



Version 3
Public Comment Draft Report
**The Canada Scotia - Fundy Fishery for
Haddock (*Melanogrammus aeglefinus*) in
NAFO Sea Areas 5Zjm, 4X5Y**

May 2010

Client

Groundfish Enterprise Allocation Council

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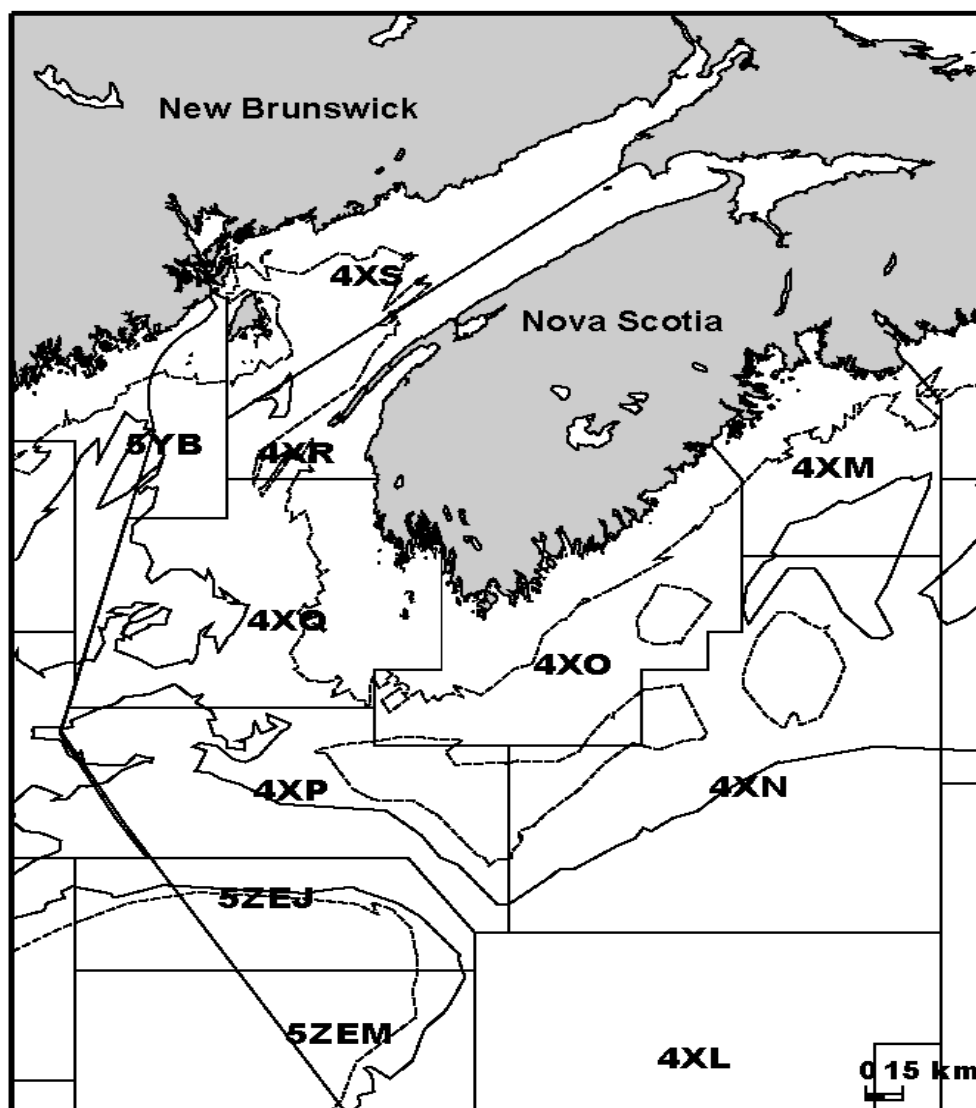
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Figure 1: The Area of the Fishery



Source: Hurley *et al* 2005

1 SUMMARY

With a site visit in July, 2009, an assessment team comprising Paul Knapman (lead assessor), Ian Scott (Project Coordinator & Expert Advisor P3), Sean Cox (Expert Advisor P1) and Tim Huntington (Expert Advisor P2) has undertaken a main assessment of the Canada Scotia – Fundy Haddock Fishery according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries. The draft report was sent to the client in early November, 2009. Following revision of the draft report by the client (until late January 2010) that led to some revisions in the text, the findings were revised by two peer reviewers (Mike Pawson and Bob Furness in April, 2010). The comments and recommendations of the peer reviewers were subsequently reviewed by the team with various changes made to the draft (May, 2010).

Eight units of certification were considered in the main assessment. These are as follows, with the achieved scores for Principles 1, 2 and 3.

- 4X5Y Otter Trawl: P1 = 83.8; P2 = 81.0; P3 = 87.9.
- 4X5Y Bottom Longline: P1 = 83.8; P2 = 83.0; P3 = 87.4
- 4X5Y Gillnet: P1 = 83.8; P2 = 91.7; P3 = 87.4
- 4X5Y Hand Line: P1 = 83.8; P2 = 98.7; P3 = 87.4
- 5Zjm Otter Trawl: P1 = 92.5; P2 = 86.3; P3 = 87.9.
- 5Zjm Bottom Longline: P1 = 92.5; P2 = 84.3; P3 = 87.4
- 5Zjm Gillnet: P1 = 92.3; P2 = 93.0; P3 = 87.4
- 5Zjm Hand Line: P1 = 92.5; P2 = 98.7; P3 = 87.4.

Accordingly, as each of the Units of Certification attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Performance Indicators, it is therefore recommended that the Canada Scotia – Fundy Haddock Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries according to the following Units of Certification.

- 4X5Y Otter Trawl
- 4X5Y Bottom Longline
- 4X5Y Gillnet
- 4X5Y Hand Line
- 5Zjm Otter Trawl
- 5Zjm Bottom Longline
- 5Zjm Gillnet
- 5Zjm Hand Line

A total of 34 PIs in the 8 UoCs failed to achieve a score of 80.

- 4X5Y Otter Trawl: 8 PIs attained a score of below 80.
- 4X5Y Bottom Longline: 6 PIs attained a score of below 80.
- 4X5Y Gillnet: 3 PIs attained a score of below 80.
- 4X5Y Hand Line: 3 PIs attained a score of below 80.
- 5Zjm Otter Trawl: 4 PIs attained a score of below 80.
- 5Zjm Bottom Longline: 4 PIs attained a score of below 80.

- 5Zjm Gillnet: 3 PIs attained a score of below 80.
- 5Zjm Hand Line: 3 PIs attained a score of below 80.

The assessment team has therefore set conditions for continuing certification of each Unit of Certification that the client for certification is required to address. The conditions are applied to improve performance to at least the 80 level within a period set by the certification body but no longer than the term of the certification. Where possible scores below 80 for PIs have been treated collectively; resulting in the setting of 8 conditions.

2 BACKGROUND TO THE REPORT

2.1 Introduction

This report sets out the results of the assessment of the “Canada Scotia – Fundy Haddock Fisheries” against the Marine Stewardship Council (MSC) Principles and Criteria for Sustainable Fishing. The client is the Groundfish Enterprise Allocation Council (GEAC).

2.2 Fishery Proposed for Certification

Following MSC Guidelines to Certifiers that define a unit of certification as "the fishery or fish stock (=biologically distinct unit) combined with the fishing method/gear and practice (=vessel(s) pursuing the fish of that stock)," the following eight fisheries are proposed for certification:

Species: Haddock (*Melanogrammus aeglefinus*)
Geographical Area: 4X5Y
Method of Capture: Otter Trawl
Management System: DFO
Client Group: GEAC

Species: Haddock (*Melanogrammus aeglefinus*)
Geographical Area: 4X5Y
Method of Capture: Bottom Longline
Management System: DFO
Client Group: GEAC

Species: Haddock (*Melanogrammus aeglefinus*)
Geographical Area: 4X5Y
Method of Capture: Gillnet
Management System: DFO
Client Group: GEAC

Species: Haddock (*Melanogrammus aeglefinus*)
Geographical Area: 4X5Y
Method of Capture: Hand Line
Management System: DFO
Client Group: GEAC

Species: Haddock (*Melanogrammus aeglefinus*)
Geographical Area: 5Zjm
Method of Capture: Otter Trawl
Management System: DFO
Client Group: GEAC

Species: Haddock (*Melanogrammus aeglefinus*)
Geographical Area: 5Zjm
Method of Capture: Bottom Longline
Management System: DFO
Client Group: GEAC

Species: Haddock (*Melanogrammus aeglefinus*)
Geographical Area: 5Zjm
Method of Capture: Gillnet
Management System: DFO
Client Group: GEAC

Species: Haddock (*Melanogrammus aeglefinus*)
Geographical Area: 5Zjm
Method of Capture: Hand line
Management System: DFO
Client Group: GEAC

It should be noted that the Canadian haddock fishery is part of a mixed groundfish fishery. In this case, the consideration of retained and discarded by catch covers other main species taken in that fishery, while management refers to that applied to groundfish as a group.

The certification would cover all Canadian vessels licensed to fish haddock in the two areas.

2.3 Report Structure and Assessment Process

The aim of this assessment is to determine the degree of compliance of the defined fisheries with the MSC Principles and Criteria for Sustainable Fishing, as set out in Section 10 below.

The assessment is based on the MSC Default Assessment Tree, Performance Indicators (PIs) and Scoring Guideposts (SG) – Version 1 that covered all MSC Assessments from July 21, 2008 until July 31, 2009.

This report contains:

- The background to the fisheries that provides Stakeholders with information putting the scoring commentary in context;
- The qualifications and experience of the team that undertook the assessment;
- The standard used (MSC Principles and Criteria);
- Details of Stakeholder consultation;
- The methodology used to assess (“score”) the fishery against the MSC Standard;
- A summary of the results of the assessments together with the Certification Recommendation and any conditions attached to certification; and
- A “scoring table” (Annex 1) for all PIs with related commentary that analyses the fishery in relation to the MSC criteria

The client reviewed an initial draft (Version 1) and the team modified the report where it considered the client comments to be appropriate;

The second draft (Version 2) was peer reviewed by nominated experts. The comments of the peer reviewers are contained in Annex 2 together with the responses of the certification team and a note of where amendments were made to the draft report on the basis of those comments.

2.4 Information Sources Used

Published information and unpublished reports used during the assessment are listed below:

1. Aboriginal Fisheries Strategy Formative Evaluation http://www.dfo-mpo.gc.ca/communic/cread/evaluations/07-08/60285_e.htm?template=print

2. Akiba O. Policy issues, and challenges in Canadian management of the Atlantic fisheries Environmental Conservation, 24:2:159-167 Cambridge University Press 1997
3. Application of the Sustainable Fisheries Framework through the Integrated Fisheries Management Planning Process <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/ifmp-pgip-back-fiche-eng.htm>
4. Atlantic Fisheries Policy Review - A Policy Framework for the Management of Fisheries on Canada's Atlantic Coast <Http://Www.Dfo-Mpo.Gc.Ca/Fm-Gp/Policies-Politiques/Afpr-Rppa/Framework-Cadre-Eng.Htm>
5. Begg, G.A. 1998. A review of stock identification of haddock, *Melanogrammus aeglefinus*, in the northwest Atlantic Ocean. Marine Fisheries Review 60(4): 1 – 15
6. Begg, G.A., Overholtz, W.J., and Munroe, N.J. 2001. The use of internal otolith morphometrics for identification of haddock (*Melanogrammus aeglefinus*) stock on Georges Bank. Fishery Bulletin 99: 1-14
7. Benjamins, S., D. Kulka & J. Lawson, 2008. Incidental catch of seabirds in Newfoundland and Labrador gillnet fisheries, 2001–2003. Endangered Species Res. Vol. 5: 149–160, 2008
8. Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. U.S. Fish Wildl. Serv., Fish. Bull. 53. 577 p.
9. Bilateral Management of Transboundary Fish Stocks: An Informal Approach To Ecosystem Based Management. F. G. Peacock & G. Peters, Fisheries & Oceans. www.Fish.Wa.Gov.Au/Docs/Events/Sharefish/.../Gregpeacock.Pdf
10. Breeze, H., D.G. Fenton, R.J. Rutherton and M.A. Silva 2002. The Scotian Shelf: An ecological overview for ocean planning. Can. Tech. Rep. Fish. Aquat. Sci. 2393: x + 259 pp.
11. Brown, M.W., Fenton, D., Smedbol, K., Merriman, C., Robichaud-Leblanc, K., and Conway, J.D., 2009. Recovery Strategy for the North Atlantic Right Whale (*Eubalaena glacialis*) in Atlantic Canadian Waters [Final]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada. vi + 66p.
12. Bundy, A., 2005. Structure and functioning of the eastern Scotian Shelf ecosystem before and after the collapse of groundfish stocks in the early 1990s. Can. J. Fish. Aquat. Sci. 62: 1453–1473 (2005)
13. Campana, S., J. Gibson, L. Marks, W. Joyce, R. Rulifson and Mike Dadswell, 2007. Stock structure, life history, fishery and abundance indices for spiny dogfish (*Squalus acanthias*) in Atlantic Canada. CSAS Research Document 2007/089
14. Canadian Code of Conduct for Responsible Fishing Operations, 1998
15. Charles A. Community Fishery Rights in Canada's Atlantic Region
16. Chopin, F., Inoue, Y., Matsuhita, Y. & Arimoto, T., 1995. Sources of accounted and unaccounted fishing mortality. In B. Baxter & S. Keller, eds. Proceedings of the Solving By-catch Workshop on Considerations for Today and Tomorrow, pp. 41–47. University of Alaska Sea Grant College Program Report No. 96–03.
17. Clark, D. and Emberley, J. 2008. Summer Scotian Shelf and Bay of Fundy research vessel survey update for 2007. CSAS, Research Document 2008/053: 75 p.
18. Clark, K. L. O'Brien, Y. Wang, S. Gavaris and B. Hatt., 2008. Assessment of Eastern Georges Bank Atlantic Cod for 2008. TRAC Reference Document 2008/01
19. Collie J.S., Hall S.J.; Kaiser M.J. and Poiner I.R., 2000. A quantitative analysis of fishing impacts on shelf-sea benthos. Journal of Animal Ecology, Volume 69, Number 5, September 2000, pp. 785-798(14)
20. COMFIE. 1997. Report of the Comprehensive Fishery Evaluation Working Group. ICES CM 1997/assess: 15 154 p.

21. COSEWIC, 2005. COSEWIC assessment and status report on the winter skate *Leucoraja ocellata* in Canada. COSEWIC. Ottawa. vii + 41 pp.
(www.sararegistry.gc.ca/status/status_e.cfm).
22. CSAS. 2005. Haddock on the southern Scotian Shelf and Bay of Fundy (Div. 4X/5Y). CSAS, Science Advisory Report 2005/056
23. Desrosiers, G., C. Savenkoff, M. Olivier, G. Stora, K. Juniper, A. Caron, J-P Gagne, L. Legendre, S. Mulsow and J. Grant, 2000. Trophic structure of macrobenthos in the Gulf of St. Lawrence and on the Scotian Shelf. *Deep Sea Research II* 47: 663 – 697
24. DFO 2006. A harvest strategy compliant with the Precautionary Approach. CSAS, Science Advisory Report 2006/023
25. DFO 2008. DFO Maritimes Region: Implementing an Ecosystem Approach to Management. GOMAC, 11/2008
26. DFO 2009. A fishery decision-making framework incorporating the Precautionary Approach. DFO web document - <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/precaution-eng.htm>;
27. DFO Conservation Harvesting Plan: Atlantic-wide for FG Vessels 65'-100' (March, 2006)
28. DFO Conservation Harvesting Plan: Atlantic-Wide for Licence Holders that are Member Companies of GEAC (Effective February 2006)
29. DFO Conservation Harvesting Plan: Atlantic-Wide for MG Vessels 65-100' (Effective January 2006)
30. DFO Conservation Harvesting Plan: ITQ MG Vessels <65' 4VWX+5 (April 1, 2006 – March 31, 2007)
31. DFO Fishery Stewardship and Sustainability Checklist 2008-09
32. DFO The Department of Fisheries and Oceans: Procedures for Monitoring and Control of Small Fish Catches and Incidental Catches in Atlantic Groundfish Fisheries Updated February 5, 2008
33. DFO, 1999. Status of redfish stocks in the NW Atlantic: Redfish in Units 1, 2 and 3, and in Division 3O. DFO Science Stock Status Report A1-01 (1999)
34. DFO, 2002. Groundfish Management Plan. Scotia - Fundy Fisheries Maritimes Region. April 1, 2002 - March 31, 2007. March 2002.
35. DFO (2005c). Canada's Federal Marine Protected Areas Strategy. DFO/2005-799, Ottawa, Ontario. pp. 18
36. DFO, 2003a. Georges Bank Yellowtail Flounder. Stock Status Report 2003/042
37. DFO, 2003b. State of the Eastern Scotian Shelf Ecosystem. CSAS: Ecosystem Status Rep. 2003/004
38. DFO, 2004a. Allowable Harm Assessment for Leatherback Turtle in Atlantic Canadian Waters. CSAS Stock Status Report 2004/035.
39. DFO, 2004b. Allowable Harm Assessment for Spotted and Northern Wolffish. CSAS: Stock Status Report 2004/031.
40. DFO, 2004c. Policy Framework for the Management of Fisheries on Canada's Atlantic Coast. <http://www.dfo-mpo.gc.ca/media/back-fiche/2004/hq-ac27b-eng.htm>
41. DFO, 2005a. Silver Hake on the Scotian Shelf (Div. 4VWX). CSAS Sci. Advis. Rep. 2005/059.
42. DFO, 2005b. White Hake in 4VWX and 5. CSAS Sci. Advis. Rep. 2005/058.
43. DFO, 2006a. Atlantic Halibut on the Scotian Shelf and Southern Grand Banks (Div. 3NOPs4VWX). CSAS Rep. 2006/038.
44. DFO, 2006b. Impacts of Trawl Gears and Scallop Dredges on Benthic Habitats, Populations and Communities. CSAS Rep. 2006/025.

45. DFO, 2007. Assessment of Spiny Dogfish in Atlantic Canada. CSAS Sci. Advis. Rep. 2007/046.
46. DFO, 2008. Recovery Potential Assessment for Cusk (*Brosme brosme*). DFO CSAS Sci. Advis. Rep. 2008/024.
47. DFO, 2009a. Cod on the Southern Scotian Shelf and in the Bay of Fundy (Div. 4X/5Y). CSAS Sci. Advis. Rep. 2009/015.
48. DFO, 2009b. Pollock in Div. 4VWX+5. CSAS Sci. Advis. Rep. 2009/025.
49. DFO, 2009c. Assessment of Atlantic Halibut on the Scotian Shelf and Southern Grand Banks (NAFO divisions 3NOPs4VWX5Zc). DFO CSAS Sci. Advis. Rep. 2009/036.
50. DFO: Federal and Provincial Ministers Release Strategy for Rebuilding Atlantic cod stocks <http://www.releases.gov.nl.ca/releases/2005/fishaq/1123n07.htm>
51. DFO-CWS National Working Group on Seabird Bycatch in Longline Fisheries (2003). Status report and future directions towards the development of a National Plan of Action for the reduction of incidental catch of seabirds in domestic and foreign longline fisheries in Canadian waters. Can. Tech. Rep. Fish. Aquat. Sci. 2471: 50p
52. Doherty, P. and T. Horsman, 2007. Ecologically and Biologically Significant Areas of the Scotian Shelf and Environs: A Compilation of Scientific Expert Opinion. Can. Tech. Rep. Fish. Aquat. Sci. 2774: 57 + xii pp.
53. Dulvy, N.K., 2003. *Dipturus laevis*. In: IUCN 2009. IUCN Red List of Threatened Species. Version 2009.1. www.iucnredlist.org.
54. Fish Watch <http://www.nmfs.noaa.gov/fishwatch/species/haddock.htm>
55. Frank, K.T., Mohn, R.K., and Simon, J.E. 1997. Assessment of 4X haddock in 1996 and the first half of 1997. CSAS Research Document 1997/107
56. FRCC, 2003. 2003/2004 Conservation Requirements for Groundfish Stocks on the Scotian Shelf and in the Bay of Fundy (4VWX), in Sub-Areas 0, 2+3 and Redfish Stocks (January 2003) (FRCC.2003.R.1) Report to the Minister of Fisheries and Oceans. January 2003. <http://www.frcc.ca/2003/sf2003.pdf>
57. FRCC, 2004. 2004/2005 Conservation Requirements for Groundfish Stocks on the Scotian Shelf and in the Bay of Fundy (4VWX5YZ) FRCC.2004.R.2. Report to the Minister of Fisheries and Oceans. February 2004. <http://www.frcc.ca/2004/SF2004.pdf>
58. Gavaris, S and J. Black, 2004 Area Trawled on Georges Bank by the Canadian Groundfish Fishery; CSAS Res. Doc. 2004/018.
59. Gavaris, S. 1987. An evaluation of the effect of minimum fish size on yield per recruit for Georges Bank haddock. CAFSAC, Research Document 87/37: 13 p.
60. Gavaris, S., 1988. An adaptive framework for the estimation of population size. CAFSAC Res. Doc. 88/29: 12p.
61. Gavaris, S., and L. Van Eeckhaute. 1998. Assessment of haddock on eastern Georges Bank. CSAS Research Document 1998/66: 75 p.
62. Gavaris, S., L. Van Eeckhaute, and K. Clark, 2007. Discards of Cod from the 2006 Canadian Groundfish Fishery on Eastern Georges Bank. TRAC Reference Document 2007/02
63. GEAC MSC Certification of the Haddock Fisheries in areas 4X5Y and 5Zjm. GEAC Submission for the Main Assessment. July 2009.
64. Gough G. Fisheries Management in the Maritimes Region 1990 - 2005 DFO 2007
65. Gulf of Maine Advisory Committee: Terms of Reference
66. Haddock in 1998 and the first half of 1999. CSAS Research Document 99/147: 80p.
67. Halliday, R.G. 1988. Use of seasonal spawning area closures in the management of haddock fisheries in the northwest Atlantic. NAFO Sci. Coun. Studies 12: 27-36

68. <http://decisions.fct-cf.gc.ca/fceliisa/search?language=EN&courtScope=fc&all=fisheries+fish&title=&citation>
69. <http://gulfofmaine.org/council/>
70. http://www.dfo-mpo.gc.ca/communic/cread/reviews/index_e.htm
71. <http://www.dfo-mpo.gc.ca/npoa-pan/npoa-pan/npoa-sharks-eng.htm>
72. <http://www.frcc.ca/mandate.htm>
73. <http://www.mar.dfo-mpo.gc.ca/science/tmgc/structure.html>
74. <http://www.tbs-sct.gc.ca/dpr-rmr/2007-2008/inst/dfo/dfo02-eng.asp>
75. <http://www.tbs-sct.gc.ca/maf-crg/assessments-evaluations/2005/fo-po/fo-po-eng.asp>
76. Hurley, P.C.F., G.A.P. Black, Mohn, R.K., and Comeau, P.A.. 1999. Assessment of the status of Division 4X/5Y haddock in 2005. CSAS, Research Document 2005/080: 87p.
77. Hurley, P.C.F., G.A.P. Black, P.A. Comeau and R.K. Mohn. 1999. Assessment of 4X
78. Kirby M.J.L. Report of the Task Force on Atlantic Fisheries, Navigating troubled waters: a new policy for the Atlantic fisheries. 1982
79. Kostylev, V., B. Todd, G. Fader, R. Courtney, G. Cameron & R. Pickrill, 2001. Benthic habitat mapping on the Scotian Shelf based on multibeam bathymetry, surficial geology and sea floor photographs. Mar. Ecol. Prog. Ser. Vol. 219: 121–137, 2001
80. Kulka, D. W., M. R Simpson and R. G. Hooper, 2004. Changes in Distribution and Habitat Associations of Wolffish (*Anarhichidae*) in the Grand Banks and Labrador Shelf. Atl. Fish. Res. Doc. 04/113 44 pp.
81. Kulka, D., C. Hood and J. Huntington, 2007. Recovery Strategy for Northern Wolffish (*Anarhichas denticulatus*) and Spotted Wolffish (*Anarhichas minor*), and Management Plan for Atlantic Wolffish (*Anarhichas lupus*) in Canada. DFO: Newfoundland and Labrador Region. St. John's, NL. x + 103 pp.
82. Kulka, D.W., Frank, K.T., and Simon, J.E., 2002. Barndoor skate in the northwest Atlantic off Canada: distribution in relation to temperature and depth based on commercial fisheries data. Rep. No. 2002/073. , CSAS Research Document.
83. Kulka, D.W.,. 1999. Barndoor skate on the Grand Banks, Northeast Newfoundland and Labrador shelves: distribution in relation to temperature and depth based on research survey and commercial fisheries data. Rep. No. 2002/073. CSAS Research Document.
84. Lawseth D. Northeast Pacific Ocean 2007
85. Legislation Constitution Act 1867
86. Legislation Atlantic Fisheries Restructuring Act, 1985
87. Legislation Coastal Fisheries Protection Act, 1985
88. Legislation Department of Fisheries and Oceans Act, 1985
89. Legislation Fisheries Act, 1985
90. Legislation Fisheries Development Act 1985
91. Legislation Fisheries Improvement Loans Act, 1985
92. Legislation Oceans Act, 1996
93. Legislation Species at Risk Act, 2002
94. Legislation The Canada National Marine Conservation Areas Act 2002
95. Legislation The Commercial Fisheries Licensing Policy for Eastern Canada, 1996
96. Legislation The Fish Inspection Act, 1996
97. Legislation The Fishery (General) Regulations 1993
98. Legislation The Aboriginal Communal Fishing Licences Regulations 1993

99. Liew, D.S.K. Initial Allocation of Quota Rights in the Scotia - Fundy Inshore MG Groundfish Fishery 1992
100. Lindebo E. & M.L. Soboil. The Groundfish Fishery of Georges Bank: An Examination of Management & Over Capacity Issues
101. McAlpine, D.F., James, M.C., Lien, J. and Orchard, S.A., 2004. Status and conservation of marine turtles in Canadian waters. In C.R. Seburn and C.A. Bishop (eds.). Ecology, conservation and status of Canadian Reptiles. Herpetological Conservation 2. Society for the Study of Amphibians and Reptiles. St. Louis, Missouri.
102. Meeting Minutes: FG < 45' Groundfish Advisory Committee February 27, 2009
103. Needler, A.B. 1931. The haddock. Biological Board of Canada, 1931: 28 p.
104. NEFSC, 2002. O'Boyle, R.N., and W.J. Overholtz, editors. Proceedings of the fifth meeting of the TRAC, Woods Hole, Massachusetts, February 5-8, 2002. NESC Ref. Doc. 02-12: 56p.
105. NOAA. 2005. Essential fish habitat source document: haddock, *Melanogrammus aeglefinus*, life history and habitat characteristics (Second Edition). NOAA Technical Memorandum NMFS-NE-196. 74 p.
106. NRC(National Research Council). 1999. Improving fish stock assessments. Washington, D.C., National Academy Press. 188 p.
107. O'Boyle, R.N. 1981. An assessment of the 4X haddock stock for the 1962-1980 period. CAFSAC Res. Doc. 81/24.
108. O'Boyle, R.O., 2001. Meeting on turtle by-catch in Canadian Atlantic fisheries. DFO, Science Division. 31 pp.
109. O'Boyle, R. [Ed.] and 7 others. An overview of joint Science/Industry surveys on the Scotian Shelf, Bay of Fundy, and Georges Bank. DFO Atlantic Fisheries Research Document 95/133: 34 p.
110. OECD Country Note on Fisheries Management Systems – Canada
111. Page, F. H., and K. T. Frank. 1989. Spawning time and egg stage duration in Northwest Atlantic haddock (*Melanogrammus aeglefinus*) stocks with emphasis on Georges and Browns Bank. Canadian Journal of Fisheries and Aquatic Sciences 46 (Suppl. 1): 68-81
112. Peacock F.G. & C. Anand Community Management in the inshore groundfish fishery on the Canadian Scotian shelf
113. Peacock F.G. & G. Peters Bilateral Management of Transboundary Fish Stocks: An Informal Approach to Ecosystem Based Management.
www.fish.wa.gov.au/docs/events/ShareFish/.../GregPeacock.pdf
114. Peer, D.L., 1970. Relation between biomass, productivity and loss to predators in a population of a marine benthic polychaete *Pectinaria hyperboea*. Journal of the Fisheries Research Board of Canada 27: 2143 – 2153
115. Review of Dockside Monitoring Program – Reporting on the Implementation of the Management Action Plan http://www.dfo-mpo.gc.ca/communic/cread/maps/06-07/65149_e.htm?template=print
116. Rivard, D. and Rice, J. [Chairpersons]. National workshop o reference points for gadoids. CSAS Proceedings Series 2002/033: 16 p.
117. SARA, 2006. Atlantic Leatherback Turtle Recovery Team 2006. Recovery Strategy for Leatherback Turtle (*Dermochelys coriacea*) in Atlantic Canada. Species at Risk Act Recovery Strategy Series. DFO, Ottawa, vi + 45 pp.
118. Simon, J.E., Harris, L. and T. Johnston. 2003. Distribution and abundance of Winter Skate (*Leucoraja ocellata*) in the Canadian Atlantic. CSAS Working Paper. 2003/028.

119. Templeman, W., 1984. Migrations of Wolffishes, *Anarhichas* sp., from tagging in the Newfoundland Area. J. Northw. Atl. Fish. Sci., Vol 5:93-97.
120. The Marshall Decision <http://www.mar.dfo-mpo.gc.ca/communications/maritimes/FactSheets04E/MarshallDecisionE.html>
121. TMGC 2002. Development of a sharing allocation proposal for the Transboundary Resource of cod, haddock, and yellowtail flounder on Georges Bank. Fisheries Management Regional Report 2002/01: 59 p.
122. TRAC. 2008. Eastern Georges Bank haddock. TRAC, Status Report 2008/02: 6 p.
123. Van Eeckhaute, L.A.M., S. Gavaris, E.A. Trippel 1999. Movements of haddock, *Melanogrammus aeglefinus*, on eastern Georges Bank determined from a population model incorporating temporal and spatial detail. Fishery Bulletin 97: 661-679
124. Van Eeckhaute, L., Brooks, L., and Traver, M. 2008 Assessment of eastern Georges Bank haddock for 2008. TRAC, Reference Document 2008/02: 81 p.
125. Van Eeckhaute, L., M. Traver, and R. Mayo. 2007. Assessment of eastern Georges Bank haddock for 2007. TRAC, Status Report, Reference Document 2007/07: 77 p.
126. Waiwood, K.G., and J.D. Neilson. 1985. The 1985 assessment of 5Ze haddock. CAFSAC Res. Doc. 85/95: 49 p.
127. Wildish, D.J., A.J. Wilson and B. Frost, 1989. Benthic macrofaunal production of Browns Bank, Northwest Atlantic. Canadian Journal of Fisheries and Aquatic Sciences 46: 584 - 590.
128. Wildish, D.J., A.J. Wilson and B. Frost, 1992. Benthic boundary layer macrofaunal of Browns Bank, Northwest Atlantic as potential prey of juvenile benthic fish. Canadian Journal of Fisheries and Aquatic Sciences 49: 91 - 98

3 GLOSSARY OF ACRONYMS USED IN THE REPORT

AFS	Aboriginal Fisheries Strategy
B	Biomass
BLL	Bottom Longline
CB	Certification Body
CCG	Canadian Coastguard
CFIN	Canadian Fisheries Information Network
CGSB	Canadian General Standards Board
CHP	Conservation Harvest Plan
CITES	Convention on International Trade in Endangered Species
CMB	Community Management Boards
COMFIE	Comprehensive fishery evaluation working group
CPD	Conservation and Protection Division
CSAS	Canadian Science Advisory Secretariat
DFO	Fisheries and Oceans, Canada
DMC	Dockside Monitoring Companies
DMP	Dockside Monitoring Programme
DO	Dockside Observers
EA	Enterprise Allocation
EEZ	Exclusive Economic Zone
ENGO	Environmental Non-Governmental Organisations
EQ	Enterprise Quota
ESSIM	Eastern Scotian Shelf Integrated Management
ETP	Endangered, Threatened and Protected Species
F	Fishing Mortality
FAM	Fishery Assessment Methodology
FAO	Food and Agricultural Organisation
FG	Fixed Gear
FMP	Fishery Management Plan
FRCC	Fisheries Resource Conservation Council
GEAC	Groundfish Enterprise Allocation Council
GN	Gill Net
GOMAC	Gulf of Maine Advisory Committee
HCR	Harvest Control Rules
HL	Hand Line
HS	Harvest Strategy
ICES	International Council for the Exploration of the Seas
ICNAF	International Commission for the Northwest Atlantic Fisheries
IFMP	Integrated Fisheries Management Plan
ITQ	Individual Transferable Quota
IUCN	International Union for Conservation of Nature

JPA	Joint Project Agreement
LRP	Limit Reference Point
<i>M</i>	Natural Mortality Rate
MARFIS	Maritime Fisheries Information System
MCS	Monitoring, Control & Enforcement
MG	Mobile Gear
MSC	Marine Stewardship Council
MSGVO	Mid-Shore Groundfish Vessel Owners
NAFO	North Atlantic Fisheries Organisation
NEFMC	New England Fisheries Management Council
NMFS	National Marine Fisheries Service
NRC	National Research Council
NSLTWG	Nova Scotia Leatherback Turtle Working Group
OCMD	Oceans and Coastal Management Division
OECD	Organisation for Economic Cooperation & Development
OTB	Otter Trawl
P	Principle
PED	Population Ecology Division
PI	Performance Indicator
RAP	Regional Advisory Process
RMAF	Results-based Management and Accountability Framework
RV	Research Vessel
SARA	Species at Risk Act
SAW	Stock Assessment Workshop
SDS	Sustainable Development Strategy
SG	Scoring Guidepost
SMGL	Small Mesh Gear Line
SSB	Spawning Stock Biomass
SSR	Stock Status Report
TAC	Total Allowable Catch
TMGC	Trans-boundary Management Guidance Committee
TRAC	Trans-boundary Resources Assessment Committee
UoC	Unit of Certification
USR	Upper Stock Reference
VDC	Virtual Data Centre
VMS	Vessel Monitoring System
VPA	Virtual Population Analysis
WWF	World Wildlife Fund

4 BACKGROUND TO THE FISHERY

4.1 History of the Fishery

Traditionally, haddock and other groundfish such as cod provided the base of the Scotia-Fundy fishing industry. A substantial increase in catching capacity in the 1950s and 1960s was driven by technological improvement (fish finding equipment, engines and hydraulics) promoted by Federal and Provincial aid related to a fishery sector development policy. Other policy initiatives covered exploratory fishing and grant and loans for new vessels and processing plants.

Consequently, a Canadian fleet of large trawlers grew to target groundfish in international waters (> 12 miles from the Canadian Atlantic coast) alongside a large number of foreign flagged vessels. While the combined level of fishing effort led fish stocks to show signs of over-fishing, fisheries managers (International Commission for the Northwest Atlantic Fisheries (ICNAF)) were unable to find a solution.

From January 1, 1977, Canada established an Exclusive Economic Zone (EEZ). The increase in fisheries jurisdiction out to 200 miles allowed Canada to exclude foreign fishing vessels from operating in national waters.

Under the new fisheries regime, Canadian management prioritised stock recovery. Target fishing mortality was substantially reduced from previous actual levels, while measures were taken to develop an economically-viable fishing industry. The new policy encompassed fleet upgrading, industry modernization, marketing and quotas (e.g. individual transferable quotas (ITQs) and enterprise quotas (EQs)). These measures, however, met with limited success; fishery management measures were poorly enforced and the Canadian fishery industry was characterized by resource depletion, vessel tie-ups and overcapacity (Akiba 1997).

In response to these problems, in January 1982 the Federal government appointed a new Task Force on Atlantic Fisheries. The resulting Kirby report (1983) encouraged the permanent use of Enterprise Allocations (EAs)¹ to companies operating in the trawler fishery to facilitate better management of the fleet and reduce capacity. However, the practical application of fisheries management was problematic (misreporting of landings, poor reporting on discards and inaccurate resource assessments) and overfishing continued.

In 1989, a task force was commissioned to assess the situation of the Scotia – Fundy fisheries. The resulting report included many recommendations, including a reduction in fleet capacity through the use of ITQs. Subsequently, in January 1991, DFO implemented an ITQ programme for the Scotia-Fundy Inshore Mobile Gear (MG) Groundfish fleet. The initial programme consisted of ITQs for six groundfish stocks including haddock (4X5Y); in 1992 this was expanded to cover twelve groundfish stocks including haddock (5Zjm) (Liew 1992).

In 1991, in response to warnings by scientists that the Atlantic groundfish fishery was in danger of imminent collapse, DFO fishery managers closed the fisheries for cod, haddock,

¹ By 1988, all Atlantic groundfish vessels (65' to 100' in length) had switched to EAs.

pollock and all major groundfish populations east of Halifax. Groundfish fisheries in Southwest Nova Scotia, the Bay of Fundy and Georges Bank remained open but at a low level. Already at historically low levels, Scotia-Fundy groundfish landings dropped further, from 217,000 mt in 1990 to 76,000 mt in 1995.

In the 1990s, a series of special federal programmes, including the Atlantic Fisheries Adjustment Plan, The Atlantic Groundfish Strategy and the Canadian Fishery Adjustment and Restructuring Programme sought to limit the impact of the reduced fishing opportunities. Special measures included financial assistance for groundfish fishers and certain communities. Under voluntary licence retirement programmes, fishers who retired their licences instead of transferring them to other harvesters received compensation payments.

In the early 1990's, the "core fisher" policy designated those fishers with vessels of <65' as having "*a solid attachment to and dependence on*" the fishery. From 1996 on, only core fishers could acquire most licences from other fishers. The concept was that as less active fishers sold off their licences to core fishers, the total number of enterprises would gradually diminish and fishers with a long-term stake in the industry could become dominant.

The fixed-gear (FG) (long-liners and gillnetters) groundfish > 45' <65' sector switched to ITQs in 1997. From 2001, the replacement of existing vessels by larger ones was allowed as long as these were below 65' and applied other capacity restraints. In addition, fishers were obliged to pay for dockside monitoring programmes (DMP) provided by independent companies that included hail-out and hail-in and the confirmation of landings by species.

Another key policy was community-based quotas. An initial trial covered all FG vessels up to 45' in length, or about 2,500 boats. Each area or group (some "communities" were defined by gear) received a quota and management boards were set up to cover the whole Scotia-Fundy sector. Boards regulate such matters as the sub-allocation of the community quota, the transfer of quota between management boards, trip limits, seasonal or fleet quotas and ITQs. They can also review catches, apply sanctions against rule-breakers and deal with business matters.

Following the introduction of EEZs both Canada and the United States laid claim to Georges Bank. In 1984, a panel of the International Court of Justice at The Hague drew a boundary – the Hague Line that gave Canada the northeast third of the bank. A bilateral arrangement (1995) increased co-operation between the two countries, particularly at a scientific level. A Trans-boundary Resources Assessment Committee (TRAC) was established to assess trans-boundary fish stocks including haddock. The Trans-boundary Management Guidance Committee (TMGC), comprising representatives of industry, scientists and fishery managers, cooperates on harvest strategies. While each country sets its own quotas and other regulations, each takes greater account of the other's views. In 2003, co-operation on the Georges Bank strengthened through a new resource-sharing agreement. The two sides together began setting Total Allowable Catches (TACs) for haddock, cod and yellowtail flounder, and portioning out the national shares.

The recovery of the stocks from their weak position in the early nineteen nineties is detailed in the sections below.

4.2 Biology of the Target Species

4.2.1 Family

The haddock (*Melanogrammus aeglefinus*) is a member of the cod family (Gadidae), found in the northwest and northeast Atlantic Ocean. There is a substantial body of information available on all aspects of haddock biology.¹

4.2.2 Geographic Range

Although haddock occur on both sides of the north Atlantic, they are somewhat restricted in their range to particular areas. In the western north Atlantic, haddock occur from Cape Hatteras, North Carolina in the south to the Strait of Belle Isle, Newfoundland in the north (Needler 1931; Bigelow, H.B. and W.C. Schroeder. 1953; NOAA. 1999). Within this range, haddock stocks are most abundant in the areas off Cape Cod, the Gulf of Maine and Nova Scotia.

4.2.3 Habitat

Haddock occupy bottom habitats with substrate composed of pebble-gravel, broken ground and sand. They are "especially partial to the smooth areas between rocky patches" (Needler 1931; Bigelow, H.B. and W.C. Schroeder. 1953; NOAA. 1999). Haddock are most common at 40 m to 150 m depths, but seem to prefer depths shallower than 100 m where temperatures range from 0° - 10° c. Juvenile haddock live in bottom habitats following the larval phase, but are found in shallower water on bank and shoal areas compared to larger adults that typically occur in deeper water. Both juvenile and adult haddock rarely occur near ledges, rocks, kelp or soft oozy mud.

4.2.4 Natural Mortality Rate, Life Span & Maturity

Stock assessments for haddock currently assume a natural mortality rate of $M = 0.20$ (Hurley *et al.* 2005, Van Eeckhaute *et al.* 2008). At this rate, approximately 50 out of every 100 age1 recruits will live at least 3 to 4 years, 10 out of every 100 recruits will live 11 to 12 years, and only 1 out of 100 will live past 23 years. Although haddock may mature at ages <3 years, female contributions to the spawning stock increase most rapidly between ages 3-5 with 50 % of females maturing by age 3 in 4X5Y although the proportion is almost 100 % by age 3 in 5Z_{jm}.

4.2.5 Prey & Predators

Haddock mainly prey upon bottom dwelling invertebrates including gastropod and bivalve molluscs, polychaete worms, amphipods, crabs, shrimps, sea stars, sea urchins, sand dollars and brittle stars, although adults will occasionally consume fish eggs and small fishes such as herring. Larval haddock and small juveniles feed mainly on small crustaceans as well as polychaetes and small fishes while inhabiting pelagic waters (Bigelow, H.B. and W.C. Schroeder. 1953; NOAA. 1999).

Predators of juvenile haddock include elasmobranchs (i.e. spiny dogfish and skates) and many groundfish species including cod, pollock, cusk, white hake, red hake, silver hake, goosefish, halibut and sea raven. Marine mammals such as grey seals also consume haddock.

¹ For example NMFS' <http://www.nmfs.noaa.gov/fishwatch/species/haddock.htm>

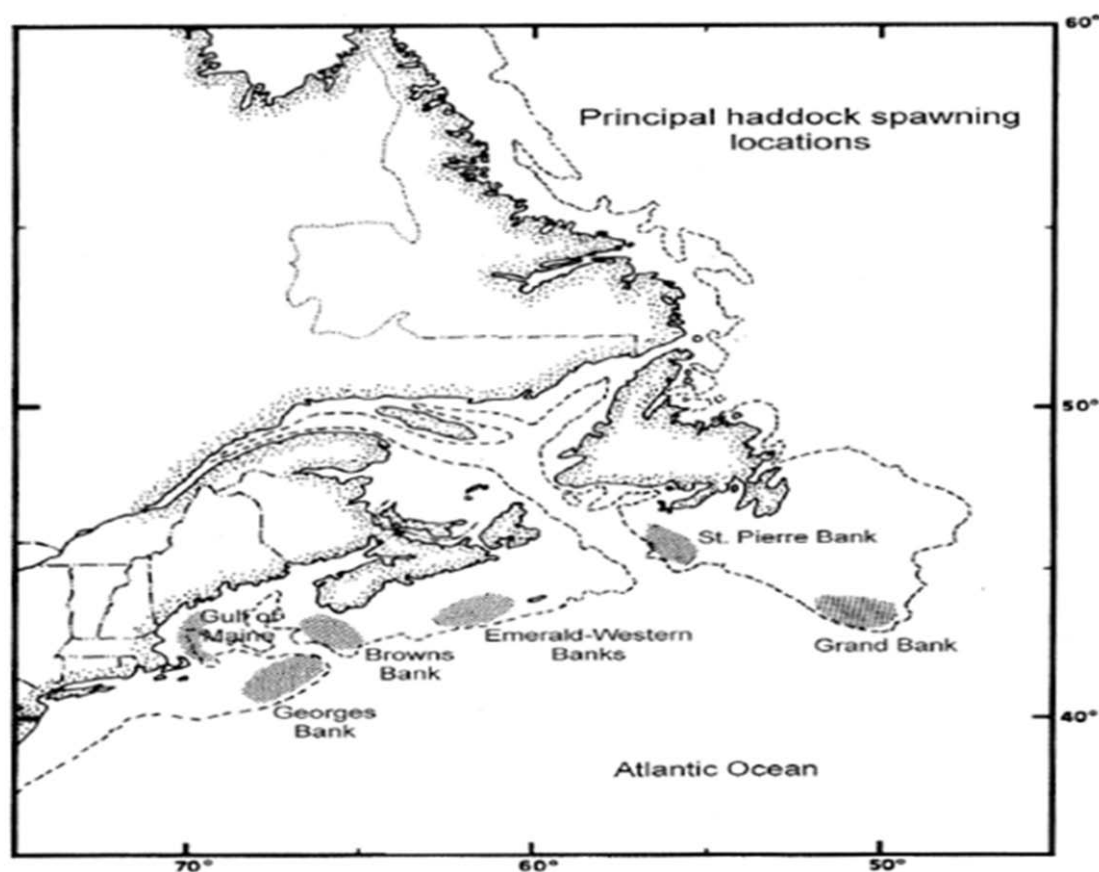
4.2.6 Growth

The theoretical maximum average length for haddock is approximately 90 cm, although growth rates have varied over the past several decades. Haddock mean length-at-age has been declining for all ages since the 1990s, particularly for the older ages. Lengths-at-age are currently among the smallest on record for all ages and regions. Body weight ranges from 0.1 kg at age 1 to approximately 1.5 kg by ages 6-7, but they are heavier for 5Zjm and currently are smaller in 4X5Y (DFO comment on draft report October, 2009). Growth rates also appear to vary significantly among the various sub-stocks in the western North Atlantic.

4.2.7 Spawning

Major spawning grounds for haddock include Georges Bank, Browns Bank on the southern Scotian Shelf, and Emerald, Western, and Sable Island Banks on the eastern Scotian Shelf (Figure 2). Haddock form spawning aggregations in these areas at various times of the year, although a seasonal peak of spawning occurs on Georges Bank in late-March through April, and on Browns Bank from late April to early May (Bigelow, H.B. and W.C. Schroeder. 1953; NOAA. 1999).

Figure 2: Main Haddock Spawning Banks in the North-west Atlantic Ocean



Source: Begg 1998¹

¹ Citing his source as Page, F. H., and K. T. Frank. 1989. Spawning time and egg stage duration in Northwest Atlantic haddock (*Melanogrammus aeglefinus*) stocks with emphasis on Georges and Browns Bank. Canadian Journal of Fisheries and Aquatic Sciences 46 (Suppl. 1): 68-81

Haddock are batch spawners with relatively high reproductive potential. For example, annual egg production for a mature female (55 cm in length) is approximately 850,000 eggs while larger females are capable of producing up to 3 million. The reproductive behaviour of haddock is complex, involving aggressive behaviour, sound production and coloration changes by males, and courtship prior to mating between individual males and females (Halliday 1988). Courting may occur on or near the bottom, but spawning occurs while a mated pair swims vertically upwards. A female will spawn batches of eggs near the bottom over rocks, gravel, smooth sand and mud at 1 to 2 day intervals over a period of 2 to 3 weeks. Once fertilized, eggs become buoyant, rise and then float near the surface where subsequent development occurs over a period of two weeks or more. Haddock eggs tolerate a range of salinities. Early stage eggs concentrate near the surface, whereas later stages are distributed either uniformly over depth or with a sub-surface maximum. Larvae are generally pelagic at 10 m to 50 m depth over a period of three months or more.

4.2.8 Migration

The relatively narrow depth preferences of haddock appear to limit mixing among adult haddock spawning populations occupying Georges Bank, the Gulf of Maine and the Scotian Shelf because deep channels separate these regions (Needler 1931; Bigelow, H.B. and W.C. Schroeder. 1953; NOAA. 1999). Movement that does occur tends to be seasonal or age-dependent with some year-to-year variation in both.

Early analyses of migration based on tagging and catch statistics indicated seasonal migrations in 4X5Y extending up to 150 km as haddock move between deep over-wintering grounds and shallow summer feeding areas. These early accounts also suggest that younger haddock (ages<4) tend to be more stationary than older fish. In some areas, such as Georges Bank, movements are limited to migrations on and off the eastern portion of the bank (Van Eeckhaute *et al.* 1999).

4.3 QUOTA & TACs

Following the 2005 stock assessment in 4X5Y, the annual TAC for haddock in that fishing area was set at 7,000 mt.

The TAC on Georges Bank is shared between the USA and Canada with a variable proportion allocated each year

The annual TACs for groundfish are allocated among fleet sectors according to historic fishing rights. As will noted from the following section below, the allocation of quotas is not related to the actual take up of fishing opportunities by the different fleet segments. In 4X5Y, the largest proportion of the TAC is allocated to MG (trawlers) < 65' with a share of 52.36 %. FG (long line and gill net) receives a total share of 34.03 % with the major part allocated to vessels <45' (table 1). In 5Z_{jm} a part of the Canadian allocation is provided for vessels greater than 100'. The total share of FG vessels is 23.57 %. MG (<65') has the largest share (table 2).

Table 1: Haddock 4X5Y: Canadian Quotas – by Sector (mt)

	mt	%
TAC	7,000	
Aboriginal Vessels	574	8.20%
FG < 45'	2,048	29.26%
FG > 45' < 65'	295	4.21%
FG > 65 < 100	39	0.56%
MG < 65"	3,665	52.36%
MG > 65' < 100 '	39	0.56%
Vessels > 100'	340	4.86%

Source: DFO 2006

Table 2: Haddock 5Zjm: Canadian Quotas by Sector (mt)

	2007	2008	2009	Share 2009
Canadian Quota	12,730	14,950	18,900	
First Nations	983	1,154	1,504	7.96%
Science Quota	378	444	-	0.00%
FG<45	2,404	2,823	3,679	19.47%
FG 45-65	474	556	724	3.83%
FG 65-100	122	144	187	0.99%
MG<65	5,226	6,137	7,997	42.31%
MG 65-100	122	144	187	0.99%
Vessels >100	2,894	3,398	4,427	23.42%
Bycatch Reserve	127	150	195	1.03%

Source: DFO 2009

4.4 Fleet and Gear Description

GEAC (2009) reports that in recent years the Canadian fishery for haddock has been conducted primarily by vessels using otter trawls (MG) and bottom longlines (FG), with a few handlines (FG) and gillnets (FG). Hook size, mesh sizes and net construction are regulated by license conditions to meet individual fisheries conservation objectives such as minimum fish size and escapement of incidental catch.

Table 3 shows that 267 vessels participated in the 4X5Y haddock fishery in fishing year 2007 / 08. Vessels < 20 m are used to catch the fleet sector allocation for vessels >30.5 m. The number of vessels active in the fishery varies on annual basis and is dependent on the availability of quota obtained through transfers from the ITQ programme. For FG vessels <14 m past catch history and available quota through community board assignment could affect the number of vessels targeting haddock. The majority of vessels were FG less than 14 m. 69 % were FG mostly longline with the remainder mobile gear (otter trawl). 80 % of the vessels were < 14 m. There are a limited number of gill netters in the 4X5Y fishery as the number of licenses is restricted to four home port zones. The transfer of gillnet licenses is only permitted to a new license holder that resides in the same gill net zone. This restricts gill net effort to the same area.

Table 3: 4X5Y Licensed Vessels Fishing Haddock 2007/08

	<u>< 14 m</u>	<u>14 m-20 m</u>	<u>20m-30.5m</u>	<u>>30.5 m</u>
Fixed Gear < 14 m	176	0	0	0
Fixed Gear 14 m - 30.5 m	6	1	0	0
Mobile Gear < 20 m	26	33	0	0
Mobile Gear 20 m - 30.5 m	1	0	1	0
Vessels > 30.5 m	3	10	1	0
Aboriginal Fishery	3	6	0	0
Total	215	50	2	0

Source: GEAC

In 2009, 129 Canadian vessels participated in the 5Z_{jm} haddock fishery (table 4). As in 4X5Y, the number of vessels active in the fishery varies on annual basis and is dependent on the availability of quota obtained through transfers from the ITQ programme.

Table 4: 5Z_{jm} Licensed Vessels Fishing Haddock 2008

	<u>Gear</u>	<u>Allocation</u>	<u>Number</u>
Fixed Gear <14 m	Gillnet	Competitive	2
Fixed Gear <14 m	Handline	Competitive	1
Fixed Gear <14 m	Longline	Competitive	44
Fixed Gear 14 m - 20 m	Longline	ITQ	1
Fixed Gear 20 m - 30 m	Longline	EA	2
Mobile Gear <20 m	Otter Trawl	ITQ	59
Mobile Gear <20 m	Otter Trawl	First Nation	6
Mobile Gear 20 m - 30 m	Otter Trawl	Midshore EA	2
Mobile Gear >30 m	Otter Trawl	Offshore EA	12
Total			129
Note: Vessels < 20 m caught the MG>30 m enterprise allocation			

Source: GEAC

Otter trawling derives its name from the rectangular otter boards that are used to keep the mouth of the trawl net open. The otter boards are made of timber or steel. They are positioned in such a way that the hydro-dynamic forces that act when the net is towed along the seabed push these outwards, so preventing the mouth of the net from closing. The net is held open vertically by floats attached to the "headline" (the rope which runs along the upper mouth of the net), and rubber disks, sometimes called "cookies" attached to the "foot rope" (the rope which runs along the lower mouth of the net). The trawls are mainly constructed of polyethylene netting. In the past few years the dominant type of trawls used are #5 - 8 Safari trawls as well as #300 - 350 balloon trawls. The dominant type of doors used is #11 - 15 Bison doors. Between the doors and trawl is 45.7 m - 54.9 m of rubber-covered bridles depending on the trawl design. The only parts of the gear that touch the benthos are the trawl door keels, bottom bridles between the net and doors and the rock skipper gear that bounces

off the bottom as the gear is towed.

Longline fishing uses a long line, called the main line, with baited hooks attached at intervals by means of branch lines called "snoods". A snood is a short length of line that is attached to the main line using a clip or swivel, with the hook at the other end. Vessels carry a number of "tubs" of long lines with the number and configuration varying between vessel size and sea area fished. In 4X5Y there may be between 400 and 500 hooks (standard size 12 circle) per tub and between 25 and 80 tubs per boat. For fishing operations in 5Zjm there are 300 hooks (standard size 12, 13 or 14) per tub and 80 to 90 tubs per vessel (*Pers. comm. Gary Dedrick*).

Gill net license holders are restricted to 40 nets with an overall length no greater than 50 fathoms (91.4 m). The net is made of polyethylene and mesh size is restricted to a minimum of 140 mm. It is anchored to the bottom and marked by surface buoys. In 5Zjm gill nets must be tended.

"Hand lining¹ involves a series of baited hooks, weighted on the bottom which are lowered to within reach of the bottom and "jigged" or moved up and down. The vessel is anchored in one spot and the fish are attracted to the baited hooks. The usual bait is squid or small pelagic fish. The line is brought to the surface periodically to remove the fish and add bait. The size of the fish can be regulated by the size of the hook and type of bait to some degree. Bugging is similar to hand lining but instead of bait, fluorescent orange tubing (bugs) on the hooks acts as visual lures and the vessel drifts with the tide through a school of fish, moving back when out of range".

Hand lines are usually hauled by hand, although in some fisheries automatic reels have been tested. The usual number of hand lines per vessel is 5. (*Pers. Comm. George Rennehan*).

Management measures in 4X5Y include mesh-size restrictions on trawl (130-mm square mesh) and gillnet (5½" gear), hook-size (12 mm gape) restrictions on bottom-longline.

4.5 Fishing Year

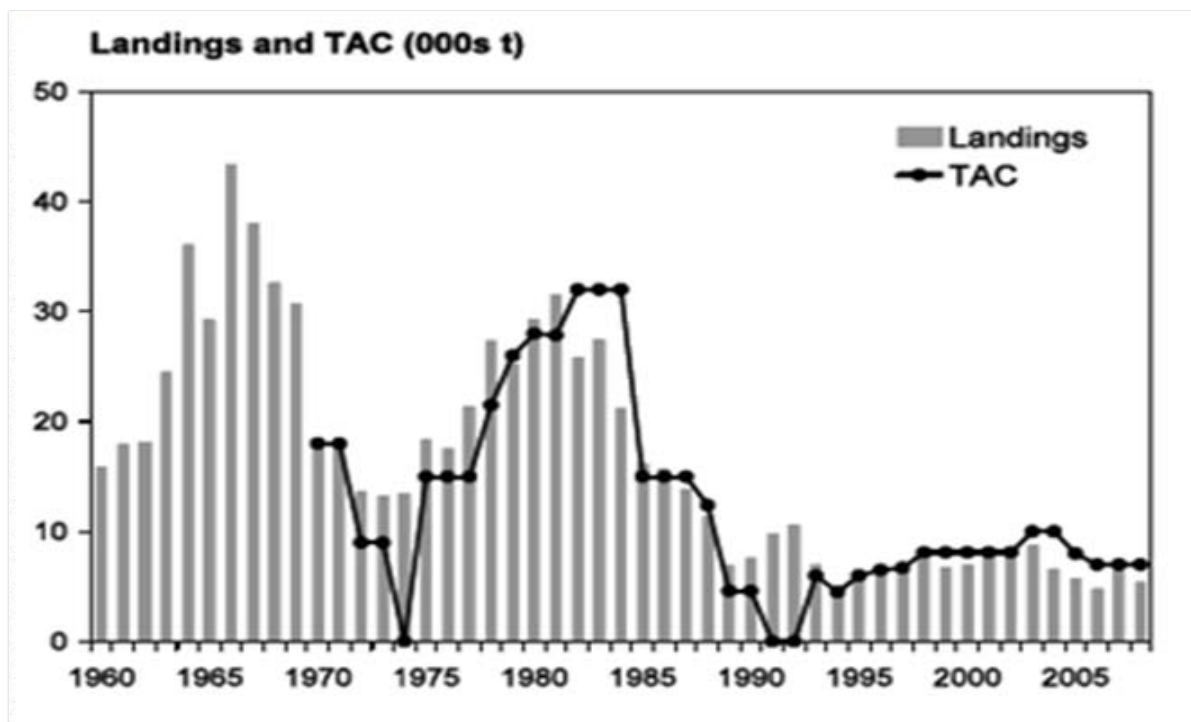
The fishing year in 4X5Y is April 1 thru March 31. In 5Zjm it is the calendar year i.e. January 1 thru December 31.

4.6 Landings

Since the reopening of the fishery in the early 1990s, landings of haddock from 4X5Y have remained fairly stable, while being at or below the established TAC (Figure 3). In contrast, in 5Zjm, there was a fairly strong increase in landings from the early part of the 1990's (albeit with some reduction in the latter years), but these were consistently below TAC (Figure 4).

¹ From <http://www.grandmanannb.com/fishing.htm>

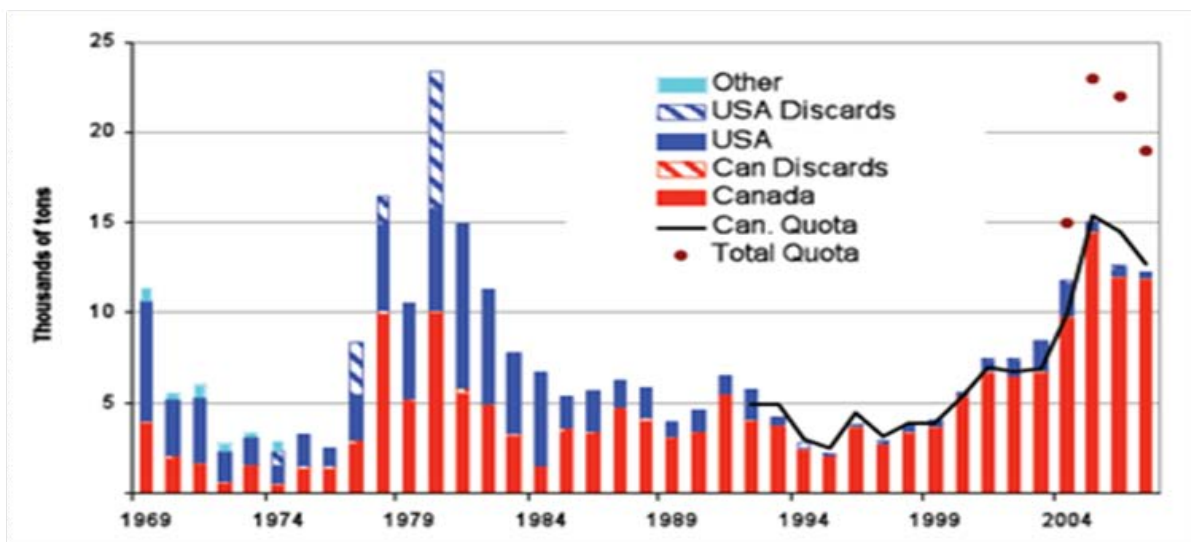
Figure 3: 4X5Y: TAC & Landings of Haddock 1960-2008 ('000 mt)



Note: Catches in 1991-1992, when the directed fishery was closed, are by-catches in cod fisheries.

Source: DFO 2009

Figure 4: 5Zjm: Quotas, Landings & Discards of Haddock 1969-2008 ('000 mt)



Note: Canadian catches below the quotas since 1995 are due to closure of some fleet sectors when the cod quotas were reached

Source: TRAC_RD_2008

As shown by table 5 & table 6, otter trawl is the most important gear type for catching haddock in both 4X5Y and 5Zjm; taking a 78 % share in the former and 85 % in the latter. Bottom long line had respective shares of 22 % and 15 %. In recent years, only small amounts of haddock have been harvested by gill net and hand line.

As gill nets are mainly used to target cod and pollock, any future increase in quotas for these two species may lead to a higher haddock take by the gear. However, in the short to medium term the catch of haddock by gill net may be expected to remain relatively insignificant.

While there are a relatively large number of hand line licenses (e.g. approximately 200 in Sherburne County), the low quotas limit the potential for economically viable fishing operations.

Table 5: Haddock: Landings from 4X5Y by Gear Type (mt)

			<u>Bottom</u>		
	<u>Trawl</u>	<u>Gillnet</u>	<u>Longline</u>	<u>Handline</u>	<u>Total</u>
1996	3,836	50	2,053	298	6,237
1997	4,303	58	2,066	110	6,537
1998	5,235	50	2,461	141	7,887
1999	4,595	31	1,955	40	6,621
2000	4,234	28	2,670	29	6,961
2001	6,216	21	2,219	10	8,466
2002	5,670	23	2,252	55	8,000
2003	6,646	26	2,008	26	8,706
2004	5,376	22	1,116	15	6,529
2005	4,664	13	951	5	5,633
2006	3,429	6	1,309	3	4,747
2007	5,290	3	1,583	-	6,876
2008	4,188	7	1,174	-	5,369

Note: 2007 & 2008 – Preliminary data

Source: DFO (after GEAC)

Table 6: Haddock: Landings from 5Zjm by Gear Type (mt)

		<u>Bottom</u>		
	<u>Trawl</u>	<u>Longline</u>	<u>Other</u>	<u>Total</u>
2001	5,112	1,633	68	6,813
2002	4,955	1,521	41	6,517
2003	4,986	1,776	112	6,874
2004	7,744	2,000	94	9,838
2005	12,116	2,368	52	14,536
2006	10,088	1,896	67	12,051
2007	10,046	1,844	61	11,951
2008	12,615	2,164	34	14,813

Note: Other includes hand lines, gill nets & discards

Source: DFO (after GEAC)

5 ADMINISTRATIVE CONTEXT

5.1 Introduction

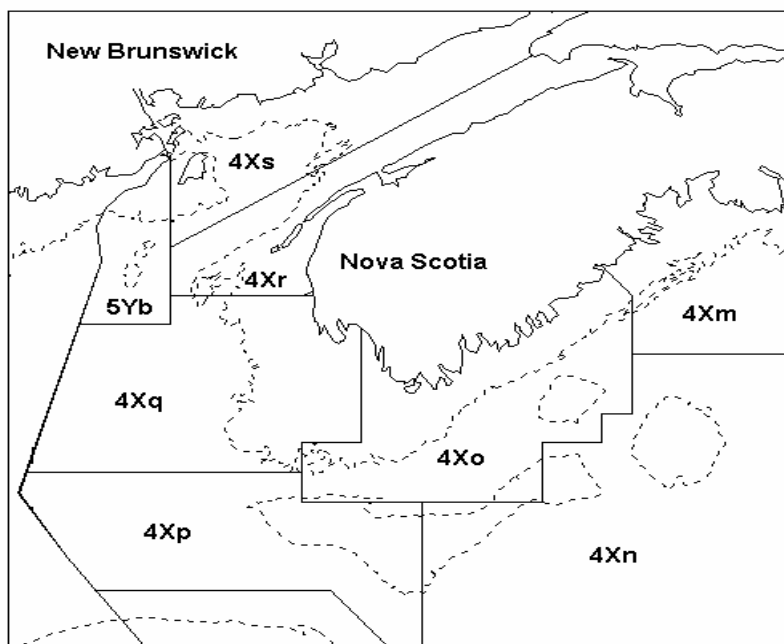
The management system in Canadian waters conforms to the main principles of the 1995 United Nations Code of Conduct for Responsible Fishing. This is achieved through enacted Canadian fishery legislation; limited entry licensing and the implementation of fishery management and ecosystem objectives outlined in Fishery Management Plans (FMP).

5.2 Fishing Area

The NAFO Convention Area encompasses most of the Northwest Atlantic which has been divided into divisions and subdivisions. These are used to manage most groundfish fisheries off Nova Scotia and New Brunswick. The DFO Maritimes Region corresponds to divisions 4V, 4W, 4X and parts of 5Y and 5Zjm. 4VS and 4VN are subdivisions of 4V (figure 1 above).

The Scotian Shelf and Bay of Fundy sea area are located in the Maritimes Region of eastern Canada off the shores of the Provinces of Nova Scotia and New Brunswick. Scotia-Fundy runs from the northern tip of Cape Breton to the United States / New Brunswick border. Scotia-Fundy's land boundaries encompass the Atlantic shore of Cape Breton, most of the Nova Scotia peninsula and the southwest side of New Brunswick. The sea area consists of statistical unit areas: 4Xmnop that is referred to as east 4X; and 4Xqrs, 5Y that is referred to as west 4X. For the purposes of this assessment the stock area is referred to as 4X5Y (Figure 5).

Figure 5: 4X5Y

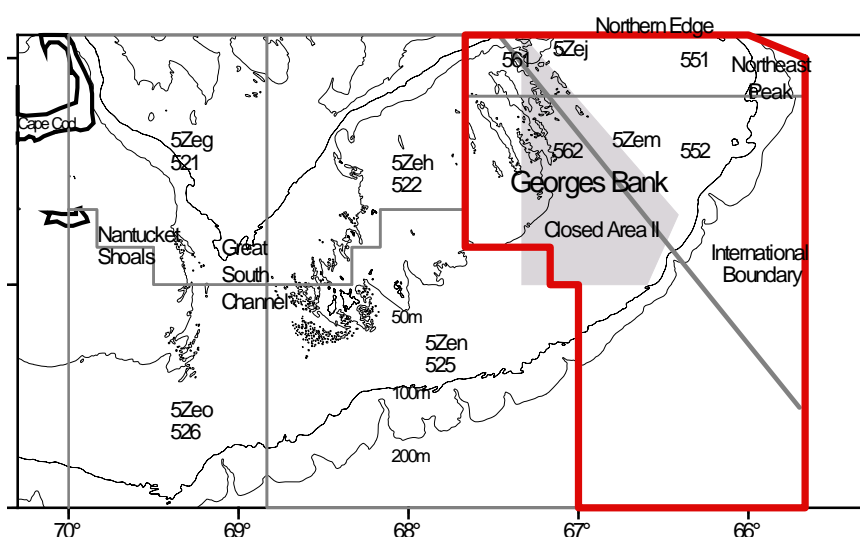


Source: CSAS Science Advisory Report 2006/047

Topographical features of 4X5Y are the Bay of Fundy, the Gulf of Maine, the Fundian Channel, Browns Bank, Rosemary Bank, Baccaro Bank, Le Havre Bank and Le Havre Basin.

Georges Bank is an oval-shaped, relatively shallow bank, 150 miles long by 70 miles wide. It lies at the south western end of a chain of banks stretching from Newfoundland. The 1982 decision of the International Court of Justice gave Canada jurisdiction (see above) over a portion of eastern Georges Bank (Figure 6); classified as DFO statistical unit areas j and m in NAFO sub division 5Ze. This Canadian portion of the area is also referred to as 5Zc; throughout this report the area is referred to as 5Zjm.

Figure 6: The Georges Bank



Note: The management unit for this assessment occurs in areas 5Zjm (551 and 552) of the Georges Bank that lie to the east of the International Boundary. Closed Area II is in U.S. waters

Source: DFO: Eastern Georges Bank Assessment Document

5.3 Legislation

DFO's legal authority for its programmes and activities is found in a number of statutes and their respective regulations. Those relating to the haddock fishery are:

- Constitution Act, 1867
 - http://www.laws.justice.gc.ca/en/const/c1867_e.html
 - This provides for the Parliament of Canada on behalf of the Canadian public to have legislative responsibility for Canada's seacoast and inland fisheries. As a result, the federal government has constitutional authority for all fisheries in Canada.
- Fisheries Act, 1985
 - <http://www.canlii.org/en/ca/laws/stat/rsc-1985-c-f-14/latest/rsc-1985-c-f-14.html>

- This authorises *inter alia* the establishment of fishing licences, fishery regulations and fishery officers; the keeping and submitting of fishery records; protecting fish habitat; and pollution prevention. Fishery officers responsible for MCS activities are designated under Section 5 of the Fisheries Act and have full enforcement powers and responsibilities as outlined in the Fisheries Act, Coastal Fisheries Protection Act, the Criminal Code of Canada and the Constitution Act. The Fisheries Act does not provide policy guidance, instead fisheries policy in Canada is developed by the national government in consultation with provincial and territorial authorities, aboriginal groups, stakeholders and the public (Lawseth).
- Department of Fisheries and Oceans Act, 1985
 - <http://www.canlii.org/en/ca/laws/stat/rsc-1985-c-f-15/latest/rsc-1985-c-f-15.html>
 - This establishes DFO and the powers, duties and functions of the Minister in respect of: sea coast and inland fisheries; harbours; hydrography and marine sciences; and the coordination of the policies and programs of the Government of Canada respecting oceans.
- Fisheries Development Act 1985
 - <http://www.canlii.org/en/ca/laws/stat/rsc-1985-c-f-21/latest/rsc-1985-c-f-21.html>
 - This provides for the development of the commercial fisheries of Canada.
- Fisheries Improvement Loans Act, 1985
 - <http://www.canlii.org/en/ca/laws/stat/rsc-1985-c-f-22/latest/rsc-1985-c-f-22.html>
 - This relates to loans to assist fishermen engaged in a primary fishing enterprise.
- Coastal Fisheries Protection Act, 1985
 - <http://www.canlii.org/en/ca/laws/stat/rsc-1985-c-c-33/latest/rsc-1985-c-c-33.html>
 - This prescribes *inter alia* that foreign vessels shall not fish in Canadian waters unless licensed to do so and in conformity with Canadian fisheries legislation, and that foreign vessels fishing in the NAFO Regulatory Zone shall not fish straddling stocks in contravention of any prescribed conservation or management measures.
- Atlantic Fisheries Restructuring Act, 1985
 - <http://www.canlii.org/en/ca/laws/stat/rsc-1985-c-a-14/latest/rsc-1985-c-a-14.html>
 - This authorises *inter alia* the provision of financial contributions or loans to a fishery enterprise for the purpose of restructuring.
- The Fishery (General) Regulations 1993
 - <http://www.canlii.org/en/ca/laws/regu/sor-93-53/latest/sor-93-53.html>
 - This consists of regulations on fishing and fish habitat in general and the payment of penalty and forfeiture proceeds under the fisheries act. It authorises *inter alia* the setting of licence conditions, the variation of fishing seasons and quotas, the designation of fisheries observers, and restrictions on construction and use of fishing gear.
- The Aboriginal Communal Fishing Licences Regulations 1993
 - <http://www.canlii.org/en/ca/laws/regu/sor-93-332/latest/sor-93-332.html>
 - This permits the issue of an aboriginal communal fishing licence.
- The Commercial Fisheries Licensing Policy for Eastern Canada, 1996.

- http://www.dfo-mpo.gc.ca/communic/lic_pol/index_e.htm
 - This is a policy document that describes the detailed rules that apply to the issue and operation of fishing licences. The aim is to achieve a balance between capacity and the resource, encourage environmentally sustainable harvesting, foster greater economic viability of the fishery sector, facilitate industry self-reliance, and develop a greater degree of partnership with a professional group of harvesters.
- Oceans Act, 1996
 - <http://www.canlii.org/en/ca/laws/stat/sc-1996-c-31/latest/sc-1996-c-31.html>.
 - This is based on a National Strategy covering sustainable development, the integrated management of activities in estuaries, coastal waters and marine waters and the precautionary approach. This Act provides for regulations relating to Marine Protection Areas. It defines *inter alia*: the Canadian territorial sea and its contiguous zones; the Canadian EEZ and continental shelf; and Canadian oceans management strategy. The latter embraces the concepts of sustainable development, the precautionary approach and the implementation of integrated management of marine activities in Canadian estuaries and waters. Integration takes into account the interests of provincial and territorial governments, affected aboriginal communities, coastal communities and other relevant bodies, including those established under land claims agreements. Integrated management may be assisted by the establishment of appropriate management boards, scientific investigations, and marine protected areas within the Canadian territorial waters and EEZ.
- The Fish Inspection Act (1996) and the Fish Inspection Regulation.
 - http://www.bclaws.ca/Recon/document/freeside/--%20F%20--/Fish%20Inspection%20Act%20%20RSBC%201996%20%20c.%20148/00_96148_01.xml; http://www.bclaws.ca/Recon/document/freeside/--%20F%20--/Fish%20Inspection%20Act%20%20RSBC%201996%20%20c.%20148/05_Regulations/10_12_78.xml
 - These govern processing operations aboard vessels in Canadian waters.
- Species at Risk Act 2002
 - http://laws.justice.gc.ca/en/showdoc/cs/S-15.3/bo-ga:s_2/20090923/en#anchorbo-ga:s_2)
 - This act is to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened. Under SARA, in 2003 The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (created in 1977) was established as an advisory body.
- The Canada National Marine Conservation Areas Act, 2002
 - <http://www.canlii.org/en/ca/laws/stat/sc-2002-c-18/latest/sc-2002-c-18.html>
 - Administered by Parks Canada this provides for the establishment of a national network of marine protected areas.

In addition, DFO is required to comply with constitutional and central agency legislation (see <http://www.tbs-sct.gc.ca/maf-crg/assessments-evaluations/2005/fo-po/fo-po-eng.asp>) such as:

- The Charter of Rights and Freedoms;
- The Financial Administration Act,
- The new Public Service Labour Relations Act,

- The new Public Service Employment Act,
- The Official Languages Act,
- The Access to Information Act and the Privacy Act, and
- The Canadian Environmental Assessment Act.

Finally, there is a large body of common law, such as administrative and aboriginal law, which has a major effect on DFO's programmes and activities.

5.4 5Zjm

From the implementation of the 200-mile EEZs, Canadian and U.S. fisheries management authorities sought some form of cooperative management of the transboundary fish stocks on Georges Bank (area 5Zjm). However, it was not until April 1998 that the first TRAC was established as a combined Canada/US peer review process for transboundary stock assessments. These have been held every year since and provide a forum for the joint Canada/US peer review of the status of the Georges Bank cod, haddock and yellowtail resources.

The TRAC process reviews stock assessments and projections necessary to support management activities for shared resources in the Georges Bank area. It produces peer-reviewed assessments which are documented in TRAC reference documents, proceedings and Status Reports (TSRs). The TSRs are used by the TMGC, which provides joint Canada/US harvest and management recommendations for both countries regulatory processes. The TRAC meetings only consider resource status and are not concerned with management issues such as allocation questions or differences in management systems.

The Transboundary Management Guidance Committee (TMGC), established in 2000, is a government – industry committee comprised of representatives from Canada and the United States. The Committee's purpose is to develop guidance in the form of harvest strategies, resource sharing and management processes for Canadian and US management authorities. One of the stocks which falls under this committee's purview is 5Zjm haddock.¹

5.5 Discretionary Powers

In Canada the Minister of Fisheries and Oceans has broad discretionary powers and the decisions are often the result of balancing interests, backed by strong public policy (Lawseth). The management system in individual fisheries / groups of fisheries is defined by the legislation and specific fisheries management plans.

5.6 Dispute Resolution & Compliance with Legal Decisions

In general terms, through the procedures developed to address the development and implementation of fisheries management policy DFO seeks to be proactive in order to reduce the risk of legal disputes (<http://www.tbs-sct.gc.ca/maf-crg/assessments-evaluations/2005/fo-po/fo-po-eng.asp>).

Legal Services lawyers participate on DFO management and other committees and working groups e.g. sectoral management boards, such as the CCG Management Board, SARA

¹ See TRAC and TMGC websites: <http://www.mar.dfo-mpo.gc.ca/science/TRAC/TRAC.html> & <http://www.mar.dfo-mpo.gc.ca/science/tmgc/TMGC-e.html>

management committees, the Fisheries and Aquaculture Management Executive Committee, and the Fisheries and Aquaculture Management Aboriginal Issues Committee.

In addition, DFO managers and employees send requests for legal advice or opinions on the legality of DFO programs, activities and policies to Legal Services and Justice regional advisory lawyers, who consult with Justice civil litigators, prosecutors and agent as required, to provide advice or opinions on their legality. Further, many DFO Memoranda to Cabinet are sent to Legal Services for legal review, prior to being submitted to Cabinet. Legal Services supports the work of DFO's Audit and Evaluation Directorate, through provision of legal advice and opinions to that Directorate, which reviews DFO programs and activities for compliance with applicable legislation. Currently most but not all new DFO programmes and activities are reviewed for lawfulness prior to implementation, and most but not all existing DFO programs and activities have already been reviewed for lawfulness.

Where parties are not satisfied with the decision of the Minister they have the right to redress through the Federal Court and Federal Court of Appeal system. A web site¹ provides details on appeals involving fishery matters.

Two examples are: (i) the Ecology Action Centre Society v Attorney General of Canada (06/08/04) that sought judicial review of a variation order issued by DFO; and (ii) the Matthews case of 1999, where the Federal Court of Appeal found in favour of Matthews in determining that *“in exercising the power conferred on him by section 7 of the Fisheries Act to issue at his "absolute discretion" a fishing license, the Minister of Fisheries and Oceans may not do it by attaching to the license limitations or conditions, the sole purpose of which is to impose sanctions for the applicant's past behaviour”*.

In addition, the confirmation of First Nation rights points to DFO compliance with binding judicial decisions.

There is no evidence to suggest that the fishing industry (public and private sectors) does not comply / would not comply with judicial decisions.

¹ http://decisions.fct-cf.gc.ca/fc_eliisa/search?language=EN&courtScope=fc&all=fisheries+fish&title=&citation

6 STOCK ASSESSMENT

6.1 4X5Y

6.1.1 Management Unit

The management unit for this assessment is the haddock fishery occurring in NAFO Divisions 4X and 5Yb (Figure 3 above).

Most indicators of stock structure favour at least two major haddock stocks within Nova Scotia waters (Begg *et al.* 2001). An eastern stock occurs on the eastern Scotian Shelf in NAFO Division 4TVW and a western stock occurs along the southern and western Scotian Shelf in NAFO Division 4X. A wide range of stock identification methods suggest that these stocks are distinct, with 4TVW haddock spawning on the Emerald Western Bank and 4X stock spawning mainly on Brown's Bank (Begg 1998)

This report, as well as most supporting documents, refers to the management unit as area 4X5Y, but occasionally uses 4X or the finer divisions of 4X West (Bay of Fundy and 5Yb) and 4X East (Scotian Shelf). Fishery regulations set by DFO are based on the entire 4X5Y unit.

Within 4X5Y, there is some limited evidence of finer scale stock structure based on differences in growth rates and movement of tagged fish. For example, some haddock tagged along inshore areas of western Nova Scotia do not migrate to offshore banks, which suggests possible resident components in 4X West (Begg 1998). Other tagging studies indicate that some of these fish may actually be migratory components of an inshore New England stock from the Gulf of Maine (Begg 1998). We note this issue because stock structure is increasingly recognized as an important feature that may affect long-term productivity of fish stocks. As shown in the Stock Assessment section (below), as well as interviews with a range of stakeholders, some concern has been raised that the 4X5Y unit may be too large, and that exploitation in 4X West needs to be more tightly controlled. Note, however, that DFO must also manage fishing impacts on cod (*Gadus morhua*) for which the unit may be appropriate.

Although catch limits and other fishery regulations are determined for the entire 4X5Y area, fishery removals, age-composition and size-at-age data are typically handled separately for areas 4X West (i.e. 4Xqrs5Y) and 4X East (i.e. 4Xmnop). This information may be used to assess specific exploitation patterns at scales finer than 4X5Y.

6.1.2 Assessments & Stock Status

Stock Assessment Information

The fisheries for haddock in 4X5Y are intensively monitored and assessed. Information for assessing status, exploitation and recruitment includes dockside monitoring of landings, fishery-independent surveys of abundance, limited at-sea observer monitoring, vessel monitoring systems (VMS), and port sampling of length, weight and maturity (of landings).

Port samples of the catch are sub-sampled for age determination and the resulting complete age composition is derived by applying age-length keys to all port-sampled length frequencies. Landings, age-length keys (both further stratified by quarter and gear) and research surveys for 4X West and 4X East are handled separately because haddock in the Bay of Fundy area grow faster than haddock on the Scotian Shelf.

Unreported catch and discards of target, as well as by-catch, species can create biased assessments of stock status. Therefore, it is important that the monitoring system verify the accuracy of reported catch, especially in situations where on-board monitoring (e.g. observers or video) is limited. In 2005, DFO compared the size composition of haddock in port samples with the size composition of observer (at-sea) samples to examine whether port sampled fish were significantly larger than fish observed at-sea. A significant difference would indicate that at-sea discarding of small haddock was occurring. Where samples were available by quarter and area (i.e. depending on at-sea observer sampling coverage) comparisons were made for otter trawl and longline gear separately. The size compositions were in most cases similar, and in some cases the proportion of small fish in the port samples was greater than in the at-sea samples. Such a result is opposite to what is expected if high-grading were prevalent and therefore provides no evidence to indicate that discarding of small haddock was occurring or that landings data do not accurately reflect catch-related mortality of haddock in area 4X for 2004/2005 (CSAS Res. Doc. 2005/80).

Two fishery-independent surveys are conducted annually to provide relative indices of haddock abundance-at-age (ages 1+) in area 4X5Y. Age 1-2 abundance derived from these surveys provide a recruitment index, which may be used between formal stock assessments as an indication of relative changes in year-class strength and upcoming recruitment to the spawning stock and fisheries. The DFO summer research vessel survey (RV survey) is a stratified random design using otter trawl gear that was originally designed to monitor Atlantic cod stocks (Figure 7).

Since 1995, the MG fleet (otter trawl < 65') has conducted a fixed-station otter trawl survey (ITQ survey) using three industry vessels chartered by DFO. The ITQ survey was specifically designed to cover the entire haddock habitat area within the 4X5Y area, including a large inshore area off southwest Nova Scotia that is not covered by the RV survey (O'Boyle *et al.* 1995; Hurley *et al.* 1999) (Figure 8). This survey was scientifically developed via collaboration between DFO and the trawl fleet. Biomass estimates for both surveys are shown in Figure 9.

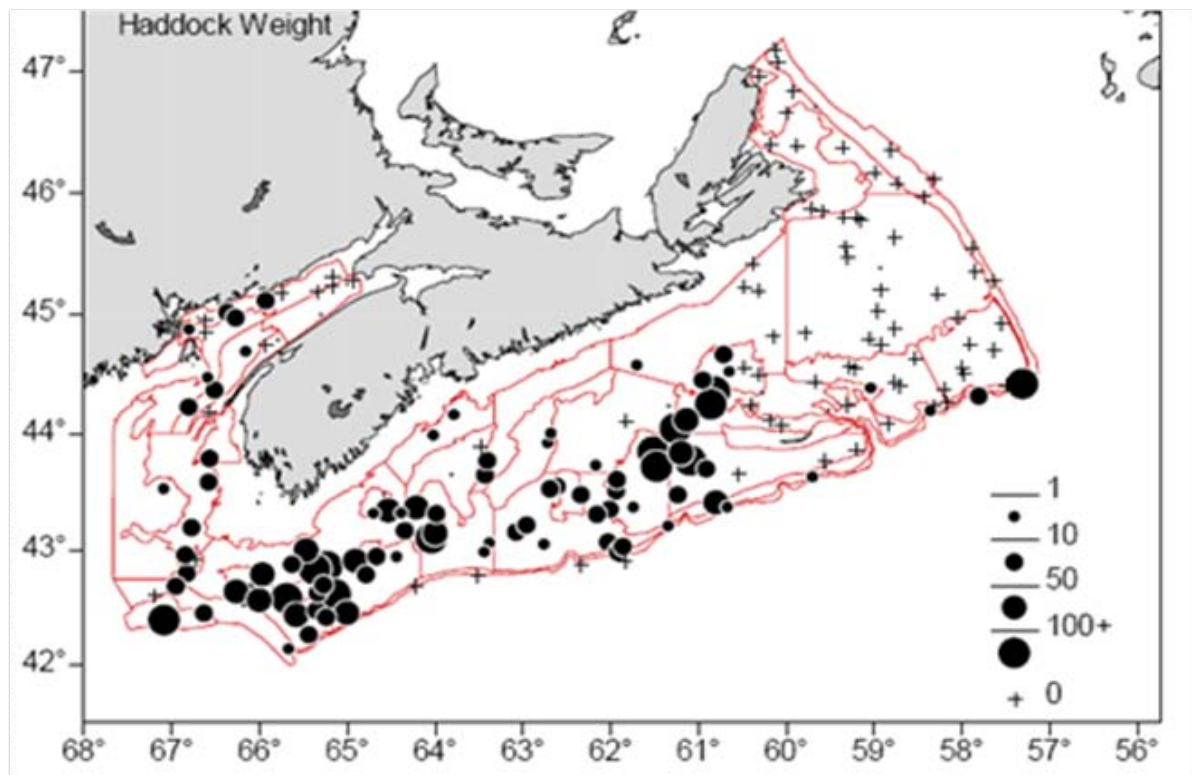
Stock Assessment Model

The status of the 4X5Y haddock stock is assessed periodically using as much of the catch and monitoring data as is practical. The last quantitative stock assessment was performed in 2004/2005 (Hurley *et al.* 2005) using virtual population analysis (VPA) as implemented in the ADAPT modelling framework (Gavaris 1988). Since 2005, monitoring data have been reviewed annually and quota adjustments made when necessary. A new quantitative stock assessment is expected in 2009.

The assessment uses the ADAPT framework to calibrate the VPA with the RV and ITQ surveys. It estimates population recruitment from 1970 to 2005. The method requires total catch-at-age across all fisheries and separate catch-at-age observations from RV and ITQ surveys. The following assumptions are made (among others):

1. Landed catch-at-age is known without error;
2. Natural mortality ($M = 0.2$) is constant over time and age;
3. Partial recruitment at each age in the final year is the same for mobile and FGs;
4. Survey catchability is constant over time, but varies with age; and
5. Maturity is 0 % prior to age4 and is 100 % for all fish age4 and older (i.e., spawning stock biomass is the total weight of age4+ fish in the population).

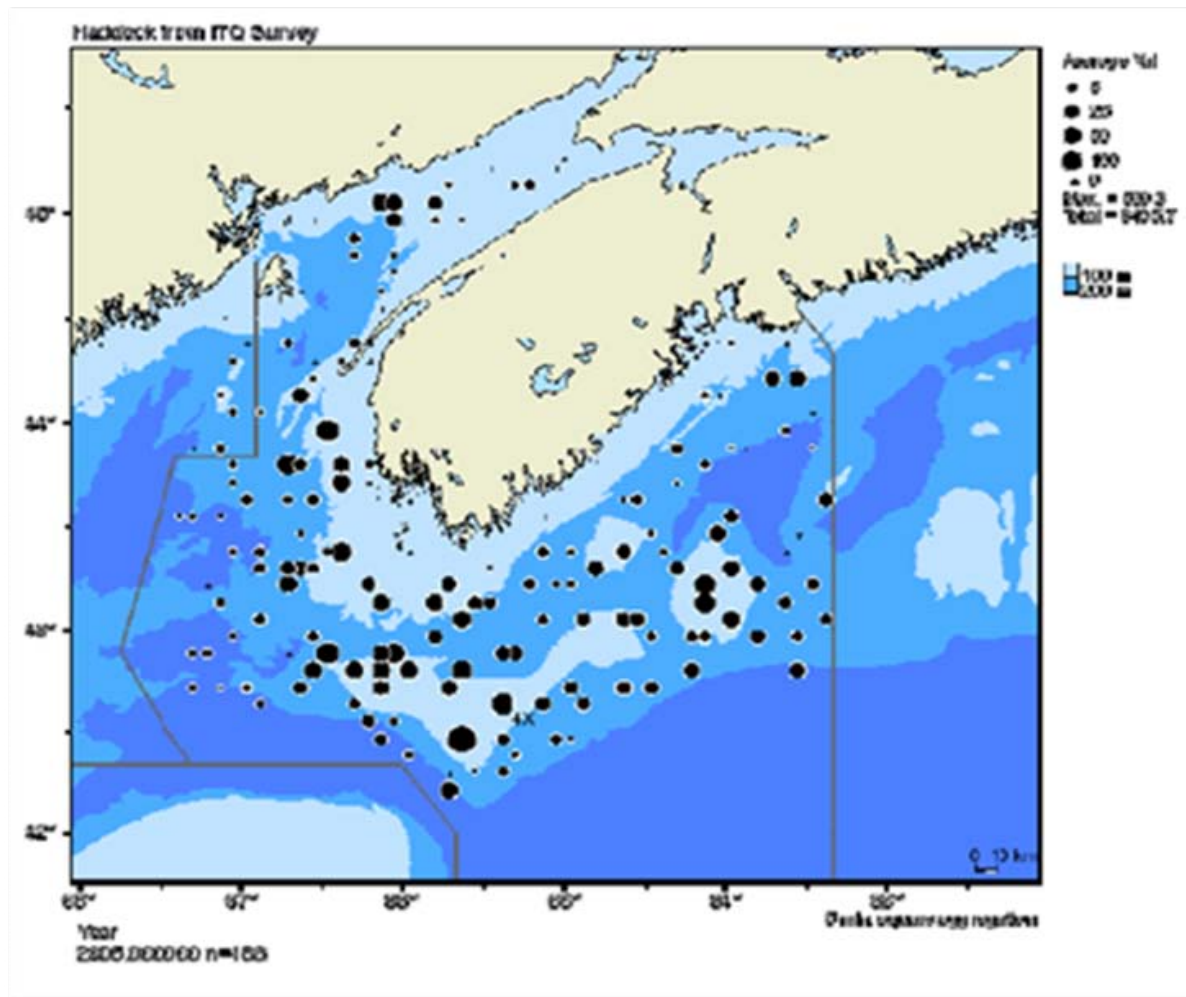
Figure 7: Example DFO RV Survey Catch Rates of Haddock in Nova Scotia Waters:
2007



Notes: "+" symbols indicate locations where no haddock were caught.

Source: CSAS Res. Doc. 2008/053

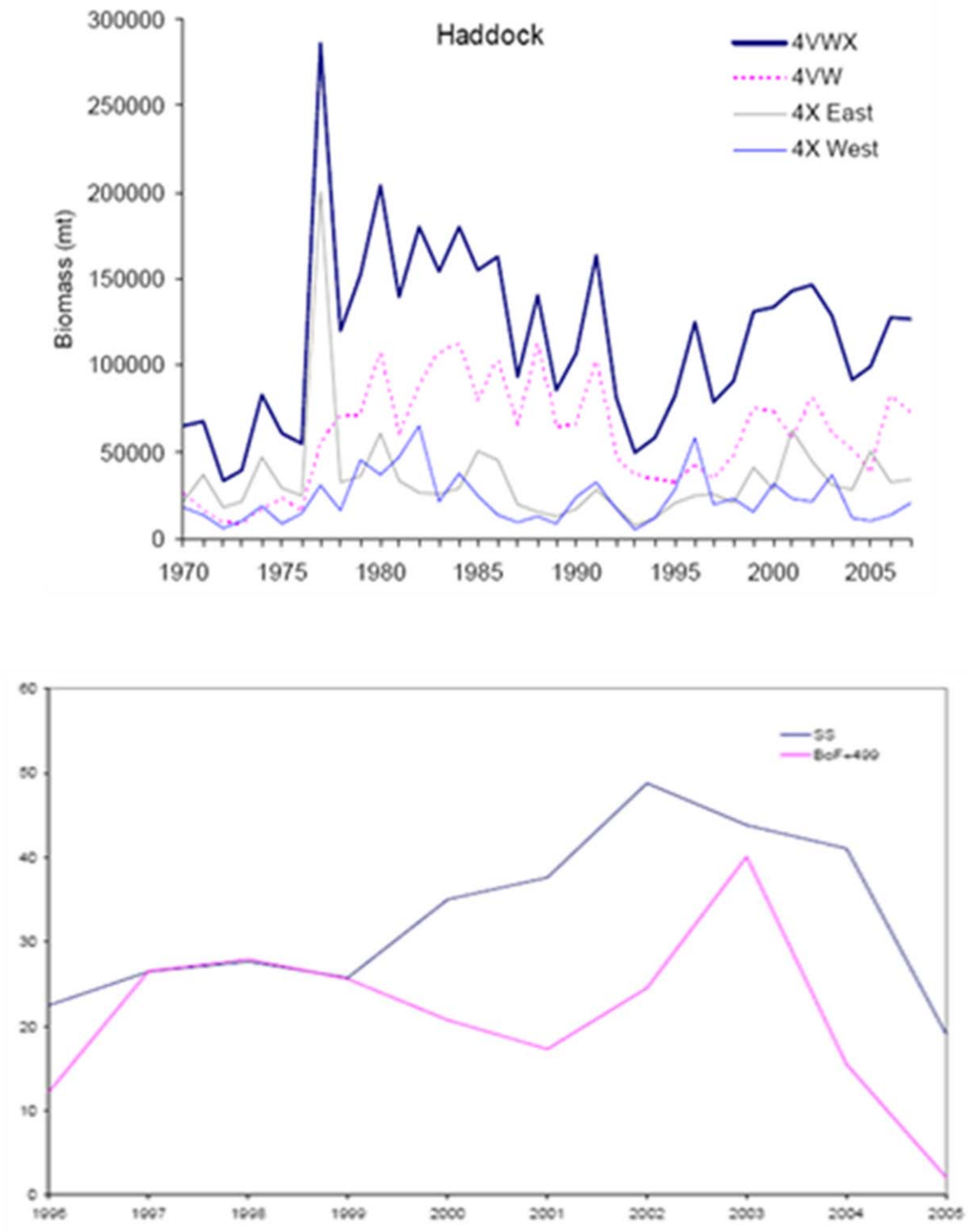
Figure 8: Example fixed-station ITO survey for area 4X5Y in 2005



Note: The grey border delineates the 4X boundary - note that survey extends into area 5Yb. "+" symbols indicate catches of zero. "Fixed-station" means that the same stations indicated are sampled every year.

Source: Clark, D and Emberley, J. Summer Scotian Shelf and Bay of Fundy Research Vessel Survey Update for 2007. CSAS Research Documents 2008/53

Figure 9: Estimated Haddock Biomass for the DFO-RV Survey in Areas 4X East (grey line) and 4X West (blue line) for 1969-2007 (Top Panel) & ITQ Survey Mean Age-4+ Total Weight per tow (kg) for 1996-2005 (Bottom Panel)



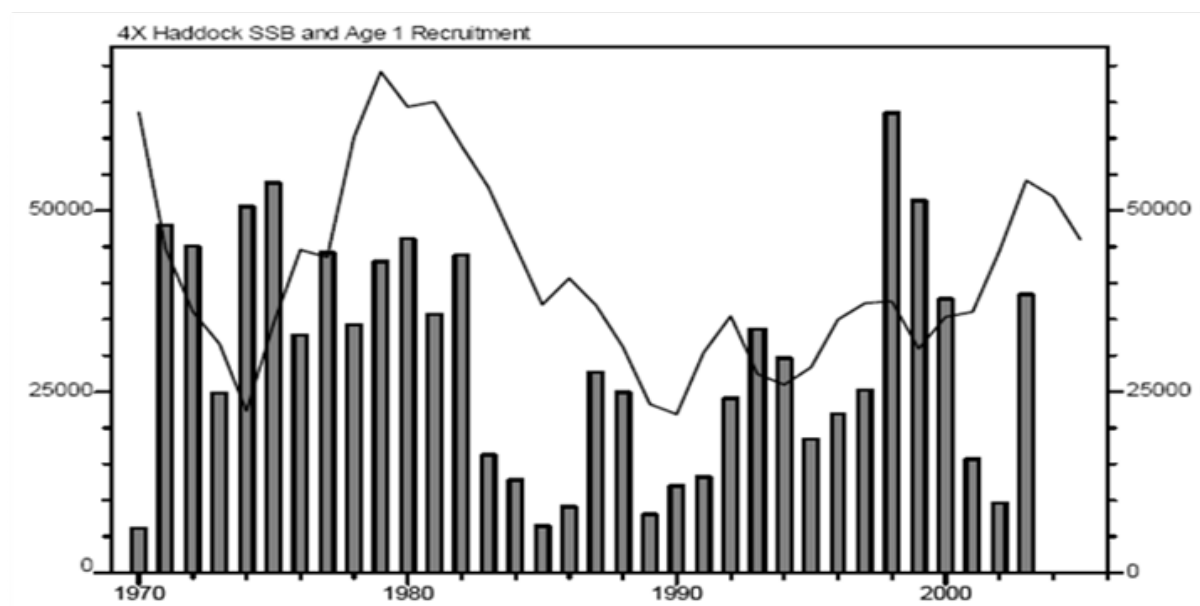
Source: Hurley *et al.* 2005

The VPA is fitted to RV ($n = 324$) and ITQ ($n = 90$) survey catch-at-age observations using non-linear least squares. The sum-of-squares fitting criterion, which is equally weighted between RV and ITQ indices, is minimized by adjusting 9 leading parameters, which are the abundances-at-age in 2005 ($N_{1,2005}, N_{2,2005}, \dots, N_{9,2005}$), while solving for 18 conditional estimates of catchability for each survey/age combination (i.e., $q_{RV,1}, q_{ITQ,1}$, etc.). Statistical uncertainty (variance and bias estimation) in population biomass is assessed using a bootstrapping procedure and retrospective analyses are used to evaluate possible systematic temporal biases in abundance estimates.

Stock Status

Based on the 2005 assessment, ages4+ spawning stock biomass (SSB) of 4X5Y haddock increased steadily from low levels that occurred in the early 1990s. Projected SSB at the beginning of the 2006 fishery was 37,000 mt or 1.68 times the lowest level from which the stock has recovered in the past (i.e. $B_{\text{recover}} = 22,000$ mt) (Figure 10). Estimated recruitment over the past 10 years has generally been good with no evidence of impairment due to fishing. Estimated fishing mortality (F) has been maintained at levels less than $F_{0.1} = 0.25$ since 1993 (Figure 11). Increasing trends in spawning stock biomass of 4X5Y haddock and frequent strong year-classes implies a high likelihood that SSB is above the point where recruitment would be impaired.

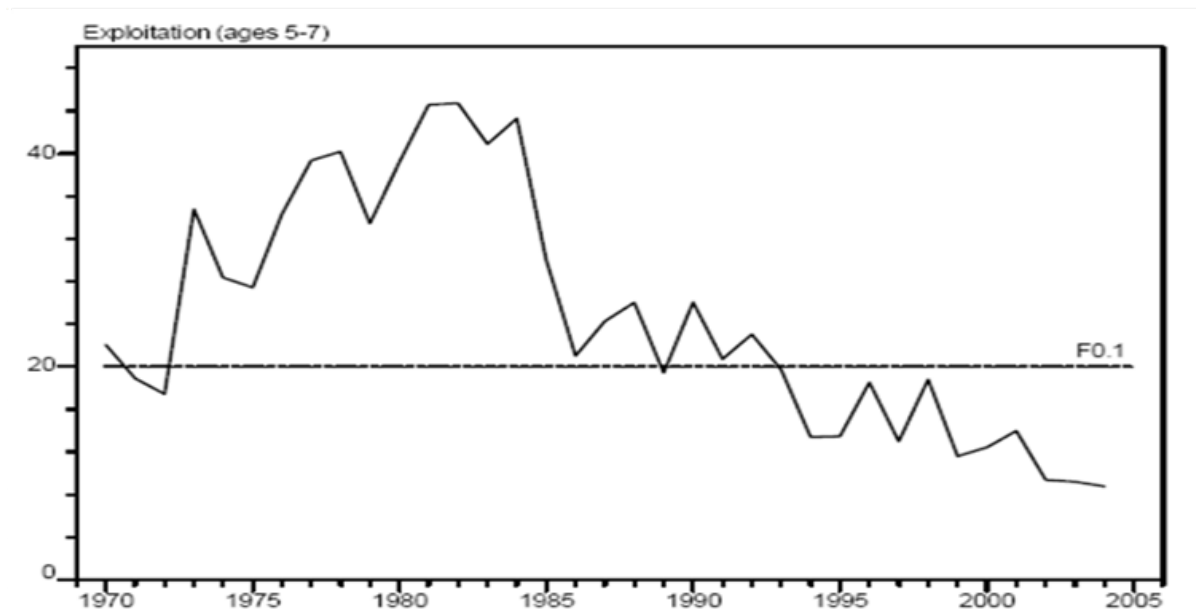
Figure 10: Stock Assessment Model Reconstruction of Spawning Stock Biomass (age4+) & Age1 Recruitment of Haddock in NAFO Subdivision 4X5Y for years 1970 to 2005



Note: The last two age1 recruitments are not estimated by the ADAPT-VPA procedure because these ages are not yet recruited to the harvestable population.

Source: Hurley *et al.* 2005

Figure 11: Reconstructed Exploitation Rates for NAFO Subdivision 4X5Y Haddock



Note: The exploitation rate corresponding to the $F_{0.1}=0.25$ fishing mortality rate reference is indicated by the horizontal line. Note that the exploitation rate U is computed as $U = F [1 - \exp(-Z)] / Z$, where $Z = M + F$

Source: Hurley *et al.* 2005

Productivity

In the most recent stock assessment, Hurley *et al.* (2005) present a surplus production analysis showing that productivity of the 4X5Y haddock stock is currently (i.e. 2005) about two-thirds of maximum productivity levels estimated for the 1970s. The difference is mainly attributed to long-term declines in haddock size-at-age.

Key uncertainties

There are two main uncertainties for 4X5Y haddock:

1. The stock status arising from persistent retrospective patterns in stock assessment model results, and
2. The implications of finer-scale stock structure within the management area.

Estimates of stock status show strong retrospective patterns in biomass estimation errors (see below; Hurley *et al.* 2005), which creates non-ignorable uncertainty in the assessment of stock status and productivity of 4X5Y haddock. Retrospective patterns arise for a number of reasons, some of which depend on the particular stock assessment method. Only limited testing of the model has been done by DFO. However, a U.S. National Research Council study (NRC 1999) evaluated the model, as well as other stock assessment methods, against known simulated datasets and found that the model worked as well as most other methods as long as two primary conditions hold:

1. M is not seriously over- or under-estimated and
2. Abundance indices are linearly proportional to stock abundance (i.e. catchability is constant over time and independent of actual abundance).

The current value assumed for natural mortality of 4X5Y haddock is $M = 0.2$. Although such an assumption may not be grossly incorrect, Frank *et al.* (1997, CSAS Res Doc 97/107) estimated natural mortality rates of approximately $M = 0.4$ for NAFO Division 4TVW haddock during an extended fishery closure in the early 1990s. Higher true rates of natural mortality than assumed in the model will cause under-estimation of abundance and over-estimation of fishing mortality. However, under-estimation of abundance is contrary to a retrospective analysis of the 4X5Y haddock stock assessment model, which indicated a tendency to over-estimate exploitable abundance and recruitment in the most recent years (Hurley *et al.* 2005). Retrospective error patterns also show that recent fishing mortality (i.e., last estimated in 2005) is typically under-estimated, especially in 2004 where the $F \sim 0.05$ over ages 5-7 (Hurley *et al.* 2005; Table 20c). The degree of under-estimation of F is difficult to judge; however, Hurley *et al.* (2005) attempt to correct population biomass estimates and management advice to compensate for possible errors. It is important to note that retrospective errors are a signal of poor model performance for which the sources may be unknown. Although such analyses cannot determine the absolute causes of retrospective bias, they can be used to evaluate hypothesized causes. For example, a partial list of possible causes of retrospective bias in the 4X5Y haddock assessment includes:

1. Changes in distribution of harvesting effort between 4X East (Scotian Shelf) and 4X West (Bay of Fundy) combined with differences in selectivity, abundance, and size-at-age between the two areas;
2. An incorrect assumption that partial recruitment in final year is different from previous years for which partial recruitment is more reliable; and
3. Equal weight placed on RV and ITQ survey catch-at-age data when fitting the model.

A realistic appraisal of the actual uncertainty in B , M and over-fishing risk is difficult without a more extensive test of the estimation procedure (e.g. using simulation).

Recent low survey biomass estimates, particularly in 4X West, further warrant a full re-assessment of the 4X5Y stock. According to the most recent DFO-RV survey results, haddock biomass is near the long-term average in 4X East, but below average in 4X West (CSAS ResDoc 2008/053), as a result of very low survey biomass in 2004 and 2005. Although the survey biomass increased in 2007, the trend in 4X West has been a slight decline since the mid-1990s. Concern over stock status in 4X West is reflected in recent management and stakeholder requests for re-assessment of the 4X5Y stock (CSAS SAR 2005/056; A. D'Entremont, pers. comm., 25 July 2009).

6.1.3 Management Advice

Introduction

This section describes the general DFO harvest strategy (DFO 2006, 2009) and its specific implementation for management advice on 4X5Y haddock. The 4X5Y harvest strategy is implemented using

1. Total allowable catch (established in 1970);
2. A seasonal spawning closure from February 1 to June 15 (Brown's Bank);
3. As mentioned previously, mesh-size restrictions on trawl (130-mm square mesh) and gillnet (5½" gear), hook-size (12 mm gape) restrictions on bottom-longline; and
4. Other minor spatial, fish size, and by-catch restrictions.

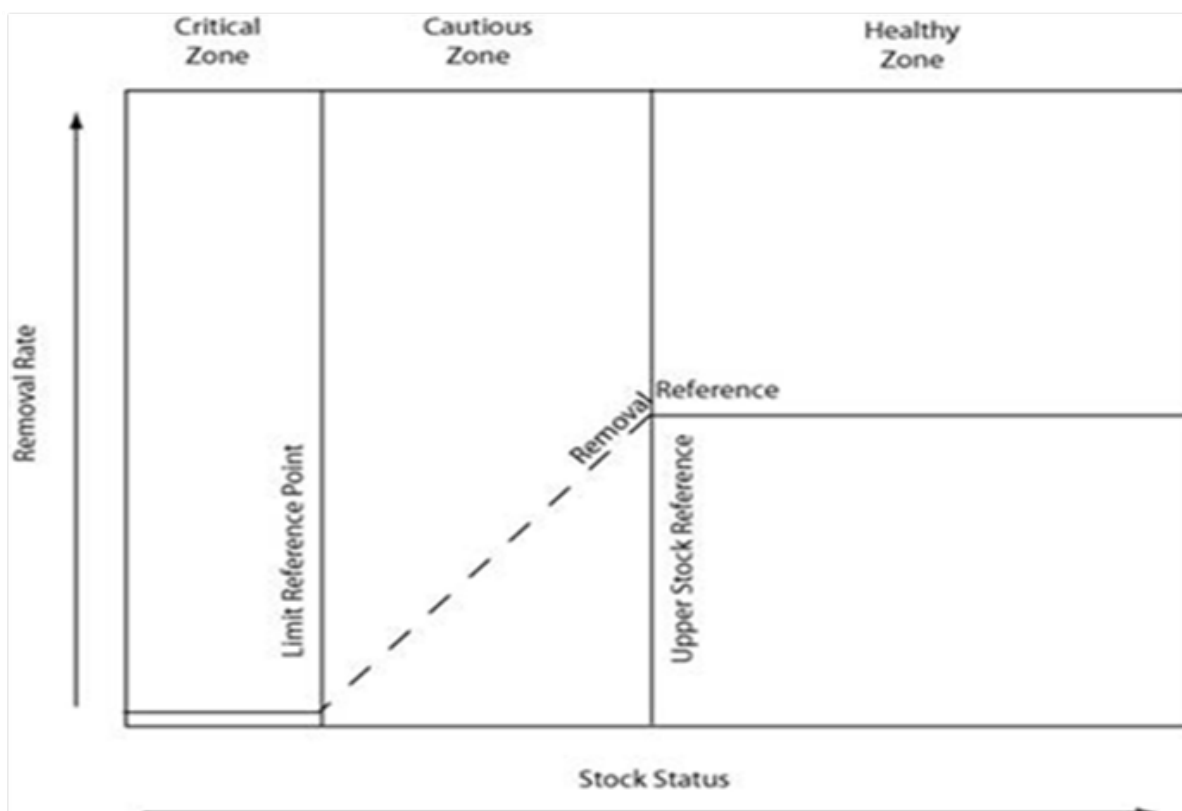
Only the annual quotas are subject to change from year-to-year.

Reference Points and Harvest Strategy

DFO Precautionary Harvest Strategy

DFO recently developed a harvest strategy (henceforth "DFO Harvest Strategy") compliant with the Precautionary Approach (DFO 2006, 2009). The strategy is developed around stock status and fishing mortality reference points using three main issues (Figure 12):

Figure 12: DFO's Precautionary Harvest Strategy



Source: DFO 2009

1. A Removal Reference fishing mortality rate to guide harvesting of stocks when their status is "Healthy";
2. An Upper Stock Reference (USR) biomass level that delineates the boundary between a Healthy stock and one in the "Cautious" zone, in which removals must be progressively reduced in order to avoid reaching the limit reference point. Management priority in the Cautious zone should be to promote stock growth toward the Healthy zone (DFO 2009); and
3. A Limit Reference Point (LRP) of stock status below which serious harm to the stock may occur. Management priority in this "Critical" zone must promote stock growth by keeping all removals to a minimum.

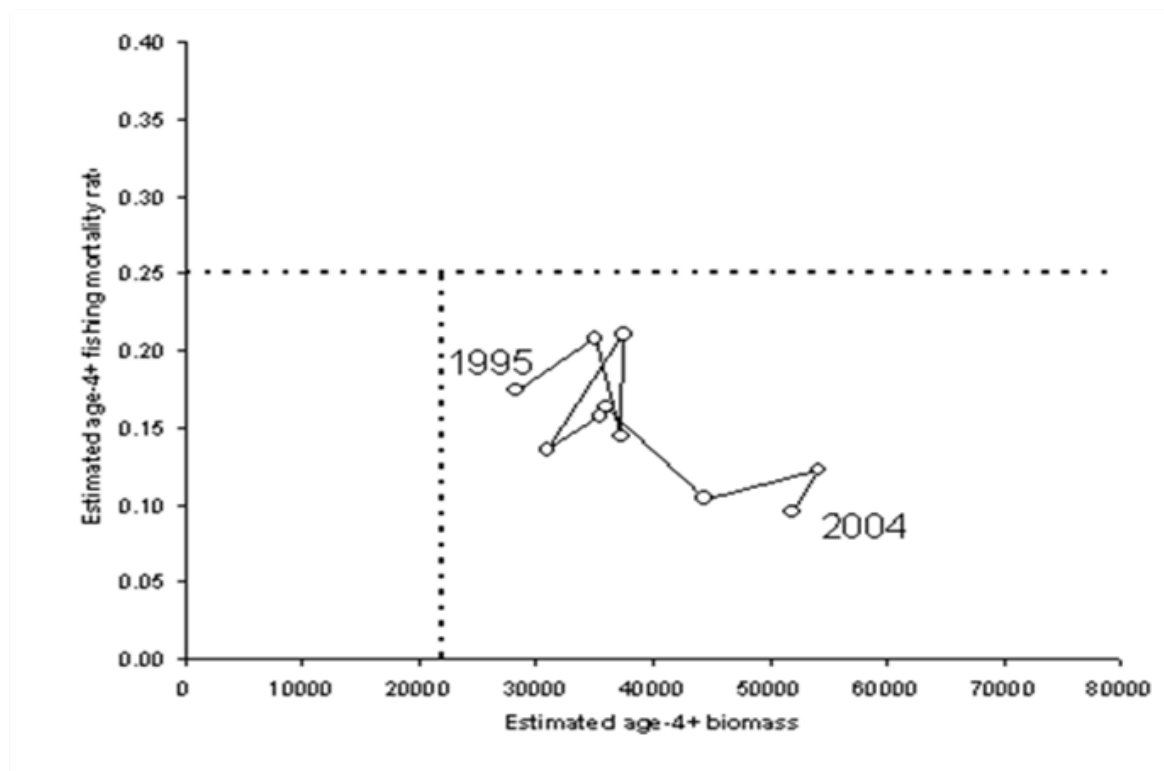
DFO (2009) further describes risk tolerances that should be adopted within each zone. For example, risk tolerance for further decline ranges from very low in the Critical Zone to high

in the Healthy Zone where fluctuations around a target level are expected.

The DFO Harvest Strategy (DFO 2006) provides a useful basis for evaluating the implementation and effectiveness of the particular harvest strategy applied to haddock over the past decade. More important though is that future management of the 4X5Y haddock stock will need to follow the DFO Harvest Strategy.

In general, management of 4X5Y haddock since the mid-1990s is consistent with the recent DFO Precautionary Harvest Strategy. The Removal Reference for the stock corresponds to an $F_{0.1} = 0.25$ harvest strategy¹, which was determined by O’Boyle (1981). Although 4X5Y haddock have been managed according to this constant fishing mortality rate strategy, in practice fishing mortality has been adjusted in a manner consistent with the DFO Harvest Strategy; i.e. fishing mortality rates have been increased (decreased) in response to increases (decreases) in stock status estimates. Reconstructed SSB and F for the 4X5Y haddock fishery shows reasonable evidence that management was able to implement a precautionary harvest strategy, at least between 1995 and 2004 (Figure 13), by keeping fishing mortality below the fishing mortality reference.

Figure 13: Realization of the Harvest Strategy for 4X5Y Haddock as Reconstructed from 2005 Stock Assessment Estimates of Age-4+ SSB and F



Note: The biomass limit reference point (22,000 mt) and removal reference fishing mortality rate ($F_{0.1} = 0.25$) are shown as vertical and horizontal dashed lines, respectively.

Source: Cox (P1 Expert) after Hurley *et al.* 2005.

¹ $F_{0.1}$ is the fishing mortality rate where the slope of the yield-per-recruit curve is 10% of the slope-at-the-origin. Such reference points are often used as surrogates for F_{MSY} when stock-recruitment data are missing or are unreliable for estimating total stock productivity.

According to the most recent stock status report (2005 SSR), explicit LRP and USR points do not exist for this stock; however, it is expected that these will be developed in the near future (P. Hurley, pers comm, 22 July 2009). An implicit LRP is based on B_{recover} , which is defined as the point below which either SSB is not expected to recover quickly, or stock dynamics are unknown (Rivard & Rice 2002). For 4X5Y haddock, the implicit LRP = 22,000 mt is the lowest SSB since the 1970s and the lowest level from which the stock has clearly recovered in the past.

Although the pattern in Figure 14 suggests an increase of F as biomass declines, F has actually remained below the $F_{0.1}$ level and it is highly likely that the stock is above the LRP. As specified in the DFO Harvest Strategy, fishing mortality rates have been maintained below the removal reference level to promote stock growth from levels near the LRP in the 1990s. Lower F at high haddock biomass during the most recent period results, in part, because realised haddock catch in 4X5Y has been constrained by cod catch limits (A. D'Entremont, pers comm, 25 July 2009; B. Chapman, pers comm., 20 July 2009).

The DFO Harvest Strategy for stocks in the Cautious Zone, which may apply to this stock, specifies that:

1. Management actions encourage stock growth in the short-term; and
2. Risk tolerance for preventable decline be low to moderate (accepting a 5 % - 50% probability of stock decline).

Management advice contained in the most recent stock status report (CSAS SAR 2005/056), suggested a higher probability than 50 % of stock decline at quota levels between 7,000 mt and 10,000 mt, but a very low probability of fishing mortality exceeding the $F_{0.1}$ removal reference (Figure 14). Projected decline was described as inevitable as strong year-classes were expected to move through the fishery (SSR). The combined 4X5Y haddock quota was ultimately set to 8,000 mt for which the probability of stock decline was greater than 90 %. Subsequent industry concerns about the distribution of catch between the Scotian Shelf (4X East) and the Bay of Fundy (4X West) combined with low survey biomass resulted in quota reductions to 7,000 mt. It therefore appears that historical management followed procedures that were consistent with the DFO Harvest Strategy, but given the assessment information and policies available at the time, greater weight was placed on maintaining a low probability of exceeding the reference fishing mortality level compared to promoting stock growth (P. Hurley pers. comm. 22 July 2009).

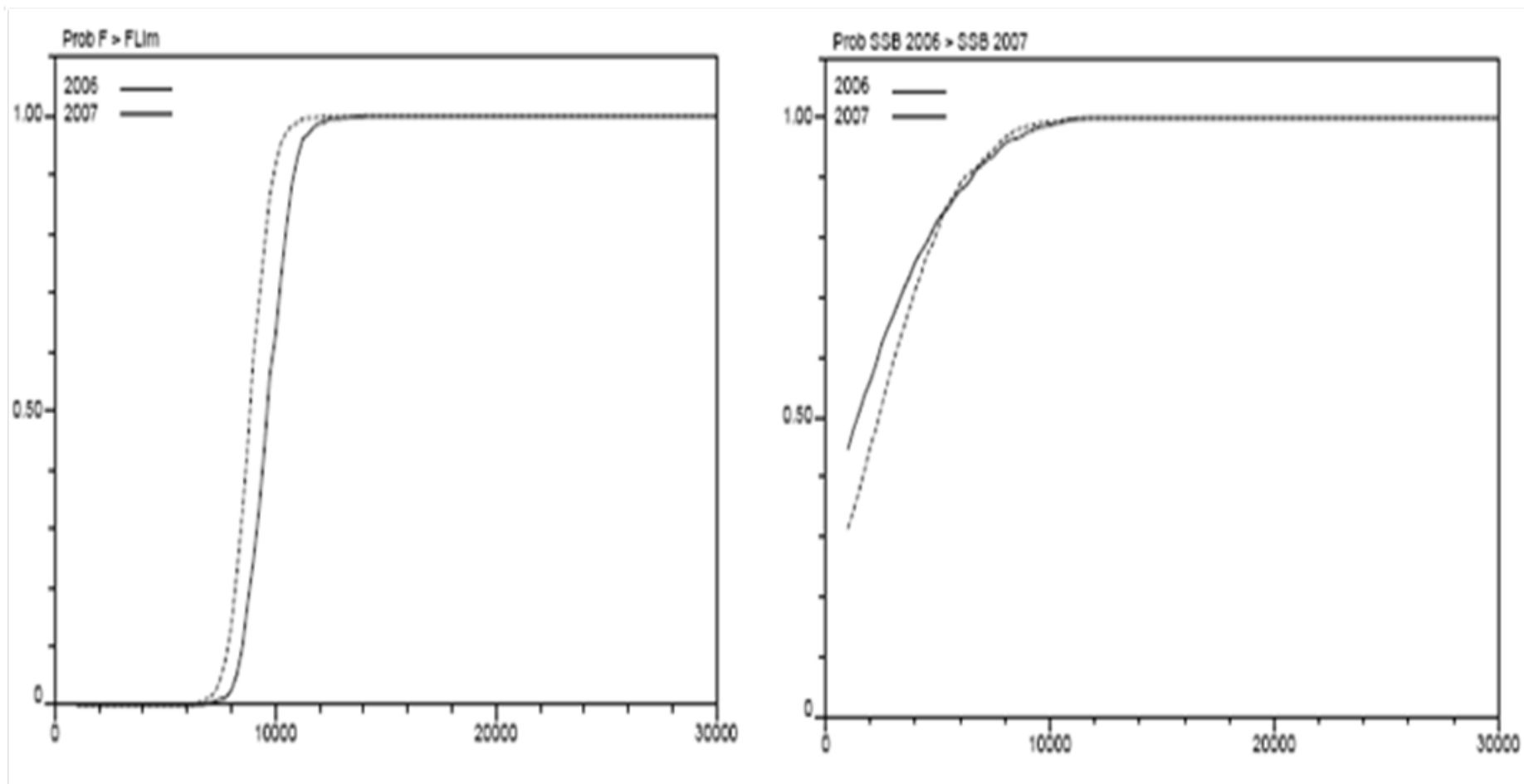
6.2 5Z

6.2.1 Management Unit

The management unit is the haddock stock in NAFO Division 5Zjm, part of which is on the Canadian side of eastern Georges Bank (Figure 6 above). DFO and NMFS assess this trans-boundary stock jointly and it is jointly managed by Canada and the US (TMGC web site).

There is reasonable evidence that offshore haddock on Georges Bank are distinct from the inshore stocks of both New England and Nova Scotia (Begg *et al.* 1998) (see above). In addition, the offshore stock on eastern Georges Bank is probably different from the stock on western Georges Bank (Van Eeckhaute *et al.* 1999). Detailed analysis of trawl survey spatial catch rates by season showed that haddock on eastern Georges Bank migrate between U.S. and Canadian waters, but the majority of age2+ fish occur in Canadian waters during most seasons. On average, 75 % - 80 % of haddock remain in Canadian waters throughout the year (Van Eeckhaute *et al.* 1999).

Figure 14: Probability that Realized Fishing Mortality in 4X5Y will Exceed the Removal Reference $F_{0.1}=0.25$ (left panel) & that SSB will Decline Between 2006 and 2007 (right panel) as a Function of Total Fishery Yield (horizontal axis)



Source: CSAS SAR 2005/056

6.2.2 Assessments & Stock Status

Stock Assessment Information

Intensive monitoring and assessment information for 5Zjm haddock fisheries includes 100 % dockside monitoring of landings, fishery-independent surveys of abundance, limited at-sea observer monitoring, VMS and port sampling of length, weight and maturity (of landings).

DFO's Conservation and Protection Division (CPD) conducts at-sea surveillance using aircraft, surface patrol vessels and observers aboard fishing boats, and onshore surveillance using land based fishery officers. The DMP accounts for all vessel landings and the associated DFO Catch and Effort database track landings against the TAC. Fishing vessel positions while at sea are recorded each hour via VMS, which are required on all vessels. Such information provides real time vessel position as well as information for spatial analysis of fishing effort to support habitat impacts and closed-area assessments. Discarding and misreporting of haddock by the groundfish fishery have been negligible since 1992 (TRAC_RD_2008).

The size and age composition of 5Zjm haddock from the Canadian groundfish fishery is characterized using port and at-sea samples from all principal gears and seasons (quarters). DFO and NMFS age readers separately assign ages to survey and commercial-caught haddock. Inter- and intra-reader agreement among DFO and NMFS ageing labs is typically high indicating that age determinations are reliable and therefore satisfactory for estimating catch-at-age as well as survey age-composition.

Stratified random surveys of Georges Bank have been conducted by DFO each year (February / March) since 1986 and by NMFS each fall (October / November) since 1963 and each spring (April) since 1968 (Figures 15 & 16).

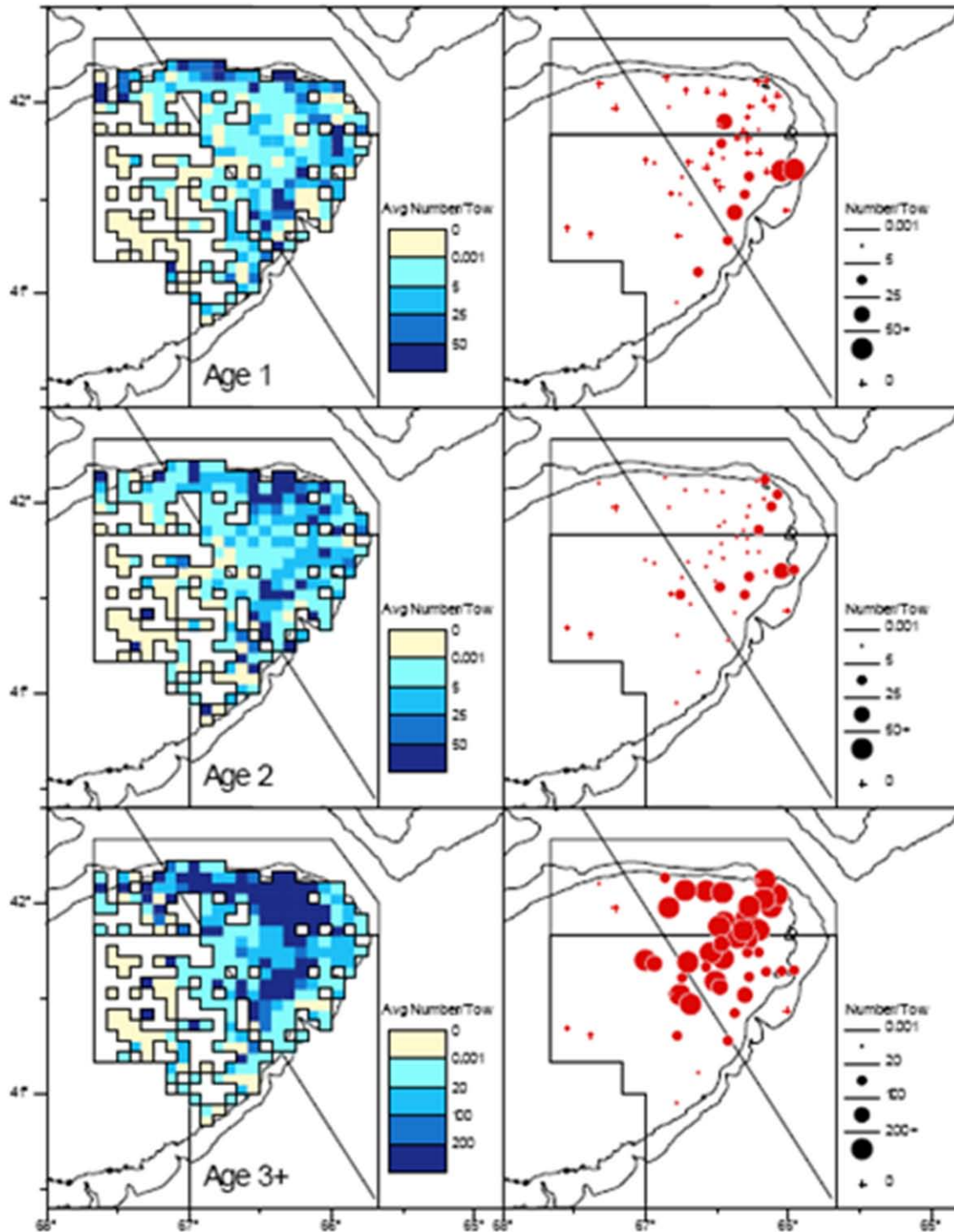
Biological information used to assess population productivity includes haddock length, weight and maturity obtained from DFO surveys. Weights-at-age from the DFO are calculated using the method described in Gavaris & Van Eeckhaute (1998) in which weights observed from the survey are weighted by population numbers at length and age. Fishery weights are derived from the fishery lengths using a length-weight relationship (Waiwood & Neilson 1985).

Assessment Methodology

Annual quantitative assessment of the 5Zjm haddock stock is conducted jointly between DFO and NMFS via TRAC. The assessment is based on a similar ADAPT-VPA methodology as other Canadian haddock stocks (e.g. 4X5Y as described above).

The most recent 5Zjm model uses annual catch-at-age for ages 0-9+ between 1969 and 2007. The VPA is calibrated to the following bottom trawl survey abundance indices: DFO (ages 1-8, 1986-2008), NMFS-spring-Yankee 36 (ages 1-8, 1969-2008), NMFS-spring-Yankee 41 (ages 1-8, 1973-1981), and NMFS fall (ages 0-5, 1969-2007). Other details of the calibration procedures can be found in Van Eeckhaute *et al.* 2007. Uncertainty in abundance and biomass estimates derived from the VPA is assessed using a bootstrapping procedure (Gavaris & Van Eeckhaute 1998). Like most age-structured stock assessment estimators, population abundance estimates at early ages (e.g. ages 1-2) typically exhibit large relative errors (40 % - 50 %) and bias (~15 % - 20 %), while the relative error (25 % - 35 %) and bias (~1 % - 6 %) for older ages is lower.

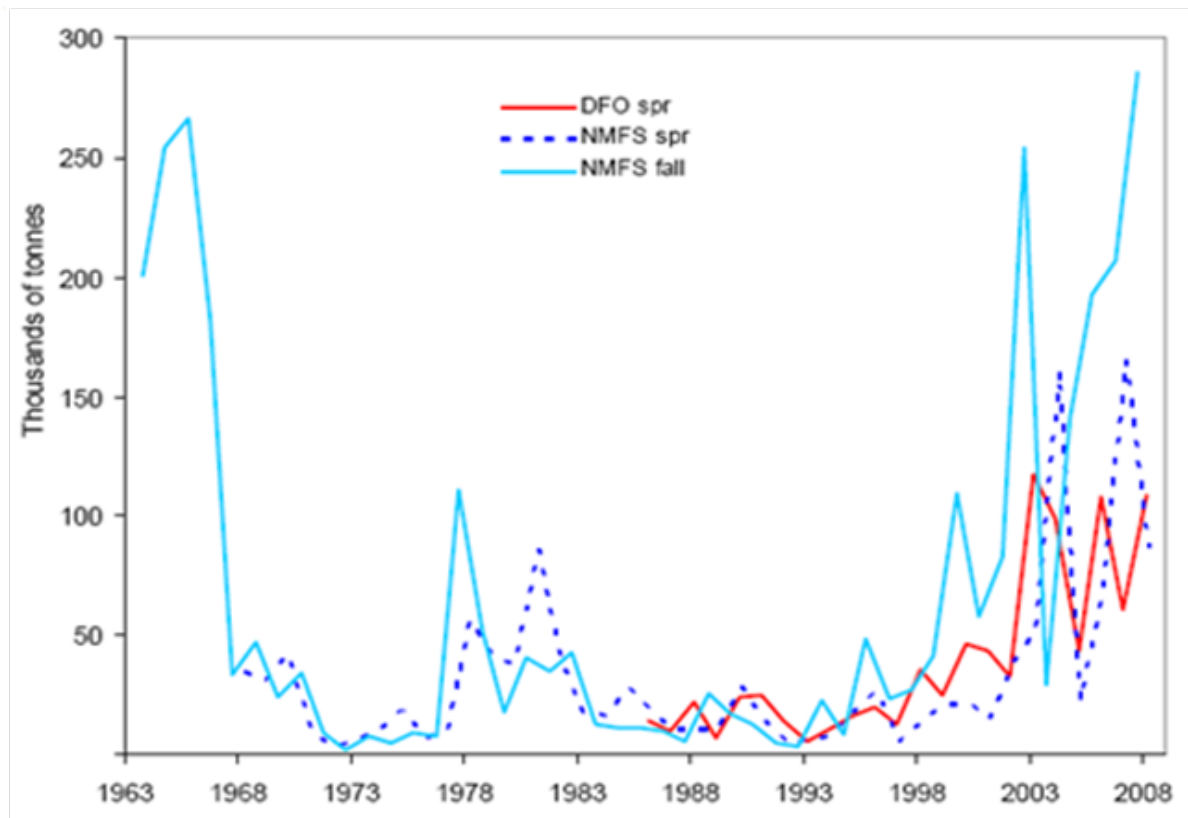
Figure 15: Distribution of Eastern Georges Bank Haddock Abundance (number/tow) Observed in the DFO Research Survey



Note: Left panels show the long-term average distribution and the right panels show the 2008 survey catches. Rows provide separate maps for age-1, age-2, and age-3+ haddock

Source: TRAC_RD_2008.pdf

Figure 16: DFO-RV and NMFS Stratified Random Surveys of Haddock Biomass in Areas 5Zjm



Source: TRAC_RD_2008.pdf

Robustness testing of the stock assessment method includes model fit diagnostics and retrospective analyses of over- or under-estimation of fishing mortality, biomass and recruitment relative to the terminal year estimates. Stock assessments limit the evaluation of alternative hypotheses to keep decision-making tractable except when simpler model evaluation procedures indicate poor performance (S. Gavaris, pers comm, 24 July 2009, Montreal). In general, ADAPT-VPA stock assessments for 5Zjm haddock display no systematic patterns in any indicators, suggesting that model misspecification may not be significant. However, recruitment estimates do sometimes change substantially when more data becomes available.

Both DFO and NMFS conduct internal reviews of 5Zjm assessment and, occasionally, perform a "benchmark assessment" that is subject to review by external experts. The last benchmark assessment, which occurred in 1998, resulted in some minor adjustments to the stock assessment model formulation (S. Gavaris, pers. comm. 02 October 2009).

Stock Status

Between 1969 and 2008, the estimated age3+ SSB of 5Zjm haddock ranged from an historical low of 9,000 mt (1993) to approximately 158,000 mt (2008) (Figure 17). The latter is possibly the largest SSB ever observed for this stock (dating back to the 1930s). Estimated SSB in 2008 is also 4.7 times greater than the 1969 - 2008 average. Furthermore, the population age-distribution of 5Zjm haddock in DFO research surveys expanded between the 1980s (max age6-7) and 2000s (max age8-9).

Growth of SSB over the past decade is due to above average productivity (i.e. recruits per unit SSB) combined with increasing spawning stock biomass (Figure 18).

Such a pattern of growth and productivity suggests that the low SSB levels during the 1990s were not low enough to impair recruitment or the ability of the stock to recover from low levels under the prevailing environmental conditions.

Using the same definition of B_{recover} as for 4X5Y haddock, there is a high degree of certainty that the 5Zjm stock is above $B_{\text{recover}} = 9,000$ mt, which is the lowest point from which the stock has recovered in the past (i.e. the smallest possible observed point where recruitment would be impaired).

An implicit target reference point for this stock is defined by computing the expected equilibrium yield when a population with average recruitment is harvested using the $F_{0.1}$ harvest strategy. The resulting target of approximately 80,000 mt is expected to be slightly larger than B_{MSY} for this stock because $F_{0.1}$ is slightly lower than F_{MAX} (i.e. the fishing mortality rate that maximizes yield-per-recruit). The 5Zjm haddock stock has been above this implicit target level for the past three years. Furthermore, the 2008 stock assessment shows a high degree of certainty that the stock is currently greater than 80,000 mt (Figure 19). Note, however, that SSB projections decline over the next several years as exceptionally strong year-classes move through the fishery.

6.2.3 Management Advice

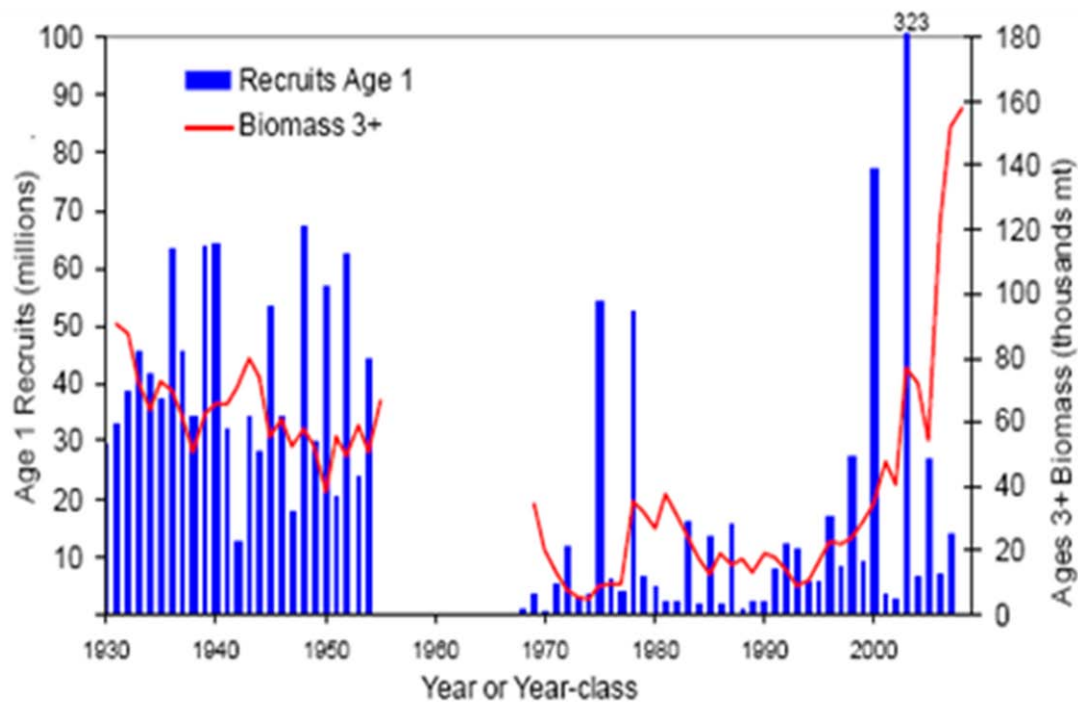
The 5Zjm haddock fishery is managed using catch quotas, and therefore, harvest strategies are defined based on biomass and fishing mortality rate reference points. Canadian domestic fisheries policy prescribes the use of the DFO Harvest Strategy (described for 4X5Y above). Advice derived from stock assessments is provided in a way that communicates risk relative to fishery reference points (Figure 20).

Reference Points

Management of 5Zjm haddock by DFO has avoided specifying explicit biomass reference points because such actions would complicate management of international resources shared with the U.S. (S. Gavaris, pers comm., 24 July 2009). Nevertheless, DFO analyses of stock-recruitment data for 5Zjm haddock suggest that "the chance of observing a strong year-class is significantly lower for [age3+] biomass below about 40,000 mt, while the chance of observing a weak year class is very high" (Figure 21). Thus, an Upper Stock Reference (USR) of 40,000 mt appeared to be a spawning biomass level where average recruitment may decline.

Current management of 5Zjm haddock uses the Upper Stock Reference = 40,000 mt as a level that is estimable and well above the lowest biomass from which the stock has recovered, B_{recover} , which is 9,000 mt.

Figure 17: Stock Assessment Model Reconstruction of SSB (age3+) and Age1 Recruitment of Haddock in NAFO Subdivision 5Zjm 1930 - 2008



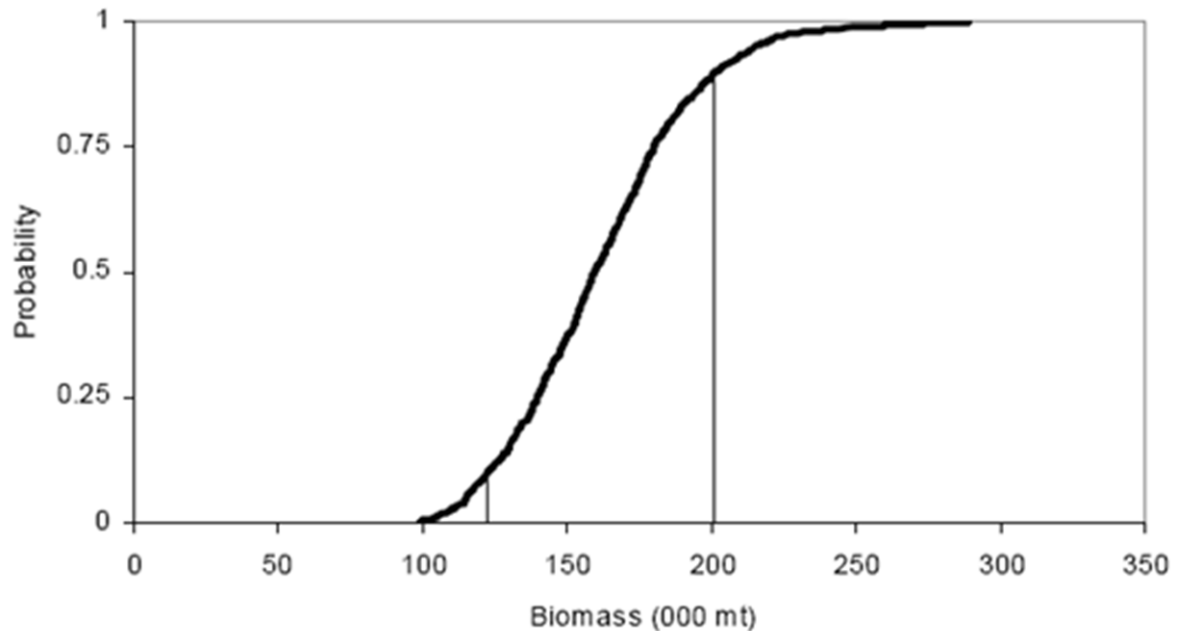
Source: TRAC_RD_2008

Figure 18: Productivity Index for 5Zjm Haddock 1969-2007

Note: Values are logarithms of recruits-per-SSB, where recruits are defined as age-1 fish and SSB is total age3+ biomass. The horizontal line is the 1969-2007 average.

Source: Cox (P1 Expert) after TRAC_RD_2008 assessment results.

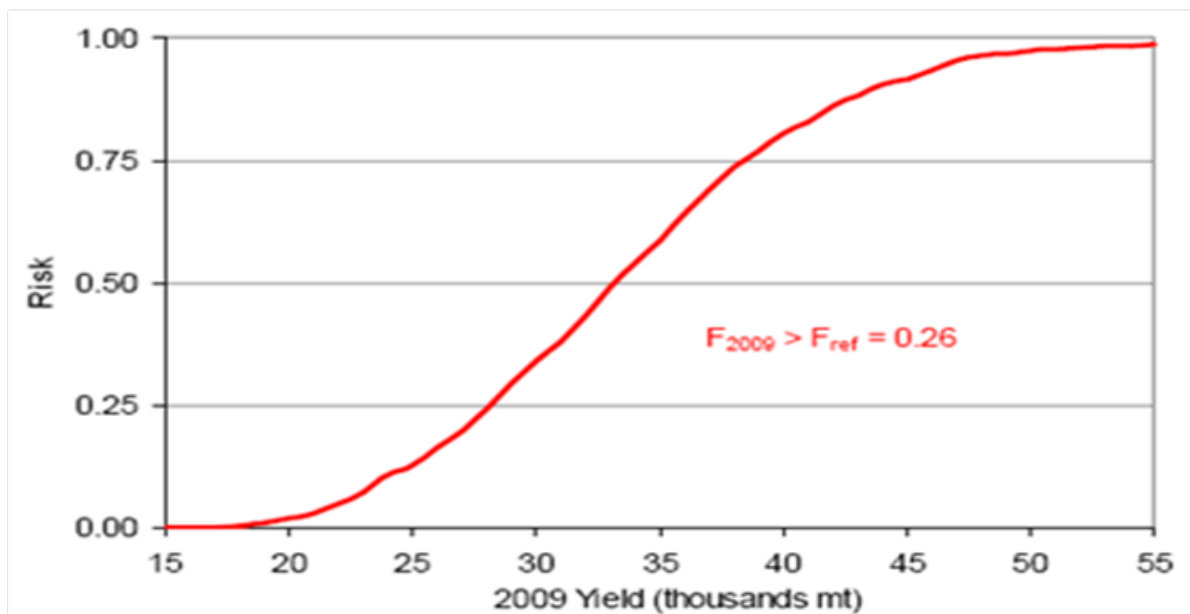
Figure 19: Cumulative Probability Distribution Function for Age-3+ Haddock Biomass in Area 5Z_{jm}



Note: The target reference point is 80,000 mt. Vertical lines indicate the 80% confidence region.

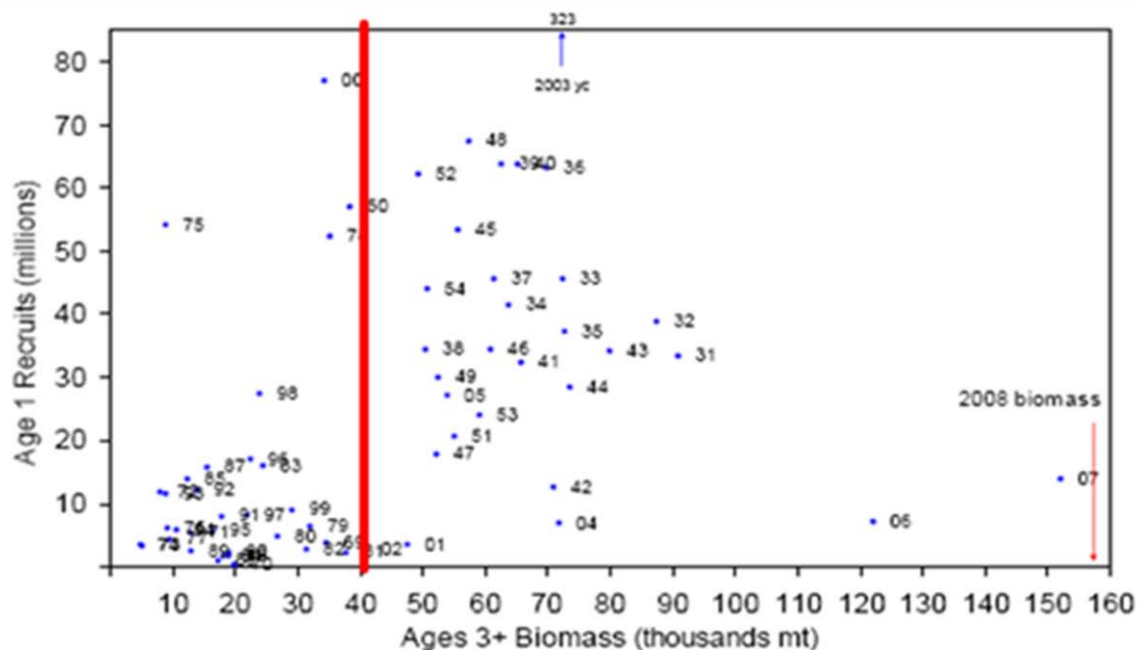
Source: TRAC_RD_2008 Figure 31

Figure 20: Example probabilistic presentation of management advice for Area 5Z_{jm} showing the relationship between the probability (Risk) of fishing mortality rate exceeding $F_{0.1} = 0.26$ as a function of the 2009 yield



Source: TRAC_RD_2008.pdf

Figure 21: Estimates of SSB & Recruitment of 5Zjm Haddock



Note: The red line indicates the LRP = 40,000 mt - this was not added by MSC review team; it is a the original figure from the 2008 5Zjm haddock assessment.

Source: TRAC RD 2008

Harvest Strategy

The TMGC, responsible for managing harvest of 5Zjm haddock uses a harvest strategy that maintains a low (5 % - 25%) to neutral (50 %) risk of exceeding the fishing mortality limit reference, $F_{\text{ref}} = F_{0.1} = 0.26$ (TRAC Status Report 2008/02). As the stock drops below the USR of 40,000 mt, fishing mortality rates should be further reduced to promote rebuilding.

The TMGC harvest strategy for 5Zjm haddock is consistent with the DFO Harvest Strategy in spirit. However, although TMGC and DFO strategies both attempt to maintain the stock around a target level near B_{MSY} , the TMGC strategy does not specify exactly how "fishing mortality rates should be further reduced to promote rebuilding". In contrast, the DFO strategy appears to require a prescriptive approach to setting $F = 0$ when stock status declines below the limit reference point.

Harvest Control Rules (HCR) & Tools

The TMGC attempts to implement the harvest strategy for the 5Zjm haddock fishery by setting $F = F_{0.1}$ unless the stock declines toward LRP. However, there is no explicit HCR defined for this stock because the TMGC procedure:

1. Does not state specifically how fishing mortality should be adjusted in response to stock decline;
2. Does not incorporate explicit biomass reference points, and

3. Has not been fully evaluated using, for example, simulations to demonstrate robustness under normal circumstances, as well as alternative hypotheses and assessment errors.

In an unpublished 1997 ICES report¹, however, DFO conducted simulation tests of four candidate HCRs for 5Zjm haddock representing different choices for LRPs, precautionary reference points (e.g., B_{pa}), and fishing mortality rates, including $F_{0.1}$. Simulation scenarios were limited in scope to alternative observation and process error scenarios rather than structural hypotheses such as stock recruitment relationships, stock status, process error structure (e.g., auto-correlated productivity) and assessment model choices.

The report found that a harvest strategy with an LRP of $B_{Lim} = B_{pa} = 40,000$ mt and $F_{pa} = 0.28$ performed best at providing reasonable certainty of stock recovery within at least 15 years (note that the report was developed in the 1990s when the stock was in need of recovery). However, according to the strategy, fishing mortality would be set equal to zero when $SSB < B_{Lim}$. The authors acknowledge that such actions are unlikely because of the potentially harsh economic consequences. Thus, although simulation work has been done to test the harvest strategy (here synonymous with HCR), the actual strategy used remains somewhat vaguely defined and untested. It is important to note that, at the national fisheries management level, the DFO Harvest Strategy has not been fully evaluated either.

The increasing trend in SSB does provide strong evidence that, despite a somewhat vague definition, the existing TMGC strategy has worked as intended in the recent past. However, it is not clear what action TMGC would take in the future unless SSB declines toward or below the LRP.

The HCRs used for 5Zjm haddock in the past have been generally understood by science, management and stakeholders involved in the assessment process (as determined through meetings with managers, scientists, and stakeholders). Furthermore, the realized relationship between SSB and F demonstrates that the HCR is responsive to changes in stock status (Figure 22); however, this pattern was generated during a period in which stock size was increasing away from the LRP, which means that one cannot judge whether the harvest control rule ensures that exploitation is reduced as biomass approaches the LRP.

Tools

The TMGC harvest strategy is implemented using tools including quotas, closed areas and a Small Fish Protocol. Evidence clearly shows that F has been under control for the past decade or more, which further supports the notion that these tools are appropriate and effective in controlling exploitation, even on sub-legal fish.

¹ Unpublished report of the Comprehensive Fishery Evaluation Working Group of ICES, 25 June - 4 July 1997.

Figure 22: Realization of the Harvest Strategy for 5Zjm Haddock as Reconstructed from 2008 Stock Assessment Estimates of Age-3+ SSB and Age-4+ F

Note: The biomass upper stock reference (40,000 mt) and removal reference fishing mortality rate ($F_{0.1} = 0.26$) are shown as vertical and horizontal dashed lines, respectively.

Source: Cox (P1 Expert) after TRAC_RD_2008 assessment results

7 FISHERY MANAGEMENT FRAMEWORK

7.1 The Legal Framework

7.1.1 Regulations

See section 5 (above).

7.2 Strategic Approach

Linked to the various acts are policies that impact fisheries management e.g. Ocean Strategy, Marine Protected Areas, Coral Conservation, Benthic Sensitive Areas Policy and an Ecosystem approach to fisheries management.

The “Canadian Code of Conduct for Responsible Fishing Operations” (1998) outlines general principles and guidelines for all commercial fishing operations that take place in Canadian waters based on the FAO “Code of Conduct for Responsible Fisheries”. As such the principles and guidelines form the basis for fishery management planning.

The nine principles are (from <http://www.dfo-mpo.gc.ca/fm-gp/policies-politiques/cccrfo-cccpr-eng.htm>):

1. Fish harvesters will take appropriate measures to ensure fisheries are harvested and managed responsibly to safeguard sustainable use of Canada's freshwater and marine resources and their habitats for present and future generations of Canadians. For the purposes of this Code, sustainability is understood to mean the harvesting of a stock in such a way, and at a rate, that does not threaten the health of the stock, or inhibit its recovery if it has previously been in decline, thereby maintaining its potential to meet the needs and aspirations of present and future generations of fish harvesters.
2. Taking into account the economic importance of the fisheries to industry participants and their communities, fish harvesters will take appropriate measures to pursue the ecological sustainability of Canadian fisheries.
3. Fish harvesters will acknowledge that conservation and sustainable use of freshwater and marine resources is a shared responsibility, and requires a spirit of cooperation, among all industry participants and the appropriate regulatory authorities.
4. Fish harvesters will address problems of fisheries in Canada, adopting specific mechanisms and regulations as required.
5. Fish harvesters will work to balance the level of fishing effort with the sustainable supply of fisheries' resources to ensure responsible management and responsible professional harvesting.
6. To the extent practical, fish harvesters will minimize unintended by-catch and reduce waste and adverse impacts on the freshwater and marine ecosystems and habitats to ensure healthy stocks.
7. Fish harvesters will develop, maintain and promote public awareness and understanding of the issues surrounding responsible fishing and the measures taken by fishers to conserve stocks and protect the environment.
8. Fish harvesters will promote the recognition of their specialized knowledge gained through experience, and the integration of this knowledge within scientific analyses and fisheries management policies and regulations.
9. Fish harvesters will conduct harvesting operations in accordance with Canadian fisheries' laws and regulations; international laws, regulations, conventions, declarations and protocols adopted by Canada; and harvesting plans adopted by each fishery.

Attached to these principles are 36 guidelines. For example, guideline 1 states “Apply sustainable fishing principles and sustainable fisheries development to all aspects of fish harvesting and management of fisheries” and guideline 5 is “Establish fisheries policies in full consultation with management and other regulatory agencies to ensure conservation of fish resources and protection of the environment”.

7.3 Aboriginal Rights

Section 35 of the Constitution Act, 1982 recognizes and affirms the existing aboriginal and treaty rights of the aboriginal peoples of Canada. In light of section 35, and the decisions of the Supreme Court of Canada in *R. v. Sparrow* and other cases involving section 35, DFO has committed to providing aboriginal people with reasonable opportunities to fish for food, social and ceremonial fishing purposes and to providing such fishing with priority over commercial and recreational fishing (Lawseth).

In 1992, DFO implemented the Aboriginal Fisheries Strategy (AFS). This aims to increase economic opportunities in Canadian fisheries for aboriginal people while achieving predictability, stability and enhanced profitability for all participants in the fishery.

The 1999 Marshall decision, found that Treaties signed in 1760 and 1761 by Mi'kmaq, Maliseet and Passamaquoddy communities in the Maritimes, Quebec and New Brunswick respectively, include a communal right to fish commercially in pursuit of a moderate livelihood. DFO subsequently worked out fishery agreements with 15 of the 16 First Nations in the Scotia-Fundy Sector.

As highlighted by DFO in 2004¹ “*fisheries agreements have been successfully negotiated with 31 of the 34 affected Mi'kmaq and Maliseet First Nations in the Maritime Provinces and the Gaspé region of Quebec. There are 16 First Nations within DFO's Maritimes Region² of which 14 have signed fisheries agreements that have led to significant economic development activities in those communities. To date, there are over 380 First Nations fishing enterprises in the Maritimes Region and over 400 people employed. It is expected that job growth in these communities will continue as a result of the fishing access provided. Work has also been created in the construction of infrastructure such as buildings and wharves*”.

In the haddock fishery, DFO purchased quota for allocation to Aboriginal fisheries. Each aboriginal band has a quota under commercial communal quota. Initial DFO policy was only to allow the transfer of quota between bands, but this was changed after First Nations argued that this was an unfair restriction on their commercial opportunities. Currently only two bands actively fish (Comment: DFO Site visit).

7.4 Consultation & The Decision Making Process

There are a number of levels to fishery management in the DFO Maritimes region that allow stakeholder participation in the fishery management process.

Government maintains the activities of licensing, registration of vessels, identification and limitation of gear and the description of area to be fished or controlled. Many of these applications occur through the DFO administered vessel licensing scheme in the context of DFO CPD enforcement.

The Regional Advisory Process (RAP) was established in 1993 to provide peer reviewed

¹ <http://www.mar.dfo-mpo.gc.ca/communications/maritimes/FactSheets04E/MarshallDecisionE.html>

² Acadia, Membertou, Millbrook, Eskasoni, Chapel Island, Glooscap, Annapolis Valley, Oromocto, Wagmatcook, We'koqmaq, Kingsclear, Woodstock, Saint Mary's, Fort Folly, Bear River and Indian Brook.

information on the status of the fisheries and marine mammal resources in the Atlantic zone (it was expanded in 1997 to include the Central & Arctic and Pacific regions). In the Maritimes Region and the Gulf Region, the RAP addresses issues in the southern Gulf of St. Lawrence, the Bay of Fundy, the Scotian Shelf and Georges Bank. The Maritimes RAP also undertakes the review of technical analysis relating to regional habitat and fisheries management issues. Stakeholders are involved in the identification of issues and the review of results.

The Canadian Science Advisory Secretariat (CSAS) coordinates Regional RAP activities, maintains several publication series that document the work of RAP on the DFO corporate website.

The Fisheries Resource Conservation Council (FRCC) was created in 1993 to form a partnership between scientific and academic expertise, and all sectors of the fishing industry. Together, Council members make public recommendations to the DFO Minister on conservation measures for the Atlantic fishery. Up until 2005, the Council's primary focus was to provide annual advice on TACs and other conservation measures related to Atlantic groundfish stocks. After a review of the FRCC's mandate in 2002, the Council took a new direction, focusing on long-term conservation strategies. The Council consists of 12 members, appointed by the DFO Minister.

The Gulf of Maine Advisory Committee (GOMAC) provides a forum for fishing industry representatives and government to develop and provide advice to DFO on Gulf of Maine fisheries issues. The Committee advises on operational, technical and scientific analyses necessary to support formal discussions with the United States. GOMAC has clear terms of reference. Membership includes the following representatives for the groundfish sector: >65' Mobile and FG (2); <65' MG (2); <65' & <45' FG (3); Offshore Scallop vessels (1); and Aboriginal harvesters. Observers are permitted to attend meetings.

The Gulf of Maine Council on the Marine Environment is a U.S.-Canadian partnership of government and non-government organizations working to maintain and enhance environmental quality in the Gulf of Maine to allow for sustainable resource use by existing and future generations.

As described in the FMP, DFO consults with stakeholders through a number of committees: the umbrella Scotia Fundy Groundfish Advisory Committee, and five subsidiary committees – the FG Advisory Committee, the ITQ Advisory Committee, the Generalist Group, the GEAC and the Mid-Shore Groundfish Vessel Owners (MSGVO).

Minutes of the meetings are prepared and circulated.

As reported by Peacock & Annand, Community Management Boards (CMB) are linked to the community quota approach (introduced on a pilot basis in 1995 and effective for all fleets < 45' from 1996) for the inshore < 45' FG sector. These input into in-season management and develop, implement and monitor controls on the activities of the community fleet. The CMB's meet together on the < 45' FG Groundfish Committee that approves a DFO prepared Conservation Harvesting Plan (CHP). The approach towards the preparation of CHPs may vary. For example, in Shelburne, there are two management boards, one comprised of five different associations, each of which develops a harvesting plan. In the other Shelburne CMB, there are three associations and corresponding plans.

In addition, CHP are prepared for member companies of GEAC, FG vessels 65' – 100', MG vessels 65' – 100' and the ITQ fleet (45' – 65').

Consultation takes place on policy initiatives. For example, the development of procedures on

the small fish protocol included three consultations that were attended by a large number of individuals and representatives of various organisations.

A further example of a DFO initiative that incorporated stakeholder involvement in the development of fisheries management policy is the formation of cod action teams in 2003, the primary objective of which was to develop a stock rebuilding strategy for Atlantic cod stocks. Each Cod Action Team undertook consultations with a variety of stakeholders, including industry, Aboriginal communities, academics, environmental groups and local interests to develop these long-term strategies.

For 5Zjm the Canada USA Steering Committee and the Canada-USA Integration Committee have been established. As reported by Peters and Peacock *“The Steering Committee is comprised of representatives from DFO, the NMFS and industry representatives from each country. Among other initiatives it guided the TRAC and TMGC..... Established in 2000, the TMGC is an industry / government committee with representatives from Canada and the United States. The mandate of the committee is to develop and propose harvest strategies as well as resource sharing and management processes for Canadian and US management authorities”*. TMGC meets as required, considers the scientific advice contained in Transboundary Status Reports, incorporates information received from fishermen, reaches agreement by consensus and produces a common guidance document for the management of transboundary resources that is communicated to national fisheries management authorities.

Currently sitting on the TMGC are the Canadian co-chair and representatives of DFO Science, DFO Fisheries Management, inshore MG, inshore FG, and offshore MG. TMGC meets as required, considers the scientific advice contained in Transboundary Status Reports, incorporates information received from fishermen, reaches agreement by consensus and produces a common guidance document for the management of transboundary resources that is communicated to national fisheries management authorities.

The TMGC also presides over public consultations to receive information from fishermen about management considerations for transboundary resources.

At regular intervals stakeholders come together in bilateral working committees. Committee members work to achieve consensus on issues such as stock assessments, TACs, country quotas (i.e. distribution), or changes to the governance structure such as the introduction of new working groups. This consensus is presented in the form of recommendations or guidance to domestic bodies which include GOMAC.

While a cornerstone of management policy is the consideration of local knowledge, and some policy documents formally acknowledge the importance of this, it would appear that there is no formal explanation of how the information and opinions of stakeholders are used or not used. Some groups feel that DFO does not take adequate consideration of their point of view. This thought was typified by comments made by representatives of the FG sector who met with the audit team. In contrast, representatives of the MG fishermen spoke highly of the level of cooperation of DFO with industry, both at the formal and informal levels with regular informal contact between the private sector and DFO to discuss issues such as the location and size of the fish.

Stakeholders cooperate with DFO in the provision of scientific data – most notably the annual ITQ survey.

The 2002 audit report on DMP reported that *“there are many participants involved in the DMP. The primary participants and stakeholders are the fish licence holders, Dockside Monitoring Companies, Dockside Observers, buyers, the Canadian General Standards Board (CGSB) and DFO. The Review Team found the roles of most DMP participants to be clearly*

understood". However, at that time concerns were expressed at the level of DFO coordination.

The DFO approach to the consultation process may be categorised as one that provides the opportunity for all interested and affected parties to be involved and facilitates their effective engagement. This is undertaken by the regular consultation with the large number of representative organisations and through public meetings

7.5 Management Policy: Long Term Objectives

The 2004 "Policy Framework for the Management of Fisheries on Canada's Atlantic Coast", updated in 2008 has four objectives:

- Conservation and Sustainable Use: Conservation of marine resources and habitat, and rebuilding of resources and restoration of habitat where necessary, will remain the highest priority for the management of all fisheries.
- Self-reliance: Self-reliant fisheries and continued collaboration with the provinces and Nunavut, communities, aboriginal groups, industry and others will contribute to the well-being of coastal communities.
- A Stable and Transparent Access and Allocation Approach: The access and allocation of fisheries resources will be more stable and predictable, and decisions will be made and conflicts resolved through a more fair, transparent and rules-based processes.
- Shared Stewardship: Participants will be effectively involved in fisheries management decision making processes at appropriate levels; they will contribute specialized knowledge and experience, and share in accountability for outcomes.

Related to these objectives are 9 principles:

- Conservation of fisheries resources and habitat — defined as sustainable use that safeguards ecological processes and genetic diversity for present and future generations — is the first priority of fisheries management decision making.
- The fishery is a common property resource to be managed for the benefit of all Canadians, consistent with conservation objectives, the constitutional protection afforded Aboriginal and treaty rights, and the relative contributions that various uses of the resource make to Canadian society.
- The Minister of Fisheries and Oceans, on behalf of all Canadians, retains authority for the sustainable use of fisheries resources and their habitat, and for the access and allocation thereof.
- DFO recognizes the historic and continued importance of commercial fisheries on the Atlantic Coast as well as the legitimacy and importance of other users, such as recreational fishers and aquaculturists.
- Governments, resource users and others with an interest in the fisheries share responsibility for the sustainable use and economic viability of fisheries.
- Fisheries management decision-making processes will provide opportunities for increased Aboriginal participation and involvement.
- Fisheries management decision-making processes must be, and must be seen to be, fair, transparent and subject to clear and consistent rules and procedures.
- Fisheries management decision-making processes will be more inclusive so that resource users and others will have appropriate opportunities to participate.
- Operational decision making affecting specific fisheries will normally be made as close to those fisheries as possible and will primarily involve resource users.

DFO's Sustainable Development Strategy (SDS) is an overarching policy to ensure

sustainability in Canada's fisheries. One of the specific outcomes of SDS is a new fisheries management governance model to meet the needs of an evolving industry, recognizing principles of sustainable development, as well as the precautionary and ecosystem approach. DFO is preparing other policies on benthos, forage species and the precautionary approach.

7.6 Incentives for Sustainable Fishing

The progressive adoption of quasi property rights schemes for all groundfish fleets (except for FG < 45') has reduced the motivation to overcapitalize vessels and fishing gear with the objective of gaining a larger share of a shared quota. It has also created an incentive to participate in government industry surveys and cooperative research projects with the objective of improving the information base needed in order to make relevant investment decisions. The ability to transfer quotas from one license to another allows permits users to maximize their economic returns from the resource. Bestowing property rights in a fishery provides security to individuals owning licenses that may be leased to provide an income following retirement.

The <45' FG fleet remains under a competitive fishery with restrictions on the size of vessels permitted to be used. The available quota for this sector is sub allocated to community groups based on catch history of their members. There are eleven management Boards in the Maritimes region. The Boards are permitted to trade quota on a temporary basis at the community level. The positive features of quasi property rights inherent in this arrangement are not as strong as the former programme but there has been some rationalization of fishing effort. It may be argued that the current management of the fishery favours larger vessels that ENGOs believe lead to greater damage to the ecosystem, and accordingly that quotas for small boats are insufficient to allow the profitable operation of smaller boats working with environmentally friendly gear – most notably hand lines. While there is some merit in this argument, it would appear that the current situation of hand liners (the number of which prosecuting groundfish fisheries has greatly reduced) is more a reflection of the better options for these vessels in other fisheries (lobster), the large number of fishing units compared to the available opportunities and the economics of bringing fish to market at a competitive price.

Peacock & Amand report that *“Community-management has improved the scientific understanding by industry in two ways. First, there has been more dialogue between scientists and industry. Partially aided by an industry advisory council (the FRCC), this dialogue has advanced the understanding within the communities of scientific issues and species interactions. Improved knowledge provides for a better approach to management. Second, the communities have provided additional funds to extend government surveys and have participated in the survey process. This improved knowledge base is manifested in a science-advisory process that is more interactive and more detailed in its analysis. Community fishers participate in the RAP and provide valuable comments on suggested inferences from data sets. An increased industry knowledge base also contributes to overall knowledge that translates into better community decisions. By understanding the process in more detail, the delivery of data by fishermen improves”*.

It may be argued that the approach to management of the small boat sector (Community quotas as opposed to ITQs) has potentially impacted interest in using certain types of gears (most notably the hand line) as established quotas have not been sufficient to maintain financial viability. On the other hand, it may be considered that high returns in other fisheries, specifically lobster, may prove to be a disincentive to undertake additional fishing outside the lobster season.

There are no negative incentives in the groundfish fishery. There is government support for

infrastructure (wharves) but this is considered a normal role for governments (similar to constructing roads and bridges). There are no price subsidies or fuel subsidies.

7.7 Management System

In Canada, FMPs should incorporate the Code of Conduct for Responsible Fishing. They are developed with stakeholders through a number of advisory processes and approved by the DFO. FMPs are publicly posted and attached to each commercial fishing licence as a way of implementing conditions of the licence. FMP development is supported by a scientific stock assessment and review process comprised of species-group committees led by DFO scientists through a series of peer-reviewed stock assessments (Lawseth 2007).

As described by DFO officials during the site visits, fishery management policy is constantly evolving and new initiatives will take form in the near future.

The Groundfish Management Plan (2002 – 2007) was based on three objectives linked to 16 strategies that in turn were related to a number of management measures (table 7).

Section 7 of the 2002 FMP states that *“in October-December of each year, the management team will sponsor a full review of all elements of plan performance in relation to stated objectives. The following year's plan will be amended as required by the review results. It is proposed that a fundamental review of all aspects of the plan, including the general and strategic objectives, be conducted in year 4 (2005-06). The results of the review will form the basis for a revised plan for the subsequent five years, 2007-12”*. While it was reported that such a review was carried out after the first year (Pers comm: Gavaris), this has not since been the case.

A key part of the management system is the CHPs. The CHPs define specific measures to be implemented in each fishery, presumably to ensure that the objectives of the FMP are met. For example, the CHP for MG < 65' defines measures on authorized fisheries, fishing gear specifications, by-catch provisions, the small fish protocol, catch monitoring and test fishing, open seasons, close seasons, spawning, juvenile and other closures, and other measures.

These are informally reviewed on an annual basis, but to a large part remain unchanged from year-to-year; stakeholders are asked to comment on what issues of the CHP require review.

Options for review are regular and *ad hoc* monitoring exercises through the auditor general and standing committees of the House of Commons and the Senate. In 2007 there was a review of the Aboriginal Fisheries Strategy Formative Evaluation. The approved objectives of the formative evaluation were to:

1. Assess whether the AFS continues to be consistent with departmental and government-wide priorities and whether it realistically addresses an actual need;
2. Determine the extent to which the program outputs and outcomes, as identified in the Results-based Management and Accountability Framework (RMAF), approved by the Departmental Audit and Evaluation Committee in April 2003, have been achieved; and
3. Assess whether the most appropriate and efficient means are being used to achieve objectives, relative to alternative design and delivery approaches.

In 2002 there was an external audit of the DMP. This was up-dated in 2005 and 2006.

Table 7: Objectives Hierarchy for Management of the Scotia-Fundy Groundfish Fishery

<u>General Objectives</u>	<u>Strategies</u>	<u>Management Measures</u>
1. <i>Conservation of the ecosystem by:</i>		
1.1 Maintaining community diversity by protecting benthic communities susceptible to disturbance	Protect high diversity coral beds	Close area in Fundian Channel
	Protect benthic communities in the Gully	Establish The Gully as a Marine Protected Area
1.2 Maintaining species diversity	Keep stock size of target species above established limits	Control fishing mortality (<i>F</i>)
	Minimize incidental mortalities on non-target species, particularly species at risk	Restrict directed catches and impose caps on by-catches
1.3 Maintaining population diversity	Maintain spawning components of target species	Define management areas that correspond to stock distributions
1.4 Maintaining trophic structure	(Insufficient knowledge at this time to establish strategies)	
1.5 Maintaining productivity of populations by managing exploitation of target species	Keep exploitation rates at moderate levels	Control fishing mortality (<i>F</i>) through annual TACs and by-catch rules
	Avoid wastage by managing size and species selection during fishing	<ul style="list-style-type: none"> - Specify aspects of gear construction, principally mesh size - Implement temporary and permanent closures of areas of small fish concentration - Restrict small-mesh groundfish fisheries to specified areas - Establish minimum fish size limits
	Prevent disturbance of fish during spawning	Prohibit fishing for haddock during the spawning season in spawning areas on Browns and Georges banks
2. <i>Manage the groundfish resource in a manner consistent with:</i>		
2.1 Meeting aboriginal treat rights	Make provision for food, social and ceremonial fisheries	Issue communal licences
	Increase participation in the commercial fishery	Acquire and transfer licences, quotas, boats and gear to First Nations

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2.2 Making provision for recreational fishing	Implement national recreational fisheries policy	Introduce licensing and catch reporting requirements
2.3 Creating conditions for economic self-reliance in the commercial fishery	Balance fleet capacity with resource availability by managing access and supporting resource sharing arrangements that allow resource users to meet their economic objectives	<ul style="list-style-type: none"> - Limit entry through licensing - Improve options for transferability of shares and quotas - Resolve disagreements over historical shares - Include all directed fisheries into existing ITQ/EA system - Review performance of Community Management boards
3. Co-management		
	Implement Code of Conduct	(To be established when appropriate)
	Undertake co-operative DFO/Industry projects	Devise policy framework for screening proposals
	Build industry management capacity	(To be established when appropriate)

Source: Groundfish Management Plan 2002

Since 2002, there has been substantial progress in understanding the needs for fisheries management and the position of fishery in relation to other elements of the eco-system. On this basis, currently there are a large number of policy initiatives with associated policy instruments – but these remain largely in the planning stage and have not been formally adopted in the haddock fishery and the eight UoC.

DFO reports that a new Integrated FMP is in process for the Groundfish fishery. As reported by DFO,¹ this renewed approach to the preparation of FMPs is based on the ecosystem approach. DFO is developing the necessary building blocks to take an ecosystem approach in fisheries management. The emerging approach includes data collection and ecosystem assessment, setting clear ecosystem and management objectives and the development of decision models. It will be supported by policies on forage species, by-catch, sensitive benthic areas and emerging fisheries. This reflects the Sustainable Fisheries Framework (SFF) that forms the basis for decision-making in Canadian fisheries. It incorporates existing policies for fisheries management conservation and sustainable use, governance, and economics with new and evolving policies using a phased-in approach. It also includes tools to monitor and assess results of conservation and sustainable use in order to identify areas that may need improvement.

The new FMP will cover:

- An overview of the fishery.
- The stock assessment and status, including ecosystem interactions, available information on precautionary approach references, and stock trends.
- Economics of the fishery, including the socio-economic profile and market trends.
- Management issues, including depleted species concerns, oceans and habitat considerations, and gear impacts.
- Access and allocation issues, including any sharing arrangements.
- Short- and long-term sustainable fisheries objectives for stock conservation, the ecosystem, shared stewardship and collaboration, socio-economic factors, and compliance.
- Management measures for the duration of the plan, including total allowable catch, fishing seasons and areas, control and monitoring of the harvest, decision rules, licensing, requirements of the Species at Risk Act, and habitat protection measures.
- The compliance plan.
- A performance review of management objectives.

When a significant change in the management regime is being considered, a socio-economic analysis may be undertaken to understand the full implications of the change, such as when an area is being considered for closure to a fishery to protect a sensitive sea-floor feature.

The DFO Fishery Stewardship and Sustainability Checklist that is proposed for use in evaluating the status of fisheries would provide the mechanism to evaluate all parts of the management system. 121 key Canadian fisheries were assessed in 2007 through a pilot run of

¹ <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/overview-cadre-eng.htm>

the checklist that assesses the scientific and management foundations of the fishery, as well as the impact of management measures on the status of the stocks and the ecosystems in which they live. While this is a significant development in terms of the measurement of the effectiveness of actions related to the achievement of specific objectives, as yet it is not clear when this will be implemented, the extent to which the data will be analysed and how it will be presented.

7.8 Monitoring, Control and Surveillance (MCS)

With 140 officers in New Brunswick and Nova Scotia, there is strong fisheries enforcement presence. About 40 % of the officers are said to be dedicated to groundfish.

Officers of the DFO CPD actively monitor fishing activity and enforcement of the various regulations through air surveillance, at-sea inspection and on-shore activities. In 2008, there were 16,124 “enforcement hours” that led to the identification of 114 violations, with FG vessels being responsible for 68 %. The main type of violation was “reporting” (40 %), followed by registration / license (20 %). The average fine in 2008 was C\$1,794. Data available for the years 2001 to 2007 indicates that enforcement effort and results have been consistent. It was reported (Site Visit) that the highest fine imposed in the Groundfish fishery was C\$30,000, while the highest fine for all fisheries was C\$300,000. This compares to a statutory limit of C\$1 million. While not specific to the haddock fishery, there has been an example of a seizure and forfeiture of catch and gear in the snow crab fishery, in addition to a fine. In addition there have been examples of creative penalties e.g. banning people from going close to the water.

Other duties include: educational activities (e.g. school visits) with the objective of promoting shared stewardship; and to maintain standards in the observer and DMP programmes.

Observer coverage is provided in Table 9 below. Fishers have to complete log books.

As reported by Peacock & Annand, a main building block of the system is Dockside Monitoring Programme (DMP). This is a 4-step process of:

- hail (i.e. reporting, usually by radio) out prior to fishing;
- hail in of amounts caught from at sea;
- verification of unloading amounts at the dockside; and
- collection and entry of catch data on a real-time basis.

A strong deterrent to infractions is the potential need for fishing vessels to have 100 % observer coverage at a cost of C\$300 per day plus travel and subsistence costs.

There appears to be no evidence of systematic non-compliance. It has been argued that low levels of observer coverage mean that certain practises may remain undetected e.g. high grading leading to the illegal discard of ground fish species. While anecdotal evidence (Site visit Ecology Action Centre) suggests this may be happening, data that shows that the average size of non-observer landings are smaller than those for observer landings would indicate otherwise.

It is reported that fishermen will inform authorities of non-compliance by their peers.

7.9 Research

There is a comprehensive research programme for haddock fisheries in both 4X5Y and 5Zjm.

The nature and type of activity are described fully in Section 6 (above) and Section 8 (below).

In addition to DFO, a number of bodies contribute to the research plan.

The role of RAP¹ is to provide peer reviewed information on the status of the fisheries and marine mammal resources in the Atlantic zone, and technical analysis relating to regional habitat and fisheries management issues. The RAP process involves industry, stakeholders, and outside scientific experts in the review process.

CSAS² *“coordinates communication of the results of the scientific review and advisory processes (research documents, status reports and proceedings). Reports on the status of fish, invertebrate and marine mammal stocks, environmental and ecosystem overviews, research documents featuring detailed scientific information, as well as proceedings of peer review meetings are available from CSAS”*.

The Bedford Institute of Oceanography (BIO)³ provides *“peer reviewed advice and support to government decision making on a broad range of ocean issues, including sovereignty, safety and security, environmental protection, the health of the oceans, safe and accessible waterways, the sustainable use of natural resources (fisheries, minerals, oil & gas) and the integrated management large ocean management areas”*.

“Each science based department at BIO has a research plan. These plans outline ways for identifying, monitoring, and interpreting trends that are important to sustaining ecosystems. These plans take into account the known effects that human activities have on ecosystems. Each plan provides direction on how to develop new knowledge and methods. The resulting information is used to help provide advice on managing ecosystems”.

The DFO Maritimes Science Branch has developed a multi-year research plan.⁴ *“This plan identifies short and long term activities in relation to:*

- *National science objectives;*
- *Departmental priorities and*
- *Regional operational issues”*.

The Population Ecology Section of DFO’s St Andrews Biological Station⁵ conducts research and stock evaluations to provide scientific advice for fisheries management and the Species at Risk programme.

The SARA Coordination Office⁶ *“provides advice and assistance to the Sectors (i.e. Fisheries and Aquaculture Management, Science, Policy, and Oceans) that implement the regional species at risk program, which includes assessment, consultations, recovery planning, and compliance monitoring”*.

¹ <http://www.mar.dfo-mpo.gc.ca/science/rap/internet/Home.htm>

² http://www.dfo-mpo.gc.ca/csas/Csas/Home-Accueil_e.htm

³ <http://www.bio.gc.ca/about-sujet-eng.htm>

⁴ <http://www.bio.gc.ca/research-recherche/index-eng.htm>

⁵ http://www.mar.dfo-mpo.gc.ca/sabs/SABS-SBSA/SABS_Welcome-eng.html

⁶ <http://www.dfo-mpo.gc.ca/species-especes/regions/Maritimes/maritimes-index-eng.htm>

8 ECOSYSTEM CHARACTERISTICS

8.1 Introduction

This chapter of the report evaluates the eight certification units jointly, with differentiation between the four different gear types and the two assessment areas where appropriate.

8.2 By-catch – Retained Species

8.2.1 Overview

This section evaluates the impact of the fisheries upon fish species that are retained, other than the targeted haddock. Under Canadian regulations, except for dogfish, sculpin and skate and those defined by licence conditions (see below) all groundfish must be retained and landed. Also, license conditions require the release of Atlantic halibut < 81cm and all threatened species (as classified under SARA) such as northern and spotted wolffish (see below).

CHPs for the different fleet segments stipulate the total by-catch of species that can be taken on each trip in percentage terms relative to the total catch. If exceeded, observer coverage is increased and further action taken as necessary.

Under the “small fish protocol”¹ provisions in the CHPs allow for fisheries to be closed if the volume of fish under the defined size² for a species exceeds 15% of the total catch of that species.

In accordance with the MSC FAM, main retained species are defined as those that constitute over 5 % of the total. Care must be taken in considering by-catch in relation to a mixed multi-species demersal fishery.

Data on retained species from the gillnet and hand line fisheries were not provided to the assessment team, but with annual landings at under 10 mt for both fisheries combined their impact on other retained species populations is considered to be insignificant.

For the bottom trawl and long line fisheries, Table 8 presents analysis of two sets of data:

- The proportion of by-catch taking the whole catch in the mixed fishery into account (annual average for the period 2002 – 08);
- The proportion of by catch where it may be considered that the fishing trip targeted haddock i.e. where the catch of haddock was >50% of the total catch for the species.

Analysis indicates that a large variety of species are taken as retained by-catch in the four fisheries. Depending on the approach taken, there is a variation in the species that may be considered as retained by catch species.

¹ See Procedures for Monitoring and Control of Small Fish Catches and Incidental Catches in Atlantic Groundfish Fisheries. http://www.glf.dfo-mpo.gc.ca/fam-gpa/groundfish-poissondefond/small_fish_protocol-e.php

² Cod, haddock, pollock and white hake 43 cm in all areas; Atlantic halibut 81 cm in all areas; all flatfish 30 cm in all areas except 33 cm for witch in 4VWX

Table 8: Retained Catch of Non-Haddock Species in (i) the Groundfish Fishery and (ii) the “Directed” Haddock Fishery

	Average Annual Total Catch in Mixed Groundfish Fishery 2002 - 2008							
	4X5Y				5Zjm			
	OTB		BLL		OTB		BLL	
	mt	%	mt	%	mt	%	mt	%
Total Catch	17,360	100.0%	6,290	100.0%	11,438	100.0%	2,876	100.0%
Haddock	4,987	28.7%	1,489	23.7%	8,935	78.1%	1,941	67.5%
Pollock	3,461	19.9%	74	1.2%	1,054	9.2%	19	0.7%
Redfish	3,093	17.8%	13	0.2%	38	0.3%	2	0.1%
Cod	2,002	11.5%	1,731	27.5%	413	3.6%	623	21.7%
Monkfish	581	3.3%	45	0.7%	83	0.7%	6	0.2%
Silver Hake	1,218	7.0%	-	0.0%	-	0.0%	-	0.0%
Winter Flounder	818	4.7%	-	0.0%	129	1.1%	-	0.0%
Dogfish	3	0.0%	1,334	21.2%	-	0.0%	-	0.0%
Cusk	24	0.1%	674	10.7%	1	0.0%	194	6.7%
Halibut	47	0.3%	350	5.6%	4	0.0%	15	0.5%
White Hake	392	2.3%	521	8.3%	15	0.1%	74	2.6%
Yellowtail	17	0.1%	-	0.0%	699	6.1%	-	0.0%
Others	717	4.1%	59	0.3%	67	0.4%	2	0.0%
Fishing Trips when Haddock > 50 % of Total Catch of Trip: 2008								
	4X5Y				5Zjm			
	OTB		BLL		OTB		BLL	
	mt	%	mt	%	mt	%	mt	%
	mt	%	mt	%	mt	%	mt	%
Total Catch	3,726	100.0%	632	100.0%	13,301	100.0%	2,594	100.0%
Haddock	3,063	82.2%	400	63.3%	12,591	94.7%	1,994	76.9%
Pollock	130	3.5%	2	0.3%	190	1.4%	14	0.5%
Redfish	66	1.8%	1	0.2%	2	0.0%	-	0.0%
Cod	263	7.1%	126	19.9%	453	3.4%	513	19.8%
Monkfish	49	1.3%	3	0.5%	-	0.0%	1	0.0%
Silver Hake	-	0.0%	0	0.0%	-	0.0%	-	0.0%
Winter Flounder	49	1.3%	0	0.0%	19	0.1%	-	0.0%
Dogfish	-	0.0%	0	0.0%	-	0.0%	-	0.0%
Cusk	5	0.1%	32	5.1%	-	0.0%	36	1.4%
Halibut	-	0.0%	9	1.4%	-	0.0%	-	0.0%
White Hake	40	1.1%	54	8.5%	-	0.0%	26	1.0%
Yellowtail	1	0.0%	0	0.0%	34	0.3%	-	0.0%
Others	60	1.6%	5	0.8%	12	0.1%	10	0.4%

Note: 0 = < 500 kg; when catch is > 0 the quantity will be included in "others".

Source: DFO

DFO does not have an official definition of a "directed fishery"; the Department authorizes fishing activity towards applicable quotas, with separate bycatch constraints for species where no quotas exist or there is zero quota. On occasion, a catch of >50% is used as a functional proxy to describe "directed" fishing activity. There are some situations where the targeted species may be inferred from gear specifications or area fished, and this is particularly the case with silver hake and redfish. DFO indicates that redfish is more likely a by-catch when directing for pollock while silver hake is usually a directed fishery. The client reports that review of individual trip catches in the mixed groundfish fishery show that many trips do not have any catch of haddock.

Accordingly, this analysis reviews those species accounting for > 5 % of the total catch in the groundfish fishery with the exception of redfish and silver hake i.e.

- 4X5Y OTB: Pollock, cod
- 4X5Y LL: Cod, dogfish, cusk, halibut and white hake
- 5Z OTB: Pollock, Yellow tail
- 5Z: LL: Cod, cusk

8.2.2 Assessment of Main Retained Species

This section of the report provides a brief analysis of the stock status, management strategies and information sources for the main retained species that form more than 5 % of the landings from the otter trawl and bottom longline fisheries.

Cod 4X5Y¹

Catch Share

The cod by-catch (2008) from trips with >51 % haddock in the catch (by otter trawl and longline) totaled 389 mt (8.9 % of the total catch in such trips). As an average total catch in the demersal fishery, cod taken by the two gear types had a 15.7 % share.

Status

Biomass indices from surveys have remained low since 2000 when a rebuilding strategy was initiated. There is no indication of a decline in either total mortality or relative fishing mortality since 2000. Mortality for causes other than reported landings, including natural mortality, for cod of ages 4 and older increased in 1996 and is currently 0.7 (46%). The high mortality greatly restricts productivity. A target F of 0.2 was adopted for this stock during the 1980s, however realized F has been above this level since 1980 and is currently 0.35.

SSB at the beginning of 2008 was 9,000 mt; this is the lowest level in a time-series that started in 1948. Recruitment for the 2006 and 2007 year classes are below average, but about twice the abundance of the very low 2003 and 2004 year classes.

B has remained low since 2000 when the quota was reduced to 6,000 mt and then to 5,000 mt in 2006 to promote rebuilding. There is no indication of a decline in total mortality or relative fishing mortality since 2000.

Projections in the assessment in the Spring of 2009 (SAR 2009/015), based on data to 2008 inclusive, indicated the following:

- At removals of 3,000 mt in 2009 there is a 90 % probability of at least a 10% growth

¹ Sources: DFO 2009a; Clark *et al.* 2009

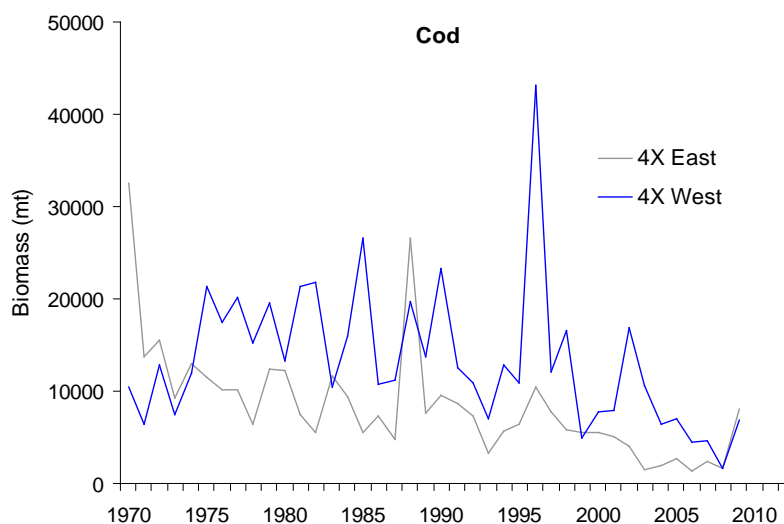
in SSB;

- At removals of 6,000 mt in 2009 there is a 50 % probability of at least a 10% growth in SSB

The TAC for 2009 was reduced to 3,000 mt, and the catch (directed cod fishery plus by-catch in other fisheries) totalled about 2,591 mt, a reduction of about 33 % from the previous two years.

Research vessel survey results (stratified mean weight per tow) (figure 23) increased by about 360 % between 2008 and 2009; the SAR 2010¹ states “4X Atlantic cod were widespread in the survey area in 2009 and there were several sets where the catch exceeded 50kg. Biomass indices in 2008 were the lowest in the series. Biomass indices for 2009 increased in 4X East and 4X West and were the highest since 1996 in 4X East.”

Figure 23: Biomass Estimate for 4X cod from the Summer RV Survey, 2009



Source: GEAC

Management Strategy

Projections indicate that at removals of 1,450 mt in 2009 (management target of $F = 0.2$) some growth in SSB is expected; however, SSB is unlikely to reach the LRP of 25,000 mt in 2010 even with no harvest. The TAC was reduced to 5,000 mt in 2006. Landings have remained near 3,900 mt and below the TAC since 2005. With the low quotas, many participants in the fishery are reserving cod as a by-catch in other directed fisheries, e.g. haddock.

A yield of 1,450 mt in 2009 would be consistent with the target exploitation rate of 16.5 %. At this yield, there is a high probability of 10 % growth in SSB (>95 %) between 2009 and 2010; however, this will only return the SSB to about the same level as in 2008. To be compliant with the principles of the precautionary approach, as well as the DFO Harvest Strategy, removals of cod from all fisheries should be reduced to the lowest possible level. This would imply continued low TACs and additional measures to reduce cod catch in the mixed-species groundfish fisheries and cod by-catch in other fisheries.

¹ Quoted by GEAC in their January 2010 submission.

This stock is under a rebuilding strategy with allowable catch allocated through EAs, ITQs and community quotas.

Information on Fishing Mortality, Stock Status & Risk Levels

F is estimated through mandatory logbooks, dockside monitoring and observer data.

A population model was used to provide estimates of abundance, fishing mortality and natural mortality. The commercial catch at age is included from 1980 to 2008. Indices used in the model are RV survey indices. The ITQ survey is a joint industry / DFO Science resource survey.

Cod 5Z_{jm}¹

Catch Share

The cod by-catch (2008) from trips with >51 % haddock in the catch (by longline) totaled 513 mt (19.8 % of the total catch in such trips). As an average total catch in the demersal fishery, cod taken by log line had a 21.7 % share.

Status

Adult population biomass declined substantially from 43,800 mt in 1990 to 8,500 mt in 1995; the lowest observed. The biomass subsequently increased to 19,400 mt by 2001, declined to 13,200 mt by 2005 but increased again to 19,300 mt by the beginning of 2008. Recruitment at age1 of the 2003 year class, at 7.1 million, is the only above average cohort since the 1990 year class. The 2002, 2004 and 2006 year classes, at less than 1 million each, are the lowest on record. Although the 2005 year class at 2.6 million fish at Age 1 is stronger than any of these cohorts, it is also below the 1978 to 2007 average.

F for ages4-6 increased sharply between 1989 and 1993 from 0.5 to 1.0. Due to restrictive management measures, F fluctuated between 0.19 and 0.50 during 1995 to 2004, and since 2005 has been at or below the F_{ref} level of 0.18. In 2007 F was 0.13.

Assuming a 2008 catch equal to the 2,300 mt total quota, a combined Canada / USA catch of about 2,100 mt in 2009 would result in a neutral risk (50 %) that F in 2009 will exceed F_{ref} , whereas a catch of 1,300 mt in 2009 would result in a neutral risk (50 %) that the 2010 adult biomass will be lower than the 2009 adult biomass. A 10 % biomass increase is unlikely even with no catch.

Management Strategy

The TMGC has adopted a strategy to maintain a low to neutral risk of exceeding the F LRP, $F_{ref} = 0.18$. When stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding.

This stock is under a rebuilding strategy and catch is allocated through EAs, ITQs and community quotas.

Information on Fishing Mortality, Stock Status & Risk Levels

F is estimated through mandatory logbooks, dockside monitoring and observer data.

Evaluation of the state of the resource was based on results from an age structured analytical assessment (VPA), which used fishery catch statistics and sampling for size and age composition of the catch for 1978 to 2007 (including discards). The VPA was calibrated to

¹ Source: Clark, K., L. O'Brien, Y. Wang, S. Gavaris and B. Hatt. 2008

trends in abundance from three bottom trawl survey series; NMFS spring, NMFS fall and DFO.

A consensus model formulation was established during the benchmark assessment review (NEFSC 2002). The adaptive framework, ADAPT, (Gavaris 1988) was used to implement the benchmark formulation for calibrating the VPA with the RV data.

Pollock 4X5Y5Z_c¹

Catch Share

The annual average take of pollock by OTB in 4X5Y was 3,461 mt or 19.9 % of the total; respective figures for OTB in 5Zjm were 1,054 mt and 9.2 %. Only taking into account the “direct” haddock trips, the by-catch of pollock was less than 5 % in 2008.

Status

Since 2000, fishery removals have averaged 6,000 mt. The Western Component of the management unit contributed 87 % and 81 % of total landings in 2006 and 2007 respectively.

Estimates of Age4+ (considered spawning stock) *B* declined from about 66,000 mt in 1984 to about 7,500 mt in 2000. *B* has been rebuilding since 2000, increasing steadily to about 29,000 mt in 2007, but declining to 27,000 mt in 2008.

The 2001 year-class is estimated to be the strongest since the one in 1988. Early indications for the 2004 and 2005 year-classes are that they are the lowest in the time series.

F steadily increased from the early 1980s to above 1.0 by the early 1990s and remained high until the early 2000s. Subsequently, reduced quotas and harvests as well as increasing population biomass have contributed to a decline in the *F* on ages6-9, which has been below the *F*_{ref} of 0.2 since 2006.

Management Strategy

If recruitment at age2 for the 2004 and 2005 year-classes is not as low as the model estimates and is set to the lowest level in the time series (3.4 million), the range of harvest strategies is 4,100 mt to 4,750 mt. If fished at *F*_{ref}, the projected 2009 / 2010 age2+ catch biomass is 4,500 mt, and at this harvest level, population biomass is expected to stay the same from 2009 to 2010.

The range of harvest strategies in the fishing year that are risk averse (25 % risk of exceeding *F*_{ref}) to risk neutral (50 % risk of exceeding *F*_{ref}) is 3,700 mt to 4,400 mt. If fished at *F*_{ref}, the projected 2009 / 2010 age2+ catch biomass is 4,100 mt. At this level of harvest, age5+ population biomass will decrease from 2009 to 2010.

These harvest strategies are for 4Xopqrs+5 and would be conservative if applied to all of 4X+5.

This stock is allocated through ITQs and community quotas.

Information on Fishing Mortality, Stock Status & Risk Levels

The last comprehensive review of the assessment framework was completed in 2003 and 2004. The last analytical assessment providing management advice on 4VWX+5 pollock was completed in 2006 and updated in 2009.

¹ Source: DFO. 2009b

F is estimated through mandatory logbooks, dockside monitoring and observer data.

Cusk 4X5Y5Zc¹

Catch Share

The cusk by-catch in 2008 from trips with >51% haddock in the catch, by longline, totaled 32 mt in 4X5Y, or 5.1 % of the total catch from “directed” haddock trips. In contrast, the annual average take in the BL groundfish fishery was 674 mt (10.7 %) in 4X5Y and 194 mt (6.7 %) in 5Zjm.

Status

In May 2003, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed cusk as threatened. They are currently being considered for listing on Schedule 1 of the Species at Risk Act (SARA). Cusk abundance has declined since the 1970s; however, there is insufficient data to determine the degree of decline and there is conflicting evidence on whether cusk abundance has continued to decline since the late 1990s. There has been no reduction in the range of cusk in Canadian waters. Cusk do not seem to have disappeared from any areas where they have been caught historically.

Fishing is the only known major source of human-induced mortality for cusk. Canadian cusk landings from 4VWX and 5Zc ranged from 790 mt to 1,490 mt between 1999 and 2006. The majority of these landings were from the groundfish longline fishery in 4X and 5Zc.

According to the Recovery Potential Assessment reported in SAR 2008/024, population models used in this assessment and assuming that unreported by-catch and discards remain constant, commercial landings in 4X of about 200 mt would result in a 75 % chance of observing at least a 50% increase in biomass after 15 years (1 generation), while 4X landings of about 600 mt would result in about a 54 % chance of observing at least a 50 % increase in biomass after 15 years. These landings would have to be increased by 1.43 times to be applicable to the entire management area (4VWX +5Zc). The quota caps have been set accordingly and landings for all areas in 2008/09 were 609 mt.

Management Strategy

Given uncertainties associated with available abundance indicators, a recovery target for the abundance of cusk has not been precisely determined. With current information, a recovery target for cusk would likely be a stock of the size observed in the mid to late 1980s, prior to the large and abrupt decline in the indices of stock status available from that period. However, a reliable measure of the current magnitude of stock size relative to that period is not available.

Accordingly, a practical interim strategy has been developed to promote measures that result in an increasing trend in cusk abundance, with a spatial target of maintaining the current distribution of cusk.

Licence conditions are set to limit incidental catch.

Information on Fishing Mortality, Stock Status & Risk Levels

F is estimated through mandatory logbooks, dockside monitoring and observer data.

There are a number of uncertainties associated with current assessments e.g. survival of

¹ Source: DFO. 2008

released cusk may be overestimated in the by-catch analysis for lobster fisheries in lobster fishing areas (LFA) 34 and 41 as it only considers immediate condition and not long-term survival. In addition, not all sources of cusk fishing mortality have been accounted for, i.e. potential by-catch in lobster fisheries outside of LFAs 34 and 41, and other trap fisheries.

White hake 4X5Y5Zjc¹

Catch Share

The white hake by-catch in 2008 from trips with >51 % haddock in the catch, by longline, totaled 54 mt in 4X5Y. This was only about 11% of the total white hake catch in this area; this low figure reflected by the annual average take in 2002 – 08 was 521 mt or 8.3 % of the total catch in the mixed demersal fishery.

Status

Landings throughout 4VWX/5Y have declined from a peak of 8,700 mt in 1987; since 2003 landings have been below 2,000 mt, reflecting quota caps. White hake is managed as a by-catch in longline, gillnet and otter trawl fisheries targeting halibut, redfish, cod, pollock and other groundfish. This has implications for quota management in a mixed groundfish fishery.

In 4X there has been a general decrease in the abundance of white hake since the early 1990s.

F is relatively low in all areas since the introduction of catch limits in 1996. Total mortality on the Scotian Shelf is high and its causes are unknown. Total mortality of white hake in the Bay of Fundy is variable without trend.

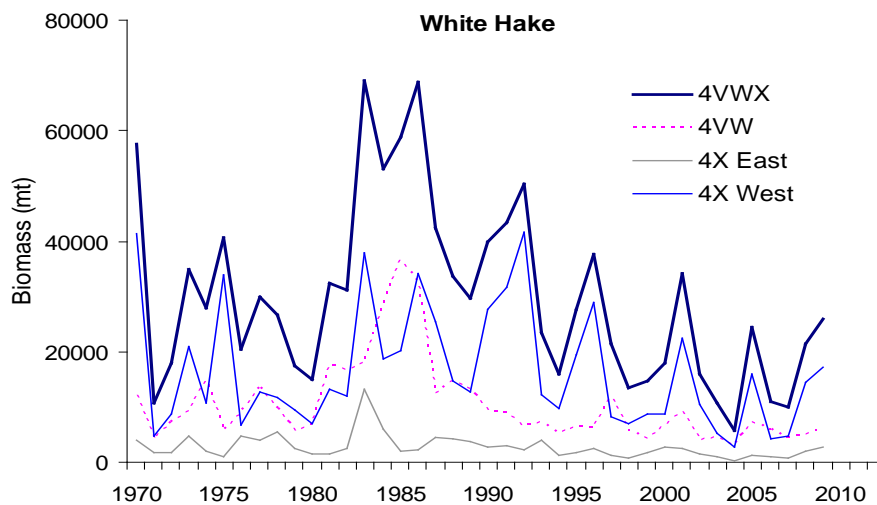
Unless there is good recruitment in 4X over the next few years, catches at the current level may lead to further decreases in abundance.

The SAR 2010² observes that white hake in 4VWX were distributed throughout the survey area, with the largest catches in the Gulf of Maine (4Xpq), the Bay of Fundy, and in 4Vn. Biomass indices have risen for the last two years in all regions (Figure 24). In 4X East, abundance indices were above average for most lengths below 58cm in 2009, but below average for larger fish. This is similar to what was seen in 2008. White hake abundance indices in 4X West were near average for most lengths in both 2008 and 2009.

¹ Source: DFO, 2005b.

² Quoted by GEAC in their January 2010 submission.

Figure 24: Biomass Estimate for White Hake in 4VWX from the Summer RV Survey



Source: GEAC

Management Strategy

Canadian fishing effort for this species was unregulated in NAFO Divisions 4X5Y until 1996 when it was placed under quote regulations.

Since 1999, the white hake fishery has been a by-catch fishery only and is managed through incidental quotas.

Information on Fishing Mortality, Stock Status & Risk Levels

There are several sampling platforms from which data are available to assess the status of white hake. Traditionally, DFO RV otter trawl surveys have been used exclusively for this purpose. In addition to these, there are a number of industry surveys that also provide data on white hake.

The stock status is based on evaluation of abundance and distribution estimates from these various sampling platforms. Mortality is estimated from the summer groundfish research vessel survey and the commercial fishery.

F is estimated through mandatory logbooks, dockside monitoring and observer data.

Dogfish 4X5Y, 5Z¹

Catch Share

The annual average take of dogfish by long line in the 4X5Y fishery for the period 2002 to 2008 was 1,334 mt, or 21.2 % of the total. In contrast, the species does not figure in the “directed” haddock fishery.

Status

In 2003, an intensive 5-year research program on Canadian dogfish was initiated by DFO, conducted in cooperation with the dogfish fishing industry through a JPA.

In the absence of a viable population model, it was not possible to estimate the exploitation rate for spiny dogfish in Atlantic Canada. However, biological studies indicate that the

¹ Campana, S., J. Gibson, L. Marks, W. Joyce, R. Rulifson and Mike Dadswell. 2007.

Atlantic population of spiny dogfish is more productive than the northwest Pacific population. However, the long gestation period (~ 2 years), late age of sexual maturation and slow growth rate for spiny dogfish means that the species is relatively unproductive compared to other fish species.

Spring minimum trawlable biomass estimates for spiny dogfish in Canadian and U.S. waters show similar trends, increasing from the early 1980s to the early 1990s, then declining somewhat to the present. Mean values for both indices were around 500,000 mt in the early 1990s, declining to about 300,000 mt in 2007 for the Canadian index. The Canadian spring index is considered to be a better indicator of total adult biomass than is the summer index.

Management Strategy

Data and stock assessment modelling is being undertaken over 2009 (TRAC Spiny Dogfish Benchmark and Assessment) in Area 5Z. This will be the basis for future on-going fisheries management.

Spiny dogfish has not previously been assessed through the TRAC process. However, scientists from Canada and the USA have participated in the peer review of each other's spiny dogfish assessments at various times in the past. The last Northeast Regional Stock Assessment Workshop (SAW) review was conducted in June 2006. The last DFO assessment of spiny dogfish occurred in November 2007.

Discards are permitted for this species due to their high post-release survival rate. Dogfish discard mortality in Canadian waters was calculated as per the following: 25 % for OTB catches > 200 kg, 0 % for OTB catches < 200 kg, 55 % for gillnet catches and 10 % for longline catches (DFO, 2007).

There is a precautionary quota (BLL) of 2,500 mt.

Information on Fishing Mortality, Stock Status & Risk Levels

In recognition that spiny dogfish stock components are found on both sides of the Canada / U.S. border, an information exchange forum was held at the Bedford Institute of Oceanography in 2003 so that science, fisheries management and industry from both the U.S. and Canada could exchange information and views about spiny dogfish biology, management and fisheries.

There are a number of RV surveys and industry surveys in Atlantic Canada that catch significant numbers of dogfish. Although these surveys together do not cover the entire range of spiny dogfish, they can be used to provide an index of relative abundance across years.

A preliminary population model has been developed for dogfish (Campana, *et al.* 2007). This model is an age- and sex-structured, forward projecting population model, which estimates a starting population size and age structure (in 1960), and projects the population forward by adding recruits (age-1 fish) to the population and subtracting catches and natural mortality. Both foreign and domestic landings are included in the model.

F is estimated through mandatory logbooks, dockside monitoring and observer data.

Halibut 3NOPs4VWX¹

Catch Share

The annual average take of halibut by long line in the 4X5Y fishery for the period 2002 to

¹ DFO 2006a, DFO 2009c

2008 was 350 mt, or 5.6 % of the total. In contrast, the species hardly figures in the “directed” haddock fishery.

Status

Atlantic halibut (*Hippoglossus hippoglossus*) is the largest of the flatfishes and ranges widely over Canada's East Coast.

Based on three catch rate analyses of the halibut survey (industry / DFO longline survey), there appears to be relative stability in the adult population of 3NOPs4VWX Atlantic halibut. The preferred analysis suggests a statistically significant increasing trend over the 11 year time series, although not all sources of uncertainty have been evaluated.

The size composition of halibut from the halibut survey in 4VWX indicates there has been no depletion of large fish from the population over the survey time series.

Management Strategy

Landings of Atlantic halibut have been recorded since 1883, and until 1988 the Atlantic halibut fishery was not regulated by TAC.

Although the exploitation rate is double M and $F_{0.1}$, given that the abundance indices from the halibut survey have been increasing recently and there are good signs of recruitment, a 15 % increase in the TAC for the 2009 / 2010 fishing season is not expected to increase the risk to the stock as compared to the previous 4 years.

However, the longer-term consequences of utilizing the relatively high catch to production ratio (3.2:1) should be evaluated in the context of stock management objectives, reference points, and a risk management framework.

Other sources of uncertainty including vessels, bait and temperature effects on the halibut survey and commercial index, have not been fully analyzed. A lack of a population model and biological reference points make it impossible to know whether the stock is rebuilt or what is precautionary.

Information on Fishing Mortality, Stock Status & Risk Levels

An industry / DFO longline halibut survey on the Scotian Shelf and Southern Grand Banks (3NOPs4VWX) was initiated in 1998 to provide estimates of abundance and distribution for Atlantic halibut, which provide input for assessment conducted on an annual basis.

While the DFO RV survey is thought to provide information on incoming recruitment (< 81cm), estimates of adult \geq 81cm) abundance are considered unreliable; consequently, the industry survey is critical to the assessment of this fishery. The industry survey provides an indicator of the direction of change in abundance of the halibut population for the Scotian Shelf and Southern Grand Banks, and also provides estimates of population size structure, including indications of incoming recruitment.

F is estimated through mandatory logbooks, dockside monitoring and observer data.

Yellowtail 4X5Y5Zjm¹

Catch Share

The annual average take of yellowtail by bottom trawl in the 5Zjm fishery for the period 2002 to 2008 was 699 mt, or 6.1 % of the total. In contrast, the species hardly figures in the

¹ DFO 2003 a

“directed” haddock fishery.

Status

Recruitment has improved, the 1997 year class being the strongest since that of 1973. Stock biomass has increased 10 fold since 1995 and is the highest since 1973. Exploitation rates are below $F_{0.1}$

Management Strategy

The Scotian Shelf stock (NAFO Divs. 4VWX) is managed in combination with the other flatfish species in this area. The fishery for yellowtail on the Grand Banks (Area 4X) came under quota management in 1973 with a TAC of 50,000 mt. This was not based on a proper stock assessment and was subsequently lowered to 40,000 mt in 1974 and 35,000 mt in 1975. In 1976, because of apparently poor recruitment, the TAC was drastically reduced to 9,000 mt. Since then the TAC has gradually increased.

The established fishing mortality threshold reference, $F_{\text{ref}} = 0.25$ has been consistently maintained. The pattern of recruitment indicates that the chance of a strong year class is significantly increased for mature biomass above 8,000 mt.

Information on Fishing Mortality, Stock Status & Risk Levels

F is estimated through mandatory logbooks, dockside monitoring and observer data.

8.3 By-catch – Discard Species

8.3.1 Overview

As previously noted, the only groundfish species permitted to be discarded are spiny dogfish, sculpin and skate, while Atlantic halibut less than 81cm and threatened species such as northern and spotted wolffish must be released. In addition, under section 33 of the General Fishing Regulations, individuals can only retain species for which they have a commercial license. While fishing under a groundfish license, all non-groundfish such as striped bass, crab and lobster must be returned to the ocean in a manner that causes the least harm. On longline vessels, white hake is permitted to be returned to the water as bait. This “limited discard” strategy is based on the premise that only those species with a higher level of post-discard survival are released at sea (S. Gavaris, pers. comm., 24 July 2009).

At present, discards are not routinely recorded through the logbook and are only estimated by the independent observer programme. Estimates of overall discard levels have been made through an extrapolation of observed discard rates for otter trawl and the bottom longline fisheries. These estimates have a number of limitations in that (i) they have not been analysed at fine temporal e.g. seasonal or spatial levels and (ii) in the case of Area 4X5Y, they are based on low observer coverage levels (table 9). However they are considered adequate for understanding the nature and magnitude of discarding from these fisheries (S. Gavaris, pers. comm., 24 July 2009).

Table 9: Observer Rates (% of total sea days observed) for Otter Trawl (OTB) & Bottom Longline Gears (BLL) in Areas 4X5Y & 5Zjm (2002 – 2008)

Area / gear	2002	2003	2004	2005	2006	2007	2008	Average
4X5Y OTB	4.1	1.7	2.8	2.0	1.2	1.5	1.3	2.1
BLL	0.2	0.5	0.5	0.7	0.2	0.2	0.4	0.4
5Zjm OTB	7.7	8.5	12.0	11.4	32.3	75.2	34.8	26.0
BLL	5.5	9.8	10.7	8.3	8.5	4.1	15.5	8.9

Source: S. Gavaris, pers. comm., from DFO observer database

The estimated discards from the otter trawl and bottom longline fisheries are provided in tables 10 thru 13.

As can be seen, the main discards from these fisheries are dogfish and skates with a minor by-catch of cusk, with the exception of the bottom longline fisheries in 4X5Y.

Of the species, the only one to be higher than 5 % is spiny dogfish. However, following the MSC FAM, the certification team considers skates and cusk to be vulnerable and thus takes these into consideration.

- 4X5Y OTB: Dogfish and skates
- 4X5Y LL: Dogfish, skates and cusk
- 5Zjm OTB: Skates
- 5Zjm LL: Skates & Cusk

Note however that the situation for skates is complex given the large number of skate species and the need to consider each one separately when reviewing the impact of discards.

Data on discarded species from the gillnet and hand line fisheries were not provided to the assessment team, but with annual landings at under 10 mt for both fisheries combined, their impact on other retained species populations is considered to be insignificant.

8.3.2 Assessment of Relevant Discarded Species

Spiny Dogfish 4X5Y 5Z1

See above

Skates

Skate discards are mainly found in the 4X5Y longline fishery and both the trawl and longline fisheries in 5Zjm, with discards of 4.4 %, 3.9 % and 4 % respectively of total catch volume. Skate by-catch has remained fairly consistent in the longline and 4X5Y trawl fisheries but has fallen from > 1,000 mt per annum in 2003 to less than 100 mt since the introduction of the separator panel in the 5Zjm trawl fishery.

The majority of the skates discarded by the longline fisheries (Table 14) are the barndoor skate (*Dipturus laevis*), with the trawl fisheries mainly discarding winter skate (*Leucoraja ocellata*) and the thorny skate (*Amblyraja radiata*).

¹ Source: Campana, S., J. Gibson, L. Marks, W. Joyce, R. Rulifson and Mike Dadswell. 2007.

Table 10: Otter Trawl Haddock Directed Fishery: Discards in 4X5Y by Main Species (mt) (2004 – 2008)

	2004	2005	2006	2007	2008	Av	% by catch	% tot. Catch
Dogfish	2,346	308	735	191	1,455	1,007	60.6%	6.4%
Skate	314	167	218	441	116	251	15.1%	1.6%
Lobster	275	128	152	252	141	190	11.4%	1.2%
Shark	1	5	11		449	117	7.0%	0.7%
Halibut (Atlantic)	57	25	25	78	23	42	2.5%	0.3%
Sculpin	32	18	28	6	3	17	1.0%	0.1%
Others	64	25	16	57	28	38	2.3%	0.2%
Total discards	3,089	676	1,185	1,025	2,215	1,661	100.0%	
Total catch	17,714	17,022	11,748	16,786	15,617	15,777		10.5%

Source: Team after GEAC submission

Table 11: Otter Trawl Haddock Directed Fishery: Discards in 5Z_{jm} by Main Species (mt) (2004 – 2008)

	2004	2005	2006	2007	2008	Av	% by catch	% tot. Catch
Skates	194	90	82	45	71	96	47.2%	0.8%
Dogfish	2	-	126	61	24	43	20.9%	0.4%
Lobster	20	16	30	11	9	17	8.3%	0.1%
Sharks	3	5	19	31	11	14	6.8%	0.1%
Sculpin	21	9	9	5	7	10	5.0%	0.1%
Haddock	1	2	-	1	37	8	4.0%	0.1%
Others	6	4	7	1	3	16	7.8%	0.1%
Total discards	247	126	273	155	162	204	100.0%	
Total catch	10,373	14,344	11,556	10,945	13,352	12,114		1.7%

Source: Team after GEAC submission

Table 12: Bottom Longline Haddock Directed Fishery: Discards in 4X5Y by Main Species (mt) (2004 – 2008)

	2004	2005	2006	2007	2008	Av	% by catch	% tot. Catch
Dogfish	142	719	964	268	36	426	55.2%	7.3%
Skate	297	198	193	233	224	229	29.7%	3.9%
Cusk	-	-	-	139	229	74	9.5%	1.3%
Halibut (Atlantic)	13	47	9	-	35	21	2.7%	0.4%
Haddock	1	2	-	18	12	7	0.9%	0.1%
Wolffish	-	12	-	15	-	5	0.7%	0.1%
Others	4	4	9	23	9	10	1.3%	0.2%
Total discards	315	263	211	428	509	771	100.0%	
Total catch	4,850	5,327	6,301	7,144	6,245	5,973		13.1%

Source: Team after GEAC submission

Table 13: Bottom Longline Haddock Directed Fishery: Discards in 5Z_{jm} by Main Species (mt) (2004 – 2008)

	2004	2005	2006	2007	2008	Av	% by catch	% tot. Catch
Skate	117	68	104	111	118	104	53.3%	3.6%
Dogfish	11	16	190	18	-	47	24.2%	1.6%
Shark	92	2	3	27	7	26	13.4%	0.9%
Cusk	8		-	15	4	7	3.5%	0.2%
Haddock	4	-	6	2	1	3	1.3%	0.1%
Wolffish	1	1	-	10	1	3	1.3%	0.1%
Halibut (Atlantic)	2	1	3	2	-	2	0.8%	0.1%
Others	12	2	2	3	1	4	2.1%	0.1%
Total discards	247	90	308	188	132	194	100.0%	
Total catch	3,032	2,883	2,731	2,736	3,116	2,876		0.6%

Source: Team after GEAC submission

Table 14: Total discards (2002 – 2008) of skate species and their proportion by species (from observations averaged over 2004 – 2008)

Species	Fishery			
	OTB 4X5Y	OTB 5Zjm	LL 4X5Y	LL 5Zjm
Total Catch (mt)	197	446*	274	114
Barndoor skate	7%	18%	41%	60%
Brier skate	0%	0%	0%	0%
Jensen's skate	0%	0%	0%	0%
Little skate	7%	5%	0%	1%
Round skate	1%	2%	0%	0%
Skates (ns)	14%	12%	23%	9%
Smooth skate	8%	6%	0%	1%
Soft skate	0%	0%	0%	0%
Spiny-tail skate	0%	0%	0%	0%
Thorny skate	22%	26%	20%	20%
White skate	0%	0%	0%	0%
Winter skate	40%	29%	15%	9%
	100%	100%	100%	100%

Note: Discards of skate from the 5Z trawl fishery have dropped to less than 100 mt since the mandatory introduction of the separator trawl.

Source: Kerri Graham, DFO, pers. comm., 18th September 2009

Trends in survey abundance and biomass indices for barndoor skate in shallow waters (< 200 fathoms) are well documented for Canada (Kulka 1999, Kulka *et al.* 2002). A decline in the survey indices occurred in the mid-1960s to early 1970s, likely caused by the high fishing effort of the distant water fleet on Georges Bank, followed by a period of low to zero catches. In 1985, consistent catches of barndoor skate began occurring and increases in survey indices were observed that have continued through thereafter (Dulvy, N.K. 2003).

Since 1994, discards of winter skate were estimated to have been generally less than 100 mt (Simon *et al.* 2003), although it should be recognized that this estimate is highly uncertain. This species underwent a COSEWIC assessment in 2005 which determined that populations within the combined 4X5Y and 5Ze area to be of “special concern”, although stable (COSEWIC, 2005).

Early in the 2000's, by-catch of thorny skate was high relative to other species but has since declined. The mandatory use of separator panels in otter trawls and reduced fishing for yellowtail flounder have reduced the capture of this species substantially. Thorny skate by-catch has continued to be consistent over several years. There is no gear modification or alternate bait strategy to reduce the harvest of skate by longline vessels. Survival of returned fish is thought to be less than 50 %.

Cusk

The only fishery that discards this species is the bottom longline fishery in 4X5Y. Observer-derived figures suggest that this is around 0.8 % of the total catch (i.e. 53 mt averaged over 2002 – 2008). It should be mentioned that this figure reflects a much higher observed by-catch over the last two years and may be an statistical artefact from the low (e.g. < 0.5 %) observer coverage of this fleet and in fact cusk by-catch is considerably lower than this, as

the previous years (2002 – 2006) show very little observed by-catch from this fishery.

The current stock status, management strategies and information on cusk (considered by COSEWIC to be threatened, DFO, 2008) are provided above.

Other Species

The discard of other species is very low in the fisheries under assessment. These include lobster (average 155 mt / year and 0.9 % of total catch in 4X5Y) and some sharks (in the 5Zjm bottom longline fishery where an average of 25 mt or 0.9 % of the total catch by this gear in this area is discarded). It is likely that this will include a proportion of the porbeagle shark which are registered by COSEWIC as “endangered” although are not included on the SARA list.

8.4 ETP Species

ETP (endangered, threatened or protected) species are those recognised by national legislation and / or binding international agreements. In this assessment we have considered those species classified as being extirpated, endangered, threatened, or a special concern under Schedule 1 of SARA. In addition, we have considered those under Appendix I (species threatened with extinction) and Appendix II (species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival) of CITES. Species that are designated at risk by COSEWIC but not on the SARA Schedule 1 are covered in Section 8.3.

8.4.1 Status

Table 15 summarises ETP species that are known to interact with the four fishing gears under assessment

Table 15: Summary of ETP Species with Known Interactions with the Fisheries under Assessment

Species	Listing		Potential gear interactions			
	SARA	CITES	Otter trawl	Long line	Gill net	Hand line
Northern wolffish (<i>Anarhichas denticulatus</i>)	✓		✓	✓		
Spotted wolffish (<i>Anarhichas minor</i>)	✓		✓	✓		
Atlantic salmon (<i>Salmo salar</i>)	✓					
North Atlantic right whale (<i>Eubalaena glacialis</i>)	✓	✓			✓	
Harbour porpoises (<i>Phocoena phocoena</i>)		✓			✓	
Leatherback turtle (<i>Dermochelys coriacea</i>)	✓	✓		✓	✓	

Source: Authors

Northern wolffish (*Anarhichas denticulatus*) can be found across the North Atlantic from Norway to southern Newfoundland. In Canada, it occurs primarily off northeast Newfoundland, largely outside the assessment areas. Scientific surveys from all parts of the western Atlantic range indicate declines in the abundance of Northern wolffish over the past 20 years. From 1978 to 1994, abundance in the primary range off northeast Newfoundland declined by 98 %. The number of locations where the species occurs has also declined.¹ It is currently listed as “endangered” under SARA.

¹ http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=667, 2009.

Spotted wolffish (*Anarhichas minor*) is found across the North Atlantic from Scotland to Cape Breton and in the Arctic Ocean. In the western North Atlantic, it occurs primarily off northeast Newfoundland, again largely to the north of the assessment areas. Since 1978, scientific surveys in the western Atlantic indicate a 96 % decline in the Canadian population of Spotted wolffish over 21 years (equivalent to three generations of wolffish). The species is also found in significantly fewer survey stations.¹ It is currently listed as “endangered” under SARA.

Atlantic salmon (*Salmo salar*) populations in the inner Bay of Fundy were designated as endangered in 2001. However it is not considered that the gears used in the fisheries under assessment are a threat to this species’ recovery.²

In Canadian waters, North Atlantic right whale (*Eubalaena glacialis*) congregate in the summer and fall in the lower Bay of Fundy, mainly east of Grand Manan Island, and in the vicinity of Roseway Basin between Browns and Baccaro banks on the western Scotian Shelf. They are also seen in small numbers in the summer and fall elsewhere on the Scotian Shelf. As of February 2003, a database maintained by the North Atlantic Right Whale Consortium contained records of 438 known individuals, of which 402 (92 %) had been seen in Canadian waters at least once. The population appears to have been declining over the past decade. It is currently estimated to contain 322 individuals; from 222 to 238 of these are thought to be mature.

Harbour porpoises (*Phocoena phocoena*) are an Appendix II species under CITES but only the Pacific Ocean population is regarded as endangered by SARA.

Leatherback turtle (*Dermochelys coriacea*) are often sighted on the east coast of Canada between June and October. It is currently listed as “endangered” under SARA.

8.4.2 Management Strategies by Gear

Otter Trawl Fisheries

There is no directed fishery for wolffish (*Anarhichas* spp.) but they are a small by-catch element of the 4X5Y fishery (c. 1.4 mt per annum averaged over 2002 – 2008) and the 5Zjm fishery (<1 mt). Since 2004, all *A. minor* and *A. denticulatus* taken incidentally in Canadian waters must be released in a manner that maximizes the chances of survival. Incremental losses of nesting and shelter habitat due to bottom trawling are potential threats to the recovery of these species, a family of fish that have limited dispersal and possible nesting requirements. For practical reasons, trawling operations avoid rocky areas since trawling in such areas leads to the destruction of expensive gear. This affords a level of protection for rocky habitats. Also, areas of greatest decline for wolffish do not correspond with locations of most intense trawling (Kulka *et al.* 2007).

The most intensely trawled areas along the shelf edge from the northern Labrador Shelf to the Grand Banks are where the three wolffish species continue to be most abundant. These species undertake limited movements (Templeman 1984) and there is a mismatch in area of greatest decline for wolffish and trawling activity. This evidence is contrary to the hypothesis that trawling is the only or perhaps the proximal cause for the decline in wolffish (Kulka *et al.* 2004) - although trawling certainly contributes to total mortality. This suggests significant

¹ http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=669, 2009.

² http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=672, 2009.

non-fishery influences coupled with fishery related mortality contribute to the distribution and abundance changes observed (Kulka *et al.* 2007).

In 2004, DFO undertook an Allowable Harm Assessment for wolffish (DFO, 2004b). In summary, the conclusions from that process were: “*Given that mortality due to fishing is considered the dominant source of human induced mortality for northern and spotted wolffish and that the populations of both species have been steady or increasing prior to any prohibitions, it appears that the recent (2000-2002) level of mortality does not impair the ability of the species to recover. However, all efforts should be taken to enhance survival in the fisheries, primarily through mandatory release of wolffish in a manner that will increase the chance of survival it is critical that the populations and sources of harm be monitored to ensure that recovery continues to take place*”.

Longline Fisheries

The longline fisheries in Areas 4X5Y and 5Zjm have discarded around 12 mt and 2.1 mt respectively of wolffishes on average over 2002 – 2008. Since 2004, all *A. minor* and *A. denticulatus* taken incidentally in Canadian waters must be released in a manner that maximizes chance of survival.

Although the actual capture of leatherback turtles is unusual as hooks are used close to the sea bottom, accidental entanglement in the line is a potential concern and has been detected in observer data (O’Boyle 2001; SARA, 2006).

Observer data seems to suggest that bottom-set longlines rarely catch seabirds. Observer data from DFO suggests that Northern Fulmar, Greater Shearwater and Great Black-Backed Gulls are greatest risk, although observed levels have been very low (< a maximum of 8 kg in 2005 and zero in most years). A study looking at observed demersal longline seabird bycatch in the Scotian Shelf and Bay of Fundy over 1986 – 2001 (DFO-CWS, 2003) recorded 75 birds caught from 15,765 sets (e.g. 0.005 birds per set, mostly of Northern Fulmars (71%).

Gillnet Fisheries

The attribution of entanglements of right whales to a particular geographical location or gear type is difficult to determine because the whales are highly mobile and the entangling gear retrieved is often unmarked. However, it has been shown that the types of fishing gear most often implicated in right whale entanglements are the vertical and horizontal lines used in FG fisheries (i.e. gillnets and pot gear) in Canadian and U.S waters (Johnson *et al.* 2005).

In Atlantic Canadian waters, researchers are using right whale sighting data and logbook data from the FG fisheries to determine where there is a seasonal overlap between the whales and fishing operations (Taggart *et al.* 2005). In the past, most fishing activity was thought to occur at a time of year when right whales were not present (WWF/DFO 2000). However, due to more comprehensive sighting data, examination of fishing gear retrieved from entangled right whales, and the emergence of new FG fisheries that are carried out in the summer and autumn, it is clear that there is a greater risk for right whale entanglement in Canadian waters than was previously thought.

A protocol has been established for releasing entangled whales from fishing gear and there are a number of first responders in Canadian waters. The Grand Manan Basin has been identified as a SARA critical habitat for right whales. This area has been recognized previously as an important area for right whale aggregation with the designation of the Bay of Fundy Right Whale Conservation Area.

Roseway Basin, on the south-western Scotian Shelf, is another important area of right whale

aggregation wherein right whales have been observed feeding and socializing. Like the Grand Manan Basin, this area has been designated as a conservation area for right whales since 1993. Other mitigation measures involve education and raising awareness with fishermen under the World Wildlife Fund's Right Whale Recovery Plan.

By-catches of harbour porpoises in the groundfish gillnets of the Bay of Fundy – Gulf of Maine have been addressed under an informal agreement with the USA to limit mortalities that have reduced catches to well below the agreed limit of 110 animals per year in the Grand Manan gillnet fishery (DFO, 2002).

O'Boyle (2001) identified the groundfish gillnet fishery in 5Zjm as having potential for interaction with sea turtles. Unfortunately, no observer information exists regarding interactions between the leatherback turtle and FG. However, valuable information is available through strandings.

The Recovery Strategy for Leatherback Turtles in Atlantic Canadian Waters (SARA, 2006) is the main mechanism for reducing interactions. Many recovery efforts to date have been initiated by the Nova Scotia Leatherback Turtle Working Group (NSLTWG); a collaborative marine turtle research and conservation initiative involving volunteer commercial fishers amongst others. Since 1997, NSLTWG and its many fisher representatives have worked with coastal community members in Nova Scotia to increase public awareness of marine turtle biology and conservation issues, and to study the biology of marine turtles in the North Atlantic. Sighting data collected by fisher-members of NSLTWG as well as data summarized in McAlpine *et al.* (2004) revealed that eastern Canadian waters are within the regular range of large numbers of leatherbacks. According to SARA (2006), NSLTWG fishers remain committed to effecting practical conservation for the leatherback at sea, particularly through their efforts to disentangle accidentally entrapped turtles. NSLTWG reported 87 records of stranded leatherbacks from 1995-2002 – turtles entangled in fixed fishing gear and turtles found floating dead in shelf waters off Atlantic Canada (SARA, 2006).

The IMPGF (2002 - 2007) also requires that observer reporting requirements for turtles were upgraded to ensure that actual impacts were better assessed. The "Allowable Harm Assessment" for leatherback turtles in 2004 concluded that assuming current levels of fishing effort within Canadian jurisdiction, *"that there was scope for human-induced mortality without jeopardizing survival or recovery of this species"* (DFO, 2004a). However, the same review committee goes on to urge that *"all feasible measures to minimize the impact of human activities on this species be undertaken"*.

Whilst seabird by-catch is an issue within the inshore gillnet fisheries of Newfoundland and Labrador (Benjamins *et al.* 2008), observer data seems to suggest that the greater depth in which the 4X5Y and 5Zjm gillnet fisheries operate seems to preclude incidental seabird capture.

Hand Line Fisheries

The hand line fisheries are not known to have any significant impact with ETP species.

8.4.3 Information and monitoring

Information on the nature and outcomes from interaction with ETP species are mainly based from observer programmes (Table 16). These record information on the capture and subsequent fate of both megafauna such as cetaceans, pinnipeds and sea turtles, as birds (identified to species level) and other flora, fauna and inanimate objects, inc. groups such as 'sponges', 'snails and slugs', 'jellyfish' and 'stones and rocks'.

Table 16: Summary of observer trips conducted by DFO (2004 – 2008)

Gear	Area	Year				
		2004	2005	2006	2007	2008
Mobile	4X5Y	40	15	18	19	13
	5Zjm	65	106	257	475	177
LL	4X5Y	19	10	5	6	11
	5Zjm	33	24	26	11	44
GN	4X5Y	4	5			
	5Zjm	1				1

Source: Kerri Graham, DFO, pers. comm., 18th September 2009

In addition, licensed fishers are required to collect and subsequently report information to DFO for each fishing trip where Schedule 1 SARA species (e.g. Northern wolffish, Spotted wolffish, Atlantic salmon and leatherback turtle) are caught. Fishers are required to provide details of the date, position, number and weight of species at risk caught, as well as their condition. These interactions are recorded in special SARA log sheets, which have to be completed and submitted, even if no species at risk are caught. This data is collected and then compiled by DFO's Commercial Data Division (Anne-Marie Leger, pers. comm., 7th April 2010).

8.5 Habitats

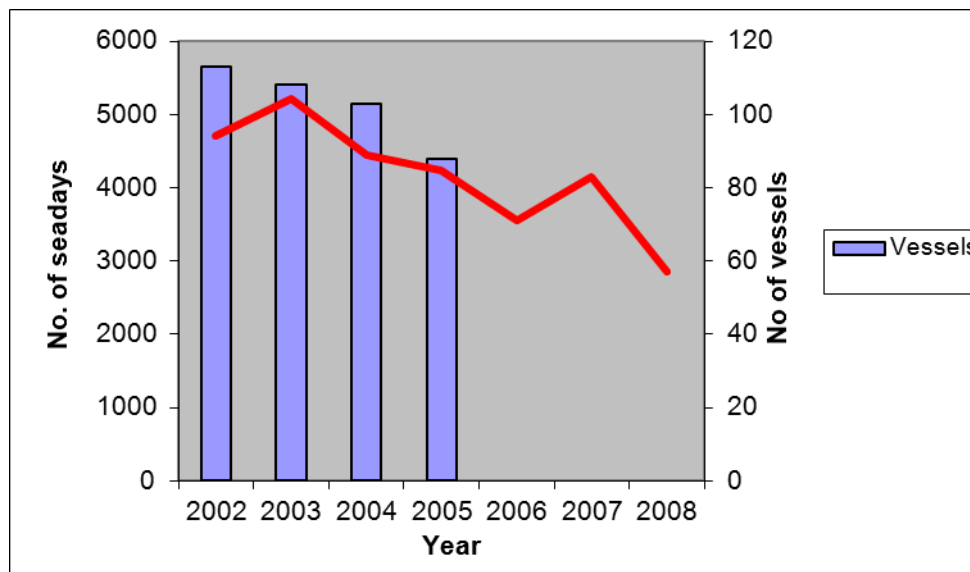
8.5.1 Status

Assessment Areas

Area 4X5Y

This sea area is a complex series of habitats including several important fishing banks. One of most highly productive areas is Browns Bank that appears as two flat plateau, with water depths ranging from < 50 m in the western area to almost 100 m in the east. The south-western edge of Browns Bank drops abruptly to the Northeast Channel (> 200 m), which is a major trough separating Browns Bank and Georges Bank and acts as the principal hydrodynamic connection between Scotian Slope water and the Gulf of Maine. Browns Bank is bounded to the north by a rough-floored bedrock channel with depths > 100 m. To the west of NAFO Divisions 4X5Y, there is German Bank which has a moraine, parallel ridges, and rough topography. German Bank supports a scallop broodstock area, herring spawning area, groundfish aggregations and a deepwater lobster spawning area. Further west is the Bay of Fundy; an intense high-energy tidal zone. To the east there are several important fishing Banks and basins. The Roseway, Baccaro and LaHave Banks are gravel and boulder strewn and have limited trawlable areas. It is apparent that fishing effort in terms of sea days and the number of vessels has declined steadily over the past decade (see figure 25).

Figure 25: MG 4X5Y Effort (Sea Days & Number of Vessels)



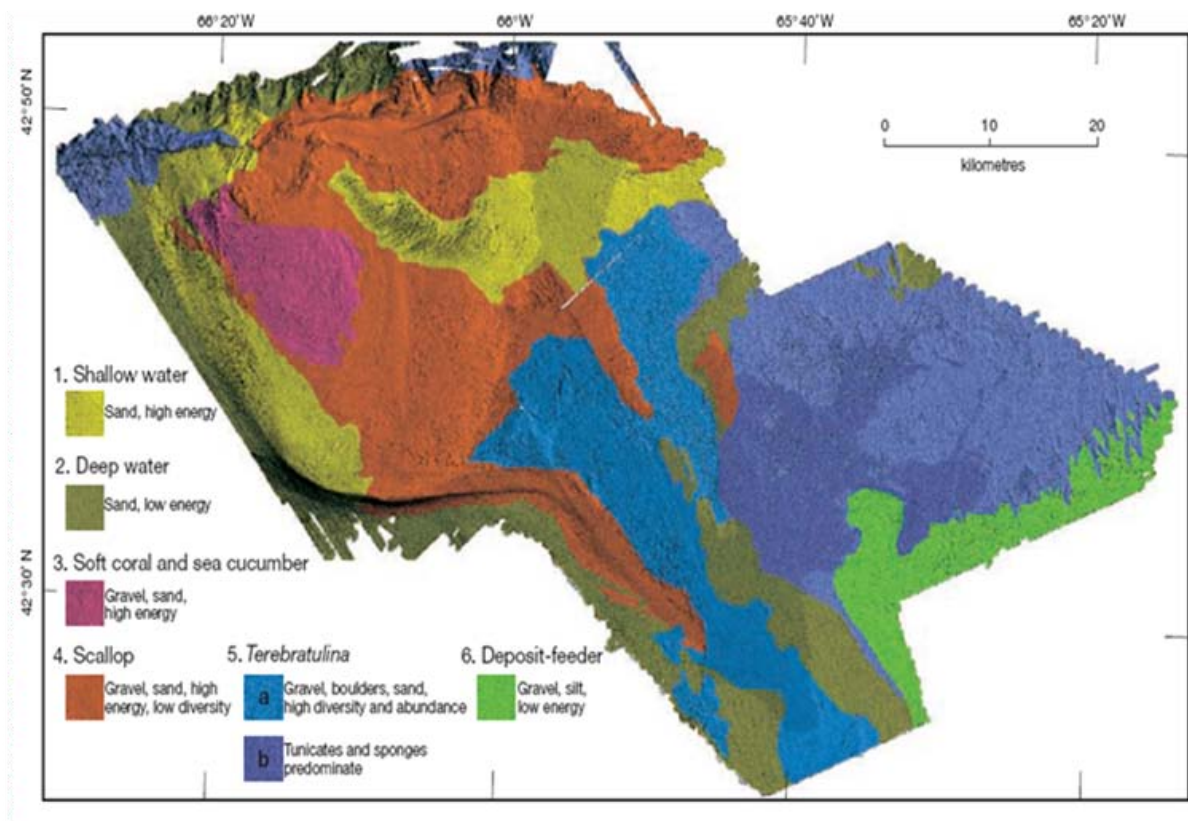
Source: DFO

Area 5Zjm

Georges Bank is a high-energy environment with strong tidal action and strong ocean swells that affect the benthic habitat. This area is considered more homogenous in terms of habitat variability when compared to 4X5Y. Three major types of surficial sediment have been identified on eastern Georges Bank. Mobile sand dominates the shallowest part of the bank, gravel dominates the northern edge and northeast peak and gravelly sand dominates the remainder of the bank. The sand comprises sheets and superimposed sand wave fields oriented perpendicular to the predominant semidiurnal tidal flow. Substantial areas of suitable substrate for haddock (i.e., sand, gravelly sand & gravel) are found on Georges Bank.

A study in 2001 developed a new approach for sea floor habitat mapping based on an integrated analysis of multi-beam bathymetric data, associated geo-scientific information and benthos data from Browns Bank on the south western Scotian Shelf (Figure 26). Based on sea floor sediment maps and statistical analysis of mega-benthos determined from photographs, six habitats and corresponding associations of benthos were derived and mapped. The habitats are distinguished primarily on the basis of sediment type and water depth. Additional factors are sea floor geomorphology, habitat complexity and relative current strength. A Browns Bank benthic habitat map was developed as a conceptual model summarizing the understanding of the bank ecology. This study highlights the utility of multi-beam bathymetric sonar for interpretation of sea floor sediments and for extrapolating benthic habitat characteristics across large areas of sea floor. Each of the habitats is distinguished on the basis of substrate, habitat complexity, relative current strength and water depth. The spatial allocation of samples, abundance and commonness of species are used as additional guidelines for identification of habitat zones.

Figure 26: Interpreted Habitat Map of Browns Bank



Note: Six colour-coded benthic habitats are defined, distinguished on the basis of substrate type, benthic assemblage, habitat complexity, relative current strength and depth. 2 subtypes of *Terebratulina* habitat are shown

Source: Kostylev *et al* 2001

Gear / Habitat Interactions

Mobile bottom-contact fishing gears such as otter trawls do have impacts on benthic populations, communities, and habitats. Collie *et al* (2000) determined that fauna in stable gravel, mud and biogenic habitats are more adversely affected than those in less consolidated coarse sediments. Also, while the recovery rate appears most rapid in less physically stable habitats, which are generally inhabited by more opportunistic species, areas that are fished in excess of three times per year are likely to be maintained in a permanently altered state. The effects are not uniform, but depend on at least: the specific features of the seafloor habitats, including the natural disturbance regime; the species present; the type of gear used and the methods and timing of its deployment together with the frequency with which a site is impacted by specific gears; and the history of human activities, especially past fishing, in the area of concern (DFO, 2006).

The area trawled by Canadian groundfish bottom trawl fishery on Georges Bank has been estimated using fishing log records and information obtained at-sea by observers. In 2001 and 2002, a rough estimate was the footgear disturbed less than 10 % of the bottom while the bridles and warp swept less than 30 %, whilst the doors impacted less than 1 % of the bottom (Gavaris & Black, 2004). Similar figures for Area 4X5Y have not been prepared, although the raw data (via VMS, logbook and observer sources) is available.

The terminal anchors of bottom-set longlines interact with the bottom habitat. Otherwise this gear has little or momentary contact with that bottom habitat and as such has little physical

impact during controlled fishing. Hooks and complete snoods (i.e. branch lines) may, however, be lost or deliberately discarded, especially when gear is damaged or tangled during fishing.

Each gillnet license is restricted to 40 nets with an overall length no greater than 50 fathoms. The net is made of polyethylene and mesh size is restricted to a minimum of 140mm. It is anchored to the bottom and marked by surface buoys. Haddock landings over 2008 from gillnets in 4X5Y and 5Zjm are less than 8 t and 34 t respectively. Given these very low levels of effort, the controlled use of static gears such as bottom-set gillnets is considered to have a minimal direct impact on the environment as the spatial footprint is limited and the pressure on bottom sediments low. Gillnets can, however, be lost both accidentally and deliberately (Macfadyen *et al.* 2009) and this may lead to the smothering, abrasion or “plucking” of organisms with mesh closing around them and the translocation of sea-bed features. Canadian Atlantic gillnet fisheries were estimated to suffer a 2 % loss rate (8,000 nets per year) up to 1992 (Chopin *et al.* 1995). However lost gillnets tend to roll up and become buried in sediment, especially in dynamic environments such as those found in the assessment areas. To avoid the risk of lost nets and gear conflict they cannot be left unattended by fishermen for more than 48 hours in 4X5Y and must be attended by fishermen at all times in 5Zjm. In both areas during the winter months gillnets must be tended at all times outside 12 miles from any land and anytime a licensed vessel leaves home zone mandatory tending of nets is required.

The low levels of effort involved, combined with the minimal impact on the benthic and pelagic environments, means that hand lines have negligible impacts on the marine habitats.

8.5.2 Management Strategies

Controlling Fishing Pressure on Sensitive Benthic Environments

In 2005, DFO conducted a study to assess the impacts of trawl gears and scallop dredges on benthic habitats, populations and communities (DFO, 2006b) which led to it outlining a policy for the “Managing the Impacts of Fishing on Sensitive Benthic Areas”¹. Implementation of this policy has been delayed by other priorities, such as reducing fishing mortality for target and by-catch species but is now beginning to become the focus of DFO attention (S. Garvaris, pers. comm., 24 July 2009).

It is planned to adopt the following process:

1. Assemble and map existing data and information that would help determine the extent and location of benthic habitat types, features, communities and species; including whether the benthic features (communities, species and habitat) situated in areas where fishing activities are occurring or being proposed are important from an ecological and biological perspective;
2. Assemble and map existing information and data on the fishing activity (see next section);
3. Based on all available information, and using the Ecological Risk Analysis Framework, assess the risk that the activity is likely to cause harm to the benthic habitat, communities and species, and particularly if such harm is likely to be serious or irreversible;
4. Determine whether management measures are needed and implement such management measures; and

¹ See <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/benthi-eng.htm>

5. Monitor and evaluate the effectiveness of the management measure and determine whether changes are required to the management measures following this evaluation.

Two pilot projects have been initiated – one on Georges Bank and the second in coastal areas of 4X5Y - ‘testing’ the Maritimes EAM Framework and the results will be used to fine-tune the approach for the wider roll-out of the strategy.

Marine Protected Areas Strategy

Canada’s ‘Federal Marine Protected Areas Strategy’ (DFO, 2005c) provides a basis under which general spatial management, closed areas, gear modifications and effort reductions could provide some mitigation of the effects of mobile bottom-contacting gears on benthic habitats, populations and communities .

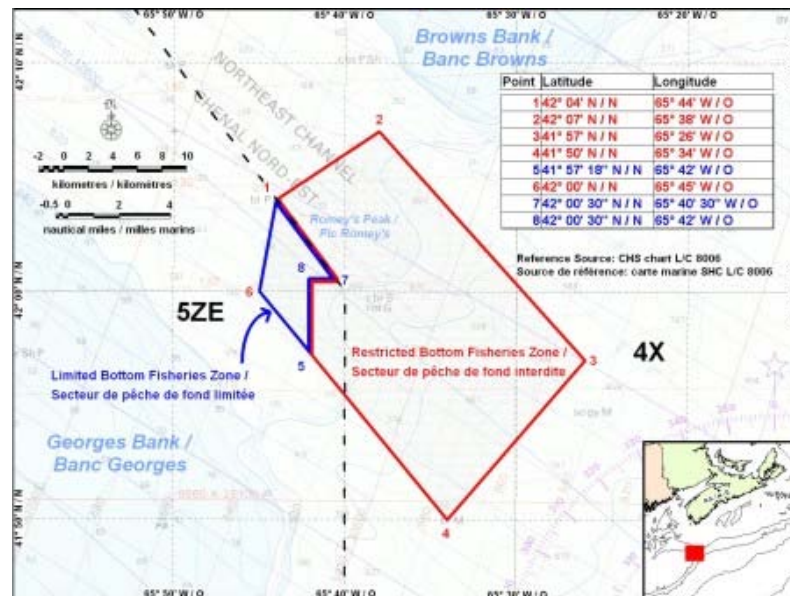
- Gully Marine Protected Area: a 2,364 km² area protecting the large canyon feature and associated habitats of the Gully near Sable Island (Figure 27 A).
- Northeast Channel Coral Conservation Area: a 424 km² area protecting deep water coral concentrations adjacent to Georges Bank (Figure 27 B).
- Lophelia Coral Conservation Area: a 15 km² area protecting the only known living *Lophelia pertusa* coral reef in Atlantic Canada (Figure 27 C).
- Right Whale Conservation Areas in Roseway Basin and Grand Manan Basin: two important areas for the endangered right whales subject to voluntary avoidance and traffic control measures for navigation (Figure 27 D).

Figure 27: Location of key MPAs relevant to the assessment area

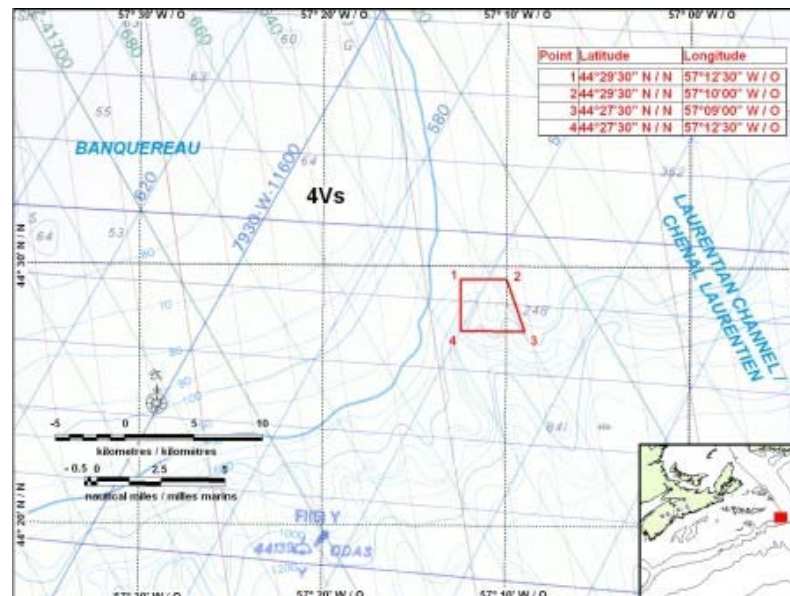
A. The Gully



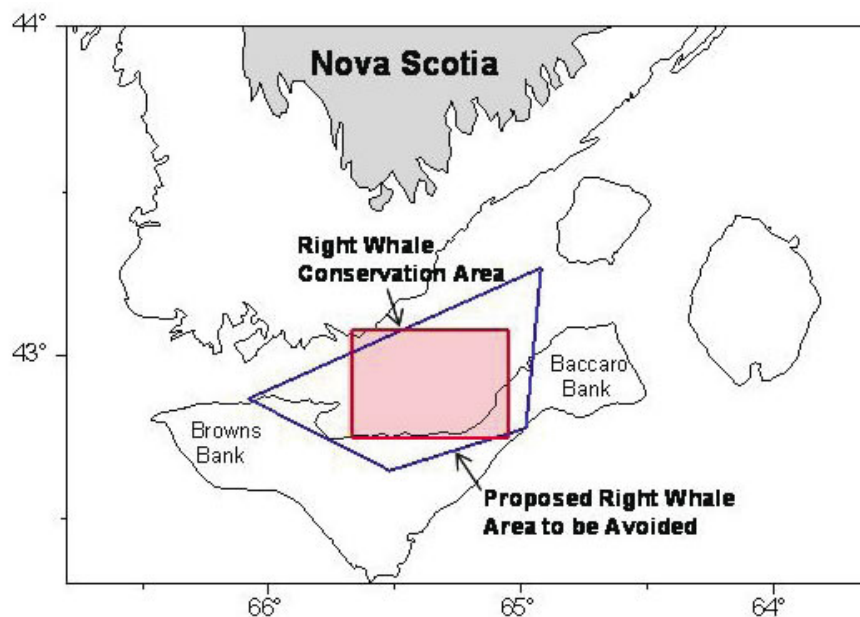
B. Northeast Channel Coral Conservation Area



C. Lophelia Coral Conservation Area



D. Right Whale
Conservation
Areas in Roseway
Basin and Grand
Manan Basin



8.5.3 Information & Monitoring

Fishing Pressure

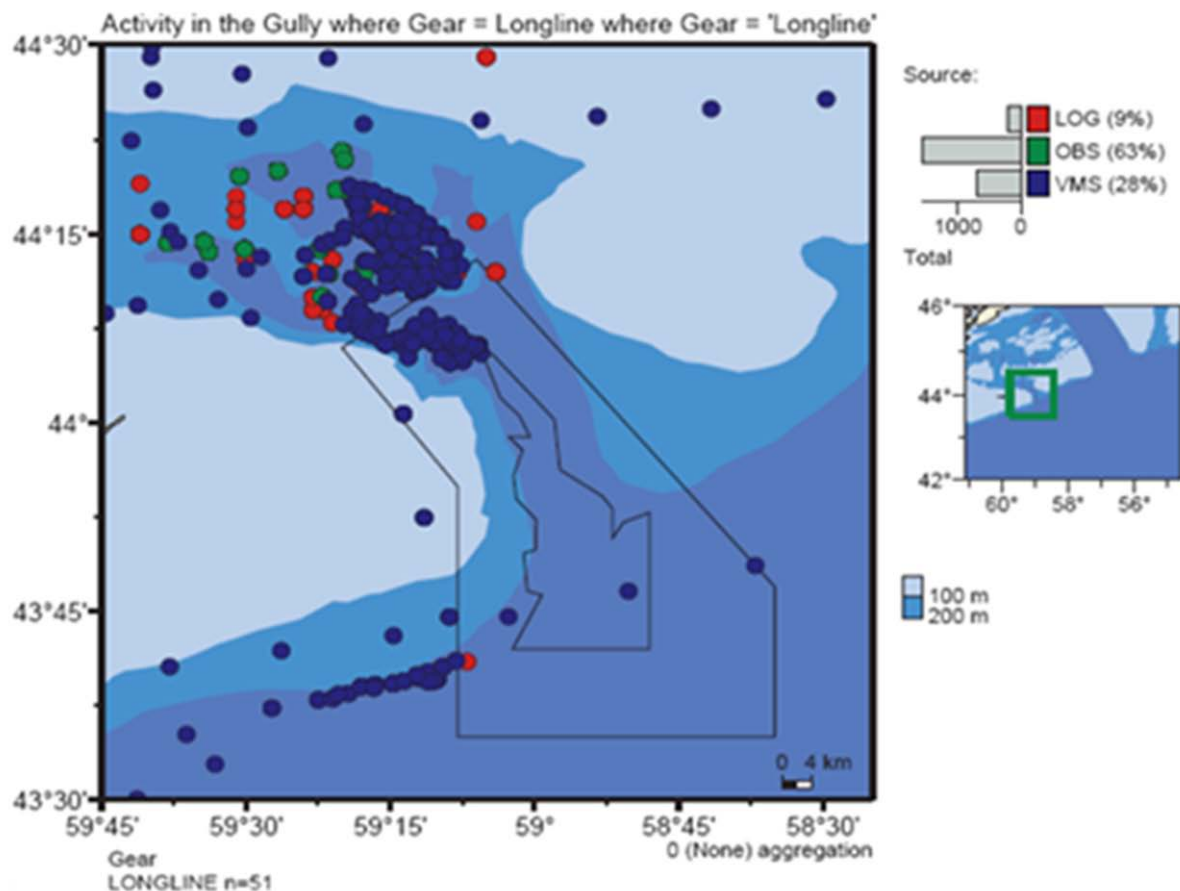
DFO's Oceans and Coastal Management Division (OCMD) and Population Ecology Division (PED) are undertaking a joint programme to build and maintain a "recognized fishing picture" computer application for several marine conservation areas on the Scotian Shelf. This 'Virtual Data Center' (VDC) is a compliance and monitoring tool to track illegal fishing (vessels) in relation to the closed Northeast Channel Coral Conservation Zone, among other conservation areas in Maritimes Region. The VDC could be used to track fishing pressure in the haddock fishery on broader scales.

The rationale and impetus for this program is based on the on-going need to demonstrate and apply capabilities for monitoring human activity in special management and conservation areas, using all available information sources and tools. The program builds and maintains near real-time information on fishing activity by combining data from four DFO information systems:

- Maritime Fisheries Information System (MARFIS): the primary source of commercial fishing data obtained through logbooks, vessel hails and other reporting systems;
- VMS: vessel positions from onboard black boxes;
- Canadian Fisheries Information Network (CFIN): DFO's offshore fisheries surveillance information system (e.g., aerial surveillance information); and
- At-Sea Observer System: data provided through DFO's on-board fisheries observer programme.

Using the mapping, statistical and query functions available through the VDC, analysts can select, view and analyze information on fishing activity according to a range of parameters, such as gear type, vessel name, information source (i.e. VMS, logbook etc.) and catch composition. An email-based push reporting application enables analysts to receive tailored activity reports through the DFO email system according to a pre-set schedule (e.g. daily or weekly). Figure 28 shows a typical view of longline fishing activity over a 60-day period in the Gully Marine Protected Area, sorted by information source (logbook, at-sea observer and VMS).

Figure 28: Mapping of Longline Fishing Activity in the Gully MPA



Source: DFO Information Leaflet

8.6 Ecosystem Impacts

8.6.1 Status

Many features of the Scotian Shelf ecosystem have changed over the past 30 years, including:

1. A major cooling of bottom waters occurred in the mid-1980's;
2. The index of zooplankton abundance was low in the 1990's when phytoplankton levels were high and the opposite pattern during the 1960s / early 1970's;
3. Major structural changes in the fish community; a number of groundfish species have declined while small pelagic species and commercially exploited invertebrate species have increased;
4. Reductions in the average body size of groundfish, with impacts on condition and growth; and
5. Steadily increasing abundance of grey seals up to around 300,000, triple that in the early 1990s.

Ecopath mass-balance models of the ecosystem before and after the collapse have been developed to explore how the structure, function and key species of the ecosystem had changed (Bundy, 2005). A comparison of the two Ecopath models indicated that although total productivity and total biomass of the ecosystem remained similar, there were changes in

predator structure, trophic structure and energy flow, many of which were robust to uncertainty. Biomass has significantly increased at trophic levels 3 (forage fish species) and 4 (grey seals, large silver hake) and the composition of these trophic levels has changed as a result of the mean increase in trophic level of many species-groups. Piscivory has increased, presumably because of the high abundance of small pelagic fish, and the ratio of pelagic feeders to demersal feeders has increased from 0.3 to 3.0. Thus, the ecosystem has changed from a demersal-feeder-dominated system to a pelagic feeder-dominated system. Although uncertainty remains concerning some model estimates, the ecosystem has been profoundly altered. However, overall system properties were generally considered to have been conserved.

The current recovery of the haddock stock indicates that the ecosystem may be able to move back towards its original state, although the continued slow pace of cod stock rebuilding remains a major concern.

8.6.2 Management

As described by DFO (2008), in 2007, a working group of the Maritimes Region initiated development of a consistent approach to ecosystem-based management across its operational sectors. In June, 2008 a draft framework for implementing an integrated Ecosystem Approach to Management (EAM) was presented. *“The framework was based on work begun by Science and Fisheries Management in adopting an ecosystem approach to fisheries management, but began to consider the cumulative impacts of other activities, as well as the governance and socio-economic objectives being pursued through DFO’s Integrated Management program. The framework is built on the concept of developing objectives and strategies to address the impacts of various activities on important ecosystem attributes that are implemented through various management plans”.*

DFO’s “Sustainable Fisheries Framework” forms the basis for decision-making in Canadian fisheries. It incorporates existing policies for fisheries management conservation and sustainable use, governance and economics with new and evolving policies using a phased-in approach. It also includes tools to monitor and assess results of conservation and sustainable use in order to identify areas that may need improvement. The Framework comprises four main elements: (i) conservation and sustainable use policies; (ii) economic policies; (iii) governance policies and principles; and (iv) planning and monitoring tools. The first of these is aimed at incorporating precautionary and ecosystem approaches into fisheries management and includes three particular approaches:

1. A Fishery Decision-Making Framework incorporating the Precautionary Approach;
2. Managing Impacts of Fishing on habitat, communities and species; and
3. Policy on New Fisheries for Forage Species.

The main mechanism through which the ecosystem approach is being implemented is the ESSIM Initiative. This collaborative ocean management and planning process is being led and facilitated by DFO under Canada's Oceans Act. Its primary aim is to develop and implement an Integrated Ocean Management Plan for this large marine region that will provide long-term direction and a common basis for integrated, ecosystem-based and adaptive ocean management.

8.6.3 Information

The marine ecosystem dynamics of the Scotian Shelf and Bay of Fundy area have been well studied, particularly in respect to understanding groundfish population dynamics (Peer, 1970, Mills *et al.* 1984; Wildish *et al.* 1989; Wildish *et al.* 1992; Desrosiers *et al.* 2000 and Breeze *et al.* 2002). While the vertebrate components of the ecosystem are well known, knowledge on the diversity of species at lower trophic levels is increasingly sparse. However, information is generally adequate to broadly understand the key elements of the ecosystem.

The main impacts of the different gears under assessment can be inferred from existing information, which are well understood for target and incidental catch fish removals (through individual stock assessments, especially for key groundfish species), trawl effects (DFO, 2006b) and any structural changes to key commercial fish populations. However some issues, such as the extent and impact of ghost fishing and the impact of fish removals on the trophic structure of the Bay of Fundy and Scotian shelf, have not been investigated in detail.

Sufficient information is available on the impacts of the fishery on the target and incidental retained by-catch, discards, ETP species and habitats to allow the main consequences of the 8 fisheries subject of this assessment on the ecosystem to be inferred. Information is sufficient to support the development of strategies to manage ecosystem impacts. These were present in the Groundfish Management Plan (2002 – 2007) and are expected to be considerable advanced in the now overdue successor plan.

9 OTHER FISHERIES RELEVANT TO THESE ASSESSMENTS

This main assessment has the objective of gaining certification for all Canadian groundfish fishing vessels active in 4X5Y and 5Zjm. Some haddock is taken in other Canadian fisheries (for example as a by catch in the scallop fishery). .

In a mixed fishery effort on haddock is strongly correlated to the effort on other ground fish species, especially cod. If the cod quota was to increase, some increased catch of haddock by the FG sector might be expected. In 5Zjm, Canada shares fishing opportunities with the U.S. The basis of joint fisheries management in that fishing area is covered above.

10 STANDARD USED

The MSC Principles and Criteria for Sustainable Fisheries form the standard against which the fishery is assessed and are organised in terms of three principles. Principle 1 addresses the need to maintain the target stock at a sustainable level; Principle 2 addresses the need to maintain the ecosystem in which the target stock exists, and Principle 3 addresses the need for an effective fishery management system to fulfil Principles 1 and 2 and ensure compliance with national and international regulations. The Principles and their supporting Criteria are presented below.

Consideration of each principle is with reference to a number of PIs which are scored according to the approach established by MSC in the Default Assessment Tree. A brief introduction to the PIs is provided below.

Principle 1: A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

The intent of this principle is to ensure that the productive capacities of resources are maintained at high levels and are not sacrificed in favour of short term interests. Thus, exploited populations would be maintained at high levels of abundance designed to retain their productivity, provide margins of safety for error and uncertainty, and restore and retain their capacities for yields over the long term.

Criteria:

1. The fishery shall be conducted at catch levels that continually maintain the high productivity of the target population(s) and associated ecological community relative to its potential productivity.
2. Where the exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level consistent with the precautionary approach and the ability of the populations to produce long-term potential yields within a specified time frame.
3. Fishing is conducted in a manner that does not alter the age or genetic structure or sex composition to a degree that impairs reproductive capacity.

Principle 1 PIs focuses on two key aspects of a fishery's performance -the current status of the target stock resource and a precautionary and effective harvest strategy. There is consideration of the tools, measures or strategies that are being used specifically to manage the impact of the fishery on the target species.

There are two primary PIs and one supplementary PI covering the current status of the target stock resource. These express the concept that (i) sustainability of target stocks comes from management behaviour that increases the probability that exploited biomass fluctuates around the B_{MSY} target¹ and (ii) decreases the probability that it will drop significantly towards the point where recruitment becomes impaired.

Four PIs assess the performance of the harvest strategy (HS). In addition to a PI that considers the overall performance of the HS, three further ones consider key elements of harvest strategies: the control rules and tools in place, the information base and monitoring

¹ Or a higher target if this is warranted from a consideration of the trophic inter-dependencies of the target species.

and the assessment method.

Principle 2: Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

The intent of this principle is to encourage the management of fisheries from an ecosystem perspective under a system designed to assess and restrain the impacts of the fishery on the ecosystem.

Criteria:

1. The fishery is conducted in a way that maintains natural functional relationships among species and should not lead to trophic cascades or ecosystem state changes.
2. The fishery is conducted in a manner that does not threaten biological diversity at the genetic, species or population levels and avoids or minimises mortality of, or injuries to endangered, threatened or protected species.
3. Where exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level within specified time frames, consistent with the precautionary approach and considering the ability of the population to produce long-term potential yields.

Principle 2 is divided into five Components that cover the range of potential ecosystem elements that may be impacted by a fishery: retained by-catch; discarded by-catch; ETP species; habitats and; ecosystem i.e. broader ecosystem elements such as trophic structure and function, community composition and biodiversity.

Consideration of the impact of the fishery on all Principle 2 components may include unobserved mortality where these are appreciable e.g. illegal fishing, unregulated catches and ghost fishing.

Each of the five components comprises three PIs:

- An ‘Outcome’ PI considers the status of the impact or the risk that the fishery poses to that Component;
- A ‘Management Strategy’ PI considers the basis, reliability and implementation of the management strategy for the Component; and
- An “Information” PI considers the nature, extent, quality and reliability of the monitoring and information that is relevant to developing and implementing the management strategy and measuring the outcomes of the strategy.

Principle 3: The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

The intent of this principle is to ensure that there is an institutional and operational framework for implementing Principles 1 and 2, appropriate to the size and scale of the fishery.

A. Management System Criteria:

1. The fishery shall not be conducted under a controversial unilateral exemption to an international agreement.

The management system shall:

2. Demonstrate clear long-term objectives consistent with MSC Principles and Criteria and contain a consultative process that is transparent and involves all interested and affected parties so as to consider all relevant information, including local knowledge. The impact of fishery management decisions on all those who depend on the fishery for their livelihoods, including, but not confined to subsistence, artisanal, and fishing-dependent communities shall be addressed as part of this process.
3. Be appropriate to the cultural context, scale and intensity of the fishery – reflecting specific objectives, incorporating operational criteria, containing procedures for implementation and a process for monitoring and evaluating performance and acting on findings.
4. Observe the legal and customary rights and long term interests of people dependent on fishing for food and livelihood, in a manner consistent with ecological sustainability.
5. Incorporates an appropriate mechanism for the resolution of disputes arising within the system¹.
6. Provide economic and social incentives that contribute to sustainable fishing and shall not operate with subsidies that contribute to unsustainable fishing.
7. Act in a timely and adaptive fashion on the basis of the best available information using a precautionary approach particularly when dealing with scientific uncertainty.
8. Incorporate a research plan – appropriate to the scale and intensity of the fishery – that addresses the information needs of management and provides for the dissemination of research results to all interested parties in a timely fashion.
9. Require that assessments of the biological status of the resource and impacts of the fishery have been and are periodically conducted.
10. Specify measures and strategies that demonstrably control the degree of exploitation of the resource, including, but not limited to:
 - a) setting catch levels that will maintain the target population and ecological community's high productivity relative to its potential productivity, and account for the non-target species (or size, age, sex) captured and landed in association with, or as a consequence of, fishing for target species;
 - b) identifying appropriate fishing methods that minimise adverse impacts on habitat, especially in critical or sensitive zones such as spawning and nursery areas;
 - c) providing for the recovery and rebuilding of depleted fish populations to specified levels within specified time frames;
 - d) mechanisms in place to limit or close fisheries when designated catch limits are reached;
 - e) establishing no-take zones where appropriate.
11. Contains appropriate procedures for effective compliance, monitoring, control, surveillance and enforcement which ensure that established limits to exploitation are not exceeded and specifies corrective actions to be taken in the event that they are.

B. Operational Criteria

Fishing operation shall:

¹ Outstanding disputes of substantial magnitude involving a significant number of interests will normally disqualify a fishery from certification.

1. Make use of fishing gear and practices designed to avoid the capture of non-target species (and non-target size, age, and/or sex of the target species); minimise mortality of this catch where it cannot be avoided, and reduce discards of what cannot be released alive.
2. Implement appropriate fishing methods designed to minimise adverse impacts on habitat, especially in critical or sensitive zones such as spawning and nursery areas.
3. Not use destructive fishing practices such as fishing with poisons or explosives;
4. Minimise operational waste such as lost fishing gear, oil spills, on-board spoilage of catch etc.
5. Be conducted in compliance with the fishery management system and all legal and administrative requirements.
6. Assist and co-operate with management authorities in the collection of catch, discard, and other information of importance to effective management of the resources and the fishery.

The intent of Principle 3 is to ensure that there is an institutional and operational framework, appropriate to the size and scale of the fishery, for implementing Principles 1 and 2.

There are two Components:

- “Governance and Policy” considers:
 - the legal and/or customary framework that overarches the fishery, and possibly other fisheries under the same management framework; and
 - the consultation processes and policies, as well as the articulation of the roles and responsibilities of people and organizations within the overarching management system and other overarching policies supporting fisheries management.
- “Fishery Specific Management System” focuses on the management system directly applied to the fishery undergoing assessment. Performance indicators under this Component consider:
 - the fishery-specific management objectives;
 - the decision-making processes in the relevant fishery;
 - the fishery’s compliance and enforcement system and implementation; and
 - research planning and monitoring and evaluation of the performance of the fishery management system.

11 BACKGROUND TO THE EVALUATION

11.1 Evaluation Team

Lead Assessor – Paul Knapman

Paul is responsible for Moody Marine operations in North America. He has extensive experience of the fishing industry in North America and Europe. He was previously Head of an inshore fisheries management organisation, a senior policy advisor to the UK government on fisheries and environmental issues, a fisheries officer and a fisheries consultant working in Europe and Canada.

Project Coordinator & Expert Adviser P3 - Ian Scott

Ian is a fisheries economist specialising in fisheries certifications, fisheries policy and fishery management issues with over 20 years' experience in the fishery sector. He has advised on the development of fisheries policy and fisheries management in a number of countries: Ecuador, Turkey, Montenegro and Serbia. Ian is currently coordinator and P3 specialist on the assessments of the Portuguese Sardine fishery and the Canadian Sablefish fishery. He has undertaken a large number of MSC pre-assessments for Moody Marine and is an auditor of the MSC chain of custody.

Expert Advisor P1 – Sean Cox

Sean holds a Doctorate in Resource Management and Environmental Studies. He is Associate Professor of Fisheries Science in the School of Resource and Environmental Management at Simon Fraser University. Sean's current research themes are (i) design and evaluation of management procedures for commercial groundfish, herring, and salmon fisheries, (ii) design, evaluation, and application of visual survey methods for assessment of Pacific salmon, rockfish, and marine invertebrates, and (iii) management implications of spatial structure in fish populations and fisheries. He has undertaken significant work in the field of design and evaluation of stock assessment and management procedures for commercial fisheries. His collaborative work on the B.C. sablefish fishery involved stakeholders, DFO groundfish managers, DFO scientists and academics in the collaborative development of precautionary fishery management policies that meet conservation and economic objectives. He provides fisheries advice to Wild Canadian Sablefish, Ltd, Skeena Wild Conservation Trust, Pacific Halibut Management Association, Fisheries and Oceans Canada, and the BC Ministry of Water, Land, and Air Protection

Expert Advisor P2 – Tim Huntington

Tim is an experienced fisheries assessor, having led on six main assessments and participated in a number of others in Europe and elsewhere. This experience includes three trawl fisheries in the North Sea, including one targeting haddock. He has also conducted a number of pre-assessments and chain of custody audits and also developed the MSC group chain of custody on behalf of MSC's Technical Advisory Board. Tim's works outside of MSC includes sustainability issues in fisheries and aquaculture for a wide range of clients including the EC (DG Mare and DG Env), World Bank, FAO, WorldFish Centre, GEF and Danida, as well as ENGOs such as WWF, RSPB and the UK Wildlife Trusts. Tim has a Masters degree in Applied Fish Biology and is a Director of Poseidon Aquatic Resource Management in the UK.

11.2 Previous Certification Evaluations

The fishery has not been previously assessed against the MSC standard.

11.3 Inspections of the Fishery

Inspection of the fishery focused on the practicalities of fishing operations, the mechanisms and effectiveness of management agencies, environmental issues and the scientific assessment of the fisheries.

Various meetings were held as follows (Table 17). Areas discussed have been identified for each meeting.

Table 17: Site Visit: Persons Met

25.07.13	Belliveau, Raymond	Vessel Manager
24.07.11	Butler, Mark	Policy Director, Ecology Action Center
22.07.09 & 21.07.09	Chapman, Bruce	Exec. Dir. GEAC
23.07.09	Cunningham, Adlai	Fish Processor
23.07.09	Dendrick, Gary	<45' Longline sector
25.07.09	D'Entrement Aaron	Processing plant manager
25.07.09	D'Entrement, Alain	Fish vessel manager (trawler)
25.07.09	D'Entrement, Claude	Fish vessel manager (trawler)
25.07.09	D'Entrement, Gilles	Trawler skipper
25.07.09	D'Entrement, Martin	Trawler skipper
24.07.09	Gavaris Stratis	DFO, St. Andrews Biological Station, Research Scientist
22.07.09	Graham, Kerri	DFO Senior Policy Adviser, Policy & Economics
22.07.09	Hansen, Jorgen	DFO Senior Adviser, Resource Management
22.07.09	Hurley, Peter	Bedford Institute of Oceanography, Research Scientist
24.07.09	Johnson, Rob	Atlantic Canada, Sea Choice Coordinator, Ecology Action Centre
22.07.09	Leslie, Stefan	DFO Director Resource Management
22.07.09	Macleane, Melanie	DFO Ocean Man. Biol., Oceans Habitat, SARA Branch
24.07.09	McPhie, Romney	Ecology Action Centre
23.07.09	Rennehan, George	45' – 65' Fixed Gear
22.07.09	Van Eeckhaute, Lou	St Andrews Biological Station, Assessment Biologist
22.07.09	Wood, Bryan	DFO Staff Officer Enforcement

12 STAKEHOLDER CONSULTATION

12.1 Stakeholder Consultation

A total of 14 potential stakeholders were identified and consulted specifically by Moody Marine. Information was also made publicly available at the following stages of the assessment (table 18):

Table 18: Stakeholder Consultation

Date	Purpose	Media
22 May, 2009	Announcement of assessment	Direct E-mail/letter Notification on MSC website Advertisement in press
26 May, 2009	Notification of Assessment Team nominees	Direct E-mail Notification on MSC website
2 June, 2009	Notification of intent to use MSC FAM Standard Assessment Tree	Direct E-mail Notification on MSC website
19 June, 2009	Notification of assessment visit and call for meeting requests	Direct E-mail Notification on MSC website
20 – 28 July, 2009	Assessment visit	Meetings
13 October, 2009	Notification of Proposed Peer Reviewers	Direct E-mail Notification on MSC website
	Notification of Public Draft Report	Direct E-mail Notification on MSC website
	Notification of Final Report	Direct E-mail Notification on MSC website

12.2 Stakeholder Issues

Prior to the site visit stakeholders did not identify any specific issues in relation to the certification of the Canada Scotia Fundy haddock fishery.

There was no feedback on the default assessment tree.

By letter dated July 24, 2009 addressed to Moody International Certification, the Ecology Action Centre presented its views on the potential for certification of the Canada Scotia Fundy haddock fishery. A synopsis of the points made is given below.¹

- The nature of by catch and habitat effects are areas of most critical concern in this fishery.
- In 2006 the biomass indices for haddock in the Scotian shelf and in the Bay of Fundy showed the lowest levels recorded in recent times.
- All three of the separate haddock stocks currently managed in Canada have been significantly overfished and can be considered to be recovering from overfishing;
- Exploitation in the Bay of Fundy might be too high and be hindering rebuilding of the haddock population.
- Although the southern Scotian shelf and the Bay of Fundy are managed as a single stock, they are thought to be separate stocks.

¹ EAC cites a number of references in support of their analysis and arguments that have not be reproduced here

- Haddock has experienced marked reductions in growth rate, size-at-age is at a historical low, and productivity has been impaired in some regions.
- DFO has stated (in 2005) that haddock exploitation in the Bay of Fundy may be too high, and might be hindering stock recovery and rebuilding of the size/age structure of the population in this area.
- Strong concern is expressed with regard to by-catch species considered at risk by COSEWIC including porbeagle shark, shortfin mako shark, cusk, cod, winter skate, blue shark and Atlantic wolffish.
- The by catch of cod in the haddock fishery is of particular concern, while the achievement of rebuilding objectives for cod and pollock may constrain the harvesting of haddock and an imbalance in quotas between haddock and cod creates potential for discarding and requires improved monitoring.
- Mandatory gear modifications for the 2007 Georges Bank trawl fishery resulted in relatively low by-catch rates however it is unclear whether these low numbers were the result of gear modification or low availability of non target species in this area.
- Bottom trawling impacts habitat through physically altering the habitat (damaging biotic, e.g. coral and abiotic structures e.g. boulders) and overall cause a loss of habitat complexity, and cause the re-suspension of bottom sediments which might damage fish gills and smother spawning areas. Some locations suffer from repeated trawling, which inhibits recovery, and overall it is likely that repetitive trawling causes substantial and likely adverse impacts to seabed ecosystems along the east coast of Canada and the U.S. Extensive commercial overexploitation may have contributed to the observed shifts in fish community structure and composition.
- Trawling for groundfish (including haddock) has significantly altered or damaged a large proportion of the seabed and the ecosystem. The effects of these fishing practices on habitats and ecosystems are therefore considered a high conservation concern.
- Intense fishing pressure in the past 50 years has resulted in a marked shift from a marine community dominated largely by benthic fishes to one dominated largely by smaller pelagic forage fish. Recent evidence suggests that the collapse of cod and other commercially exploited groundfish, including haddock, triggered this change and the new ecosystem state may be impairing the recovery of cod. One contributing factor to this is the increased predation on groundfish larvae by small pelagic species such as mackerel and herring. Continued harvest of cod, including cod caught incidentally, will slow the recovery of this stock and thus contribute to persistence of this altered ecosystem.
- Harvesters need to invest more time in trying to target specifically for haddock at specific times and in specific areas so as to minimize by-catch.
- Management measures that are in place are ineffective for preventing damage to habitat. EAC strongly recommends the inclusion of habitat protection into fisheries management policy, where it is currently and inadequately absent.
- EAC strongly advocates for the implementation of an Ecosystem Approach that applies the precautionary principle and resilience thinking to the management of natural marine resources and social- ecological systems. EAC asserts that it is at least as important to manage systems to enhance their resilience, as it is to manage for the optimization of specific species stocks.

13 OBSERVATIONS AND SCORING

13.1 Introduction to Scoring Methodology

The MSC Principles and Criteria set out the requirements of certified fishery. These Principles and Criteria have been developed into a standard (Fishery Assessment Methodology) assessment tree - Performance Indicators and Scoring Guideposts - by the MSC, which is used in this assessment.

The Performance Indicators (PIs) have been released on the MSC website. In order to make the assessment process as clear and transparent as possible, each PI has three associated Scoring Guideposts (SGs) which identify the level of performance necessary to achieve 100, 80 (a pass score), and 60 scores for each Performance Indicator; 100 represents a theoretically ideal level of performance and 60 a measurable shortfall.

For each Performance Indicators, the performance of the fishery is assessed as a 'score'. In order for the fishery to achieve certification, an overall weighted average score of 80 is necessary for each of the three Principles and no Indicator should score less than 60. As it is not considered possible to allocate precise scores, a scoring interval of five is used in evaluations. As this represents a relatively crude level of scoring, average scores for each Principle are rounded to the nearest whole number.

Weights and scores for the Fishery are presented in the scoring table (Appendix 1).

14 LIMIT OF IDENTIFICATION OF LANDINGS FROM THE FISHERY

14.1 Traceability

As detailed above, catches are recorded by the skipper and entered into vessel logbooks.

Vessels may be subject to at-sea inspections by the Coastguard and there is a degree of observer coverage. There is 100 % dockside monitoring for landings. Buyers are required to report purchases to the DFO.

Haddock is processed at on-shore facilities in Nova Scotia. It is considered that the risk of informal landings (i.e. by licensed or non-licensed vessels at unofficial landing places) is extremely low.

Following landing, haddock is purchased by a number of buyers.

14.2 Eligibility to enter Chain of Custody

Chain of Custody should commence following first hand sale of product landed by an eligible vessel.

14.3 Target Eligibility Date

The target eligibility date for product from the fishery (as and when certified) to bear the MSC label is the date of certification.

15 ASSESSMENT RESULTS

15.1 4X5Y Otter Trawl

The performance of the Otter Trawl Fishery in 4X5Y in relation to MSC Principles 1, 2 and 3 is shown in Table 19 and summarised below:

Principle 1 - Target species	83.8
Principle 2 - Ecosystem	81.0
Principle 3 – Management	87.9

This fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any PI.

It is therefore recommended that the CANADA SCOTIA – FUNDY HADDOCK (Melanogrammus aeglefinus) FISHERY IN 4X5Y USING OTTER TRAWL be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

This fishery attained a score below 80 against eight of the PIs. This has led to conditions to certification being raised (see section 15.9 below). Once these conditions have been satisfied these PIs will be re-scored.

Table 19: 4X5Y OTB: Performance Indicators - Weightings & Scoring Table

P	Wt (L1)	Component	Wt (L2)	PI		Wt (L3)	Wt in P.	Score	Wt Score
1	1	Outcome	0.5	1.1.1	Stock status	0.5000	0.2500	80	20.00
				1.1.2	Reference points	0.5000	0.2500	90	22.50
				1.1.3	Stock rebuilding			0	0.00
		Management	0.5	1.2.1	Harvest strategy	0.2500	0.1250	80	10.00
				1.2.2	Harvest control rules & tools	0.2500	0.1250	75	9.38
				1.2.3	Information & monitoring	0.2500	0.1250	85	10.63
				1.2.4	Assessment of stock status	0.2500	0.1250	90	11.25
2	1	Retained species	0.2	2.1.1	Outcome	0.3333	0.0667	70	4.67
				2.1.2	Management	0.3333	0.0667	80	5.33
				2.1.3	Information	0.3333	0.0667	100	6.67
		Bycatch	0.2	2.2.1	Outcome	0.3333	0.0667	70	4.67
				2.2.2	Management	0.3333	0.0667	80	5.33
				2.2.3	Information	0.3333	0.0667	75	5.00
		ETP species	0.2	2.3.1	Outcome	0.3333	0.0667	100	6.67
				2.3.2	Management	0.3333	0.0667	100	6.67
				2.3.3	Information	0.3333	0.0667	80	5.33
		Habitats	0.2	2.4.1	Outcome	0.3333	0.0667	60	4.00
				2.4.2	Management	0.3333	0.0667	70	4.67
				2.4.3	Information	0.3333	0.0667	85	5.67
		Trophic function	0.2	2.5.1	Outcome	0.3333	0.0667	80	5.33
				2.5.2	Management	0.3333	0.0667	80	5.33
				2.5.3	Information	0.3333	0.0667	85	5.67
3	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.2500	0.1250	100	12.50
				3.1.2	Consultation, roles &	0.2500	0.1250	95	11.88
				3.1.3	Long term objectives	0.2500	0.1250	100	12.50
				3.1.4	Incentives for sustainable fishing	0.2500	0.1250	80	10.00
		Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.2000	0.1000	60	6.00
				3.2.2	Decision making processes	0.2000	0.1000	90	9.00
				3.2.3	Compliance & enforcement	0.2000	0.1000	90	9.00
				3.2.4	Research plan	0.2000	0.1000	100	10.00
				3.2.5	Management performance	0.2000	0.1000	70	7.00

15.2 4X5Y Bottom Longline

The performance of the Bottom Longline Fishery in 4X5Y in relation to MSC Principles 1, 2 and 3 is shown in Table 20 and summarised below:

Principle 1 - Target species	83.8
Principle 2 - Ecosystem	83.0
Principle 3 – Management	87.4

This fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any PI.

It is therefore recommended that the CANADA SCOTIA – FUNDY HADDOCK (Melanogrammus aeglefinus) FISHERY IN 4X5Y USING BOTTOM LONGLINE be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

This fishery did not achieve a score of 80 against six PIs. This has led to conditions to certification being raised (see section 15.9 below). Once these conditions have been satisfied these PIs will be re-scored.

Table 20: 4X5Y BLL: Performance Indicators -Weightings & Scoring Table

P	Wt (L1)	Component	Wt (L2)	PI		Wt (L3)	Wt in P.	Score	Wt Score
1	1	Outcome	0.5	1.1.1	Stock status	0.5000	0.2500	80	20.00
				1.1.2	Reference points	0.5000	0.2500	90	22.50
				1.1.3	Stock rebuilding			0	0.00
		Management	0.5	1.2.1	Harvest strategy	0.2500	0.1250	80	10.00
				1.2.2	Harvest control rules & tools	0.2500	0.1250	75	9.38
				1.2.3	Information & monitoring	0.2500	0.1250	85	10.63
				1.2.4	Assessment of stock status	0.2500	0.1250	90	11.25
2	1	Retained species	0.2	2.1.1	Outcome	0.3333	0.0667	70	4.67
				2.1.2	Management	0.3333	0.0667	80	5.33
				2.1.3	Information	0.3333	0.0667	100	6.67
		Bycatch	0.2	2.2.1	Outcome	0.3333	0.0667	70	4.67
				2.2.2	Management	0.3333	0.0667	80	5.33
				2.2.3	Information	0.3333	0.0667	75	5.00
		ETP species	0.2	2.3.1	Outcome	0.3333	0.0667	100	6.67
				2.3.2	Management	0.3333	0.0667	100	6.67
				2.3.3	Information	0.3333	0.0667	80	5.33
		Habitats	0.2	2.4.1	Outcome	0.3333	0.0667	80	5.33
				2.4.2	Management	0.3333	0.0667	80	5.33
				2.4.3	Information	0.3333	0.0667	85	5.67
		Trophic function	0.2	2.5.1	Outcome	0.3333	0.0667	80	5.33
				2.5.2	Management	0.3333	0.0667	80	5.33
				2.5.3	Information	0.3333	0.0667	85	5.67
3	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.2500	0.1250	100	12.50
				3.1.2	Consultation, roles &	0.2500	0.1250	95	11.88
				3.1.3	Long term objectives	0.2500	0.1250	100	12.50
				3.1.4	Incentives for sustainable fishing	0.2500	0.1250	80	10.00
		Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.2000	0.1000	60	6.00
				3.2.2	Decision making processes	0.2000	0.1000	90	9.00
				3.2.3	Compliance & enforcement	0.2000	0.1000	85	8.50
				3.2.4	Research plan	0.2000	0.1000	100	10.00
				3.2.5	Management performance	0.2000	0.1000	70	7.00

15.3 4X5Y Gill Net

The performance of the Gill Net Fishery in 4X5Y in relation to MSC Principles 1, 2 and 3 is shown in Table 21 and summarised below:

Principle 1 - Target species	83.8
Principle 2 – Ecosystem	91.7
Principle 3 – Management	87.4

This fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any PI.

It is therefore recommended that the CANADA SCOTIA – FUNDY HADDOCK (Melanogrammus aeglefinus) FISHERY IN 4X5Y USING GILL NET be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

This fishery did not achieve a score of 80 against three PIs. This has led to conditions to certification being raised (see section 15.9 below). Once these conditions have been satisfied these PIs will be re-scored.

Table 21: 4X5Y GN: Performance Indicators - Weightings & Scoring Table

P	Wt (L1)	Component	Wt (L2)	PI		Wt (L3)	Wt in P.	Score	Wt Score
1	1	Outcome	0.5	1.1.1	Stock status	0.5000	0.2500	80	20.00
				1.1.2	Reference points	0.5000	0.2500	90	22.50
				1.1.3	Stock rebuilding			0	0.00
		Management	0.5	1.2.1	Harvest strategy	0.2500	0.1250	80	10.00
				1.2.2	Harvest control rules & tools	0.2500	0.1250	75	9.38
				1.2.3	Information & monitoring	0.2500	0.1250	85	10.63
				1.2.4	Assessment of stock status	0.2500	0.1250	90	11.25
2	1	Retained species	0.2	2.1.1	Outcome	0.3333	0.0667	100	6.67
				2.1.2	Management	0.3333	0.0667	100	6.67
				2.1.3	Information	0.3333	0.0667	100	6.67
		Bycatch	0.2	2.2.1	Outcome	0.3333	0.0667	80	5.33
				2.2.2	Management	0.3333	0.0667	100	6.67
				2.2.3	Information	0.3333	0.0667	80	5.33
		ETP species	0.2	2.3.1	Outcome	0.3333	0.0667	100	6.67
				2.3.2	Management	0.3333	0.0667	100	6.67
				2.3.3	Information	0.3333	0.0667	80	5.33
		Habitats	0.2	2.4.1	Outcome	0.3333	0.0667	80	5.33
				2.4.2	Management	0.3333	0.0667	80	5.33
				2.4.3	Information	0.3333	0.0667	85	5.67
		Trophic function	0.2	2.5.1	Outcome	0.3333	0.0667	100	6.67
				2.5.2	Management	0.3333	0.0667	100	6.67
				2.5.3	Information	0.3333	0.0667	90	6.00
3	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.2500	0.1250	100	12.50
				3.1.2	Consultation, roles &	0.2500	0.1250	95	11.88
				3.1.3	Long term objectives	0.2500	0.1250	100	12.50
				3.1.4	Incentives for sustainable fishing	0.2500	0.1250	80	10.00
		Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.2000	0.1000	60	6.00
				3.2.2	Decision making processes	0.2000	0.1000	90	9.00
				3.2.3	Compliance & enforcement	0.2000	0.1000	85	8.50
				3.2.4	Research plan	0.2000	0.1000	100	10.00
				3.2.5	Management performance	0.2000	0.1000	70	7.00

15.4 4X5Y Hand Line

The performance of the Hand Line Fishery in 4X5Y in relation to MSC Principles 1, 2 and 3 is shown in Table 22 and summarised below:

Principle 1 - Target species	83.8
Principle 2 - Ecosystem	98.7
Principle 3 – Management	87.4

This fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any PI.

It is therefore recommended that the CANADA SCOTIA – FUNDY HADDOCK (Melanogrammus aeglefinus) FISHERY IN 4X5Y USING HAND LINE be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

This fishery did not achieve a score of 80 against three PIs. This has led to conditions to certification being raised (see section 15.9 below). Once these conditions have been satisfied these PIs will be re-scored.

Table 22: 4X5Y HL: Performance Indicators - Weightings & Scoring Table

P	Wt (L1)	Component	Wt (L2)	PI		Wt (L3)	Wt in P.	Score	Wt Score
1	1	Outcome	0.5	1.1.1	Stock status	0.5000	0.2500	80	20.00
				1.1.2	Reference points	0.5000	0.2500	90	22.50
				1.1.3	Stock rebuilding			0	0.00
		Management	0.5	1.2.1	Harvest strategy	0.2500	0.1250	80	10.00
				1.2.2	Harvest control rules & tools	0.2500	0.1250	75	9.38
				1.2.3	Information & monitoring	0.2500	0.1250	85	10.63
				1.2.4	Assessment of stock status	0.2500	0.1250	90	11.25
2	1	Retained species	0.2	2.1.1	Outcome	0.3333	0.0667	100	6.67
				2.1.2	Management	0.3333	0.0667	100	6.67
				2.1.3	Information	0.3333	0.0667	100	6.67
		Bycatch	0.2	2.2.1	Outcome	0.3333	0.0667	100	6.67
				2.2.2	Management	0.3333	0.0667	100	6.67
				2.2.3	Information	0.3333	0.0667	100	6.67
		ETP species	0.2	2.3.1	Outcome	0.3333	0.0667	100	6.67
				2.3.2	Management	0.3333	0.0667	100	6.67
				2.3.3	Information	0.3333	0.0667	90	6.00
		Habitats	0.2	2.4.1	Outcome	0.3333	0.0667	100	6.67
				2.4.2	Management	0.3333	0.0667	100	6.67
				2.4.3	Information	0.3333	0.0667	100	6.67
		Trophic function	0.2	2.5.1	Outcome	0.3333	0.0667	100	6.67
				2.5.2	Management	0.3333	0.0667	100	6.67
				2.5.3	Information	0.3333	0.0667	90	6.00
3	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.2500	0.1250	100	12.50
				3.1.2	Consultation, roles &	0.2500	0.1250	95	11.88
				3.1.3	Long term objectives	0.2500	0.1250	100	12.50
				3.1.4	Incentives for sustainable fishing	0.2500	0.1250	80	10.00
		Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.2000	0.1000	60	6.00
				3.2.2	Decision making processes	0.2000	0.1000	90	9.00
				3.2.3	Compliance & enforcement	0.2000	0.1000	85	8.50
				3.2.4	Research plan	0.2000	0.1000	100	10.00
				3.2.5	Management performance	0.2000	0.1000	70	7.00

15.5 5Zjm Otter Trawl

The performance of the Otter Trawl Fishery in 5Zjm in relation to MSC Principles 1, 2 and 3 is shown in Table 23 and summarised below:

Principle 1 - Target species	92.5
Principle 2 - Ecosystem	86.3
Principle 3 – Management	87.9

This fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any PI.

It is therefore recommended that the CANADA SCOTIA – FUNDY HADDOCK (Melanogrammus aeglefinus) FISHERY IN 5Zjm USING OTTER TRAWL be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

This fishery did not achieve a score of 80 against four PIs. This has led to conditions to certification being raised (see section 15.9 below). Once these conditions have been satisfied these PIs will be re-scored.

Table 23: 5Zjm OTB: Performance Indicators - Weightings & Scoring Table

P	Wt (L1)	Component	Wt (L2)	PI	Wt (L3)	Wt in P	Score	Wt Score
1	1	Outcome	0.5	1.1.1 Stock status	0.5000	0.2500	100	25.00
				1.1.2 Reference points	0.5000	0.2500	100	25.00
				1.1.3 Stock rebuilding			0	0.00
		Management	0.5	1.2.1 Harvest strategy	0.2500	0.1250	85	10.63
				1.2.2 Harvest control rules & tools	0.2500	0.1250	75	9.38
				1.2.3 Information & monitoring	0.2500	0.1250	85	10.63
				1.2.4 Assessment of stock status	0.2500	0.1250	95	11.88
2	1	Retained species	0.2	2.1.1 Outcome	0.3333	0.0667	80	5.33
				2.1.2 Management	0.3333	0.0667	90	6.00
				2.1.3 Information	0.3333	0.0667	100	6.67
		Bycatch	0.2	2.2.1 Outcome	0.3333	0.0667	80	5.33
				2.2.2 Management	0.3333	0.0667	100	6.67
				2.2.3 Information	0.3333	0.0667	80	5.33
		ETP species	0.2	2.3.1 Outcome	0.3333	0.0667	100	6.67
				2.3.2 Management	0.3333	0.0667	100	6.67
				2.3.3 Information	0.3333	0.0667	80	5.33
		Habitats	0.2	2.4.1 Outcome	0.3333	0.0667	80	5.33
				2.4.2 Management	0.3333	0.0667	70	4.67
				2.4.3 Information	0.3333	0.0667	85	5.67
		Trophic function	0.2	2.5.1 Outcome	0.3333	0.0667	80	5.33
				2.5.2 Management	0.3333	0.0667	80	5.33
				2.5.3 Information	0.3333	0.0667	90	6.00
3	1	Governance and policy	0.5	3.1.1 Legal & customary framework	0.2500	0.1250	100	12.50
				3.1.2 Consultation, roles &	0.2500	0.1250	95	11.88
				3.1.3 Long term objectives	0.2500	0.1250	100	12.50
				3.1.4 Incentives for sustainable fishing	0.2500	0.1250	80	10.00
		Fishery specific management system	0.5	3.2.1 Fishery specific objectives	0.2000	0.1000	60	6.00
				3.2.2 Decision making processes	0.2000	0.1000	90	9.00
				3.2.3 Compliance & enforcement	0.2000	0.1000	90	9.00
				3.2.4 Research plan	0.2000	0.1000	100	10.00
				3.2.5 Management performance	0.2000	0.1000	70	7.00

15.6 5Zjm Bottom Long Line

The performance of the Bottom Long Line Fishery in 5Zjm in relation to MSC Principles 1, 2 and 3 is shown in Table 24 and summarised below:

Principle 1 - Target species	92.5
Principle 2 - Ecosystem	84.3
Principle 3 – Management	87.4

This fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any indicator.

It is therefore recommended that the CANADA SCOTIA – FUNDY HADDOCK (Melanogrammus aeglefinus) FISHERY IN 5Zjm USING BOTTOM LONG LINE be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

This fishery did not achieve a score of 80 against four PIs. This has led to conditions to certification being raised (see section 15.9 below). Once these conditions have been satisfied these PIs will be re-scored.

Table 24: 5Zjm BLL: Performance Indicators: Weightings & Scoring Table

P	Wt (L1)	Component	Wt (L2)	PI		Wt (L3)	Wt in P	Score	Wt Score
1	1	Outcome	0.5	1.1.1	Stock status	0.5000	0.2500	100	25.00
				1.1.2	Reference points	0.5000	0.2500	100	25.00
				1.1.3	Stock rebuilding			0	0.00
		Management	0.5	1.2.1	Harvest strategy	0.2500	0.1250	85	10.63
				1.2.2	Harvest control rules & tools	0.2500	0.1250	75	9.38
				1.2.3	Information & monitoring	0.2500	0.1250	85	10.63
				1.2.4	Assessment of stock status	0.2500	0.1250	95	11.88
2	1	Retained species	0.2	2.1.1	Outcome	0.3333	0.0667	80	5.33
				2.1.2	Management	0.3333	0.0667	80	5.33
				2.1.3	Information	0.3333	0.0667	100	6.67
		Bycatch	0.2	2.2.1	Outcome	0.3333	0.0667	70	4.67
				2.2.2	Management	0.3333	0.0667	80	5.33
				2.2.3	Information	0.3333	0.0667	80	5.33
		ETP species	0.2	2.3.1	Outcome	0.3333	0.0667	100	6.67
				2.3.2	Management	0.3333	0.0667	100	6.67
				2.3.3	Information	0.3333	0.0667	80	5.33
		Habitats	0.2	2.4.1	Outcome	0.3333	0.0667	80	5.33
				2.4.2	Management	0.3333	0.0667	80	5.33
				2.4.3	Information	0.3333	0.0667	85	5.67
		Trophic function	0.2	2.5.1	Outcome	0.3333	0.0667	80	5.33
				2.5.2	Management	0.3333	0.0667	80	5.33
				2.5.3	Information	0.3333	0.0667	90	6.00
3	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.2500	0.1250	100	12.50
				3.1.2	Consultation, roles &	0.2500	0.1250	95	11.88
				3.1.3	Long term objectives	0.2500	0.1250	100	12.50
				3.1.4	Incentives for sustainable fishing	0.2500	0.1250	80	10.00
		Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.2000	0.1000	60	6.00
				3.2.2	Decision making processes	0.2000	0.1000	90	9.00
				3.2.3	Compliance & enforcement	0.2000	0.1000	85	8.50
				3.2.4	Research plan	0.2000	0.1000	100	10.00
				3.2.5	Management performance	0.2000	0.1000	70	7.00

15.7 5Zjm Gill Net

The performance of the Gill Net Fishery in 5Zjm in relation to MSC Principles 1, 2 and 3 is shown in Table 25 and summarised below:

Principle 1 - Target species	92.3
Principle 2 - Ecosystem	93.0
Principle 3 – Management	87.4

This fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any indicator.

It is therefore recommended that the CANADA SCOTIA – FUNDY HADDOCK (Melanogrammus aeglefinus) FISHERY IN 5Zjm USING BOTTOM LONG LINE be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

This fishery did not achieve a score of 80 against three PIs. This has led to conditions to certification being raised (see section 15.9 below). Once these conditions have been satisfied these PIs will be re-scored.

Table 25: 5Zjm GN: Performance Indicators - Weightings & Scoring Table

P	Wt (L1)	Component	Wt (L2)	PI		Wt (L3)	Wt in P	Score	Wt Score
1	1	Outcome	0.5	1.1.1	Stock status	0.5000	0.2500	100	25.00
				1.1.2	Reference points	0.5000	0.2500	100	25.00
				1.1.3	Stock rebuilding			0	0.00
		Management	0.5	1.2.1	Harvest strategy	0.2500	0.1250	85	10.63
				1.2.2	Harvest control rules & tools	0.2500	0.1250	75	9.38
				1.2.3	Information & monitoring	0.2500	0.1250	85	10.63
				1.2.4	Assessment of stock status	0.2500	0.1250	95	11.88
2	1	Retained species	0.2	2.1.1	Outcome	0.3333	0.0667	100	6.67
				2.1.2	Management	0.3333	0.0667	100	6.67
				2.1.3	Information	0.3333	0.0667	100	6.67
		Bycatch	0.2	2.2.1	Outcome	0.3333	0.0667	100	6.67
				2.2.2	Management	0.3333	0.0667	100	6.67
				2.2.3	Information	0.3333	0.0667	80	5.33
		ETP species	0.2	2.3.1	Outcome	0.3333	0.0667	100	6.67
				2.3.2	Management	0.3333	0.0667	100	6.67
				2.3.3	Information	0.3333	0.0667	80	5.33
		Habitats	0.2	2.4.1	Outcome	0.3333	0.0667	80	5.33
				2.4.2	Management	0.3333	0.0667	80	5.33
				2.4.3	Information	0.3333	0.0667	85	5.67
		Trophic function	0.2	2.5.1	Outcome	0.3333	0.0667	100	6.67
				2.5.2	Management	0.3333	0.0667	100	6.67
				2.5.3	Information	0.3333	0.0667	90	6.00
3	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.2500	0.1250	100	12.50
				3.1.2	Consultation, roles &	0.2500	0.1250	95	11.88
				3.1.3	Long term objectives	0.2500	0.1250	100	12.50
				3.1.4	Incentives for sustainable fishing	0.2500	0.1250	80	10.00
		Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.2000	0.1000	60	6.00
				3.2.2	Decision making processes	0.2000	0.1000	90	9.00
				3.2.3	Compliance & enforcement	0.2000	0.1000	85	8.50
				3.2.4	Research plan	0.2000	0.1000	100	10.00
				3.2.5	Management performance	0.2000	0.1000	70	7.00

15.8 5Zjm Hand line

The performance of the Hand Line Fishery in 5Zjm in relation to MSC Principles 1, 2 and 3 is shown in table 26 and summarised below

:

Principle 1 - Target species	92.5
Principle 2 - Ecosystem	98.7
Principle 3 – Management	87.4

This fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any PI.

It is therefore recommended that the CANADA SCOTIA – FUNDY HADDOCK (Melanogrammus aeglefinus) FISHERY IN 5Zjm USING HAND LINE be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

This fishery did not achieve a score of 80 against three PIs. This has led to conditions to certification being raised (see section 15.9 below). Once these conditions have been satisfied these PIs will be re-scored.

Table 26: 5Zjm HL - Performance Indicators - Weightings & Scoring Table

P	Wt (L1)	Component	Wt (L2)	PI		Wt (L3)	Wt in P	Score	Wt Score
1	1	Outcome	0.5	1.1.1	Stock status	0.5000	0.2500	100	25.00
				1.1.2	Reference points	0.5000	0.2500	100	25.00
				1.1.3	Stock rebuilding			0	0.00
		Management	0.5	1.2.1	Harvest strategy	0.2500	0.1250	85	10.63
				1.2.2	Harvest control rules & tools	0.2500	0.1250	75	9.38
				1.2.3	Information & monitoring	0.2500	0.1250	85	10.63
				1.2.4	Assessment of stock status	0.2500	0.1250	95	11.88
2	1	Retained species	0.2	2.1.1	Outcome	0.3333	0.0667	100	6.67
				2.1.2	Management	0.3333	0.0667	100	6.67
				2.1.3	Information	0.3333	0.0667	100	6.67
		Bycatch	0.2	2.2.1	Outcome	0.3333	0.0667	100	6.67
				2.2.2	Management	0.3333	0.0667	100	6.67
				2.2.3	Information	0.3333	0.0667	100	6.67
		ETP species	0.2	2.3.1	Outcome	0.3333	0.0667	100	6.67
				2.3.2	Management	0.3333	0.0667	100	6.67
				2.3.3	Information	0.3333	0.0667	90	6.00
		Habitats	0.2	2.4.1	Outcome	0.3333	0.0667	100	6.67
				2.4.2	Management	0.3333	0.0667	100	6.67
				2.4.3	Information	0.3333	0.0667	100	6.67
		Trophic function	0.2	2.5.1	Outcome	0.3333	0.0667	100	6.67
				2.5.2	Management	0.3333	0.0667	100	6.67
				2.5.3	Information	0.3333	0.0667	90	6.00
3	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.2500	0.1250	100	12.50
				3.1.2	Consultation, roles &	0.2500	0.1250	95	11.88
				3.1.3	Long term objectives	0.2500	0.1250	100	12.50
				3.1.4	Incentives for sustainable fishing	0.2500	0.1250	80	10.00
		Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.2000	0.1000	60	6.00
				3.2.2	Decision making processes	0.2000	0.1000	90	9.00
				3.2.3	Compliance & enforcement	0.2000	0.1000	85	8.50
				3.2.4	Research plan	0.2000	0.1000	100	10.00
				3.2.5	Management performance	0.2000	0.1000	70	7.00

15.9 Conditions

A total of 40 PIs in the 8 UoCs have failed to achieve a score of 80. Where possible these have been treated collectively, resulting in 8 conditions to the certifications.

As a standard condition of certification, the client shall develop an “Action Plan” for Meeting the Conditions for Continued Certification, to be approved by Moody Marine. This action plan is shown as part of the conditions below.

15.9.1 Condition 1: All Gear Types 4X5Y

Condition 1: All Gear Types 4X5Y: There are well defined and effective harvest control rules in place	
PI	1.2.2
Rationale	The assessment team concluded that although it seems clear from management and assessment documents that F has been maintained at or below $F_{0.1}$, specific rules for adjusting F in response to changes in stock status are not well defined. Furthermore, there is a lack of well-defined harvest control rules for years in which quantitative stock assessments are not done (e.g., 2006-2008). While evidence exists that quotas can be reduced in response to changes in survey indices, it is not certain that these adjustments will be consistent and transparent when such situations arise in the future.
Condition	The client is required to ensure that well defined and effective harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached.
Client Action Plan	<p>This will be achieved by the following:</p> <ul style="list-style-type: none"> • GEAC will collaborate with the Scotia-Fundy Region of Fisheries & Oceans Canada (DFO), and other industry organizations through the Scotia-Fundy Groundfish Advisory Committee (SFGAC) to translate implicit reference points and/or harvest control rules into explicit ones, while enabling scope for the exercise of judgment relative to circumstance. DFO's Precautionary Approach (PA) Framework will be utilized for this purpose, providing a limit and upper stock reference, and a fishing mortality strategy will be linked to quantitative assessment outputs and/or research vessel biomass indices, and be designed to promote an agreed direction and trajectory of the spawning stock biomass, taking into account stock status, risk factors, projected outcomes and socio-economic objectives. This process may or may not include simulation of results, and if not would include references that the chosen approach has worked elsewhere with stocks of similar attributes, e.g. life history. • By the second annual audit there will be documented evidence that the options for well-defined reference points and harvest control rules have been outlined and discussed with stakeholders. • By the third annual audit there will be documented evidence that the reference points and harvest control rules have been adopted. • By the fourth annual audit there will be documented evidence that the adopted harvest control rules have been implemented, i.e. forms the basis of TAC-setting and other relevant management advice.
Consultation on Condition	The client has fully consulted with DFO.

15.9.2 Condition 2: All Gear Types 5Zjm

Condition 2: All Gear Types 5Zjm: There are well defined and effective harvest control rules in place	
PI	1.2.2
Rationale	<p>The assessment team concluded that, as shown by interviews during the site visit, the harvest control rules used for 5Zjm haddock in the past have been generally understood by science, management, and stakeholders involved in the assessment process. Despite this general understanding, the specific harvest control rule is not "well defined". The realized relationship between SSB and F between 1998 and 2006 demonstrates that the harvest control rule is responsive to changes in stock status; however, observed changes in fishing mortality were generated during a period in which stock size was increasing away from the LRP. Therefore, one cannot judge whether the harvest control rule ensures that exploitation will be reduced when biomass declines in the future toward the LRP. The harvest control rule has not been designed and tested to take known uncertainties explicitly into account.</p>
Condition	<p>The client is required to ensure formal definition of a set of well-defined pre-agreed rules or actions used for determining a management action in response to changes in indicators of stock status with respect to reference points for the 5Zjm haddock fishery.</p>
Client Action Plan	<p>This will be achieved by the following:</p> <ul style="list-style-type: none"> • Reflecting the fact that this is a trans-boundary stock for which TAC-setting is a cooperative process between Canada and the USA, who have differing legislative frameworks and processes, the action plan is applicable to mechanisms that function within the jurisdiction of Canada, principally the Gulf of Maine Advisory Committee (GOMAC), which is a DFO/industry consultative body that provides recommendations to the Minister of Fisheries & Oceans Canada. Once established, positions advanced by Canadian representatives at various international consultative mechanisms are to be consistent with explicit approaches adopted by GOMAC, subject only to legislated Ministerial discretion. Such approaches and positions may or may not be available to the public, but shall be available for audit by the certifying body in any event. • GEAC will collaborate with other stakeholders on the GOMAC to translate implicit reference points and/or harvest control rules into explicit ones, while enabling scope for the exercise of judgment relative to circumstance. DFO's Precautionary Approach (PA) Framework may be utilized, or, the harvest strategy adopted will be consistent with this PA framework. The fishing mortality strategy will be linked to quantitative assessment outputs and/or research vessel biomass indices, and be designed to promote an agreed direction and trajectory of the spawning stock biomass, taking into account stock status, risk factors, projected outcomes and socio-economic objectives. This process may or may not include simulation of results, and if not would include references that the chosen

	<p>approach has worked elsewhere with stocks of similar attributes, e.g. life history.</p> <ul style="list-style-type: none"> • By the second annual audit there will be documented evidence that options for well-defined limit reference points and harvest control rules have been outlined and discussed with stakeholders through the Gulf of Maine Advisory Committee (GOMAC). • By the third annual audit there will be documented evidence that GOMAC has established reference points and harvest control rules to guide Canadian representatives in their future discussions on TAC-setting with their counterparts in the USA. • By the fourth annual audit there is documented evidence that Canadian representatives have advanced positions that are consistent with the harvest control rules that have been adopted by GOMAC.
Consultation on Condition	The client has fully consulted with DFO.

15.9.3 Condition 3 : 4X5Y (OTB & LL)

Condition 3. Areas 4X5Y (OTB & LL) Main retained species are <i>highly likely</i> to be within biologically-based limits, or if outside the limits there is a partial strategy of demonstrably effective management measures in place such that the fishery does not hinder recovery and rebuilding	
PI	2.1.1
Rationale	<p>The assessment team concluded that:</p> <p>Cod 4X5Y: Cod. The annual average retained catch of cod by otter trawlers targeting haddock in 4X for the period 2002 to 2008 was 2,002 mt. The annual average retained catch of cod by bottom long liners targeting haddock in 4X5Y for the period 2002 to 2008 was 1,731 mt. 4X biomass indices from surveys have remained low since 2000 when a rebuilding strategy was initiated. SSB at the beginning of 2008 was 9,000 mt; the lowest level in a time-series that started in 1948. Recruitment for the 2006 and 2007 year classes was below average, but about twice the abundance of the very low 2003 and 2004 year classes. While research vessel survey results increased by about 360% between 2008 and 2009, in historic terms biomass remains low and conclusions cannot depend on the results of one year. Total landings remained near 3,900 mt (i.e. < 5,000 mt TAC) from 2005 to 2008. The TAC for 2009 was reduced to 3,000 mt, and preliminary data indicates that the catch (directed cod fishery plus by-catch in other fisheries) totalled about 2,591 mt. The first scoring issue for SG60 is met, however whilst there a partial strategy in place that might be expected to ensure that the fishery does not hinder recovery and rebuilding of cod, it cannot yet be shown to be demonstrably effective and therefore the scoring issue for SG80 is not met.</p> <p>White hake 4X5Y. The annual average retained catch of white hake by bottom long liners targeting haddock in 4X5Y for the period 2002 to 2008 was 521 mt. In 4X5Y, there has been a general decrease in the abundance of white hake since the early 1990s. Fishing mortality is relatively low in all areas since the introduction of catch limits in 1996. Total mortality on the Scotian Shelf is high and its causes are unknown. Total mortality of white hake in the Bay of Fundy is variable without trend. The SAR 2010</p>

	<p>(as reported by GEAC in January, 2010) observes that white hake in 4VWX were distributed throughout the survey area, with the largest catches in the Gulf of Maine (4Xpq), the Bay of Fundy, and in 4Vn. Biomass indices have risen for the last two years in all regions. In 4X East, abundance indices were above average for most lengths below 58cm in 2009, but below average for larger fish. This is similar to what was seen in 2008. White hake abundance indices in 4X West were near average for most lengths in both 2008 and 2009.</p> <p>The second scoring issue for SG60 is met, however whilst there a partial strategy in place that might be expected to ensure that the fishery does not hinder recovery and rebuilding of white hake, it cannot yet be shown to be demonstrably effective and therefore the scoring issue for SG80 is not met.</p>
Condition	<p>The client is required to ensure that the main retained species are highly likely to be within biologically-based limits, or if outside the limits there is a partial strategy of demonstrably effective management measures in place such that the fisheries do not hinder recovery and rebuilding.</p> <p>The outcome above should be achieved within 4 years of certification</p>
Client Action Plan	<p>This will be achieved by the following:</p> <ul style="list-style-type: none"> • GEAC will collaborate with the Scotia-Fundy Region of Fisheries & Oceans Canada (DFO), and other industry organizations through the Scotia-Fundy Groundfish Advisory Committee (SFGAC) to articulate a “recovery plan” for each of cod and white hake in 4X5Y. This may include the translation of implicit reference points and/or harvest control rules into explicit ones, while enabling scope for the exercise of judgment relative to circumstance. DFO’s Precautionary Approach (PA) Framework may be utilized, or, the harvest strategy adopted will be consistent with this PA framework. The fishing mortality strategy will be linked to quantitative assessment outputs and/or research vessel biomass indices as the case may be, and be designed to promote an agreed direction and/or trajectory of the spawning stock biomass, taking into account stock status, projected outcomes and socio-economic objectives. This process may or may not include simulation of results, and if not would include references that the chosen approach has worked elsewhere with stocks of similar attributes, e.g. life history. • By the second annual audit there is documented evidence that recovery milestones and management options for cod and white hake in 4X5Y have been outlined and discussed at the SFGAC. • By the third annual audit there is documented evidence that the agreed catch and/or by-catch targets for cod by the OT and LL gear and white hake by LL gear have been defined by DFO. • By the fourth annual audit there is documented evidence that recovery plans for cod and white hake in 4X5Y, and for the control or reduction in fishing mortality are being implemented as planned.
Consultation on Condition	<p>The client has fully consulted with DFO.</p>

15.9.4 Condition 4 : 4X5Y (OTB & LL) & 5Zjm (LL)

Condition 4. Area 4X5Y (OTB & LL) & 5Zjm (LL). Main by-catch species are highly likely to be within biologically based limits or if outside such limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding.	
PI	2.2.1
Rationale	<p>The assessment team concluded that:</p> <ul style="list-style-type: none"> • The annual average discarded catch of skate by otter trawlers targeting haddock in 4X5Y in 2002 - 2008 was 197 mt (114 mt in 2008) - 1.1 % of the haddock catch. The annual average discarded catch of skate by bottom long liners targeting haddock in 4X5Y in 2002 - 2008 was 274 mt (224 mt in 2008) - 4.4 % of the haddock catch. The annual average discarded catch of skate by bottom long liners targeting haddock in 5Zjm in 2002 - 2008 was 114 mt (118 mt in 2008), or 4.0 % (over the period) of the haddock catch. • Abundance of thorny skate (<i>Amblyraja radiata</i>), the most common of the Scotian Shelf skates, has stabilised after decreases from the highs of the 1980s. Barndoor skate is considered by IUCN to be ‘threatened’. There was a decline in the survey indices in the mid-1960s to early 1970s, likely caused by the high fishing effort of the distant water fleet on Georges Bank, followed by a period of low to zero catches. In 1985, consistent catches of barndoor skate started and observed increases in survey indices have continued. A COSEWIC assessment for the species in 2005 concluded that populations within the combined 4X and 5Ze areas were of “special concern”, although stable.
Condition	<p>The client is required to ensure that the by-catch of skates are highly likely to be within biologically based limits or if outside such limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding.</p> <p>The outcome above should be achieved within 4 years of certification</p>
Client Action Plan	<p>This will be achieved by the following:</p> <ul style="list-style-type: none"> • GEAC will collaborate with the Scotia-Fundy Region of Fisheries & Oceans Canada (DFO), and other industry organizations through the Scotia-Fundy Groundfish Advisory Committee (SFGAC) towards the development and adoption of a suite of management measures specific to skate in 4X5Y and 5Ze, designed to avoid hindering the recovery and rebuilding of skate populations. • By the first annual audit, specific abundance indices for skate by species and area will be adopted for monitoring by DFO, the results of which shall be considered by the SFGAC annually. • By the second annual audit, a plan to identify discards by species and area will be tabled at the SFGAC and adopted. • By the second annual audit: (a) a best practices handling and live release protocol will be adopted, (b) a move-away protocol will be adopted, and (c) management measures to control or to reduce bycatch of skates in the directed haddock fishery (>50% haddock in a trip) will

	<p>be adopted to achieve or continue improvement in the abundance indices for skate.</p> <ul style="list-style-type: none"> • By the third annual audit there will be documented evidence that the adopted management measures are being implemented. • By the fourth annual audit a review of the effectiveness of the respective management measures will be completed, including an evaluation of the likely impact of the various sources of recent fishing mortality on the stock condition of skate.
Consultation on Condition	The client has fully consulted with DFO.

15.9.5 Condition 5: OTB (4X5Y), LL (4X5Y)

Condition 5. Area 4X5Y (OTB & LL). Qualitative information and some quantitative information are available on the amount of main by-catch species affected by the fishery.	
PI	2.2.3
Rationale	<p>The assessment team found there is no direct recording of the quantity of discards in logbooks. The only source of information is through independent observer coverage. While observer coverage is high on the OTB fishery (26%) and BLL (8.9%) in 5Zjm, it is lower in 4X5Y (2.1% and 0.4% for OTB and BLL respectively) and this leads to uncertainty about the level of discards. Accordingly the 4X5Y otter trawl and 4X5Y bottom long line do not meet the fourth issue of SG80 and achieve a score of 75 for this PI.</p>
Condition	The client is required to ensure that sufficient data continue to be collected to detect any increase in risk to main by-catch species.
Client Action Plan	<p>This will be achieved by the following:</p> <ul style="list-style-type: none"> • By the first annual audit, DFO and GEAC will (a) evaluate the risk to main bycatch/discard species associated with haddock fished in 4X5Y, (b) identify options to improve the information base and estimates of discards, and (c) table these products for consideration by the SFGAC. • By the second annual audit, mechanisms to improve data collection and estimations of discards by the OTB and LL in 4X5Y fisheries will be adopted. • By the fourth annual audit there will be documented evidence that the adopted data collection and discard estimation mechanisms have been implemented.
Consultation on Condition	The client has fully consulted with DFO.

15.9.6 Condition 6: OTB (4X5Y)

Condition 6. Area 4X5Y (OTB). The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm; and there is some evidence that the partial strategy is being implemented successfully.	
PI	2.4.1, 2.4.2
Rationale	<p>2.4.1: The assessment team concluded that mobile bottom-contact fishing gears do have impacts on benthic populations, communities, and habitats. The effects are not uniform, but depend on at least (i) the specific features of the seafloor habitats, including the natural disturbance regime, (ii) the species present, (iii) the type of gear used, the methods and timing of deployment of the gear, and the frequency with which a site is impacted by specific gears; and (iv) the history of human activities, especially past fishing, in the area of concern. The area trawled by Canadian groundfish bottom trawl fishery on Georges Bank was estimated using fishing log records and information captured by observers at sea. In 2001 and 2002, a rough estimate was the footgear disturbed less than 10% of the bottom while the bridles and warp swept less than 30%. The doors impacted less than 1% of the bottom. This information was based upon logbook data but has the potential for being updated and expanded to Area 4X using VMS data. Similar figures for Area 4X5Y have not been prepared, although the raw data (via VMS, logbook and observer sources) are available. The UoC meets the single issue of SG60 as there is evidence that the fishery is unlikely to reduce habitat structure and function as these areas have been fished for many years without serious or irreversible harm. Accordingly a score of 60 is allocated.</p> <p>2.4.2: A policy and process exists for ‘managing the impacts of fishing on sensitive benthic areas’¹, but it has yet to be implemented. Two pilot projects have been initiated to test this approach – one on Georges Bank and the second in coastal areas of 4X and the results will be used to fine-tune the approach for the wider roll-out of the strategy. Protected areas have been developed to protect the Gully (a 2,364 square kilometre area protecting the large canyon feature and associated habitats of the Gully, near Sable Island) as well as coral (the Northeast Channel Coral Conservation Area: a 424 km² area protecting deep water coral concentrations adjacent to Georges Bank). In the case of both the 4X5Y and 5Zjm otter trawl fisheries, these UoCs meet the first issue of SG80 as there is a partial strategy in place. However, this is a work in progress and accordingly it is considered that the UoC only meets the second issue of SG60. Accordingly a score of 70 is allocated.</p>
Condition	<p>The client is required to provide evidence to show that the otter trawl fishery in 4X5Y is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.</p> <p>The client is also required to demonstrate an active participation in rolling out DFO’s ‘Policy for Managing the Impacts of Fishing on Sensitive Benthic Areas’, e.g. participating where required in the risk analysis process, the determination of management measures and their subsequent</p>

¹ See <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/benthi-eng.htm>

	implementation.
Client Action Plan	<p>This will be achieved by the following:</p> <ul style="list-style-type: none"> • GEAC will collaborate with the Scotia-Fundy Region of Fisheries & Oceans Canada (DFO), and other industry organizations through the Scotia-Fundy Groundfish Advisory Committee (SFGAC) towards development of a program (a) to enhance the collection of information, and (b) to conduct an evaluation of the impact of otter trawl fishing for haddock in 4X5Y, at a minimum to the extent completed for 5Zjm. A project team will be assembled this purpose, which more generally will also ensure implementation of DFO's Policy with respect to Sensitive Benthic Areas as it applies to the conduct of haddock fishing. • By the first annual audit there will documented evidence that a plan for the assembly of available information and a program for evaluation has been developed by the "project team", and data collection and assembly for this purpose has commenced. • By the third annual audit there will documented evidence showing the information that has been assembled and the results of analysis to date. • By the fourth annual audit there will be documented evidence that at least a provisional evaluation has been completed, and mitigation measures have been identified and are being implemented as appropriate for this fishing activity.
Consultation on Condition	The client has fully consulted with DFO.

15.9.7 Condition 7: All UoC 4X5Y (All gear types) 5Zjm (All gear types)

Condition 7. Area 4X5Y (All Gear Types); Area 5Zjm (All gear types). Short and long term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.	
PI	3.2.1
Rationale	The assessment team concluded that while the Groundfish Management Plan (2002 – 2007) was based on three objectives, this plan has not been up dated since 2007. It does not provide defined and measurable short and long term objectives. It is largely descriptive of the situation and how various issues may be addressed, without presenting specific measures designed to meet the objectives. There is not a statement of the policy and related objectives in relation to the individual fleet segments and gear types. Currently, short and long term objectives consistent with achieving the outcomes expressed by MSC's Principles 1 and 2 are not explicit within the fishery's management system (SG80). However the UoC meets the single issue of SG60 with objectives implicit within the fishery management system (as contained in policy documents including the FMP 2002 – 2007).
Condition	The client is required to ensure that clear long term objectives consistent with MSC Principles and Criteria and the precautionary approach are explicit within the fishery management system for Canada Scotia Fundy haddock fishery
Client Action Plan	<p>This will be achieved by the following:</p> <ul style="list-style-type: none"> • GEAC will collaborate with the Scotia-Fundy Region of Fisheries & Oceans Canada (DFO), and other industry organizations through the Scotia-Fundy Groundfish Advisory Committee (SFGAC) and through the Gulf of Maine Advisory Committee (GOMAC) towards the updating and/or development and adoption of clear long-term objectives that are explicitly applicable to haddock fishing in 4X5Y and 5Zjm. • By the first annual audit there will be documented evidence that drafts of long-term objectives explicitly applicable to haddock fishing have been tabled for discussion at SFGAC and GOMAC. • By the second annual audit, there will be documented evidence that long-term objectives explicitly applicable to haddock fishing have been adopted by DFO. • By the fourth annual audit, there will be documented evidence that measures consistent with the adopted long-term objectives are being implemented.
Consultation on Condition	The client has fully consulted with DFO.

15.9.8 Condition 8: 4X5Y (All gear types); 5Zjm (All gear types)

Condition 8. Area 4X5Y (All Gear Types); Area 5Zjm (All gear types). The fishery has in place mechanisms to evaluate key parts of the management system and is subject to regular internal and occasional external review.	
PI	3.2.5
Rationale	The assessment team concluded that a review of the 2002 – 2007 IFMP as required by Section 7 of that plan was only carried out after the first year. While CHPs are informally reviewed on an annual basis, to a large part they remain unchanged. There are examples of evaluation of management policies with the Audit and Evaluation Directorate of the DFO e.g. the 2007 review of the Aboriginal Fisheries Strategy. In 2002 there was an external audit of the DMP. This was up-dated in 2005 and 2006. The new audit check list once implemented would provide the mechanism to evaluate all parts of the management system. Accordingly, each UoC meets the single issue of SG60 as mechanisms are in place to evaluate some parts of the management system and the fishery is subject to occasional internal review. As there is regular internal review of one part of the management system (CHPs) and there has been occasional external review, each UoC meets part of the single issue of SG80. Accordingly, a score of 70 is allotted for this PI.
Condition	The client is required to ensure that the fishery has in place mechanisms to evaluate key parts of the management system and is subject to regular internal and occasional external review.
Client Action Plan	<p>To achieve this outcome:</p> <ul style="list-style-type: none"> • GEAC will collaborate with the Scotia-Fundy Region of Fisheries & Oceans Canada (DFO) towards the development of an updated Integrated Fisheries Management Plan, applying the model developed for use for all major Canadian commercial fisheries. This plan will include biennial internal and occasional external reviews of haddock fishing in 4X5Y and 5Zjm. By the first annual audit, this plan will be adopted by DFO. • By the third annual audit, the results of a DFO internal review will be available to the audit team. • By the fourth annual audit, as a supplement to the on-going external reviews through TRAC and TMGC, the results of the internal review of the management system for haddock fishing in 5Zjm have been tabled for discussion by GOMAC, with documented evidence of resulting actions taken (if required). • By the fourth annual audit, the results of the internal review of the management system for haddock fishing in 4X5Y have been tabled for discussion by SFGAC, the principal advisory committee that is open to the public, with documented evidence of resulting actions taken (if any).
Consultation on Condition	The client has fully consulted with DFO.

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Appendix 1: Scoring Table

Principle 1	A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.			
1.1	Management Outcomes:			
1.1.1	Stock Status: The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing	It is likely (P>0.7) that the stock is above the point where recruitment would be impaired (i.e., recruitment risk point)	It is highly likely (P>0.8) that the stock is above the point where recruitment would be impaired. The stock is at or fluctuating around its target reference point.	There is a high degree of certainty (P>0.95) that the stock is above the point where recruitment would be impaired. There is a high degree of certainty that the stock has been fluctuating around its target reference point, or has been above its target reference point, over recent years.
Scoring Comments				
<p>4X5Y. Based on the 2005 assessment, age4+ SSB of 4X5Y, the biomass of haddock increased steadily from low levels that occurred in the early 1990s. Projected SSB at the beginning of the 2006 fishery was 37,000 mt or 1.68 times the lowest level from which the stock has recovered in the past (i.e. $B_{\text{recover}} = 22,000$ mt). Estimated recruitment over the past 10 years has generally been good with no evidence of impairment due to fishing. Estimated fishing mortality has been maintained at levels less than $F_{0.1} = 0.25$ since 1993. Increasing trends in spawning stock biomass of 4X5Y haddock and frequent strong year-classes imply a high likelihood that SSB is above the point where recruitment would be impaired. Between 1992 and 2002, the population age-distribution of haddock in research survey tows expanded to include ages7-8 in area 4X East (Scotian Shelf), which is unique in the post-1970 era. Similar expansion of the age distribution has not occurred in the area 4X West (Bay of Fundy). The resource assessment completed in 2009 was not available to the auditors.</p> <p>5Zjm. The haddock resource in 5Zjm (Eastern Georges Bank) is a transboundary stock that is jointly assessed by Canada (DFO) and the USA (NMFS). Most</p>				

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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fish are taken by Canadian harvesters because 70 % - 90 % of the haddock stock occurs in Canadian waters. Between 1969 and 2008, the estimated age3+ SSB of 5Zjm haddock ranged from an historical low of 9,000 mt (1993) to approximately 158,000 mt (2008), which is possibly the largest SSB ever observed for this stock (dating back to the 1930s). Estimated SSB in 2008 is also 4.7 times greater than the 1969 - 2008 average. Growth of SSB over the past decade is due to above average productivity (i.e. recruits per unit SSB) during the 1990s combined with an exceptional 2003 year class, which is also the largest on record. Such a pattern of recruitment suggests that the low SSB levels during the 1990s were not low enough to impair recruitment or the ability of the stock to recover from low levels under the prevailing environmental conditions. The population age-distribution of 5Zjm haddock in DFO research surveys expanded between the 1980s (max age6-7) and 2000s (max age8-9).

The target reference point is implicit in the definition of $F_{0.1}$, which serves as an estimable surrogate for F_{MSY} (see 1.1.2 Reference Points indicator). If harvested consistently at or below $F_{0.1}$, the 5Zjm haddock stock should fluctuate near or above $B_{MSY} \sim 80,000$ mt. The estimated SSB of 5Zjm haddock stock has been above this target level for the past three years. The 2008 stock assessment shows a high degree of certainty that the stock is currently greater than 80,000 mt. Note, however, that the SSB is projected to decline over the next several years as exceptionally strong year-classes move through the fishery.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	80	80	80	80
	5Zjm	100	100	100	100

4X5Y: All gears. Due to the vintage of the most recently available stock assessment, it may be considered only highly likely that the stock is above the point where recruitment would be impaired. The stock is at or fluctuating around its target reference point (SG80); but, there is not a high degree of certainty as the estimated 4X5Y haddock spawning biomass recently crossed the B_{MSY} proxy target reference point. On that basis a score of 80 is allocated to each UoC in this fishing area.

5Zjm: All gears. The fishery meets both issues of SG100: (i) there is a high degree of certainty that the 5Zjm stock is above $B_{recover} = 9,000$ mt, where recruitment may be impaired and stock dynamics are unknown; and (ii) there is a high degree of certainty that the stock has been fluctuating around its target reference point, or has been above its target reference point, over recent years. The 2008 stock assessment indicates that the stock has been above the target level of 80,000 mt for the past three years. On that basis a score of 100 is allocated to each UoC in this fishing area.

Audit Trace References

ICES 1997 Comprehensive fishery evaluation working group (COMFIE), unpublished report, pgs 51-54; Hurley *et al.* (2005); CSAS Science Advisory Report 2005/056; Van Eekhaute *et al.* 2008; TRAC Status Report 2008/02.

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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1.1.2	<p>Reference Points: Limit and target reference points are appropriate for the stock.</p>	<p>Generic limit and target reference points are based on justifiable and reasonable practice appropriate for the species category.</p>	<p>Reference points are appropriate for the stock and can be estimated.</p> <p>The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity.</p> <p>The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome.</p> <p>For low trophic level species, the target reference point takes into account the ecological role of the stock.</p>	<p>Reference points are appropriate for the stock and can be estimated.</p> <p>The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity following consideration of relevant precautionary issues.</p> <p>The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome, or a higher level, and takes into account relevant precautionary issues such as the ecological role of the stock with a high degree of certainty.</p>
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Scoring Comments					
<p>4X5Y. The biomass level of 22,000 mt for 4X5Y haddock appears to be an appropriate and estimable choice of limit reference point because the stock has clearly recovered from that level in the past and within a reasonable time. During the past 10 years, there have been at least 4 strong year-classes indicating a low risk that recruitment is impaired at biomass levels near the LRP. The target reference point is implicit in the definition of $F_{0.1}$, which serves as an estimable surrogate for F_{MSY}. If harvested consistently at or below $F_{0.1}$, the 4X5Y haddock stock should fluctuate around or above B_{MSY}. The stock is not considered a low trophic level species.</p> <p>5Zjm. Management of 5Zjm haddock by DFO has avoided specifying explicit biomass reference points because such actions would risk imposing Canadian domestic fisheries policy on management of international resources shared with the U.S. (S. Gavaris, pers comm., 24 July 2009). Nevertheless, DFO analyses of stock-recruitment data for 5Zjm haddock suggest that "the chance of observing a strong year-class is significantly lower for [age3-9] biomass below about 40,000 mt, while the chance of observing a weak year class is very high". Thus, an LRP = 40,000 mt appeared to be a spawning biomass level where average recruitment may decline. Note, however, that $B_{recover} = 9,000$ mt for this stock, which leaves the point of productivity impairment far below 40,000 mt. Management of 5Zjm haddock currently uses a limit reference point of 40,000 mt as a level that is estimable and well above the point at which there is appreciable risk of impairing reproductive capacity.</p> <p>An implicit target reference point for this stock is defined by computing the expected equilibrium yield when a population with average recruitment is harvested using the $F_{0.1}$ harvest strategy. The resulting target of approximately $B_{MSY} = 80,000$ mt is expected to be slightly larger than B_{MSY} for this stock because $F_{0.1}$ is slightly lower than F_{MAX} (i.e., the fishing mortality rate that maximizes yield-per-recruit).</p>					
Score:	Area	OTB	BLL	GN	HL
	4X5Y	90	90	90	90
	5Zjm	100	100	100	100
<p>4X5Y. All gears. The fishery meets the first and third issues of SG100 i.e., reference points are appropriate for the stock and can be estimated, and the target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome, while precautionary issues such as the ecological role of the stock are not considered relevant when setting this target reference point. Setting the limit reference point above the level at which there may be an appreciable risk of impairing reproductive capacity meets the second issue of SG80; however, in setting these reference points there has not been explicit consideration of relevant precautionary issues such as stock structure and alternative growth and recruitment hypotheses. Accordingly, each UoC is awarded a score of 90</p> <p>5Zjm. All gears. The fishery meets all three issues of SG100 – although reference points are not defined for transboundary management reasons, they are</p>					

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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implicit and can be estimated. The implicit target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome, or higher level (e.g., by fishing at rates lower than $F_{0.1}$). The ecological role of the stock is not considered relevant when setting this target reference point. The limit reference point (LRP = 40,000 mt) is set above the level ($B_{recover} = 9,000$ mt) at which there may be appreciable risk of impairing reproductive capacity and although the reference points have not been evaluated extensively, the LRP is considered conservative based on some precautionary issues (e.g., COMFIE 1997). Accordingly, each UoC is awarded a score of 100

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ICES 1997, Comprehensive fishery evaluation working group (COMFIE), unpublished report, pgs 51-54; Hurley et al. (2005); CSAS Science Advisory Report 2005/056; Van Eekhaute et al. 2008; TRAC Status Report 2008/02;

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1.1.3	Stock Rebuilding: Where the stock is depleted, there is evidence of stock rebuilding.	Where stocks are depleted rebuilding strategies which have a reasonable expectation of success are in place. Monitoring is in place to determine whether they are effective in rebuilding the stock within a specified timeframe.	Where stocks are depleted rebuilding strategies are in place. There is evidence that they are rebuilding stocks, or it is highly likely based on simulation modelling or previous performance that they will be able to rebuild the stock within a specified timeframe.	Where stocks are depleted, strategies are demonstrated to be rebuilding stocks continuously and there is strong evidence that rebuilding will be complete within the shortest practicable timeframe.
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Scoring Comments

4X5Y The stock is considered to be rebuilt.

5Zjm The stock is considered to be rebuilt

Score:	Area	OTB	BLL	GN	HL
	4X5Y	NA	NA	NA	NA
	5Zjm	NA	NA	NA	NA

NA

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NA

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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1.2	Harvest Strategy (management)			
1.2.1	Harvest Strategy: There is a robust and precautionary harvest strategy in place	<p>The harvest strategy is expected to achieve stock management objectives reflected in the target and limit reference points.</p> <p>The harvest strategy is likely to work based on prior experience or plausible argument.</p> <p>Monitoring is in place that is expected to determine whether the harvest strategy is working.</p>	<p>The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving management objectives reflected in the target and limit reference points.</p> <p>The harvest strategy may not have been fully tested but monitoring is in place and evidence exists that it is achieving its objectives.</p>	<p>The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in the target and limit reference points.</p> <p>The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.</p> <p>The harvest strategy is periodically reviewed and improved as necessary.</p>

Scoring Comments

4X5Y. The harvest strategy for 4X5Y haddock aims to maintain fishing mortality at or below $F_{0.1}$. F has also been reduced in response to recent uncertainty in stock status. Evidence based on quantitative stock assessments suggest that this approach has maintained a steady rate of SSB growth over the past 15 years to a point where it is highly likely that the stock is well above the LRP. At the present time, life history characteristics appear to be in flux and the stock structure of

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4X5Y haddock is somewhat uncertain, which means that the robustness of the $F_{0.1}$ strategy and consequences of biomass estimation errors should be evaluated.

5Zjm. TMGC which is responsible for managing harvest of 5Zjm haddock uses a harvest strategy that maintains a low (5 % - 25 %) to neutral (50 %) risk of exceeding the F limit reference, $F_{\text{ref}} = F_{0.1} = 0.26$. If the stock approaches poor conditions (i.e. biomass near LRP = 40,000 mt), fishing mortality rates should be further reduced to promote rebuilding. TMGC's harvest strategy, which has been in place since the 1990s when the stock was below the LRP, is consistent with the DFO Harvest Strategy (described above for 4X5Y haddock) in spirit, but it does not have a clearly defined response to declining biomass. Both strategies look to maintain the stock around a target level near B_{MSY} , and both should reduce F as the spawning stock status approaches LRP. However, the TMGC strategy: (i) does not state specifically how F should be adjusted in response to stock decline; (ii) does not incorporate explicit reference points; and (iii) has not been fully evaluated using, for example, simulations to demonstrate robustness under normal circumstances (nor has the DFO strategy been fully evaluated). Despite these limitations, the increasing trend in spawning stock biomass since the 1990s provides strong evidence that the existing TMGC strategy has worked as intended over the past decade.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	80	80	80	80
	5Zjm	85	85	85	85

4X5Y. All gears. Each UoC meets the first and second issue of SG80 as (i) the harvest strategy is responsive to the state of the stock and the issues of the harvest strategy work together towards achieving management objectives reflected in the target and limit reference points.; and (ii) the harvest strategy may not have been fully tested, but monitoring is in place and evidence exists that it is achieving its objectives. The harvest strategy has not been periodically reviewed or changed since it was first adopted. On that basis each UoC is allocated a score of 80.

5Zjm. All gears. Each UoC meets the first and second issues of SG80 as (i) the harvest strategy is responsive to the state of the stock and the issues of the harvest strategy work together towards achieving management objectives reflected in the target and limit reference points.; and (ii) the harvest strategy may not have been fully tested, but monitoring is in place and evidence exists that it is achieving its objectives. The harvest strategy was partially evaluated in 1997 (COMFIE 1997). On that basis each UoC is allocated a score of 85.

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Hurley *et al.* (2005); Van Eekhaute *et al.* 2008; CSAS Science Advisory Report 2005/056; TRAC Status Report 2008/02; DFO. 2009. A fishery decision-making framework incorporating the Precautionary Approach. Website document - <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/precaution-eng.htm>; accessed 26 July 2009); ICES 1997, Comprehensive fishery evaluation working group (COMFIE), unpublished report, pgs 51-54

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1.2.2	Harvest control rules and tools: There are well defined and effective harvest control rules in place	<p>Generally understood harvest control rules are in place that are consistent with the harvest strategy and which act to reduce the exploitation rate as limit reference points are approached.</p> <p>There is some evidence that tools used to implement harvest control rules are appropriate and effective in controlling exploitation.</p>	<p>Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached.</p> <p>The selection of the harvest control rules takes into account the main uncertainties.</p> <p>Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules</p>	<p>Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached.</p> <p>The design of the harvest control rules take into account a wide range of uncertainties.</p> <p>Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules.</p>
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Scoring Comments

4X5Y. As shown by interviews during the site visit, the harvest control rules used for 4X5Y haddock in the past have generally been understood by science, management and stakeholders involved in the assessment process. Although it seems clear from management and assessment documents that F has been maintained at or below $F_{0.1}$, specific rules for adjusting F in response to changes in stock status are not well defined. In recent years, the lack of clear definition is attributable, in part, to other constraints on haddock fisheries such as limits on cod quotas in 4X5Y. In addition, there is a lack of well-defined harvest control rules for years in which quantitative stock assessments are not done (e.g. 2006-2008). Although evidence exists that quotas can be reduced in response to changes in survey indices, it is not certain that these adjustments will be consistent and transparent when such situations arise in the future.

Harvest control rules use a number of tools: quotas, closed areas and a Small Fish Protocol. Evidence showing that fishing mortality is under control supports the notion that these tools are appropriate and effective in controlling exploitation, even on sub-legal fish.

5Zjm. As shown by interviews during the site visit, the harvest control rules used for 5Zjm haddock in the past have been generally understood by science, management, and stakeholders involved in the assessment process. Despite this general understanding, the specific harvest control rule is not "well defined". The realized relationship between SSB and F between 1998 and 2006 demonstrates that the harvest control rule is responsive to changes in stock status; however,

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observed changes in fishing mortality were generated during a period in which stock size was increasing away from the LRP. Therefore, one cannot judge whether the harvest control rule ensures that exploitation will be reduced when biomass declines in the future toward the LRP. The harvest control rule has not been designed and tested to take known uncertainties explicitly into account.

Harvest control rules are implemented using a number of tools: quotas, closed areas, and a Small Fish Protocol. Evidence clearly shows that fishing mortality is under control, which further supports the notion that these tools are appropriate and effective in controlling exploitation, even on sub-legal fish.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	75	75	75	75
	5Zjm	75	75	75	75

4X5Y: All gears. The UoCs meet the first issue of SG60 as generally understood harvest control rules are in place that are consistent with the harvest strategy and which act to reduce the exploitation rate as limit reference points are approached. In addition, the UoCs meet the second and third issues of SG80; the selection of harvest control rules takes into account the main uncertainties and available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules. On that basis, each UoC achieves a score of 75. *As this score is below 80, a condition to certification has been raised (Condition 1). Once this condition has been satisfied the score for this PI will increase to 80 or above.*

5Zjm: All gears. The UoCs meet the first issue of SG60 as generally understood harvest control rules are in place that are consistent with the harvest strategy and which act to reduce the exploitation rate as limit reference points are approached. In addition, the UoCs meet the second and third issues of SG80; the selection of harvest control rules takes into account the main uncertainties and available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules. On that basis, each UoC achieves a score of 75. *As this score is below 80, a condition to certification has been raised (Condition 2). Once this condition has been satisfied the score for this PI will increase to 80 or above.*

Audit Trace References

Hurley *et al.* (2005); Van Eekhaute *et al.* 2008; CSAS Science Advisory Report 2005/056; TRAC Status Report 2008/02;

SCORING CRITERIA		SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
1.2.3	Information / monitoring: Relevant information is collected to support the harvest strategy	<p>Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.</p> <p>Stock abundance and fishery removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.</p>	<p>Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.</p> <p>Stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.</p> <p>There is good information on all other fishery removals from the stock.</p>	<p>A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, fishery removals and other information such as environmental information), including some that may not be directly relevant to the current harvest strategy, is available.</p> <p>All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of the inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.</p>
Scoring Comments				
4X5Y. There is a comprehensive range of information gathered on all aspects of haddock fisheries in 4X5Y including stock structure and abundance, fleet composition and removals by fisheries. Annual fishery-independent biomass surveys are critical to support the DFO Harvest Strategy and control rules - the 4X5Y fishery combines a DFO RV multi-species trawl survey with a fixed-station ITQ trawl survey designed specifically to monitor haddock biomass in 4X5Y.				

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Stock structure has been assessed in the past using a wide range of indicators. Fleet composition is known and fishing location is monitored regularly using VMS. Environmental data, such as temperature and salinity, oceans currents and forage species are also monitored either during the RV survey or by other DFO science activities. There is limited evaluation of assessment and management robustness to uncertainties in information.

5Zjm. There is a comprehensive range of information gathered on all aspects of haddock fisheries in 5Zjm including stock structure and abundance, fleet composition and removals by fisheries. Annual fishery-independent biomass surveys support the DFO Harvest Strategy and control rules - the 5Zjm fishery combines a DFO RV multi-species trawl survey with two NMFS trawl surveys. Stock structure has been assessed in the past using a wide range of indicators as well as explicit modelling of stock mixing based on survey data. Fleet composition is known and fishing location is monitored regularly using VMS. Environmental data, such as temperature and salinity oceans currents, and forage species are also monitored either during the trawl surveys or by other DFO and NMFS science activities.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	85	85	85	85
	5Zjm	85	85	85	85

4X5Y. All gears. Each UoC meets the first issue of SG 100 as there is a comprehensive range of information collected that may be used to support the harvest strategy. Each UoC meets the second and third issues of SG 80 as stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule and there is good information on all other fishery removals from the stock. Accordingly, each UoC is awarded a score of 85.

5Zjm. All gears. Each UoC meets the first issue of SG 100 as there is a comprehensive range of information collected that may be used to support the harvest strategy. Each UoC meets the second and third issues of SG 80 as stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule and there is good information on all other fishery removals from the stock. Accordingly, each UoC is awarded a score of 85.

Audit Trace References

Hurley *et al.* (2005); Van Eekhaute *et al.* 2008

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1.2.4	<p>Assessment of stock status: There is an adequate assessment of the stock status</p>	<p>The assessment estimates stock status relative to reference points.</p> <p>The major sources of uncertainty are identified.</p>	<p>The assessment is appropriate for the stock and for the harvest control rule, and is evaluating stock status relative to reference points.</p> <p>The assessment takes uncertainty into account.</p> <p>The stock assessment is subject to peer review.</p>	<p>The assessment is appropriate for the stock and for the harvest control rule and takes into account the major features relevant to the biology of the species and the nature of the fishery.</p> <p>The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.</p> <p>The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.</p> <p>The assessment has been internally and externally peer reviewed.</p>
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Scoring Comments

4X5Y. Assessment of stock status for 4X5Y haddock is done by estimating the number-at-age, biomass-at-age, fishing mortality-at-age and recruitment using the ADAPT implementation of VPA. Like any stock assessment method, VPA needs to be evaluated for systematic biases that may arise, especially from model

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mis-specification. A brief review of the 4X5Y ADAPT-VPA assessment suggests several potential misspecifications that need to be evaluated. Nevertheless, a quantitative model fitted to two fishery-independent survey datasets is reasonably appropriate for implementing the $F_{0.1}$ harvest strategy. The peer-reviewed approach taken for 4X5Y haddock is also appropriate for probabilistic determination of stock status relative to the LRP. Although information is monitored with high frequency, formal assessments are not performed with high frequency (last assessment in 2004/2005) or a high degree of certainty, and robustness of the management strategy, harvest control rules and assessments have not been rigorously evaluated.

5Zjm. Assessment of stock status for 5Zjm haddock is done by estimating the number-at-age, biomass-at-age, fishing mortality-at-age and recruitment using VPA as described above for 4X5Y haddock. However, unlike the 4X5Y assessment, the ADAPT-VPA for 5Zjm shows little systematic retrospective error, which lends greater confidence in the results. The ADAPT-VPA fitted to three fishery-independent survey datasets is reasonably appropriate for implementing the $F_{0.1}$ harvest strategy. The approach also provides a probabilistic determination of stock status relative to the chosen fishing mortality reference. However, the combination of a well-defined harvest control rule and assessment model needs to be developed and rigorously tested against alternative plausible hypotheses for stock dynamics, assessment errors and information gaps.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	90	90	90	90
	5Zjm	95	95	95	95

4X5Y. All gears. The assessment for 4X5Y haddock meets the first two issues of SG 100 as: it is appropriate for the stock and for the harvest control rule; it takes into account the major features relevant to the biology of the species and the nature of the fishery; it takes into account uncertainty; and is evaluating stock status relative to reference points in a probabilistic way. The fishery does not meet issue 3 of SG 100 because there is only limited testing of the specific ADAPT assessment method; robustness has not been tested against alternative hypotheses and alternative assessment approaches have not been rigorously explored. The stock assessment is subject to peer review and thus meets the third issue of SG80. Accordingly, the allocated score for each UoC is 90.

5Zjm. All gears. The assessment for 5Zjm haddock meets the first, second and fourth issues of SG 100 as: the assessment is appropriate for the stock and for the harvest control rule; it takes into account the major features relevant to the biology of the species and the nature of the fishery; it takes into account uncertainty; it is evaluating stock status relative to reference points in a probabilistic way; and it is subject to both internal and external peer review. The assessment did not meet issue 3 under SG 100 because: there is only limited testing of the specific ADAPT assessment method; robustness has not been tested against alternative hypotheses; and alternative assessment approaches have not been rigorously explored. Accordingly, the allocated score for each UoC is 95.

Audit Trace References

Hurley *et al.* (2005); Van Eekhaute *et al.* 2008

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Principle 2	Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends			
2.1	Retained non-target species			
2.1.1	<p>Status: The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species.</p>	<p>Main retained species are likely to be within biologically based limits or if outside the limits there are measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding of the depleted species.</p> <p>If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the retained species to be outside biologically based limits or hindering recovery.</p>	<p>Main retained species are highly likely to be within biologically-based limits, or if outside the limits there is a partial strategy of demonstrably effective management measures in place such that the fishery does not hinder recovery and rebuilding.</p>	<p>There is a high degree of certainty that retained species are within biologically based limits.</p> <p>Target reference points are defined and retained species are at or fluctuating around their target reference points.</p>
Scoring Comments				
<p>For the purposes of MSC assessments only species that comprise >5% of the total catch (by weight) are considered for analysis. A summary of the main retained by-catch species in the otter trawl and bottom long line haddock fisheries is provided in the main text, along with a review of information on the stocks of interest to this assessment. It should be noted the information available for white hake is quite dated. All groundfish (except dogfish, skates and sculpin) must be landed, with amounts recorded through logbooks, dockside monitoring and risk-based independent observer coverage. Below is a summary of the current status of these stocks (all 4X5Y, 5Zjm unless otherwise indicated):</p> <p>4X5Y Otter Trawl</p> <p>Cod. The annual average retained catch of cod by otter trawlers targeting haddock in 4X for the period 2002 to 2008 was 2,002 mt. 4X biomass indices from surveys have remained low since 2000 when a rebuilding strategy was initiated. SSB at the beginning of 2008 was 9,000 mt; the lowest level in a time-series that</p>				

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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started in 1948. Recruitment for the 2006 and 2007 year classes was below average, but about twice the abundance of the very low 2003 and 2004 year classes. While research vessel survey results increased by about 360% between 2008 and 2009, in historic terms biomass remains low and conclusions cannot depend on the results of one year. Total landings remained near 3,900 mt (i.e. < 5,000 mt TAC) from 2005 to 2008. The TAC for 2009 was reduced to 3,000 mt, and preliminary data indicates that the catch (directed cod fishery plus by-catch in other fisheries) totalled about 2,591 mt. The first scoring issue for SG60 is met, however whilst there a partial strategy in place that might be expected to ensure that the fishery does not hinder recovery and rebuilding of cod, it cannot yet be shown to be demonstrably effective and therefore the scoring issue for SG80 is not met.

Pollock. The annual average retained catch of pollock by otter trawlers targeting haddock in 4X for the period 2002 to 2008 was 3,461 mt. Estimates of Age 4+ (considered spawning stock) biomass declined from about 66,000 mt in 1984 to about 7,500 mt in 2000. Biomass has been rebuilding since 2000, increasing steadily to about 29,000 mt in 2007, but declining to 27,000 mt in 2008. Reduced quotas and harvests as well as increasing population biomass have contributed to a decline in the F on ages 6-9, which has been below the F_{ref} of 0.2 since 2006.

4X5Y Bottom Long Line

Cod. The annual average retained catch of cod by bottom long liners targeting haddock in 4X5Y for the period 2002 to 2008 was 1,731 mt. See above for stock status

Cusk. Cusk is considered by COSEWIC to be “threatened.” The annual average retained catch of cusk by bottom long liners targeting haddock in 4X5Y for the period 2002 to 2008 was 674 mt. Cusk abundance has declined since the 1970s; however, there is insufficient data to determine the degree of decline and there is conflicting evidence on whether cusk abundance has continued to decline since the late 1990s. Note that the assessment area is at the extreme SW of this species’ range The 2008 Recovery Potential Assessment (RPA) for cusk stated that, assuming that unreported bycatch and discards remain constant, commercial landings in 4X of about 200 mt would result in a 75% chance of observing at least a 50% increase in biomass after 15 years (1 generation), while 4X landings of about 600 mt would result in only about a 54% chance of observing at least a 50% increase in biomass after 15 years. These landings would have to be increased by 1.43 times to be applicable to the entire management area (4VWX + 5Zc). The quota caps have been set accordingly and landings for all areas in 2008/09 were 609 mt. Note that the assessment area is at the extreme SW of this species’ range.

White Hake. The annual average retained catch of white hake by bottom long liners targeting haddock in 4X5Y for the period 2002 to 2008 was 521 mt. In 4X5Y, there has been a general decrease in the abundance of white hake since the early 1990s. Fishing mortality is relatively low in all areas since the introduction of catch limits in 1996. Total mortality on the Scotian Shelf is high and its causes are unknown. Total mortality of white hake in the Bay of Fundy is variable without trend. The SAR 2010 (as reported by GEAC in January, 2010) observes that white hake in 4VWX were distributed throughout the survey area, with the largest catches in the Gulf of Maine (4Xpq), the Bay of Fundy, and in 4Vn. Biomass indices have risen for the last two years in all regions. In 4X East, abundance indices were above average for most lengths below 58cm in 2009, but below average for larger fish. This is similar to what was seen in 2008. White hake abundance indices in 4X West were near average for most lengths in both 2008 and 2009.

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Halibut. (3NOPs4VWX). The annual average retained catch of Atlantic halibut by bottom long liners targeting haddock in 4X5Y for the period 2002 to 2008 was 350 mt. Based on catch rate analyses of the halibut survey (industry / DFO longline survey), the adult population seem relatively stable. The preferred analysis suggests a statistically significant increasing trend over an 11 year time series, although not all sources of uncertainty have been evaluated.

Spiny Dogfish. The annual average retained catch of spiny dogfish by bottom long liners targeting haddock in 4X5Y for the period 2002 to 2008 was 1,334 mt. Spring minimum trawlable biomass estimates for spiny dogfish in Canadian and U.S. waters show similar trends, increasing from the early 1980s to the early 1990s, then declining somewhat to the present. Mean values for both indices were around 500,000 mt in the early 1990s, declining to about 300,000 mt in 2007 for the Canadian index.

5Zjm Otter Trawl

Pollock. The annual average retained catch of pollock by otter trawlers targeting haddock in 5Zjm for the period 2002 to 2008 was 1,054 mt. See above for stock status

Yellowtail. The annual average retained catch of yellowtail by otter trawlers targeting haddock in 5Zjm for the period 2002 to 2008 was 699 mt. Recruitment has improved; the 1997 year class being the strongest since that of 1973. Stock biomass has increased 10 fold since 1995 and is the highest since 1973. Exploitation rates are below $F_{0.1}$

5Zjm Bottom Long Line

Cod. The annual average retained catch of cod by bottom long liners targeting haddock in 5Zjm for the period 2002 to 2008 was 623 mt. 5Zjm adult population biomass declined substantially from 43,800 mt in 1990 to 13,200 mt in 2005 but increased again to 19,300 mt at the beginning of 2008. The 2002, 2004 and 2006 year classes, at less than 1 million fish each, are the lowest on record. Although the 2005 year class at Age1 is stronger than any of these cohorts, it is below the 1978 to 2007 average. Assuming a 2008 catch equal to the 2,300 mt total quota, a combined Canadian / US catch of about 2,100 mt in 2009 would result in a neutral risk (50 %) that the fishing mortality rate in 2009 will exceed F_{ref} , whereas a catch of 1,300 mt in 2009 would result in a neutral risk (50 %) that the 2010 adult biomass will be lower than the 2009 adult biomass. A 10 % biomass increase is unlikely even with no catch.

Cusk. The annual average retained catch of cusk by bottom long liners targeting haddock in 4Zjm for the period 2002 to 2008 was 194 mt. See above for stock status.

4X/5Y / 5Z Gillnet & Hand line. While data is not available on by catch in these four fisheries, the level of activity would appear to be strongly indicative that retained by catch is minimal

Score:	Area	OTB	BLL	GN	HL
	4X5Y	70	70	100	100
	5Zjm	80	80	100	100

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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4X5Y Otter Trawl. The score allocated to this UoC is dependent on the stock status of two main retained species – pollock and cod. On the basis of available information, cod meets the first issue of SG 60 and pollock meets the single issue of SG80. Accordingly, for this PI the UoC is awarded a score of 70. *As this score is below 80, a condition to certification has been raised (Condition 3). Once this condition has been satisfied the score for this PI will increase to 80 or above.*

4X5Y Bottom Long Line. The score allocated to this UoC is dependent on the stock status of five retained species – in order of importance (by weight): Cod, Cusk, Spiny Dogfish, White Hake and Atlantic Halibut. On the basis of available information, cod meets the first element of SG 60 while white hake meets the second element of SG 60. Spiny dogfish, cusk and Atlantic halibut meet the single element of SG80. Accordingly, for this PI the UoC is awarded a score of 70. *As this score is below 80, a condition to certification has been raised (Condition 3). Once this condition has been satisfied the score for this PI will increase to 80 or above.*

5Zjm Otter Trawl. The score allocated to this UoC is dependent on the stock status of two retained species – in order of importance (by weight): Pollock and Yellowtail. Both of these species meet the single element of SG80. Accordingly for this PI the UoC is awarded a score of 80.

5Zjm Bottom Long Line. The score allocated to this UoC is dependent on the stock status of two retained species – Cod and Cusk. Both cod and cusk meet the single issue of SG80. Accordingly, for this PI the UoC is awarded a score of 80

4X5Y Gillnet. Given the nature, scale and intensity of this fishery, there is a high degree of certainty that retained species are within biologically based limits and accordingly the UoC is allocated a score of 100 for this PI.

5Zjm Gillnet. See 4X5Y gill net The UoC is allocated a score of 100 for this PI.

4X5Y Hand line. See 4X5Y gill net The UoC is allocated a score of 100 for this PI.

5Zjm Hand line. See 4X5Y gill net The UoC is allocated a score of 100 for this PI.

Audit Trace References

DFO, 2009a; Clark *et al.* 2008, DFO, 2009b; DFO, 1999; FRCC, 2004; DFO, 2003a; DFO, 2008; Campana *et al.*, 2007; DFO, 2005b; DFO, 2004a; DFO, 2006a; DFO, 2009c.

SCORING CRITERIA		SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
2.1.2	<p>Management strategy: There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species.</p>	<p>There are measures in place, if necessary, that are expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.</p> <p>The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).</p>	<p>There is a partial strategy in place, if necessary that is expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.</p> <p>There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.</p> <p>There is some evidence that the partial strategy is being implemented successfully.</p>	<p>There is a strategy in place for managing retained species.</p> <p>The strategy is mainly based on information directly about the fishery and/or species involved, and testing supports high confidence that the strategy will work.</p> <p>There is clear evidence that the strategy is being implemented successfully, and intended changes are occurring.</p> <p>There is some evidence that the strategy is achieving its overall objective.</p>

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Scoring Comments

The CHPs provide the measures for the different fleet segments to complement the specific species strategies by stipulating the total bycatch of species that can be taken on each trip in percentage terms. If this limit is exceeded, observer coverage is increased and further action may be taken as necessary. Under the “small fish protocol” in the CHPs, fisheries can be closed if the number of fish reaches or exceeds 15% of the catch of cod, pollock, white hake, Atlantic halibut and all flatfish or when incidental catches of a closed species reaches or exceeds the established level for the fleet (refers to CHP).

Regarding the specific stocks of interest to the various UoCs under consideration:

4X5Y Otter Trawl

Cod. This stock is under a rebuilding strategy with TACs allocated through EAs, ITQs and community quotas. However, the latest DFO advisory report (DFO, 2009a) suggests that “to be compliant with the principles of the precautionary approach, removals of cod from all fisheries should be reduced to the lowest possible level. This would imply substantial reductions in TAC below current catch levels, and additional measures to reduce cod catch in the mixed-species groundfish fisheries and cod by-catch in other fisheries”.

Pollock. The catch is allocated through ITQs and community quotas. The risk averse (25% risk of exceeding F_{ref} of 0.2) to risk neutral (50% risk of exceeding F_{ref}) range of harvest strategies for 4Xopqrs+5 in the 2009/2010 fishing year is 3,700 mt to 4,400 mt. If fished at F_{ref} , the projected 2009/2010, age 2+ catch biomass is 4,100 mt; 83 % of which will be represented by ages 6-8. At this level of harvest, Aae 5+ population biomass will decrease from 2009 to 2010.

4X5Y Bottom Long Line

Cod. See above

Cusk. Licence conditions are set to limit incidental catch. According to the population models used and assuming that unreported bycatch and discards remain constant, commercial landings in 4X of about 200 mt would result in a 75 % chance of observing at least a 50 % increase in biomass after 15 years (1 generation). In contrast, landings of about 600 mt would result in a 54 % chance of observing at least a 50 % increase in biomass in the same period..

Spiny Dogfish. Data and stock assessment modelling in 2009 (TRAC Spiny Dogfish Benchmark and Assessment) for Area 5Z will be the basis for future fisheries management. There is currently a precautionary quota (2,500 mt). Discarding is allowed due to high rate of survival. The level of retained catch is to a larger extent dependent on market conditions.

White Hake. Since 1999, the white hake fishery has only been a by-catch fishery and is managed through incidental quotas.

Atlantic Halibut. (3NOPs4VWX). Although the exploitation rate is double M and $F_{0.1}$, given that recent abundance indices from the halibut survey have shown an increase and there are good signs of recruitment, a 15 % increase in the TAC for the 2009 / 2010 fishing season is not expected to increase the risk to the

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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stock as compared to the previous 4 years.. The TAC is allocated through ITQs and community quotas.

5Zjm Otter Trawl

Pollock. See above

Yellowtail. The TAC for this stock was reduced drastically from the nineteen seventies to 9,000 mt but has since increased. The established fishing mortality threshold reference, $F_{\text{ref}} = 0.25$, has been consistently maintained. The TAC for this species allocated through ITQs and community quotas

5Zjm Bottom Long Line

Cod. TMGC has adopted a strategy to maintain a low to neutral risk of exceeding the fishing mortality limit reference, $F_{\text{ref}} = 0.18$. When stock conditions are poor, F should be further reduced to promote rebuilding. Cod in 5Zjm is under a rebuilding strategy with TAC allocated through EAs, ITQs and community quotas

Cusk. See above.

4X5Y / 5Zjm Gillnet & Hand line. While data is not available on by catch in these four fisheries, the level of activity would appear to be strongly indicative that retained by catch is minimal.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	80	80	100	100
	5Zjm	90	80	100	100

4X5Y Otter Trawl. Through the CHP there is a strategy in place for managing main retained species (pollock, cod), so the UoC meets the first element of SG100. The UoC meets the second element of SG 60 for cod, while pollock meets the second and third elements of SG 80. On that basis the score allocated is 80.

4X5Y Bottom Long Line. Through the CHP there is a strategy in place for managing main retained species (cod, cusk, spiny dogfish, white hake and Atlantic halibut), so the UoC meets the first element of SG100. Cod, cusk and white hake only meet the second element of SG60, while spiny dogfish and Atlantic halibut meet the second element and third elements of SG80. On that basis the score allocated is 80.

5Zjm Otter Trawl. Through the CHP and separator trawl there is a strategy in place for managing main retained species (pollock and yellowtail), so the UoC meets the first element of SG100. In addition, pollock and yellowtail meet the second and third elements of SG80. Accordingly, the UoC is allocated a score of 90 for this PI.

5Zjm Bottom Long Line. Through the CHP there is a strategy in place for managing main retained species (cod and cusk) so the UoC meets the first element of SG100. Both species meet the second element of SG60. Accordingly, the UOC receives a score of 80 for this PI.

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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4X5Y Gillnet. Given the nature, scale and intensity of this fishery, there is a high degree of certainty that retained species are within biologically based limits and accordingly the UoC is allocated a score of 100 for this PI.

5Zjm Gillnet. See 4X5Y gill net The UoC is allocated a score of 100 for this PI.

4X5Y Hand line. See 4X5Y gill net The UoC is allocated a score of 100 for this PI.

5Zjm Hand line. See 4X5Y gill net The UoC is allocated a score of 100 for this PI.

Audit Trace References

DFO, 2009a; Clark *et al.*, 2008, DFO, 2009b; DFO, 1999; FRCC, 2004; DFO, 2003a; DFO, 2008; Campana *et al.*, 2007; DFO, 2005b; DFO, 2004a; DFO, 2006a; DFO, 2009c.

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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2.1.3	<p>Information / monitoring: Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species.</p>	<p>Qualitative information is available on the amount of main retained species taken by the fishery.</p> <p>Information is adequate to qualitatively assess outcome status with respect to biologically based limits.</p> <p>Information is adequate to support measures to manage main retained species.</p>	<p>Qualitative information and some quantitative information are available on the amount of main retained species taken by the fishery.</p> <p>Information is sufficient to estimate outcome status with respect to biologically based limits.</p> <p>Information is adequate to support a partial strategy to manage main retained species.</p> <p>Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy).</p>	<p>Accurate and verifiable information is available on the catch of all retained species and the consequences for the status of affected populations.</p> <p>Information is sufficient to quantitatively estimate outcome status with a high degree of certainty.</p> <p>Information is adequate to support a comprehensive strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.</p> <p>Monitoring of retained species is conducted in sufficient detail to assess ongoing mortalities to all retained species.</p>
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Scoring Comments
All groundfish (except dogfish, skates and sculpin) must be landed and are recorded by a combination of logbook recordings supported by dockside monitoring

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and risk-based independent observer coverage.

With the absence of discarding of these species, unobserved mortality is likely to be low. Anecdotal reports of high grading (discarding of smaller fish to allow a greater proportion of larger fish within quota limits) appear to be disproven by DFO observed in comparison to dockside monitoring assessments.

Score:	Area	OTB	BLL	GN	HL
	4X/5Y	100	100	100	100
	5Zjm	100	100	100	100

4X5Y Otter Trawl. This UoC meets all the issues of SG100. Given the level of dock side monitoring and associated sales slips, information about retained species is both accurate and verifiable, and may be used to quantitatively estimate outcome status, support a comprehensive strategy to manage retained species and provide sufficient detail to assess on-going mortalities to all retained species. The allocated score is 100.

4X5Y Bottom Long Line. See above. The allocated score is 100.

5Zjm Otter Trawl. See above. The allocated score is 100

5Zjm Bottom Long Line. See above. The allocated score is 100

4X5Y Gillnet. See above. The allocated score is 100

5Zjm Gillnet. See above. The allocated score is 100

4X5Y Hand line. See above. The allocated score is 100

5Zjm Gillnet. See above. The allocated score is 100

Audit Trace References

DFO, 2009a; Clark *et al.*, 2008, DFO, 2009b; DFO, 1999; FRCC, 2004; DFO, 2003a; DFO, 2008; Campana *et al.*, 2007; DFO, 2005b; DFO, 2004a; DFO, 2006a; DFO, 2009c.

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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2.2	Discarded species (also known as “by-catch” or “discards”)			
2.2.1	<p>Status The fishery does not pose a risk of serious or irreversible harm to the by-catch species or species groups and does not hinder recovery of depleted by-catch species or species groups.</p>	<p>Main by-catch species are likely to be within biologically based limits, or if outside such limits there are mitigation measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding.</p> <p>If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the by-catch species to be outside biologically based limits or hindering recovery.</p>	<p>Main by-catch species are highly likely to be within biologically based limits or if outside such limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding.</p>	<p>There is a high degree of certainty that by-catch species are within biologically based limits.</p>

Scoring Comments

The only groundfish species permitted to be discarded are dogfish, sculpin, skate, Atlantic halibut less than 81cm in length, Northern wolffish & spotted wolffish, non-licensed groundfish and any non-groundfish species. Of the species, the only one to be higher than 5 % is spiny dogfish. However, following the MSC FAM, the certification team considers skates and cusk to be vulnerable and thus takes these species into consideration.

4X5Y Otter Trawl.

Spiny Dogfish. The annual average discarded catch of spiny dogfish by otter trawlers targeting haddock in 4X5Y in 2002 - 2008 was 777 mt (1,455 mt in 2008), or less than 5 % (over the period) of the haddock catch.

Skate. The annual average discarded catch of skate by otter trawlers targeting haddock in 4X5Y in 2002 - 2008 was 197 mt (114 mt in 2008), or 1.1 % (over the period) of the haddock catch. The thorny skate (*Amblyraja radiata*) is the most common of the Scotian Shelf skates. Its abundance has decreased from the highs

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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of the 1980s but has since stabilised. The species is mainly concentrated to the SW of the Grand Banks. Trends in survey abundance and biomass indices for barndoor skate (considered by IUCN to be ‘threatened’) in shallow waters (< 200 fathoms) are well documented for Canada. A decline in the survey indices occurred in the mid-1960s to early 1970s, likely caused by the high fishing effort of the distant water fleet on Georges Bank, followed by a period of low to zero catches. In 1985, consistent catches of barndoor skate started with observed increases in survey indices that have continued. There was a COSEWIC assessment for this species in 2005 which determined that populations within the combined 4X and 5Ze area were of ‘special concern’, although stable.

Cusk. The annual average discarded catch of cusk by otter trawlers targeting haddock in 4X5Y in 2002 - 2008 was virtually 0 with only 3 mt taken in 2004.

4X5Y Bottom Long Line

Spiny Dogfish. The annual average discarded catch of spiny dogfish by bottom long liners targeting haddock in 4X5Y in 2002 - 2008 was 445 mt (36 mt in 2008), or 7.1 % (over the period) of the haddock catch.

Skate. The annual average discarded catch of skate by bottom long liners targeting haddock in 4X5Y in 2002 - 2008 was 274 mt (224 mt in 2008), or 4.4 % (over the period) of the haddock catch.

Cusk. The annual average discarded catch of cusk by bottom long liners targeting haddock in 4X5Y in 2002 - 2008 was 53 mt, but almost all was in the final two years, with only 3 mt taken in the remaining period. Cusk abundance has declined since the 1970s and is considered by COSEWIC as ‘threatened’. However, there is insufficient data to determine the degree of decline and there is conflicting evidence on whether cusk abundance has continued to decline since the late 1990s.

5Zjm Otter Trawl

Spiny Dogfish. The annual average discarded catch of spiny dogfish by otter trawlers targeting haddock in 5Zjm in 2002 - 2008 was 33 mt (24 mt in 2008) , or less than 0.3% (over the period) of the haddock catch.

Skate. The annual average discarded catch of skate by otter trawlers targeting haddock in 5Zjm in 2002 - 2008 was 446 mt. There was only 71 mt in 2008 as the data is strongly weighted by the catch in 2002 & 2003. The low level of discards is indicative of the success of the separator trawl.

5Zjm Bottom Long Line

Spiny Dogfish. The annual average discarded catch of spiny dogfish by bottom long liners targeting haddock in 5Zjm in 2002 - 2008 was 34 mt (0 mt in 2008), or 1.2 % (over the period) of the haddock catch.

Skate. The annual average discarded catch of skate by bottom long liners targeting haddock in 5Zjm in 2002 - 2008 was 114 mt (118 mt in 2008), or 4.0 % (over the period) of the haddock catch.

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Cusk. The annual average discarded catch of cusk by bottom long liners targeting haddock in 5Z in 2002 - 2008 was 7 mt (4 mt in 2008), or 0.2 % (over the period) of the haddock catch.

4X5Y Gillnet. The limited observer data suggests that this fishery does discard spiny dogfish, albeit at low levels compared to the trawl and longline fisheries.

5Zjm Gillnet & 4X5Y & 5Zjm Hand line. While data is not available on by catch in these three fisheries, the level of activity would appear to be strongly indicative that the level of discarded by catch is minimal.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	70	70	80	100
	5Zjm	80	70	100	100

4X5Y Otter Trawl. While the by-catch of dogfish is relatively high, given the good post-discard survival levels and its resilience there is a high degree of certainty that the stock is within biologically based limits and it therefore meets the single issue of SG80. While the by-catch of skate is low this includes around 40% winter skate that is considered by COSEWIC to be of “special concern”, although populations appear stable this meets the first issue of SG60.

Accordingly, the overall score allocated to this UoC is 70. *As this score is below 80, a condition to certification has been raised (Condition 4). Once this condition has been satisfied the score for this PI will increase to 80 or above.*

4X5Y Bottom Long Line. As above, except that skate catches tend to be the barndoor skate, which is considered by IUCN to be ‘threatened’. Despite consistent catches and increases in survey indices since about 1985 this only meets the first issue of SG60. The overall score allocated is 70. *As this score is below 80, a condition to certification has been raised (Condition 4). Once this condition has been satisfied the score for this PI will increase to 80 or above.*

5Zjm Otter Trawl. Discarded by catch is low due to the mandatory use of the separator trawl. It is considered that there is a high degree of certainty that by-catch species are within biologically based limits and accordingly the UoC receives a score of 80 for this PI.

5Zjm Bottom Long Line. As 4X/5Y above, although dogfish by-catch is substantially lower. The overall score allocated is 70. *As this score is below 80, a condition to certification has been raised (Condition 4). Once this condition has been satisfied the score for this PI will increase to 80 or above.*

4X5Y Gillnet. There is some discard of spiny dogfish, although at levels reflecting the low intensity of this fishery. The overall score allocated is 80.

5Zjm Gillnet While data is not available on by catch in this fishery, the level of activity and the selectivity of the gear would indicate that there is a high degree of certainty that by-catch species are within biologically based limits. A score of 100 is allocated

4X5Y Hand line. See 5Zjm gill net. A score of 100 is allocated

5Zjm Hand line. See 5Zjm gill net A score of 100 is allocated

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Audit Trace References
Kulka 1999, Kulka <i>et al.</i> 2002 Dulvy, N.K. 2003 ; COSEWIC, 2005 ; DFO, 2007 ; Simon <i>et al.</i> , 2003

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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2.2.2	<p>Management strategy: There is a strategy in place for managing by-catch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to by-catch populations.</p>	<p>There are measures in place, if necessary, which are expected to maintain main by-catch species at levels which are highly likely to be within biologically based limits or to ensure that the fishery does not hinder their recovery.</p> <p>The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).</p>	<p>There is a partial strategy in place, if necessary, for managing by-catch that is expected to maintain main by-catch species at levels which are highly likely to be within biologically based limits or to ensure that the fishery does not hinder their recovery.</p> <p>There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or the species involved.</p> <p>There is some evidence that the partial strategy is being implemented successfully.</p>	<p>There is a strategy in place for managing and minimising by-catch.</p> <p>The strategy is mainly based on information directly about the fishery and/or species involved, and testing supports high confidence that the strategy will work.</p> <p>There is clear evidence that the strategy is being implemented successfully, and intended changes are occurring. There is some evidence that the strategy is achieving its objective.</p>
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Scoring Comments

All groundfish species targeted or caught incidentally must be retained except for those groundfish species identified in license conditions. The only groundfish species permitted to be discarded are dogfish, sculpin and skate. License conditions also require the release of all Atlantic halibut less than 81cm and all threatened species such as northern and spotted wolffish. Under section 33 of the General Fishing Regulations individuals can only retain species for which they have a commercial license. While fishing under a groundfish license, all non-groundfish such as striped bass, crab and lobster must be returned to the ocean in a manner that causes the least harm. On longline vessels, white hake is permitted to be returned to the water as bait. This 'limited discard' strategy is based on the premise that only those species with a higher level of post-discard survival are released at sea. CHPs also provide details of mesh & hook sizes and other technical limits that assist minimise non-target by-catch. In the case of the fixed gears e.g. gillnets, the CHPs (for (i) <45' vessels, (ii) 45 – 65' and (iii) 65-

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100' vessel classes) represent a specific management strategy - these CHPs are prepared by DFO and supported by the Scotia Fundy Fixed Gear Advisory Committee that meets twice yearly.

Dogfish. This species is fished under a precautionary quota (BLL) and permitted discards due to high survivability. Spiny dogfish are relatively hardy fish, so it is reasonable to assume that discard mortality is not 100%. Published studies report discard mortalities of 0-29% for dogfish caught with OTB (depending on catch size), and 55% mortality for gillnet-caught fish. On this basis, dogfish discard mortality rates in Canadian waters were calculated as: 25% for OTB catches > 200 kg; 0% for OTB catches < 200 kg; 55% for gillnet catches; 10% for longline catches; and 25% for purse seine catches. Observer data in 4X5Y for the years 2002-2006 have been analysed. For groundfish OTB, 77% of the sets corresponding to 15% of the landed catch were less than 200 kg, suggesting that overall mortality rates in the OTB fishery are around 35%. Longliners avoid dogfish as they damage the gear and they often use 'test tubs' to determine the level of dogfish in the area and move on if too high.

Skates. Skate by-catch has remained fairly consistent in the longline and 4X5Y trawl fisheries but has fallen from >1,000 mt per annum in 2003 to less than 100 mt since the introduction of the separator panel in the 5Zjm trawl fishery. The majority of the skates caught are thought to be thorny skate, although there may be a small quantity of winter skate (*Leucoraja ocellata*) included in the discards. Early in the 2000's, by-catch of thorny skate was high relative to other species but has since declined. The mandatory use of separator panels in otter trawls and reduced fishing for yellowtail flounder have reduced the capture of this species substantially. Thorny skate by-catch has been stable over several years. There is no gear modification or alternate bait strategy to reduce the harvest of skate by longline vessels but survival of returned fish is thought to be less than 50%. Research on skate survival following discarding from demersal trawlers is around 55% and like dogfish, was positively correlated with cod end weight.

Cusk. The only fishery that discards this species is the bottom longline fishery in 4X5Y. Observer-derived figures suggest that this is around 0.8% of the total catch (i.e. 53 mt averaged over 2002 – 2008). It may be that this figure is a statistical artefact that reflects changes in observer coverage and in fact cusk by-catch may be significantly lower.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	80	80	100	100
	5Zjm	100	80	100	100

4X5Y Otter Trawl. The UoC meets the three issues of SG 80. There is a partial strategy in place (release of species with likely high post-discard survival e.g. dogfish and skate) that is expected to maintain the main by-catch species within biologically-based limits. This is likely to work, based upon comparable research and experience. A score of 80 is allocated.

4X5Y Bottom Long Line. As above. A score of 80 is allocated.

5Zjm Otter Trawl Dogfish catches have been effectively eliminated and skate catches have reduced over past 8 years from 1,500 to <100 mt through the

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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mandatory use of separator trawls. There is therefore a high confidence that this strategy will work and clear evidence that it is being implemented successfully and this UoC meets the three issues of SG100 and a score of 100 is allocated.

5Zjm Bottom Long Line. The UoC meets the three issues of SG80: there is a partial strategy in place (release of species with likely high post-discard survival e.g. dogfish and skate) that is expected to maintain the main by-catch species within biologically-based limits. This is likely to work, based upon comparable research and experience. A score of 80 is allocated.

4X5Y Gillnet. Given the low intensity of this fishery, this UoC meets the three issues of SG100. A score of 100 is allocated.

5Zjm Gillnet. Given the low intensity of this fishery, this UoC meets the three issues of SG100. A score of 100 is allocated.

4X5Y. Hand line. Given the low intensity of this fishery, this UoC meets the three issues of SG100. A score of 100 is allocated.

5Zjm Hand line. Given the low intensity of this fishery, this UoC meets the three issues of SG100. A score of 100 is allocated.

Audit Trace References

S. Gavaris, pers.comm., 24 July 2009; Kulka 1999, Kulka *et al.* 2002 ; Dulvy, N.K. 2003; COSEWIC, 2005; DFO, 2007; DFO, 2008; Simon *et al.*, 2003

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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2.2.3	<p>Information / monitoring</p> <p>Information on the nature and amount of by-catch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage by-catch.</p>	<p>Qualitative information is available on the amount of main by-catch species affected by the fishery.</p> <p>Information is adequate to broadly understand outcome status with respect to biologically based limits.</p> <p>Information is adequate to support measures to manage by-catch.</p>	<p>Qualitative information and some quantitative information are available on the amount of main by-catch species affected by the fishery.</p> <p>Information is sufficient to estimate outcome status with respect to biologically based limits.</p> <p>Information is adequate to support a partial strategy to manage main by-catch species.</p> <p>Sufficient data continue to be collected to detect any increase in risk to main by-catch species (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy).</p>	<p>Accurate and verifiable information is available on the amount of all by-catch and the consequences for the status of affected populations.</p> <p>Information is sufficient to quantitatively estimate outcome status with respect to biologically based limits with a high degree of certainty.</p> <p>Information is adequate to support a comprehensive strategy to manage by-catch, and evaluate with a high degree of certainty whether a strategy is achieving its objective.</p> <p>Monitoring of by-catch data is conducted in sufficient detail to assess ongoing mortalities to all by-catch species.</p>
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SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Scoring Comments					
Only a limited number of species are permitted to be discarded (dogfish, skates and sculpin). There is no direct recording of discards in logbooks. They are only recorded by independent observer coverage. Observer coverage is high on the OTB fishery (26%) and BLL (8.9%) in 5Zjm but lower in 4X5Y (2.1% and 0.4% for OTB and BLL respectively) and this is translated into uncertainty about the actual volumes of discards.					
Score:	Area	OTB	BLL	GN	HL
	4X5Y	75	75	80	100
	5Zjm	80	80	80	100
<p>4X5Y Otter Trawl. The UoC meets the first three issues of SG 80, as there is qualitative and quantitative information available on the main by-catch species that is sufficient to estimate outcome status and support a partial management strategy for discard species. However, due to low observer coverage and no routine recording of discards, the UoC does not meet the fourth issue of SG80. Accordingly a score of 75 is allocated. <i>As this score is below 80, a condition to certification has been raised (Condition 5). Once this condition has been satisfied the score for this PI will increase to 80 or above.</i></p> <p>4X5Y Bottom Long Line. As above. A score of 75 is allocated. <i>As this score is below 80, a condition to certification has been raised (Condition 5). Once this condition has been satisfied the score for this PI will increase to 80 or above.</i></p> <p>5Zjm Otter Trawl. The UoC meets all four issues of SG80. There are both qualitative and some quantitative information on the amount of main by-catch species affected by the fishery through the observer programme, although coverage is low. This information is adequate to broadly understand the outcome with respect to biologically-based limits and support a partial strategy to managed main by-catch species. Information continues to be collected to detect any changes in risk. Accordingly a score of 80 is allocated.</p> <p>5Zjm Bottom Long Line. The UoC meets all four issues of SG 80, as there is qualitative and quantitative information available on the main by-catch species that is sufficient to estimate outcome status and support a partial management strategy for discard species and sufficient data continue to be collected to detect any increase in risk to main by-catch species. A score of 80 is allocated.</p> <p>4X5Y Gillnet. This UoC meets all four issues of SG80. Although there is qualitative information on the amount of main by-catch species affected by the fishery through the observer programme, coverage is low. This information is adequate to broadly understand the outcome with respect to biologically based limits. This information is adequate to support a partial strategy to managed main by-catch species and continues to be collected to detect any changes in risk. There is no routine recording of discards. Accordingly a score of 80 is allocated.</p> <p>5Zjm Gillnet. See 4X5Y gill net. A score of 80 is allocated.</p>					

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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<p>4X5Y Hand line. Given the low scale & intensity of this highly selective fishery, this UoC is awarded a score of 100. 3</p> <p>5Zjm Hand line. Given the low scale & intensity of this highly selective fishery, this UoC is awarded a score of 100.</p>
Audit Trace References
S. Gavaris, pers. comm., 24 July 2009; Kulka 1999, Kulka <i>et al.</i> 2002 ; Dulvy, N.K. 2003; COSEWIC, 2005; DFO, 2007; DFO, 2008; Simon <i>et al.</i> , 2003

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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2.3	Endangered, Threatened and Protected (ETP) species			
2.3.1	<p>Status: The fishery meets national and international requirements for protection of ETP species.</p> <p>The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species.</p>	<p>Known effects of the fishery are likely to be within limits of national and international requirements for protection of ETP species.</p> <p>Known direct effects are unlikely to create unacceptable impacts to ETP species.</p>	<p>The effects of the fishery are known and are highly likely to be within limits of national and international requirements for protection of ETP species.</p> <p>Direct effects are highly unlikely to create unacceptable impacts to ETP species.</p> <p>Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts.</p>	<p>There is a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species.</p> <p>There is a high degree of confidence that there are no significant detrimental effects (direct and indirect) of the fishery on ETP species.</p>

Scoring Comments

Interactions with ETP species by these fisheries is generally low as they are conducted at the bottom of the water column in reasonably deep water.

Wolffishes. The assessment areas are the extreme SW of these species range. Populations have declined heavily over the past 20 years although have now stabilised. It has been presumed that fishing mortality from bottom gears has been the primary cause (there is no directed fishery for wolffish but they are a small by-catch issue of the 4X5Y OTB fishery (c. 1.4 mt per annum average over 2002 – 2008) and the 5Zjm fishery (<1 t)), but the mismatch in area of greatest decline for wolffish and trawling activity indicates that trawling is the not the only cause of the decline in wolffish.

Atlantic salmon. Populations in the inner Bay of Fundy were designated as endangered in 2001. However it is not considered that the gears used in the fisheries

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under assessment are a threat to its recovery.

North Atlantic right whale. In Canadian waters, individuals congregate in the summer and fall in the lower Bay of Fundy, mainly east of Grand Manan Island, and in the vicinity of Roseway Basin between Browns and Baccaro banks on the western Scotian Shelf. The population appears to have been declining over the past decade. It is currently estimated to contain 322 individuals; from 222 to 238 of these are thought to be mature. Interaction with the fisheries under assessment appears from observer data to be negligible.

Harbour porpoises. These are an Appendix II species under CITES but only the Pacific Ocean population is regarded as endangered by SARA. Interaction with the fisheries under assessment appears from observer data to be negligible

Leatherback turtle. It is currently listed as ‘endangered’ under SARA. Interaction with the fisheries under assessment appears to be negligible

Score:	Area	OTB	BLL	GN	HL
	4X5Y	100	100	100	100
	5Zjm	100	100	100	100

4X5Y Otter Trawl. The UoC meets the two issues of SG100. Very low (<2 mt/annum) catches of wolffish suggest a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species and that there are no significant detrimental effects (direct and indirect) of the fishery on ETP species. Accordingly a score of 100 is allocated.

4X5Y Bottom Longline. The UoC meets the two issues of SG100. Wolffish catches in 4X5Y are the highest of all gears, but the effects of the fishery are known and are highly likely to be within limits of national and international requirements for this species. The direct effects are highly unlikely to create unacceptable impacts to ETP species. A score of 100 is allocated.

5Zjm Otter Trawl. The UoC meets the two issues of SG100. Negligible catches of wolffish suggest a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species and that there are no significant detrimental effects (direct and indirect) of the fishery on ETP species. Accordingly a score of 100 is allocated.

5Zjm Bottom Longline. The UoC meets the two issues of SG100. Very low (<2 mt/annum) catches of wolffish suggest a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species and that there are no significant detrimental effects (direct and indirect) of the fishery on ETP species. A score of 100 is allocated

4X5Y Gillnet. The UoC meets the two issues of SG100. There are negligible interactions with ETP species. A score of 100 is allocated.

5Zjm Gillnet. See 4X5Y gill net. A score of 100 is allocated.

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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<p>4X5Y Hand line There are no interactions with ETP species and this UoC is awarded a score of 100.</p> <p>5Zjm Hand line There are no interactions with ETP species and this UoC is awarded a score of 100.</p>
Audit Trace References
SARA registry (accessed July 2009) ; Kulka <i>et al.</i> 2004; Kulka <i>et al.</i> 2007

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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2.3.2	<p>Management strategy</p> <p>The fishery has in place precautionary management strategies designed to:</p> <ul style="list-style-type: none"> - meet national and international requirements; - ensure the fishery does not pose a risk of serious or irreversible harm to ETP species; - ensure the fishery does not hinder recovery of ETP species; and - minimise mortality of ETP species. 	<p>There are measures in place that minimise mortality, and are expected to be highly likely to achieve national and international requirements for the protection of ETP species.</p> <p>The measures are considered likely to work, based on plausible argument (eg general experience, theory or comparison with similar fisheries/species).</p>	<p>There is a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality that is designed to be highly likely to achieve national and international requirements for the protection of ETP species.</p> <p>There is an objective basis for confidence that the strategy will work, based on some information directly about the fishery and/or the species involved.</p> <p>There is evidence that the strategy is being implemented successfully.</p>	<p>There is a comprehensive strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, that is designed to achieve above national and international requirements for the protection of ETP species.</p> <p>The strategy is mainly based on information directly about the fishery and/or species involved, and a quantitative analysis supports high confidence that the strategy will work.</p> <p>There is clear evidence that the strategy is being implemented successfully, and intended changes are occurring. There is evidence that the strategy is achieving its objective.</p>
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Scoring Comments

The limited interactions with ETP species for all eight UoC indicate that specific ETP avoidance strategies are not needed. However, a number of national programmes have been employed to protect SARA registered species through designated recovery strategies. The main fishery related strategy means all incidentally taken endangered species must be released in a manner that maximizes their chance of survival. Other mechanisms include the designation of

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conservation areas for Northern right whales in the Roseway and Grand Manan basins, and an agreement with the USA to reduce catches of harbour porpoises to well below the agreed limit of 110 animals per year in the Grand Manan gillnet fishery.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	100	100	100	100
	5Zjm	100	100	100	100

4X5Y Otter Trawl. The UoC meets all three issues of SG100. A number of strategies manage the fishery's impact on ETP species. These are designed to meet national and international requirements for the protection of ETP species. They are mainly based on information directly about the fishery and / or species involved, and observer and other surveys support high confidence that the strategy will work. There is clear evidence that these strategies are being implemented successfully and that interactions with ETP species remain low. Accordingly a score of 100 is allocated.

4X5Y Bottom Long Line. As above. A score of 100 is allocated.

5Zjm Otter Trawl. As above. Accordingly a score of 100 is allocated.

5Zjm Bottom Long Line. As above. A score of 100 is allocated

4X5Y Gillnet. As above. A score of 100 is allocated.

4X5Y Hand line As above. A score of 100 is allocated

5Zjm Gillnet. As above. A score of 100 is allocated.

5Zjm Hand line As above. A score of 100 is allocated

Audit Trace References

DFO, 2002; DFO, 2004b; DFO, 2004b; SARA registry (accessed July 2009) ; SARA, 2006; Kulka *et al.* 2004; Kulka *et al.* 2007; Templeman 1984; O'Boyle 2001; Johnson *et al.* 2005; WWF/DFO 2000; Benjamins *et al.* 2008

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2.3.3	<p>Information / monitoring</p> <p>Relevant information is collected to support the management of fishery impacts on ETP species, including:</p> <ul style="list-style-type: none"> - information for the development of the management strategy; - information to assess the effectiveness of the management strategy; and - information to determine the outcome status of ETP species. 	<p>Information is adequate to broadly understand the impact of the fishery on ETP species.</p> <p>Information is adequate to support measures to manage the impacts on ETP species</p> <p>Information is sufficient to qualitatively estimate the fishery related mortality of ETP species.</p>	<p>Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species, and if so, to measure trends and support a full strategy to manage impacts.</p> <p>Sufficient data are available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species.</p>	<p>Information is sufficient to quantitatively estimate outcome status with a high degree of certainty.</p> <p>Information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives.</p> <p>Accurate and verifiable information is available on the magnitude of all impacts, mortalities and injuries and the consequences for the status of ETP species</p>
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Scoring Comments

Direct interactions with ETP species are recorded by independent observer coverage and in SARA log books. Observer coverage is high in the OTB (26%) and BLL (8.9%) fisheries in 5Zjm but lower in 4X5Y (2.1% and 0.4% for OTB and BLL respectively) and this translates into uncertainty about the actual levels of

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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interactions.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	80	80	80	90
	5Zjm	80	80	80	90

4X5Y Otter Trawl. The UoC meets the first issue of SG80 as information is sufficient to determine whether the fishery may be a threat to the protection and recovery of the ETP species, and if so, to measure trends and support a full strategy to manage impacts. There is also sufficient information recorded through the ‘Species at Risk’ logbook scheme to meet the second issue of SG80. Accordingly a score of 80 is allocated.

4X5Y Bottom Long Line. See above.

5Zjm Otter Trawl. The UoC meets the two issues of SG80 as information is sufficient to determine whether the fishery may be a threat to the protection and recovery of the ETP species, and if so, to measure trends and support a full strategy to manage impacts. High observer coverage provides sufficient data to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species. A score of 80 is allocated.

5Zjm Bottom Long Line. The UoC meets the two issues of SG80 as information is sufficient to determine whether the fishery may be a threat to the protection and recovery of the ETP species, and if so, to measure trends and support a full strategy to manage impacts. High observer coverage provides sufficient data to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species. A score of 80 is allocated

4X5Y / 5Zjm Gillnet. The UoC meets the first issue of SG80 as information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species, and if so, to measure trends and support a full strategy to manage impacts. There is also sufficient information recorded through the ‘Species at Risk’ logbook scheme to meet the second issue of SG80. Accordingly a score of 80 is allocated.

5Zjm Gillnet. See 4X5Y gill net. Accordingly a score of 80.

4X5Y Hand line Given the lack of interactions with ETP species, this UoC meets the first issue of SG100. This data (no interaction) allows the UoC to meet the second issue of SG80. However it cannot meet the second issue of SG100. A score of 90 is allocated

5Zjm Hand line See 4X5Y hand line. A score of 90 is allocated.

Audit Trace References

DFO observer database (Kerri Graham, DFO, pers. comm., 18th September 2009); SARA logbook scheme (Anne-Marie Leger, pers. comm., 7th April 2010).

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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2.4	Strategies have been developed within the fisheries management system to address and restrain any significant negative impacts of the fishery on the ecosystem			
2.4.1	<i>Status</i> The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function.	The fishery is unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	There is evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.

Scoring Comments

Otter trawl fisheries. Mobile bottom-contact fishing gears do have impacts on benthic populations, communities, and habitats. The effects are not uniform, but depend on at least (i) the specific features of the seafloor habitats, including the natural disturbance regime, (ii) the species present, (iii) the type of gear used, the methods and timing of deployment of the gear, and the frequency with which a site is impacted by specific gears; and (iv) the history of human activities, especially past fishing, in the area of concern. The area trawled by Canadian groundfish bottom trawl fishery on Georges Bank was estimated using fishing log records and information captured by observers at sea. In 2001 and 2002, a rough estimate was the footgear disturbed less than 10% of the bottom while the bridles and warp swept less than 30%. The doors impacted less than 1% of the bottom. This information was based upon logbook data but has the potential for being updated and expanded to Area 4X using VMS data. Similar figures for Area 4X5Y have not been prepared, although the raw data (via VMS, logbook and observer sources) are available.

Bottom-set longlines. This gear interacts with the bottom habitat through the terminal anchors. Otherwise they have limited or only momentary contact with the bottom habitats. As such have little physical impact during controlled fishing. However, hooks and complete snoods (i.e. branchlines) may be lost or deliberately discarded, especially when gear is damaged or tangled during fishing.

Gillnets. The controlled use of static gears such as gillnets has minimal direct impact on the environment as the spatial footprint is limited and the pressure on bottom sediments is limited to a static, leaded bottom line and terminal anchors. However, gillnets can be lost both accidentally or deliberately and once control is lost, may lead to the smothering, abrasion, “plucking” of organisms, meshes closing around them, and the translocation of sea-bed features. Canadian Atlantic

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gillnet fisheries were estimated to suffer a 2% loss rate up to 1992. However, lost gillnets tend to roll up and become buried in sediment, especially in dynamic environments such as those found in the assessment areas.

Hand lines. The low levels of effort involved, combined with the minimal impact on the benthic and pelagic environments, means that these gears have negligible impacts on the marine habitats.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	60	80	80	100
	5Zjm	80	80	80	100

4X5Y Otter Trawl. The UoC meets the single issue of SG60 as there is evidence that the fishery is unlikely to reduce habitat structure and function as these areas have been fished for many years without serious or irreversible harm. Accordingly a score of 60 is allocated. *As this score is below 80, a condition to certification has been raised (Condition 6). Once this condition has been satisfied the score for this PI will increase to 80 or above.*

4X5Y Bottom Long Line. The UoC meets the single issue of SG80, due to its limited scale with minimal bottom habitat interactions. Given the potential for gear (e.g. snood) loss the UoC does not meet SG100. Accordingly a score of 80 is allocated.

5Zjm Otter Trawl. The UoC meets the single issue of SG80 as less than 10% of the bottom area is trawled, while the bridles and warp sweep less than 30% and the doors impact less than 1%. There is evidence that the fishery is highly unlikely to reduce habitat structure and function as these areas have been fished for many years without serious or irreversible harm.. A score of 80 is allocated.

5Zjm Bottom Long Line. See 4X5Y bottom long line. A score of 80 is allocated

4X5Y Gillnet. The UoC meets the single issue of SG80 as the fishery is very small scale. Despite the potential for some gear loss, the fishery is highly unlikely to reduce habitat structure and function. A score of 80 is allocated.

5Zjm Gillnet. See 4X5Y gill net. A score of 80 is allocated.

4X5Y Hand line Due to its scale and intensity with limited habitat contact and a low potential for interaction, the UoC meets SG100. A score of 100 is allocated.

5Zjm Hand line See 4X5Y hand line.. A score of 100 is allocated.

Audit Trace References

S. Gavaris, pers. comm., 24 July 2009); DFO, 2006; Gavaris and Black, 2004; Macfadyen *et al.* 2009; Chopin *et al.*, 1995

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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2.4.2	<p>Management strategy</p> <p>There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types.</p>	<p>There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.</p> <p>The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/habitats).</p>	<p>There is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.</p> <p>There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or habitats involved.</p> <p>There is some evidence that the partial strategy is being implemented successfully.</p>	<p>There is a strategy in place for managing the impact of the fishery on habitat types.</p> <p>The strategy is mainly based on information directly about the fishery and/or habitats involved, and testing supports high confidence that the strategy will work.</p> <p>There is clear evidence that the strategy is being implemented successfully, and intended changes are occurring. There is some evidence that the strategy is achieving its objective.</p>
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Scoring Comments

A policy and process exists for ‘managing the impacts of fishing on sensitive benthic areas’, but it has yet to be implemented. This will utilise an ‘ecological risk analysis framework’ to assess the risk that fishing activities are likely to cause harm to the benthic habitat, communities and species, and particularly if such harm is likely to be serious or irreversible. Based on this, necessary management measures will be determined and implemented. Monitoring and evaluation systems for developing the approach will also be put in place. Two pilot projects have been initiated to test this approach – one on Georges Bank and the second in coastal areas of 4X - and the results are expected later in 2009. These will then be used to fine-tune the approach for the wider roll-out of the strategy. Protected areas have been developed to protect the Gully (a 2,364 square kilometre area protecting the large canyon feature and associated habitats of the Gully, near Sable Island) as well as coral (the Northeast Channel Coral Conservation Area: a 424 km² area protecting deep water coral concentrations adjacent to

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Georges Bank).

Score:	Area	OTB	BLL	GN	HL
	4X5Y	70	80	80	100
	5Zjm	70	80	80	100

4X5Y Otter Trawl. The UoC meets the first issue of SG80 as there is a partial strategy in place. However, this is a work in progress and accordingly it is considered that the UoC only meets the second issue of SG60. Accordingly a score of 70 is allocated. *As this score is below 80, a condition to certification has been raised (Condition 6). Once this condition has been satisfied the score for this PI will increase to 80 or above.*

4X5Y Bottom Long Line. This UoC meets the three issues of SG80. Direct habitat impacts from this fishery are low. There is some risk from abandoned, lost & discarded gear, but there are partial strategies in place (e.g. fixing set positions) that are both being implemented and are working Accordingly a score of 80 is allocated.

5Zjm Otter Trawl. See 4X5Y Otter trawl. A score of 70 is allocated. *As this score is below 80, a condition to certification has been raised (Condition 6). Once this condition has been satisfied the score for this PI will increase to 80 or above.*

5Zjm Bottom Long Line. See 4X5Y bottom long line. A score of 80 is allocated

4X5Y Gillnet. See 4X5Y bottom long line. A score of 80 is allocated

5Zjm Gillnet. See 4X5Y bottom long line. A score of 80 is allocated

4X5Y Hand line Due to its scale and intensity, habitat impacts from this fishery are negligible and a strategy is not required. A score of 100 is allocated.

5Zjm Hand line See 4X5Y hand line. A score of 100 is allocated.

Audit Trace References

DFO, 2006b; S. Garvaris, pers. comm., 24 July 2009

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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2.4.3	<p>Information / monitoring</p> <p>Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types.</p>	<p>There is a basic understanding of the types and distribution of main habitats in the area of the fishery.</p> <p>Information is adequate to broadly understand the main impacts of gear use on the main habitats, including spatial extent of interaction.</p>	<p>The nature, distribution and vulnerability of all main habitat types in the fishery area are known at a level of detail relevant to the scale and intensity of the fishery.</p> <p>Sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified and there is reliable information on the spatial extent, timing and location of use of the fishing gear.</p> <p>Sufficient data continue to be collected to detect any increase in risk to habitat (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).</p>	<p>The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types.</p> <p>Changes in habitat distributions over time are measured.</p> <p>The physical impacts of the gear on the habitat types have been quantified fully.</p>
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Scoring Comments

Assessment of fishing pressure: DFO's OCMD and PED are undertaking a joint program to build and maintain a 'recognized fishing picture' computer application for several marine conservation areas on the Scotian Shelf. The program builds and maintains near real-time information on fishing activity by combining data from four DFO information systems: (i) MARFIS: the primary source of commercial fishing data obtained through logbooks, vessel hails and other reporting systems; (ii) VMS: vessel positions from onboard black boxes; (iii) CFIN: DFO's offshore fisheries surveillance information system (e.g., aerial

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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surveillance information); and At-Sea Observer System: data provided through DFO's on-board fisheries observer program. Using the mapping, statistical and query functions available through the VCD, analysts can select, view and analyze information on fishing activity according to a range of parameters, such as gear type, vessel name, information source (i.e., VMS, logbook etc.) and catch composition.

Vulnerability of the benthic environment: A study in 2001 developed a new approach for sea floor habitat mapping based on an integrated analysis of multi-beam bathymetric data, geo-scientific information & benthos data from Browns Bank on the SW Scotian Shelf. Each of the habitats is distinguished on the basis of substrate, habitat complexity, relative current strength & water depth. Based on sea floor sediment maps and statistical analysis of mega-benthos determined from photographs, six habitats and corresponding associations of benthos were derived and mapped. A Browns Bank benthic habitat map was developed as a conceptual model summarizing the understanding of the bank ecology, and commonness of species are used as additional guidelines for identification of habitat zones. Georges Bank (5Z) has been fully mapped and the rest of 4X will be mapped by the end of 2009.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	85	85	85	100
	5Zjm	85	85	85	100

4X5Y Otter Trawl. The UoC meets the first issue of SG100 due to the amount of work in progress looking at the vulnerability of the benthic environment. While the physical impacts of the gear on habitat types have not been quantified fully, sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified. Reliable information on the spatial extent, timing and location of use of the fishing gear is sufficient to detect any increase in risk to habitat thus allowing the UoC to meet the second and third issues of SG80. There is a high level of industry and RV habitat mapping, full VMS coverage and knowledge of the distribution of habitat types including the occurrence of vulnerable habitat types Accordingly a score of 85 is allocated.

4X/5Y Bottom Long Line. The UoC meets the first issue of SG100 due to the amount of work in progress looking at the vulnerability of the benthic environment. While the physical impacts of the gear on habitat types have not been quantified fully, sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified. Reliable information on the spatial extent, timing and location of use of the fishing gear is sufficient to detect any increase in risk to habitat thus allowing the UoC to meet the second and third issues of SG80. There is a high level of industry and RV habitat mapping, partial VMS coverage and knowledge of the distribution of habitat types including the occurrence of vulnerable habitat types A score of 85 is allocated.

5Zjm Otter Trawl. See 4X5Y otter trawl. A score of 85 is allocated.

5Zjm Bottom Long Line. See 4X5Y bottom long line. A score of 85 is allocated

4X5Y Gillnet. See 4X5Y bottom long line. A score of 85 is allocated

5Zjm Gillnet. See 4X5Y bottom long line. A score of 85 is allocated

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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<p>4X5Y Hand line This is a low intensity fishery, but supported by a high level of RV habitat mapping. The distribution of habitat types is known over their range, with increasing knowledge of the occurrence of vulnerable habitat types. A score of 100 is allocated</p> <p>5Zjm Hand line. See 4X5Y hand line. A score of 100 is allocated.</p>
Audit Trace References
Kostylev, <i>et al.</i> 2001; DFO, 2006b; S. Garvaris, pers. comm., 24 July 2009

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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2.5	Ecosystem			
2.5.1	<i>Status</i> The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function.	The fishery is <u>unlikely</u> to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The fishery is <u>highly unlikely</u> to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is <u>evidence</u> that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.

Scoring Comments

Many features of the Scotian Shelf ecosystem have changed over the past 30 years, including: (i) a major cooling of bottom waters occurred in the mid-1980's; (ii) the index of zooplankton abundance was low in the 1990s when phytoplankton levels were high and the opposite pattern during the 1960s / early 1970's; (iii) major structural changes in the fish community – a number of groundfish species have declined while small pelagic species and commercially exploited invertebrate species have increased; (iv) reductions in the average body size of groundfish, with unexpectedly low improvements in condition and growth; and (v) steadily increasing abundance of grey seals up to around 300,000, triple the number in the early 1990s.

The current recovery of the haddock stock indicates that the ecosystem may be able to move back towards its original state, although the continued slow pace of cod stock rebuilding remains a major concern. The eight fisheries contribute around 4,500 mt of the cod catch in the area, mainly from 4X5Y where separator trawls are not required as the fisheries operate within their cod TACs in this area. Given the precautionary management of cod stocks in the region it is considered that the haddock-directed fishery is unlikely to disrupt the key issues underlying the ecosystem structure to the point where there would be serious or irreversible harm.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	80	80	100	100
	5Zjm	80	80	100	100

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
<p>4X5Y Otter Trawl. High levels of haddock and cod catches in this fishery result in significant fishing mortality of these species. However given the current precautionary TACs and other harvest control mechanisms it is considered that the haddock-directed fishery is highly unlikely to disrupt the key issues underlying the ecosystem structure to the point where there would be serious or irreversible harm, thus meeting the 80 scoring guidepost. Accordingly a score of 80 is allocated.</p> <p>4X5Y Bottom Long Line. See above. A score of 80 is allocated.</p> <p>5Zjm Otter Trawl See above. A score of 80 is allocated.</p> <p>5Zjm Bottom Long Line. See above. A score of 80 is allocated</p> <p>4X5Y Gillnet. Given the low level of activity this UoC meets the single issue of SG 100. A score of 100 is allocated.</p> <p>4X5Y Hand line See above A score of 100 is allocated.</p> <p>5Zjm Gillnet. See above A score of 100 is allocated.</p> <p>5Zjm Hand line See above A score of 100 is allocated.</p>			
Audit Trace References			
Bundy, 2005; Peer, 1970; Mills <i>et al.</i> 1984; Wildish <i>et al.</i> 1989; Wildish <i>et al.</i> 1992; Desrosiers <i>et al.</i> 2000; Breeze <i>et al.</i> 2002 ; DFO, 2003b			

SCORING CRITERIA		SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
2.5.2	<p>Management strategy</p> <p>There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function.</p>	<p>There are measures in place, if necessary, that take into account potential impacts of the fishery on key elements of the ecosystem.</p> <p>The measures are considered likely to work, based on plausible argument (eg, general experience, theory or comparison with similar fisheries/ecosystems).</p>	<p>There is a partial strategy in place, if necessary, that takes into account available information and is expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.</p> <p>The partial strategy is considered likely to work, based on plausible argument (eg, general experience, theory or comparison with similar fisheries/ecosystems).</p> <p>There is some evidence that the measures comprising the partial strategy are being implemented successfully.</p>	<p>There is a strategy that consists of a plan, containing measures to address all main impacts of the fishery on the ecosystem, and at least some of these measures are in place. The plan and measures are based on well-understood functional relationships between the fishery and the Components and elements of the ecosystem.</p> <p>This plan provides for development of a full strategy that restrains impacts on the ecosystem to ensure the fishery does not cause serious or irreversible harm.</p> <p>The measures are considered likely to work based on prior experience, plausible argument or information directly from the fishery/ecosystems involved.</p> <p>There is evidence that the measures are being implemented successfully.</p>

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Scoring Comments					
<p>The Oceans Act does not specify attributes to be used in assessing the status of the ocean’ ecosystems. However, DFO has developed three ‘conceptual’ objectives related to conserving diversity, productivity and habitat. These are linked to a number of specific objectives: (i) to conserve enough components (communities, species, populations etc) so as to maintain the natural resilience of the ecosystem, (ii) to conserve each component of the ecosystem so that it can play its historic role in the food web; and (iii) to conserve the physical and chemical properties of the ecosystem. DFO has embedded these ecosystem objectives as part of the Groundfish Management Plan (2002 – 2007). A number of these are implicit within the target species harvest strategy, others look at reducing by-catch and developing spatial protection through MPAs.</p> <p>Given the trophic changes that have occurred in the Bay of Fundy and Scotian Shelf over the last 30 years, the declared objective of ‘maintaining trophic structure’ is particularly relevant. However it is recognised that this is a complex area with insufficient information to make decisions on how to individually manage or manipulate the different trophic components. Therefore the strategy invests in research on how to take trophic relationships into account when devising fishing strategies in the absence of quantitative knowledge about them.</p>					
Score:	Area	OTB	BLL	GN	HL
	4X5Y	80	80	100	100
	5Zjm	80	80	100	100
<p>4X5Y Otter Trawl. The current combination of target, by-catch and discard strategies are sufficient to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance. Accordingly a score of 80 is allocated.</p> <p>4X5Y Bottom Long Line. See above. A score of 80 is allocated.</p> <p>5Zjm Otter Trawl. See above. A score of 80 is allocated.</p> <p>5Zjm Bottom Long Line. See above. A score of 80 is allocated</p> <p>4X5Y / 5Zjm Gillnet. Given the low level of catch no strategy is required and by default these UoCs meet SG100. A score of 100 is allocated.</p> <p>4X5Y / 5Zjm Hand line. See above. A score of 100 is allocated</p> <p>4X5Y / 5Zjm Gillnet. See above. A score of 100 is allocated.</p> <p>4X5Y / 5Zjm Hand line. See above. A score of 100 is allocated.</p>					

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Audit Trace References
Peer, 1970; Mills <i>et al.</i> 1984; Wildish <i>et al.</i> 1989; Wildish <i>et al.</i> 1992; Desrosiers <i>et al.</i> 2000; Breeze <i>et al.</i> 2002 ; DFO, 2003b

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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2.5.3	<p><i>Information / monitoring</i></p> <p>There is adequate knowledge of the impacts of the fishery on the ecosystem.</p>	<p>Information is adequate to identify the key elements of the ecosystem (e.g. trophic structure and function, community composition, productivity pattern and biodiversity).</p> <p>Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, but have not been investigated in detail.</p>	<p>Information is adequate to broadly understand the functions of the key elements of the ecosystem.</p> <p>Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, but may not have been investigated in detail.</p> <p>The main functions of the Components (i.e. target, By-catch, Retained and ETP species and Habitats) in the ecosystem are known.</p> <p>Sufficient information is available on the impacts of the fishery on these Components to allow some of the main consequences for the ecosystem to be inferred.</p>	<p>Information is adequate to broadly understand the key elements of the ecosystem.</p> <p>Main interactions between the fishery and these ecosystem elements can be inferred from existing information, and have been investigated.</p> <p>The impacts of the fishery on target, By-catch, Retained and ETP species and Habitats are identified and the main functions of these Components in the ecosystem are understood.</p> <p>Sufficient information is available on the impacts of the fishery on the Components and elements to allow the main consequences for the ecosystem to be inferred.</p>
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SCORING CRITERIA		SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	
			Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	Information is sufficient to support the development of strategies to manage ecosystem impacts.	
Scoring Comments					
<p>The marine ecosystem dynamics of the Scotian Shelf and Bay of Fundy area have been well studied, particularly in respect to understanding groundfish population dynamics (Peer, 1970, Mills <i>et al.</i> 1984; Wildish <i>et al.</i> 1989; Wildish <i>et al.</i> 1992; Desrosiers <i>et al.</i> 2000 and Breeze <i>et al.</i> 2002. The vertebrate components of the ecosystem are well known, but knowledge of the diversity of species at lower trophic levels is sparse. However, information is generally adequate to broadly understand the key issues of the ecosystem.</p> <p>The main impacts of the different gears under assessment can be inferred from existing information, which are well understood for target and incidental catch fish removals (through individual stock assessments, especially for key groundfish species), trawl effects (DFO, 2006b) and any structural changes to key commercial fish populations. However some issues, such as the extent and impact of ghost fishing and the impact of fish removals on the trophic structure of the Bay of Fundy and Scotian shelf have not been investigated in detail.</p> <p>Sufficient information is available on the impacts of the fishery on the target and incidental retained by-catch, discards, ETP species and habitats to allow the main consequences of the eight fisheries on the ecosystem to be inferred. Information is sufficient to support the development of strategies to manage ecosystem impacts. These were present in the Groundfish Management Plan (2002 – 2007) and are expected to be considerable advanced in the now overdue successor plan.</p>					
Score:	Area	OTB	BLL	GN	HL
	4X5Y	85	85	90	90
	5Zjm	90	90	90	90
<p>4X5Y Otter Trawl. The UoC meets the first three issues of SG 80 as information is adequate to broadly understand the functions of the key issues of the ecosystem and the main impact of the fishery upon them, while the main functions of the components in the ecosystem are known. The UoC meets the fourth & fifth issues of SG100 due to the level of available information being sufficient to allow the main consequences of the fishery on the ecosystem to be inferred and</p>					

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
<p>support the development of strategies. Accordingly a score of 85 is allocated.</p> <p>4X5Y Bottom Long Line. See above. A score of 85 is allocated.</p> <p>5Zjm Otter Trawl The UoC meets the first & third issues of SG 80 as information is adequate to broadly understand the functions of the key issues of the ecosystem while the main functions of the components in the ecosystem are known. The UoC meets the second, fourth & fifth issues of SG100 due to the investigation of the main interactions between the fishery and the ecosystem, and the level of available information being sufficient to allow the main consequences of the fishery on the ecosystem to be inferred and support the development of strategies. Accordingly a score of 90 is allocated.</p> <p>5Zjm Bottom Long Line. See above. A score of 90 is allocated</p> <p>4X5Y Gillnet. See above. A score of 90 is allocated</p> <p>4X5Y Hand line See above. A score of 90 is allocated</p> <p>5Zjm Gillnet. See above. A score of 90 is allocated</p> <p>5Zjm Hand line See above. A score of 90 is allocated</p>			
Audit Trace References			
Peer, 1970; Mills <i>et al.</i> 1984; Wildish <i>et al.</i> 1989; Wildish <i>et al.</i> 1992; Desrosiers <i>et al.</i> 2000; Breeze <i>et al.</i> 2002 ; DFO, 2003b; DFO, 2006b			

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Principle 3	The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable			
3.1	Governance and Policy			
3.1.1	<p>Legal and/or customary framework</p> <p>The management system exists within an appropriate and effective legal and/or customary framework which ensures that it:</p> <ul style="list-style-type: none">- Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2;- Observes the legal rights created explicitly or established by custom of people dependent	<p>The management system is generally consistent with local, national or international laws or standards that are aimed at achieving sustainable fisheries in accordance with MSC Principles 1 and 2.</p> <p>The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system.</p> <p>Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by</p>	<p>The management system is generally consistent with local, national or international laws or standards that are aimed at achieving sustainable fisheries in accordance with MSC Principles 1 and 2.</p> <p>The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the fishery.</p> <p>The management system or fishery is attempting to comply in a timely fashion with binding judicial decisions arising from any legal challenges.</p>	<p>The management system is generally consistent with local, national or international laws or standards that are aimed at achieving sustainable fisheries in accordance with MSC Principles 1 and 2.</p> <p>The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective.</p> <p>The management system or fishery acts proactively to avoid legal disputes or rapidly implements binding judicial decisions arising from legal challenges.</p>

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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	<p>on fishing for food or livelihood; and</p> <ul style="list-style-type: none"> - Incorporates an appropriate dispute resolution framework. 	<p>repeatedly violating the same law or regulation necessary for the sustainability for the fishery.</p> <p>The management system has a mechanism to generally respect the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</p>	<p>The management system has a mechanism to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</p> <p>The management system has a mechanism to formally commit to the legal rights created explicitly or established by custom on people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</p>
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Scoring Comments

The Canadian Code of Conduct for Responsible Fishing Operations that outlines the general principles and guidelines for all commercial fishing operations taking place in Canadian waters is based on the FAO “Code of Conduct for Responsible Fisheries” The nine principles of the Canadian code incorporate standards that are aimed at achieving sustainable fisheries in accordance with MSC P1 and P2 (see main text). The Sustainable Fisheries Framework (SFF) now forms the basis for decision-making in Canadian fisheries. It incorporates existing policies for fisheries management conservation and sustainable use, governance and economics with new and evolving policies to be phased-in over time. Also, it includes tools to monitor and assess results of conservation and sustainable use in order to identify areas that may need improvement.

In common with other FMPs, the initial Groundfish IFMP that covers haddock had to meet the Canadian code of conduct. The current approach to fishery management planning in Canada is changing to reflect the SFF, with new plans incorporating the ecosystem approach. DFO is developing this approach by providing the necessary building blocks i.e. data collection and ecosystem assessment, clear ecosystem and management objectives and decision models supported by policies on forage species, by-catch, sensitive benthic areas and emerging fisheries.

The fisheries management system in Canadian waters is centred on the adoption and implementation of Canadian fishery legislation ranging from the Constitution Act 1867 through the Fisheries Act (1985) to the Species at Risk Act (2002). The list of relevant legislation is described more fully in the main text to this report. Linked to the legislation are various policies that impact fisheries management e.g. Ocean Strategy, Marine Protected Areas, Coral Conservation, Benthic

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Sensitive Areas Policy and an Ecosystem approach to fisheries management.

Following the decision of the International Court of Justice in 1984 on the partition of the Georges Bank, in 2003 Canada and USA reached a ten year sharing agreement for three groundfish stocks on Georges Bank. This agreement institutionalized the governance regime and defined approaches for consistent management in both countries (see Peacock & Peters).

In Canada the Minister of Fisheries and Oceans has broad discretionary powers and the decisions are often the result of balancing interests, backed by strong public policy (Lawseth). DFO has developed procedures to address policy within which it seeks to be proactive in order to reduce the risk of legal disputes. DFO Legal Services lawyers fully participate at various levels to ensure DFO compliance with the legislation. In addition, they provide legal advice or opinions on the legality of DFO programmes. Currently most but not all new DFO programmes and activities are reviewed for lawfulness prior to implementation, and most but not all existing DFO programs and activities have already been reviewed for lawfulness.

Where parties are not satisfied with the decision of the Minister they have the right to redress through the Federal Court and Federal Court of Appeal system and there are a number of examples of this e.g. the Ecology Action Centre Society v Attorney General of Canada (06/08/04) and the Matthews case of 1999.

Section 35 of the Constitution Act, 1982 recognizes and affirms the existing aboriginal and treaty rights of the aboriginal peoples of Canada. In 1992, DFO implemented the AFS. The AFS aims to increase economic opportunities in Canadian fisheries for Aboriginal people while achieving predictability, stability and enhanced profitability for all participants in the fishery. Of the 16 First Nations in the Maritimes region, 14 have signed fisheries agreements which have led to significant economic development activities in those communities. In the haddock fishery, DFO purchased quota for allocation to Aboriginal fisheries. Each band has a quota under commercial communal quota. Initial DFO policy was only to allow the transfer of quota between bands, but this was changed after First Nations argued that this was an unfair restriction on their commercial opportunities. Currently only two bands actively fish.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	100	100	100	100
	5Zjm	100	100	100	100

4X5Y Otter Trawl. On the basis of the above, the UoC meets the four issues of SG 100. The fishery management system is generally consistent with local, national or international laws or standards; the management system is subject by law to a transparent mechanism for the resolution of legal disputes and this has been tested and proven to be effective; the management system acts proactively to avoid legal disputes; and the management system is formally committed to the legal rights created explicitly or established by custom on people dependent on fishing for food and livelihood. A score of 100 is allocated.

4X5Y Bottom Long Line. See above.

4X5Y Gillnet. See above

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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<p>4X5Y Hand line See above</p> <p>5Zjm Otter Trawl See above</p> <p>5Zjm Bottom Long Line. See above.</p> <p>5Zjm Gillnet. See above</p> <p>5Zjm Hand line See above</p>
Audit Trace References
<p>Bilateral Management of Transboundary Fish Stocks: An Informal Approach To Ecosystem Based Management. F. G. Peacock & G. Peters, www.fish.wa.gov.au/docs/events/ShareFish/.../GregPeacock.pdf; http://www.tbs-sct.gc.ca/maf-crg/assessments-evaluations/2005/fo-po/fo-po-eng.asp http://www.dfo-mpo.gc.ca/npoa-pan/npoa-pan/npoa-sharks-eng.htm; FAO Code of Conduct for Responsible Fisheries 1995 http://www.fao.org/docrep/005/v9878e/v9878e00.HTM</p>

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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3.1.2	<p>Consultation, roles and responsibilities</p> <p>The management system has effective consultation processes that are open to interested and affected parties.</p> <p>The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties.</p>	<p>Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood.</p> <p>The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.</p>	<p>Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction.</p> <p>The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.</p> <p>The consultation process provides opportunity for all interested and affected parties to be involved.</p>	<p>Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.</p> <p>The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used.</p> <p>The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.</p>
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Scoring Comments

There are a number of levels to fishery management in the DFO maritime region which allow organisations and individuals to be involved in the fishery

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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management process. Responsibilities are well understood. Government is responsible for licensing, registration of vessels, identification and limitation of gear and the description of area to be fished or controlled. The RAP provides peer reviewed information on the status of the fisheries and marine mammal resources in the Atlantic zone, with the work incorporating stakeholders who identify issues and review of result. The CSAS coordinates Regional RAP activities, maintains several publication series that document the work of RAP on the DFO corporate website. The FRCC makes recommendations to DFO on conservation measures for the Atlantic fishery. The Council consists of 12 members, appointed by the DFO Minister. GOMAC provides a forum for fishing industry representatives and government to develop and provide advice to DFO on Gulf of Maine fisheries issues. The Committee advises on operational, technical and scientific analyses necessary to support formal discussions with the United States. GOMAC has clear terms of reference. Membership includes the eight representatives for the groundfish sector plus Aboriginal harvesters. Observers are permitted to attend meetings.

DFO consults with stakeholders through a number of committees: the umbrella Scotia Fundy Sector Groundfish Advisory Committee, and five subsidiary committees – the FG Advisory Committee, the ITQ Advisory Committee, the Generalist Group, the GEAC and the MSGVO. DFO prepares CHPs in full consultation with the relevant sectors – Community Management Boards, GEAC, FG vessels 65’ – 100’, MG vessels 65’ – 100’ and the ITQ fleet (45’ – 65’). In addition, consultation takes place on policy initiatives. For example, the development of procedures on the small fish protocol included three consultations that were attended by a large number of individuals and representatives of various organisations.

For 5Zjm the Canada USA Steering Committee and the Canada-USA Integration Committee comprises representatives from DFO, NMFS and industry representatives from each country. Among other activities, it guides the TRAC and TMGC. TMGC is an industry / government committee with representatives from Canada and the United States that develops and proposes harvest strategies as well as resource sharing and management processes for Canadian and US management authorities. Currently membership includes representatives of the GEAC, Scotia – Fundy MG Association and Scotia-Fundy Inshore Fishermen’s Association and a representative of the Inshore Fisheries, as well as two representatives from DFO. In addition to producing a common guidance document for the management of transboundary resources that is communicated to national fisheries management authorities, also it presides over public consultations to receive information from fishermen about management considerations for transboundary resources.

At regular intervals stakeholders come together in bilateral working committees. Committee members work to achieve consensus on issues such as stock assessments, total allowable catch, country quotas (i.e. distribution), or changes to the governance structure such as the introduction of new working groups. This consensus is presented in the form of recommendations or guidance to domestic bodies which include GOMAC.

While a cornerstone of management policy is the consideration of local knowledge, and some policy documents formally acknowledge the importance of this, it is the case that it would appear that there is no formal explanation of how that information is used or not used. Some groups feel that DFO does not take adequate consideration of their point of view. This thought was typified by comments made by representatives of the FG sector who met with the audit team. In contrast, representatives of the MG fishermen spoke highly of the level of cooperation of DFO with industry, both at the formal and informal levels with regular informal contact between the private sector and DFO to discuss issues such as the location and size of the fish.

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Stakeholders cooperate with DFO in the provision of scientific data – most notably the annual ITQ survey.

The 2002 audit report on DMP reported that “there are many participants involved in the DMP. The primary participants and stakeholders are the fish licence holders, Dockside Monitoring Companies (DMCs), Dockside Observers (DOs), buyers, the Canadian General Standards Board (CGSB) and DFO. The Review Team found the roles of most DMP participants to be clearly understood”. However, at that time concerns were expressed at the level of DFO coordination.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	95	95	95	95
	5Zjm	95	95	95	95

4X5Y Otter Trawl. On the basis of the above analysis, it may be concluded that the UoC meets the first issue of SG100 as organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.

The UoC meets the first part of the second issue of SG 100 i.e. the management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. It may be considered that the management system demonstrates consideration of the information obtained (i.e. the second part of the second issue of SG80, but the indications are that it does not explain how it is used or not used.

Finally, the consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.

Accordingly, the UoC meets all three issues of SG100, save the second part of the second issue where it meets SG80. Accordingly, a score of 95 is allocated.

4X5Y Bottom Long Line. See above.

4X5Y Gillnet. See above

4X5Y Hand line See above

5Zjm Otter Trawl See above

5Zjm Bottom Long Line. See above

5Zjm Gillnet. See above

5Zjm Hand line See above

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Audit Trace References
<p>Bilateral Management of Transboundary Fish Stocks: An Informal Approach To Ecosystem Based Management. F. G. Peacock & G. Peters, Fisheries & Oceans. www.Fish.Wa.Gov.Au/Docs/Events/Sharefish/.../Gregpeacock.Pdf; Groundfish Management Plan: Scotia Fundy Fisheries Maritimes Region; http://gulfofmaine.org/council/; ; http://www.mar.dfo-mpo.gc.ca/science/tmgc/structure.html; Conservation Harvesting Plan (CHP): Atlantic-Wide for Licence Holders that are Member Companies of GEAC (Effective February 2006); Conservation Harvesting Plan (CHP): ITQ MG Vessels <65' 4VWX+5 (April 1, 2006 – March 31, 2007); Conservation Harvesting Plan (CHP): Atlantic-wide for FG Vessels 65'-100' (March, 2006); Conservation Harvesting Plan (CHP): Atlantic-Wide for MG Vessels 65-100' (Effective January 2006); Gulf of Maine Advisory Committee: Terms of Reference; The Department of Fisheries and Oceans: Procedures for Monitoring and Control of Small Fish Catches and Incidental Catches in Atlantic Groundfish Fisheries Updated February 5, 2008; Federal and Provincial Ministers Release Strategy for Rebuilding Atlantic cod stocks http://www.releases.gov.nl.ca/releases/2005/fishaq/1123n07.htm</p>

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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3.1.3	Long term objectives The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach.	Long-term objectives to guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are implicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are explicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are explicit within and required by management policy.
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Scoring Comments

As reported by OECD in March 2004, there is a policy framework for the management of Atlantic Fisheries. This was updated in 2008. It contains four objectives relating to conservation & sustainable use; self-reliance; a stable & transparent access and allocation approach; and shared stewardship. Related to these objectives are 9 principles. DFO's SDS is an overarching policy to ensure sustainability in Canada's fisheries. One of the specific outcome of the SDS policy is a new fisheries management governance model to meet the needs of an evolving industry, recognizing principles of sustainable development, as well as the precautionary and ecosystem approach. DFO is preparing other policies (benthos, forage species & the precautionary approach).

Score:	Area	OTB	BLL	GN	HL
	4X5Y	100	100	100	100
	5Zjm	100	100	100	100

4X5Y Otter Trawl. On the basis of the scoring comments it may be considered that the UoC meets the single issue of SG 100. A score of 100 is allocated.

4X5Y Bottom Long Line. See above.

4X5Y Gillnet. See above

4X5Y Hand line See above

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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<p>5Zjm Otter Trawl See above</p> <p>5Zjm Bottom Long Line. See above.</p> <p>5Zjm Gillnet. See above</p> <p>5Zjm Hand line See above</p>
Audit Trace References
<p>OECD Country Note On Fisheries Management Systems – Canada; Atlantic Fisheries Policy Review - A Policy Framework For The Management Of Fisheries On Canada's Atlantic Coast http://www.Dfo-Mpo.Gc.Ca/Fm-Gp/Policies-Politiques/Afpr-Rppa/Framework-Cadre-Eng.Htm; Groundfish Management Plan. Scotia – Fundy Fisheries Maritimes Region April 1, 2002 – March 31 2007. DFO 2002</p>

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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3.1.4	Incentives for sustainable fishing The management system provides economic and social incentives for sustainable fishing and does not operate with subsidies that contribute to unsustainable fishing.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and seeks to ensure that negative incentives do not arise.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and explicitly considers incentives in a regular review of management policy or procedures to ensure that they do not contribute to unsustainable fishing practices.
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Scoring Comments

The main incentive to fishers with vessels of 14 m. and above provided by the DFO management approach of groundfish fisheries, including haddock, is improved economic and financial viability through quasi property rights. This negates the need for high investment in order to gain as high a share as possible of TACs. Also, it allows for the transfer of licenses. Vessel owners have been informed on which to base their investment decisions through their participation in surveys and research projects.

The <14m FG fleet operates under a different system, with its available quota allocated to 11 community management boards in the Maritimes region. This system has led to some rationalization of fishing effort. It may be argued that quotas for small boats with “environmentally friendly” gear are insufficient to allow their profitable operation. While there is some merit in this argument, it would appear that the reduced number of hand liners in the haddock fishery reflects their better opportunities in other fisheries, the large number of fishing units operating and their price competitiveness in the market. Community-management has led to greater dialogue between scientists and industry and the sector’s greater understanding of scientific issues and species interactions and consequently a better capacity for decision taking.

The 2002 – 2007 IFMP does not consider incentives and subsidies, nor does DFO formally review policy these, although it would be possible through regular and *ad hoc* monitoring exercises by the auditor general and Government standing committees. The template for a new approach to the preparation of FMP (see

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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below) does not explicitly cover incentives, nor does the draft “Fishery Stewardship and Sustainability Checklist 2008-09” that is proposed for use in evaluating the status of fisheries (see below).

There are no negative incentives in the groundfish fishery. There is government support for infrastructure (wharves) but this is considered a normal role for governments (similar to constructing roads and bridges). There are no price subsidies or fuel subsidies.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	80	80	80	80
	5Zjm	80	80	80	80

4X5Y Otter Trawl. On the basis of the foregoing it may be considered that the UoC meets the single issue of SG80. It does not meet SG100 due to the lack of explicit consideration of incentives. The allocated score is 80.

4X5Y Bottom Long Line. See above.

4X5Y Gillnet. See above

4X5Y Hand line See above

5Zjm Otter Trawl See above

5Zjm Bottom Long Line. See above.

5Zjm Gillnet. See above

5Zjm Hand line See above

Audit Trace References

Fishery Stewardship and Sustainability Checklist 2008-09; <http://www.tbs-sct.gc.ca/dpr-rmr/2007-2008/inst/dfo/dfo02-eng.asp>; Application of the Sustainable Fisheries Framework through the Integrated Fisheries Management Planning Process <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/ifmp-pgip-back-fiche-eng.htm>; Peacock & Amand

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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3.2	Fishery- specific management system			
3.2.1	<p>Fishery- specific objectives</p> <p>The fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.</p>	<p>Objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are implicit within the fishery's management system.</p>	<p>Short and long term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.</p>	<p>Well defined and measurable short and long term objectives, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.</p>

Scoring Comments

The Groundfish Management Plan (2002 – 2007) was based on three objectives that were linked to 16 strategies that in turn were linked to a number of management measures (see main text).

However, this not been up dated since 2007. It does not provide defined and measurable short and long term objectives as it is largely descriptive of the situation and how various issues may be addressed, without presenting specific measures designed to meet the objectives. Nor is there a statement of the policy and related objectives in relation to the individual fleet segments and gear types.

CHPs define specific measures to be implemented in each fishery. For example the CHP for MG < 65 defines measures on authorized fisheries, fishing gear specifications, by-catch provisions, the small fish protocol, catch monitoring and test fishing, open seasons, close seasons, spawning, juvenile and other closures, and other measures. These are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the management system.

Since 2002, there has been substantial progress in understanding the needs for fisheries management and the position of fishery in relation to other issues of the eco-system. While there are a large number of policy initiatives with associated policy instruments, these remain largely in the planning stage and have not been formally adopted in the haddock fishery. Similarly the audit check list (see below) is a significant development in terms of the measurement of the effectiveness of actions related to the achievement of specific objectives; however the auditors have not been given a final check list and it is not clear the extent to which the

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data will be analysed and presented.

DFO reports that a new Integrated FMP will be prepared for the Groundfish fishery, but there is no clear idea of the scheduling of this. A new IFMP presents an ideal opportunity to present the objectives and approach to management of the haddock resource with specific consideration of the different gear types and how the policy relates to other parts of Government policy, especially in relation to Principle 2.

The template for the new FMP indicates that these will cover a number of areas (see main text) including short- and long-term sustainable fisheries objectives for stock conservation, the ecosystem, shared stewardship and collaboration, socio-economic factors, and compliance; management measures for the duration of the plan, including TAC, fishing seasons and areas, MCS, decision rules, licensing, requirements of the *Species at Risk Act*, and habitat protection measures; a compliance plan; and a performance review of management objectives.

The draft “Fishery Stewardship and Sustainability Checklist 2008-09” will assess the scientific and management foundations of the fishery, as well as the impact of management measures on the status of the stocks and the ecosystems in which they live.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	60	60	60	60
	5Zjm	60	60	60	60

4X5Y Otter Trawl. Currently, short and long term objectives consistent with achieving the outcomes expressed by MSC’s Principles 1 and 2 are not explicit within the fishery’s management system (SG80). However the UoC meets the single issue of SG60 with objectives implicit within the fishery management system (as contained in policy documents including the FMP 2002 – 2007). *As this score is below 80, a condition to certification has been raised (Condition 7). Once this condition has been satisfied the score of the PI will increase to 80 or above.*

4X5Y Bottom Long Line. See above. *As this score is below 80, a condition to certification has been raised (Condition 7). Once this condition has been satisfied the score of the PI will increase to 80 or above.*

4X5Y Gillnet. See above *As this score is below 80, a condition to certification has been raised (Condition 7). Once this condition has been satisfied the score of the PI will increase to 80 or above.*

4X5Y Hand line See above *As this score is below 80, a condition to certification has been raised (Condition 7). Once this condition has been satisfied the score of the PI will increase to 80 or above.*

5Zjm Otter Trawl See above *As this score is below 80, a condition to certification has been raised (Condition 7). Once this condition has been satisfied the score of the PI will increase to 80 or above.*

5Zjm Bottom Long Line. See above. *As this score is below 80, a condition to certification has been raised (Condition 7). Once this condition has been*

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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satisfied the score of the PI will increase to 80 or above.

5Zjm Gillnet. See above *As this score is below 80, a condition to certification has been raised (Condition 7). Once this condition has been satisfied the score of the PI will increase to 80 or above.*

5Zjm Hand line See above *As this score is below 80, a condition to certification has been raised (Condition 7). Once this condition has been satisfied the score of the PI will increase to 80 or above.*

Audit Trace References

Groundfish Management Plan. Scotia – Fundy Fisheries Maritimes Region April 1, 2002 – March 31 2007. DFO 2002

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3.2.2	<p>Decision-making processes</p> <p>The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives.</p>	<p>There are informal decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.</p> <p>Decision-making processes respond to serious issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.</p>	<p>There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.</p> <p>Decision-making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.</p> <p>Decision-making processes use the precautionary approach and are based on best available information.</p> <p>Explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.</p>	<p>There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.</p> <p>Decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.</p> <p>Decision-making processes use the precautionary approach and are based on best available information.</p> <p>Formal reporting to all interested stakeholders describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.</p>

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Scoring Comments

There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives when these are formally updated and defined. Such processes include GOMAC and stakeholder consultations (e.g. Scotia Fundy Sector Groundfish Advisory Committee, and five subsidiary committees – the FG Advisory Committee, the ITQ Advisory Committee, the Generalist Group, the GEAC and the Mid-Shore Groundfish Vessel Owners). There is specific stakeholder consultation in the process of designing and implementing management policy. The consultative approach responds to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions e.g. GOMAC advises on operational, technical and scientific As described above, fishery management is bound to follow the precautionary approach. Formal reporting is achieved through the publication of scientific reports, the dissemination Plans and Strategies, CHPs and minuting of meetings.

In 5Zjm, TMGC develops and proposes harvest strategies as well as resource sharing and management processes for Canadian and US management authorities. Also, it presides over public consultations to receive information from fishermen about management considerations for transboundary resources.

At regular intervals stakeholders come together in bilateral working committees. Committee members work to achieve consensus on issues such as stock assessments, total allowable catch, country quotas (i.e. distribution), or changes to the governance structure such as the introduction of new working groups. This consensus is presented in the form of recommendations or guidance to domestic bodies which include GOMAC.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	90	90	90	90
	5Zjm	90	90	90	90

4X5Y Otter Trawl. The established decision making process is the discussion and preparation of CHP. These result in strategies to achieve the fishery specific objectives. Accordingly the fishery meets the first issue of SG 100. The discussions revolve around the serious and important issues that are identified. Accordingly the UoC meets the second issue of SG 80. All decisions with the Canadian system of fisheries management use the precautionary approach and are based on the best available information, and accordingly the fishery meet the third issue of SG100. To an extent explanations are provided for actions or lack of action. This allows the fishery to meet the fourth issue of SG 80. Accordingly, the overall score allocated is 90.

4X5Y Bottom Long Line. See above.

4X5Y Gillnet. See above

4X5Y Hand line. See above

5Zjm Otter Trawl. See above

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5Zjm Bottom Long Line. See above.

5Zjm Gillnet. See above

5Zjm Hand line See above

Audit Trace References

Meeting Minutes: FG < 45’ Groundfish Advisory Committee February 27, 2009

SCORING CRITERIA		SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
3.2.3	Compliance and enforcement Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with.	Monitoring, control and surveillance mechanisms exist, are implemented in the fishery under assessment and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A comprehensive monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
		Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and demonstrably provide effective deterrence.
		Fishers are generally thought to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	Some evidence exists to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
			There is no evidence of systematic non-compliance.	There is no evidence of systematic non-compliance.

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Scoring Comments

The system of MCS involves a variety of programmes and associated mechanisms. There is a strong enforcement presence in fisheries with officers of the DFO Conservation and Protection Division actively monitoring fishing operations and enforcing regulations through air surveillance, at-sea inspection and on-shore activities. In 2008, there were 16,124 “enforcement hours” that led to the identification of 114 violations and an average fine in 2008 of C\$1,794. Data available for the years 2001 to 2007 indicates that enforcement effort and results have been consistent.

It was reported (Site Visit) that the top fine imposed in the Groundfish fishery was C\$30,000, while the highest fine for all fisheries was C\$300,000. This compares to a statutory limit of C\$1 million. While not specific to the haddock fishery, there has been an example of a seizure and forfeiture of catch and gear in the snow crab fishery, in addition to a fine. In addition there have been examples of creative penalties e.g. banning people from going close to the water. One duty of the CPD is to maintain standards in the observer and DMP programmes.

The MCS system is supported by VMS. DFO will be consulting on mandatory VMS for 2010/11 season in all fleets. The two remaining fleets are FG <45 and FG 45-65.

Observer coverage in some fisheries is relatively low. In addition, fishers have to complete log books.

The Dockside Monitoring Program (DMP) covers hail out (i.e. reporting, usually by radio) prior to fishing; hail in of amounts caught from at sea; verification of unloading amounts at the dockside; and the collection and entry of catch data on a real-time basis. There was an audit of the DMP in 2002. A strong deterrent to infractions is the potential need for fishing vessels to have 100 % observer coverage at a cost of C\$300 per day plus travel and subsistence costs.

There appears to be no evidence of systematic non-compliance. It has been argued that low levels of observer coverage mean that certain practises may remain undetected e.g. high grading leading to the illegal discard of ground fish species. While anecdotal evidence (Site visit Ecology Action Centre) suggests this may be happening, data that shows that the average size of non-observer landings are smaller than those for observer landings would indicate otherwise.

It is reported that fishermen will inform authorities of non-compliance by their peers.

Score:	Area	OTB	BLL	GN	HL
	4X5Y	90	85	85	85
	5Zjm	90	85	85	85

4X5Y Otter Trawl. In overall terms, MCS is comprehensive and rigorous. However, given the nature of the fishery, with a large number of small boats landing at numerous points around the coast, it is more effective for the large boats than smaller vessels. While FG vessels are responsible for the largest number of transgressions, there are a substantially greater number of these compared to MG vessels.

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Given VMS, observer coverage and DMP, MCS of MG activities is considered comprehensive and this UoC meets the first issue of SG 100.

Sanctions to deal with non-compliance exist and it is thought that these provide effective deterrence.

Evidence suggests that fishers comply with the management system. Information is provided through VMS, observer coverage, log books and DMP.

There is no evidence of systematic non-compliance with regulations..

Accordingly, the MG fisheries meet the first and fourth scoring issues of SG 100, and the second and third issues of SG 80. The overall score allocated is 90.

4X5Y Bottom Long Line. In overall terms, MCS is comprehensive and rigorous. However, given the nature of the fishery, with a large number of small boats landing at numerous points around the coast, it is more effective for the large boats than smaller vessels. While FG vessels are responsible for the largest number of transgressions, there are a substantially greater number of these compared to MG vessels.

FG fisheries meet the first issue of SG80 as an MCS system has been implemented and this has demonstrated an ability to enforce relevant management measures, strategies and/or rules.

Sanctions to deal with non-compliance exist and it is thought that these provide effective deterrence.

Evidence suggests that fishers comply with the management system. Information is provided through some VMS, observer coverage, log books and DMP.

There is no evidence of systematic non-compliance with regulations in any of the UoC.

Accordingly, FG fisheries meet the first three issues of SG80 and the fourth issue of SG 100. The allocated score is therefore 85.

4X5Y Gillnet. See above

4X5Y Hand line See above

5Zjm Otter Trawl See 4X5Y Otter trawl

5Zjm Bottom Long Line. See 4X5Y Bottom Long Line.

5Zjm Gillnet. See above

5Zjm Hand line See above

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Audit Trace References
Peacock and Annand

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3.2.4	Research plan The fishery has a research plan that addresses the information needs of management.	Research is undertaken, as required, to achieve the objectives consistent with MSC's Principles 1 and 2. Research results are available to interested parties.	A research plan provides the management system with a strategic approach to research and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2. Research results are disseminated to all interested parties in a timely fashion.	A comprehensive research plan provides the management system with a coherent and strategic approach to research across P1, P2 and P3, and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2. Research plan and results are disseminated to all interested parties in a timely fashion and are widely and publicly available.
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Scoring Comments

Research related to the haddock fishery, and the use of that research in the inputs required to achieve the objectives consistent with MSC's Principles 1 & 2, is the responsibility of a number of bodies e.g. RAP, CSAS, the Bedford Institute of Oceanography and St Andrews Biological Station. Apart from RAP, the research plans are made on the basis of inputs of a number of advisory bodies e.g. GOMAC, TRAC and the Scotia Fundy Groundfish Advisory Committee. The results of research are disseminated widely, initially to respective working groups before publication on relevant web sites. Similarly discussion on research needs is widely based.

There is a comprehensive research programme for haddock fisheries in both 4X5Y and 5Zjm. Section 6 details the information gathered for the two area fisheries and the sources.

Section 8 details the research carried out into main retained and discarded by-catch species, ETP species, habitat and ecological interactions e.g. Allowable Harm Assessment for wolffish (DFO, 2004b), research into the overlap between Right whales and fishing operations, the Nova Scotia Leatherback Turtle Working

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Group and sea floor habitat mapping.					
Score:	Area	OTB	BLL	GN	HL
	4X5Y	100	100	100	100
	5Zjm	100	100	100	100
<p>4X5Y Otter Trawl. The fishery meets both issues of SG100 and the UoC is awarded a score of 100.</p> <p>4X5Y Bottom Long Line. See above.</p> <p>4X5Y Gillnet. See above</p> <p>4X5Y Hand line See above</p> <p>5Zjm Otter Trawl See above</p> <p>5Zjm Bottom Long Line. See above.</p> <p>5Zjm Gillnet. See above</p> <p>5Zjm Hand line See above</p>					
Audit Trace References					
Site visits; Analysis contained under P1 and P2.					

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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<p>3.2.5</p>	<p>Monitoring and management performance evaluation</p> <p>There is a system for monitoring and evaluating the performance of the fishery-specific management system against its objectives.</p> <p>There is effective and timely review of the fishery-specific management system.</p>	<p>The fishery has in place mechanisms to evaluate some parts of the management system and is subject to occasional internal review.</p>	<p>The fishery has in place mechanisms to evaluate key parts of the management system and is subject to regular internal and occasional external review.</p>	<p>The fishery has in place mechanisms to evaluate all parts of the management system and is subject to regular internal and external review.</p>
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Scoring Comments

A review of the 2002 – 2007 IFMP as required by Section 7 of that plan was only carried out after the first year.

A key part of the management system is the CHP. These are informally reviewed on an annual basis, but to a large part remain unchanged from year-to-year; Stakeholders are asked to comment on what issues of the CHP require review.

There are examples of evaluation of management policies with the Audit and Evaluation Directorate of the DFO. In 2007 there was a review of the Aboriginal Fisheries Strategy Formative Evaluation that had three objectives (see main text). In 2002 there was an external audit of the DMP. This was up-dated in 2005 and 2006. The new audit check list once implemented would provide the mechanism to evaluate all parts of the management system.

External review is provided by the structure consisting TRAC, TMGC, advisory committee meetings, GOMAC.

SCORING CRITERIA	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100
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Score:	Area	OTB	BLL	GN	HL
	4X5Y	70	70	70	70
	5Zjm	70	70	70	70

4X5Y Otter Trawl. The UoC meets the single issue of SG60 as mechanisms are in place to evaluate some parts of the management system and the fishery is subject to occasional internal review. As there is regular internal review of one part of the management system (CHPs) and there has been occasional external review, the UoC meets part of the single issue of SG80. None of the fisheries meet the single issue of SG 100. Accordingly, a score of 70 is allotted for this PI. *As this score is below 80, a condition to certification (Condition 8) has been raised. Once this condition has been satisfied the score of individual PIs will increase to 80 or above.*

4X5Y Bottom Long Line. See above. *As this score is below 80, a condition to certification (Condition 8) has been raised. Once this condition has been satisfied the score of individual PIs will increase to 80 or above.*

4X5Y Gillnet. See above *As this score is below 80, a condition to certification has been raised (Condition 8). Once this condition has been satisfied the score of individual PIs will increase to 80 or above.*

4X5Y Hand line. See above *As this score is below 80, a condition to certification has been raised (Condition 8). Once this condition has been satisfied the score of individual PIs will increase to 80 or above.*

5Zjm Otter Trawl See above. *As this score is below 80, a condition to certification has been raised (Condition 8). Once this condition has been satisfied the score of individual PIs will increase to 80 or above.*

5Zjm Bottom Long Line. See above *As this score is below 80, a condition to certification has been raised (Condition 8). Once this condition has been satisfied the score of individual PIs will increase to 80 or above.*

5Zjm Gillnet. See above *As this score is below 80, a condition to certification has been raised (Condition 8). Once this condition has been satisfied the score of individual PIs will increase to 80 or above.*

5Zjm Hand line. See above. *As this score is below 80, a condition to certification has been raised (Condition 8). Once this condition has been satisfied the score of individual PIs will increase to 80 or above.*

Audit Trace References

FMP; Aboriginal Fisheries Strategy Formative Evaluation http://www.dfo-mpo.gc.ca/communic/cread/evaluations/07-08/60285_e.htm?template=print; Review of Dockside Monitoring Program – Reporting on the Implementation of the Management Action Plan <http://www.dfo-mpo.gc.ca/communic/cread/maps/06->

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07/65149_e.htm?template=print; http://www.dfo-mpo.gc.ca/communic/cread/reviews/index_e.htm

Appendix 2 Peer Review Reports

Dr Mike Pawson: Peer Review of Draft MSC Assessment Certification Report, Canada Scotia-Fundy Haddock Fishery Prepared by S. Cox, T. Huntington, P. Knapman and I. Scott (Moody Marine Ltd) for Groundfish Enterprise Allocation Council

This review is in three parts, commenting on the presentation of the above report (for Moody Marine to consider in revisions of the report); on the accuracy and interpretation of the information and evidence presented as a basis for the assessment, and on the scoring comment table and overall recommendation for certification including the suitability of the attached conditions. Throughout, I have identified the section(s) of the report at which my comments are aimed, and have not commented where I am content with the information provided or the conclusions reached.

Presentation: the report contains generally exhaustive information on the fishery, resources and habitat, which would benefit from some critical summarisation in order not to overburden the reader with unnecessary detail. There is some repetition (for example, the paragraph immediately prior to Gear / Habitat Interactions would best replace the sentence at the end of the next paragraph), and more generally between the text of the report, comments in the scoring table and in some of the Conditions. I appreciate, however, that the authors have attempted to minimise this where possible.

Moody Response

We have further edited the report bearing this comment in mind and made changes as considered appropriate.

The Glossary of Acronyms is a very long list which a reader either has to remember or keep referring back to, so please make sure that they are used consistently, retaining only those that appear more than once in the text (omit e.g. enterprise quotas and enterprise allocations), and ensuring that they are fully described the first time they are used. I presume FG and MG are fixed and mobile gear respectively. To avoid misunderstanding, please use the scientific names for fish the first time they are mentioned, and make sure they are correct (e.g. *M. aeglefinus* should be *M. aeglefinus*, and *A. radiata* *A. radiata*).

Moody Response

We have further edited the report bearing this comment in mind and made changes as considered appropriate.

2.2 Fishery Proposed for Certification. Figure 1 does not clearly delineate the two UoC areas 4X5Y and 5Zjm, other than to suggest that the latter may be situated further offshore from Nova Scotia than 4X5Y. This is eventually explained in section 5.2 Fishing Area, though there is still some scope for confusion. It would be beneficial to omit the description of the NAFO divisions and subdivisions, and statistical unit areas (which do not appear to be used later in the assessment report), and just refer to the stock area used in this assessment as 4X5Y, and the Canadian side of eastern Georges Bank (551 and 552) as 5Zjm. It may be useful here to make it clear that this assessment refers to all Canadian vessels fishing for groundfish in 4X5Y and 5Zjm, and also to provide some indication of the number of vessels involved.

Moody Response

Figure 1 is included to set the scene for the certification - the title has been changed to reflect this point. We consider that it is relevant to define the NAFO area as this forms the basis for definition of the two areas being considered in the assessments. The reference to the fishing vessels to be covered has been included in section 2.2. Sections 4.3 and 4.4 have been reordered and extended to include two new tables

covering the number of licensed vessels that were mistakenly omitted from V2 of the report.

2.4 Information Sources Used: is there any significance to the numbers used against the list of published information and unpublished reports used during the assessment?

Moody Response

The numbers are included for ease of reference.

4 History of the Fishery: you state that Canadian management prioritised stock recovery in 1977 and set maximum fishing mortality at F0.1, but provide no explanation of what this means (to the non-specialist, see footnote 6 on page 37). Even to explain that this would require exploitation levels to be reduced considerably would be useful, given that F was much higher than F0.1 until 1985. Does 65' = 65 feet (for those of us who are now used to working in metres, which you also use later)?

Moody Response

This part of the text has been amended as fishing mortality is covered in some detail elsewhere in the report. Feet (the measure) is signified by the conventional '. It is noted that it is common in Canada to use both imperial and metric measurements.

4.2.6 Growth: you note that haddock growth rates vary considerably, and then suggest that current length-at-age ranges are from 38 - 42 cm at age 4 and 50 - 55 cm between ages 6-8. If true, these suggest very regular growth with little variation (for a marine teleost). Are these actually annual mean lengths?

Moody Response

The paragraph on in 4.2.6 has been redrafted.

Under 4.2.8 Migration, it would be useful to include any information that helped explain the stock structure of haddock in and between the two UoC areas. Is there evidence that they use separate spawning areas, or mix at particular life stages, and how do the major spawning grounds for haddock shown in Figure 2 relate to the stock(s) exploited by the UoCs? The later assessments of stock dynamics, however, do suggest that haddock in these areas represent distinct stocks (and see comments against Management Units).

Moody Response

Following review we consider that the information contained in 4.2.6 is adequate.

4.3 Fleet and gear description: what is the mesh size used in trawls, and is the minimum of 140 mm for gill nets across the diagonal knot-to knot in stretched mesh? The information in 6.1.3 Management Advice should be elaborated here. There is too little information on the hand-line fishery (e.g. the bait is used; no discard or by catch information), given that it represents two UoCs that are given very high scores.

Moody Response

The information provided in 6.1.3 has been copied to section 4.4. Discard and by catch information on hand lines is contained in Section 8. More information has been incorporated on hand line gear.

4.6 Landings: should be accompanied by a section on discards (is there a minimum landing size?), even if only to say that there is no evidence to indicate that discarding of small haddock was occurring.

Moody Response

This section is background; full information on discards is contained elsewhere in the report (mainly in section 8) and covers the specific point mentioned (although it is acknowledged that the figure used to show the trend of landings in 5Z_{jm} does include discards.

6.1.1 Management Unit (4X5Y): NB Figure 5 refers. You here present details of the evidence for the stock structure of haddock within Nova Scotia waters, indicating that it is the western stock occurring along the southern and western Scotian Shelf in NAFO Division 4X and spawning mainly on Brown's Bank that is

relevant to this assessment. However, Table 5 is uninterpretable in this context. I suggest that the text alone is sufficient to illustrate the point being made, noting that assessment data are typically handled separately for areas 4X West (Bay of Fundy) and 4X East (Scotian Shelf) in view of growth differences (presumably not as separate “stocks”, though note comments to that effect from the Ecology Action Centre, July 24, 2009).

Moody Response

The table has been omitted.

6.1.2 Assessments & Stock Status: Stock Assessment model: you note that the most recent quantitative stock assessment for the 4X5Y haddock was performed in 2004/2005 and that a new quantitative was due in 2009. If this has been carried out, its results should be reported here, since 5/6 years can be a long time in the evolution of stocks such as haddock where recruitment can vary by several orders of magnitude. The evidence that there is “a high likelihood that SSB is above the point where recruitment would be impaired” is lacking, unless more recent information on recruitment is available (is it?). This uncertainty is exacerbated by the observation of strong retrospective patterns in biomass and F estimates, and is reflected in Condition 1. Predictions of probability that F will exceed the F_{0.1} and putative trends in SSB for 2006 and 2007 (Figure 14) are redundant.

Moody Response

A stock status assessment was completed in Fall 2009 but is not yet available.

6.2.2 Assessments & Stock Status (5Zjm): although a more up-to-date assessment is available for the 5Zjm stock, which showed a high degree of certainty that the stock was greater than BMSY in 2008, the impact of the passing of the strong 2000 and 2003 year classes to the present time is not known (see Condition 2).

Moody Response

On review, we do not see the connection to Condition 2, which is to provide "well-defined" harvest control rules. Assessing the fate of particular year classes is not within the scope of this criterion. Presumably, the established stock assessment protocol will deal with this when the time comes.

8.3 Bycatch – Discard Species: in the overview, you state that the only groundfish species permitted to be discarded are spiny dogfish, sculpin and skate; Atlantic halibut less than 81cm and threatened species such as northern and spotted wolffish must be released; and all non-groundfish such as striped bass, crab and lobster must be returned to the ocean in a manner that causes the least harm while fishing under a groundfish licence. Presumably, all these species are “discards” from the haddock fishery, so what is the status of cusk in this respect?

Moody Response

Cusk is considered as a main retained species and is therefore considered under Section 8.2.

8.3.2 Assessment of Relevant Discarded Species, Spiny Dogfish: in discussing discard mortality, and overall mortality rates, please make clear that this is in relation to survival of fish caught and released, and not the proportional contribution of discarding to total or fishing mortality.

Moody Response

Section clarified to reflect the above.

Under Gear /habitat interactions, it is not sufficient to suggest that the spatial footprint of static gears such as gillnets is limited and has minimal direct impact on the environment, unless the extent of the fishery (nets can be set across many km of sea bed) is known and whether or not the gear is in contact with the sea bed (and dragged across it on retrieval).

Moody Response

The type and scale of gillnet use is clarified in the main text.

Marine Protected Areas Strategy: if there are any MPAs in either of the assessment areas, these should be described, preferably on a chart.

Moody Response

Chart with for MPAs and conservation areas included.

8.5.3 Information & Monitoring, fishing pressure: appears to describe a system that is yet to be implemented and untested in the haddock fishery and, if so, should not be part of this assessment.

Moody Response

The VDC is in place and is used to compile information from the existing Maritime Fisheries Information System (MARFIS), VMS (carried by all vessels in this assessment), the Canadian Fisheries Information Network (CFIN), DFO's offshore fisheries surveillance information system and DFO's At-Sea Observer System. It therefore can be used to monitor vessel activities related to conservation zones in the assessment area.

8.6.1 Ecosystem Impacts, Status: if there have been reductions in the average body size of groundfish, why are improvements in condition and growth expected? You state that modelling indicates that the ecosystem has been profoundly altered, having changed from a demersal-feeder-dominated system to a pelagic feeder-dominated system. Then, that the current recovery of the haddock stock indicates that the ecosystem may be able to move back towards its original state. What is the evidence for this?

Moody Response

We agree this statement is confusing. It meant to say that as groundfish stocks start to recover, then an increase in fish condition and growth might be expected. The text has been clarified. Regarding the movement back towards a demersal feeder dominated state this potential is evidenced by the continued recovery of haddock stocks.

Scoring table

Except where indicated, I have no problem with the marks given, and the following comments are mainly intended to draw attention to inconsistencies in the statements or with the underlying evidence.

1.1.1 Stock status, 4X5Y: See my comments against 6.1.2. Since the most recent stock assessment is now 5-6 years out of date, the level of certainty is less than stated and a score of more than 80 cannot be justified.

Moody Response

The referee is correct that the probability may be over-stated. We have therefore reduced the score from 100 to 80 for this PI.

1.2.3 Information/monitoring: I agree with the score given, but would have expected some comment (either here or in the body of the report) about the utility of surveys or biological sampling of catches in monitoring recruitment. This is important in years between full analytical stock assessments, especially if they are carried out infrequently (e.g. NB the last estimate presented for the 4X5Y stock was for the 2002 year class).

Moody Response

Following review the paragraph in section 6.1.2 that includes the reference to figure 7 has been amended.

1.2.4 Assessment of stock status (there is an adequate assessment of the stock status): whilst there does appear to be an appropriate assessment methodology (and data) for 4X5Y haddock, there is a lack of evidence presented that its use does adequately meet the needs of determining stock status in a timely manner, as explained above. To score highly here surely requires it to be demonstrated that inter-benchmark assessments are able to map the state of the stock, not just used for setting TACs.

Moody Response

Following close review we do not agree with the comment. There is no mention of timing of stock assessments under this criterion. The current assessment clearly meets most of the Scoring Guidepost 100 elements, and the issue of model uncertainty and its implications have been taken into account by reducing the score to 90 and imposing conditions on evaluating the assessment modelling approach.

2.1 Retained non-target species: you have decided that, for the purposes of MSC assessments, only species that comprise >5% of the total catch (by weight) of each UoC are to be considered here. Thus, cod is excluded from consideration in 5Zjm Otter Trawl (for which you award a score of 100), even though the annual retained by catch of c. 400 t is of the same magnitude as in the 5Zjm longline UoC (where cod is scored, at 80) and much higher than in each of the 4X5Y UoCs (where low scores result, although the status of the cod stock is apparently much worse in 4X5Y than in 5Zjm). I suggest that retained species are examined or excluded on the basis of their catch in relation to the total catch of that species in the assessment area, rather than on the species' proportion in relation to the haddock catch in each UoC.

In this PI, you appear to have ignored that fact that cusk was assessed as threatened in 2003 by COSEWIC, that there are uncertainties associated with available abundance indicators, and that there is no reliable measure of the current magnitude of stock size (commented on under 2.2.1 Discarded species). There is no evidence, therefore, to support a score >60 for any UoC in which cusk is a retained species.

In view of the different ways in which stock status of retained and by catch species is presented in the body of the assessment report, some being difficult to interpret by the non-specialist, I suggest that a simple statement about current stock status (biomass and F in relation to either a stock-recruitment- based reference level, or MSY reference) is provided for each species.

Moody Response

The approach to the identification of main retained species has been changed and this is now reflected in the main body of text and the scoring. As will be noted in a mixed fishery when some trips are not targeting haddock, such identification is not straight forward.

Regarding cusk, the annual average retained catch of cusk by bottom long liners targeting haddock in 4X5Y for the years 2007 and 2008 was 56 mt. The 2008 Recovery Potential Assessment (RPA) for cusk stated that, assuming that unreported bycatch and discards remain constant, commercial landings in 4X of about 200 mt would result in a 75% chance of observing at least a 50% increase in biomass after 15 years (1 generation), while 4X landings of about 600 mt would result in only about a 54% chance of observing at least a 50% increase in biomass after 15 years. These landings would have to be increased by 1.43 times to be applicable to the entire management area (4VWX + 5Zc). The quota caps have been set accordingly and landings for all areas in 2008/09 were 609 mt. Note that the assessment area is at the extreme SW of this species' range.

The above comments also apply to 2.2 Discarded species.

Moody Response

As above.

2.2.2. Management strategy: it is unclear that there is actually a strategy in place for managing by-catch in gillnet and handline fisheries, and you should not award these UoCs a score or 100 just because they involve relatively low effort (though noting that handlines are highly selective).

Moody Response

There is a management strategy specific to the fixed gears in the form of 'Conservation Harvesting Plans (CHPs) for (i) <45' vessels, (ii) 45 – 65' and (iii) 65-100' vessel classes. These CHPs are prepared by DFO and supported by the Scotia Fundy Fixed Gear Advisory Committee that meets twice yearly. The scoring text has been clarified to reflect this.

This comment also applies to 2.1.2.

Moody Response

See above.

The scores of 100 against all UoCs in 2.3.1 ETP species Status, awarded on the basis that there is a high degree of certainty that the effects of the fishery are within limits of the requirements for protection of ETP species, or that there are negligible interactions, do not reflect the corresponding scores of 80-90 under 2.3.3 Information / monitoring, which states that there is uncertainty about the actual levels of interactions.

Moody Response

For the species groups involved – wolffishes, Atlantic salmon, North Atlantic right whale, harbour porpoises and leatherback turtle – confidence is high that interactions are within acceptable limits, despite the degree of uncertainty due to the low observer coverage. There was an error in the scoring comments of 2.3.3 in that direct interactions with ETP species are recorded in logbooks, albeit special SARA logbooks and this has been corrected.

3.1.3 Long term objectives: section 7.5 Management Policy: Long Term Objectives states that the highest priority for the management of all Canadian fisheries is conservation of marine resources and habitat, and rebuilding of resources and restoration of habitat where necessary, defined as sustainable use that safeguards ecological processes and genetic diversity for present and future generations. This is not such a clear statement as to be unequivocally consistent with MSC Principles and Criteria and the precautionary approach that it deserves a score of 100. This lack of clarity is reflected in the comments and universal score of 60 against 3.2.1 Fishery- specific objectives.

Moody Response

We believe that long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are explicit within and required by management policy.

Certification recommendation

Subject to your response to my comments on some aspects of Principle 2, which attracts the lowest overall marks for the bottom trawl and long line UoCs in both areas, I agree with your assessment that the eight UoCs in the Canada Scotia-Fundy Haddock Fishery have passed in relation to MSC Principles 1, 2 and 3, and with your recommendation that the UoC be certified according to the MSC Principles and Criteria for Sustainable Fisheries.

My concerns are addressed adequately by the eight Conditions (note typo in Condition 8/9)

Dr Mike Pawson

29th April 2010

There are various spelling errors, typos and errors of English grammar that I have not listed. I spent my limited time available for this review considering scientific content rather than presentation. However, in Section 2.2 spelling should be “aeglefinus” not “aeglifinus”. This is a fairly frequent, though not consistent, error throughout the report and should be corrected using “find & replace”, given that it does not look good to spell the study species’ name wrongly. More important points are:

Moody Response

See above.

1. p17 Fleet and gear description. Here you mention “the Canadian fishery for haddock”. Is there such a fishery? Or is it a mixed groundfish fishery? Elsewhere in the report you often call it the groundfish fishery, which seems reasonable. Yet certification is of only the haddock component. It is only much later in the report that you seem to define the “haddock fishery” as trawls where more than 51% of the catch is haddock (p61). Some kind of explanation of what you define as “the haddock fishery” would be useful early in this report. Particularly as it seems somewhat odd to be certifying a component of several different fisheries rather than a fishery (the groundfish fishery).

Moody Response

An explanation has been added in section 2.2. The consideration of by catch species has been changed (see response to the second peer reviewer above).

2. p21. Gill nets target cod and pollock. This means that haddock are retained bycatch in that fishery. This leads to what seems rather odd to me which is the idea that a retained bycatch might be certified in a fishery that is not. Does this require some explanation? I can see a form of logic that would suggest that either the whole fishery meets MSC criteria, or it does not, and that certifying one component of a fishery but not the main part of the fishery is illogical.

Moody Response

This is covered in Section 2.1 i.e. retained bycatch not included in the unit of certification e.g. cod and pollock.

3. p33. “A new quantitative stock assessment is expected in 2009”. This is an odd statement to read in a report dated April 2010. Surely you can include the actual 2009 assessment in this report? Or at least summarise its outcome?

Moody Response

See response to the first peer reviewer.

4. Section 7.3. The last sentence of this section seems to indicate that you were intending to add more to this text but have overlooked that?

Moody Response

No – the text appears fine.

5. Section 7.7. “The Management system for the Haddock fishery”. Surely this should read “The Management system for the groundfish fishery”?

Moody Response

The section heading has been amended.

6. Section 8.2 Bycatch – Retained species 8.2.1. Overview. Here you define the haddock fishery as catches where haddock form >51% of the catch. I assume this is by total mass rather than by numbers of fish? Is this definition of the haddock fishery following some convention or precedent? If so, it would be helpful to explain that this definition is a generally accepted one. If it is a novel definition, then I think it needs some justification. I imagine that in a mixed groundfish trawl fishery the fishermen target mixed groundfish most of the time, rather than specifically haddock. If you select only those catches where most of the catch is haddock, then by definition the bycatch cannot be very large (because most of the catch is haddock). However, in catches where only a small part of the catch was haddock, there may be a very large bycatch. But that does not seem to me to mean by definition that the target of the fishing was not haddock.

Moody Response

See response to second peer reviewer above.

7. You say seabird bycatch does not seem to be a problem in the demersal longline fishery. But there are no data presented or referenced. It may be correct to say seabird bycatch is not a problem, but there are plenty of demersal longline fisheries where seabird bycatch is a problem. The fact that the fishery is demersal does not prevent seabird bycatch as birds take hooks as the line is deployed from the surface. So it would be appropriate to cite some data or references here that support the view that seabird bycatch is not an issue. Certainly, in the North Atlantic there are no albatrosses that would create ETP species bycatch issues, but in longline demersal fisheries off Norway, for example, very large numbers of northern fulmars *Fulmarus glacialis* have been reported as bycatch from some studies of ling and cod longlining.

Moody Response

New data and references are presented in the main text.

8. Section 8.4.3. A table of observer effort monitoring bycatch of ETP species is included here, but there are no data presented on the actual amounts of bycatch reported by these observers.

Moody Response

We have obtained the bycatch and discard data for all ETP species. The observed catches of ETP species are negligible, with the exception of wolffish apart which are reported in Section 8.4.2

9. Section 15.9.4 Condition 4. The data cited here do not quite match up to data tables in the main text. For example, skate discards in 4X5Y 2002-08 are given as average 197 mt (114 mt in 2008). Yet in Tables 12, 13 on p73 data are for 2004-08 only (not including 2002, 03), and show 116 mt skate in 2008, not 114 mt.

Moody Response

Amended

10. I do not see any problems in the scores given based on the information presented in Appendix 1. However, some of these scores in P2 relate to data extracted from trawl catches with haddock >51% defined as “the haddock fishery”, and I’m not entirely comfortable with that definition (see point 6 above).

Moody Response

See response above.

Robert W Furness, BSc, PhD, FRSE
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26 April 2010

Appendix 3: Stakeholder Comments

Appendix 4: Registered companies / vessels within Unit of Certification: eligible to sell MSC certified product