

# **SOCIOECONOMIC CONSIDERATIONS**

## **TO INFORM A DECISION WHETHER OR NOT TO LIST THREE POPULATIONS OF ATLANTIC COD UNDER SARA**

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### **Discussion Document**

**Economic Analysis and Statistics  
Policy Sector**

**Fisheries and Oceans Canada**

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## 1. INTRODUCTION

The objective of this report is to present estimates of the potential socio-economic impacts of fisheries management scenarios which could occur under a listing of three populations of Atlantic cod on Schedule 1 of the *Species at Risk Act* (SARA). This discussion document pertains to the two populations designated as endangered and threatened, respectively, by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC): the Newfoundland and Labrador population (2GH, 2J3KL, 3NO) and the Laurentian North population (4RS3Pn, 3Ps). The scenarios presented in this document are a subset of a more comprehensive socio-economic impact analysis, available in a companion technical report<sup>1</sup>.

This analysis, along with the results of consultations and the COSEWIC assessments, will be used to inform the SARA listing process. It provides estimates on the potential impacts that may occur under plausible fisheries management scenarios, if particular stocks are listed under SARA. It should be stressed that no decision has been made regarding either the listing of Atlantic cod under SARA or future stock management measures.

### 1.1 Importance of the Atlantic Cod Fishery

The commercial fishery of Eastern Canada comprises over 1,300 coastal communities, 43,000 licensed fishers and 35,000 processing plant workers all of whom rely on fishing (all species) to varying degrees. Many communities depend on the fishery as their only source of economic activity.

Historically, Atlantic cod was an extremely important component of the fishery in the Atlantic provinces and Québec. However, in the early 1990's it became clear that groundfish populations were in distress. Many stocks were closed to fishing in 1992/93. Cod management through the 1990's and into the early 2000's focused on the recovery of a collapsed fishery. Moratoria on directed fishing of many cod stocks prevail to this day, throughout much of Canada's Exclusive Economic Zone. Through government assistance and policy changes to respond to the reduced fishery, 40% of groundfish licences have been removed. Cod now represents 2% of the value of the Atlantic fishery (including Quebec), down from 26% in 1990.

Despite the fact that shellfish have dominated the Atlantic fishing industry in terms of value and effort since the collapse of most groundfish species in the 1990s, cod still holds a place of pre-eminence among those who rely on the fishery for their livelihood, as the species upon which the Atlantic fishery was built. The cod fishery is at the core of the cultural roots of many coastal rural communities in Atlantic Canada and Quebec.

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<sup>1</sup> The technical document is available on the web at [http://www.dfo-mpo.gc.ca/species-especes/cod/main\\_e.asp](http://www.dfo-mpo.gc.ca/species-especes/cod/main_e.asp). The Maritimes cod population (4TVn, 4VsW, 4X, 5ZEj,m), for which the impact was determined to be minimal under the designation of Special Concern, is included in the technical document. A fourth population, the Arctic population (0A, 0B) is not included in this study.

Consequently, any decision that is made with respect to the management of Atlantic cod will likely generate intense reactions. This was certainly evidenced in 2003 when the directed cod fisheries in 4RS3Pn and 2J3KL were closed. These closures resulted in forceful and extended public backlash including that from industry and provinces. The public consultations that were held regarding COSEWIC's status report and designations for the Atlantic cod populations resulted in a similarly intense reaction from thousands of industry stakeholders.

### *Aboriginal fishery*

In the Newfoundland and Labrador Region the number of communal commercial licences, that may include cod, issued or available to Aboriginal groups is fifteen. On the Island of Newfoundland, the Miawpukek First Nation (Conne River Band), adjacent to NAFO Division 3Ps, holds six licences and the Federation of Newfoundland Indians (FNI) has three. In Labrador, the Labrador Metis Nation (LMN) has one, the Labrador Inuit Association (Nunatsiavut Government) holds four, and the Innu Nation has one licence reserved for it, which has yet to be issued.

Four First Nations in the Gaspé region of Quebec have commercial groundfish licences that may include cod. In addition, 7 Aboriginal communities on the North Shore of Quebec hold a total of 7 Groundfish licences that were acquired through the Aboriginal Fishing Strategy. These North Shore communities also have access to a total allocation of 79 tonnes of cod for food, social and ceremonial purposes.

There are additional people of Aboriginal descent who hold commercial groundfish licences as individuals independent from their Aboriginal organization or government.

## **1.2 SARA Process and the Role of Socio-Economic Analysis**

COSEWIC submitted an assessment of Atlantic cod in May 2003. Within that assessment, four Atlantic cod populations were identified and assessed to be at various degrees of risk (Table 1.1).

**Table 1.1 : Atlantic cod populations**

<b>COSEWIC Population</b>	<b>COSEWIC Designation</b>	<b>NAFO Fishing Areas</b>
Newfoundland and Labrador	Endangered	2GH, 2J3KL, 3NO
Laurentian North	Threatened	4RS3Pn, 3Ps
Maritimes	Special Concern	4TVn, 4VsW, 4X, 5ZEj,m
Arctic	Special Concern	0A, 0B

Endangered species are those that are at imminent risk of extinction. Species listed as Threatened are those that are likely to become endangered if limiting factors are not reversed. Species of Special Concern are those that may become threatened or endangered in response to a combination of biological characteristics and identified threats. For species listed as Endangered (Threatened), a recovery strategy must be

developed within one (two) years of listing. For species listed of Special Concern, a management plan must be prepared which will include measures to prevent the population from becoming threatened or endangered.

Under SARA, the Governor in Council (GIC) has three options with respect to adding a species to Schedule 1, the List of Wildlife Species at Risk, upon receipt of the COSEWIC assessment:

1. accept the COSEWIC assessment and add the species to the legal list;
2. decide not to add the species to the legal list; or,
3. refer the matter back to COSEWIC for further information or consideration.

With respect to aquatic species, GIC will make its decision based on a recommendation from the Minister of the Environment, which is in turn based on advice received from the Minister of Fisheries and Oceans. In order for the Minister to provide informed advice, a comprehensive analysis must be undertaken to estimate the socio-economic impacts of this listing decision. The approach followed is generally that of a regional economic impact analysis, though additional costs and benefits are discussed briefly. This report summarizes the analyses for the two populations assessed as endangered or threatened (Newfoundland and Labrador, and Laurentian North cod populations, respectively). The companion technical document discusses the Special Concern Maritimes cod population as well, and presents significantly more detail for the assessments summarized here.

### 1.3 Listing Scenarios

To assess socio-economic impacts, it is necessary to consider measures which might be undertaken, should a stock be listed. The stock management scenarios considered in this analysis include closures of directed cod fisheries, as well as by-catch restrictions in other fisheries, that could be implemented as part of a species recovery plan under SARA. These kinds of restrictions are commonly implemented in order to control fishing mortality, to protect and prevent further decline of the stock, and where possible, promote growth and recovery of the population in question. They are not the only conservation measures available to fisheries managers, should a recovery strategy be required.

DFO Fisheries and Aquaculture Management Sector, in consultation with DFO Science Sector, developed potential stock management scenarios for the Laurentian North and Newfoundland and Labrador cod populations. Scenarios were developed separately for each NAFO division within a population, according to traditional stock management units. The management scenarios are:

- 1) **No directed fishery** (either keeping the moratorium in place or closing a current directed fishery, as the case may be). Permissible by-catch levels remain unchanged;
- 2) **Prioritized re-building** (no directed fishery, reduce harm from by-catch by 50%);

- 3) **Maximum rebuilding** (no directed fishery, reduce bycatch to 0 by closing all fisheries in which cod is incidental).

In area 3NO, the scenarios were further refined to examine the effects of compliance versus non-compliance of NAFO fleets outside Canada's Exclusive Economic Zone (EEZ).

Although scenarios were developed for area 2GH, analysis of the impacts is not warranted as catches have been negligible over the past number of years. The reported catch of cod in 2GH, including by-catch, has been zero in every year since 1997 except 2002, when the reported by-catch was 82 kg.

It is recognized that cod recovery strategies and action plans could include other management options such as area/time closures, gear restrictions, reduced total allowable catches (TACs), increased monitoring and enforcement, and measures to control (protect) predator (prey) species. However, this document assesses only those management scenarios that were developed by DFO fisheries management and science experts and which relate to the closure of directed fisheries and by-catch restrictions. This does not preclude consideration of a wider array of alternatives in the future. Indeed, these other management options should be considered as potentially lower-cost means by which recovery could be facilitated. If a decision is taken to list any population of Atlantic cod, the development of SARA recovery plans and action plans would involve the participation of those likely to be affected. Harvesters, the processing industry, and others would be invited to help develop the means by which conservation goals would be achieved.

Although several scenarios to reduce cod harvests were developed, it is clear that some scenarios would require management measures that are more restrictive than others. In all cases, reducing cod harvests to zero would require the closure of a number of other fisheries. Some of these are high-value shellfish fisheries in which only a small amount of cod is caught. It would not be cost effective or prudent to close these fisheries as only a negligible amount of cod would be protected at a very high cost (for instance closing a shellfish fishery with landings worth several million dollars to save less than one tonne of cod). In this analysis, bycatch restrictions are focused within the fisheries where foregone revenue would be lowest, per tonne of cod conserved. This should not necessarily be interpreted to mean that these by-catch restrictions would be implemented in the event of a listing. Discussions with industry representatives indicated that there would be an industry expectation that by-catch restrictions would actually be spread out over all fisheries rather than concentrated in a small number, so as to minimize losses to each individual. Again, stakeholders would be consulted before such decisions would be taken, in the actual event of a listing.

The by-catch restrictions have been modeled in this document as fixed proportions of the overall cod stock. As the cod stock grows over time, the proportion of by-catch allowed remains constant in each scenario, however the absolute amount of allowable by-catch increases.

Of the three management scenarios developed for each NAFO division (**no directed fishery**, **prioritized rebuilding**, and **maximum rebuilding**), this summary document presents only the most plausible alternative, if cod is listed under SARA and additional harvest restrictions are required. Analysis for the complete set of scenarios is presented in the companion technical document. The scenarios considered in this report are shown in Table 1.2.

**Table 1.2: Scenarios**

<b>COSEWIC Population</b>	<b>Current Management Approach (Current Conservation)</b>	<b>Plausible Management Scenario Under SARA listing</b>
<b>Newfoundland and Labrador</b>		
2J3KL	Moratorium on directed fishery	<b>Prioritized rebuilding</b> scenario: Continue moratorium on directed fishery, reduce by-catch of cod by 50% through reductions in winter flounder fishery by 53%
3NO	Moratorium on directed fishery	<b>Maximum rebuilding</b> scenario: Continue moratorium on directed fishery, reduce by-catch of cod to lowest level through closure of skate*, yellowtail, redfish, and Atlantic halibut fisheries.
<b>Laurentian North</b>		
3Ps	Total Allowable Catch in 2005 of 15,000 tonnes	<b>Current conservation</b> : Directed fishery at current level of 15,000 tonnes
4RS3Pn	Total Allowable Catch in 2005 of 5,000 tonnes	<b>No directed fishery</b> , bycatch fisheries continue at current rate.

\* Closure of the skate fishery has potential consequences for the viability of the monkfish fishery, which was temporarily less active in 2004.

The Newfoundland and Labrador cod population is already under a complete moratorium on directed harvest. Therefore under SARA, the next most plausible management alternative to the current conservation measures would impose the bycatch restrictions of **prioritized rebuilding** (Table 1.2) for 2J3KL. However, discussions with industry representatives indicated that for 3NO, efforts to reduce the bycatch of cod would make fishing in 3NO economically inviable, and therefore the most plausible alternative would be “**maximum rebuilding**”.

The Laurentian North population currently supports directed fisheries in both 4RS3Pn and 3Ps. However, if it is ultimately decided to list this stock under SARA, the most plausible scenario for 4RS3Pn would be “**no directed fishery**”. Additional bycatch restrictions are unlikely to be required if closing the directed fishery results in stock improvement. No alternative management scenario was developed for 3Ps, as the stock

is currently above the level that would cause concern, therefore no options to speed recovery need be considered at this time. However, more restrictive management measures (whether thorough SARA or the Fisheries Act) may be envisaged in the future to protect this stock, should it experience a decline.

#### **1.4 Socio-Economic Analysis – Methodology and assumptions**

The methodology used in this analysis is:

- 2004 was used as the base case year
- Harvesting data are from 2004
- Processing data are based on 2002 production values (the most recent year available to DFO). Landed values were subtracted from product values to obtain a measure of added value, and to avoid the double-counting of impacts.
- Unit conversion factors were developed and applied to 2004 landings in order to estimate the processing value added and employment for 2004

The analysis considers the marginal impacts of a potential SARA listing – i.e. in comparison to the base year. The intent is to analyse the additional impacts from a potential listing. These impacts could be seen as cumulative with those from the collapse of the groundfish stocks in the early 1990's. Certainly, had a base year from the 1980's (before the moratorium) been used instead, the impacts would be much more profound.

The immediate analysis (*i.e.* one year) focuses on the costs of plausible scenarios in terms of foregone revenues and jobs. In order to estimate the immediate impacts, the following assumptions were made:

- Costs are on-going (annual) while the management scenario remains in place;
- Fishers do not adjust to the management scenarios by transferring to another fishery;
- Harvest revenue is realized in the province of the homeport of the licensee, while processing revenue is realized in the province of landing.

Any consumptive benefits to be derived from listing cod under SARA will be through the potential increased productivity of the stock, resulting from the protective management measures that have been implemented. The long term analysis presented in this summary includes the potential future benefits from increased harvesting and processing revenues. In order to assess the long term impacts, the following assumptions were made:

- The study period is 20 years, which allows for 3 generations of cod growth;
- The discount rate is 5%<sup>2</sup>;

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<sup>2</sup> In order to compute the present value of future cash flows and state them in current (today's) dollars, a discount rate is used. A discount rate expresses the time preference for money -- a person may feel equally well off if they get \$100 today or \$105 in one year; thus \$105 in 2006 is "equal" to \$100 in 2005. The discount rate is the ratio of the two payments (today versus next year) between which an individual would feel indifferent, in an inflation- and risk-free environment. Similarly, a social discount rate measures time

- Growth rates remain constant for 20 years but a range of rates are examined;
- Real prices remain constant;
- If a critical threshold, called the Limit Reference Point (LRP) is reached, a directed fishery would be opened at a level equal to the growth rate minus five percent.

The long term projections are not predictions of the future. They assume that all other factors, other than the management scenario and its effect on cod spawning stock biomass, are held constant over the 20-year period. This is clearly not realistic. However, by comparing current conservation measures to each alternative, within the same set of background assumptions, it is possible to obtain a picture of the relative merits of various management actions.

## 1.5 Key Issues

Several key issues require consideration when analysing the potential socio-economic impacts of listing Atlantic cod populations under SARA.

### i. Biological Parameters

In order to estimate long term benefits, an assumption must be made about potential growth rates of the stock in question as a result of listing under SARA. For the purpose of this analysis, a range of natural growth rates are examined, including the current estimate from stock assessments.<sup>3</sup> Current estimates are as follows:

- <2% offshore, 40% inshore for 2J3KL,
- 20% for 3NO,
- 15% for 4RS3Pn, and
- 4% for 3Ps<sup>4</sup>.

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preferences of society as a whole. For this impact analysis, an individual and social discount rate of 5 percent was applied; this rate is currently commonly accepted in Canada. A sensitivity analysis using discount rates of 3 percent and 7 percent was also carried out in order to assess the robustness of the results.

<sup>3</sup> The stock status reports produced by DFO Science sector that give the current estimated growth rates by NAFO zone can be found at the following URLs (last visited June 8, 2005):

2J3KL [http://www.dfo-mpo.gc.ca/csas/Csas/status/2004/SSR2004\\_011\\_e.pdf](http://www.dfo-mpo.gc.ca/csas/Csas/status/2004/SSR2004_011_e.pdf)

4RS3Pn [http://www.dfo-mpo.gc.ca/csas/Csas/status/2004/SSR2004\\_019\\_e.pdf](http://www.dfo-mpo.gc.ca/csas/Csas/status/2004/SSR2004_019_e.pdf)

3Ps [http://www.dfo-mpo.gc.ca/csas/Csas/status/2004/SSR2004\\_039\\_e.pdf](http://www.dfo-mpo.gc.ca/csas/Csas/status/2004/SSR2004_039_e.pdf)

The stock status report for 3NO is produced by the North Atlantic Fisheries Organization (NAFO). The current estimated growth rate can be found in the latest stock status report, located at the following URL (last visited June 9, 2005) <http://archive.nafo.int/open/sc/2003/scr03-059.pdf>

<sup>4</sup>DFO Science sector representatives provided a current growth rate estimate of 2.5 to 5 %, with the caveat that this rate is unusually low for this stock; growth in this area has commonly been much higher. The management decision to set the TAC at 15,000 mt reflects the rate observed in recent years as opposed to this year's observed rate.



There is evidence that fish harvesters are encountering growing numbers of cod near shore in 2J3KL, despite the low overall estimated growth rate in this NAFO area. Scenarios that allow for separate management strategies for inshore versus offshore components of the cod populations were not provided. Nevertheless, we have modelled the hypothetical dynamics of the two components of 2J3KL separately, and then combined the two sub-populations into a single unit with a common limit reference point. A decision to list northern cod will encounter resistance from fishers whose experience suggests cod is becoming more abundant near the shore, but the joint dynamics of this stock are not well-enough understood to determine if a more concentrated harvest inshore would be harmful to the long-term recovery of 2J3KL cod overall.

The limit reference point (LRP) for spawning stock biomass represents a critical threshold, below which stock productivity is impaired and below which a stock should not be permitted to fall. Under precautionary management, actions should be taken *before* a population declines to this level. Nonetheless, many cod stocks are currently well below their LRPs. The LRPs and current spawning stock biomass (SSB) estimates are:

NAFO Division	LRP (,000 t)	SSB (,000 t)
2J3KL	> 300	Inshore: 22 (inferred from central inshore est. ) Offshore: no official estimate, inferred value of 12.5 from biomass index
3NO	60	5
4RS3Pn	100 <sup>a</sup>	38
3Ps	13 - 36	88 - 130

<sup>a</sup> The LRP provided for 4RS3Pn was actually a range (85,000 to 110,000 tonnes). For the purpose of this analysis, the mid-point of the range, rounded to the nearest 5,000 tonnes, was used.

The establishment of reference points for good management is ongoing in DFO Science Sector in co-operation with other management, advisory and stewardship groups, and for some stocks the LRP used in this analysis is a preliminary estimate. The use of the LRP as a lower critical threshold for establishing a directed fishery is not specifically addressed by SARA, and de-listing criteria have not yet been established. Even outside the context of SARA, cod stocks are not likely to be considered recovered until some higher threshold, often called a Target Reference Point, is reached. However, these targets have not yet been established. The use of LRPs is valid for the purpose of comparing the *relative* effects of the different scenarios, in a manner which is consistent across stocks.

## ii. Sale of Listed Species

A key issue for commercial fisheries within the framework of SARA is the sale (and purchase) of individuals of a listed species which have been legally harvested (i.e., within by-catch restrictions or within a directed fishery). SARA prohibits the possessing, collecting, buying, selling or trading of individuals of a species that has been listed as endangered or threatened. There are exempting mechanisms within SARA that may

permit by-catch and even a directed fishery to proceed, however commercial trade in a listed species is currently prohibited unless regulations are made under SARA providing that the prohibitions on possessing, buying and selling do not apply to possessors of legally harvested individuals of a listed extirpated, endangered or threatened species. If no regulations are made, commercial fisheries directed at a listed species may not be able to operate; commercial fisheries that incidentally catch a significant amount of a listed species would suffer a major impact. This analysis includes an assessment of the potential immediate impacts resulting from this element of SARA, however this issue is not addressed in the long term analysis. Unless resolved, this restriction will result in major additional socio-economic impacts (as indicated in Table 1.5) due to the closure of the directed fishery in 3Ps. The assumption in the long term analysis is that cod can be traded commercially.

### iii. De-listing

The de-listing process (i.e. the process by which a species is removed from the lists of endangered or threatened species), timelines and COSEWIC criteria are currently unclear. In this analysis, we assume that when a stock reaches its limit reference point, a directed fishery would be allowed.

### iv. Activity Outside Canada's Exclusive Economic Zone (200 Miles)

For some cod stocks, notably 3NO cod but also in 2J3KL, the efficacy of any stock management measure depends largely on the activity of vessels outside the 200 mile limit. In other words, any management measure to protect the stock under SARA will only be effective if catches of the stock outside the 200 mile limit are also restricted. Consequently, for some stocks, protective measures will require coordination with the Northwest Atlantic Fishery Organization (NAFO) and compliance of fleets fishing in the NAFO Regulatory Area (NRA) to adhere to quotas, eliminate unreported catches and reduce by-catch.

Increased monitoring and enforcement by Canada has already led to a decrease in the incidence of overfishing in the NRA. It is unknown at this time if additional measures would be required, if cod is listed under SARA.

### v. Potential Additional Costs

Given the directives of SARA for the responsible Minister to protect a species listed as Endangered or Threatened from killing, harm or harassment, there may be increased costs to government in the form of significant additional enforcement activity. Discussions with stakeholders indicated that there would very likely be a significant protest fishery if cod were to be listed. General estimates were calculated on the basis of historical departmental experience in enforcing the conservation of fisheries. Additional enforcement costs would be expected to range from \$230,000 if non-compliance were to be limited to two days to \$4.6 million for each 60 day period of non-compliance. These

costs are additional to the costs from foregone harvesting or processing resulting from implementing the plausible scenarios detailed in this document.

An additional unquantifiable cost to listing cod for DFO would be the loss of stewardship and co-operation from the industry. A listing would also likely drive catch information underground. Also, discussions with stakeholders indicated that there is an expectation that if cod is listed, DFO will implement a significant scientific and research initiative, similar to the recent Northern Cod Science Program, in order to increase knowledge of the stock's biology and demonstrate a commitment to de-listing cod as soon as possible. The cost of any such potential initiative is not included in this analysis.

The analysis presents the marginal impacts of a potential SARA listing from the base year (2004), holding other factors constant. However, it should be noted that the Canadian dollar has appreciated significantly in 2005, and fuel costs have risen sharply (for instance, diesel fuel prices have increased by over 50% since September 2004). These factors have already affected harvesters and processors, and would exacerbate the effects of a potential SARA listing.

#### vi. Potential Additional Benefits

Atlantic cod may also have substantial non-market/intangible value to Canadian society, as many individuals who do not use this resource directly may still wish to see it preserved. Citizens may want to preserve the species for future generations to enjoy (bequest value), or the public may derive value from knowing the species exists, even if they will never personally see or 'use' the species (existence value). There is also value derived from retaining the option to observe or even use the species at some future time (option value).

*Non-use* value is extremely difficult to measure because of its subjectivity, and due to the difficulty in eliciting from individuals their true values for the good in question (and only that good). Estimating non-market *use* value is less problematic conceptually, but usually requires access to data that are not routinely collected. Non-market values have not been estimated for Atlantic cod at this time, but it is likely that these benefits are high. A prominent species like Atlantic cod carries national significance. Furthermore, the cod fishery is much more than employment for a large number of individuals; it is a tradition embedded in the history and culture of coastal communities in Eastern Canada, and particularly in Newfoundland and Labrador and the lower north shore of Québec where fishing for cod is regarded by some as a right.

Even market benefits can be difficult to estimate in a complete way, for natural resources such as fisheries. There is a value to the stock of cod in the ocean, akin to the capital or "book" value of an asset, beyond the realized income stream that may result from its harvesting and processing within a finite time period.

## vii. Impacts on Communities

The importance of fisheries, and indeed Atlantic cod, to many rural and remote coastal communities is significant. These communities typically have higher than average unemployment rates (rates above 20% are common). They have little, if any, opportunity for economic diversification especially given downturns in forestry and other natural resource sectors.

Many processing plants without access to crab or shrimp are particularly vulnerable to a decline in access to cod. Plants that are highly dependent on cod may have to close as a result of the listing decision. Closure becomes even more likely if a plant owner has not been reinvesting in plant machinery and equipment so as to maintain productivity. Although it is not possible to predict which processing plants may become uneconomic to operate should cod be listed, it should nonetheless be recognized that closing a plant would have dire consequences for the community in which it is located. Jobs would be lost, and other workers would see their hours reduced.

A detailed account of the status of the fish processing labour force in Newfoundland and Labrador can be found in the Province's 2003 *Fish Processing Policy Review*<sup>5</sup>. The total number of individuals working in fish processing declined from more than 25,000 in 1990 to fewer than 13,000 in 2000. The aggregate income received by fish processing workers declined 31% from \$218M in 1990 to \$151M in 2001, and total employment insurance benefits decreased comparably (by 32%) from \$132M to \$89M. At the individual level, the average income (from processing) declined markedly for these workers through the early 1990's, recovering somewhat along with the development of shellfish resources. By 2001, average real income from processing for a typical worker had approximately recovered to 1990 levels; however, this average does not necessarily reflect the situation for groundfish processing workers.

The impacts of cod listing may impair the ability of affected harvesters and processors to qualify for employment insurance (EI), which is typically a significant source of income for many of these primarily seasonal workers. For instance, in the Lower North Shore region of Quebec, the average payment for EI for fishing-related employment in 2004 was \$8,300. Self-employed harvesters may qualify for Fisher's EI if, in the 31 weeks before their claim, they have earned at least \$2,400 to \$4,200 depending on their region. Others, such as a harvester's crew and workers in processing plants may qualify for EI regular benefits if they have worked the required number of hours in the previous year (the exact requirement depends on their region's unemployment rate). Harvesters/crew and processors who work less hours as a result of a potential cod listing may no longer qualify for this income.

Recent trends also show a significant out-migration of individuals from these communities into larger urban centres. Younger people have been the most likely to move away. Along with this trend, demographic data show that there has been a general

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<sup>5</sup> Final Report of the Fish Processing Policy Review Commission. Eric Dunne (Commissioner). December, 2003.

aging of the population, with the proportion of the population under 45 years of age decreasing by about 10% in Newfoundland and Labrador and about 7% in maritime Québec<sup>6</sup> from 1996-2001. Education levels also affect the ability of an area to absorb the impact of a listing. Lower levels of education severely limit the mobility of workers, especially those in rural areas who also tend to be older. The more highly educated are also more prone to outmigrate, which has a negative impact on the long term sustainability of a community. The population decline of these communities, the increase in age of those remaining in these communities, and the limited economic opportunities to attract new migration puts the future of these communities in some doubt. As a result, the ability of these communities to absorb further losses is limited and decisions respecting the management of cod, whether under SARA or the *Fisheries Act*, must take this into account.

Management scenarios that involve further restrictions on harvesting cod may increase out-migration from rural communities (and a corresponding increase in migration to urban regions in other parts of Canada). There are costs associated with this migration, for the communities affected, for the province as a whole, and for the individuals. For communities, population decreases can negatively impact funding allotments for schools, infrastructure and general public and private services. For the province, out migration can mean the province is home to a lower proportion of Canada's population, resulting in lower transfer payments from the federal government when the amounts of those payments are calculated on a per capita basis. For individuals, the cost of moving is not trivial; there are costs associated with buying and selling homes, shipping belongings and hiring moving vans. Downturns in economic fortunes of communities can significantly reduce the market value of homes being sold by people intending to move. Many fishers have significant mortgages on their vessels -- selling the vessels to pay off the mortgage would be difficult, especially when downturns in the fishery reduce their resale value. This may limit their ability to relocate. However without additional economic opportunities in their community, these fishers may be left to rely on social assistance and/or may end up declaring bankruptcy. While estimating these costs is beyond the scope of this analysis, they should be considered in a listing decision.

#### viii. Other Issues

Note that long term benefits may not accrue until a number of years into the future, if at all. In light of the aging demographic of the industry and rural communities, those who would bear the immediate costs may not be those who would realize the future benefits of a management scenario. This analysis does not examine the distributions of costs and benefits across generations.

Globalization is increasingly a factor in the competitiveness of Canada's fishing industry relative to other countries around the world, China in particular. There are already instances where Canadian companies are exporting their catch to China for processing. This means fewer jobs for domestic plant workers for processing this fish. Further

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<sup>6</sup> The maritime region of Québec includes the administrative regions of: Côte Nord, the Bas-Saint Laurent and the Gaspésie-Îles de la Madeleine.

reductions in product for processing as a result of SARA will only magnify these impacts. Lengthy closures or reductions would also make market re-entry more difficult considering the cost structures domestic processors face.

In light of continuing moratoria on some Atlantic cod stocks, much of the impact of listing decisions will not be from prohibiting directed fisheries for cod but from measures taken in *other* fisheries to protect Atlantic cod. Moreover, any negative impacts such as loss of revenue that may occur from a listing of cod will be all the more difficult for communities to absorb should there also be a decrease of total allowable catch for other more lucrative species or the price of more lucrative species declines (as has happened in 2005: the price of crab has declined by about 40%, and the price of shrimp has declined by about 28%). This is particularly relevant to the issue of temporary shellfish allocations to groundfish licence holders in Quebec.

While beyond the scope of this report, costs may result to other industries (e.g. oil and gas exploration, seismic surveying) from restrictions to protect a species' residence or critical habitat (restrictions to bottom otter trawling, scallop dredging). These impacts must be considered in the development of recovery strategies and action plans.

Finally, there are a number of international issues which must be considered. Harvests by NAFO fleets have a significant impact upon cod conservation in area 3NO outside Canada's Exclusive Economic Zone - this is discussed more fully in the following sections. In addition, St. Pierre and Miquelon (France) have rights within Canadian waters according to a Canada-France treaty (15.6% of the Total Allowable Catch in area 3Ps, and smaller amounts in the Gulf of St. Lawrence).

## **2. IMMEDIATE IMPACTS OF PLAUSIBLE MANAGEMENT ALTERNATIVES, IF COD IS LISTED**

Analysis of the immediate impacts (i.e. one year) of the most plausible alternative scenarios under a SARA listing focuses on the costs, in terms of foregone revenue and jobs at risk. The analysis is presented separately for each NAFO area, first with harvest restrictions only, and second with the additional restriction of "no sales" of any cod. A breakdown by province is also presented.

### **2.1 Immediate Impacts with Harvest Restrictions Only (sales allowed)**

#### ***2.1.1 Immediate Impact (Harvest Restrictions only) by NAFO zone***

Table 1.3 summarizes the estimated immediate effects of the scenarios presented in Table 1.2. These are the potential impacts in the first year in which the management measures are imposed, assuming that individuals and processing firms do not adjust their behaviour in response to the scenarios.

A fisher is a licence-holder, and can be an individual or a company. Fishers typically own vessels and employ a crew. Precise data on the size of the crew employed by each licence holder are not available. Instead, crew multipliers were developed based on the size of the harvester's vessel in order to estimate the number of crew that may be affected.

For this analysis, "affected" fishers and crew are those who derived any revenue from a fishery that would be the subject of harvest restrictions in a given scenario. For instance, in 2J3KL, prioritized rebuilding involves a reduction in the winter flounder fishery, so affected fishers all obtained at least \$1 in revenue in 2004 from fishing in the winter flounder fishery.

"Dependent" fishers are those who earned more than \$3,000 from fishing and who could lose 25% or more of their fishing revenue as a result of the implementation of one of these management scenarios. Continuing the example of 2J3KL, dependent fishers are those who could lose at least 25% of their revenue due to the proposed reduction in the winter flounder fishery. Dependent crew are those associated with a dependent licence holder.

Foregone processing employment is estimated as the number of "job-equivalents" that would have been supported by the foregone landings in a scenario. In a seasonal industry, job-equivalents are not the same as person-years or FTE's (full time equivalents). The definition of "job" used in this analysis is based upon the average duration of employment per year in the processing industry.<sup>7</sup>

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<sup>7</sup> Different methods were required for estimating foregone processing jobs, depending upon the type of data available. Details are provided in the technical companion document.

**Table 1.3: Direct Annual Impact in Harvest and Processing Sectors, from Incremental Conservation Scenarios, by NAFO Division and Cod Population. COD SALES ALLOWED.**

NAFO DIV.	Affected Harvesters (and crew)	Dependent Harvesters (and crew)	Foregone Processing Employment	Foregone Harvest Revenue	Foregone Processing Revenue	Total Foregone Revenue
<b>Newfoundland and Labrador Cod Population</b>						
2GH	0	0	0	\$ 0	\$ 0	\$ 0
2J3KL	811 (1419 crew)	1 (2 crew)	15 jobs (6 FTE)	\$ 0.39 M	\$ 0.63 M	\$ 1.0 M
3NO	30 (425 crew)	13 (263 crew)	660 jobs (269 FTE)	\$ 10.5 M	\$ 16.1 M	\$ 26.6 M
<b>Total N&amp;L</b>	<b>841 (1844 crew)</b>	<b>14 (265 crew)</b>	<b>675 jobs (275 FTE)</b>	<b>\$ 10.9 M</b>	<b>\$ 16.8 M</b>	<b>\$ 27.7 M</b>
<b>Laurentian North Cod Population</b>						
4RS3Pn	863 (1829 crew)	303 (606 crew)	143 jobs (59 FTE)	\$ 4.1 M	\$ 6.4 M	\$ 10.5 M
3Ps	0	0	0	\$ 0	\$ 0	\$ 0
<b>Total Laur. N.</b>	<b>863 (1829 crew)</b>	<b>303 (606 crew)</b>	<b>143 jobs (59 FTE)</b>	<b>\$ 4.1 M</b>	<b>\$ 6.4 M</b>	<b>\$ 10.5 M</b>
<b>Both Populations</b>						
<b>Grand Total</b>	<b>1704 (3673 crew)</b>	<b>317 (871 crew)</b>	<b>818 jobs (334 FTE)</b>	<b>\$ 15.0 M</b>	<b>\$ 23.2 M</b>	<b>\$ 38.2 M</b>

### 2J3KL

NAFO zones 2J, 3K and 3L are located off the coast of Labrador and the east coast of Newfoundland. Directed fishing for cod in these areas has been under moratorium for much of the last 12 years, although a limited fishery was allowed from 1998-2002. Some by-catch of cod continues to occur (about 470 tonnes in 2004) despite the moratorium, primarily in the winter flounder fishery. Under prioritized rebuilding (the most plausible alternative to current conservation measures), the moratorium would be continued and by-catch restrictions would be placed on the winter flounder fishery to reduce the by-catch of cod in 2J3KL by 50%.

There are 811 fishers who would be affected by reducing the winter flounder fishery. Only one is considered “dependent” based on the chosen criteria. Overall losses of revenue to all fishers would be \$390,000. In the processing sector, an estimated 15 jobs could be affected by this scenario. Foregone processing revenue is estimated to total \$630,000. The total foregone revenue estimated under this scenario is \$1.0 million.

It should be noted that these impacts do not include enforcement costs nor the adjustment costs that may be experienced within communities, as discussed previously in this document.



### **3NO**

This fishery is located on the southern Grand Banks, off the southeast coast of Newfoundland. Although much of it is within Canada's 200 mile exclusive economic zone (EEZ), the "tail" section extends beyond that limit, where significant fishing activity occurs. Cod fishing in Canada's EEZ has been under moratorium since 1994. By-catch of cod within in this area was 481 tonnes in 2004, and catches outside Canada's EEZ were reported to be approximately 413 tonnes in 2004. However, under-reporting by vessels fishing in the NRA remains a problem. The alternative assessed for this area maintains the moratorium on directed cod fishing and reduces domestic by-catch of cod to the lowest possible level through closure of the skate, yellowtail, redfish, and Atlantic halibut fisheries. Closure of the skate fishery has potential consequences for the viability of the monkfish fishery, which was temporarily less active in the base year of 2004 (therefore impacts on monkfish fishers and processors are not included, however the impacts on them are potentially significant).

This analysis only considers the effects of a reduction in Canadian landings. It should be noted, however, that the efficacy of any conservation measures will require the compliance of vessels in the NAFO regulatory area. It should be further noted that without compliance in the NRA, this stock is expected to become extirpated, with or without a listing decision under SARA.

Thirty licence holders/vessels in this area would be affected (with 425 crew) by these closures, and 13 licence holders/vessels in this area derive more than 25% of their fishing revenue from the fisheries proposed for harvest restrictions. The revenue from harvesting foregone under this scenario is estimated to be \$10.5 million; all but \$620,000 of this is expected to be borne by licence holders/vessels from Newfoundland. In the processing sector, an estimated 660 jobs could be affected by this scenario, mostly those involved in yellowtail flounder processing in one community in Newfoundland. Foregone processing revenue is estimated to total \$16.1 million. The total foregone revenue estimated under this scenario is \$26.6 million, though it should be noted that these impacts do not include enforcement costs or adjustment costs.

### **4RS3Pn**

This area is the northern Gulf of St. Lawrence, off the North Shore in Quebec and the west coast and southwest corner of the Island of Newfoundland. A directed cod fishery of 3,500 tonnes was established there in 2004, and a 5,000 tonne fishery will be open in 2005.

Under a SARA listing, the most plausible scenario would involve closing the directed fishery for cod, but taking no action to reduce bycatch. Of the 863 fishers that would be affected by the closure, 303 fishers derive more than 25% of their fishing revenue from catching Atlantic cod in this area. The harvest revenue foregone under this scenario is estimated to be \$4.1 million, approximately \$3.2 million borne by fishers from

Newfoundland and \$0.9 million by Quebec fishers. In the processing sector, an estimated 143 jobs could be affected. Foregone processing revenue is estimated to total \$6.4 million, about \$4.7 million by processing plants in Newfoundland and \$1.7 million in Quebec. The total foregone annual revenue estimated under this scenario is \$10.5 million.

There are additional fishers, all in Quebec, who have access to cod in 4RS3Pn but did not fish for cod in 2004 because of restrictive management measures. In 2002, 10 fixed gear and longliner fishing vessels over 50 feet were involved in cod harvesting in 4RS3Pn. These fishermen from Gaspé-East and Gaspé-South could be considered cod-dependent since 42% of their gross revenues were derived from cod. In addition, 82% of their catches were in 4RS. Furthermore, these companies are supplying raw materials to Consortium Gaspé Cured, which has 5 plants in Gaspésie and specializes in the production of dry salted cod. Therefore, the impacts of a listing decision would also strongly affect the fleets and plants located in Gaspé-East and Gaspé-South. These individuals are not included as “affected” in table 1.3 (nor in table 1.4 below), but could be significantly affected by the closure of the directed cod fishery. .

In Quebec, the temporary allocation program has allowed disadvantaged fishermen, a result of groundfish moratorium in the early 1990’s, to continue fishing related activities. However, this program does not guarantee crab and/or shrimp quotas each year due to the fact that quota availability is directly related to the availability of resources. Numerous factors affect the availability of resources: stock status, natural variation of crab and shrimp stocks, market conditions and economical viability of traditional fleets. Shrimp prices are experiencing a significant decline and crab prices have been falling as well since 2004. Furthermore, many crab fishing areas have reached the peak of their supply cycle and the declining period will likely span over the upcoming years.<sup>8</sup> This adds to the eventual impacts of listing cod under the Species at Risk Act and will affect disadvantaged fishermen who are already facing an uncertain future. If temporary allocations were removed from the 2004 revenue of Quebec fishers in 4RS3Pn, then an additional 7 fishers (18 crew members) would be considered “dependent” upon the cod fishery, although they are currently only counted as “affected”

These figures are based on the 2004 fishery, where the TAC was 3,500 mt. However, the TAC will be 1,500 mt higher in 2005, an increase of 43%. At this point it is difficult to estimate the effects of a directed cod fishery closure on the number of affected and dependent fishers with reference to the higher TAC, as it is unknown how many additional fishers will catch cod, nor how much they will catch. A pure extrapolation of foregone harvest and processing revenue would increase all the dollar impacts for 4RS3Pn by 43%.

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<sup>8</sup> DFO 2005: *Southern Gulf of St. Lawrence Snow Crab (Areas 12, E and F)*, Canadian Science Advisory Secretariat, Science Advisory Report 2005/022, and *Snow Crab of the Estuary and Northern Gulf of St. Lawrence (areas 13 to 17 and 12A, 12B and 12C) in 2004*, Canadian Science Advisory Secretariat, Science Advisory Report 2005/027.

It should be noted that these impacts do not include enforcement costs nor adjustment costs, as discussed previously in this document.

### 2.1.2 Immediate Impacts (harvest restrictions only), by Province

Table 1.4 also summarizes the immediate impacts of the harvest restrictions in the most plausible scenarios shown in table 1.2. The estimates are the same as in Table 1.3, but are presented according to the province in which the impact would be expected to occur.

In order to calculate impacts by province, the harvester’s revenue is assumed to be lost from the province of their homeport, while the processing revenue is foregone in the province of landing (where processing occurs).

**Table 1.4 Direct Annual Impact in Harvest and Processing Sectors, from Incremental Conservation Scenarios, by Province. COD SALES ALLOWED.**

Province	Affected Harvesters (and crew)	Dependent Harvesters (and crew)	Foregone Processing Employment	Foregone Harvest Revenue	Foregone Processing Revenue	Total Foregone Revenue
NL	1583 (3346 crew)	266 (757 crew)	755 (305 FTE)	\$ 13.5 M	\$ 21.0 M	\$ 34.5 M
QC	115 (288 crew)	50 (108 crew)	50 (21 FTE)	\$ 0.9 M	\$ 1.7 M	\$ 2.6 M
NS	6 (39 crew)	1 (6 crew)	13 (8 FTE)	\$ 0.6 M	\$ 0.5 M	\$ 1.1 M
<b>Total</b>	<b>1704 (3673 crew)</b>	<b>317 (871 crew)</b>	<b>818 jobs (334 FTE)</b>	<b>\$ 15.0 M</b>	<b>\$ 23.2 M</b>	<b>\$ 38.2 M</b>

A very high percentage (90%) of the total impacts would be felt in Newfoundland and Labrador (Table 1.4). However, the impacts in Québec and Nova Scotia would nevertheless be significant - all of these impacts are concentrated upon an economically vulnerable group of individuals.

### 2.2 Harvest Restrictions plus “No Sales” restriction, by NAFO zone

In addition to the harvest restrictions contained in the scenarios under consideration throughout this document, a listing under SARA could result in additional impacts from an automatic prohibition on the sale of cod, whether that cod originates from a directed fishery or is by-caught in another fishery.

Table 1.5a adds the “no sale” restriction to the harvest restrictions already considered (shown in Table 1.3), and table 1.5b adds the “no sale” restriction to the breakdown of the impacts by province already considered (Table 1.4). Tables 1.5a and 1.5b therefore presents the sum of the two effects (harvest restrictions plus prohibition of the sale of cod). A comparison of the values in Tables 1.3 and 1.5a shows that the additional immediate impacts of a no sale provision are an additional loss of revenue totaling \$900K, \$100K and \$700K from 2J3KL, 3NO, and 4RS3Pn respectively. Restrictions in

2J3KL could eliminate an additional 10 jobs in the processing sector, while in 4RS3Pn, an additional 8 jobs in the processing sector could be lost.

**Table 1.5a Direct Annual Impact in Harvest and Processing Sectors, from Incremental Conservation Scenarios, by NAFO Division and Cod Population. COD SALES PROHIBITED.**

NAFO DIV.	Affected Harvesters (and crew)	Dependent Harvesters (and crew)	Foregone Processing Employment	Foregone Harvest Revenue	Foregone Processing Revenue	Total Foregone Revenue
<b>Newfoundland and Labrador Cod Population</b>						
2GH	0	0	0	\$ 0	\$ 0	\$ 0
2J3KL	838 (1690 crew)	5 (8 crew)	25 jobs (10 FTE)	\$ 0.72 M	\$ 1.14 M	\$ 1.9 M
3NO	44 (483 crew)	13 (263 crew)	660 jobs (269 FTE)	\$ 10.5 M	\$ 16.2 M	\$ 26.7 M
<b>Total N&amp;L</b>	<b>882 (2173 crew)</b>	<b>18 (271 crew)</b>	<b>685 jobs (279 FTE)</b>	<b>\$ 11.2 M</b>	<b>\$ 17.3 M</b>	<b>\$ 28.6 M</b>
<b>Laurentian North Cod Population</b>						
4RS3Pn	899 (2027 crew)	319 (682 crew)	151 jobs (63 FTE)	\$ 4.4 M	\$ 6.9 M	\$ 11.2 M
3Ps	1059 (2724 crew)	690 (1504 crew)	512 jobs (215 FTE)	\$ 17.1 M	\$ 25.1 M	\$ 42.2 M
<b>Total Laur. N.</b>	<b>1958 (4751 crew)</b>	<b>1009 (2186 crew)</b>	<b>663 jobs (278 FTE)</b>	<b>\$ 21.5 M</b>	<b>\$ 31.9 M</b>	<b>\$ 53.4 M</b>
<b>Both Populations</b>						
<b>Grand Total</b>	<b>2840 (6924 crew)</b>	<b>1027 (2457 crew)</b>	<b>1348 jobs (557 FTE)</b>	<b>\$ 32.8 M</b>	<b>\$ 49.2 M</b>	<b>\$ 82.0 M</b>

Note: columns may not add to total due to rounding

However, in NAFO subdivision 3Ps, the impact from the restriction on the sale of cod would be much more significant. An ongoing directed fishery of 15,000 mt is open in this area, and the most plausible scenario would see this continue. However, if the sale of Atlantic cod was prohibited by a SARA listing (or if the directed fishery itself is no longer permitted upon listing), then the revenue from this fishery would be expected to disappear. Foregone harvesting revenue from the closure of 3Ps would be \$17.1 million (\$16.1 million from fishers from Newfoundland, 1 million from fishers in Nova Scotia). Foregone processing revenue would be \$25.1 million, of which more than 90% would be lost from Newfoundland. Over 3,700 licence holders plus crew would be affected, with almost 700 of those licence holders losing 25% or more of their total fishing revenue. Additionally, about 510 jobs in the processing sector would likely disappear, 93% in Newfoundland and 7% in Nova Scotia.

**Table 1.5b Direct Annual Impact in Harvest and Processing Sectors, from Incremental Conservation Scenarios, by Province. COD SALES PROHIBITED.**

Province	Affected Harvesters (and crew)	Dependent Harvesters (and crew)	Foregone Processing Employment	Foregone Harvest Revenue	Foregone Processing Revenue	Total Foregone Revenue
NL	2678 (6363 crew)	976 (2343 crew)	1248 (504 FTE)	\$ 30.2 M	\$ 44.8 M	\$ 75.0 M
QC	142 (381 crew)	50 (108 crew)	51 (22 FTE)	\$ 0.9 M	\$ 1.8 M	\$ 2.7 M
NS	20 (180 crew)	1 (6 crew)	49 (31 FTE)	\$ 1.6 M	\$ 2.7 M	\$ 4.3 M
<b>Total</b>	<b>2840 (6924 crew)</b>	<b>1027 (2457 crew)</b>	<b>1348 jobs (557 FTE)</b>	<b>\$ 32.8 M</b>	<b>\$ 49.2 M</b>	<b>\$ 82.0 M</b>

A comparison of the data in tables 1.3, and 1.5a, as well as in tables 1.4 and 1.5b highlights the significance of the “no sales” restriction and the importance of having this issue resolved as soon as possible. If these cod populations are listed and the current SARA requirement pertaining to the possession, collection, buying, selling or trading in an endangered or threatened species continues to apply, it is estimated that the immediate total foregone revenue will more than double from \$38.2 M under the harvest restrictions alone, to \$82 M under the “no sales” scenario, primarily due to the closure of the 15,000 mt directed cod fishery in subdivision 3Ps. This would double the impacts of a SARA listing in Newfoundland, and quadruple the impacts of a SARA listing in Nova Scotia.

### 2.3 Impacts of these scenarios on communities

It is not the goal of this analysis to attribute specific impacts to specific communities; indeed it would be highly inadvisable to make such a forecast. Nevertheless, impacts on communities can be discussed in general terms, and are presented below, grouped by NAFO area.

Transportation costs and competition among firms (domestically and internationally) affect where cod is processed and therefore the effects described within the processing sector are less easily attributable to a specific region or community. Nonetheless, any communities which derive significant income from groundfish processing will no doubt be adversely affected by these management scenarios.

It is recognized that there will be spin-off impacts in these communities as revenues/incomes normally realized by workers living in these communities are foregone. Consumption of goods and services by directly affected individuals will decrease, which will impact indirectly upon other businesses in the communities. These indirect effects are not quantified in this analysis however they may be significant to many communities. Likewise, businesses which supply fishing or processing enterprises will also be impacted.

## **2J3KL**

Although the impacts are not large in the context of an entire industry, they will clearly be significant to the affected households and communities. The number of harvesters who participate in the winter flounder fishery and stand to lose income is large - just over 800 licence holders and an additional 1,400 crew (Table 1.3). Many of these individuals are marginal non-core fishers living in communities along the northern and eastern coasts of Newfoundland and who, as a result of their non-core status, do not have access to lucrative shellfish quota. Their incomes are often pieced together from activities both inside and outside the fishery, and tend to be low overall. Earnings from the limited groundfish fishery are an important component of income for this group. The immediate impact on Labrador should be rather minimal given the very low levels of cod catches in recent years.

Plant workers in communities in 2J3KL will not be overly affected by a listing of the 2J3KL cod stock, given the relatively small amount of cod that is involved and because it is dissipated among many plants. However, in view of the trucking of fish around the island, these workers will bear some of the burden of any cutbacks in the landings of cod from other stocks, notably 4RS3Pn and 3Ps.

## **3NO**

The relatively large impacts of the plausible scenario in this area are likely to be concentrated in a small geographic region along the south coast of Newfoundland. This area is fished primarily by larger vessels with a relatively high number of crew, and as indicated in table 1.3 there are 30 licence holders/vessels with 425 crew members who would be affected (under a “no sales” scenario this number is 44 licence holders/vessels with 483 crew as listed on table 1.5a). The effect on the processing sector is expected to be concentrated among a small number of processing plants in one region, and the potential processing job losses are, in this context, quite significant – particularly to the extent that the offshore groundfish processing sector in 3Ps is already being realigned. The relatively older labour force on the Burin Peninsula will accentuate the impact of the reduction in the catch of yellowtail.

## **4RS3PN**

The dependence on this fishery is concentrated geographically. In Quebec, 46 of the 50 fishermen identified as dependent (Table 1.4) live on the Lower North Shore and operate vessels less than 35 feet long; this represents 27% of all active fishermen in this area. The dependence on the fishing industry is marked, since more than 80% of the population aged 15 years and older working in the primary and secondary sector are attached to the fishing industry, and the unemployment rate currently exceeds 30%.

Historically, an important part of Quebec’s 4RS cod landings were processed in two regions of Gaspé, the East and South, where the landings from the longliner and mobile gear fleets were processed. For 2004, the more restrictive management measures did not

permit the longliners to operate in the 4RS3Pn cod fishery and since the moratorium, the mobile fleet cannot operate in that fishery. However, 4RS cod remains important in the production of the specialty “Gaspé-cure” salt cod. Cod caught by fishermen from the North Shore is processed on the North Shore to a large extent, but is also sold to processors in Newfoundland.

There are similar localized regions of dependence on this stock in Newfoundland. There is a large concentration of fishermen who are dependent on this stock on the Northern Peninsula in the Port au Choix / River of Ponds area, and points north, including the Labrador side of the Straits of Belle Isle. Another concentration occurs at the south-west corner of the Island of Newfoundland, in the area from Channel-Port aux Basques to Burgeo. The western portion of the island has already experienced large scale outmigration, in particular since the impact of previous groundfish declines has not been offset by the growth of other species. Much of the cod landings are shipped elsewhere in Newfoundland for processing and, while the processing plants local to these areas tend to be small, some are highly dependent upon cod. However, all plants that process cod throughout Newfoundland would be adversely affected by a closure of the directed fishery.

### **3Ps**

The impacts of a “no sales” scenario would make this area by far the most affected of all the areas considered. The number of dependent fishers is over twice that of all other areas combined. The foregone processing employment (512 jobs) would be quite significant to this area, particularly in light of the closure of the Harbour Breton plant and the transition underway in Fortune. Potential impacts would be large and widespread. As per table 1.5a, about 50% of the total revenue impact from all areas would stem from changes to the 3Ps cod fishery.

This area of the province has already been hard hit by the reduction in the offshore fishery in the 1990’s that had a devastating impact on the Burgeo/Ramea area as well as the Connaigre and Burin peninsulas. The impact of any changes to the 3NO fishery would also be concentrated on the Burin Peninsula area of 3Ps.

### **3. LONGER TERM IMPACTS**

Long term impacts were assessed by comparing the estimated revenue under the current management practice (*current conservation measures*) with that under the alternative (plausible) scenario, for a twenty year period, discounted back to 2005. Cod stock growth was projected using a basic population model obtained from DFO Science, parameterized with current stock assessments for biomass, growth rates, and limit reference points. A variety of growth rates and discount rates were examined to assess the sensitivity of the results to these factors. Only a subset are presented in this summary.

A number of factors are not included in these estimates. Non-market benefits such as value of the increased SSB and existence value changes are not quantified in the estimates. A number of costs are likewise not included. With the additional restrictions of the plausible scenarios, reduced harvesting and processing jobs may well lead to additional out-migration from rural fishing communities; the cost of moving (dislocation cost) is not included<sup>9</sup>. Downturns in economic fortunes of communities can significantly reduce the market value of homes being sold by people intending to move, an important cost but one that is impossible to estimate. The additional restrictions may require increased monitoring and enforcement; if so, the cost of these additional measures is not included in the estimates.

SARA contains very stringent compensation guidelines. SARA only provides for the payment of fair and reasonable compensation to persons who have suffered an extraordinary loss from applying the critical habitat prohibitions or applying an emergency order to protect critical habitat. Compensation does not apply to other economic losses resulting from the listing of a species. The federal government has, in the past, provided income and adjustment programs in response to dramatic declines of certain fish stocks. For the most part, these were large multi-departmental programs focused on transition out of the fishery. More recently, the Government of Canada has decided to focus efforts on improving the ability of individuals and communities to adapt to downturns in the fishery, through active measures, such as stock recovery strategies and long-term economic diversification for affected communities. Any income and adjustment programs that may be of assistance to those who would be impacted by the plausible scenarios would be the purview of another federal Department besides DFO. This possible cost is not included in the analysis.

## **2J3KL**

The 2J3KL stock is comprised of two subpopulations - inshore and offshore. Historically, the resident inshore sub-population was a small proportion of the stock complex, and most of the inshore harvest consisted of seasonal migrants from offshore. However, current conditions are very different. Mortality in the offshore sub-population is now very high; few individuals survive beyond age six. The biomass offshore is so small as to be almost immeasurable – less than 1% of the level observed in the 1980's. The inshore sub-population appears to be faring better, but it is difficult to compare it to pre-moratorium levels since it was never assessed as a separate stock. Despite the dismal status of the 2J3KL stock overall, the robust growth of the inshore sub-population has encouraged some to call for the opening of a directed inshore fishery.

However, for the purposes of this impact assessment, the inshore and offshore subpopulations are not viewed as stocks that can be managed as independent units. No

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<sup>9</sup> Dislocation costs include costs of buying and selling homes, search costs for both new homes and jobs, shipping costs for belongings, transportation costs to the new destination, and potential losses on the value of the home being sold. It may be possible that the home to be purchased in the new location is smaller and less luxurious than the one being sold due to different costs prevailing in the real estate markets in the two communities.



scenario for managing them as independent units were developed by departmental experts for the purpose of this analysis. At this time, too little is known of the migration and joint biology of these sub-populations. In particular, it is not known if the inshore sub-population produces migrants that could contribute to repopulation of the offshore area. Nor is it known if an inshore harvest increases the risk that seasonal landward migrants from offshore would be caught incidentally

The main population model used to estimate the long term impacts for 2J3KL (Table 1.6) incorporates different growth dynamics for the inshore and offshore sub-populations. However, since the actual amount of population mixing is unknown, the simplest case of zero mixing is assumed, and one LRP is applied to the combined stock. The details of the population modeling are documented in the technical report.

Under the **prioritized rebuilding** alternative, the LRP of 300K+ tonnes is not expected to be reached at any realistic growth rate (Table 1.6); there would be no directed fishery in this area at any point in the 20-year reference period. If the restrictions of prioritized rebuilding are undertaken, then \$39 million in revenue would be foregone, compared to current management practices extended over 20 years (net present value in 2004 dollars). The additional harvest restrictions, under zero mixing, would only affect the inshore population, leading to a modest increase in biomass (1,900 t). In this simple population model, the offshore growth rate is the most important determinant of stock recovery, and additional harvest restrictions **beyond the current moratorium** appear to impose significant costs with few additional benefits (measured as stock biomass). As more is learned of the population dynamics, the value of additional conservation measures can be reassessed.

**Table 1.6. Long term impacts of prioritized rebuilding scenario, 2J3KL**

Area 2J3KL							
Current SSB: Inshore 22,000 t (inferred from central inshore estimate); Offshore: no official estimate, inferred value of 12,500 tonnes from biomass index							
Limit Reference Point: > 300,000 tonnes							
Offshore Growth Rate <sup>a</sup>	Directed Harvest at Year 20		Year 20 Biomass (,000 t)				Difference in NPV <sup>b</sup>
	<i>Current conservation measures</i>	Prioritized Rebuilding	<i>Current conservation measures</i>		Prioritized Rebuilding		
			Inshore <sup>c</sup>	Offshore	Inshore	Offshore	
2 %	0	0	96.3	17.5	98.2	17.5	- \$ 39 M
5 %	0	0	96.3	30.3	98.2	30.3	- \$ 39 M

<sup>a</sup> Higher growth rates were not assessed because they are unrealistic in light of current mortality.

<sup>b</sup> Difference in discounted net benefit stream (net present value @ 5%), for prioritized rebuilding minus *current conservation measures*.

<sup>c</sup> Experts believe that the inshore component has an upper limit, beyond which there is little potential for further growth. This “carrying capacity” is assumed to be 100,000 tonnes.

### 3NO

Results from the 20-years projections for 3NO show clearly that the success of Canadian conservation efforts depend critically upon the harvest in the NAFO Regulatory Area (NRA). Table 1.7 shows the population's approach to the LRP (60K t), both with and without compliance in the NRA (compliance in this context means catches in the NRA that do not exceed established quotas). Without compliance, continued harvesting at rates that exceed the natural growth rate outside Canada's EEZ will lead to the virtual extirpation of the stock<sup>10</sup>; no Canadian conservation measures would be sufficient. Only under compliance in the NRA does stock growth become positive.

Even with compliance by NAFO countries, the LRP is not reached in less than 20 years, except under sustained high growth of 25%. Growth of the 3NO stock is currently assessed at 20% annually. If this growth were to continue throughout the reference period, foregone revenue would be approximately \$346 million, mostly from Newfoundland. The benefits of the harvest restrictions would allow the stock to increase to 31,100 t. At all growth rates examined, the present value of costs for maximum rebuilding exceeds \$325 M.

**Table 1.7. Long term impacts of maximum rebuilding scenario, 3NO**

3NO Current SSB: 5,000 tonnes LRP: 60,000 tonnes						
	Years to Reach LRP ( 60,000 t )			Marginal Impacts of Maximum Rebuilding with NAFO compliance <sup>a</sup>		
Growth Rate	<i>Current conservation measures</i> (no NAFO compliance)	Maximum Rebuilding (no NAFO compliance)	Maximum Rebuilding (with NAFO compliance)	Directed Harvest at Year 20	Year 20 Biomass <sup>b</sup>	Difference in NPV <sup>c</sup>
2 %	extirpated	extirpated	>20	0	1,200 t	- \$ 342 M
15 %	extirpated	extirpated	>20	0	13,400 t	- \$ 344 M
20 %	extirpated	extirpated	>20	0	31,100 t	- \$ 346 M
25 %	extirpated	extirpated	19	6.8	62,200 t	- \$ 328 M

<sup>a</sup> The marginal impacts for maximum rebuilding without NAFO compliance are not presented. The costs are approximately the same, but there are no benefits from stock enhancement.

<sup>b</sup> Difference in spawning stock biomass at year 20, for maximum rebuilding (with NAFO compliance) minus *current conservation measures*. This is equal to the actual biomass, since the *current conservation measures* biomass is zero.

<sup>c</sup> Difference in discounted net benefit stream (Net Present Value @ 5%), for maximum rebuilding (with NAFO compliance) minus *current conservation measures*.

<sup>10</sup> A residual biomass of Atlantic cod may remain in area 3NO due to migration from other stocks in other NAFO areas.

#### 4RS3Pn

For this stock, the LRP of 100K t can be reached within 20 years under several realistic growth rates (Table 1.8). This is true for both current management practices (a directed fishery) and under the plausible alternative scenario (no directed fishery), depending upon the rate of growth. However, allowing the stock to grow without a directed fishery until the LRP is reached can lead to a significantly higher biomass (as much as 130,000 mt more), which in turn leads to a greater level of harvesting than would be experienced under current management practices. As a result, the initial lost revenue from the closure of the directed fishery is mitigated by higher future revenues, except where the growth rate is very low. The present value of future revenue under the temporary closure exceeds that of continuing current management practices by as much as \$187 M, under the hypothetical situation of sustained growth at 20 or 25%. However, the growth rate over a 20 year period is uncertain, and may not remain constant throughout the period. If growth rate estimates return to the lower values that were observed a few years ago, the benefits of a closure become lower. In addition, the extent of mixing between 4RS3Pn and 3Ps cod is unknown. The efficacy of conservation measures in 4RS3Pn may depend upon the presence or absence of a directed fishery in 3Ps.

The companion technical report also estimates the long term impacts of a significant TAC reduction rather than a complete closure of the directed fishery; the result is that the marginal impacts of a lower TAC can also be a higher net present value of harvesting and processing revenues than current conservation measures would yield.

**Table 1.8. Long term impacts of temporary closure of directed fishery, 4RS3Pn**

4RS3Pn Current SSB: 38,000 tonnes LRP: 100,000 tonnes						
	Years to Reach LRP ( LRP = 100,000 t )		Directed Harvest at Year 20 (,000 t)		Marginal Impacts of Temporarily Closing the Directed Fishery	
Growth Rate <sup>a</sup>	<i>Current conservation measures</i>	Temporary Closure of Directed Fishery	<i>Current conservation measures</i>	Temporary Closure of Directed Fishery	Difference in Year 20 Biomass <sup>b</sup> (,000 t)	Difference in NPV <sup>c</sup>
5%	>20	>20	1.6	0	32.9	- \$ 50 M
15 %	>20	8	6.0	17.7	130.9	+ \$ 69 M
20 %	19	6	16.0	25.9	65.9	+ \$ 187 M

<sup>a</sup> The *current conservation* measures harvest rate is based upon the current (2005) harvest rate of 13% of the spawner stock biomass. However, for a growth rate of 5%, a sustained *current conservation* measures harvest at 13% is unrealistic. Therefore the *current conservation* measures for a 5% growth rate is set at 3%. This is also consistent with current management (2% below the current estimated growth rate of 15%).

<sup>b</sup> Difference in spawning stock biomass at year 20, for closure of directed harvest minus *current conservation* measures.

<sup>c</sup> Difference in discounted net benefit stream (Net Present Value @ 5%), for closure of directed harvest minus *current conservation* measures.

### **3Ps**

This population is currently above its Limit Reference Point of 13 - 36 thousand tonnes. The most recent estimate of spawning stock biomass is between 88 and 130 thousand tonnes. With a TAC of 15,000 tonnes, the exploitation rate therefore falls between 12% and 17% of spawning stock biomass. However, much of the current stock productivity is supported by two strong year classes (1997-1998), with weak recruitment in subsequent years. The current management plan is expected to meet the requirements of SARA in the near term, implying there would be no marginal impact on costs and benefits due to harvest restrictions. If the population declines, there may be significant socio-economic impacts whether the population is listed or not. However, a significant amount of harvesting revenue, processing revenue, and employment would certainly be at risk if a prohibition on sales were to remain in force over an extended period.