Development of a Sharing Allocation Proposal

for Transboundary Resources of

Cod, Haddock and Yellowtail Flounder on Georges Bank

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January 2002

ABSTRACT

The USA and Canada have embarked on renewed discussions to develop consistent management for the transboundary resources of cod, haddock and yellowtail on Georges Bank. With the declaration of exclusive economic zones by the USA and Canada in 1977, both nations claimed a disputed zone on eastern Georges Bank. A bilateral agreement negotiated in 1979 was never ratified. The dispute was referred to the International Court of Justice and in October 1984, the Court delivered its judgement establishing the international maritime boundary.

While fishing activities by the USA and Canada were subsequently restricted to their respective territories, the border did not resolve all fisheries management concerns. Fishing intensity for groundfish increased rapidly during the late 1980s on both sides of the border. Coordination of fisheries management strategies was virtually non existent in those early years after the establishment of the border. Calls to reduce exploitation were countered by arguments that conservation efforts were futile because the fish would be caught on the other side of the boundary anyway.

The 1992 year-class of haddock appeared promising and informal discussions between authorities led to a commitment by both the USA and Canada to limit harvesting and to use this potential towards rebuilding. The success of these coordinated actions promoted increased discussion of common concerns regarding transboundary resources. In 1998, the Transboundary Resource Assessment Committee (TRAC) was formed to realize efficiencies in conducting stock evaluations of transboundary resources and to ensure the advice was based on the best available combined information. Consultations on fisheries management matters culminated in the formation of the Transboundary Management Guidance Committee (TMGC) in 2000.

The terms of reference for the TMGC included providing guidance on principles and options for determining a resource sharing strategy. In December 2001, the TMGC reached an agreed proposal that they could recommend to administrators. They agreed to use 5Zjm as the management unit for cod and haddock and 5Zhjmn for yellowtail, with percentage share based on contemporary resource distribution and on landings during 1967-1994. The sharing formula gives weighting of 60% to resource distribution and 40% to landings in 2003, the initial year. The weighting of resource distribution would progressively increase reaching 90% (10% for landings) by 2010, the end of the transition period.

RÉSUMÉ

Les États-Unis et le Canada ont entrepris à nouveau des discussions en vue de mettre en place une gestion harmonieuse des stocks transfrontaliers de morue, d'aiglefin et de limande à queue jaune sur le banc Georges. Lorsqu'elles ont institué leurs zones économiques exclusives, en 1977, les deux nations ont revendiqué chacune une certaine partie de l'est du banc Georges. L'entente bilatérale qui avait été négociée à ce sujet en 1979 n'a jamais été ratifiée. Le litige a donc été porté devant la Cour internationale de justice, qui, en octobre 1984, a rendu son jugement établissant la frontière maritime internationale.

Quoique les activités de pêche des États-Unis et du Canada aient été par la suite limitées aux territoires respectifs des deux pays, l'établissement de la frontière n'a pas réglé tous les problèmes de gestion des ressources visées. L'effort de pêche du poisson de fond s'intensifia rapidement à la fin des années 1980, de part et d'autre de la frontière. Il faut dire que dans les premières années qui suivirent la création de la frontière, la coordination des stratégies de gestion des pêches était pratiquement inexistante. Aux appels lancés en vue de réduire l'exploitation on rétorquait que les tentatives de conservation étaient vaines car, de toute façon, le poisson serait capturé de l'autre côté de la frontière.

Parmi le stock d'aiglefin, la classe d'âge de 1992 semblait prometteuse; aux termes de discussions entre leurs autorités respectives, les États-Unis et le Canada s'engagèrent tous deux à limiter la pêche et à tirer parti du potentiel que représentait cette classe d'âge pour rétablir le stock. Le succès de ces mesures coordonnées eut pour effet d'encourager la discussion sur les préoccupations communes concernant les ressources transfrontalières. En 1998, on mit sur pied le Comité d'évaluation des ressources transfrontalières (CERT), qui avait pour but de rationaliser les évaluations de stocks transfrontaliers et de faire en sorte que les avis scientifiques concernant ces stocks soient fondés sur les meilleurs renseignements dont disposaient les deux pays. Les consultations sur la gestion des pêches aboutirent à la création du Comité d'orientation de la gestion des stocks transfrontaliers (COGST), en 2000.

Le COGST est chargé notamment de donner des conseils sur les principes et les options à prendre en considération pour établir une stratégie de partage des ressources halieutiques. En décembre 2001, le COGST s'entendit sur une proposition à recommander aux administrateurs. Il s'agissait d'utiliser les divisions 5Zjm comme unité de gestion de la morue et de l'aiglefin et les divisions 5Zhjmn comme unité de gestion de la limande à queue jaune, et de fonder les parts respectives sur la distribution actuelle des ressources et sur les débarquements de 1967 à 1994. La formule de partage accorde une pondération de 60 % à la distribution des ressources et de 40 % aux débarquements en 2003, première année de son application. Il est prévu que la pondération de la distribution de la ressource augmente progressivement jusqu'à 90 % (10 % pour les débarquements) d'ici 2010, année marquant la fin de la période de transition.

BACKGROUND

Since 1977, with the declaration of exclusive economic zones by coastal states, only the USA and Canada have conducted fisheries for groundfish on Georges Bank. Immediately prior to this, the fisheries on Georges Bank fell under the mandate of the International Commission for the Northwest Atlantic Fisheries. The Commission coordinated stock evaluations and was also involved with management. Distant water fleets from various nations expanded their fishing intensity on Georges Bank during the 1960s. The Commission was concerned with moderating this fishing effort and introduced catch quotas and area/season closures in the early 1970s.

After 1977, the USA and Canada used national institutions for stock evaluation. The analyses were supported by exchanges of respective fishery and scientific information as well as complementary participation in the review processes. The USA developed a Multispecies Fisheries Management Plan and turned largely to input controls, i.e. area/season closures, mesh size, trip limits, etc., for regulation, with all catch quotas being eliminated by the early 1980s. In addition, beginning in 1994 the USA implemented effort control mechanisms to reduce fishing pressure on groundfish stocks. The key components of the effort control measures included a limited entry program and a days-at-sea (DAS) program, which reduced the amount of time a vessel owner can participate in the groundfish fishery. By contrast, Canada embraced output controls, principally catch quotas, for regulation and developed reporting and monitoring systems to support it. Though both the USA and Canadian management systems have evolved over the years, this distinction remains (see Attachment 1 for details).

The declaration of exclusive economic zones by the USA and Canada in 1977 gave rise to conflicting interest, with both nations claiming a disputed zone on eastern Georges Bank. Negotiations resulted in the proposed East Coast Fisheries Bilateral Agreement in 1979. Dissatisfaction with the terms of the agreement led to intense lobbying by fishing interests, and while both sides had signed the agreement, it was never ratified. The USA and Canada agreed to refer the boundary dispute to the International Court of Justice. In October 1984, the Court delivered its judgement and the international maritime boundary between the USA and Canada was established.

While fishing activities by the USA and Canada were subsequently restricted to their respective territories, the boundary did not resolve all fisheries management concerns. Several fisheries resources on Georges Bank are considered transboundary. A transboundary resource is one whose distribution spans the boundary and for which there is substantial migration and movement across the boundary. Active fisheries by the USA and Canada on Georges Bank for cod and haddock gave these transboundary resources a higher profile. Fishing intensity for groundfish increased rapidly during the late 1980s on both sides of the boundary. Calls to reduce exploitation were countered by arguments that conservation efforts were futile because the fish would be caught on the other side of the boundary anyway. While coordination of fisheries management strategies was virtually non-existent in those early years after the establishment of the boundary, USA and Canada reached agreement to cooperate in enforcing illegal incursions across the boundary.

Recognizing the spatial complexity of the cod and haddock resources on Georges Bank, Canada adopted eastern Georges Bank (unit areas 5Zj and 5Zm or 523 and 524, see map in Attachment

2) as the management unit in the early 1990s. While full benefits from the fisheries in this management unit would require consistent management with the USA, it was expected that independent action could contribute to rebuilding and sustainability. Consequently, Canada introduced restrictive catch quotas aimed at recovery of these resources, and in particular, haddock. At about the same time, there were increasing concerns in the USA about the state of the haddock resource and this led to spatial and temporal extensions of the area/season closures in 1994. The 1992 year-class of haddock appeared promising and informal discussions between authorities led to a commitment by both the USA and Canada to limit harvesting and to use this potential towards rebuilding.

TRAC PROCESS

The success of these coordinated actions promoted an increased frequency of informal meetings between USA and Canadian authorities to discuss common concerns regarding transboundary resources. In 1998, the Transboundary Resource Assessment Committee was formed to realize efficiencies in conducting stock evaluations of transboundary resources and to ensure the advice was based on the best available combined information (see Attachment 3). The successful implementation of a joint review process served to emphasize the differences in fisheries management responses to the common perception of stock status. This stimulated concerted discussions regarding how to bring about consistent management for cod, haddock and yellowtail.

Early meetings were aimed at enhancing understanding of the respective fisheries management systems and processes (see Attachment 4). An initial concern was the divergent use of stock status evaluations and the timeliness of the provision of advice. For the USA, fishery management plans in any given year were based on stock status evaluations of the previous year, while for Canada, they were based on the stock status evaluation of the same year. This difference reflected differences in fishing years and in the duration of the public consultation process. A Timing Working Group was tasked with identifying the timeline options, beginning with the TRAC review process and ending with plan approval, which:

- make best use of available data;
- minimize differences in information used to draft plans by USA and Canada;
- consider operational concerns of industry;
- consider administrative constraints; and
- consider workload constraints.

The meeting was held in Portland, Maine on 16 December 1999 and several options were identified. Subsequent clarification of the mandate and further consultations resulted in refinement of the options. Full resolution of a preferred option was deferred until other aspects of consistent management were dealt with.

FORMATION OF TRANSBOUNDARY MANAGEMENT GUIDANCE COMMITTEE (TMGC)

Another concern was development of a management advisory process. The Working Group on Consistent Management of Transboundary Resources was tasked with recommending the institutional structures required for accomplishing this. These consultations culminated in the formation of the Transboundary Management Guidance Committee (TMGC) consisting of 6 members (two government and four industry) from each of Canada and the USA, to be co-chaired by members from each side and to provide non-binding guidance to the two parties. The final agreed Terms of Reference were:

1. Develop process for implementation of TMGC's recommendations.
2. Recommend F-based harvesting strategies that are consistent with USA and Canadian objectives.
3. Provide guidance on principles and options for determining a USA/Canadian resource sharing strategy.
4. Make recommendations for actual US and Canadian harvest levels.
5. Make other recommendations that are mutually beneficial to USA and Canadian fisheries.

In addition, it was also agreed to establish a common database for transboundary resources in the Gulf of Maine, covering as long a time period and as fine a spatial scale as reasonable, including:

(a) historical catch data;
(b) research vessel survey data; and
(c) biological information on migration patterns, spawning areas and nursery grounds.

SHARING PROPOSALS

A Technical Working Group of the TMGC was tasked with developing a pilot common database, with priority on cod, haddock and yellowtail. At the 14-15 May 2001 meeting of the TMGC, recommendations for refining the database were made, it was agreed that there was scope to develop a common USA/Canada F based harvest strategy and there were preliminary discussions on principles for sharing arrangements. Senior administrators then tasked the TMGC to complete the refinements to the database, simultaneously exchange proposals for sharing allocations and to follow with a meeting to discuss the proposals. Both the pilot database for cod, haddock and yellowtail (see Attachment 5) and initial sharing proposals (see Attachments 6 and 7) were completed in 2001.

At its 5-6 September 2001 meeting in Portland, Maine, the USA and Canada discussed each proposal. The key objective of the Canadian proposal involved a consistent management strategy with a uniform exploitation rate across the respective areas. Two key elements to determine resource shares were resource utilization and distribution. Canada identified the implementation of the ICJ boundary as an integral part of its proposal and noted that any utilization prior to 1985 was not considered. Utilization from 1985 - 2000 was only considered with weighting of 5% while resource distribution was 95%. The proposal considers either a combined stock complex of 5Z with the caveat of additional management measures, or the smaller stock component of 5Zjm for cod and haddock.

The USA proposal was based on the following four elements: 1) Time period: Selected based on anticipated stock distribution for rebuilt stocks. Stocks have wider distribution when near MSY; 2) Management unit: Considered the bank as a single management unit, resulting in a whole bank distribution and management unit scheme; 3) Weighting: Landings and surveys are considered equally important as proxies for resource distribution and historic dependence; and 4) Research investment element: Consider historic research investments, as recognized in international agreements. Offers very simple proxy using relative number of groundfish surveys.

Given the wide disparity in the resource distribution implied in both proposals, a sharing agreement based on distribution that was more sensitive to the rate of change was preferred to the two extreme proposals offered. The USA and Canada developed constructive suggestions to bridge the differences. The suggestions included:

- agreement on a technique to establish current trends in resource distribution (Attachment 8);
- combining and normalizing the results for resource utilization from the proposed USA time period and the proposed Canadian time period; and
- transition from roughly equal importance to resource utilization and resource distribution to greater importance given to resource distribution.

SHARING AGREEMENT

The 3-5 December meeting of TMGC in Halifax, Nova Scotia, explored these avenues and finally arrived upon an agreed proposal that they could recommend to administrators (see Attachment 9). As with any negotiated settlement, the agreed proposal is a compromise. The USA and Canada reached consensus to use 5Zjm as the management unit for cod and haddock, apply a responsive smoothing procedure, employ the average of three surveys for yellowtail flounder and haddock and the average of two seasons for cod, base landings on the 1967-1994 time period and incorporate a fixed 7-year transition schedule. As an additional consideration, as part of the sharing agreement, the USA and Canada reconfirmed that the two countries develop a common fishing mortality based harvest strategy for the shared management units.

The underlying motivation that fuelled the effort to reach an agreement was the recognition that each countries independent conservation actions could be compromised and that the full benefits of management actions were more likely to be realized if there was consistent management by the USA and Canada. Cod and haddock resources reached historic low abundance in the early to mid 1990s as a consequence of high fishing intensity from both Canada and USA when coordination of management was at its lowest ebb. Partly due to concerted actions by the USA and Canada during the 1990s, haddock has shown strong rebuilding. Cod has increased in abundance somewhat, but remains a concern (see Attachment 10). Continued efforts to pursue consistent management by the USA and Canada are needed. The proposal for a sharing allocation is a first step. The TMGC has been tasked with turning its attention to the remaining Terms of Reference.

Attachment 1. USA and Canadian Management Measures

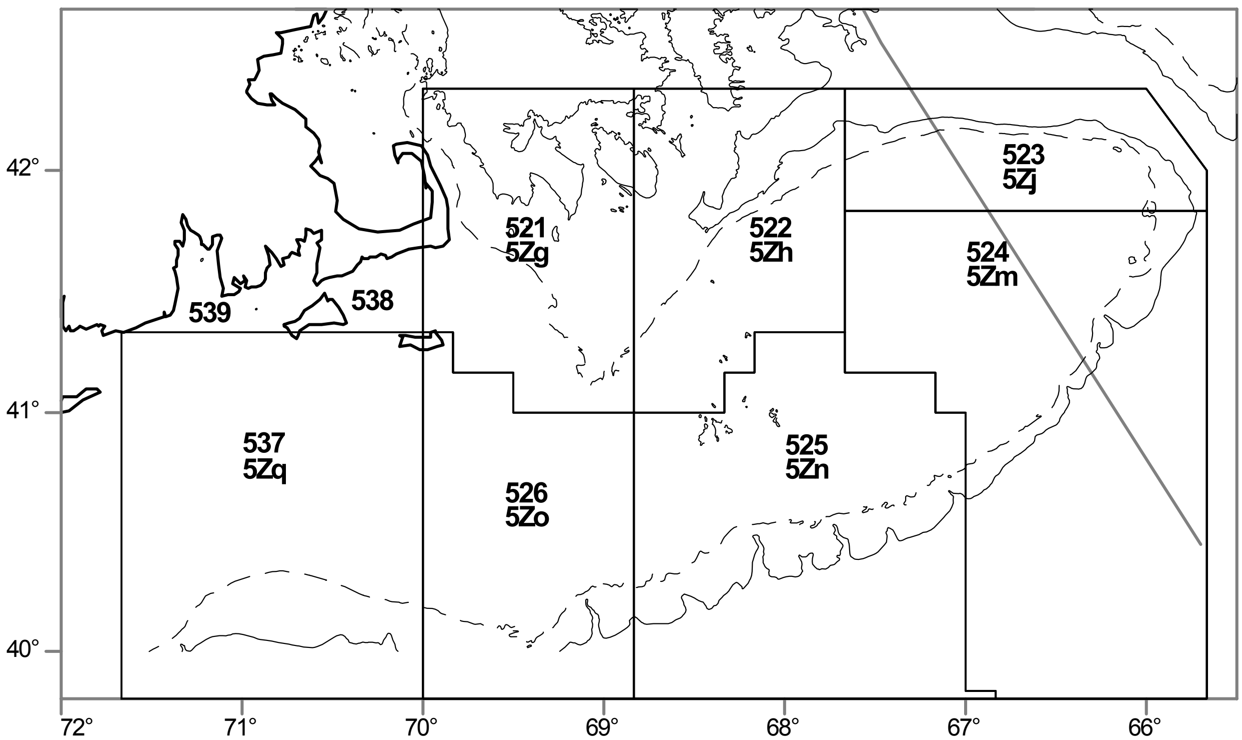
The USA fishery is almost exclusively conducted by larger mobile gear vessel in the 75' range using bottom otter trawl gear. Management has relied primarily on input controls such as area/season closures and mesh size regulation. All catch quota controls were eliminated in 1982 when the minimum landing size regulations were introduced. Further gear regulations were subsequently introduced in 1985. In 1994 the USA implemented effort control mechanisms to reduce fishing pressure on groundfish stocks. The key components of the effort control measures included a limited entry program and a days-at-sea (DAS) program, which reduced the amount of time a vessel owner can participate in the groundfish fishery. Additional measures such as additional DAS reductions, trip limits, and increased minimum mesh sizes have also been used.

The Canadian fishery is conducted primarily by inshore vessels less than 65' with the fixed gear (longline and gillnet) having the larger cod share while bottom otter trawl gear have higher haddock quotas. Management has relied primarily on output controls, principally catch quota management. Additional measures have included limited entry licensing, fleet allocations, mesh size/hook size regulation, area/season closures, third party 100% dockside monitoring to verify species and amounts landed, user pay at sea monitoring, minimum fish size through small fish protocol, mandatory reporting requirements and mandatory landing requirement (no discards).

The following table highlights the recent development of management measures.

	USA	**Canada**
1977-82	**Mesh** size of 5 1/8” (140 mm), seasonal spawning closures (1 March - 31 May), quotas and trip limits.	Catch **Quota** regulation, seasonal spawning closures (1 March - 31 May) .
1982-85	**All** catch controls eliminated, retained closed area and mesh size regulations, implemented minimum landings size (43 cm).	
1984 Oct.	**Implementation of the ‘Hague’ line .**	
1985	**5 ½”** mesh size,. **Areas** 1 and 2 closed during February-May.	
1989		**Combined** cod-haddock-pollock quota for 4X-5Zc
1990		**5Zjm** adopted as management unit for cod and haddock. **For** MG < 65 ft. – trip limits with a 30% by-catch of haddock to a maximum of 8 trips of 35,000 lbs. per trip between June 1 and Oct. 31 and 130 mm square mesh required. **Fixed** gear required to use large hooks until June
1991	**Established** overfishing definitions for haddock.	**MG** < 65 ft similar to 1990 but mesh size increased to 145 mm diamond.
1992		**Introduction** of ITQs for <65' OT and dockside monitoring.
1993	**Area** 2 closure in effect from Jan 1-June30.	**OT** fishery permitted to operate in Jan. and Feb. **Increase** in use square mesh.
1994	Jan.: **Expanded** Area 2 closure to include June and increased extent of area. **Area** 1 closure not in effect. **500** lb. trip limit. **Catch** data obtained from mandatory log books combined with dealer reports (replaces interview system). May: **6**” mesh restriction. Dec.: **Area** 1,2 closed year-round.	**Spawning** closure extended to Jan. 1 to May 31. **Fixed** gear vessels must choose between 5Z or 4X for the period of June to September. **Small** fish protocol. **Increased** at sea monitoring. **OT** > 65 could not begin fishing until July 1. **Predominantly** square mesh by end of year.
1995		**All** OT vessels using square mesh. **Fixed** gear vessels with a history since 1990 of 25t or more for 3 years of cod, haddock pollock, hake or cusk combined can participate in 5Z fishery. **ITQ** vessel require at least 2t of cod and 8t of haddock quota to fish Georges.
1996	July: **Additional** Days-at-Sea restrictions, trip limit raised to 1000 lbs.	**Fixed** gear history requirement dropped.
1997	May: **Additional** scheduled Days-at-sea restrictions. September: **Trip** limit raised to 1000 lbs./day, maximum of 10,000 lbs./trip.	**Vessels** over 65 ft operated on enterprise allocations, otter trawlers under 65 ft on individual quotas, fixed gear vessels 45-65 ft on self-administered individual quotas and fixed gear vessels under 45 ft on community quotas administered by local boards.
1998	Sept. 1: **Trip** limit raised to 3000 lbs./day, maximum of 30,000 lbs./trip.	**Fixed** gear vessels 45-65 ft operated on individual quotas.
1999	May 1: Trip limit 2,000 lbs./day, max. 20,000 lbs./trip. Square mesh size increased to 6.5” (diamond is 6”). June 15: Scallop exemption fishery in Closed Area II. Nov. 5: Trip limit 5,000 lbs./day, max. 50,000 lbs./trip. Nov. 15: New overfishing definitions and harvest control rules to comply with Sustainable Fisheries Act.	Same as 1997 and 1998.
2000	October: Daily trip limit suspended to April 2001but retained max. trip limit of 50,000 lbs./trip.	Same as 1999.

Attachment 2. USA/Canada Statistical Management Units



Note: Unit areas 523 and 524 have been re-designated in the USA statistical system as 551, 552, 561 and 562, subsequent to 1984 to respect the boundary.

Attachment 3. Description of TRAC Process

INTRODUCTION

Since the termination of ICNAF in 1977, Canada and the USA have independently developed peer review processes for their stock assessments. In Canada, in late 1992, the Canadian Atlantic Fisheries Scientific Advisory Committee (CAFSAC) was disbanded and the Regional Advisory Process (RAP) put in its place. RAP in the Maritimes Region currently provides advice on about 120 marine and freshwater finfish, shellfish and marine plant resources in the DFO Maritimes Region. In the Northeast Region of the National Marine Fisheries Service (NMFS), the Stock Assessment Workshop (SAW) series was initiated in 1985. The SAW process currently provides advice on about 44 marine finfish and shellfish resources in the Northeast Region of NMFS.

Collaboration between Canada and the USA on stock assessments and related research has been strong. Regular scientific meetings are held to co-ordinate joint research programs and facilitate inter-lab communication. Protocols for routine data exchange, particularly commercial and survey, have been established and joint work on assessment related issues is common. Finally, participation in each other's peer review process is routine.

The 1996 Canada/USA Scientific Discussions noted that it would be desirable to conduct joint assessments of the Georges Bank groundfish stocks during the 1997 assessment cycle. Thus in April 1997, scientists from Canada and the USA combined efforts to prepare assessments of Georges Bank cod, haddock, and yellowtail flounder. The peer review of these assessments was subsequently conducted first by RAP in Canada and then by the SAW Stock Assessment Review Committee (SARC) in the USA. Upon completion of the 1997 process, it was evident that there would be efficiencies realized by eliminating the duplication in the peer review process. This would also ensure that RAP and SARC would not produce divergent and inconsistent status reports on these stocks.

In the fall of 1997, discussions were initiated between the two countries to define a joint peer review process. The Transboundary Resources Assessment Committee, or TRAC, is the result of these discussions. The TRAC process is outlined in the following Sections.

THE JOINT PEER REVIEW PROCESS

There has been close interaction between Canada and the USA on 5Z cod, haddock, and yellowtail flounder. To date, these stocks have been the principal focus of the new process, although other "transboundary" resources in the Georges Bank - Gulf of Maine region may be considered in future years.

Structure of the Peer Review

Transboundary Assessment Working Group

The Transboundary Assessment Working Group (TAWG) includes Canadian and USA scientists with a range of backgrounds and thus is multidisciplinary in nature. As well, industry participation from both countries are encouraged. Its mandate is to:

- analyze pertinent assessment information and produce stock assessments on identified stocks; and
- formulate research recommendations which will lead to long-term improvements in the assessments.

Meetings of the TAWG are arranged on a mutually agreed basis by both countries. The TAWG is co-chaired by a stock assessment scientist from each country. Annual meetings will be held alternately in Canada and the USA to prepare assessments and to address other issues as requested by the TRAC.

Transboundary Resources Assessment Committee

The Transboundary Resources Assessment Committee (TRAC) has been established to peer review stock assessments produced by the TAWG. The TRAC is distinct from RAP and SARC. The Committee is co-chaired by representatives from Canada and the USA who are responsible for all logistical arrangements associated with TRAC meetings (e.g., dates, venue, participation).

As for the TAWG, the TRAC will alternate its venue between Canada and the USA. The TRAC is responsible for producing final, approved assessments and resulting documentation on the status of the transboundary resources.

Participation is by invitation and will include stock assessment scientists, fisheries managers, and industry representatives from both countries. While there are currently no limitations on numbers of participants it is likely that 10-15 participants from both countries will attend future meetings.

TRAC Coordination

The RAP and SARC Chairs, with the guidance of their respective steering committees, oversee the activities of the TRAC and TAWG.

Management Advice and Public Meetings

Once the TRAC review process has completed its deliberations, the results may be used by either country for fisheries management purposes as appropriate e.g., preparation of management advice in Canada by the Fisheries Resource Conservation Council (FRCC) and in the USA by the Multispecies Monitoring Committee (MMC). Each country may conduct independent consultations with clients or disseminate the information to the public, informing the other side as required.

Stock Status/Advisory Documents

The purpose of the joint Canada/USA stock assessment process for transboundary resources is only to produce and peer review assessments of stocks of mutual interest and not to prepare management advice. The assessment results from this joint process will be used by each country for their respective fisheries management purposes. The document series currently employed by each country to convey a brief summary of stock status and management advice for individual stocks (i.e., the DFO Stock Status Report series in Canada and the SAW Advisory Report on Stock Status in the USA) will continue to be used for those purposes in each country. In addition, more comprehensive research reports will be produced for the Canadian Research Document Series under the auspices of the Canadian Stock Assessment Secretariat and the USA NEFSC Research Reference Document series.

Attachment 4. Summary of Current Management Systems and Processes

In Canada, the Department of Fisheries and Oceans will advise the Minister of Fisheries and Oceans of the findings of this group. The Minister will also be advised of the results of the TRAC process, which identifies the consequences of alternative harvest levels on F and biomass reference points (taking uncertainty into account). Additionally, the FRCC provides advice to the Minister based on their review of the available science and their consideration of stock objectives, including an exploitation rate, spawning stock biomass threshold, and expectations of rate of increase in biomass. The Minister will consider these findings to establish an appropriate harvest level for each stock. While there is an F reference point (usually $F_{0.1}$), neither F nor the TAC is prescribed by the scientific analysis. The Minister usually makes his recommendation in May for a fishing year beginning in June.

In the USA, the New England Fishery Management Council will be advised of the Steering Group recommendations. The Council will consider this information during their annual meetings to establish the TAC and management measures for the subsequent fishing year. For cod, haddock, and yellowtail flounder, the fishing year runs from May through April, and the annual management measures are discussed at two meetings starting in November. At the November meeting, the Council receives the recommendations of the Multispecies Monitoring Committee (MMC). The MMC reviews the effectiveness of the previous year’s management measures and considers the TRAC and other stock assessment results, and makes recommendations on the appropriate target TACs and management measures necessary to constrain fishing effort to the allowable F. The F is prescribed by the Northeast Multispecies Fishery Management Plan.

Attachment 5.

Pilot Summary: Common Database for Transboundary Resources in the Gulf of Maine and Georges Bank Area

Prepared by : Technical Group of the Transboundary Management Guidance Committee

Terms of Agreement

There was agreement that USA and Canadian scientists should develop a common database regarding transboundary resources for the Transboundary Management Guidance Committee (TMGC). The following Terms of Agreement were accepted for the technical group:

For transboundary resources, establish a common database covering as long a time period and as fine a spatial scale as reasonable, including:

(a) historical catch data
(b) research vessel survey data
(c) biological information on migration patterns, spawning areas and nursery grounds

A general database of historical catch data, and perhaps research vessel survey data, will be prepared for transboundary resources for which data are available. The USA and Canada then need to come to agreement on issues such as data gaps, data sources, interpretations, limitations, etc. Data regarding Transboundary Resource Assessment Committee (TRAC) species have already been processed as part of the TRAC process and are ready to be compiled in a more detailed "pilot" database. Therefore, TRAC species (cod, haddock, yellowtail, and, soon, herring) will be given priority by the Technical Working Group. The availability and quality of data in the broad database may indicate which additional species on Georges Bank require transboundary management.

Introduction

On 5 May 2001 the TMGC was provided with a pilot database of fisheries and bottom trawl survey information for cod, haddock and yellowtail. At the 13-16 May 2001 meetings of the TMGC and the Steering Group, while database limitations were recognized, it was agreed that this database offered a suitable basis for considerations regarding consistent management. To facilitate such considerations, further summarization and compilation were requested. Specifically,

- Summarize the catch data for cod, haddock and yellowtail as annual totals by Canada and USA.
- For cod and haddock, the catches should be provided for 2 zones, eastern Georges Bank (5Zej and 5Zem or 523 and 524) and western Georges Bank (the remainder of 5Z); it is understood that after 1984, the USA and Canadian catches from eastern Georges Bank were taken on the respective sides of the boundary.
- Estimate the biomass index for strata sections that are partitioned by the international boundary and, for cod and haddock, also by the 5Zej and 5Zem unit area boundaries.
- Summarize the biomass indices by Canada and USA sides of the boundary for each survey for Georges Bank (all of 5Z).
- For cod and haddock, summarize the biomass indices by Canada and USA sides of the boundary for each survey for eastern Georges Bank (5Zej and 5Zem or 523 and 524).
- Interpret any seasonal and annual variations in the biomass distribution.

This document should be considered an adjunct to the pilot database provided on 5 May 2001. Accordingly, figures and tables in that document are not reproduced here.

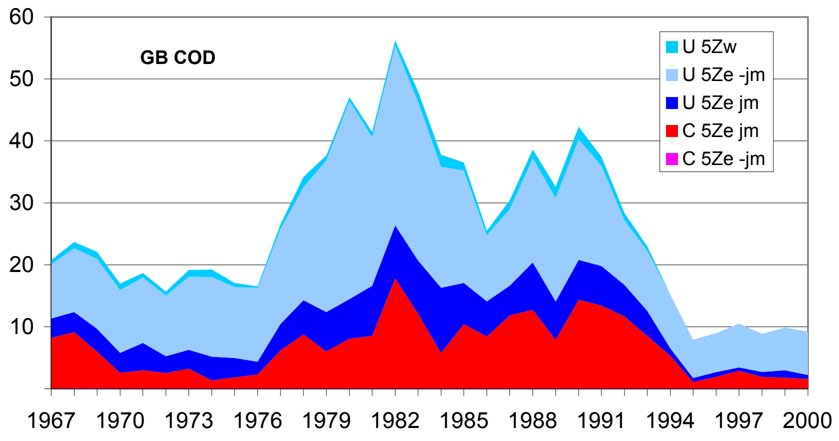
Notes

These notes are intended to assist interpretation of results.

- There are slight differences between the NMFS area 524 and the DFO area 5Zm boundaries.
- For 5Ze jm haddock results, DFO stratum 5Z8 and NMFS strata 29 and 30 were not included as per the assessment.
- For missing strata or strata sections, density and distribution patterns from adjacent areas and years were used to estimate values. This procedure required judgement, however, the biomass contributed by the missing strata or strata sections was generally small and should not unduly influence results.
- Discrepancies in resolution between GIS software and coded strata/area may introduce some minor distortions, but these should not significantly influence results.
- Caveats, footnotes and qualifications given for the 5 May 2001 pilot database also apply here.

Cod in Div. 5Z
Fishery Landings

	Canada			USA				Total
	5Ze -jm	5Ze jm	Total	5Ze -jm	5Ze jm	5Zw	Total	
1967	40	8188	8228	8723	3115	684	12522	20749
1968	76	9055	9131	10300	3244	1027	14572	23703
1969	111	5876	5987	11276	3676	1143	16094	22081
1970	4	2580	2583	10140	3211	1048	14398	16981
1971	29	2950	2979	10613	4389	702	15704	18682
1972	11	2535	2545	9769	2708	675	13151	15697
1973		3222	3222	11783	3064	1093	15940	19162
1974	4	1370	1373	12857	3792	1220	17869	19242
1975	12	1833	1845	11484	3108	636	15228	17073
1976	8	2320	2328	11901	2037	275	14214	16542
1977	17	6156	6173	15320	4256	770	20346	26519
1978		8777	8777	18285	5502	1631	25418	34195
1979		5979	5979	24505	6408	781	31694	37673
1980	1	8065	8066	31947	6418	643	39008	47074
1981	10	8498	8508	23987	8092	850	32928	41436
1982	2	17825	17827	28950	8565	859	38374	56201
1983		12131	12131	25574	8573	1750	35896	48028
1984		5761	5761	19500	10551	1953	32004	37765
1985		10442	10442	18162	6641	1267	26071	36513
1986		8411	8411	10651	5697	731	17079	25490
1987		11844	11844	12370	4793	1429	18592	30436
1988	0	12740	12740	16813	7645	1436	25894	38634
1989		7895	7895	16744	6182	1810	24736	32631
1990		14364	14364	19452	6414	2064	27930	42295
1991	3	13459	13462	16145	6353	1465	23963	37425
1992		11673	11673	10431	5080	1189	16700	28373
1993		8524	8524	9670	4027	752	14448	22972
1994	0	5278	5278	8664	1229		9893	15171
1995	1	1099	1100	6148	638		6786	7886
1996	6	1921	1926	6288	757		7045	8971
1997		2919	2919	7039	551		7590	10509
1998	14	1893	1907	6113	828		6941	8848
1999	0	1818	1818	6911	1151		8062	9880
2000		1572	1572	6955	662		7617	9189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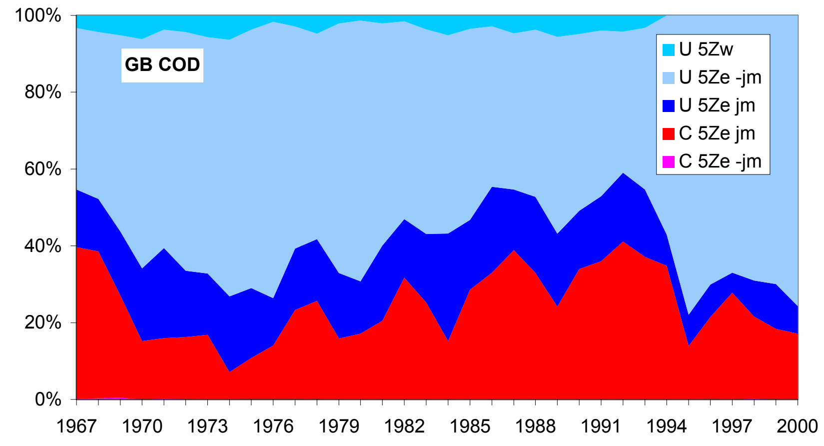
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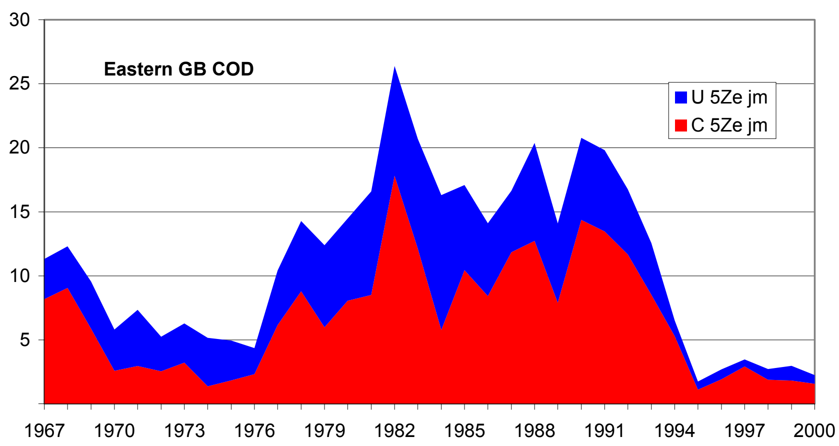
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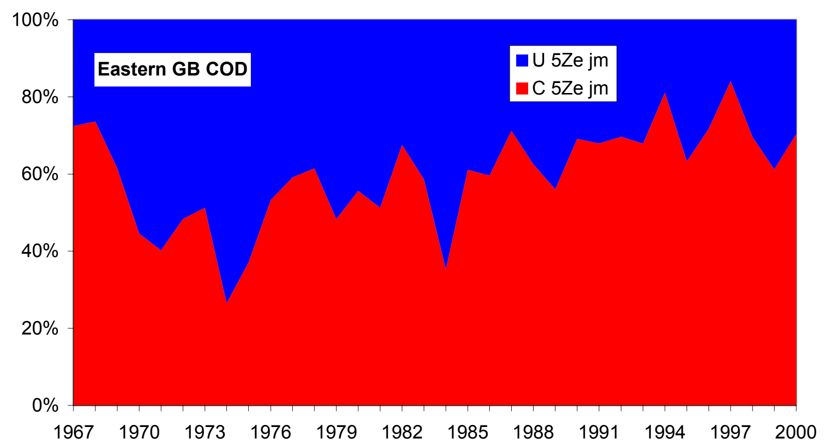
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1967 1970 1973 1976 1979 1982 1985 1988 1991 1994 1997 2000
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C 5Ze jm

Surveys

NMFS spring biomass index

	5Z					5Zjm				
	CAN	USA	TOTAL	%CAN	%USA	CAN	USA	TOTAL	%CAN	%USA
1968	2451	16663	19114	13	87	2451	4640	7091	35	65
1969	4278	22869	27147	16	84	4278	7623	11902	36	64
1970	5280	17498	22777	23	77	5280	2441	7721	68	32
1971	4890	16970	21860	22	78	4890	5830	10720	46	54
1972	6645	21486	28131	24	76	6645	6518	13163	50	50
1973	15035	130370	145405	10	90	15035	70212	85247	18	82
1974	14370	39883	54252	26	74	14370	11733	26102	55	45
1975	4008	36015	40023	10	90	4008	29382	33390	12	88
1976	3402	24859	28261	12	88	3402	13032	16434	21	79
1977	4391	18106	22497	20	80	4391	4966	9357	47	53
1978	12375	32354	44729	28	72	12375	7129	19505	63	37
1979	7885	15957	23842	33	67	7885	4148	12033	66	34
1980	11805	24004	35809	33	67	11805	8865	20670	57	43
1981	5137	34344	39480	13	87	5137	11391	16528	31	69
1982	125717	11588	137305	92	8	125717	3972	129689	97	3
1983	8963	27380	36343	25	75	8963	10258	19221	47	53
1984	2240	21132	23372	10	90	2240	7500	9740	23	77
1985	11747	17949	29696	40	60	11747	7088	18835	62	38
1986	7817	17863	25680	30	70	7817	4751	12568	62	38
1987	4444	10927	15371	29	71	4444	2856	7301	61	39
1988	6432	14354	20787	31	69	6432	2942	9374	69	31
1989	4923	9679	14602	34	66	4923	3008	7931	62	38
1990	6068	10931	16999	36	64	6068	2110	8178	74	26
1991	4499	8643	13143	34	66	4499	2748	7248	62	38
1992	4296	6219	10516	41	59	4296	862	5159	83	17
1993	2380	7660	10041	24	76	2380	3451	5831	41	59
1994	752	1066	1818	41	59	752	318	1070	70	30
1995	8026	4064	12090	66	34	8026	1154	9180	87	13
1996	3419	8056	11475	30	70	3419	2803	6222	55	45
1997	2214	5696	7910	28	72	2214	1355	3569	62	38
1998	12168	7184	19351	63	37	12168	531	12699	96	4
1999	2858	4555	7413	39	61	2858	2552	5409	53	47
2000	3691	9373	13064	28	72	3691	3965	7655	48	52

NMFS fall biomass index

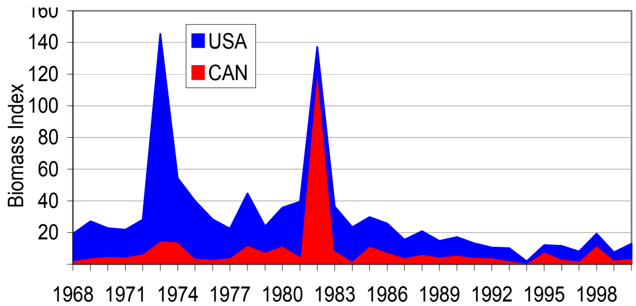
	5Z					5Zjm				
	CAN	USA	TOTAL	%CAN	%USA	CAN	USA	TOTAL	%CAN	%USA
1963	8968	18895	27862	32	68	8968	7287	16255	55	45
1964	6864	9967	16831	41	59	6864	1840	8703	79	21
1965	2110	15384	17494	12	88	2110	295	2405	88	12
1966	3021	8868	11889	25	75	3021	859	3880	78	22
1967	3793	16915	20708	18	82	3793	6682	10475	36	64
1968	2087	10780	12867	16	84	2087	1236	3323	63	37
1969	1723	10886	12609	14	86	1723	893	2616	66	34
1970	1674	17581	19256	9	91	1674	3306	4980	34	66
1971	2314	12952	15266	15	85	2314	3285	5599	41	59
1972	2639	32106	34746	8	92	2639	953	3592	73	27
1973	4886	42503	47388	10	90	4886	7128	12013	41	59
1974	2807	9594	12401	23	77	2807	1227	4034	70	30
1975	3513	17317	20830	17	83	3513	1112	4625	76	24
1976	4824	21985	26809	18	82	4824	1367	6191	78	22
1977	4050	15360	19410	21	79	4050	4407	8456	48	52
1978	6756	28602	35358	19	81	6756	3333	10089	67	33
1979	8957	17357	26315	34	66	8957	3336	12293	73	27
1980	2585	7811	10396	25	75	2585	1385	3970	65	35
1981	5431	26386	31817	17	83	5431	1495	6926	78	22
1982	1286	7965	9251	14	86	1286	648	1934	67	33
1983	1751	9575	11326	15	85	1751	288	2039	86	14
1984	5423	8549	13972	39	61	5423	244	5668	96	4
1985	2313	2444	4757	49	51	2313	10	2323	100	0
1986	1187	4304	5491	22	78	1187	848	2035	58	42
1987	2006	4465	6471	31	69	2006	217	2223	90	10
1988	4799	2264	7063	68	32	4799	38	4837	99	1
1989	3451	2890	6341	54	46	3451	33	3484	99	1
1990	3989	13248	17237	23	77	3989	12	4001	100	0
1991	322	1808	2129	15	85	322	0	322	100	0
1992	1784	3011	4795	37	63	1784	105	1889	94	6
1993	361	2835	3196	11	89	361	0	361	100	0
1994	1997	2873	4870	41	59	1997	7	2004	100	0
1995	1392	7150	8542	16	84	1392	95	1487	94	6
1996	1284	2545	3829	34	66	1284	66	1350	95	5
1997	1342	1520	2862	47	53	1342	0	1342	100	0
1998	2001	2061	4061	49	51	2001	0	2001	100	0
1999	748	3782	4530	17	83	748	22	770	97	3
2000	778	1184	1962	40	60	778	0	778	100	0

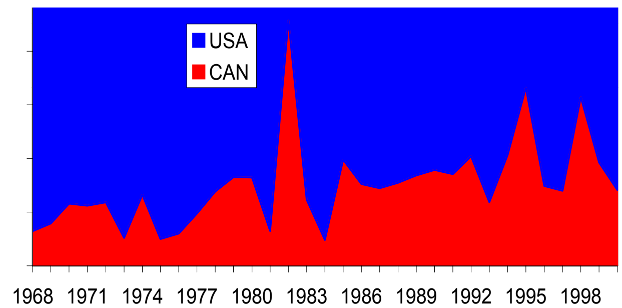
DFO biomass index

	5Z					5Zjm				
	CAN	USA	TOTAL	%CAN	%USA	CAN	USA	TOTAL	%CAN	%USA
1987	7381	11072	18453	40	60	7381	1443	8824	84	16
1988	14821	14801	29622	50	50	14821	4631	19452	76	24
1989	10704	19666	30371	35	65	10704	3842	14547	74	26
1990	50608	24044	74653	68	32	50608	6057	56665	89	11
1991	19601	23145	42746	46	54	19601	5467	25068	78	22
1992	9689	21436	31125	31	69	9689	4892	14581	66	34
1993	10146	22578	32724	31	69	10146	6399	16545	61	39
1994	12638	7290	19928	63	37	12638	502	13140	96	4
1995	4197	8511	12708	33	67	4197	3921	8118	52	48
1996	23581	15287	38868	61	39	23581	8594	32174	73	27
1997	7714	8538	16252	47	53	7714	3290	11004	70	30
1998	4423	3838	8262	54	46	4423	583	5006	88	12
1999	7092	5151	12243	58	42	7092	2086	9178	77	23
2000	22174	14453	36627	61	39	22174	10123	32297	69	31
2001	17062	2785	19847	86	14	17062	975	18037	95	5

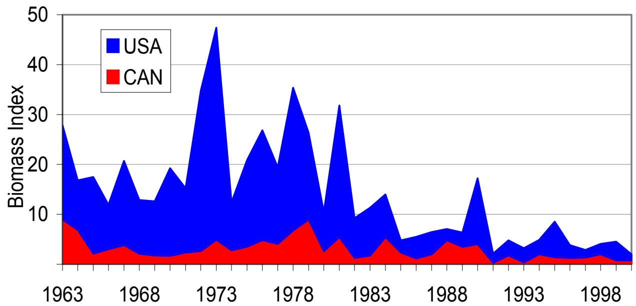
5Z

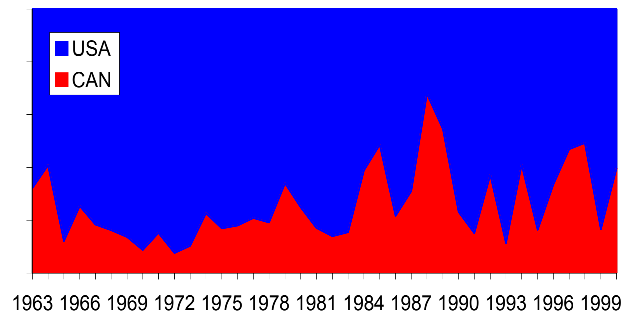
NMFS spring





NMFS fall





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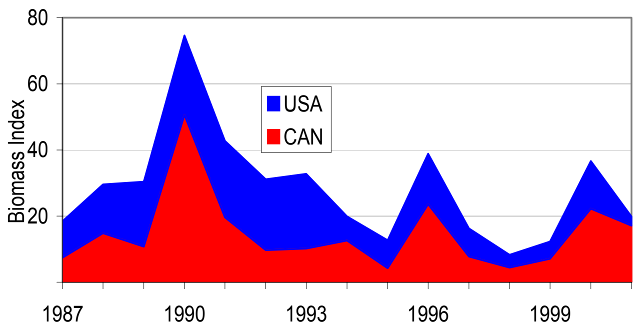
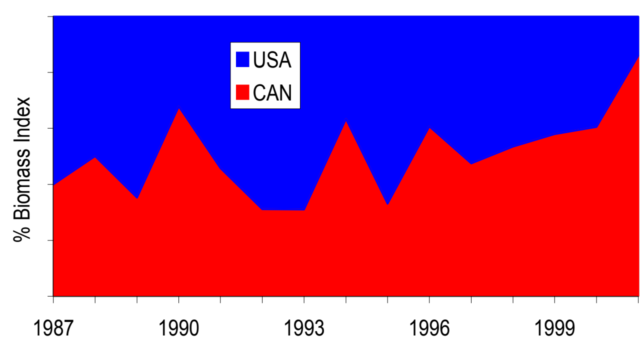
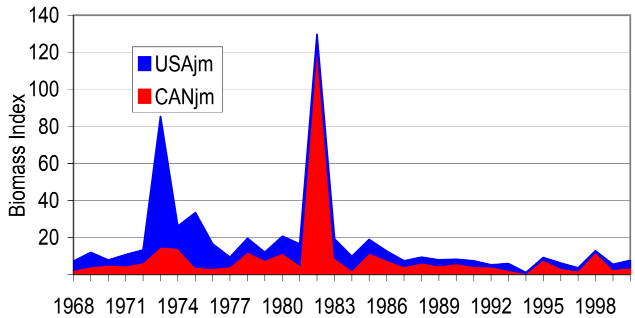
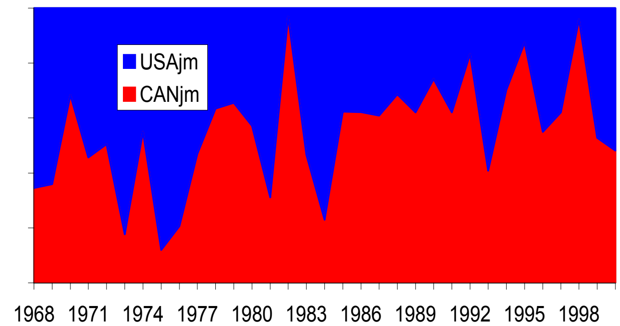




5Zjm

NMFS spring





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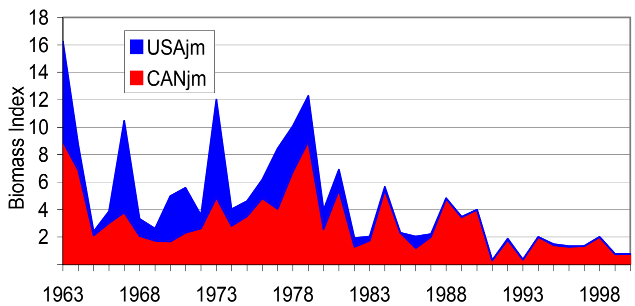

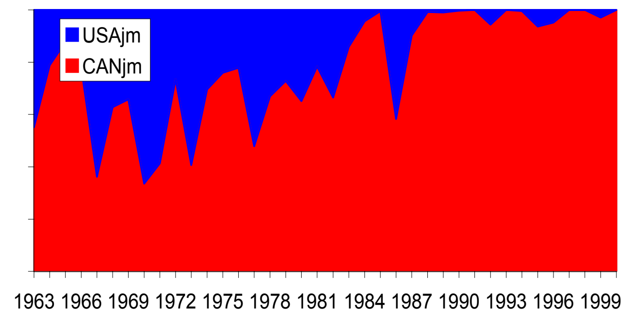

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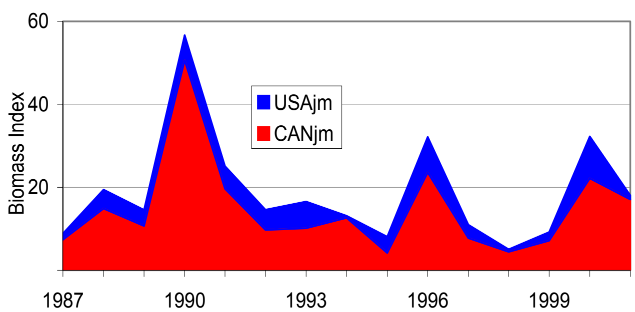

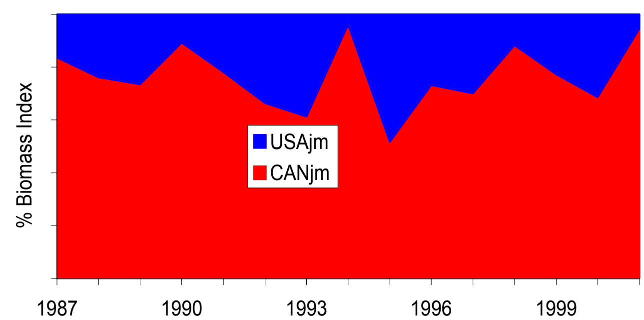

Haddock in Div. 5Z
Fishery Landings

	Canada			USA				Total
	5Ze -jm	5Ze jm	Total	5Ze -jm	5Ze jm	5Zw	Total	
1967	38	12999	13037	22668	11999	37	34703	47741
1968	127	9195	9323	17554	7646	244	25445	34768
1969	48	3941	3989	9829	6621	15	16464	20453
1970	8	1970	1978	5249	3154	9	8411	10389
1971	21	1610	1630	3769	3533	8	7310	8940
1972		609	609	2325	1551	5	3881	4489
1973		1565	1565	1389	1396	3	2788	4353
1974		462	462	1450	955	2	2407	2869
1975		1353	1353	2264	1705	17	3986	5339
1976	2	1362	1364	1919	974	2	2895	4259
1977	38	2871	2909	5474	2428	6	7908	10817
1978		9968	9968	7376	4724	15	12115	22083
1979		5080	5080	9007	5212	12	14231	19311
1980	6	10017	10023	11765	5615	14	17395	27418
1981	1	5658	5659	10054	9075	16	19146	24804
1982		4872	4872	6296	6280	35	12611	17483
1983		3208	3208	4215	4453	13	8682	11890
1984		1463	1463	3680	5120	5	8805	10268
1985		3484	3484	2583	1684	5	4272	7756
1986		3415	3415	1124	2201	15	3340	6755
1987		4703	4703	736	1418	1	2156	6859
1988		5941	5941	797	1694	0	2492	8433
1989		3060	3060	645	785	0	1430	4490
1990	0	3340	3340	810	1188	6	2005	5344
1991	1	5423	5424	461	931	3	1395	6819
1992		4090	4090	373	1629	3	2005	6095
1993		3725	3725	262	424	1	687	4412
1994		2412	2412	185	32		217	2629
1995	1	2062	2063	197	22		219	2282
1996	0	3666	3666	279	35		314	3980
1997		2749	2749	839	47		886	3635
1998	19	3362	3381	1529	311		1840	5221
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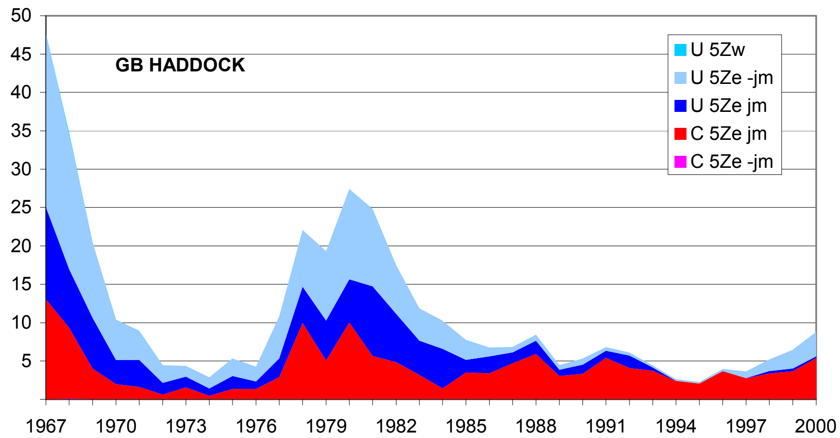
GB HADDOCK
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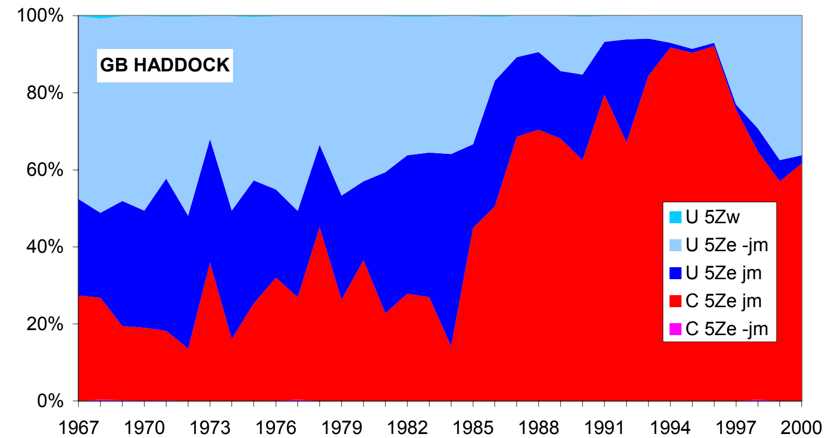
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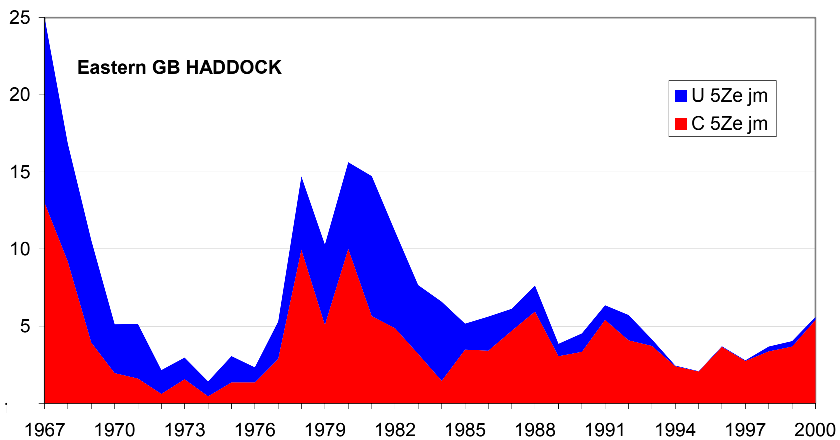
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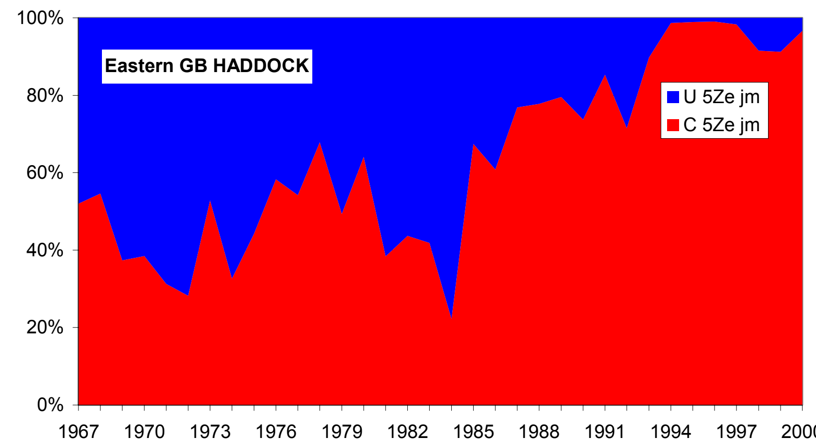
Eastern GB HADDOCK
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Surveys

NMFS spring biomass index

	5Z					5Zjm				
	CAN	USA	TOTAL	%CAN	%USA	CAN	USA	TOTAL	%CAN	%USA
1968	7267	31855	39123	19	81	6367	10642	17010	37	63
1969	4313	28091	32405	13	87	3664	13797	17461	21	79
1970	3263	42319	45582	7	93	3263	38474	41736	8	92
1971	2260	6920	9180	25	75	1798	2561	4359	41	59
1972	4412	9351	13764	32	68	4256	2151	6407	66	34
1973	6752	20640	27392	25	75	6752	4116	10868	62	38
1974	14042	15195	29237	48	52	14042	5052	19094	74	26
1975	15171	8649	23820	64	36	15171	5273	20444	74	26
1976	2887	27624	30510	9	91	2887	2961	5848	49	51
1977	17046	26475	43521	39	61	17046	2771	19817	86	14
1978	21352	41748	63101	34	66	21119	9531	30650	69	31
1979	15294	20369	35664	43	57	15294	5137	20432	75	25
1980	25985	82526	108511	24	76	25985	48036	74021	35	65
1981	21326	52751	74078	29	71	21073	25642	46716	45	55
1982	12594	11908	24502	51	49	12450	6112	18562	67	33
1983	10559	18585	29144	36	64	10559	2741	13300	79	21
1984	5541	8396	13937	40	60	5276	5166	10442	51	49
1985	12898	4635	17533	74	26	12686	1974	14659	87	13
1986	8197	3324	11522	71	29	8197	1578	9775	84	16
1987	7856	3162	11019	71	29	7856	1250	9107	86	14
1988	2419	4103	6522	37	63	2419	3255	5674	43	57
1989	4279	6508	10788	40	60	4193	5929	10122	41	59
1990	10273	2398	12671	81	19	10238	1645	11882	86	14
1991	6067	1591	7658	79	21	6067	1012	7079	86	14
1992	1986	741	2728	73	27	1986	536	2522	79	21
1993	4214	767	4981	85	15	4214	266	4481	94	6
1994	6455	638	7093	91	9	6446	19	6464	100	0
1995	4881	3709	8590	57	43	4881	3119	8000	61	39
1996	2313	46273	48586	5	95	2026	12362	14388	14	86
1997	4622	30120	34741	13	87	3237	273	3510	92	8
1998	7463	3125	10588	70	30	7024	859	7883	89	11
1999	5511	9861	15372	36	64	5487	6420	11907	46	54
2000	4229	29429	33658	13	87	4138	5626	9764	42	58

NMFS fall mean biomass index

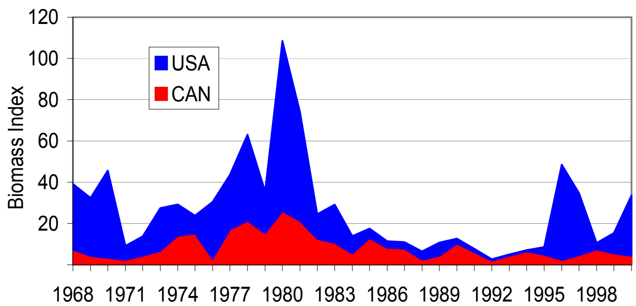
	5Z					5Zjm				
	CAN	USA	TOTAL	%CAN	%USA	CAN	USA	TOTAL	%CAN	%USA
1963	30080	124537	154617	19	81	15814	41832	57646	27	73
1964	13219	173467	186686	7	93	9986	63275	73261	14	86
1965	20068	119224	139293	14	86	14047	25056	39103	36	64
1966	14296	40199	54495	26	74	9115	17100	26216	35	65
1967	4340	44486	48826	9	91	3005	6080	9085	33	67
1968	14543	17965	32508	45	55	9188	92	9280	99	1
1969	1482	14280	15763	9	91	333	3633	3967	8	92
1970	4331	21878	26209	17	83	3149	9223	12372	25	75
1971	3027	7241	10268	29	71	1272	2819	4091	31	69
1972	4915	11843	16758	29	71	2076	223	2299	90	10
1973	12458	8003	20460	61	39	10169	83	10251	99	1
1974	2467	5186	7654	32	68	1279	341	1620	79	21
1975	29244	4257	33501	87	13	2835	1022	3857	74	26
1976	57754	10753	68507	84	16	55381	152	55534	100	0
1977	36839	16275	53114	69	31	31628	827	32455	97	3
1978	24057	14431	38487	63	37	11010	737	11747	94	6
1979	17917	45858	63775	28	72	7171	3143	10314	70	30
1980	20342	21551	41893	49	51	7002	974	7977	88	12
1981	12497	14825	27322	46	54	8705	1467	10172	86	14
1982	7639	5105	12744	60	40	6305	316	6621	95	5
1983	3147	6790	9936	32	68	2431	357	2788	87	13
1984	5408	2119	7526	72	28	2632	152	2784	95	5
1985	4088	2624	6712	61	39	2195	504	2698	81	19
1986	8852	1605	10457	85	15	6321	16	6337	100	0
1987	3863	479	4342	89	11	911	22	933	98	2
1988	7361	956	8318	89	11	5224	50	5274	99	1
1989	8569	1416	9985	86	14	4257	66	4323	98	2
1990	4444	202	4645	96	4	2842	51	2893	98	2
1991	1403	393	1795	78	22	831	28	858	97	3
1992	3444	1552	4996	69	31	1077	179	1256	86	14
1993	5771	969	6739	86	14	4846	0	4846	100	0
1994	5374	738	6112	88	12	1793	0	1793	100	0
1995	14858	6892	21750	68	32	14005	4	14009	100	0
1996	4716	1564	6280	75	25	4012	10	4022	100	0
1997	9789	2615	12403	79	21	6149	15	6163	100	0
1998	7909	2028	9937	80	20	6406	51	6456	99	1
1999	23968	36947	60916	39	61	16184	0	16184	100	0
2000	15863	13167	29031	55	45	12795	100	12895	99	1

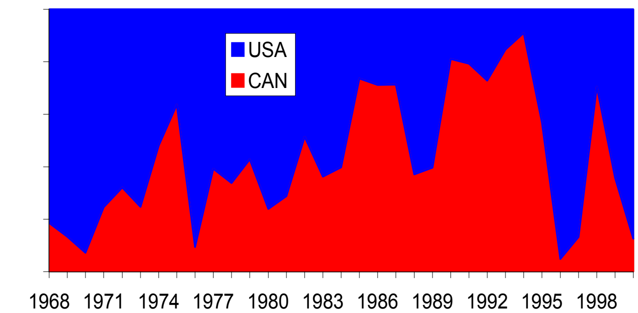
DFO biomass index

	5Z					5Zjm				
	CAN	USA	TOTAL	%CAN	%USA	CAN	USA	TOTAL	%CAN	%USA
1987	15617	1990	17608	89	11	15617	475	16092	97	3
1988	17909	7308	25217	71	29	17909	8401	26310	68	32
1989	10359	2354	12713	81	19	10359	839	11198	93	7
1990	19907	10607	30513	65	35	19907	7579	27485	72	28
1991	16680	15798	32478	51	49	16680	10643	27323	61	39
1992	13946	9751	23697	59	41	13946	6530	20476	68	32
1993	4432	6775	11206	40	60	4432	2521	6953	64	36
1994	18839	2318	21157	89	11	18839	108	18947	99	1
1995	20285	2280	22565	90	10	20285	336	20621	98	2
1996	21933	6433	28365	77	23	21933	1279	23212	94	6
1997	12875	9313	22188	58	42	12875	1476	14351	90	10
1998	45167	1494	46661	97	3	45167	99	45267	100	0
1999	29996	1316	31312	96	4	29996	825	30821	97	3
2000	46205	53086	99291	47	53	46205	11206	57411	80	20
2001	53225	5191	58416	91	9	53225	2535	55760	95	5

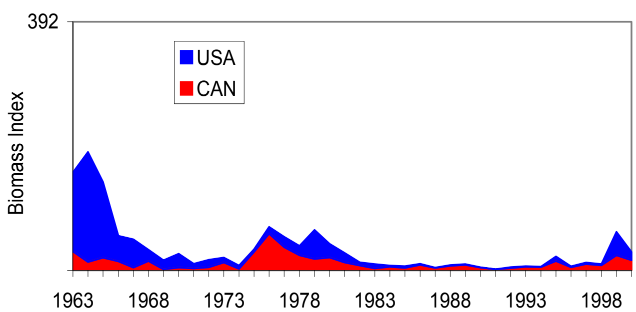
5Z

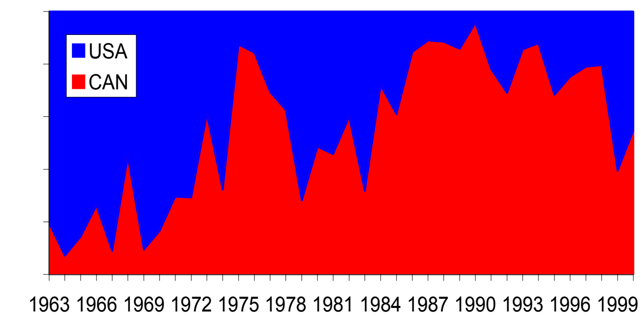
NMFS spring



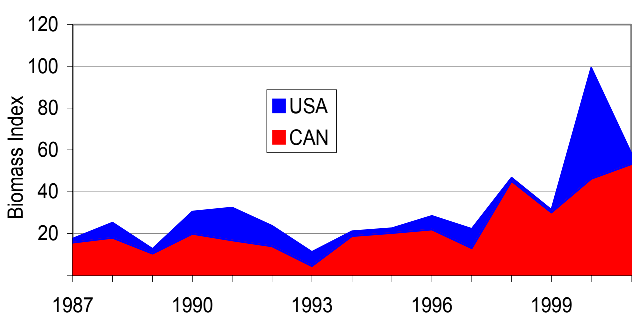


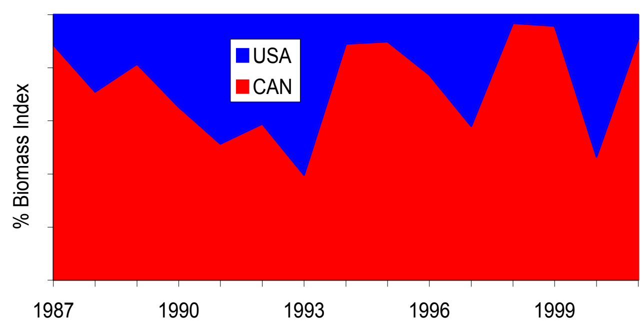
NMFS fall





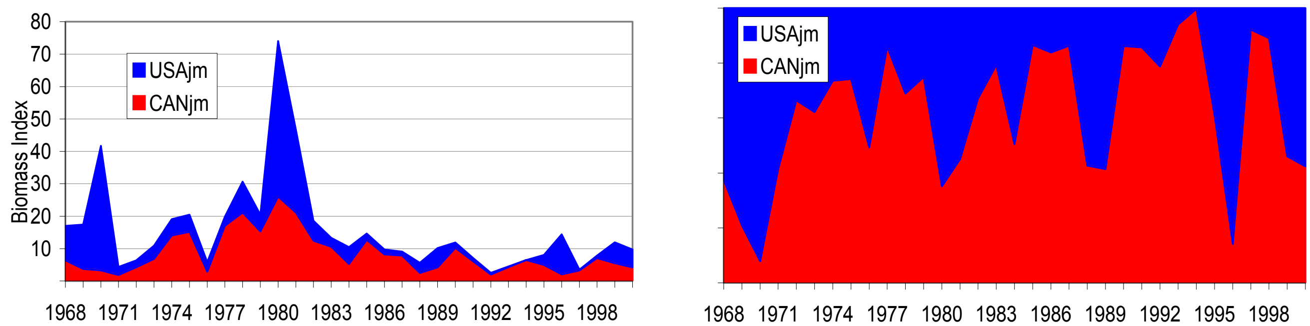
DFO



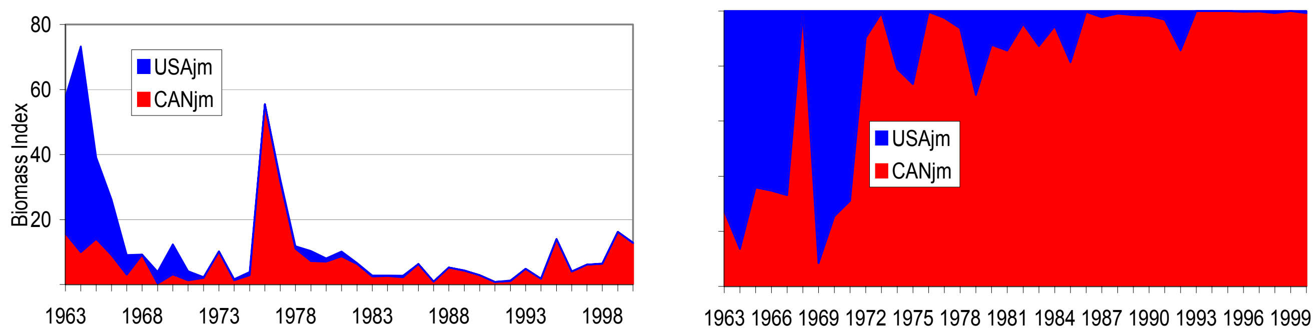


5Zjm

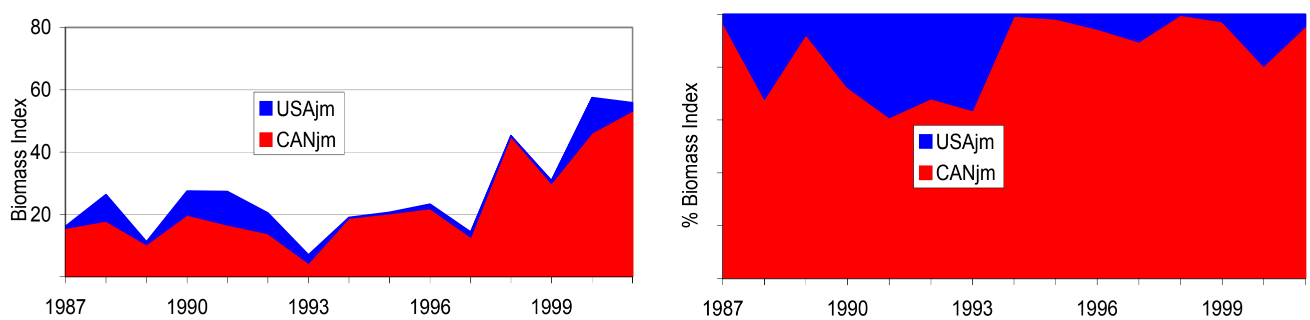
NMFS spring



NMFS fall

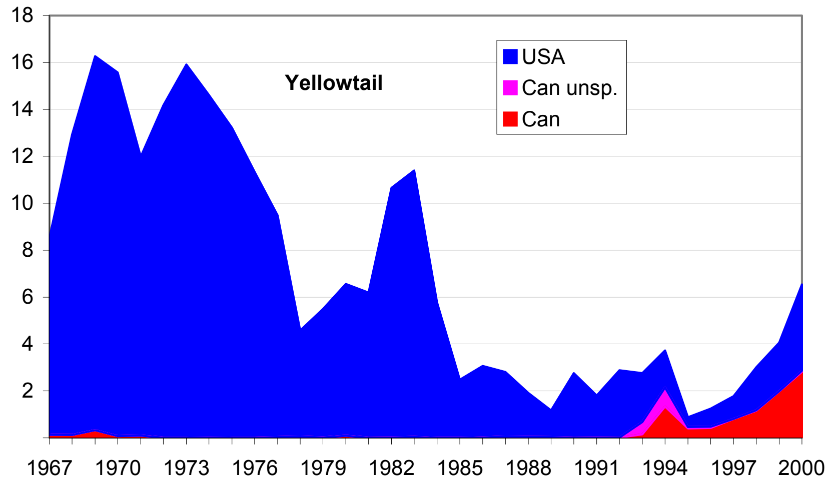


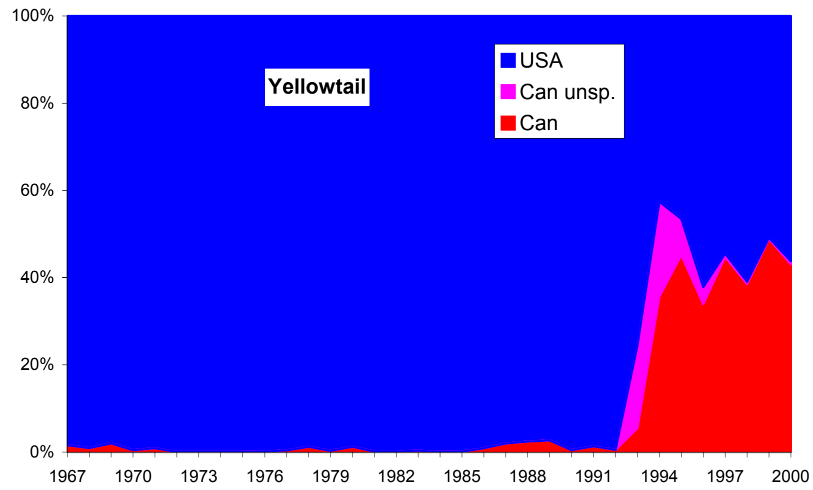
DFO



Yellowtail in Div. 5Z
Fishery Landings

	Canada	USA	Total
1967	133	8407	8540
1968	122	12799	12921
1969	327	15944	16272
1970	70	15505	15576
1971	102	11878	11980
1972	8	14157	14165
1973	12	15899	15912
1974	5	14607	14613
1975	8	13205	13212
1976	11	11336	11347
1977	38	9444	9482
1978	56	4519	4575
1979	17	5475	5492
1980	81	6481	6562
1981	12	6182	6194
1982	18	10634	10652
1983	43	11350	11393
1984	4	5764	5767
1985	3	2477	2480
1986	27	3041	3068
1987	56	2743	2799
1988	47	1866	1913
1989	32	1134	1166
1990	13	2751	2764
1991	25	1784	1809
1992	15	2859	2874
1993	675	2089	2764
1994	2139	1589	3727
1995	470	410	880
1996	472	777	1249
1997	809	969	1779
1998	1175	1836	3011
1999	1992	2066	4058
2000	2860	3678	6537


Yellowtail
USA
Can unsp.
Can
18
16
14
12
10
8
6
4
2
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000


Yellowtail
USA
Can unsp.
Can
100%
80%
60%
40%
20%
0%
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000

Surveys

NMFS spring biomass index

	CAN	USA	TOTAL	%Can	%USA
1968	413	2705	3119	13	87
1969	633	11416	12049	5	95
1970	156	5806	5962	3	97
1971	183	4622	4805	4	96
1972	1307	5764	7071	18	82
1973	932	2528	3460	27	73
1974	522	2488	3010	17	83
1975	781	1057	1838	43	57
1976	680	1748	2428	28	72
1977	703	332	1035	68	32
1978	182	607	789	23	77
1979	432	849	1281	34	66
1980	2437	1793	4230	58	42
1981	235	1459	1694	14	86
1982	578	2084	2662	22	78
1983	875	1999	2874	30	70
1984	747	960	1707	44	56
1985	475	512	987	48	52
1986	604	338	942	64	36
1987	102	253	356	29	71
1988	146	467	613	24	76
1989	324	363	687	47	53
1990	124	612	736	17	83
1991	286	380	666	43	57
1992	1233	688	1921	64	36
1993	363	217	579	63	37
1994	419	356	775	54	46
1995	1898	794	2693	71	29
1996	1756	1485	3242	54	46
1997	3631	626	4257	85	15
1998	978	1737	2715	36	64
1999	6833	3448	10281	66	34
2000	4933	2956	7889	63	37

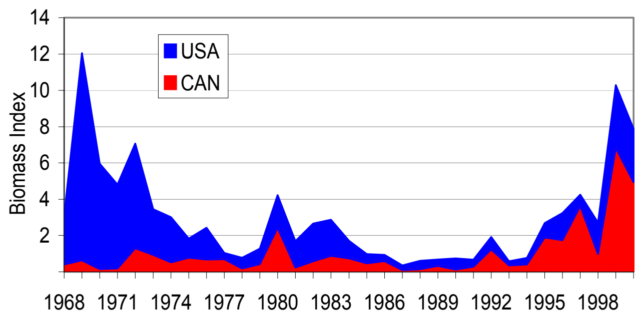
NMFS fall biomass index

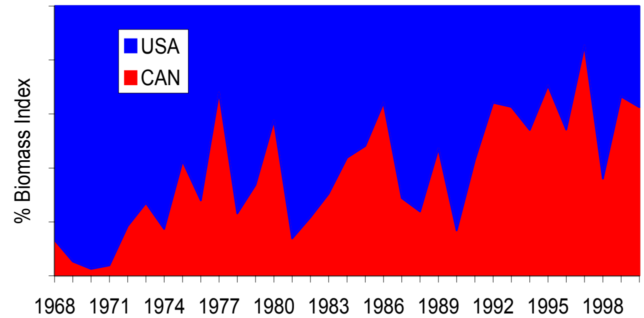
	CAN	USA	TOTAL	%CAN	%USA
1963	518	13502	14020	4	96
1964	154	14751	14904	1	99
1965	97	9879	9975	1	99
1966	1345	2566	3911	34	66
1967	0	6830	6830	0	100
1968	1491	9521	11012	14	86
1969	298	8773	9072	3	97
1970	424	4812	5236	8	92
1971	183	6514	6697	3	97
1972	306	6930	7236	4	96
1973	2414	4638	7051	34	66
1974	825	3160	3985	21	79
1975	747	1842	2588	29	71
1976	276	1333	1609	17	83
1977	1772	1235	3007	59	41
1978	414	2151	2564	16	84
1979	165	1320	1486	11	89
1980	4068	3211	7279	56	44
1981	106	2403	2509	4	96
1982	603	1792	2395	25	75
1983	676	1625	2300	29	71
1984	108	581	690	16	84
1985	212	547	759	28	72
1986	155	659	815	19	81
1987	267	278	544	49	51
1988	73	144	217	34	66
1989	83	1026	1109	7	93
1990	76	702	778	10	90
1991	99	779	878	11	89
1992	419	224	643	65	35
1993	339	96	435	78	22
1994	792	347	1139	70	30
1995	214	211	424	50	50
1996	284	1593	1877	15	85
1997	2003	2115	4118	49	51
1998	2367	1435	3803	62	38
1999	4154	4200	8354	50	50
2000	1121	5978	7099	16	84

DFO biomass index

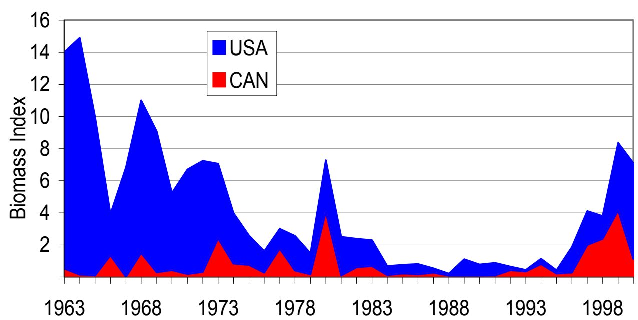
	CAN	USA	TOTAL	%CAN	%USA
1987	819	445	1264	65	35
1988	283	952	1235	23	77
1989	140	331	471	30	70
1990	397	1181	1578	25	75
1991	501	1258	1759	28	72
1992	550	1925	2475	22	78
1993	1693	949	2642	64	36
1994	591	2162	2753	21	79
1995	820	1206	2027	40	60
1996	2833	2470	5304	53	47
1997	3332	9960	13292	25	75
1998	2577	1715	4292	60	40
1999	6806	10860	17666	39	61
2000	7545	12404	19949	38	62
2001	5438	16720	22157	25	75

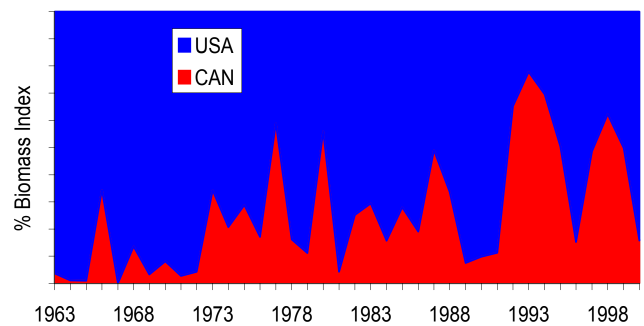
NMFS spring



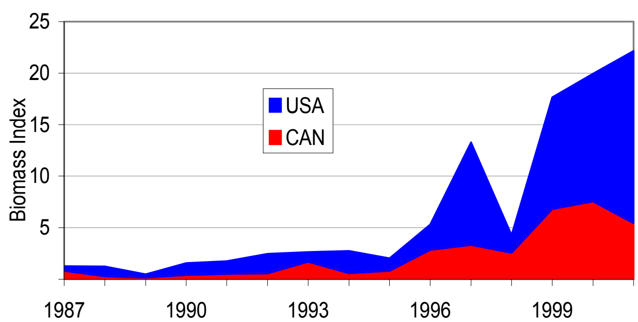


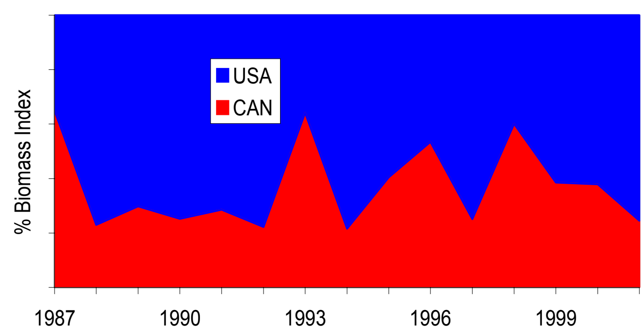
NMFS fall





DFO





Attachment 6

US TMGC PROPOSED SHARING AGREEMENT WITH CANADA FOR COD, HADDOCK, AND YELLOWTAIL FLOUNDER

Overview of Principles

The US TMGC applied the following principles for the proposed sharing agreement for cod, haddock and yellowtail: (1) Data from time periods representative of rebuilt stock distribution were selected. (2) Whole-Bank stock structure is assumed in this proposal. A scientific review of the best available information on haddock and cod stock structure on Georges Bank is needed, preferably through TRAC and in the near future. The review of the best available information may cause us to reconsider our position regarding whether to manage haddock and cod as one or two stocks. If the two-stock option is selected, the sharing formula should reflect this change, using the same data-periods and principles. (3)Landings and survey data are adopted as equally important criteria. (4) Historical investment in research is considered important, but only a rough proxy is easily calculable therefore this criteria is weighted lower than landings and survey data. Justification for the criteria selected for the proposed sharing agreement and the data time periods selected as representative of rebuilt stock distributions is given below.

Landings Data

Most fish allocation agreements, whether between countries, industry sectors, or states, take historical landings patterns into account at least to identify valid participants. The UN Fish Stocks Agreement lists fishing practices, patterns, and community dependence among the few criteria to be considered when determining participatory rights of new members of fishery management organizations. Historical landings provide a proxy for less quantifiable elements that determine the importance of fisheries for a particular country or, in local fishery management decisions, a sector of the industry. Landings provide some insight into elements such as historical investment in the development of the fishery, economic dependence, cultural identity, and heritage.

The allocations in the unratified 1979 US-CDA East Coast Fishery Treaty were based largely on landings records between 1965 and 1977. While this time period does not fully capture the historical importance of the Georges Bank groundfish fisheries upon which the first New England settlements were founded, this Treaty represents the most recent attempt to identify US and Canadian entitlements to Georges Bank fish. The allocations of Georges Bank stocks within the disputed fishing area (prior to the Hague Line decision) proposed under the treaty gave the US 83% of the cod, 79% of the haddock, and approximately 99% of the yellowtail flounder (Canada was given 1% of yellowtail landings in area 5 and 6). Although the basis for the proposed treaty did not fully consider the historical importance of Georges Bank to US fishers, these proposed allocations provide the most valid starting point for discussions of future sharing agreements with Canada.

Fishery management decisions in the USA are based on rebuilding overfished stocks to target stock biomasses that produce MSY. Landings data from the period for which stocks were healthy best reflect the yield potential of a rebuilt stock. The US TMGC applied landings data from the time periods for which the cod, haddock, and yellowtail stocks on Georges Bank were at target biomass levels. Additionally, we recognized the importance of the consensus decision of the US/CDA TMGC and the Transboundary Steering Committee to disregard landings data after 1994, when cod and haddock stocks collapsed and severe management measures were implemented. Landings during that rebuilding period do not reflect interest, capacity or perceived entitlements.

Survey Information

The distribution of the stocks on either side of the Hague, or ICJ, Line must be considered when identifying USA and Canadian allocations. Each country considers its fishers to be entitled to the resources that occur in their respective waters. In the case of these resources, seasonal variation in the percentage occurring on either side of the boundary is significant. Thus neither side can claim percentage entitlement based on the maximum fraction of the stocks occurring in their zone in a particular season. If a uniform harvest strategy is one of the goals of management measures or the allocation agreement, consideration of the distribution of stocks across Georges Bank should equal the claims based on historical distribution.

However, existing survey data are insufficient to design an absolutely uniform harvest strategy across any given year. Fish move throughout the year, and the 3 distinct annual surveys conducted to assess the relative abundance of these stocks merely provide regular snapshots of distribution. For all three stocks, there is significant variability in the fractions of stocks occurring on either side of the boundary over time that may be explained by changes in abundance or by unidentified shifts in environmental conditions. Relying only on current distribution data or using a short time period would only be valid if the sharing agreement is going to be recalculated annually. Given the large inter-annual variability possible in these data, such annual recalculations and resultant fluctuations in allocations would be unpopular with fishers that rely on these stocks and who require predictable allocations to support basic business decisions.

As discussed above, these stocks are currently being managed to rebuild stock abundance, age structures and spatial distributions. The distribution of these stocks during periods of relative abundance best mirrors the distribution we anticipate once the stocks have recovered and reached their target biomass levels. Therefore survey data from these rebuilt time periods were selected in developing the proposed sharing agreement.

The proportional distribution of these stocks based on the time series of fish abundance data was determined from standardized bottom trawl surveys conducted on Georges Bank. The primary survey series used were the USA spring and autumn surveys since they are continuous, have approximately equal sample density (stations per square mile) over the entirety of the Bank, and were conducted over long time periods that span times of resource abundance and depletion. A straight average of the USA spring and autumn data was used to compute the fraction of stocks occurring on the USA and Canadian sides of the ICJ line. A finer resolution in time (e.g., by month) is not possible, but the spring and autumn time periods approximately correspond to the annual bottom temperature minima (spring) and maxima (autumn), and patterns of distribution between the two surveys do seem to illustrate large-scale movement patterns especially characteristic of cod and haddock. The Canadian survey series was not incorporated into the proposals because of the variable sampling effort and short time series available. There were some years (>93->94) when no stations were surveyed in the western-most strata in the Canadian survey or wherein the sample density was lower in the west (reflecting different levels of survey precision across the Bank). Additionally, the database does not extend back long enough in time (i.e., only back to 1987) to allow the calculation of resource spatial distributions associated with time periods in which the stock abundance was considered high and at target levels (e.g. 60s-1982 for haddock, 60s-1990 for cod, 60s-2000 for yellowtail).

Historical Investment in Science

Just as landings data are a rough proxy of the historical, cultural investment in a fishery, many international allocation agreements also give strong consideration to investments in scientific research that provide the data that enable us to assess the status of the stocks and support current management goals, objectives, and decisions. Historical investment in research is difficult to quantify, as broad research efforts have been conducted that include surveys, life history studies, sea sampling efforts, and numerous other investigations. As a simple proxy, we have selected the relative number of research surveys as a rough indicator of historical investment. There have been a total of 85 surveys conducted; 71 (84%) by the US and 14 (16%) by CDA. Because this proxy is imprecise, this criteria is given only half the weight of the other two in our sharing formula.

Results

HADDOCK

<u>Time period selected</u>: For landings data, the 1967-1982 period was chosen to reflect the spatial distribution of a rebuilt stock. This period does not necessarily reflect the yield potential of the rebuilt stock (e.g. the database used by the TMGC begins in 1967, after the very large 1962 and 1963 year classes had been depleted) but does reflect two time periods when western and eastern stock components both contributed significantly to the catches. The use of the 1967-1982 period for landings is intended to encompass the remnants of the early 1960s year classes, as well as the relatively large 1975 and 1978 year classes that temporarily reversed resource depletion, while for survey data, the 1963 (fall)/1968 (spring) to 1982 period was chosen. Fishery managers in the USA have established target stock biomasses for haddock that, on average, should avoid recruitment overfishing and produce MSY. These levels were last observed in the 1960s and again nearly so in the late 1970s to early 1980s. The full time series of landings do not necessarily reflect the yield potential of the rebuilt stock (e.g. the database used by the TMGC begins in 1967, after the very large 1962 and 1963 year classes had been depleted) but do reflect two time periods when western and eastern stock components both contributed significantly to the catches. The use of the 1967-1982 period for landings is intended to encompass the remnants of the early 1960s year classes, as well as the relatively large 1975 and 1978 year classes that temporarily reversed the scenario of resource depletion. Likewise, the 1963 (fall) and 1968 (spring) to 1982 period used as the averaging period for surveys is intended to be consistent with the philosophy of indexing, as best as possible, a time period reflecting the rebuilt stock condition considering the large year classes of the early 1960s and mid-late 1970s. The average proportion of landings and biomass occurring on the USA side of the boundary during the pre-1983 period are almost identical. Current stock size for haddock is again approaching target

biomass levels, with greater fractions of the haddock resource now accumulating on the USA side, consistent with the pattern observed in the pre-1983 period. However, the landings fractions accruing on each side of the ICJ line are now skewed by differences in management between the two countries.

Sharing formula: Note: proposed shares expressed as a fraction of fishing mortality rather than weight to allow for evaluation of conservation equivalency of varying management measures

L=US % landings; D=distribution,% in US waters; S=% Surveys by US
US allocation = .4(L from 67-82)+.4(D from 63-82)+.2(S)
US haddock allocation =.4(72%) + .4(70%) + .2(84%)= 74%

COD

Time period selected: For landings data, the 1967-1990 period was chosen to reflect the spatial distribution of a rebuilt resource, while for survey data, the 1963 (fall)/1968 (spring) to 1990 period was chosen. The period through 1990 reflects generally rebuilt conditions, although the biomass targets have not been approached since the 1980s. A succession of large year classes (1978, 1980, 1983, 1985 and 1987) supported relatively high landings throughout the 1980s. High landings were also observed in the 1960s and early 1970s, probably supported by the 1965 and 1970 year classes. The use of the 1967-1990 landings period and the 1963 (fall)/1968 (spring) to 1990 survey averaging periods reflect the Bank-wide distribution that can be expected from the presence of these dominant large year classes.

Sharing formula: Proposed shares expressed as a fraction of fishing mortality rather than weight to allow for evaluation of conservation equivalency of varying management measures

L=US % landings; D=distribution,% in US waters; S=% Surveys by US
US allocation=.4(L 67-90) + .4(D 63-90) + .2(S)
US Cod allocation = .4(75%) + .4(73%) + .2(84%) = 76%

YELLOWTAIL FLOUNDER

For yellowtail flounder, the entire time series is averaged to reflect rebuilt stock spatial distribution. During the period from 1963 to present, the yellowtail flounder stock has fluctuated significantly in abundance reflecting the production of strong and weak year classes and the overall level of fishing mortality. Yellowtail biomass peaks occurred during three periods; in the 1960s to early 1970s, in the late 1970s to early 1980s, and again in the period since 1998. In the intervening years yellowtail abundance and landings were relatively low. Selecting a period over which to determine the spatial distribution of yellowtail consistent with a rebuilt stock status is complicated by the fact that spatial distribution patterns in the most recent period of abundance show somewhat different patterns than during the previous periods of high abundance. It is clear that factors other than stock abundance can influence the relative distribution of yellowtail flounder on either side of the ICJ line. Since the relative distribution patterns have varied even when the stock was "rebuilt", the entire time series (1963/68-2000) of survey data was averaged to reflect the uncertainty in long-term distribution patterns. Landings data for the entire period, until 1994, were selected to reflect this distribution of the rebuilt resource while excluding the period of severe management regimes.

Sharing formula: Proposed shares expressed as a fraction of fishing mortality rather than weight to allow for evaluation of conservation equivalency of varying management measures

L=US % landings; D=distribution,% in US waters; S=% Surveys by US
US allocation = .4(L 67-94) + .4 (D 63-00) + .2(S)
US yellowtail flounder allocation = .4(98%) + .4(73) + .2(84%) =85%

Attachment 7

RESOURCE SHARING PROPOSAL

Submitted By: Canadian Team to TMGC
22 August 2001

The Georges Bank cod, haddock and yellowtail resources are entirely within USA and Canadian exclusive economic zones and the objective of our mutual collaboration is to achieve consistency of management measures applied to their respective territories. As directed at the recent (May 16, 2001) Transboundary Management Guidance Committee (TMGC) Steering Committee the following proposal on sharing arrangements is submitted by the Canadian members of the TMGC working group.

This proposal recognizes two key principles for determining shares of the transboundary resources of cod, haddock and yellowtail, resource utilization and resource distribution. Resource utilization is reflected by the landings while resource distribution is derived from survey results.

Resource Utilization

Both Canadian and USA members of the Steering Committee agree on the landings history for both Canada and USA for the period from 1967 to 2000. The international maritime boundary between USA and Canada on Georges Bank was established in 1984 and subsequent fishing by USA and Canada has been conducted within each country's respective territory. In recognition of this fundamental change that occurred in 1984, it is considered that the landings history prior to 1985 is not relevant to the current or future opportunities for utilization of these transboundary resources for either country. Accordingly, the Canadian proposal advances the use of the average percentage landed by USA and Canada between 1985 and 2000 as the basis for reflecting resource usage**.**

1985-2000

	COD (5Z)	COD (5Zjm)	HAD (5Z)	HAD (5Zjm)	YELLOWTAIL
USA	71%	32%	29%	15%	77%
CDN	29%	68%	71%	85%	23%

Resource Distribution

The agreed to database includes the survey results for NMFS fall surveys from 1963 to 2000, for NMFS spring surveys from 1968 to 2000 and for DFO surveys from 1987 to 2001. While survey results are variable and show annual fluctuations, examination of these results confirms that persistent changes in resource distribution relative to the international maritime boundary have occurred in the past.

To account for temporal shifts in resource distribution while moderating ephemeral year to year differences, the Canadian proposal advances the use of the average percentage of survey biomass in respective territories between 1991 and 2000. For cod and haddock on eastern Georges Bank

(5Zjm), these surveys indicate a seasonal migration pattern, westward between fall and spring and eastward between spring and fall. This migration pattern is not as obvious for cod and haddock on Georges Bank (5Z), probably due to the confounding by the movements of the Southwest Channel components. To account for this seasonal migration, for cod and haddock, the NMFS spring (March) and DFO (February) surveys are each given 25% weighting while the NMFS fall (October) survey is given 50% weighting. For yellowtail, the three surveys are averaged without weighting.

1991-2000

	COD (5Z)	COD (5Zjm)	HAD (5Z)	HAD (5Zjm)	YELLOWTAIL
USA	63%	16%	34%	12%	52%
CDN	37%	84%	66%	88%	48%

Sharing Formula

Both countries have accepted that resource utilization and distribution are key principles for developing any resource sharing formula. The relative importance of each principle in determining sharing arrangements must be established. The Georges Bank cod, haddock and yellowtail resources are entirely within USA and Canadian exclusive economic zones and the objective is to achieve consistency of management measures applied in their respective territories. In this circumstance historical resource utilization has little relevance while resource distribution is directly associated with achieving this objective. Accordingly, the Canadian proposal attributes less importance to resource utilization and advances a weighting of 95% to resource distribution and 5% to resource utilization. The resulting allocation shares are:

	COD (5Z)	COD (5Zjm)	HAD (5Z)	HAD (5Zjm)	YELLOWTAIL
USA	63%	17%	34%	12%	53%
CDN	37%	83%	66%	88%	47%

The Canadian proposal for the larger 5Z management units of cod and haddock implicitly assumes that additional effective management would be taken to reflect any heterogeneous area patterns in these stock complexes

Attachment 8

Scientific Evaluation of Resource Distribution Across the Boundary

Prepared by : Technical Group of the Transboundary Management Guidance Committee

Terms of Reference

Purpose: Given the wide disparity in the resource distribution implied in both the USA and Canadian resource sharing proposals, a sharing agreement based on distribution that was more sensitive to the rate of change was preferred to the two extreme proposals offered. The following terms of reference (TOR) will provide data to the TMGC to develop a flexible mechanism for responding to change in distribution.

- Develop and illustrate methods to provide near-term forecasts of resource distributions using finfish surveys.
- Examine the sensitivity of results to averaging period, calculation method (weighting of surveys and methods to combine percentages), time tapering for weighting results, and other factors, as appropriate.
- Apply the methods developed to the time series of survey data to evaluate the historical performance of the method in relation to implications for fishery resource sharing.

Introduction

Bottom trawl surveys can be used to determine the distribution of groundfish resources relative to the USA/Canada maritime border. Results from three surveys, the NMFS spring, the NMFS fall and the DFO surveys are available. This task raises two issues:

- how to combine the three surveys; and
- how to smooth undesirable annual variation.

Each of these issues is dealt with separately and possible options are identified along with their strengths and weaknesses.

Combining the Surveys

The issue of how to combine the three surveys concerns understanding of seasonal migration patterns. Ideally, information on the resource distribution for many times during the year, if it were available, could be integrated over the year to get an annual average. The three available surveys are generally conducted in February, March and October. Additional observations from fishery catches and studies of spawning behaviour can help interpret how the surveys are used. Marked migrations have not been noted for yellowtail while cod and haddock are thought to migrate to shallower depths on the Bank for spawning during the colder winter-spring season and move to the deeper slopes during the warmer summer-fall season. In accord with this view, the resource distribution results for yellowtail do not show persistent seasonal patterns for yellowtail between the three surveys. Resource distribution results for cod and haddock in 5Zjm show a distinct pattern consistent with the spawning behaviour. Resource distribution results for cod and haddock in 5Z as a whole are less clear and may be confounded by migrations during the summer-fall to the deeper slopes of both the South Channel and the Northeast Peak.

If marked migrations are not a major feature, each survey can be viewed as an equally representative and independent observation of the average annual resource distribution. A simple average of the available surveys in any year provides an estimate of the resource distribution that makes best use of all the data. It is **recommended** that a simple average of available surveys in each year be used for **yellowtail**.

If marked migrations are an important feature, each survey can be associated with the season it represents. A simple average of surveys that occur during the same season can be used to combine within a season. Seasonal results can then be combined, taking into account the duration of the seasons. For example, the cod and haddock resource distribution results from the NMFS spring and DFO surveys can be averaged to characterize the colder winter-spring period and subsequently combined with the NMFS fall survey that depicts the warmer summer-fall period. While this may be a reasonable interpretation of the distribution patterns for cod and haddock, consistent with our understanding of their biology and spawning behaviour, the limitations of using three "snapshots" to interpret a continuous migration process leave any scheme for combining the surveys open to criticism. Consequently, it is not possible to **recommend** a single unequivocal approach for combining the survey results of **cod and haddock**. Rather, we submit two options for your consideration

- Average of 2 seasons:

    1. Average NMFS spring and DFO surveys, or use the NMFS spring (prior to 1987) to characterize distribution during the colder winter-spring period.
    2. Use the NMFS fall survey to characterize distribution during the warmer summer-fall period.
    3. Combine the two periods assuming equal duration.

- Average of 3 surveys:

    1. Use a simple average of available surveys in each year.

Smoothing Annual Variation

What is desired is a reliable near-term (1-3 years) forecast of resource distribution. Annual observations display considerable dispersion. Some of this dispersion is due to real, but unpredictable, fluctuations in resource distribution. These “high frequency” fluctuations do not tell us much about near-term forecasts. Another component of the dispersion is due to statistical sampling variation. The intent is to remove both the high frequency fluctuations and the sampling variations. One way of doing this is to apply a “scatterplot smoother”. Because scatterplot smoothers are a “descriptor” of existing data, extrapolation beyond the data requires judgement. In order to avoid imposing questionable model assumptions, it is **recommended** that the scatterplot smoothers are applied to the available time series and the results for the last observation be accepted as the near-term forecast.

For our problem, another consideration is at what stage to apply the scatterplot smoother. The smoother can be applied to each of the indices to obtain smooth indices from which resource distribution for each survey can be derived and subsequently combined. Alternatively, the resource distribution for each survey may be derived using the observed data, subsequently combined and the smoother applied as the final step. Applying the smoother at some intermediate step is also possible. It is **recommended** that applying the scatterplot smoother only once, as the final step of the analysis, offers a more transparent process that is less subject to complications.

A generally accepted “scatterplot smoother” is the robust locally weighted regression, referred to as loess. Unfortunately, these tools, while useful, involve some subjective judgement. Loess requires two subjective inputs, a) the fraction of data used to obtain the “smooth” at any point, and b) the number of iterations for robustness. Available guidelines suggest that the fraction of data be between 20% and 80% with 50% as a reasonable compromise. Experience suggests that most of the benefits associated with the robustness algorithm are achieved in two iterations. It is **recommended** that the default of two robustness iterations be used unless this results in inconsistencies. We submit results using 30%, 50% and 70% as the fraction of the data included in the local regressions. The 30% value corresponds to a time window of approximately 10 years, to contrast against the default of 50%. The 70% value is used to illustrate a "more" smooth scenario.

A point for future consideration is whether it would be desirable to reduce the fraction of data included in the local regression as the time series is augmented in order to maintain a roughly consistent time window.

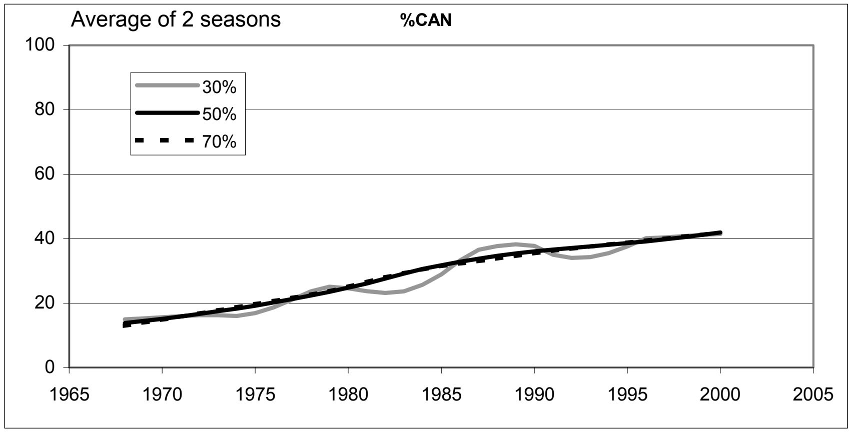
Summary and Results

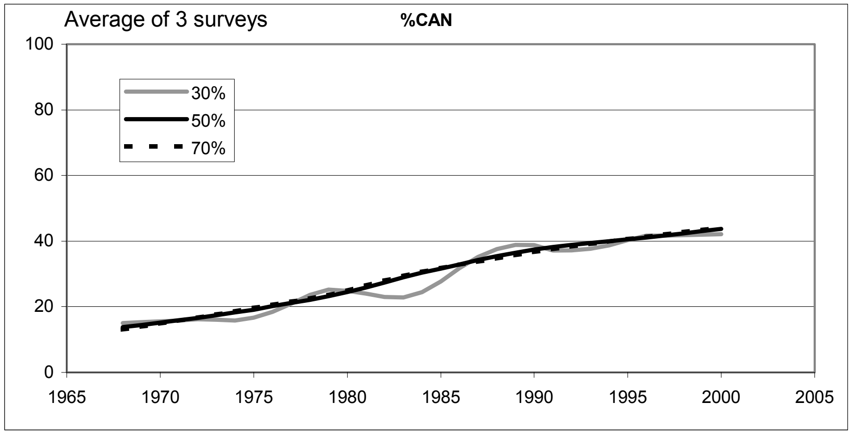
For yellowtail the surveys are combined using a simple average of surveys available in each year. For cod and haddock, two options for combining surveys are provided, one reflecting understanding of migration and the other a default simple average. The robust locally weighted regression scatterplot smoother is applied as the final stage of the analysis to the combined percent distribution. Results are presented for 30%, 50% and 70% as the fraction of the data included in the local regressions.

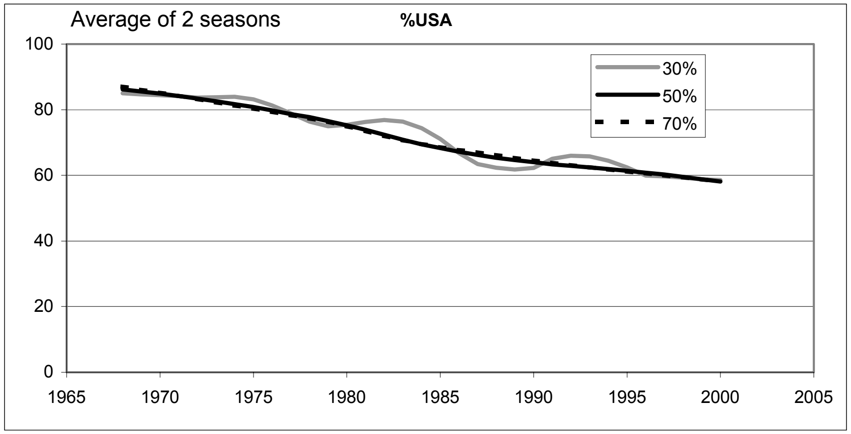
Cod 5Z

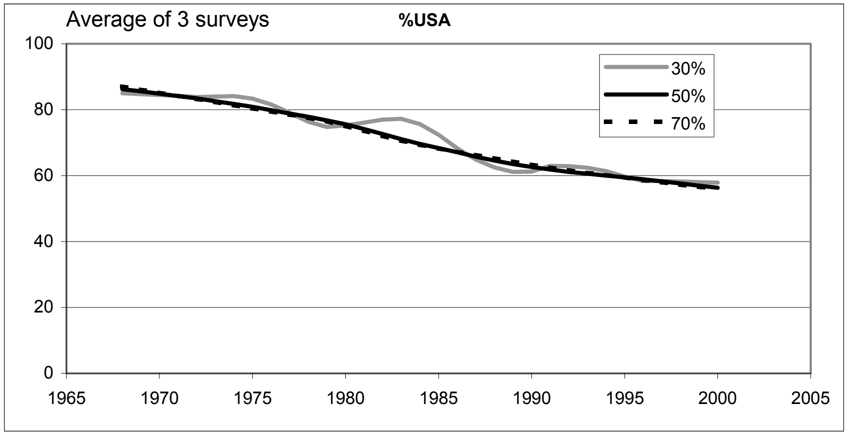
Resource distribution across boundary in 2000

	30%		50%		70%	
	%CAN	%USA	%CAN	%USA	%CAN	%USA
Average of 2 Seasons	41	59	42	58	42	58
Average of 3 Surveys	42	58	44	56	44	56





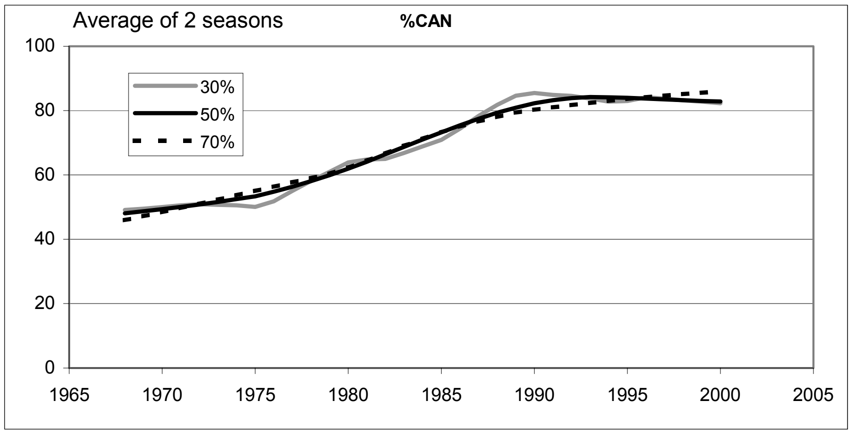


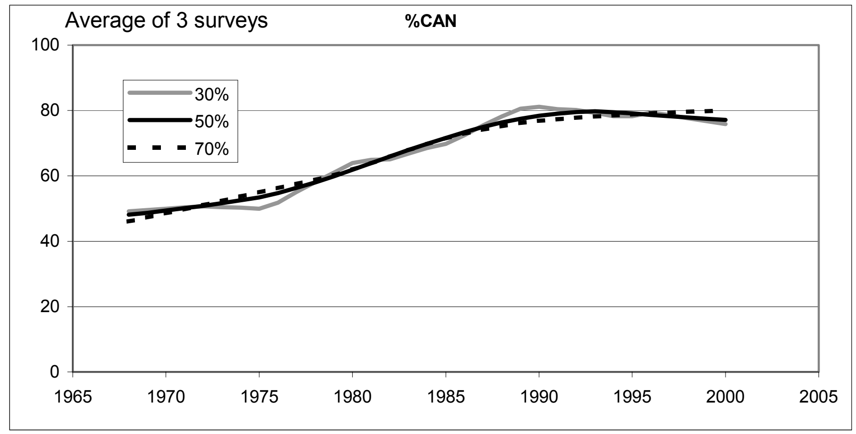


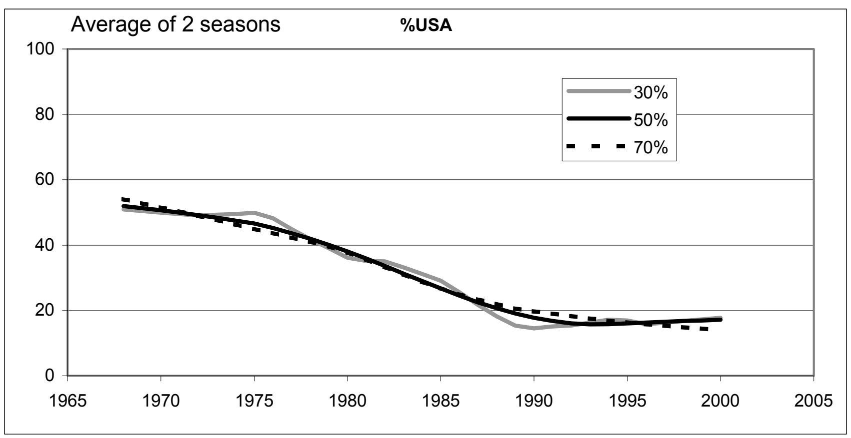
Cod 5Zjm

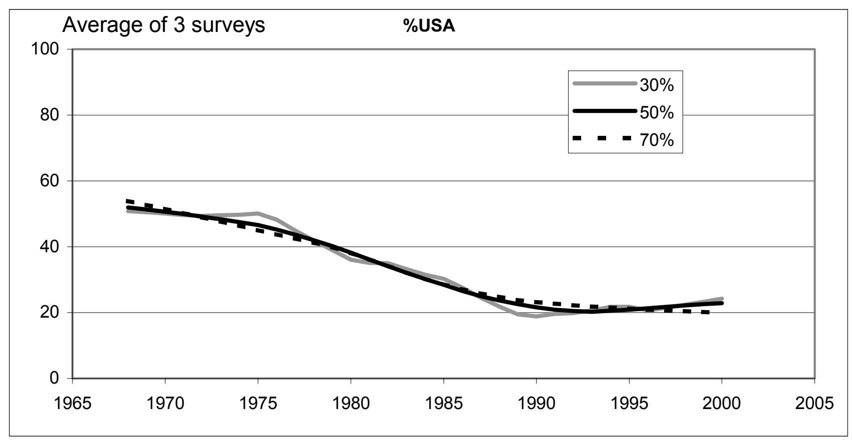
Resource distribution across boundary in 2000

	30%		50%		70%	
	%CAN	%USA	%CAN	%USA	%CAN	%USA
Average of 2 Surveys	82	18	83	17	86	14
Average of 3 Seasons	76	24	77	23	80	20





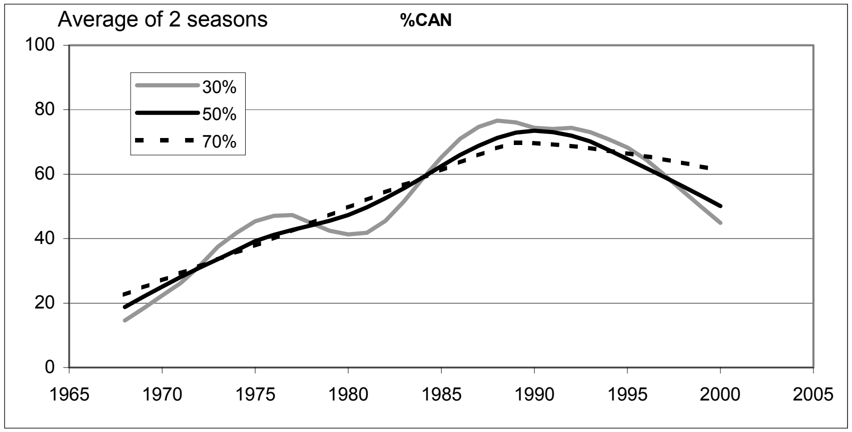


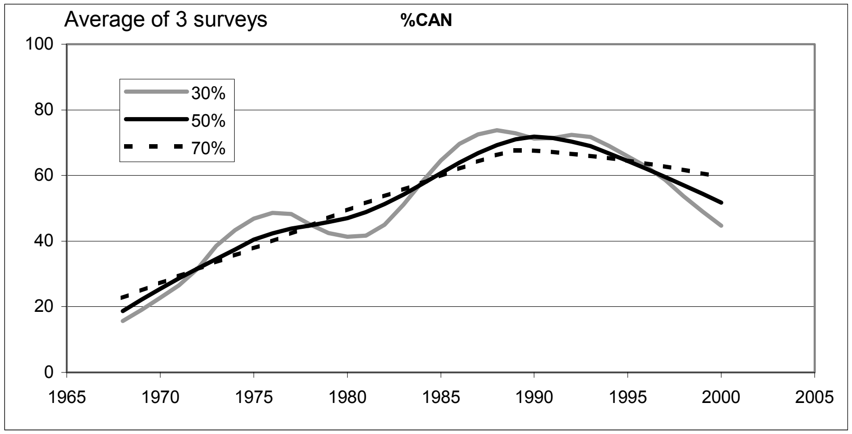


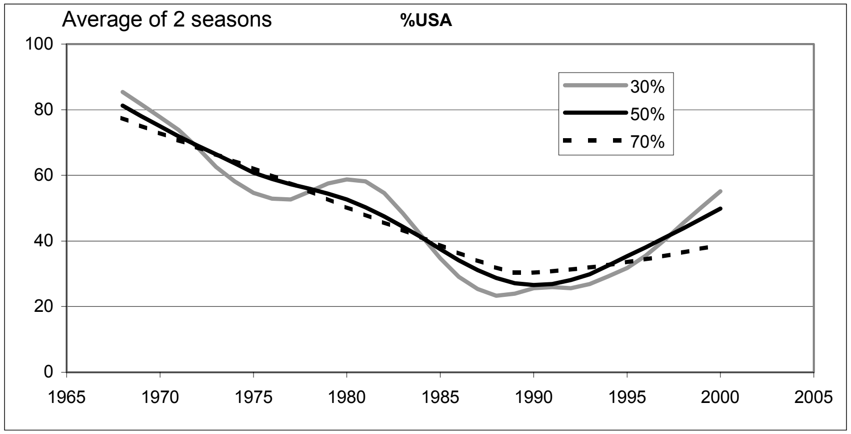
Haddock 5Z

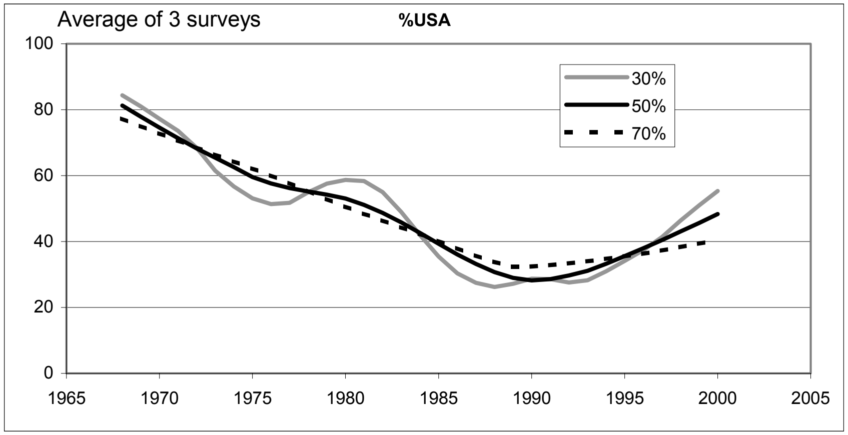
Resource distribution across boundary in 2000

	30%		50%		70%	
	%CAN	%USA	%CAN	%USA	%CAN	%USA
Average of 2 Seasons	45	55	50	50	61	39
Average of 3 Surveys	45	55	52	48	60	40





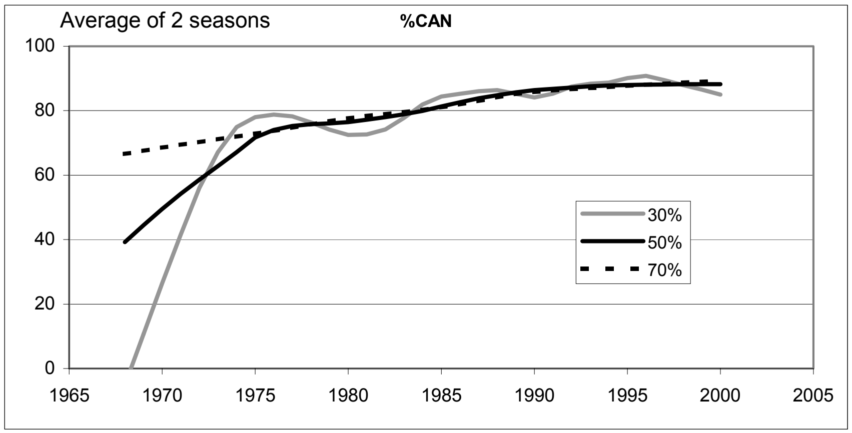


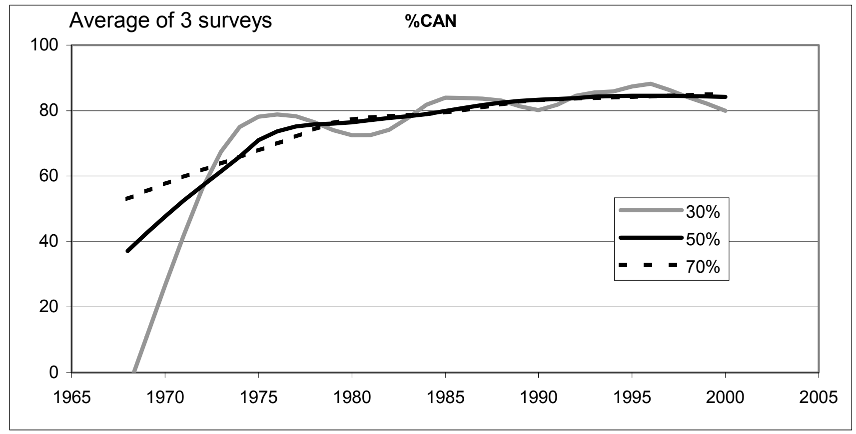


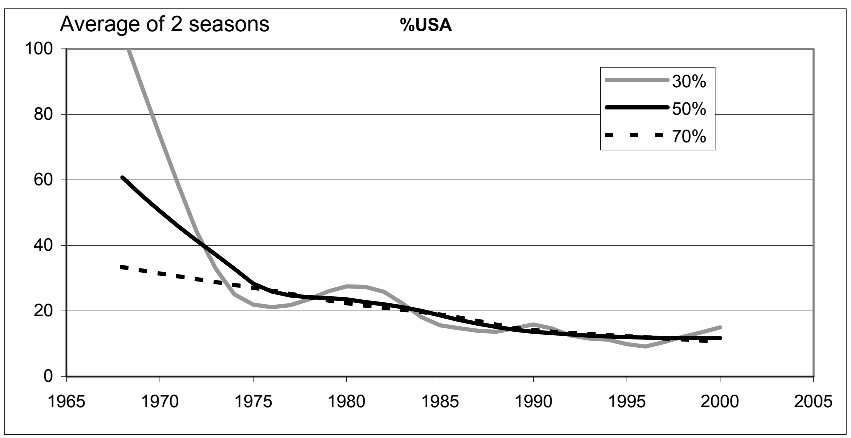
Haddock 5Zjm

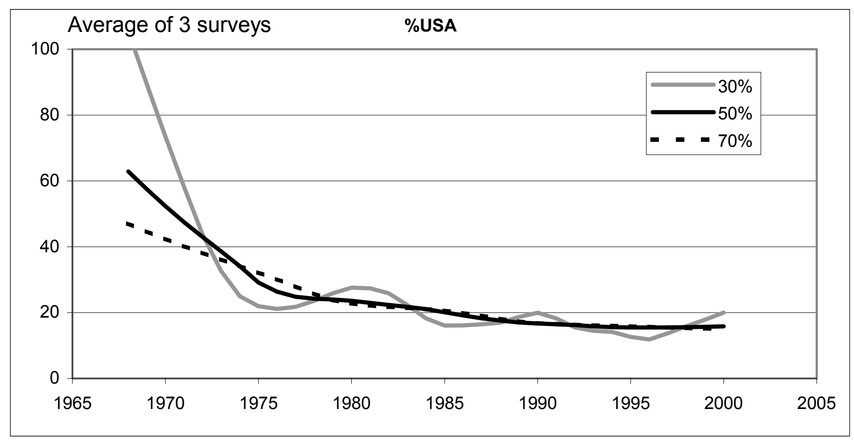
Resource distribution across boundary in 2000

	30%		50%		70%	
	%CAN	%USA	%CAN	%USA	%CAN	%USA
Average of 2 Seasons	85	15	88	12	89	11
Average of 3 Surveys	80	20	84	16	85	15





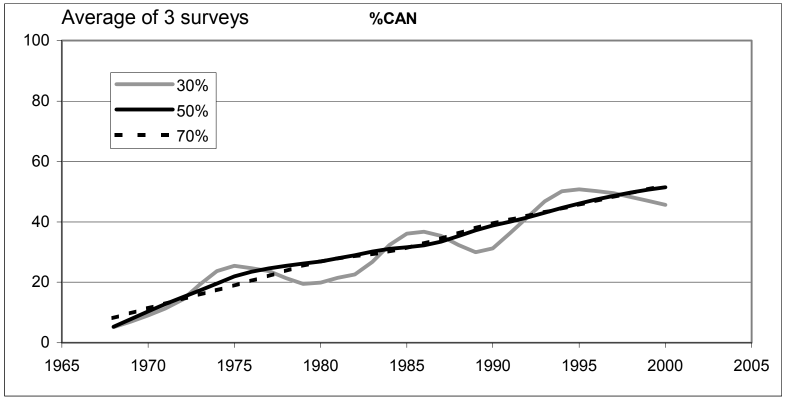


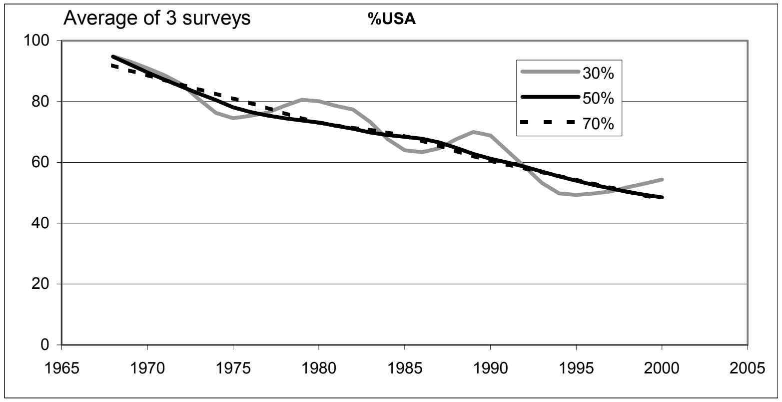


Yellowtail

Resource distribution across boundary in 2000

	30%		50%		70%	
	%CAN	%USA	%CAN	%USA	%CAN	%USA
Average of 3 Surveys	46	54	51	49	52	48





Attachment 9

GUIDANCE ON OPTIONS FOR DETERMINING PERCENTAGE OF RESOURCE SHARE

Prepared by: Transboundary Management Guidance Committee
5 December 2001

Introduction

At it is inaugural meeting on 13 September 2000, the Transboundary Management Guidance Committee was charged with establishing rules and clarifying its work mandate. The following Terms of Reference were agreed:

1. Recommend F-based harvesting strategies that are consistent with US and Canadian objectives. (and laws).
2. Provide guidance on options for determining percentage of resource share.
3. Develop process for implementation of TMGC's recommendations.
4. Make recommendations for actual US and Canadian harvest levels.
5. Make other recommendations that are mutually beneficial to US and Canadian fisheries.

This report addresses Term of Reference #2.

Procedure

It was agreed to apply an approach that accounts for historical utilization and that adapts to shifts in resource distribution. The sharing agreement applies to the following management units: haddock 5Zjm, cod 5Zjm, and the entire Georges Bank yellowtail flounder. There are four major components to the agreement:

- The use of resource survey data based on the three bottom trawl surveys (NMFS spring, DFO winter and NMFS fall) to calculate the annual proportion of the resource on either side of the boundary. After combining the percent resource distribution from the three surveys, 30% loess smoothing was applied to the most recent 33 years. This same procedure (30% loess smoothing applied to the most recent 33 years) will be used to update resource distribution.

- Historic proportions of fishery landings data calculated from the period 1967-1994 inclusive.

- The following formula was agreed for calculating the respective country shares:

$$\%\text{country share} = \alpha_{year}\ \text{country utilization} + \beta_{year}\ \text{resource distribution}$$

where α_{year} = percentage weighting for utilization in year
β_{year} = percentage weighting for distribution in year
$\alpha_{year} + \beta_{year} = 100\%$
country utilization = 1967-1994 historic catch percentage share
resource distribution = 30% loess smoothing of most recent 33 years

- Initial sharing formulas are based on proportions of resource distributions from surveys (60% of the formula) and average percentages of the 1967-1994 landings by country (40% of the formula). The percentage weighting would change in equal increments from the starting point to 90% (resource surveys) and 10% (fishery landings data).

- Starting date for the agreement is 2003, with the end of the transition to a 90/10 weighting formula in the 2010 fishing year according to the following schedule.

2003	2004	2005	2006	2007	2008	2009	2010
60/40	60/40	65/35	70/30	75/25	80/20	85/15	90/10

- The resource sharing allocations will be updated annually to reflect shifts in resource distribution. The catch distributions used in the sharing formula remain fixed according to the 1967-1994 period and are:

	USA	CANADA
COD (5Zjm)	40%	60%
HADDOCK (5Zjm)	45%	55%
YELLOWTAIL	98%	2%

- Update of the database on resource distribution will occur as soon as possible after completion of a calendar year and no later than February 15th. The calculation of updated percentage of resource sharing allocations will be reviewed by TMGC no later than April 1st.

- TMGC will draft an advisory communication, to be conveyed to fisheries management authorities in Canada and USA, reporting on the determination of percentage of resource sharing allocations for fishing years for which management plans are being developed. It will be recommended that respective Canadian and USA fisheries management plans be based on the same determination for a fishing year most closely corresponding to the calendar year. For example, the USA fishing plans for May 2003-April 2004 and Canadian fishing plans for Jan-Dec 2003 would both be based on the determination made using end of year 2001 information.

For each of the resources, details of the survey series mixing and specific starting conditions based on current resource distributions would be:

GEORGES BANK YELLOWTAIL

The management unit for which this agreement applies is the entire Georges Bank yellowtail flounder resource. Resource distributions based on research vessel surveys use the three surveys equally weighted. The calculated proportions of the resource on each side of the boundary in 2000, based on smoothed survey data are Canada 46% and USA 54%. Based on catch distributions (for 1967-1994), current information on resource distribution and a weighting factor of 60/40 for initial allocations, the starting allocations would be:

Canada Proportion: 28%
USA Proportion: 72%

Without change in the resource distribution, the allocations in 2010 would be:

Canada Proportion: 42%
USA Proportion: 58%

5Zjm HADDOCK

The management unit for which this agreement applies is the 5Zjm haddock resource. Resource distributions based on research vessel surveys use the three surveys equally weighted. The calculated proportions of the resource on each side of the boundary in 2000, based on smoothed survey data are Canada 80% and USA 20%. Based on catch distributions (for 1967-1994), current information on resource distribution and a weighting factor of 60/40 for initial allocations, the starting allocations would be:

Canada Proportion: 70%
USA Proportion: 30%

Without change in the resource distribution, the allocations in 2010 would be:

Canada Proportion: 77.5%
USA Proportion: 22.5%

5Zjm COD

The management unit for which this agreement applies is the 5Zjm cod resource. Resource distributions based on research vessel surveys use the two seasons equally weighted, with DFO and NMFS spring surveys averaged to represent the winter-spring season and the NMFS fall survey representing the summer-fall season. The calculated proportions of the resource on each side of the boundary in 2000, based on smoothed survey data are Canada 82% and USA 18%. Based on catch distributions (for 1967-1994), current information on resource distribution and a weighting factor of 60/40 for initial allocations, the starting allocations would be:

Canada Proportion: 73%
USA Proportion: 27%

Without change in the resource distribution, the allocations in 2010 would be:

Canada Proportion: 80%
USA Proportion: 20%

Attachment 10: Summary of Stock Status

YELLOWTAIL FLOUNDER: Following a steady decline from the early 1970s, biomass increased in the early 1980s due to the strong 1980 year-class, then decreased to historic lows. Biomass increased 10-fold since 1995, and is at the highest observed level since 1973. However, the age structure remains truncated and dominated by younger ages. Recent recruitment is strong, with an outstanding 1997 year-class and above average 1996, 1998 and 1999 year-classes. Exploitation was generally above 50% since the 1970s but declined markedly after 1994 reaching about 15% in 2000. However, exploitation on ages 2 and 3 has not declined proportionally and the partial recruitment to the fishery for these ages has increased.

HADDOCK: Biomass has steadily increased more than 5-fold since 1993 from near historic low levels due to higher survivorship and improved recruitment since 1992, but remains below the 1930-55 average. The 1998 and 2000 year-classes are estimated to be the strongest since 1978. The 1996 and 1999 year-classes were estimated to be the third and fourth largest since 1978. A broad age structure is reflected in both the fishery catch and the population and age 4+ biomass is at its highest level since 1982. Exploitation has been reduced to below 20% from pre-1994 levels that peaked at about 40%, but has increased slightly in each of the past three years.

COD: Biomass declined between 1980 and 1985, increased in 1988, and subsequently declined to a record low in 1994/1995. Biomass has since gradually increased as a result of growth and survival of recent year classes rather than improved recruitment. Since the 1990 year-class, the sizes of recruiting year-classes have all been well below average. The 1997 and 2000 year classes are estimated to be the weakest in the time series. Exploitation reached a record high of over 50% in 1994 but has since declined to below 20%. Without improved recruitment biomass rebuilding is unlikely.