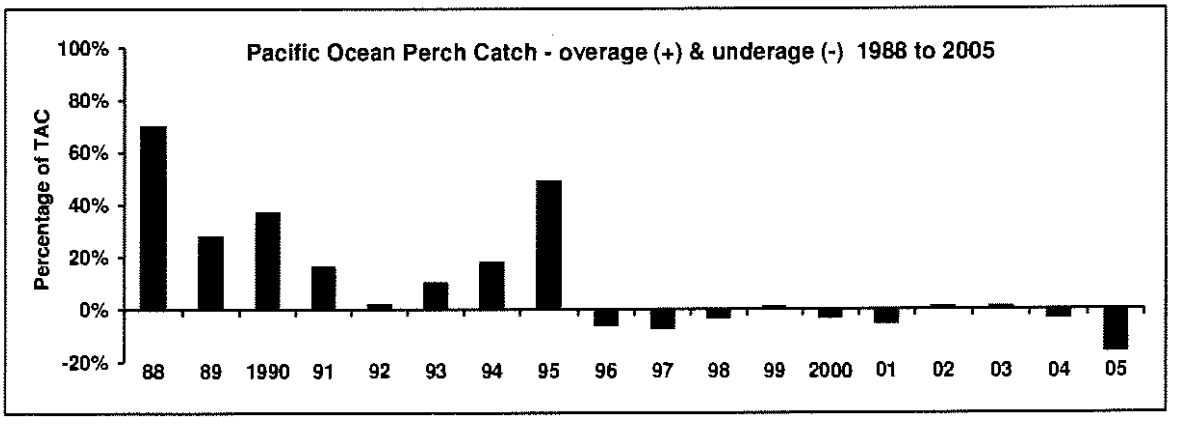
Prices vary from year to year depending on supply, inventory levels, exchange rates and other factors. In 2005 the Canadian wholesale price for fresh rockfish fillets was an estimated $8.00 per kg whereas the frozen fillet price was $5.95 per kg - there is a significant price advantage to selling fresh fillets (prices for fresh rockfish fillets declined to about $6.00 per kg in 2007 as a result of the strengthening of the Canadian dollar against the US dollar).

5.2 Fishery Management Today Without ITQs

We assume that the BC fishery would still be managed as a derby or competitive fishery if ITQs in BC had not been implemented.

Chronic TAC Overages. In the pre-ITQ period the groundfish trawl fleet was consistently over its TAC each year for several species.

The chart below for Pacific Ocean Perch demonstrates the dramatic turnaround in the fleet's ability to meet its TAC under the ITQ program (derived from data in Clark & Munro 2007).



The chronic overage problem under the derby system could be even worse today, and put downward pressure on the setting of TACs.

DMP and 100% Observer Coverage Would Still Exist. The Dockside Monitoring Program (DMP) for all vessel offloads that was implemented in 1994 pre ITQs would still exist.

It is also likely that the 100% observer program for all bottom trawl fishing operations, first introduced in the 1996 transition year, would exist today.

Much Less Science. DFO scientists report that their research budget was cut significantly in the mid 1990s. Since that time the groundfish fleet through the CGRCS has funded several scientific surveys. In addition, the 100% observer coverage in place since 1996 has allowed estimates of total mortality- retained catch plus mortality associated with discards - to be made. The result is much better stock assessment work and yield estimates. The current level of science would not be maintained if the derby fisheries format still persisted.

The Precautionary Approach and TAC-setting. Today's fishery management environment is characterized by the precautionary approach to setting TACs, an influential environmental movement, increasing public awareness of fisheries issues, selective fishing practices and so on.

Our discussions with scientists and fisheries managers suggest that better science can lead to higher TACs since the fishery manager can be less conservative and can justify this stance, (the corollary is that poorer science leads to lower TACs). In fact when ITQs were introduced in 1997, DFO arbitrarily increased TACs for flatfish and rockfish by 10% or more in anticipation of better data/science under the ITQ fishing format.

We also mote that the DFO closed the trawl fishery in 1995 due to chronic catch overages - and that in 2003 DFO mandated that all groundfish fleets find a way to change their operating practices due to bycatch/discard concerns (the result was the Groundfish Integration Program discussed in Section 2). The management of the trawl fishery today, if still under a derby format, would be very restrictive with closed areas and seasons and very low trip limits - it is likely that the fleet would be closed down once the first species TAC was hit leaving much uncaught fish of other species.

For our projections, we assume that the catch for all species except hake would be cut in half if ITQs had not been implemented (23,800 tonne catch under derby fishery vs actual 47,600 tonne catch in 2005).

Hake is a Special Case. Hake is caught by midwater trawl gear, gear with much fewer bycatch issues than bottom trawl gear. Hake is also subject to international treaty and coordinated science programs between Canada and the US - these would continue in the absence of ITQs.

Most importantly, hake had a defacto IQ program before the formal introduction of ITQs in 1997. Hake flesh deteriorates quickly after death due to the presence of an intestinal organism and therefore the catch must be processed quickly. There were processing capacity constraints in the 1990s and these capacity constraints still exist today. As a result, the onshore processors and the hake fleet in the 1990s entered into informal agreements allocating the hake TAC amongst different size boats and scheduling deliveries to the plant. A similar type of cooperation between the JV hake fleet and the factory processors has existed since the 1980s.

Therefore, in the absence of ITQs, we argue that the hake fleet and hake processing would operate in a similar manner to what exists today. We do not attribute any ITQ impacts for the hake portion of the trawl fleet - our subsequent analysis focuses on trawl operations other than hake.

Severe Operating Restrictions. We suggest that DFO would use a system of staggered openings for different fleet segment e.g., a vessel could only fish 2 of the 4 quarters (3 month period) in the year. This is the type of measure DFO implemented in the 1996 transition year before the introduction of ITQs. Moreover, we suggest that DFO also would impose severe trip limits on the fleet. The end result would be a cut in fishing time per active vessel under a derby format.

5.3 ITQ Impacts - Employment & Wages

Exhibit 10 presents a profile of groundfish trawl industry activity in 2005 and a projection of 2005 activity if the industry had not gone to ITQs i.e., the fishery was still managed as a derby or competitive fishery (the Exhibit excludes the hake fishery and Option B boats).

Under the ITQ format, the pace of fishing has slowed, there is a steady supply of fish to the market throughout the year, fish handling and quality is improved, and less fillets are frozen.

The key parameters underlying our projections of changes in industry structure under ITQs include:

- a product price increase - of $0.33 per kg RD at the wholesale level and $0.22 per kg RD at the fleet level attributable to ITQs (based on interviews, and the fact that it is common for processors today to pay $0.22 to $0.44 per kg less to fishermen if the fillets produced are frozen); conversely prices to fishermen decrease by about 25% under a derby fishery
- an increase in the active fleet - from about 40 Option A non-hake vessels in the derby fishery to 52 ITQ vessels (and the ITQ fleet fishing more weeks on average than the derby fleet)
- no change in crew size - crew size is 4 in both scenarios
- a decrease in average crew share - from about 40% of landed value under derby fishing to 35% of landed value under ITQ fishing reflecting the fact that charges for leased quota are deducted from gross stock before determining crew shares under ITQs (Nelson Bros Fisheries 2006)
- a decrease in labour processing content - reflecting less product frozen, less trimming needed etc from the better quality raw material under the ITQ regime

We assume that 25 weeks fished equals one person-year (PY) of employment and that the average plant position, including administration positions, pays $40,000 per year including benefits.

	2005 Projections		
	w ITQs (a)	w/o ITQs (b)	ITQ Impact (c) = (a) - (b)
Revenues $000			
Fleet	39,980	14,760	+25,220
Processing Margin	43,800	19,270	+24,530
Processed Value	83,780	34,030	+49,750
Wages $000			
Fleet	13,990	5,900	+8,090
Plant	20,940	13,090	+7,850
	34,930	18,990	+15,940
Employment PYs			
Fleet	166	83	+83
Plant	524	327	+197
	690	410	280
Other			
Active Vessels	52	40	+12
Crew Jobs	208	160	+48

Source: Exhibit 10

ITQs have resulted in more crew jobs, more year-round employment and higher wages both on vessels and in plants. The increases are significant and reflect largely the much higher catches possible under the ITQ fishery format.

5.4 ITQ Impacts - Communities

The ITQ management regime also has affected communities and community interests.

Community Licence Holdings. Today the urban areas of the Lower Mainland and Greater Victoria are the residence of 98 or 69% of the 142 commercial groundfish trawl licence holders - see Exhibit 11. This represents essentially no change from the 1996 situation.

Community Distribution of Offloads. Prior to the introduction of IQs in the 1980s, the Lower Mainland and Prince Rupert in the North Coast accounted for over 40% of groundfish offloads.

	% Share of Offloads			
	tonnes* pre ITQs 1996		tonnes ITQs 2005	
Lower Mainland	22,700	33%	32,800	24%
North Coast	6,500	9%	13,400	10%
Vancouver Island - North	4,700	7%	13,900	10%
- West Coast	25,300	36%	70,900	52%
- Other	3,600	5%	600	1%
US	7,200	10%	4,500	3%
	70,000		136,100	

* *excludes a very small amount of fish with unknown offload location*

Source: DFO Groundfish Unit (the offload figures include shoreside hake - 33,000 tonnes in 1996 and 88,500 tonnes in 2005)

Shoreside deliveries of hake dominate the above landings data - almost all hake today is landed in either Ucluelet or Port Alberni on the WCVI or in Greater Vancouver (the Steveston Seafood Auction in Greater Vancouver custom unloaded about 18,500 tonnes of hake in 2005, Greater Vancouver would have had essentially zero hake deliveries in 1995). Port Hardy on the North Coast of Vancouver Island would have very few hake deliveries in either year.

There has been a reduction in landings of species other than hake to the Vancouver area since the introduction of IQs. More fish is landed in communities such as Port Hardy on North Vancouver Island and Ucluelet on the WCVI and then trucked to Vancouver. In particular, Port Hardy has become an important offload port for the groundfish trawl fleet. The rationale for increased deliveries to outports is tied to proximity to fishing grounds and high fuel costs.

In addition, product quality can be enhanced through offloading fish on Vancouver Island and transshipping the fish by truck to Greater Vancouver for processing, rather than direct delivery of fish by boat straight to Vancouver. The travel time by boat to Vancouver from Port Hardy, for example, is 24-30 hours whereas the travel time by truck is 8 hours.

Unloading in Port Hardy also provides more certainty as to the time when the fish will arrive in Vancouver. Often the truck from Port Hardy will get the first ferry in the morning or the last ferry at night from Nanaimo. This allows the fish to be ready for processing at the Vancouver plant destination for 8 AM when the plant processing shift starts. The scheduling of boat deliveries to Vancouver is much more uncertain.

The increase in landings to the North Coast in 2005 is mainly attributable to turbot - see discussion below.

Turbot Processing. Turbot landings tripled to 16,500 tonnes in 2005 after holding steady at about 5,000 tonnes for many years (1996 turbot landings were 4,600 tonnes). In 2006 turbot landings decreased to 5,900 tonnes.

The main reason for the one year increase was that: 1) a new market in China emerged for frozen, tail-off headed & gutted turbot, and 2) several BC trawl vessels started to target turbot. The trawl fish was mainly processed at two northern plants, one in Masset in the QCI and one in Prince Rupert.

However, the market became glutted and concerns were expressed at the quality of the BC product. The Chinese market collapsed - turbot processing at the Masset and Prince Rupert plants ceased. At about the same time, two large factory freezer trawlers started to catch, process and freeze turbot at sea, a strategy that conferred a quality advantage since turbot deteriorates quickly.

DFO became concerned about the large increase in turbot landings in 2005 (as turbot did not have a TAC). In October 2005, DFO introduced a TAC and an ITQ program for turbot for groundfish trawl vessels.

The fact that the introduction of ITQ management and the collapse of the Chinese market occurred at about the same time was a coincidence. The cessation of turbot processing in northern BC was unconnected to the ITQ management measure. Nevertheless, the turbot situation has spurred calls for Community Development Quotas or CDQs (e.g., White 2005).

5.5 ITQ Impacts - Other Labour Issues

There are several other labour impacts from the move to ITQs for groundfish trawl.

Increased Safety. Crew safety has improved under ITQ management. Vessels are no longer forced to "race for the fish" and fish 24 hours a day, have a sleep-deprived crew and compromise safety. In addition, on bad weather days the vessel operator can decide not to fish without incurring a revenue penalty.

Better Working Conditions. Working conditions are much improved with shorter working days.

Although four is the standard crew size, some boats rotate crew from a pool of 5 people (4 are used in any one trip). This allows flexibility for crew to attend family events, take holidays etc.

Other Job Impacts. The DMP function for groundfish has created new jobs in port validation. Based on discussions with the service provider, we estimate the wage and employment base of port validations to be approximately $550,000 in wages and 11 person-years of employment (including provision for overhead labour). But as noted previously, DMP was adopted by the trawl fleet prior to ITQs and likely would still exist today if ITQs had not been adopted.

This is a complicated issue e.g., halibut "L" and sablefish "K" fleets adopted DMP, in concert with ITQs, before the trawl fleet adopted DMP in 2004 - the halibut and sablefish experience may have spurred DMP for the trawl fleet.

The Role of the GDA. The labour dimension of the groundfish trawl industry - both the vessel and plant components - differs dramatically from the labour dimensions of the halibut and sablefish industry sectors. The latter two fisheries are low volume, high value fisheries with each vessel operating only a few weeks per year and relatively little processing involved. In contrast, the groundfish trawl sector has a much longer operating season and involves substantial processing into fillets.

The concerns of plants and shore workers had much greater prominence in discussions leading to the design of the GF Trawl ITQ program. In addition, unforeseen repercussions of the halibut and sablefish ITQ programs, such as an imputed lease charge being deducted before crew settlements on quota originally granted under the IVQ program, had emerged for these two fisheries.

The intent of the GDA component of the GF Trawl ITQ program is to act as a "conscience for the industry" in terms of fair treatment for crews and regional development/community interests - there was no such design feature for halibut and sablefish fisheries.

How well the GDA is working is open to some debate - see GSIC 2003. Tangible evidence of success is mostly lacking e.g., no crew member has lodged a complaint under the Code of Conduct provision (the vessel, and hence the crew gets penalized for a successful complaint as part of the ITQ is taken away from the vessel). But the GDA may have acted as a deterrent. The mere existence of the GDA has facilitated dialogue and cooperation amongst fishermen and processors. This value chain cooperation is a benefit in itself and helps the industry meet the needs of the customer base.

Exhibit 9: Profile of BC Commercial Fishery - Groundfish Trawl "T"

Year	Regulations**	Activity*			Vessel Landings		Landed Value		Rockfish Processing Indicator Activity		
					tonnes		$ millions			Rockfish Fillet $ per kg	
	Licences (1)	Active Vessels (2)	Deliveries (3)	Tows (4)	Hake*** (5)	Other (6)	Hake*** (7)	Other (8)	% Fillets Fresh (9)	Fresh (10)	FZ (11)
1983	142	103	807		43,520	24,996	7.1	10.4			
84	142	111	869		43,398	27,181	6.8	12.1			
85	142	138	1,007		29,861	32,566	4.8	15.0		3.60	3.55
86	142	138	968		60,243	38,300	8.7	21.1		4.10	4.05
87	142	99	1,236		60,713	47,762	9.4	30.7		4.35	4.55
88	142	111	1,437		56,335	48,779	8.9	28.5		3.50	3.00
89	142	112	1,632		74,706	45,958	11.3	25.5		3.50	2.90
1990	142	112	1,632		79,453	49,243	12.8	28.1		3.15	3.70
91	142	112	2,052		99,055	53,052	15.4	30.0		4.10	3.65
92	142	123	2,524		97,184	57,123	15.5	32.7		4.00	3.65
93	142	118	2,664		62,571	59,998	8.7	33.1	65%	4.10	3.50
94	142	117	2,143		116,664	47,919	16.8	33.5	69%	4.80	4.80
95	142	122	2,465		82,853	38,441	11.1	33.9	76%	5.20	4.65
96	142	112	1,947	19,665	99,823	38,145	14.5	27.3	77%	5.20	4.65
97	142	92	2,332	16,314	97,344	32,039	15.9	~30	79%	6.40	4.80
98	142	88	2,319	17,233	84,378	33,483	17.7	~34	82%	6.85	5.80
99	142	89	2,920	17,409	92,553	36,454	17.1	~40	86%	7.65	4.60
2000	142	82	1,703	18,203	22,347	36,525	6.5	~46	84%	8.10	5.55
01	142	83	2,406	16,687	61,429	39,612	16.4	~39	88%	8.65	5.65
02	142	79	2,602	17,801	56,894	41,236	13.8	~43	86%	8.20	5.05
03	142	78	2,593	15,471	69,159	41,768	13.7	~43	90%	7.30	5.60
04	142	72	2,433	14,776	124,873	38,698	26.6	~39	89%	8.00	5.50
05	142	75	2,578	14,377	101,979	47,568	29.7	~40	88%	8.00	5.95

* *Activity measures include the shoreside hake fishery plus the non-hake fishery (but exclude JV hake and Option B vessel activity)*

** *Fisheries Management Regimes - limited entry pre 1997, ITQs 1997 onwards*

*** *Includes JV and shoreside hake*

Source: GSGislason 1999, Clark & Munro 2007, DFO Groundfish Unit "Summary of Groundfish Trawl Catch vs Available Weight", Annual plus GSGislason & Associates Ltd. estimates

Exhibit 10: Projections with vs without ITQs - GF Trawl "T" (excluding Hake)

			2005		
			Actual w ITQs (a)	Projected w/o ITQs (b)	Difference /ITQ Impact (c) = (a) - (b)
A.	**FLEET REGULATION**				
(1)	Season Length (days)		365	180	+185
(2)	No. of Licences		142	142	0
B.	**FLEET ACTIVITY**				
(3)	No. of Active Vessels (exc. hake-only vessels)		52	40	+12
(4)	Harvest RD tonnes		47,600	23,800	+23,800
(5)	Average	- Landed Price $ per kg RD*	0.84	0.62	+0.22
(6)		- Crew Size inc Skipper	4.0	4.0	0
(7)		- Weeks Fished	20	13	+7
(8)		- Crew Share %	35%	40%	-5%
(9)	Total	- Landed Value $000*	39,980	14,760	+25,220
(10)		- Crew Jobs	208	160	+48
(11)		- Crew Weeks	4,160	2,080	+2,080
(12)		- Crew PYs	166	83	+83
(13)		- Crew Wages $000	13,990	5,900	+8,090
C.	**PROCESSOR ACTIVITY**				
(14)	Average	- Product Price $ per kg RD	1.76**	1.43	+.33
(15)		- Labour $/kg RD	.44	.55	-.11
(16)		- Labour Rate $/PY	40,000	40,000	0
(17)	Total	- Processed Value $000	83,780	34,030	+49,750
(18)		- Plant PYs	524	327	+197
(19)		- Plant Wages $000	20,940	13,090	+7,850

* *The fleet profile excludes the hake fishery and Option B boats (the 2005 harvest includes about 17,600 tonnes of turbot and dogfish worth $4 million or $0.22 per kg and 30,000 tonnes of other species - rockfish, soles, cod, etc - worth $36 million or $1.21 per kg)*

** *The product price for fillets is about $7.75 per kg - weighted average of fresh & frozen - which translates into about $2.33 per kg RD fish (based on 30% fillet recovery). The processed product price for turbot and dogfish is much less*

Source: Exhibit 9 and GSGislason & Associates Ltd. estimates

Note: *(9) = (4) x (5)*
(10) = (3) x (6)
(11) = (10) x (7)
(12) = (11) ÷ 25
(13) = (9) x (8)
(17) = (4) x (14)
(18) = (19) ÷ 40
(19) = (4) x (15)

Exhibit 11: Regional Distribution of Commercial Fishing Licence Holders - Groundfish Trawl "T"

Region	Year	
	1996*	2005
QCI	1	1
North Coast	9	8
Central Coast	0	1
North Vancouver Island	3	2
Mid Vancouver Island	17	16
South Vancouver Island	10	7
WCVI	2	5
Victoria - Sooke	24	20
Sunshine Coast	1	2
Lower Mainland	75	78
Other BC	0	1
Outside BC	0	1
TOTAL	142	142

** Year before Individual Quota management was introduced*

Source: Derived from special tabulation from DFO Licensing (licence counts includes both Option A and Option B vessels for 2005)

6.0 Case Study - Geoduck

This case study analyzes the employment, wage and community impacts of the Individual Transferable Quota (ITQ) management system implemented for geoduck in 1989.

The analysis of employment-related impacts draws on a variety of previous studies (Kerr 1991, Turris & Sporer 1994, Muse 1998b, Heizer 2000, Sporer 2001, and Jones 2003). This body of work was augmented by several industry interviews, specifically addressing labour deployment and remuneration at the fleet and plant levels.

The impact analysis requires projecting fleet management, fleet industry and processor activity in the absence of the ITQ program i.e., if the fleet had still been managed as a derby fishery. This admittedly is subjective and requires professional judgment.

Nevertheless, the analysis should be considered a reasonable approximation of impacts. Three Exhibits at the end of this section support the analysis - Industry Profile, Impact Projections, and Community Licence Holdings.

6.1 Fishery Development with ITQs

Geoducks are large clams that are widely distributed along coastal BC. Geoducks are harvested by divers using air supplied by hoses from the surface boat. As a bivalve, all geoducks harvested must go through a Canadian Food Inspection Agency (CFIA) federally-registered shellfish plant.

Management Responsibility. Canada Department of Fisheries & Oceans (DFO) is responsible for management and sets an overall TAC, conducts stock assessment work, and enacts other regulatory measures.

The Move to ITQs. The BC fishery adopted limited entry licences in 1981. An individual vessel quota (IVQ) system was introduced in 1989 for the 55 "G" category licence holders.

The impetus for moving to individual quotas in 1989 had several facets:

- an inability to fish within a fleet-wide TAC, the real possibility the resource might have collapsed (geoduck is a sedentary species that is slow growing, long-lived, and easily exploited)
- issues related to compromised crew safety & poor working conditions
- poor quality product, inability to serve the lucrative live market year-round
- excessive amounts of capital, labour and operating costs e.g., boats, crew, fuel,
- inability to monitor & enforce fishery regulations
- an inherently unstable industry

These symptoms of poor conservation, business, and people practices all resulted from the "race for the fish" under the derby fishery management format.

The Response was ITQs. In 1989 each licence holder received an equal Individual Vessel Quota or share of TAC.

The geoduck industry engages in co-management with DFO through an industry association - the Underwater Harvesters Association (UHA) - and pays for a variety of activities including a Dockside Monitoring Program (DMP) for all product offloads, at-sea monitoring, stock assessment work, water quality testing, biotoxin testing for PSP (Paralytic Shellfish Poisoning) in geoducks and mussels, and fishery management staff.

Transferability. Temporary transfers are only allowed and the complete quota block must be transferred - no partial quota transfers are allowed. Although multi-years transfers are not permitted, legal agreements such as long term leases effectively provide longer term quota transfers.

Markets, Products & Prices. Prior to the introduction of ITQs, the geoduck market was primarily processed frozen neck meat. Accessing the live market was hindered by short seasons (as often each area TAC was caught in 2 or 3 months), poor product quality e.g., cracked shells, and the inability of fishermen and processors to coordinate market deliveries. The management system in place prevented the industry from serving the lucrative live geoduck market to a much greater content.

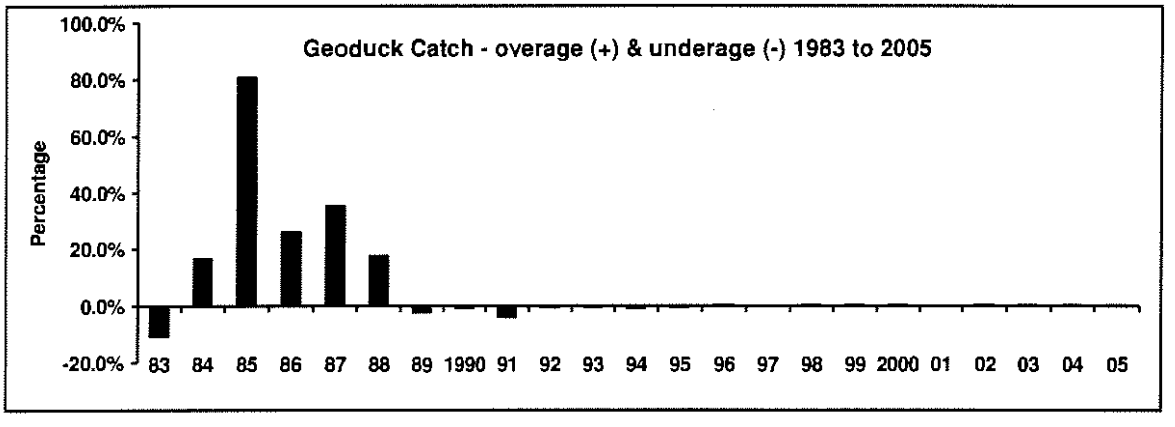
The ITQ system essentially allowed live geoduck to become the dominant market product (live geoduck is worth five times or more what processed geoduck is worth and entails much lower processing costs). The fishery operates year round today.

Today over 95% of geoducks are exported with over 90% of exports going to greater China (James 2007).

6.2 Fishery Management Today Without ITQs

We assume that the BC fishery would still be managed as a derby or competitive fishery if ITQs had not been implemented. Management considerations include:

Chronic TAC Overages. In the 1984 to 1988 pre IQ period, the geoduck fleet exceeded its TAC in every year (by an average amount of 34%) - see chart below. This chronic problem could be even worse today, and put downward pressure on the setting of TACs.



No DMP. It is unlikely that the Dockside Monitoring Program (DMP) for all vessel offloads that was implemented with the introduction of Individual Quotas in 1989 would be in place today - the DMP program has led to better catch statistics data.

Much Less Science. The geoduck fleet pays for the bulk of science conducted on geoduck and fisheries management targeted to geoduck (James 2007). The science research includes research for stock assessment, biosampling, bed surveys etc. It is very unlikely that the current level of science would be maintained if the derby fisheries format still persisted. UHA-funded science has allowed the assessment/categorization of 4,000+ beds along the coast.

The Precautionary Approach and TAC-setting. Today's fishery management environment is characterized by the precautionary approach to setting TACs, an influential environmental movement, increasing public awareness of fisheries issues, selective fishing practices and so on.

Our discussions with scientists and fisheries managers suggest that better science can lead to higher TACs since the fishery manager can be less conservative and can justify this stance, (the corollary is that poorer science leads to lower TACs). Without the better science attributable to ITQs, DFO would not be able to implement bed-by-bed management.

We suggest that the geoduck TAC would decrease substantially under a derby fishery format - we use a 50% figure in our projections (780 tonne TAC under derby fishery vs actual 1,560 tonne TAC in 2005).

Area Licensing. DFO introduced area licensing with the 1989 ITQ program - today there are 40 licences in the north with the remaining 15 on the WCVI or the Strait of Georgia. The area licensing regime would be maintained under a derby format.

6.3 ITQ Impacts - Employment & Wages

Exhibit 13 presents a profile of geoduck industry activity in 2005 and a projection of 2005 activity if the industry had not gone to ITQs i.e., the fishery was still managed as a derby or competitive fishery.

Under the ITQ format, the pace of fishing has slowed, there is a steady supply of live fish to the market throughout the year, and the fish is handled much better on the boats and at the plants. These improvements have led the fishery to focus almost exclusively on the high quality, high value Chinese market.

The key parameters underlying our projections of changes in industry structure under ITQs include:

- a substantial product price increase - with the price doubling to $22.30 per kg at the wholesale level with ITQs from $11.15 per kg in the derby format (based on industry interviews and the price trends in Exhibit 12).
- a decrease in the active fleet - from 55 active vessels under derby fishery to the 40 active vessels in 2005 with the smaller active fleet fishing more weeks per vessel under ITQs
- a decrease in average crew size from about 4.5 in the derby situation to 3.0 under ITQs (consistent with previous analysis by Kerr 1991, Turris & Sporer 2004, Muse 1998 and our interviews)
- a decrease in average crew share from about 35% of landed value in derby fishing to the present 25% of landed value
- a lower labour processing content - live product requires much less processing than neck and body meat products (direct labour costs for meat products may be three times that for live products)

We assume that 25 weeks fished equals one person-year (PY) of employment and that the average plant position, including administration positions, pays $40,000 per year including benefits.

	2005 Projections		
	w ITQs (a)	w/o ITQs (b)	ITQ Impact (c) = (a) - (b)
Revenues $000			
Fleet	32,600	6,830	+25,770
Processing Margin	2,190	1,870	+320
Processed Value	34,790	8,700	+26,090
Wages $000			
Fleet	8,150	2,390	+5,760
Plant	1,030	1,200	-170
	9,180	3,590	+5,590
Employment PYs			
Fleet	58	35	+23
Plant	26	30	-4
	84	65	+19
Other			
Active Vessels	40	55	-15
Crew Jobs	120	220	-100

Source: Exhibit 13

There are substantial gains in industry revenues and wages paid under the ITQ management regime.

ITQs have resulted in fewer crew jobs but those remaining in the industry have more steady employment and earn much more on average.

6.4 ITQ Impacts - Communities

The ITQ management regime for geoduck has had only a minor effect on communities and community interests.

Community Licence Holdings. Today the urban areas of the Lower Mainland and Greater Victoria are the residence of 19 or 35% of the 55 commercial geoduck licence holders, a decline from 23 or 42% of licences in 1988 - see Exhibit 14. Licence holdings in the Campbell River-Comox area of Mid Vancouver Island have increased.

Community Distribution of Deliveries. Prior to the introduction of ITQs, there were some landings in the Cowichan Bay and Victoria areas of Vancouver Island. As the industry moved almost exclusively to supplying live product, almost all the product is processed in the Greater Vancouver area where direct air connections to Asia exist.

6.5 ITQ Impacts - Other Labour Issues

There are other labour impacts from the move to ITQs for geoduck.

Increased Safety & Better Working Conditions. Crew safety has improved under ITQ management. Vessels are no longer forced to "race for the fish" and compromise safety. In addition, on bad weather days the vessel operator can decide not to fish without incurring a revenue penalty. Working conditions are much improved with shorter working days.

Pre-ITQs the imperative to continue fishing resulted in decompression issues and tendinitis problems for several divers. Periods that divers were on WCB claims declined after ITQs (Kerr 1991).

Other Jobs Created. Packers, each with a crew of two, are used in the North and the WCVI areas to collect geoducks from fishermen at sea and deliver to port. It is likely that the employment associated with the packing function has increased under ITQs with the much longer fishing season.

The DMP function for geoduck has created new jobs in port validation and at-sea monitoring. Based on discussions with the service provider, we estimate the wage and employment base of these functions to be approximately $400,000 and 8 person-years of employment (including provisions for overhead labour).

Less Part-Time Divers. The share of the diver workforce that is full-time has increased with a decrease in the number of part-time workers (Kerr 1991). There has been a professionalization of the industry as divers require CSA (Canadian Standards Association) certification. In the derby days, there were some uncertified, untrained divers.

Exhibit 12: Profile of BC Commercial Fishery - Geoduck "G"

Year	Regulations*			Activity		Vessel Landings			Live Product**	
	TAC tonnes (1)	Licences (2)	Active Vessels (3)	Divers (4)	Diver Hours (5)	Tonnes (6)	$ millions Value (7)	$ per kg* (8)=(7)/(6)	% Sales (9)	$ per kg (10)
1983	2,948	54	53			2,635	1.8	.68	9%	1.65
84	2,994	54	44			3,484	2.9	.84	11%	1.70
85	2,971	55	52			5,370	4.7	.88	11%	1.70
86	3,980	55	55			5,005	4.3	.86	18%	2.05
87	4,239	55	55			5,735	6.2	1.08	15%	3.60
88	3,890	55	55			4,567	9.8	2.14	18%	4.10
89	3,992	55	47	176	18,070	3,904	12.3	3.15	26%	4.30
1990	3,992	55	44	145	19,500	3,958	10.6	2.67	29%	4.10
91	3,368	55	44	133	17,210	3,234	9.2	2.84	47%	5.15
92	2,863	55	41	135	14,750	2,852	16.1	5.65	53%	7.05
93	2,432	55	44	112	13,050	2,422	26.7	11.00	76%	15.20
94	2,245	55	44	110	12,400	2,227	33.7	15.11	80%	20.00
95	2,096	55	42	108	11,330	2,085	43.0	20.64	83%	27.15
96	1,841	55	44	94	10,640	1,842	36.3	19.69	88%	24.45
97	1,796	55	42	91	11,820	1,796	33.3	18.54	92%	21.75
98	1,796	55	42	88	10,700	1,797	29.8	16.58	93%	18.80
99	1,796	55	41	93	10,790	1,797	32.8	18.25	96%	23.90
2000	1,796	55	42	92	10,860	1,797	40.6	22.61	95%	27.45
01	1,821	55	40	91	10,610	1,821	43.5	23.88	96%	25.90
02	1,821	55	40	96	10,780	1,822	38.5	21.12	96%	25.65
03	1,721	55	41	93	10,050	1,724	32.8	19.03	97%	24.50
04	1,796	55	40	95	10,070	1,797	35.7	19.84	98%	22.33
05	1,559	55	40	83	8,260	1,560	32.7	20.94	98%	23.52

* *Fisheries Management Regimes - limited entry pre 1989, ITQs 1989 onwards*

** *There is approximately 5% shrinkage between the harvested live product and the processed live product due to loss of liquid*

Source: DFO Geoduck Fishery Manager pers. comm., Turris & Sporer 1994, Muse 1998b, Sporer 2001, BC Environment Annual plus GSGislason & Associates Ltd. estimates

Exhibit 13: Projections with vs without ITQs - Geoduck "G"

			2005		
			Actual w ITQs (a)	Projected w/o ITQs (b)	Difference /ITQ Impact (c) = (a) - (b)
A.	**FLEET REGULATION**				
(1)	TAC tonnes*		1,559	780	+779
(2)	No. of Licences		55	55	0
B.	**FLEET ACTIVITY**				
(3)	No. of Active Vessels		40	55	-15
(4)	Harvest RD tonnes		1,560	780	+780
(5)	Average	- Landed Price $ per kg RD	20.90	8.75	+12.15
(6)		- Crew Size inc Skipper	3.0	4.0	-1.0
(7)		- Weeks Fished	12	4	+8
(8)		- Crew Share %	25%	35%	-10%
(9)	Total	- Landed Value $000	32,600	6,830	+25,770
(10)		- Crew Jobs	120	220	-100
(11)		- Crew Weeks	1,440	880	+560
(12)		- Crew PYs	58	35	+23
(13)		- Crew Wages $000	8,150	2,390	+5,760
C.	**PROCESSOR ACTIVITY**				
(14)	Product Mix	- % Live	95%	25%	+70%
(15)	Average	- Product Price $ per kg	22.30	11.15	+11.15
(16)		- Labour $/kg	.66	1.54	-.88
(17)		- Labour Rate $/PY	40,000	40,000	0
(18)	Total	- Processed Value $000	34,790	8,700	+26,090
(19)		- Plant PYs	26	30	-4
(20)		- Plant Wages $000	1,030	1,200	-170

Source: Exhibit 12 and GSGislason & Associates Ltd. estimates

Note: *(9) = (4) x (5)* *(18) = (4) x (15)*
(10) = (3) x (6) *(19) = (20) ÷ 40*
(11) = (10) x (7) *(20) = (4) x (16)*
(12) = (11) ÷ 25
(13) = (9) x (8)

Exhibit 14: Regional Distribution of Commercial Fishing Licence Holders - Geoduck "G"

Region	Year	
	1988*	2005
QCI	0	0
North Coast	3	2
Central Coast	0	0
North Vancouver Island	0	0
Mid Vancouver Island	20	26
South Vancouver Island	5	6
WCVI	2	0
Victoria - Sooke	7	5
Sunshine Coast	0	0
Lower Mainland	16	14
Other BC	1	1
Outside BC	1	1
TOTAL	55	55

* *Year before Individual Quota management was introduced*

Source: Derived from special tabulation from DFO Licensing.

7.0 Case Study - Red Sea Urchin

This case study analyzes the employment, wage and community impacts of the Individual Transferable Quota (ITQ) management system implemented for red sea urchin in 1995 (IQs were introduced partway through 1994).

The analysis of employment-related impacts draws on a variety of previous studies (Muse 1998a, Sporer 2001, and Jones 2003). This body of work was augmented by several industry interviews, specifically addressing labour deployment and remuneration at the fleet and plant levels.

The impact analysis requires projecting fleet management, fleet industry and processor activity in the absence of the ITQ program i.e., if the fleet had still been managed as a derby fishery. This admittedly is subjective and requires professional judgment.

Nevertheless, the analysis should be considered a reasonable approximation of impacts. Three Exhibits at the end of this section support the analysis - Industry Profile, Impact Projections, and Community Licence Holdings.

7.1 Fishery Development with ITQs

Red sea urchins are a shellfish species with a ball-shaped shell from which sharp spines protrude. Red sea urchin are harvested by divers. The roe then is extracted at the processing plant. For a description of the industry see Explorations Unlimited 2006 a&b.

Management Responsibility. Canada Department of Fisheries & Oceans (DFO) is responsible for management and sets an overall TAC, conducts stock assessment work, and enacts other regulatory measures.

The Move to ITQs. The red sea urchin category "ZC" licence was created in 1983 although entry to the fishery initially was not limited. After effort and landings increased in the 1980s, licence limitation was introduced in 1991 (102 licences). By 1994, licence appeals had increased the licence count to 110.

There was a tremendous buildup of fishing effort and catch through the early 1990s - see Exhibit 15. The impetus for moving to individual quotas had several facets:

- supply gluts and price crashes soon after the start of fishing in each area
- an inability to fish within a fleet-wide TAC (in 1992 the catch exceeded the TAC by 700%)
- issues related to compromised crew safety & poor working conditions
- poor quality product
- excessive amounts of capital, labour and operating costs e.g., boats, crew, fuel,
- inability to monitor & enforce fishery regulations
- an inherently unstable industry

These symptoms of poor conservation, business, and people practices all resulted from the "race for the fish" under the derby fishery management format.

The Response was ITQs. Industry established a voluntary IQ program partway through 1994 (1995 was the first full year of the program). DFO sanctioned in regulations the IQ program for the 1996 season. Each licence holder received an equal quota.

Many red urchin operators also had geoduck licences - these operators saw the benefits of the geoduck IQ program launched in 1989 and realized that similar benefits could be realized for the red urchin fishery.

The red urchin industry engages in co-management with DFO through an industry association - the Pacific Urchin Harvesters Association (PUHA) - and pays for a variety of activities including a Dockside Monitoring Program (DMP) for all product offloads, at-sea monitoring, and stock assessment work.

Transferability. Temporary transfers are only allowed and the complete quota block must be transferred in such cases with no partial quota transfers allowed. Although multi-years transfers are not permitted, legal agreements such as long term leases effectively provide longer term quota transfers.

Markets, Products & Prices. Live red sea urchin are processed for their roe which is marketed almost exclusively to Japan as uni. There are two types of roe products - bulk (semi-finished) and tray-pack (finished).

The ITQ management system allowed the harvesters and processors to work together to supply the Japanese market year-round and to avoid supply gluts and associated price volatility. The result was substantial price increases to both fishermen and processors in the late 1990s.

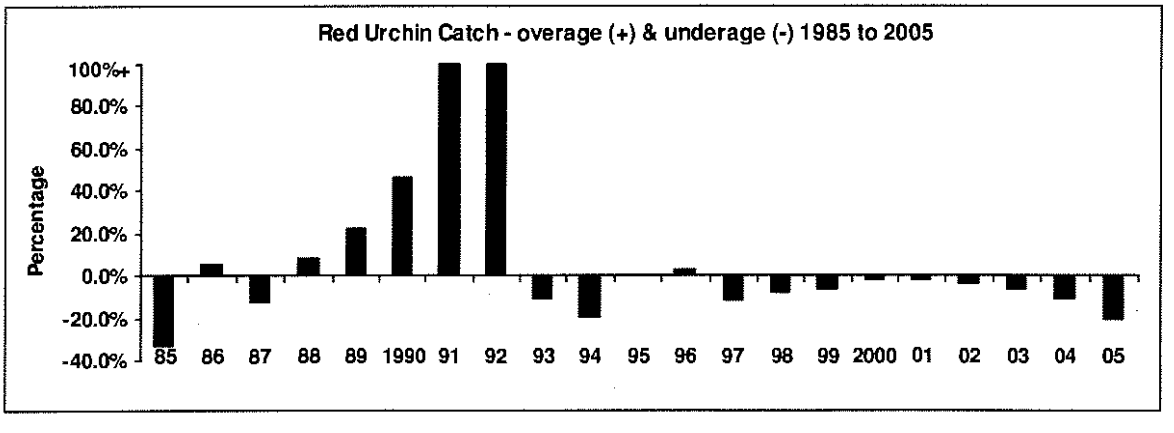
Prices have declined in the last few years due to currency movements and large supplies of raw product coming from Russia into Hokkaido Japan for processing and distribution. One result is that the fleet is no longer catching the full TAC. As Exhibit 15 shows, significant amounts of urchins were "left in the water" in 2005 (an urchin operator will not fish unless he has a buyer lined up ahead of time, many licence holders can not find buyers). The situation is even worse today.

7.2 Fishery Management Today Without ITQs

We assume that the BC fishery would still be managed as a derby or competitive fishery if ITQs had not been implemented. Management considerations include:

Chronic TAC Overages. In the late 1980s pre IQ period, the red sea urchin fleet exceeded its TAC in many years (often by a large amount) - see chart below. This chronic problem could be even worse today, and put downward pressure on the setting of TACs.

No DMP. It is unlikely that the Dockside Monitoring Program (DMP) for all vessel offloads and the at-sea monitoring that was implemented with the introduction of Individual Quotas would be in place today - the DMP program has led to better catch statistics data, the at-sea monitoring results in better compliance to regulations.



Much Less Science. The red urchin fleet contributes to fisheries management targeted to red urchins (Jones 2007). The science research includes biomass surveys, aquaculture research, and independent biologist research. It is very unlikely that the current level of science would be maintained if the derby fisheries format still persisted.

The Precautionary Approach and TAC-setting. Today's fishery management environment is characterized by the precautionary approach to setting TACs, an influential environmental movement, increasing public awareness of fisheries issues, selective fishing practices and so on.

Our discussions with scientists and fisheries managers suggest that better science can lead to higher TACs since the fishery manager can be less conservative and can justify this stance, (the corollary is that poorer science leads to lower TACs). As the red urchin fishery is managed to a fixed harvest rate, better data allows the flexibility to have higher harvests in areas where surveys show a larger-than-expected population.

We suggest that the red urchin TAC would decrease substantially under a derby fishery format - we use a 50% figure in our projections (2,443 tonne TAC under derby fishery vs actual 4,886 tonne TAC in 2005).

We note that in the early years of the ITQ program for sea cucumbers 75% of the coast was closed to fishing (GSGislason "SWOT" 2004 p.61). Subsequent survey work, conducted in collaboration with industry, indicated a much higher biomass than previously thought and the sea cucumber TAC was increased substantially. This is an example of where better science leads to higher TACs under the precautionary management approach.

Area Licensing. Area licensing was introduced with the voluntary ITQ program partway through 1994. The area licensing regime would be maintained under a derby format.

7.3 ITQ Impacts - Employment & Wages

Exhibit 16 presents a profile of red urchin industry activity in 2005 and a projection of 2005 activity if the industry had not gone to ITQs i.e., the fishery was still managed as a derby or competitive fishery.

Under the ITQ format, the pace of fishing has slowed, there is a steady supply of urchin roe to the market throughout the year, and the urchin is handled much better on the boats and at the plants. These changes have provided benefits to business owners and labour.

The key parameters underlying our projections of changes in industry structure under ITQs include:

- a product price increase - with the price increasing to $55.00 per kg for roe ($4.35 per kg round urchins) at the wholesale level with ITQs from $44.30 per kg ($3.50 per kg round urchins) in the derby format based on industry interviews and the price trends in Exhibit 15.
- an increase in the active fleet - from 30 active vessels under derby fishery to the 44 active vessels in 2005 with the larger active fleet fishing more weeks per vessel under ITQs i.e., the derby format makes the fishery uneconomical for many licence holders
- a decrease in average crew size from about 4.0 in the derby situation to 3.0 under ITQs (consistent with previous analysis by Muse 1998, Sporer 2001, and our interviews)

- a decrease in average crew share from about 45% of landed value in derby fishing to the present 40% of landed value
- no change in labour processing content - there has not been a change in bulk vs tray-pack roe products under ITQs

We assume that 25 weeks fished equals one person-year (PY) of employment and that the average plant position, including administration positions, pays $40,000 per year including benefits.

	2005 Projections		
	w ITQs (a)	w/o ITQs (b)	ITQ Impact (c) = (a) - (b)
Revenues $000			
Fleet	5,810	2,440	+3,370
Processing Margin	11,040	6,110	+4,930
Processed Value	16,850	8,550	+8,300
Wages $000			
Fleet	2,320	1,100	+1,220
Plant	5,540	3,490	+2,050
	7,860	4,590	+3,270
Employment PYs			
Fleet	84	58	+26
Plant	139	87	+52
	223	145	+78
Other			
Active Vessels	44	30	+14
Crew Jobs	132	120	+12

Source: Exhibit 16

There are substantial gains in industry revenues and wages paid under the ITQ management regime. And there are gains in employment, both on vessels and in plants.

ITQs actually have resulted in more crew jobs and those jobs last longer and pay more.

7.4 ITQ Impacts - Communities

The ITQ management regime for geoduck has had only a minor effect on communities and community interests.

Community Licence Holdings. Today the urban areas of the Lower Mainland and Greater Victoria are the residence of 51 or 46% of the 110 commercial geoduck licence holders - see Exhibit 17. This represents an increase from the 24 or 22% of total licences held by urban interests in 1994. Several processors in the Lower Mainland have purchased licences in recent years.

Community Distribution of Deliveries & Processing. There does not appear to be any major shift in delivery patterns under ITQ management. Essentially all the roe product is produced at Lower Mainland plants today, the same pattern as before ITQs.

7.5 ITQ Impacts - Other Labour Issues

There are other labour impacts from the move to ITQs for red sea urchin.

Increased Safety & Better Working Conditions. Crew safety has improved under ITQ management. Vessels are no longer forced to "race for the fish" and compromise safety. Operators report that in the derby days many vessels overturned each year - this is no longer the case. One operator opined"...under the derby fishery we spent part of every season rescuing people".

In addition, on bad weather days the vessel operator can decide not to fish without incurring a revenue penalty. Working conditions are much improved with shorter working days.

Pre-ITQs the imperative to continue fishing resulted in decompression issues and tendinitis problems for several divers.

Other Jobs Created. The DMP and at-sea monitoring functions for red urchin has created new jobs. Based on discussions with the service provider, we estimate the wage and employment base of these functions to be approximately $250,000 and 5 person-years of employment (including provisions for overhead labour).

Packers that collect red urchins from fishermen at sea and deliver to port are a key part of the red urchin fishery in the North Coast. It is likely that the employment associated with the packing function has increased under ITQs with the longer fishing season.

Less Part-Time Divers. The share of the diver workforce that is full-time has increased with a decrease in the number of part-time workers. There is also less turnover in divers. There has been a professionalization of the industry as divers require certification. In the derby days, there were some uncertified, untrained divers.

Exhibit 15: Profile of BC Commercial Fishery - Red Sea Urchin "ZC"

Year	Regulations		Activity			Vessel Landings			Roe Processed Price
	TAC tonnes (1)	Licences (2)	Active Vessels (3)	Divers (4)	Diver Hours (5)	Tonnes (6)	$ millions Value (7)	$ per kg* (8)=(7)/(6)	$ per kg (9)
1983		64	26		1,430	720	0.3	.36	14.60
84		85	32		3,780	1,377	0.6	.40	15.90
85	1,803	86	31		2,880	1,204	0.5	.42	19.40
86	1,500	103	49		3,400	1,582	0.8	.49	19.80
87	1,633	184	72		3,430	1,436	0.8	.57	25.70
88	1,633	184	81	151	5,060	1,764	1.0	.59	26.00
89	1,644	240	98	147	5,410	2,005	1.2	.61	24.20
1990	1,667	188	86	185	7,480	2,440	1.5	.62	30.00
91	1,542	102	76	187	16,360	6,427	3.9	.60	22.20
92	1,554	108	102	292	31,170	12,480	8.3	.67	36.10
93	6,844	107	95	257	17,200	6,106	5.1	.84	37.30
94	7,439	110	95	235	18,940	5,960	8.2	1.38	37.20
95	6,827	108	88	201	21,400	6,807	11.7	1.72	42.90
96	6,305	109	77	179	18,180	6,466	12.6	1.95	45.60
97/98**	9,851	110	82	156	30,230	8,738	14.5	1.66	45.90
98/99	5,602	110	64	164	16,550	5,183	8.2	1.58	57.70
99/00	5,602	110	58	150	16,660	5,283	8.5	1.60	56.50
2000/01	4,886	110	53	140	14,040	4,815	8.5	1.77	56.00
01/02	4,886	110	48	110	13,000	4,782	8.1	1.69	55.80
02/03	4,886	110	46	122	12,860	4,722	7.9	1.67	62.90
03/04	4,886	110	44	113	13,290	4,593	7.4	1.62	60.00
04/05	4,886	110	44	105	12,640	4,359	6.8	1.57	57.40
05/06	4,886	110	44	101	7,070	3,873	5.8	1.50	55.00

* *Conversion factor round to roe of .079 i.e., 1 kg of raw whole urchins produces .079 kg of roe*

** *In 1997 DFO converted the fishing year to an August to July period - the result was a 19 month fishing year for 1997/98*

Fisheries Management Regimes - licensing but unlimited entry pre 1991, limited entry 1991 to 1993, voluntary industry IQ program partway through 1994 to 1996, formal ITQs 1997 onwards.

Source: DFO Red Sea Urchin Fisheries Manager pers. comm., Muse 1998a, Sporer 2001, BC Environment Annual plus GSGislason & Associates Ltd. estimates

Exhibit 16: Projections with vs without ITQs - Red Sea Urchin "ZC"

			2005		
			Actual w ITQs (a)	Projected w/o ITQs (b)	Difference /ITQ Impact (c) = (a) - (b)
A.	**FLEET REGULATION**				
(1)	TAC tonnes*		4,886	2,443	+2,443
(2)	No. of Licences		110	110	0
B.	**FLEET ACTIVITY**				
(3)	No. of Active Vessels		44	30	-14
(4)	Harvest RD tonnes		3,873	2,443	+1,430
(5)	Average	- Landed Price $ per kg RD	1.50	1.00	+0.50
(6)		- Crew Size inc Skipper	3.0	4.0	-1.0
(7)		- Weeks Fished	16	12	+4
(8)		- Crew Share %	40%	45%	-5%
(9)	Total	- Landed Value $000	5,810	2,440	+3,370
(10)		- Crew Jobs	132	120	+12
(11)		- Crew Weeks	2,110	1,440	+670
(12)		- Crew PYs	84	58	+26
(13)		- Crew Wages $000	2,320	1,100	+1,220
C.	**PROCESSOR ACTIVITY**				
(14)	Average	- Product Price $ per kg RD*	4.35	3.50	+.85
(15)		- Labour $/kg	1.43	1.43	0
(16)		- Labour Rate $/PY	40,000	40,000	0
(17)	Total	- Processed Value $000	16,850	8,550	+8,300
(18)		- Plant PYs	139	87	+52
(19)		- Plant Wages $000	5,540	3,490	+2,050

* *Conversion factor round to roe is .079 e.g., roe of price of $55.00/kg is equivalent to price of $4.35 per kg round material*

Source: Exhibit 15 and GSGislason & Associates Ltd. estimates

Note: *(9) = (4) x (5)*
(10) = (3) x (6)
(11) = (10) x (7)
(12) = (11) ÷ 25
(13) = (9) x (8)
(17) = (4) x (14)
(18) = (19) ÷ 40
(19) = (4) x (15)

Exhibit 17: Regional Distribution of Commercial Fishing Licence Holders - Red Sea Urchin "ZC"

Region	Year	
	1994*	2005
QCI	0	1
North Coast	5	7
Central Coast	4	6
North Vancouver Island	3	0
Mid Vancouver Island	36	27
South Vancouver Island	16	10
WCVI	17	4
Victoria - Sooke	12	12
Sunshine Coast	0	0
Lower Mainland	12	39
Other BC	4	2
Outside BC	1	2
TOTAL	110	110

** Quota management was introduced part way through 1994.*

Source: Derived from special tabulation from DFO Licensing.

8.0 Case Study - Area F Troll Chinook

This case study analyzes the employment, wage and community impacts of the Individual Transferable Quota (ITQ) management system implemented for Northern troll chinook in 2005.

The analysis of employment-related impacts draws on a previous review report (Sporer 2006). This work was augmented by several industry interviews, specifically addressing labour deployment and remuneration at the fleet and plant levels.

The impact analysis requires projecting fleet management, fleet industry and processor activity in the absence of the ITQ program i.e., if the fleet had still been managed as a derby fishery. This admittedly is subjective and requires professional judgment.

Nevertheless, the analysis should be considered a reasonable approximation of impacts. Three Exhibits at the end of this section support the analysis - Industry Profile, Impact Projections, and Community Licence Holdings.

8.1 Fishery Development with ITQs

Troll chinook are large salmon that are harvested by trollers using hook & line gear.

Management Responsibility. Canada Department of Fisheries & Oceans (DFO) is responsible for management and sets an overall TAC, conducts stock assessment work, and enacts other regulatory measures. The Northern troll TAC is consistent with the US-Canada Salmon Treaty obligations i.e., the Treaty number less allocations for aboriginal food purposes and a Queen Charlotte Islands recreational fishery allocation.

The overall troll TAC also has a subTAC for WCVI chinook, a stock of concern, monitored in-season from DNA analysis of sampled catch - in 2005 the WCVI TAC was 10,400 fish of the 168,000 total TAC.

The Move to ITQs. The Area F troll fishery had 168 licences in 2005 (area licensing for the salmon fishery was first introduced in 1996). The fishery tried a demonstration ITQ fishery for chinook under scientific licence in 2005. The ITQ fishery did not cover coho or other salmon species.

Industry asked DFO to implement the ITQ demonstration fishery. The impetus for moving to individual quotas in 2005 had several facets:

- poor quality product, poor handling practices on boats
- excessive amounts of capital, labour and operating costs e.g., boats, crew, fuel,
- issues related to compromised crew safety & poor working conditions

These symptoms of poor business and people practices resulted from the "race for the fish" under the derby fishery management format. Note that there was no conservation concern under the derby fishery i.e., the fleet was not exceeding the TAC.

The Demonstration ITQ Fishery. A demonstration ITQ fishery was launched in 2005 - licence holders had the option of participating in the ITQ fishery or a derby fishery. A total of 161 licence holders chose the ITQ fishery with an allocation of 1,000 chinook each whereas 7 licence holders chose the derby option with an overall derby TAC of 7,000 chinook.

The ITQ fishery was open from June 3 to September 30 in 2005. The derby fishery was open June 16 to July 17.

The IQ fleet paid for a Dockside Monitoring Program (DMP), but the derby fleet was not subject to DMP.

Transferability. Temporary transfers were only allowed. Partial quota transfers were allowed.

Markets, Products & Prices. There are 2 main types of trollers - "ice" boats that gut, ice and deliver fresh fish to the plant, and "freezer" boats or Frozen at Sea (FAS) boats that gut, freeze and deliver frozen fish to the plant (typically the delivery mix is 30% ice, 70% frozen). Traditionally in the north, much of the ice fish was frozen at the plant due to poor quality, supply gluts etc with the result that almost all Area F troll chinook was delivered to the market in frozen form under the derby format.

The demonstration ITQ program allowed the fresh fish delivered to the plants to be sold to the market in fresh form - the fresh market reaps a price premium. Prices for fresh fish have been strong in recent years, not only because of the better quality of BC product, but also because of supply shortfalls in Lower 48 troll fisheries in Oregon and California.

8.2 Fishery Management Today Without ITQs

The BC fishery would still be managed as a derby or competitive fishery if ITQs had not been implemented in 2005 i.e., management would be similar to the 2004 situation. Management considerations include:

Meeting the TAC. The fleet has been able to fish to the TAC but not exceed it under derby situations in the recent past.

No DMP. There would be no Dockside Monitoring Program (DMP) for the derby fleet (just as there was no DMP for the small derby component in 2005).

A comparison of Area F catch figures from DMP to DFO hail catch estimates from the Fisheries Operating System or FOS database for 2005 indicates that the FOS figures are about 10% lower i.e., the DMP produces timely and accurate catch data that would not be available under the derby fishery format (Sporer 2006).

The Precautionary Approach and TAC-setting. Today's fishery management environment is characterized by the precautionary approach to setting TACs, an influential environmental movement, increasing public awareness of fisheries issues, selective fishing practices and so on.

However, there does not seem to be much of a fleet manageability issue with the Northern troll fleet. Therefore, we assume that the TAC under a 100% derby situation would be identical to that in 2005.

8.3 ITQ Impacts - Employment & Wages

Exhibit 19 presents a profile of industry activity in 2005 and a projection of 2005 activity if the industry had not gone to ITQs i.e., the fishery was still managed as a derby or competitive fishery.

Under the ITQ format, the pace of fishing has slowed, there is a longer season and the fish is handled much better on the boats and at the plants. These improvements have allowed the processors to sell more of the product to the fresh market.

The key parameters underlying our projections of changes in industry structure under ITQs include:

- a modest product price increase of $1.00 per kg at the wholesale level and $0.80 per kg at the fishermen level (the Sporer 2006 review suggested a price increase of $2.20 per kg dressed head-on for ice fish - this translates to about $2.60 per kg RD for ice fish or $0.80 per kg RD for all fish where ice fish comprises 30% of total landings)
- the same active fleet - of 138 vessels but the average ITQ boat fishes 8 weeks rather than the 5 weeks under the derby format
- a small decrease in average crew size from about 2.2 in the derby situation to 2.0 under ITQs (consistent with previous analysis by Sporer 2006 and our interviews)
- a decrease in average crew share from about 40% of landed value in derby fishing to the present 35% of landed value in ITQ fishing (crew shares include payment to the skipper)
- a lower labour processing content - fresh product does not require as much processing as frozen product

To date it does not appear that the ice-FAS mix of fish delivered to the plant has changed under the ITQ format.

We assume that 25 weeks fished equals one person-year (PY) of employment and that the average plant position, including administration positions, pays $40,000 per year including benefits. Exhibit 19 Summary Results are:

	2005 Projections		
	w ITQs (a)	w/o ITQs (b)	ITQ Impact (c) = (a) - (b)
Revenues $000			
Fleet	8,370	7,290	+1,080
Processing Margin	2,090	1,820	+270
Processed Value	10,460	9,110	+1,350
Wages $000			
Fleet	2,930	2,920	+10
Plant	890	1,040	-140
	3,820	3,960	+60
Employment PYs			
Fleet	88	61	+27
Plant	22	26	-4
	110	87	+23
Other			
Active Vessels	138	138	0
Crew Jobs	276	304	-28

Source: Exhibit 19

There were gains in industry revenues of $1.4 million under the ITQ management regime in 2005. Crew employment in terms of person-years increase by over 40% due to the longer season. Crew jobs decrease under the ITQ program.

8.4 ITQ Impacts - Communities

The ITQ management regime for chinook in 2005 had only a very minor effect on communities and community interests in the first year of the program.

Community Licence Holdings. In 2005 the urban areas of the Lower Mainland and Greater Victoria were the residence of 48 or 29% of the 168 commercial ATF licence holders - see Exhibit 20 (the 168 total includes 10 commercial aboriginal fishing licences). The QCI, North Coast, and Central Coast areas had about 1 in 4 Area F licences in 2005.

Community Distribution of Deliveries. Our interviews suggest that there does not appear to be any major change in landing patterns e.g., between Masset in the QCI and Prince Rupert.

8.5 ITQ Impacts - Other Labour Issues

There are other impacts from the move to ITQs for Area F Chinook.

Increased Safety & Better Working Conditions. Crew safety has improved under ITQ management. Vessels are no longer forced to "race for the fish" and compromise safety. In addition, on bad weather days the vessel operator can decide not to fish without incurring a revenue penalty. Working conditions are much improved with shorter working days.

Our interviews suggest that the fleet is much more likely to take a "harbour day" in Masset under the ITQ format. The pace of fishing is less frantic.

Other Jobs Created. The DMP function has created new jobs in port validation. Based on discussions with the service provider and the previous analysis (Sporer 2006), we estimate the wage and employment base of these DMP functions to be approximately $100,000 and 2 person-years of employment (including provisions for overhead labour).

There are no packers in the Area F troll fishery.

8.6 ITQ Impacts - Developments Since 2005

The Area F Troll Chinook ITQ demonstration program continued in 2006 and 2007 with licence holders having the option of choosing the derby or ITQ fishery format. Two important developments have occurred since 2005:

- the number of Area F licences has increased dramatically through the periodic area reselection process for the 538 Areas F, G and H troll licence holders that DFO allows (the spring 2006 area reselection process increased the number of Area F licences from 168 to 246 and the fall 2007 area reselection process increased this number further to 284 as many former Area G & H licence holders chose Area F)
- the WCVI TAC constraint became binding in 2007 for the first time since 2002 with the result the ITQ fishery was closed on August 17, 2007 and over 35,000 chinook in the TAC were not caught

The results of the first development are that the ITQ per licence has dropped (from 1,000 chinook in 2005 to 620 in 2006 to 480 in 2007), and that more licence holders opt to lease their quota to others. The result of the second development is that ITQ fishermen in the future likely will strive to catch their ITQ quickly because of the fear that DFO will close the fishery early.

These two issues undermine the certainty of access integral to an ITQ program. As long as the two threats of first, new licence entrants, and second, closing the fishery early, exist the Area F troll ITQ chinook fishery can not realize its potential.

Area F Troll Chinook ITQ Demonstration Fishery

	No. of Licences		No. of Active Vessels		TAC '000 pieces		Catch '000 pieces	
	Derby	ITQ	Derby	ITQ	Derby	ITQ	Derby	ITQ
2005	7	161	6	136	7,000	161,000	7,000	160,300
2006	6	240	6	159	3,720	148,800	3,900	146,400
2007*	2	244	2	145	960	117,120	850	82,400

* *2007 ITQ fishery closed on August 17, 2007 due to meeting WCVI mortality TAC (the ITQ fishery is normally open until September 30)*

Our interviews suggest that revenue gains to the fleet would be much greater today as the better quality fish has earned a reputation in the marketplace (and a price increase would exist for both ice and FAS deliveries). It is likely that industry revenue gains would exceed $3 million today from the same ITQ allocation as in 2005.

It appears that almost all new entrants into the Area F fishery since 2005 came from Vancouver Island and Southern BC regions. The result is that individuals from the QCI, North Coast and Central Coast regions have about 1 in 7 Area F licences today, as compared to 1 in 4 licences in 2005.

However, this regional shift in troll licence holdings can not be attributed to the ITQ program. There was an economic incentive to move north as the landed value per troll licence in Area F has been much higher than that of southern troll licences in recent years.

Exhibit 18: Profile of BC Commercial Fishery - Area F Troll "ATF" Chinook

Year	Chinook Regulations**			Chinook Activity	Chinook Landings				Chinook Processed Price	
	TAC '000 pieces (1)	Season (2)	Licences (3)	Active Vessels (4)	'000 Pieces (5)	Tonnes (6)	$ millions Value (7)	$ per kg* (8)=(7)/(6)	Fresh HD/ON (9)	FZ HD/OFF $ per kg* (10)
1996	0	0 days	340	NA	<0.1	NA	NA	NA	NA	NA
97	188	107 "	314	41	86.8	760	3,040	4.00	6.45	6.20
98	201	91 "	312	160	116.4	1,140	4,650	4.08	6.55	6.80
99	120	15 "	235	148	44.6	420	2,310	5.50	8.20	7.60
2000	108	23 "	146	45	9.9	90	670	7.43	7.85	7.20
01	102	48 "	140	72	13.1	130	760	5.88	8.65	5.95
02	146	93 "	145	93	103.5	880	3,780	4.29	7.35	6.75
03	142	68 "	154	116	137.4	1,180	4,240	3.59	7.25	5.10
04	170	37 "	158	132	167.5	1,350	8,070	5.98	9.25	7.85
05	7-161	32-120 "	7-161	6-136	7.0-160.3	1,350	8,090	5.99	9.60	7.75

* *Chinook landed prices refer to coastwide averages for all troll i.e., not specific to Area F & chinook wholesale prices refer to coastwide averages for all net-caught and troll chinook i.e., not specific to Area F troll*

** *"x-y" format means "derby-ITQ" split e.g., "7-161" means derby TAC is 7 thousand fish, ITQ TAC is 161 thousand fish (total TAC of 168 thousand fish)*

Fisheries Management Regimes - limited entry pre 2005, ITQ demonstration fishery in 2005 (161 licence holders opted for ITQ fishery with 1,000 pieces chinook per licence, 7 licence holders opted to participate in a derby fishery with a derby TAC of 7,000 pieces)

Source: DFO Catch Statistics, DFO Area F Record of Management Strategies (RMS) Annual, Sparer (2006) and GSGislason & Associates Ltd. estimates

Exhibit 19: Projections with vs without ITQs - Area F Troll "ATF" Chinook

			2005		
			Actual w ITQs (a)	Projected w/o ITQs (b)	Difference /ITQ Impact (c) = (a) - (b)
A. FLEET REGULATION					
(1)	TAC '000 pieces		168	168	0
(2)	No. of Licences		168	168	0
B. FLEET ACTIVITY					
(3)	No. of Active Vessels		138	138	0
(4)	Harvest	- '000 pieces	167	167	0
(5)		- RD tonnes	1,350	1,350	0
(6)	Average	- Landed Price $ per kg RD	6.20	5.40	+0.80
(7)		- Crew Size inc Skipper	2.0	2.2	-0.2
(8)		- Weeks Fished	8	5	-3
(9)		- Crew Share %	35%	40%	-5%
(10)	Total	- Landed Value $000	8,370	7,290	+1,080
(11)		- Crew Jobs	276	304	-28
(12)		- Crew Weeks	2,210	1,520	+690
(13)		- Crew PYs	88	61	+27
(14)		- Crew Wages $000	2,930	2,920	+10
C. PROCESSOR ACTIVITY					
(15)	Product Mix	- % Fresh	30%	3%	+27%
(16)	Average	- Product Price $ per kg RD	7.75	6.75	+1.00
(17)		- Labour $/kg RD	.66	.77	-0.11
(18)		- Labour Rate $/PY	40,000	40,000	0
(19)	Total	- Processed Value $000	10,460	9,110	+1,350
(20)		- Plant PYs	22	26	-4
(21)		- Plant Wages $000	890	1,040	-150

Source: Exhibit 18 and GSGislason & Associates Ltd. estimates

Note: *(10) = (4) x (6)* *(19) = (5) x (16)*
(11) = (3) x (7) *(20) = (21) ÷ 40*
(12) = (11) x (8) *(21) = (5) x (17)*
(13) = (12) ÷ 25
(14) = (10) x (9)

Exhibit 20: Regional Distribution of Commercial Fishing Licence Holders - Area F Troll "ATF"

Region	Year 2004*	2005
QCI	13	13
North Coast	24	27
Central Coast	2	1
North Vancouver Island	5	7
Mid Vancouver Island	33	37
South Vancouver Island	21	22
WCVI	3	3
Victoria - Sooke	23	22
Sunshine Coast	8	8
Lower Mainland	25	26
Other BC	1	2
Outside BC	0	0
TOTAL	158	168**

** Year before Individual Quota management was introduced*

*** 10 individuals bought Area G or H Troll licence holders and redesignated the licence as Area F between 2004 and 2005*

Source: Derived from special tabulation from DFO Licensing

9.0 Conclusions & Discussion

The introduction of Individual Transferable Quotas (ITQs) to Pacific Region fisheries management in Canada has been controversial. There is the view in some quarters that ITQ fisheries management reduces the employment base, reduces the bargaining power of workers, and transfers wealth from labour to capital interests in the fishing industry. There is the view in other quarters that the fisheries were vastly oversubscribed in terms of capital and labour, that reductions in both capital and labour were needed for the industry to continue to exist and be viable, and that there would be no fisheries jobs unless the business model was viable.

This study through case study analysis of six fisheries provides some empirical evidence of the employment, wage and community impacts of moving to ITQ fisheries. These six fisheries, and the impacts of ITQs on them, have been analyzed or discussed several times in the past (e.g., Sporer 2001, Jones 2003). What this study has added is an empirical dimension to past reviews, quantitative estimates are presented.

The following general conclusions, discussion, and "lessons learned" refer to all case study fisheries except Area F Troll Chinook. As the Area F chinook fishery only went to ITQs in 2005, there is a small exposure period from which to glean insights. More importantly, the Area F situation does not have the certainty associated with a true ITQ program i.e., DFO can shut down the fishery early before the complete TAC is taken, the number of licence holders is not fixed from year to year (i.e., limited entry to Area F does not really exist).

9.1 The Impetus for Change

The impetus to moving to ITQs for the case study fisheries generally had several common features:

- an inability to fish within fleet-wide TACs; overages occurred year after year
- issues related to compromised crew safety & poor working conditions
- poor quality product, the inability to serve lucrative year-round markets since TACs were caught or exceeded early in the year.
- incentives to misreport on logbooks & sales (transaction) slips increasing
- excessive amount of capital, labour and operating costs e.g., boats, crew, fuel, gear
- inability to monitor & enforce fisheries regulations
- an inherently unstable industry

These symptoms of poor conservation, business and people practices all resulted from the "race for the fish" under the derby fishery management format. A common theme was that the status quo was no longer acceptable.

9.2 The Alternative to ITQs

True impact analysis requires explicit recognition as to what is the alternative for comparison purposes i.e., to focus on incremental effects and to compare the employment and wage base of the industry "with" ITQs to the likely wage and employment base "without ITQs".

This is not simply a case of comparing the present situation to the situation immediately preceding ITQs. We live in a much more precautionary fisheries management world today as compared to many years ago when ITQs in most case study fisheries were implemented. There could have been substantial changes to fisheries management, including reduction in TACs and closed seasons/area, if ITQs had not been adopted. In addition, ITQs, in some cases, have allowed new products and new markets to be developed.

We chose the derby or competitive fishery situation as the alternative to ITQs in our analysis.

Some individuals that we interviewed asserted that there were other measures, apart from ITQs, that could have been pursued to address the problems of the day e.g., IQs (non-transferable), Community Development Quotas or CDQs, giving crews or processors part of the initial ITQ allocation as has been done in some cases in Alaska.

We concur that there were alternatives. But for the purposes of this study, we chose the derby situation as the base case or "without ITQ" scenario. This base case is most meaningful and appropriate for this exercise. In our case study discussions, we do point out how GF Trawl ITQ development was affected by earlier developments in halibut and sablefish so that community and crew interests were better accommodated. The analysis of the pros and cons of CDQs, for example, is a worthy exercise but an exercise that needs to be addressed in another forum.

9.3 Summary Results

Our discussions with over 60 fisheries scientists and managers, fishing vessel/licence owners, processors, industry associations and others, as well as our knowledge of industry sectors and a literature review, allowed us to make reasonable projections of the current 2005 situation and what the 2005 situation likely would have been if ITQs had not been introduced.

The summary results of Exhibit 21 show that - after projecting changes in catches, active vessels, market products and prices with ITQs - all fisheries show an increase in industry value. In fact, industry value has close to doubled under ITQs for the six fisheries sectors combined. And most fisheries show an increase in wages and employment expressed in person-years over the derby situation. At first glance, this latter result is surprising.

The reason for the result is that, under the derby situation, reductions in TAC/catches are required to protect the interests of the resource, especially in light of today's precautionary fisheries management world. Moreover, under ITQs the fishing season is extended and this creates more weeks fished for each active vessel.

Exhibit 21 also demonstrates how each fishery is different e.g., some are high volume, low value fisheries such as Groundfish Trawl, some are low volume, high value fisheries such as geoduck. The GF trawl fishery also has the highest processing labour content of all fisheries considered (fleet vs processing impacts are provided in the case study chapters). And the GF trawl fishery by far had the highest revenue, wage and employment increases attributable to ITQs of all sectors considered.

Apart from the red sea urchin case, the rural share of commercial fishing licenses did not change appreciably under ITQ fisheries management.

For the halibut, sablefish and groundfish trawl fleets, there has been a shift in the geographic pattern of landings under ITQs - more fish is landed on Vancouver Island, specifically Port Hardy, and less fish landed in Greater Vancouver under ITQ fisheries management. The underlying reasons include proximity to fishing grounds, high fuel costs, and better product quality.

9.4 Lessons Learned

Our analysis offers several "lessons learned". These lessons are broad and likely are applicable to other jurisdictions.

***Lesson #1**: The situation in the case study fisheries prior to introducing ITQs was untenable. Change was mandated by poor conservation, business, and people practices. Changes were happening to all other elements of the economy such as forestry, communications and food manufacturing. The fishery is not immune from these broad winds of change.*

***Lesson #2**: Changes in the economy usually involves the substitution of capital for labour. This is what happened in case study fisheries where each active vessel/operating unit caught more fish - but each ITQ crew member worked much longer and generally earned more money over the season.*

***Lesson #3**: ITQs create an incentive for fishermen, processors, and buyers to cooperate in identifying market needs and ensuring appropriate catch timing/handling to meet those needs. The change drew the industry closer to business practices of other elements of the food industry such as red meat and poultry.*

***Lesson #4**: ITQs allow the production of high value products. Higher quality builds a demand niche that is more insulated from the broad supply and demand trends, macroeconomic changes etc that buffet commodities on world markets e.g., halibut prices to fishermen and processors have increased in recent years in spite of the strengthening of the Canadian dollar vs the US dollar. Higher quality builds "brand loyalty" which in turn provides stability to both capital and labour interests.*

***Lesson #5**: ITQs have led to better monitoring of port offloads and at-sea activities. ITQs also have led to much better science in most fisheries considered, science for which industry has paid. In today's precautionary world, better monitoring and better science can lead to higher TACs - the fisheries scientists can provide narrower confidence baunds on yield scenarios and the fishery manager does not automatically feel compelled to choose the lowest of such scenarios for implementation.*

***Lesson #6**: The long term benefits of ITQs are generally greoter than the short term benefits e.g., it takes time for the fleet to consolidate to an economic size, it takes time for market acceptance of improved quality products. In addition for several of the fisheries studied, IQs were made nontransferable for an initial trial period - it was only after they became transferable that larger benefits became available.*

***Lesson #7**: ITQs shift the balance of power between the licence/vessel owner and the vessel crew and the processor-buyer. The licence/vessel owner appropriates a greater share of the increase in "industry value" than does the processor or crew. We argue, nevertheless, and this study substantiates this, both crew and processor interests in aggregate can be better off under ITQs.*

***Lesson #8**: Certainty of access is a necessary condition to the success of an ITQ program. The ITQ level per licence needs to be set well in advance of the season, the threat that the fishery will be closed down early due to conservation concerns needs to be minimized, and the number of licence holders from year-to-year needs to be fixed to facilitate business planning.*

***Lesson #9**: Commercial fishing licences under ITQ fisheries management do not necessarily grovitate to interests in large urban centres at the expense of rural interests.*

***Lesson #10**: It is difficult to analyze the employment, wage, and community impacts of ITQs in isolation of resource conservation, fisheries management, market/revenue, and cost impacts. Future analysis of the employment impacts of ITQ fisheries should comprise one component of a more broad-based, integrated review of ITQ programs.*

9.5 Final Comments

It is hoped that our analysis, with its empirical focus, offers a fresh perspective on the enduring debate as to the employment impacts of ITQs fisheries. By conducting the analysis in a dynamic setting, and taking into account the precautionary approach and the need to reduce TACs in problem derby situations, the impacts of ITQs on worker interests in aggregate in many cases are positive. However, there are job losses for some individual crew members under ITQ fisheries management.

Nevertheless, some people will still argue that employment associated with the fishing industry is a benefit, whereas others will still argue that employment associated with the fishing industry is a cost. Perhaps the interests of the resource are paramount - and this study as well as others demonstrate that the resource and conservation objectives can be well-served by ITQ fisheries management.

Exhibit 21: Summary of Employment-Related Impacts of Case Study ITQ Fisheries in BC

Management/Indicator	Case Studies					
	Halibut	Sablefish	GF Trawl*	Geoduck	Red Urchin	Area F Chinook
A. FISHERY DESCRIPITON						
Fishing Technology	longline	longline & trap	trawl	dive	dive	hook & line
Number of Licences	435	48	142	55	110	168
IQ Implementation Year	1991	1990	1997	1989	1995	2005
B. ITQ IMPACT ANALYSIS						
2005 Situation w ITQs						
Catch tonnes	5,566	3,815	47,600	1,560	3,873	1,350
Processed Value $000	62,620	30,800	83,780	34,790	16,850	10,460
Wages $000	13,470	6,980	34,930	9,180	7,860	3,820
Employment PYs	232	109	690	84	223	110
Other - Active Vessels	221	35	52	40	44	138
- Crew Jobs	775	280	208	120	132	276
- % Rural Licences	60%	31%	31%	65%	54%	71%
2005 Projection w/o ITQs**						
Catch tonnes	5,400	3,150	23,800	780	2,443	1,350
Processed Value $000	42,930	20,750	34,030	8,700	8,550	9,110
Wages $000	14,250	6,780	18,990	3,590	4,590	3,960
Employment PYs	204	73	410	65	145	87
Other - Active Vessels	360	40	40	55	30	138
- Crew Jobs	1,440	480	160	220	120	304
- % Rural Licences****	62%	25%	30%	58%	78%	70%
2005 ITQ Impacts***						
Catch tonnes	+166	+665	+23,800	+780	+1,430	0
Processed Value $000	+19,690	+10,050	+49,750	+26,090	+8,300	+1,350
Wages $000	-780	+200	+15,940	+5,590	+3,270	-140
Employment PYs	+28	+36	+280	+19	+78	+23
Other - Active Vessels	-139	-5	+12	-15	+14	0
- Crew Jobs	-665	-200	+48	-100	+12	-28
- % Rural Licences	-2%	+6%	+1%	+7%	-24%	+1%

* *GF Trawl excludes hake and Option B operations*

** *The "Without ITQ" scenario is the derby or competitive fishing scenario*

*** *Impact is "With ITQ" scenario less "Without ITQ" scenario*

**** *% rural licences without ITQs is % immediately prior to introduction of IQs ("rural" is the area other than Lower Mainland plus Victoria & Area)*

Source: Sections 3 through 8

Notes: 1. Dressed, head-off weight for halibut & round weight for all others

2. Wages and employment figures are sums of vessel plus plant-level figures

3. Assumptions - 25 person weeks fished equals 1 person-year (PY)

- 1 PY per $40,000 plant-level wages & benefits (including allowance for administrative positions)

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