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Public Certification Report for

NORWEGIAN SAITHE FISHERY

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c/o Fiskebat (Norwegian Fishing Vessel Owners Association)

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1. INTRODUCTION

This report sets out the results of the assessment of the Norwegian Saithe (*Pollachius virens*) Fisheries against the Marine Stewardship Council Principles and Criteria for Sustainable Fishing.

1.1 The fishery proposed for certification

This main assessment report contains 10 units of certification (or 'fisheries' according to the definition below). The approach taken has been to produce one report that contains information and sections of text that are common to all 10 units of certification, and to identify differences between the fisheries – in terms of area or fishing gear used - where appropriate. However, each unit of certification has been assessed individually and will receive a separate certificate.

In the text below, comments, and scores, are common to the different areas and gear types unless specified otherwise.

The MSC Guidelines to Certifiers specify that the unit of certification is "The fishery or fish stock (=biologically distinct unit) combined with the fishing method/gear and practice (=vessel(s) pursuing the fish of that stock) and management framework."

The fisheries proposed for certification are defined as:

Species: Saithe
Geographical Area: Norwegian EEZ ICES Sub-Areas I and II
Method of Capture: Trawl
Stock: NE Arctic
Management: Managed by Norwegian Authorities.
Client Group: Not applicable, certification to apply to whole Norwegian Fishery

Species: Saithe
Geographical Area: Norwegian EEZ ICES Sub-Areas I and II
Method of Capture: Purse Seine
Stock: NE Arctic
Management: Managed by Norwegian Authorities.
Client Group: Not applicable, certification to apply to whole Norwegian Fishery

Species: Saithe
Geographical Area: Norwegian EEZ ICES Sub-Areas I and II
Method of Capture: Gill Net
Stock: NE Arctic
Management: Managed by Norwegian Authorities.
Client Group: Not applicable, certification to apply to whole Norwegian Fishery

Species: Saithe
Geographical Area: Norwegian EEZ ICES Sub-Areas I and II
Method of Capture: Danish Seine
Stock: NE Arctic
Management: Managed by Norwegian Authorities.
Client Group: Not applicable, certification to apply to whole Norwegian Fishery

Species: Saithe

Geographical Area: Norwegian EEZ ICES Sub-Areas I and II
Method of Capture: Handline (Hook and Line)
Stock: NE Arctic
Management: Managed by Norwegian Authorities.
Client Group: Not applicable, certification to apply to whole Norwegian Fishery

Species: Saithe
Geographical Area: North Sea ICES Area IV
Method of Capture: Trawl
Stock: North Sea
Management: Managed under EU-Norway Agreement and by Norwegian Authorities.
Client Group: Not applicable, certification to apply to whole Norwegian Fishery

Species: Saithe
Geographical Area: North Sea ICES Area IV
Method of Capture: Purse Seine
Stock: North Sea
Management: Managed under EU-Norway Agreement and by Norwegian Authorities.
Client Group: Not applicable, certification to apply to whole Norwegian Fishery

Species: Saithe
Geographical Area: North Sea ICES Area IV
Method of Capture: Gill Net
Stock: North Sea
Management: Managed under EU-Norway Agreement and by Norwegian Authorities.
Client Group: Not applicable, certification to apply to whole Norwegian Fishery

Species: Saithe
Geographical Area: North Sea ICES Area IV
Method of Capture: Danish Seine
Stock: North Sea
Management: Managed under EU-Norway Agreement and by Norwegian Authorities.
Client Group: Not applicable, certification to apply to whole Norwegian Fishery

Species: Saithe
Geographical Area: North Sea ICES Area IV
Method of Capture: Handline (Hook and Line)
Stock: North Sea
Management: Managed under EU-Norway Agreement and by Norwegian Authorities.
Client Group: Not applicable, certification to apply to whole Norwegian Fishery

The following abbreviations have been adopted throughout the report and scoring table:

NEA	North East Artic
NE Atlantic	North East Atlantic
NS	North sea
Tr	Trawl
Gn	Gill Net
Ps	Purse Seine
Ds	Danish Seine
Hl	Handline

1.2 Report Structure and Assessment Process

The aims of the assessment are to determine the degree of compliance of the fishery with the Marine Stewardship Council (MSC) Principles and Criteria for Sustainable Fishing, as set out in Section 5.

This report firstly sets out:

- the background to the fishery under assessment
- the qualifications and experience of the team undertaking the assessment
- the standard used (MSC Principles and Criteria)
- stakeholder consultation carried out. Stakeholders include all those parties with an interest in the management of the fishery and include fishers, management bodies, scientists and Non-Governmental Organisations (NGO's)

Section 9 of the report sets out the methodology used to assess ('score') the fishery against the MSC Standard. The scoring table then sets out the Scoring Indicators adopted by the assessment team and Scoring Guidelines which aid the team in allocating scores to the fishery. The commentary in this table then sets out the position of the fishery in relation to these Scoring Indicators.

The intention of the earlier sections of the report is to provide the reader with background information to interpret the scoring commentary in context.

Finally, as a result of the scoring, the Certification Recommendation of the assessment team is presented, together with any conditions attached to certification.

In draft form, this report is subject to critical review by appropriate, independent, scientists ('peer review'). The comments of these scientists are appended to this report. Responses are given in the peer review texts and, where amendments are made to the report on the basis of Peer Review comments, these are also noted in the peer review text. The updated report is then circulated for public scrutiny on the MSC website.

The report, containing the recommendation of the assessment team, any further stakeholder comments and the peer review comments is then considered by the Moody Governing Board (a body independent of the assessment team). The Governing Board then make the final certification determination on behalf of Moody Marine.

It should be noted that, in response to comments by peer reviewers, stakeholders and the Moody Marine Governing Board, some points of clarification may be added to the final report.

Finally, the complete report, containing the Moody Marine Ltd Determination and all amendments, has been released for further stakeholder scrutiny.

1.3 Information sources used

Information used in the main assessment has been obtained from interviews and correspondence with stakeholders in the fisheries, notably:

I1. Client (Fiskebat) and other Fishing Industry Representatives
I2. Directorate of Fisheries and Institute of Marine Research
I3. Ministry of Fisheries
I4. Norges Råfisklag

Other information sources

Published information and unpublished reports used during the assessment are:

R1. Administrative order of 20 December of 2006 pertaining to the regulation of the saithe fishery in the North Sea and Skaggerak in 2007. Provided at meeting at the Fisheries Directorate 24 January 2007.

R2. Administrative order of 4 January of 2007 pertaining to the regulation of the fisheries for cod, haddock and saithe north to 62° N. Provided at meeting at the Fisheries Directorate 24 January 2007.

R3. Begley, J. and Howell, D., (2004). 'An Overview of Gadget, the Globally applicable Area-Disaggregated General Ecosystem Toolbox', ICES C.M. 2004/FF:13, 16 pp.

R4. Bekby, T. (2001) Dispersal and bycatch mortality in gray, *Halichoerus grypus*, and harbor, *Phoca vitulina*, seals tagged at the Norwegian coast. Marine Mammal Science, 18, 963-976.

R5. Benke, H., Kremer, H. & Pfander, A. (1991) Incidental catches of harbour porpoises (Phoceona phocoena) in the coastal waters of Angeln and Schwansen (Schleswig – Holstein, FRG) from 1987-1990. In: European Research on Cetaceans – 5. (Evans, P.G.H., ed), pp. 54-57 Proc. 5th Ann. Conf. ECS, Sanderfjord, Norway, 21-23 February 1991. European Cetacean Society, Cambridge.

R6. Beskatningsstrategi for nordøst-arktisk sei. (Management strategy for Northeastern Arctic saithe), Fisheries Directorate and Institute of Marine Research February 2006. Report provided at meeting at the Fisheries Directorate 24 January 2007.

R7. Bjørge, A. and Kovacs, K.M., (sci. eds.). 'Report of the working group on seabirds and mammals'.

R8. Bjørge, A., Godøy, H. and Nedreaas, K. (2006). A system for monitoring bycatches of marine mammals in Norwegian coastal and inshore waters. NAMMCO/15/MC/BC/8.

R9. Blanchard, J.L., Pinnegar, J.K. and Mackinson, S. (2002). Exploring marine mammal-fishery interactions using 'Ecopath with Ecosim': modelling the Barents Sea ecosystem. Sci. Ser. Tech Rep., CEFAS Lowestoft, 117: 52pp.

R10. Cardinale, M; Hjelm, J. 2003 Environmental stochasticity and recruitment anomalies of gadoids in the North Atlantic. ICES CM 2003/T:01.

R11. Child, A. R. 1988. Population genetics of cod, haddock, whiting and saithe. CEFAS, Fisheries Research Technical Report No. 87.

R12. Cook, R. M., and Heath, M. R. 2005. The implications of warming climate for the management of North Sea demersal fisheries. ICES Journal of Marine Science, 62: 1322-1326.

R13. Cotter, J. Jeroen van Der Kooij, Clive Satchell, Kevin Sullivan, and Trevor Boon (2004). Report on catches of saithe, cod and haddock in the northern North Sea by FV Farnella in autumn 2003. http://www.cefas.co.uk/FSP/publications/FSP-03-04-Project-2.pdf

R14. Daan, N, Heessen, H. and Hofstede, R. (2005). North Sea Elasmobranchs: distribution, abundance and biodiversity. ICES CM 2005/N:06

R15. Darby, C.D. and Flatman, S. 1994. Virtual Population Analysis: version 3.1 (Windows/ user guide. Info. Tech. Ser., MAFF Direct. Fish. Res., Lowestoft, (1): 85pp.

R16. Daskalov, G. and Mackinson, S. (2004). Trophic modelling of the North Sea. ICES CM 2004/FF:40

R17. Degel, H., Nedreaas, K. and Nielsen, J. R. (2006). Summary of results from the Danish-Norwegian fishing trials autumn 2005 exploring by-catch levels in the small-meshed fishery in the North Sea targeting Norway pout.

R18. Directorate of Fisheries. 2006. Developing resource management. Solutions for an improved resource management.

R19. Directorate of Fisheries. Presentation: Welcome to the Directorate of Fisheries.

R20. Directorate of Fisheries. Regulations amending the regulations relating to sea-water

fisheries. 2006.

R21. Dolgov, A. V., A. A. Grekov, I. P. Shestopal, and K. M. Sokolov. 2005. By-catch of Skates in Trawl and Long-Line Fisheries in the Barents Sea. J. Northw. Atl. Fish. Sci., 35: 357-366

R22. Dommasnes, A. Villy Christensen, Bjørnar Ellertsen, Cecilie Kvamme, Webjørn Melle, Leif Nøttestad, Torstein Pedersen, Sigurd Tjelmeland, and Dirk Zeller An Ecopath Model For The Norwegian Sea And Barents Sea http://www.seaaroundus.org/report/impactmodels/BarentsNorway.pdf

R23. Fisheries Directorate, 2002. Fiskeriaktiviteten I Området Lofoten – Barentshavet Delrapport Til Konsekvensutredning Av Fiskeri, Havbruk Og Skipstrafikk

R24. Fiskeridirektoratet og Havforskningsinstituttet 2006: Beskatningsstrategi for nordøst-arktisk sei.

R25. Folkow, L.P.. Haug, T., Nilssen, K.T. and Nordøy, E.S. (1997). Estimated food consumption of Minke whales Balaenoptera acutorostrata in Northeast Atlantic waters in 1992-1995. ICES CM 1997/GG:01.

R26. Fosså, J.H., P.B. Mortensen & D.M. Furevik. 2002. The deep-water coral Lophelia pertusa in Norwegian waters: distribution and fishery impacts. Hydrobiologia 471: 1–12, 2002.

R27. Frid, C.L.J., Harwood, K.G., Hall, S.J. and Hall, J.A. (2002). Long-term changes in the benthic communities on North Sea fishing grounds. ICES J. Mar. Sci. 57, 1303-1309.

R28. Hammond, P.S, P Berggren, H Benke, D.L Borchers, A Collet, M.P Heide-Jørgensen, S Heimlich, A.R Hiby, M.F Leopold, N Øien (2002) Abundance of harbour porpoise and other cetaceans in the North Sea and adjacent waters Journal of Applied Ecology 39 (2), 361–376.

R29. Haug, T., Gjøsæter, H., Lindstrøm, U. and Nilssen, K.T., (1995). 'Diet and food availability for northeast Atlantic minke whales (*Balaenoptera acutorostrata*), during the summer of 1992', ICES J. of Mar. Sci. 52, 77-86

R30. Hiddink, J.G., Jennings, S., Kaiser, M.J., Queiros, A.M., Duplisea, D.E. and Piet, G.J. (2006). Cumulative impacts of seabed trawl disturbance on benthic biomass, production, and species richness in different habitats. Can. J. Fish. Aquat. Sci. 63, 721-736.

R31. Hirst, D. et al. 2004. Estimating catch at age from market sampling data by using a Bayesian hierarchical model. Appl. Statist. 53 (1): 1-14.

R32. Hirst, D. G. Storvik, M. Aldrin, S. Aanes & R. B. Huseby. 2005. Estimating catch at age by combining data from different sources. Can J Fish Aquat Sci. 62:1377-1385.

R33. Hovland, M. Vasshus, Steinar, Indreeide, L. Nilsen, O. 2002 Mapping and imaging deep-sea coral reefs off Norway, 1982-2000. Hydrobiologica, 471, 13-17.

R34. http://ec.europa.eu/fisheries/publications/studies_reports/evaluation_bycatches_2000_en.htm

R35. http://www.ascobans.org/

R36. Humborstad, O.-B., Løkkeborg, S., Hareide, N.-R., Furevik, D.M. (2003). Catches of Greenland halibut (*Reinhardtius hippoglossoides*) in deepwater ghost-fishing gillnets on the Norwegian continental slope. Fisheries Research 64 (2-3), pp. 163-170

R37. Husebø, Å., L. Nøttestad1, J.H. Fosså1, D.M. Furevik1 & S.B. Jørgensen 2002. Distribution and abundance of fish in deep-sea coral habitats. Hydrobiologia 471: 91–99, 2002.

R38. ICES 1965. Report of the Coalfish Working Group. Co-op. Res. Rep. Int. Counc. Explor. Sea ser. A. 6: 1-23.

R39. ICES 1995. Report of the saithe study group. ICES CM 1995/G:2.

R40. ICES 2004. Report of the Study Group on Cold-Water Corals (SGCOR)

R41. ICES 2006 Report of the Arctic Fisheries working Group (AFWG). ICES Advisory Committee on Fishery Management ICES CM 2006/ACFM:25

R42. ICES 2006 Report of the ICES Advisory Committee on Fishery Management, Advisory Committee on the Marine Environment and Advisory Committee on Ecosystems, 2006

R43. ICES 2006 Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK). ICES Advisory Committee on Fishery Management ICES CM 2006/ACFM:35
R44. ICES 2006. Report of the Working Group on Marine Mammal Ecology (WGMME). ICES Advisory Committee on Ecosystems ACE:06
R45. ICES. 2005. Report of the Regional Ecosystem Study Group for the North Sea (REGNS), 9–13 May 2005, ICES Headquarters, Copenhagen. ICES CM 2005/. 49 pp.
R46. IMR book on "The Norwegian Sea ecosystem" (2004) – ed. Skjoldal, Tapir Academic Press (www.tapirforlag.no) ISBN 82-519-1841-3
R47. IMR web page
R48. Ingolffson, O.A. (2006). Size selectivity and escape mortality of gadoid fish in the Barents Sea trawl fishery. University of Bergen PhD Thesis.
R49. IUCN http://www.iucnredlist.org/
R50. Jakobsen, T 1981a. Preliminary results of saithe tagging experiments on the Norwegian coast 1975-77. ICES-CM-1981/G:35
R51. Jakobsen, T 1981b. Assessments of the north-east arctic and north sea stocks of saithe taking into account migration. ICES C.M. 1981/G:36.
R52. Jakobsen, T. & S. Olsen 1987. Variation in rates of migration of saithe from Norwegian waters to Iceland and Faroe Islands. Fisheries Research, 5:217-222.
R53. Jakobsen, T. 1986. Recruitment and distribution of North-East Arctic saithe in relation to changes in the environment. pp 213-223 in Loeng, H. (ed.) The effect of oceanographic conditions on distribution and population dynamics of commercial fish stocks in the Barents Sea. Proceedings of the third Soviet-Norwegian Symposium, Murmansk 26-28 May 1986. Institute of Marine Research, Bergen, 1987.
R54. Jakobsen, T. 1986. Recruitment and distribution of North-East Arctic saithe in relation to changes in the environment. Pp 213-223 in Loeng, H. (ed.) The effect of oceanographic conditions on distribution and population dynamics of commercial fish stocks in the Barents Sea. Proceedings of the third Soviet-Norwegian Symposium, Murmansk 26-28 May 1986. Institute of Marine Research, Bergen, 1987.
R55. Jakobsen, T. 1987. Variation in rates of migration of saithe from Norwegian waters to Iceland and Faroe Islands. Fisheries Research, 5:217-222.
R56. Jonsson, S 2001. The importance of tagging in earnest: Review of saithe tagging experiments in the NE-Atlantic and introducing an ongoing Icelandic saithe tagging study http://www.*ices*.dk/products/CMdocs/*2001*/*O*/*O-2001*.p df
R57. Kaiser, M.J., Bullimore, B. Newman, P., Lock, K. and Gilbert, S. 1996. Catches in 'ghost fishing' set nets. Marine Ecology Progress Series, 145:11-16
R58. Letter dated 04 December 2006 from Ministry of Fisheries and Coastal Affairs to the International Council for the Exploration of the Sea regarding management objectives for saithe. Provided at meeting with the Ministry of Fisheries and Coastal Affairs 25 January 2007.
R59. Letter dated 20 November 2006 from Fiskebåtredernes Forbund to the Marine Research Institute regarding ICES Working Group Report on saithe.
R60. Letter dated 29 November 2006 from The Marine Research Institute to Fiskebåtredernes forbund regarding the Working Group report on saithe.
R61. Lindstrøm, U., Harbitz, A., Haug, T. and Nilssen, K., (1998). 'Do harp seals *Phoca groenlandica* exhibit particular prey preferences?', ICES J. Mar. Sci., 55, 941-953.
R62. Management of Living Marine Resources. Paper provided at Ministry of Fisheries and Coastal Affairs, meeting 25 January 2007.
R63. Management System of Marine Resources: Quota Allocation. Paper provided at Ministry of Fisheries and Coastal Affairs, meeting 25 January 2007.
R64. Map detailing fisheries zones, borders and areas off Northern Norway. Provided at meeting at the Fisheries Directorate 24 January 2007.
R65. Map detailing statistical areas in Norwegian fisheries. Provided at meeting at the

Fisheries Directorate 24 January 2007.

R66. Mehl, S et al. 2006. Management strategies for Northeast Arctic saithe – should predation of herring be taken into account? Working document No. XX to the Arctic Fisheries Working Group 19-28 April 2006.

R67. Mehl, S. (2005). Stomach analyses of Northeast Arctic saithe sampled during the saithe survey Varanger-Møre, 1998-2003. Working Document 7 to the Arctic Fisheries Working Group.

R68. Ministry of Fisheries and Coastal Affairs. Facts about fisheries and aquaculture. 2006.

R69. Ministry of Fisheries and Coastal Affairs. Presentation: Management of living marine resources.

R70. Ministry of Fisheries and Coastal Affairs. The riches of the sea – Norway's future

R71. Misund, O.A. and Skjoldal, H.R. (2005). Implementing the ecosystem approach: Experiences from the North Sea, ICES, and the Institute of Marine Research, Norway. Marine Ecology Progress Series 300, pp. 260-265

R72. NEAFC (2004). 'GHOST FISHING BY LOST FISHING GEAR' Workshop Briefing Paper Discussion Workshop, 10-11 May 2005, The Centre, Brussels Reference: DG FISH/2004/20. http://www.neafc.org/reports/international/docs/ghost-fishing-workshop_briefing_paper.pdf

R73. Nedreaas, K. 1987. Food and feeding habits of young saithe, *Pollachius virens* (L.), on the coast of western Norway. Fiskeridirektoratets Skrifter, Serie Havundersøkelser 18: 263-301

R74. Nedreaas, K. 1997. Evaluation of the North-East Arctic saithe (Pollachius virens) acoustic survey. ICES CM 1997/Y:20.

R75. Nilssen, K.T., Pedersen, O.-P., Folkow, L.P. and Haug, T. (1997). Food consumption estimates of Barents Sea harp seals. ICES CM 1997/CC:01.

R76. North Atlantic Marine Mammal Commission, 2005. *NAMMCO Annual Report 2005*. North Atlantic Marine Mammal Commission, Tromsø, Norway, 381 pp.

R77. Northridge, S.P. & Hammond, P.S. (1999) Estimation of porpoise mortality in UK gill and tangle net fisheries in the North Sea and west of Scotland. SC/51/SM42. Unpublished paper presented to the International Whaling Commission Scientific Committee, 15pp.

R78. Norwegian delegation. Agreed record of conclusions of fisheries consultations between the Faroe Islands, the European Community, Iceland and Norway on the management of blue whiting in the North East Atlantic in 2007. Torshavn, 27 October 2006.

R79. Norwegian Ministry of the Environment Report No. 8 to the Storting. Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands.

R80. NOU 2005:10: Lov om forvaltning av viltlevende marine ressurser. Statens forvaltninstjeneste, Oslo.

R81. OSPAR 2010 presentation of quality state report

R82. Paper on the work and responsibilities of the Fisheries Directorate. Provided at meeting at the Fisheries Directorate 24 January 2007.

R83. Report Of The Second Meeting Of The Subgroup On Fishery And Environment (SGFEN) Of The Scientific, Technical And Economic Committee For Fisheries (STECF) Incidental Catches Of Small Cetaceans. Brussels, 22.10.2002 Sec(2002) 1134

R84. Report on status of Barents Sea ecosystem – joint Russian/Norwegian report, presented to ICES and Wdoc. Saithe 8 years of stomach contents data, food web studies – Wdoc to arctic fisheries working group.

R85. Riksrevisjonen Dokument nr 3:13 (2003-2004): Riksrevisjonens undersøkelse av forvaltningen av ressursene

R86. Rumohr, H. and Kujawski, T. (2000). The impact of trawl fishery on the epifauna of the southern North Sea. ICES J. Mar. Sci. 57, 1389-1394.

R87. Scientific Basis for Environmental Quality Objectives (EcoQOs) for the Barents Sea

Ecosystem', (in prep.) Norway, 2005.

R88. Silvert, R. 2004. Report on Management Simulations for the North Sea based on Ecopath with Ecosim in Work Package 6 EFEP (European Fisheries Ecology Plan), 2004. http://bill.silvert.org/pdf/ECOPATH%20Report.pdf

R89. Sparre, P. 1984. A computer program for estimation of food suitability coefficients from stomach content data and multispecies VPA. ICES CM 1984/G: 25, 59 pp.

R90. Stiansen, J.E., A. Aglen, B. Bogstad, P. Budgell, P. Dalpadado, A.V. Dolgov, A. Dommasnes, A.A. Filin, H.Gjøsæter, K.H. Hauge, Å. Høines, R. Ingvaldsen, E. Johannesen, L.L. Jørgensen, A.L. Karsakov, J. Klungsøyr, T. Knutsen, V. Lien, H. Loeng, S. Mehl, P. B. Mortensen, N.V. Muchina, V.N. Nesterova, E. Olsen, E.L. Orlova, V.K. Ozhigin, A.P. Pedchenko, E.K. Stenevik, M. Skogen, O.V. Titov, S. Tjelmeland, V.B. Zabavnikov, S.V. Ziryanov, N.G. Zhukova, N. Øien, S. Aanes. 2005. Joint PINRO/IMR report on the state of the Barents Sea ecosystem 2005/2006. IMR/PINRO Joint Report Series,No. 3/2006. ISSN 1502-8828. 122 pp.

R91. Stiansen, Jan Erik, Bjarte Bogstad, Paul Budgell, Padmini Dalpadado, Harald Gjøsæter, Kjellrun Hiis Hauge, Randi Ingvaldsen, Harald Loeng, Mette Mauritzen, Sigbjørn Mehl, Geir Ottersen, Morten Skogen and Erling Kåre Stenevik. Status report on the Barents Sea Ecosystem, 2004-2005.

R92. Stortingsmelding 22 2005-2006: Om dei fiskeriavtalene Noreg har inngått med andre land for 2006 og fisket etter avtalane i 2004 og 2005.

R93. Stratoudakis, Y., Fryer, R., Cook, R.M. & Pierce, G.J., 1999. Fish discarded from Scottish demersal vessels: estimators of total discards and annual estimates for targeted gadoids. ICES Journal of Marine Science 56, 592-605.

R94. Tasker, M.L., C.J. Kees Camphuysen, J. Cooper, S. Garthe, W. A. Montevecchi, S.J.M. Blaber 2000. the impacts of fishing on marine birds. ICES J. Mar. Sci 57, 531-547.

R95. Ugland, K. I., K. A. Jødestøl, P. E. Aspholm, A. B. Krøyer and T. Jakobsen , Fish consumption by invading harp seals off the Norwegian coast in 1987 and 1988. ICES Journal of Marine Science: Journal du Conseil 1993 50(1):27-38.

R96. Vinther, M. 1999. Bycatches of harbour porpoises (*Phocoena phocoena*, L.) in Danish set-net fisheries. J. Cetacean Res. Manage. 1(2):123-35

R97. Vinther, M. and Larsen, F. 2004. Updated estimates of harbour porpoise (*Phocoena phocoena*) bycatch in the Danish North Sea bottom-set gillnet fishery. J. Cetacean Res. Manage. 6(1):19-24

R98. Walker, P. A. and Heessen, H. J. L. (1996). Long-term changes in ray populations in the North Sea. Fish. Res. 53, 1085-1093.

R99. Wheeler, A. 1969. The fishes of the British Isles and North-west Europe. Michigan State University Press, 613pp.

R100. WWF. 2003. Norwegian coldwater coral protection Setting an international example in marine conservation.

2 BACKGROUND TO THE FISHERY

2.1 Biology of the Target Species:

North East Arctic

The North-East Arctic saithe is distributed along the coast of Norway and Russia from the Kola Peninsula southwest to Møre at 62º N. Age at maturity is five to seven years and the main spawning takes place at the coastal banks from Lofoten to the North Sea around February when the temperature is between 6 to 10º C. Migration towards the spawning grounds starts in autumn. The larvae drift northwards, settle in inshore areas and migrate to the coastal areas at age two to four. Because of this northwards drift, recruitment appears not to be linked closely with spawning stock size but is more influenced by oceanography, so that the recruitment of saithe may suffer in years with reduced inflow of Atlantic water to the Norwegian and Barents seas (Jakobsen 1986).

The stock boundary 62º N is more for management purposes than a biological basis for stock separation (ICES 2006a). Tagging experiments show a regular annual migration of mature fish from the North-Norwegian coast to the spawning areas off the west coast of Norway and also to a lesser extent to the northern North Sea (ICES 1965). There is also a substantial migration of immature saithe to the North Sea from the Norwegian coast between 62º and 66º N (Jakobsen 1981). In some years there are also examples of mass migration from northern Norway to Iceland and to a lesser extent to the Faroe Islands (Jakobsen 1987). 0-group saithe, on the other hand, drifts from the northern North Sea to the coast of Norway north of 62º N. In the context of this assessment, however, both Norwegian and North Sea stocks are assessed as being sustainably managed.

The smaller individuals feed on crustaceans, while larger saithe feed more on fish. Recent sampling indicates that NE Arctic saithe feed mainly on euphausids, capelin, herring, haddock and other fish (ICES (2006a)). The importance of fish is highest in the north, while in the south the importance of crustaceans increases.

In the Norwegian fishery, which at present accounts for more than 90 % of the landings, various gears are used, while other nations mainly use bottom trawl. On average over the last ten years about 40 % of the Norwegian catch originates from bottom trawl, 25 % from purse seine, 20 % from gill net and 15 % from other conventional gears (long line, Danish seine and hand line). The gill net fishery is most intense during winter, purse seine in the summer months while the trawl fishery takes place more evenly all year around.

North Sea

Juveniles are mainly distributed in nursery grounds inshore, in sheltered bays and coastal waters along the west and south coast of Norway, the coast of Shetland and the coast of Scotland (ICES 2006b). Around age 3 they gradually migrate from the costal areas to the northern part of the North Sea, mainly along the shelf edge, where the feeding grounds of the adult part of the stock are situated. Age at maturity is between 4 and 6 years, and spawning takes place in January-March at about 200 m depth along the Northern Shelf edge and the western edge of the Norwegian deeps. Larvae and post-larvae are widely distributed in Atlantic water masses across the northern part of the North Sea, and around May the 0-group appear along the coasts of Norway, Shetland and Scotland. The west coast of Norway is probably the most important nursery ground for saithe in the North Sea.

When saithe exceed 60-70 cm in length the diet changes from plankton (krill, copepods) to fish (mainly Norway pout, herring, sandeel, haddock and blue whiting). Large saithe (>70 cm) have a highly migratory behaviour and the feeding migrations extend from far into the Norwegian Sea to across the Norwegian deeps to the coast.

Before 1999 saithe in Sub-area IV and Division IIIa and saithe in Sub-area VI were treated as separate stock units. These stock boundaries were more for management purposes than a biological basis for stock separation. Present biological knowledge shows no evidence that saithe in Division IVa and VIa belong to separate stock units. There seems to be a similar recruitment pattern and the spawning areas in these divisions are not separated (ICES 1995).

Tagging experiments by various countries have shown that exchange between all saithe stock components in the north-east Atlantic takes place to a variable extent (ICES 1995). For example, a substantial migration of immature saithe from the Norwegian coast between 62 N and 66 N to the North Sea has been shown to occur (Jakobsen 1981). 0-group saithe, on the other hand, drift from the northern North Sea to the coast of Norway north of 62 N.

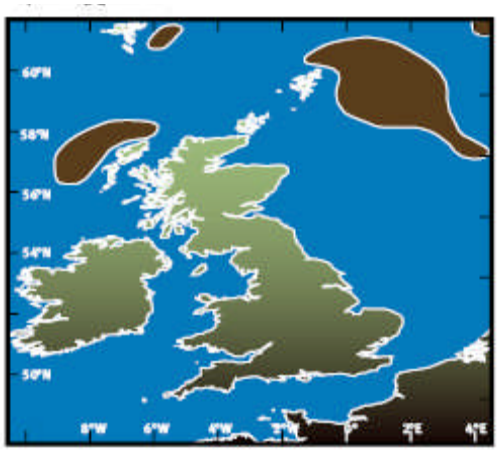


Figure 1 Saithe spawning grounds (FRS Aberdeen)

2.2 History of the Fishery:

The Norwegian saithe fisheries take place in two regions, in the North Sea, and to the north of 62° North. The fishery in the North is more important than the one in the North Sea (TAC of 202000 tons vs 123000 tons (EU and Norway) in 2007, of which 64090 t is Norwegian quota). The Northeast Arctic saithe stock is entirely in areas under Norwegian jurisdiction, while the North Sea stock is shared with the EU and managed jointly by Norway and the EU under their 1981 agreement on cooperation in fisheries.

In the 1995-2004 period, the saithe fisheries have had a landed value between 0.7 and 1 billion NOK. This makes it the fourth most important fishery in Norway (Fiskeridirektoratet og Havforskningsinstituttet 2006: Beskatningsstrategi for nordøst-arktisk sei: 9).

In Norwegian fisheries statistics, the saithe fisheries are listed in three categories according to types of gear used: Trawl, purse seine, and conventional gears. The latter category comprises hand line, longline, gillnets, and Danish seine.

North East Arctic

During the last 50 years, the fishery has been dominated by three types of gear: trawl, purse seine and gillnets. The purse seine fishery takes place in summertime, in the fjords and near the coast. During the last 20 years, landings has varied between 92000 tons (1987) and 176000 tons (2005). The bulk of the landings are by Norwegian vessels (162000 tons in 2005), while the remainder quantity is taken by Russian and EU vessels following quota allocations from Norway (ICES Advice 2006, Vol 3, pp. 29-36). The stock has shown a robust growth in recent years, due to strict regulations of the fishery,

favourable environmental conditions and good recruitment to the stock.

Over the last 40 years average annual catch has been 160000 tonnes. The catch in 2005 was 176000 tonnes. In the Norwegian fishery, which at present accounts for more than 90 % of the landings, various gears are used, while other nations mainly use bottom trawl. On average over the last ten years about 40 % of the Norwegian catch originates from bottom trawl, 25 % from purse seine, 20 % from gill net and 15 % from other conventional gears (long line, Danish sine and hand line). The gill net fishery is most intense during winter, purse seine in the summer months while the trawl fishery takes place more evenly all year around.

Table 1 Norwegian catches in 2005 by gear and stock

Gear	North East Artic (NEA)	North Sea (NS)
Trawl	75758	58147
Purse seine	42048	5799
Gill nets	25416	2397
Hand line	8418	60
Danish seine	7813	47
Long line	1571	448
Others	822	659
Total	161846	67819

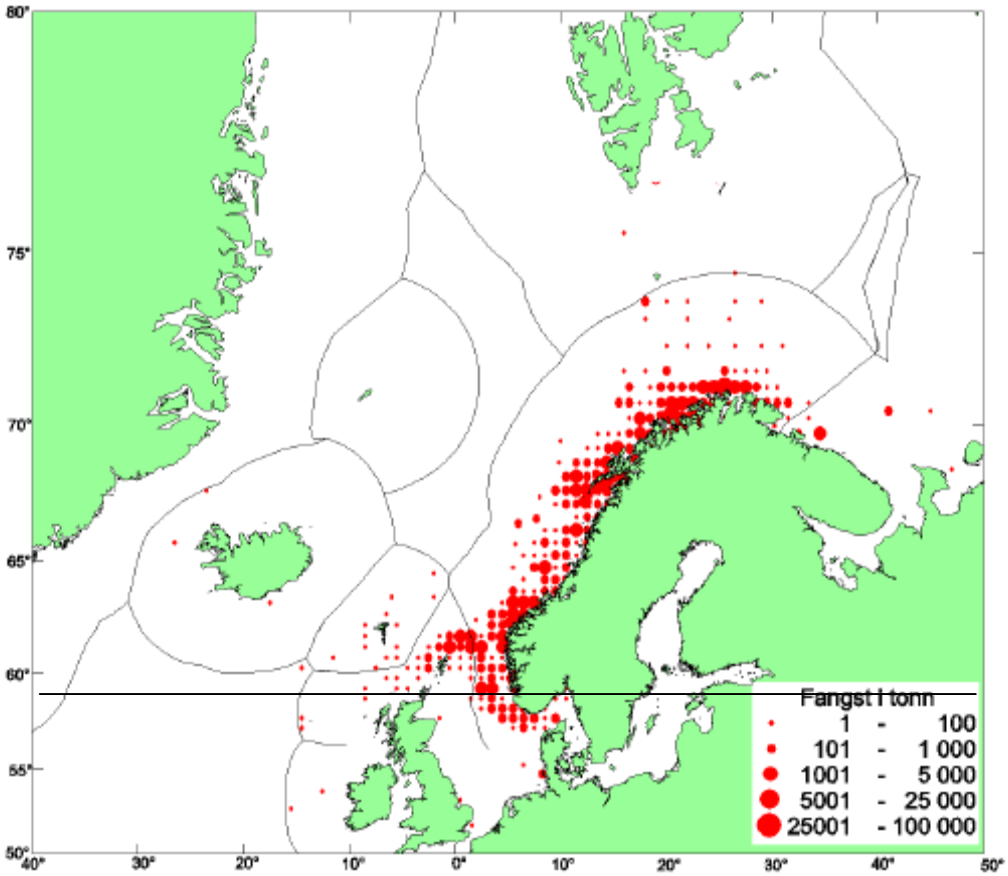


Figure 2. Distribution of catches of Saithe by Norwegian vessels, 2001(Norske fangster av sei i 2001) (Fisheries Directorate, 2002)

North Sea

Before 1999, saithe in ICES statistical area IV and IIIa were viewed as two distinct stocks. Since then they have been assessed as one stock. Saithe in statistical area VI is considered a distinct stock. The last five years reported landings have been lower than the TAC, due to low prices, high costs of fishing (high fuel prices) and conservative management. Since 1987 (149.000 tons), landings have varied between 87.000 tons (2000) and 117.000 tons (2002). The fishery in area VI is dominated by EU vessels. The Norwegian landings from areas IV and IIIa in 2005 were 67.365 tons, with negligible amounts taken in area VI. The combined TAC that year was 160.044 tons (ICES Advice 2006, Vol 6, pp. 115-124).

Over the last 38 years, average annual catch has been 132 000 tonnes. The catch in 2005 was 110 000 tonnes. Saithe in the North Sea are mainly taken in a directed trawl fishery in deep water near the Northern Shelf edge and the Norwegian Deeps. The majority of the catches are taken by Norwegian, French and German trawlers. In the first half of the year, the fishery is directed towards mature fish, while immature fish dominate in the catches the rest of the year.

Norway has 52 % of the total allowable catch, and in a typical year, about 78 % of the Norwegian catch originates from bottom trawl, 13 % from gillnet and long-line, 9 % from purse seine and 1% from other fishing gears.

2.2 Vessels and Gear

2.2.1 *North East Arctic*

Five different gear types are being considered in this evaluation of the Northeast Arctic saithe fishery:

- Demersal trawls
- Gill nets
- Purse seines
- Danish seines
- Hook and line

The NE Arctic saithe fishery was traditionally based on gill net fishing, but since the early 1960's has been dominated by purse seine and trawl fishing. A traditional gill net fishery for spawning saithe accounts for about a further 22%. The remaining catches are taken by Danish seine and hand line in addition to minor by-catches in the long line fishery for other species. According to Directorate statistics, 184 seine vessels were licensed to fish for saithe in 2005, while of vessels fishing with conventional gears, 2,346 vessels under 28m were licensed to fish for cod, haddock and saithe and 12 over 28m licensed specifically for saithe.

On average about 40% of the Norwegian saithe catch originates from bottom trawl, 25% from purse seine, 20% from gill net and 15% from other conventional gears (long line, Danish seine and hand line). The gill net fishery is most intense during winter, purse seine in the summer months, while the trawl fishery takes place throughout the year.

Trawl
Trawl vessels are typically 30-70 m stern freezer trawlers (ca. 40 vessels) and stern factory trawlers (12 vessels). In addition, there are 15 stern fresh fish trawlers that fish for saithe only to a limited extent. Vessels operate from Aalesund and surrounding communities, Lofoten/Vesterålen, Harstad, Tromsø, Båtsfjord and Hammerfest and some other communities in Finnmark. Trawl gear is, for practical purposes, limited for use beyond 12 nautical miles of the Norwegian coastline as most

trawlers are more than 1,200 BT (Directorate regulation 061221). However, trawlers under 1,200 BT may fish in to 6 nm in specified areas and/or periods. Trawls are generally deployed at depths between 100 and 400m, using Rock hopper style trawl gear. All trawling in the North East Arctic must be demersal, as it is prohibited to use trawls for pelagic fishing operations for cod, haddock and saithe within the fisheries limit and in the Economic Zone of Norway north of 64°N.

Regulation 05105 specifies the minimum mesh size is 135mm north of 64°N, and 120mm to the south of this area in the Norwegian Sea (Regulation 061221). The height of the head rope from the bottom is commonly set less than 5m from the seabed when fishing for saithe. Other protective measures are the use of sorting grid with minimum bar spacing in ground fish trawl.

Gill Net

There are 11 vessels in a distinct group of freezer vessels (over 28 m), typically 45-50 metres, plus several hundred, generally fresh fish vessels under 28 metres. For freezer vessels, fishing is a continuous process in trips of up to 6 weeks duration. Fresh fish vessels deploy gear and leave for one day soaking time, retrieved the following day. Larger vessels operate from Måløy, Stadt, Fosnavåg, Giske (west-coast), while vessels under 28m are to be found in all fishing communities from Måløy to Finnmark. Fishing begins in or close to the North Sea region, and moves north over the period, targeting saithe.

Gillnets operate at similar depths to the trawl fishery (80-300m). Deployed on the seabed, the nets are commonly 5-6m tall and 27m long. The nets are often deployed in a string. Offshore, up to 50 nets are often set at once, with the potential for around 15 separate sets to be made at one time. These can be left to soak for 6 to 12 hours, depending on the depth at which they are set. Directorate regulations set the maximum soak time at one day. In more coastal areas, 50 to 70 nets can be set in strings, with 4-5 strings deployed. Searching for saithe commonly occurs at night, with hauling of set nets occurring during daytime hours.

Directorate regulations state that gillnet meshes are regulated to be square, of 148 mm minimum mesh size. Gillnets must not be higher than 23 m measured with the meshes stretched diagonally.

Purse Seine

Both small coastal vessels and larger offshore vessels operate purse seine gears. Vessels are generally smaller than 30m, with around 6 larger vessels also operating, generally in summer (when there is near 24 hour daylight) and in autumn between dawn and dusk. However, there are regulations limiting daytime fishing where herring might be caught. The main fishing communities are in the Nordland, Troms and Finnmark regions, but mostly concentrated in Nordland and the southern area of Troms.

Purse seine fishing is pelagic, with nets preferably set shallow. This preserves the quality of the catch on pursing, and makes the operation easier. Deeper water catches are generally of lower quality. Directorate regulations (Regulation 061221) prohibit the use of purse seine nets that exceed 160m in depth when fishing for saithe.

Catches, particularly those where the net has been set shallow and inshore, may be held in the net and towed live to shore. Where this is unfeasible, fish may be held in holding pens or brailed from the net into refrigerated saltwater tanks. Larger purse seine vessels can process the catch if required, heading and gutting the fish and keeping them on ice.

Danish seine

The general operation of the Danish seine is comparable to that of the purse seine, although the net is deployed demersally, and hence must be anchored on the seabed. The main fishing communities are in the Nordland, Troms and Finnmark regions, but mostly concentrated in Nordland and the southern

area of Troms. Vessels are typically 13-27.5 metres. Danish seines are set at similar depths to trawls, down to 350m.

Minimum mesh size regulations specify 125 mm in Danish seines made of polyester and polyamide or 135 mm in Danish seines made other materials. Variations in specified minimum mesh sizes also occur within different areas of the Norwegian zone.

Hook and line
The gear involves multiple hooks with lures, deployed from vessels of typically 5 - 15 metres. One to four electronic winches are used fishing with multiple hooks with lures, and/or a handline with multiple hooks with lures. Vessels operate from all fishing communities from Måløy to Finnmark. Hook and line fishing of saithe can also be linked to the operations of the purse seine fishery. In this case, hook and line gear is used to identify the species composition of shoals of fish, to avoid setting on herring shoals that affect the performance of the net.

2.2.2 *North Sea*

Five gears are being considered in this evaluation of the North Sea fishery:

- Demersal trawls
- Gill nets
- Purse seines
- Danish seines
- Hook and line (Handline)

Saithe in the North Sea are mainly taken in a direct trawl fishery in deep water near the Northern Shelf edge and the Norwegian deeps. Norwegian, French, and German trawlers take the majority of the catch. In the first half of the year the fishery are directed towards mature fish, while immature fish dominate in the catches the rest of the year.

According to Directorate statistics, 65 seine vessels were licensed to fish for saithe south of 64°N, while 57 vessels under 28m and using conventional gears were also licensed in 2005. Furthermore, 104 North Sea trawlers were licensed (87 of which were ‘limited’ North Sea trawlers). However, not all the vessels licensed to fish within the North Sea actually do so.

Trawl
The Norwegian component of the North Sea saithe fishery has been dominated by a directed trawl fishery operated by larger trawler vessels in deep waters in the northern North Sea. As specified in the EU-Norway agreement, a minimum mesh size of 120mm has been specified for Norwegian vessels operating demersal trawls in the North Sea.

Trawl vessels are typically 30-70 meter stern freezer trawlers (ca. 40 vessels) and stern factory trawlers (12 vessels). Vessels operate from Aalesund and surrounding communities, Lofoten / Vesterålen, Harstad and Tromsø. Trawls are generally deployed at depths between 100 and 400m, using Rock hopper style trawl gear.

Gill Net
There are 11 vessels in a distinct group of freezer vessels over 28 m, typically 45-50 metres, which represent the main part of "conventional" catches, and some catches from gill-netters under 28 metres, typically small vessels. For freezer vessels, fishing is a continuous process in trips of up to 6 weeks duration. Fresh fish vessels deploy gear and leave for one day soaking time, retrieved the following day. Larger vessels operate from Måløy, Stadt, Fosnavåg, Giske (west-coast. Limited gillnet fishing occurs within the North Sea. When operating within this area, the western limit of the

Norwegian gillnet fishery is 4°W. Directorate regulation 050105 specifies the minimum mesh size to be 148mm within this area.

Purse Seine

A limited purse seine fishery operates along the west coast of Norway taking smaller individuals. Relatively small amounts of purse seine activity occur within the North Sea. Directorate regulation 061221 specifies the use of 110mm mesh in EU zone. Typical vessel size is 13-27,5 metres (with an average around 15 metres). Purse seine fishing is pelagic, with nets preferably set shallow. This preserves the quality of the catch on pursing, and makes the operation easier.

Catches, particularly those where the net has been set shallow and inshore, may be held in the net and towed live to shore. Where this is unfeasible, fish may be held in holding pens or brailed from the net into refrigerated saltwater tanks. Larger purse seine vessels can process the catch if required, heading and gutting the fish and keeping them on ice.

Danish Seine
As for purse seines, relatively small amounts of Danish seine effort is expended in the North Sea. Directorate regulation 061221 specifies the use of a minimum 110mm mesh in Danish seines operating in this area.

Hook and line
The gear involves multiple hooks with lures, deployed from vessels of typically 5 - 15 metres. One to four electronic winches are used fishing with multiple hooks with lures, and/or a handline with multiple hooks with lures. Vessels operate from fishing communities in South West Norway. Hook and line fishing of saithe can also be linked to the operations of the purse seine fishery. In this case, hook and line gear is used to identify the species composition of shoals of fish, to avoid setting on herring shoals that affect the performance of the net.

2.3 Fishing Locations and Administrative Boundaries:

Most of the Norwegian saithe fisheries take place in the Norwegian Economic Zone (EEZ). The fisheries in the EEZ is managed as a whole by the central authorities – the Ministry of Fisheries and Coastal Affairs (MFCA) and the Fisheries Directorate, which is tasked with the promulgation and implementation of regulations. There are two distinct fisheries of saithe; the Northeast Arctic stock occurring north of 62° North, and to the south of the North Sea stocks.

North East Arctic
The North East Arctic saithe stock is an exclusive stock to Norway, and the only major Norwegian fish stock that is not shared with another country. The fishery takes place along the coast and in the fjords of North Norway.

North Sea
The North Sea saithe stocks are shared with the European Union, with 48 per cent to the EU and 52 per cent to Norway. The Norwegian fishery for the North Sea saithe primarily takes place in Norwegian waters. Before 1999, saithe in ICES statistical area IV and IIIa were viewed as two distinct stock. Since then they have been assessed as one stock. Saithe in statistical area VI is considered a distinct stock, and is mainly exploited by EU vessels.

2.4 Ecosystem Characteristics:

The ecosystem approach has been agreed as a management principle in the Bergen Declaration from the 5th North Sea Conference and by the Norwegian Parliament in adopting the governmental white

paper.

North East Arctic

Knowledge of the ecosystem characteristics of the North East Arctic region can be divided into two separate areas: the Barents Sea to Lofoten, and the remainder of the Norwegian Sea to the south of this area. Although the former area covers a large proportion of the area fished by trawlers targeting saithe (see figures 3 & 4), it does not encompass the entire geographic range of activity.

The characteristics of the marine ecosystem of the Barents Sea/Lofoten area are relatively well known. Numerous joint Norwegian/Russian ecosystem cruises have been performed in this area, examining oceanographic characteristics, as well as plankton, benthos, fish, bird and mammal distributions and abundance. Some of these data sets, particularly those examining temperature and salinity, for example, extend back to the 1930's. These surveys have underpinned the Barents Sea management plan of man's use of the environment (Report no.8 to the Storting, "Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands"). This holistic study examined the variety of man's activities, including fishing, petroleum extraction, and maritime transport. As such, the plan aims to "provide a framework for the sustainable use of natural resources and goods derived from the Barents Sea and the sea areas off the Lofoten Islands, and at the same time maintain the structure, functioning and productivity of the ecosystems of the area".

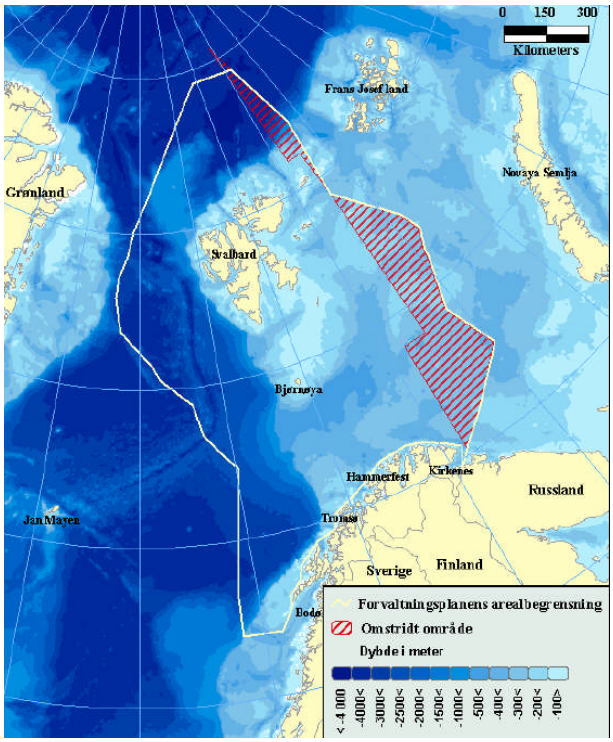


Figure 3. Chart of area considered within Barents Sea- Lofoten integrated management plan (extracted from Utredning av konsekvenser av fiskeri i området Lofoten, Barentshavet 2004).

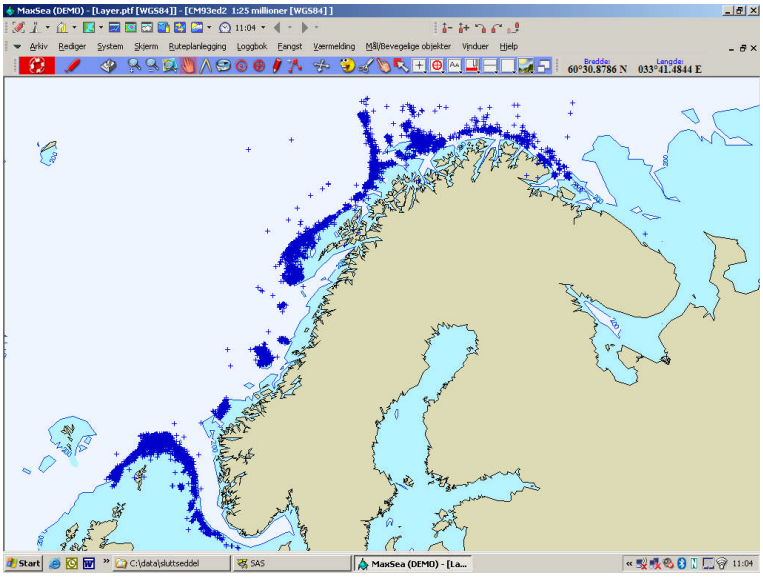


Figure 4. Indicative areas of saithe trawling activity, from recorded logbook positions from 3 trawlers in the Norwegian reference fleet (vessels that have a close cooperation with the Institute of Marine Research) during 2001-2005. Each blue mark represents a trawl haul with more than 200 kg of saithe.

Through the underpinning work, key geographical areas have been identified that are important for biodiversity and biological production in the area, and where adverse impacts might persist for many years. Besides being important within the life history stages of key commercial fish species (e.g. spawning and nursery areas), several of the areas were also identified as important as breeding, moulting or wintering areas for seabird populations of international importance, such as the lesser black-backed gull (subspecies *Larus fuscus fuscus*), Steller's eider and Atlantic puffin[1]. In addition, the areas identified include valuable and vulnerable habitats where the benthic fauna included species such as cold-water corals (the largest known cold-water coral reef is off Røst in the Lofoten Islands) and sponge communities. Unintentional negative impacts on these species "are to be reduced as much as possible by 2010".

On the basis of these studies, the most vulnerable areas within the region have been identified and oil and gas activities forbidden in these areas. So far, one purely marine protected area has been established under the Act: the Selligrunnen coral reef in the Trondheimsfjorden, which has been temporarily protected. An Official Norwegian Report (NOU 2004: 28) on an Act on the protection of the natural environment, landscape and biological diversity contains a proposal to extend the geographical scope for the protection of sea areas from 12 nautical miles to include the Norwegian continental shelf and Norway's exclusive economic zone. Five marine protected areas have been established under the fisheries legislation to protect coral reefs from damage caused by bottom trawling. These are Iverryggen, Røstrevet (in the Barents Sea–Lofoten area), Sularyggen, Tislerrevene and Fjellknausene. These areas protect these specific vulnerable species and habitats from disturbance.

The MAREANO programme[2] aims to survey and perform basic studies of the seabed's physical, biological and chemical environment. This follows the Norwegian Government's go-ahead for the

[1] J.E. Stiansen, A. Aglen, B. Bogstad, P. Budgell, P. Dalpadado, A.V. Dolgov, A. Dommasnes, A.A. Filin, H.Gjøsæter, K.H. Hauge, Å. Høines, R. Ingvaldsen, E. Johannesen, L.L. Jørgensen, A.L. Karsakov, J. Klungsøyr, T. Knutsen, V. Lien, H. Loeng, S. Mehl, P. B. Mortensen, N.V. Muchina, V.N. Nesterova, E. Olsen, E.L. Orlova, V.K. Ozhigin, A.P. Pedchenko, E.K. Stenevik, M. Skogen, O.V. Titov, S. Tjelmeland, V.B. Zabavnikov, S.V. Ziryanov, N.G. Zhukova, N. Øien, S. Aanes. 2005. Joint PINRO/IMR report on the state of the Barents Sea ecosystem 2005/2006. IMR/PINRO Joint Report Series,No. 3/2006. ISSN 1502-8828. 122 pp.
[2] IMR web page

launch of a marine survey programme in the Lofoten - Barents Sea region in 2005. Following collection, the data will be entered into a database that will cover Norway's coastal and marine regions, increasing the information on ecologically important benthic communities such as coral reefs and sponges.

Large 3D hydrodynamic numeric models for the Barents Sea are run at both IMR and PINRO. Sub-models for phytoplankton and zooplankton are now implemented in some of the hydrodynamic models. However, strong assumptions within these models mean outputs must be viewed with caution.

Further studies have looked into the food web characteristics of the Barents Sea region. Nilssen et al. (1997) estimated food consumption estimates for Barents Sea harp seals. They noted that gadoids, including saithe, were predated more heavily when capelin stocks were at low levels. Folkow et al. (1997) also derived food consumption estimates for Minke whales in northeast Atlantic waters (Norwegian and Barents Seas), supplementing work on other mammals[3]. Small amounts of saithe were found in the diet, being mainly consumed in the Vesteraen and Lofoten area. Saithe feeding habits in the region north of 62°N has been the study of a masters graduate thesis from the University of Bergen. This study concentrated on getting a general picture of the diet of saithe along the Norwegian coast in this region in late autumn. When raised by the acoustic abundance estimate of saithe estimates of saithe prey consumption in quarter 4 of the year indicated that krill was the single most important prey species, followed by Norway pout, herring, blue whiting and haddock.

These studies have begun to place saithe within the foodweb of the Norwegian and Barents Sea region. However, a particular focus has been the predation of saithe on herring, the implications of a recovering saithe stock on herring abundance, and hence on the long term management of saithe. A further aspect to the ecosystem approach includes predicting the effect of mixed fisheries on individual exploited stocks. ICES is requested to provide advice which is consistent across stocks for mixed fisheries. Although work to this end is ongoing, (ICES 2006/ACFM:14), they are limited due to a need for better methods and limited data.

A number of multispecies models have been developed to examine ecosystem interactions between exploited species, but their use is limited by their data intensive nature. Simpler models, which look at an aspect of the total ecosystem, include GADGET (www.hafro.is/gadget), which can model interactions between cod, herring, capelin and minke whale in the Barents Sea. This model is still being developed.

Further ecosystem studies by IMR have been recently launched on *Lagenorhynchus* dolphins, following a recommendation from the North Atlantic Marine Mammal Commission (NAMMCO). The study aims to explore the ecology of Atlantic white-sided dolphin *Lagenorhynchus acutus* and the white-beaked dolphin *Lagenorhynchus albirostris* to increase knowledge of the ecosystem dynamics, and investigate the exposure of mammalian top predators towards environmental contaminants and study effects on their health status. In addition to sightings, this programme involves the capture and post-mortem examination of specimens.

[3] Lindstrøm, U., Harbitz, A., Haug, T. and Nilssen, K., (1998). 'Do harp seals *Phoca groenlandica* exhibit particular prey preferences?', ICES J. Mar. Sci., 55, 941-953. Haug, T., Gjøsæter, H., Lindstrøm, U. and Nilssen, K.T., (1995). 'Diet and food availability for northeast Atlantic minke whales (*Balaenoptera acutorostrata*), during the summer of 1992', ICES J. of Mar. Sci. 52, 77-86.

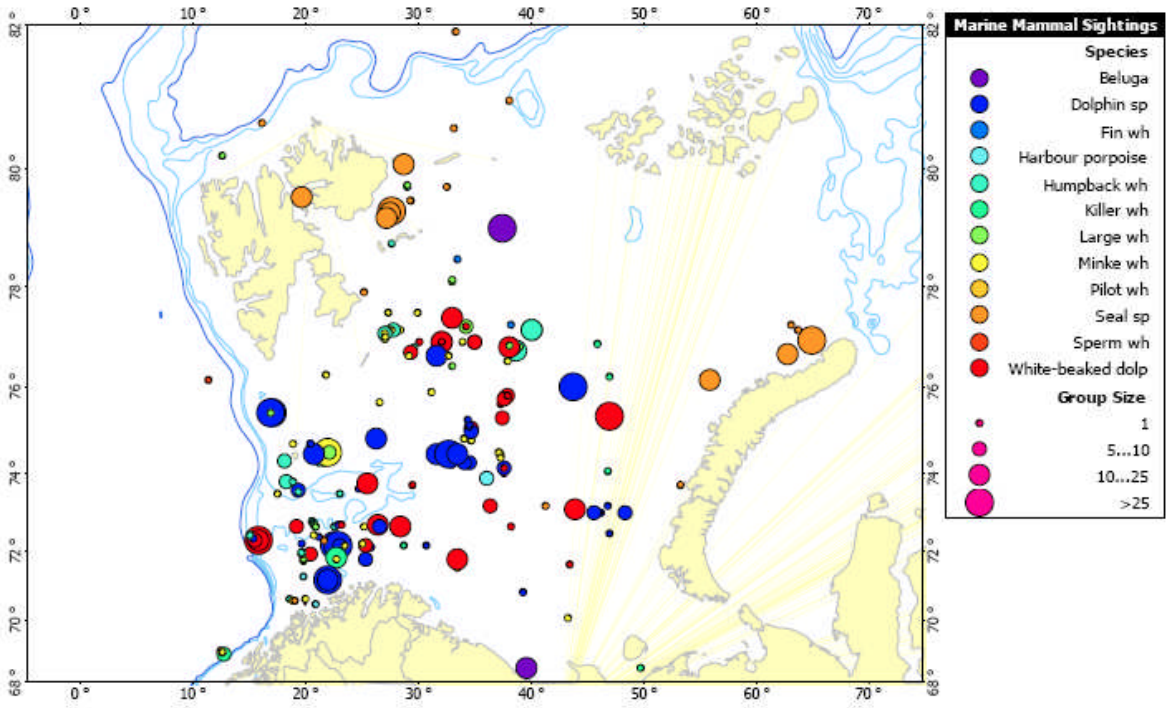


Figure 5. Distribution of marine mammals north of Norway during August - October 2004)(Johan, Hjort, Smolensk, Nansen and the PINRO airplane Arctica,.

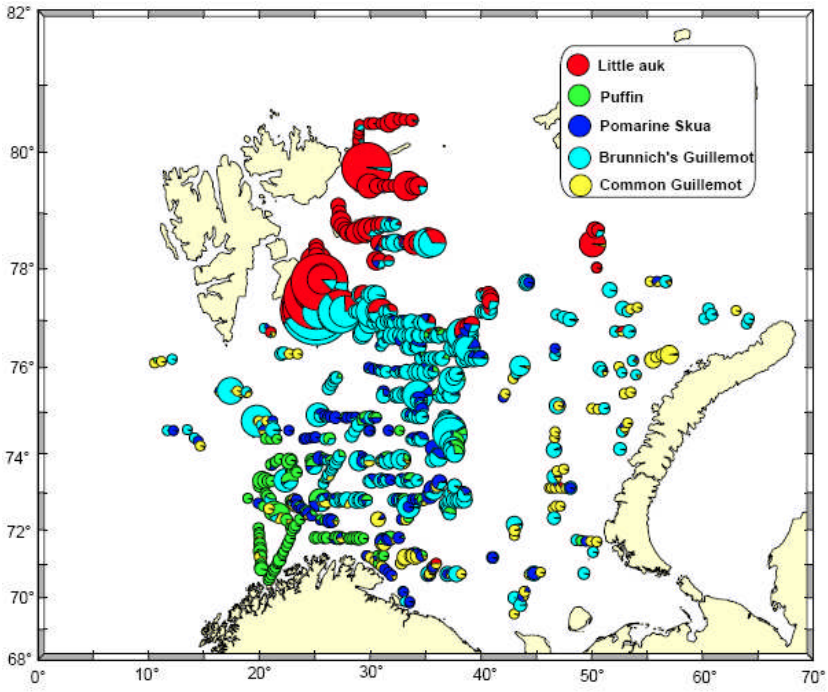


Figure 6.Observation of sea birds during the period August-October (F. Nansen and J. Hjort).

While the Barents Sea/Lofoten management plan has been developed based upon the collation of a considerable range of data sources, the process for more southerly Norwegian Sea waters is less advanced. However, the Barents Sea/Lofoten plan stated “The Government also intends to start the preparation of similar management plans for the Norwegian Sea and the North Sea, using experience gained during the preparation of this management plan as a starting point”. This process is beginning, with the aim to present a white paper in spring 2009. Work on a representative selection of marine habitats in Norwegian coastal waters (national marine protection plan) is also said to be well

advanced, and proposals are expected to be ready for public consultation in 2007 so that protected areas can be established in 2008. In the second phase of the work on the marine protection plan (2007–2012), further areas will be protected and other adjustments made as necessary.

Trawl (This section only relates to trawl gear)
The total impact of trawling activities, requiring an extensive mapping of fishing effort and bottom habitat, has not yet been performed. The impacts of experimental trawling have been studied on a high seas fishing ground in the Barents Sea. Trawling seems to affect the benthic assemblage mainly through resuspension of surface sediment and through relocation of shallow burrowing infaunal species to the surface of the seafloor.

North Sea

The North Sea is a semi-enclosed water body, situated on the continental shelf of Northwest Europe. Bounded by a number of countries, this relatively shallow sea (generally shallower than 200m) is strongly affected by both saline inflows from the north, and from freshwater inputs from the major rivers of the continent. It is a highly productive ecosystem, but primary productivity varies across the North Sea. Highest values of primary productivity occur in the coastal regions (influenced by terrestrial nutrient inputs), on the Dogger Bank, and at tidal fronts.

The North Sea is the focus of a range of human activities, including fishing, dredging, oil and gas exploration, shipping and as recipient for discharges from sources on land or offshore. In recognition of the potential impacts on the ecosystem, the Ministers at the 3rd Conference in The Hague in 1990 requested that OSPAR and ICES should establish a North Sea Task Force (NSTF), with one of the tasks being to produce a Quality Status Report (QSR) for the North Sea. This was completed in 1993 and identified fisheries as having major impacts on the North Sea ecosystem.

A range of information exists on elements of the North Sea ecosystem, including considerable knowledge on the oceanography, plankton, fish distribution and abundance, and the interactions between these fish components. Certain types of data, notably those related to fisheries, physical oceanography, plankton and nutrients, are measured typically throughout the North Sea, with many programmes covering several decades of observation. Other data, including biological effects (ecotoxicology), sediment chemistry (contaminants), species introductions, hazardous algal blooms in coastal waters and benthos surveys (to name a few) tend to be more localized (for example concentrated in coastal waters) or cover a more limited period of time, i.e., years rather than decades.

The process of linking these components of the North Sea ecosystem is beginning under the ICES Regional Ecosystem study group for the North Sea (REGNS)[4], which includes Norwegian scientific representatives. Under these auspices, a workshop to progress an Integrated Assessment of the North Sea (9–11 May, 2004) and the meeting of the REGNS Study Group (12–13 May 2004) was held at ICES Copenhagen, Denmark. This aimed to seek agreement on the methodological approach (or framework) for undertaking an Integrated Ecosystem Assessment of the North Sea (IEA). The process aims to bring together information from a range of other ICES Working Groups and organisations (including OSPAR and SAHFOS) to this aim.

Specifically concerning the interactions of fish species such as saithe within the North Sea ecosystem, the feeding habits of this species have been examined through data collected during annual research surveys and during the two ‘years of the stomach’ programmes (1981, 1991). These studies underlie the Multispecies VPA (MSVPA)[5] programme developed for the North Sea by the

[4] ICES. 2005. Report of the Regional Ecosystem Study Group for the North Sea (REGNS), 9–13 May 2005, ICES Headquarters, Copenhagen. ICES CM 2005/. 49 pp.
[5] Sparre, P. 1984. A computer program for estimation of food suitability coefficients from stomach content data and multispecies VPA. ICES CM 1984/G: 25, 59 pp.

ICES Multispecies Assessment Working Group, which estimates the predation mortalities for 9 commercially important fish stocks based upon key fish predators, and by seabirds and seals.

Detailed mass-balance trophic models of the North Sea have been developed using the Ecopath with Ecosim methodology[6]. This allows the temporal and spatial simulation of alternative fishing and environmental change scenarios to be examined on ecosystem components, which include saithe.

The impact of fishing gears on the seabed of the North Sea has been the focus of many studies, both from the impact on benthos, and the geochemistry of the seabed. The impact is most notable through the activities of the beam trawl fleet, which targets flatfish rather than gadoids such as saithe. However, the impact of demersal trawling cannot be disregarded. The impact on benthos has been found to vary. Comparisons of historical and modern data on benthic abundance and diversity have shown potential local effects[7], and more regional changes in sessile, scavenger and predator species[8]. However, these shifts could be the result of a combination of the physical fishery impact of fishing and additional potential food for scavenging and predator species provided by the large amounts of discards and moribund benthos. Other direct studied effects of fishing include the physical disturbance to the seabed, and the generation of seabed litter from discarded gears etc. Despite these clear, and in many cases quantifiable, effects, it is still very difficult to separate the effects of commercial fisheries from natural fluctuations in reproductive success and predator-prey interactions. However, models suggest that trawling reduces biomass, production, and species richness. The impacts of trawling is greatest in areas with low levels of natural disturbance, while the impact of trawling was small in areas with high rates of natural disturbance. For the North Sea, models suggest that the bottom trawl fleet reduced benthic biomass and production by 56% and 21%, respectively, compared with an unfished situation[9].

The ICES Working Group on Seabird Ecology (WGSE) has a wide remit which includes the review of current approaches for identifying offshore seabird aggregations and delineating Important Bird Areas (IBAs) and Special Protection Areas (SPAs); the development of recommendations for a comprehensive monitoring programme for seabirds; and details of how to sample diet and how to report results of dietary studies in seabirds.

The different areas of ecosystem interactions are yet to be drawn together. However, this work has begun under the auspices of ICES. In turn, as noted for the North East Arctic region above, the Barents Sea/Lofoten plan stated “The Government also intends to start the preparation of similar management plans for the Norwegian Sea and the North Sea, using experience gained during the preparation of this management plan as a starting point”.

2.4.1 By-catch and Discards

By-catches of saithe in other fisheries are covered by the total saithe quota, and by-catches of other commercial species in the saithe fisheries are landed and counted against the respective quota for each species. Due to the use of sorting grids and large meshes, by-catches of non-commercial species are reported to be low, and mainly consist of dab, sharks and skates. Birds are caught in longline fisheries and harbour porpoises and occasionally arctic seals are reported to be caught in net fisheries (ICES, 2005).

[6] Daskalov, G. and Mackinson, S. (2004). Trophic modelling of the North Sea. ICES CM 2004/FF:40

[7] Frid, C.L.J., Harwood, K.G., Hall, S.J. and Hall, J.A. (2002). Long-term changes in the benthic communities on North Sea fishing grounds. ICES J. Mar. Sci. 57, 1303-1309.

[8] Rumohr, H. and Kujawski, T. (2000). The impact of trawl fishery on the epifauna of the southern North Sea. ICES J. Mar. Sci. 57, 1389-1394.

[9] Hiddink, J.G., Jennings, S., Kaiser, M.J., Queiros, A.M., Duplisea, D.E. and Piet, G.J. (2006). Cumulative impacts of seabed trawl disturbance on benthic biomass, production, and species richness in different habitats. Can. J. Fish. Aquat. Sci. 63, 721-736.

Norwegian fisheries regulations (Regulation amending the regulations relating to sea-water fisheries, paragraph 48) prohibit discarding of a number of commercial species:

a) Cod
b) Haddock
c) Saithe
d) Redfish
e) Mackerel
f) Norwegian spring-spawning herring
g) Trondheimsfjord herring
h) North Sea herring
i) Greater argentine
j) Capelin
k) Greenland halibut
l) Whiting
m) Blue whiting
n) Angler (monkfish)
o) Shrimps
p) Snow crabs

In addition to quota regulations there are regulations aiming at protecting immature fish. Minimum catching size is 45 cm in Norwegian waters for all gears except for the purse seine, where the minimum catching size is 42 cm north of Lofoten, 40 cm between Lofoten and 62º N and 35 cm for the first 3000 tonnes between 65º 30' N and 62º N). Other protective measures are the use of a sorting grid with minimum bar spacing in ground fish trawl, and minimum mesh size in trawl, Danish seine and gill net. If catches contain more than a certain percentage of undersized fish (30 % for purse seine, 15 % for other gears), the particular fishing ground is temporarily closed.

Discarding may occur if trawlers targeting cod catch saithe without having a quota for saithe, but it is understood that all trawlers with quota for cod will also have quota for saithe. Discarding can occur in the purse seine fishery - in 2005 the purse seine fleet had problems finding saithe of above minimum landing size, and areas were closed due to a too high percentage of undersized fish in the catches. In the second half of 2005, the minimum landing size was reduced from 42 to 40 cm north of Lofoten (the same size as south of Lofoten). The purse seine fleet was thereby able to target the relatively strong 2002 year class (3-year-olds).

The purse seine fleet apparently occasionally slips catches of undersized fish, even though this is illegal. There are currently three different minimum landing sizes allowed from the purse seine fleet (35, 40 and 42 mm depending upon area) even though a higher proportion of undersized fish are allowed from the purse seine fishery (20-30%) than the trawl fishery (15%). Although there are no reliable statistics on the volume so slipped.

Full extent of discarding of commercial species is not well known because there is no observer programme in Norwegian waters, but inspection reports suggest that discarding, which is illegal, is rare. Inspections are based upon ambulating fisheries inspectors working on, and shifting between vessels, particularly in offshore fisheries. In addition there is a relatively high presence of coast guard vessels offshore. For coastal fisheries there are inspectors on chartered vessels present at important fishing grounds, and also inner coast-guard vessels present. The reference fleet also provide useful indications.There are, however, no statistics on the extent of catches and discarding of non-commercial species.

2.4.2 Interactions with Protected, Endangered and Threatened Species:

Norway has signed a number of conventions on species protection and management. The Convention on Biological Diversity sets out a general framework for these efforts, and proposals and decisions on which species should be given special protection are made under the regional and global nature conservation conventions, primarily the Bern, Bonn and CITES Conventions.

Norway's current Red List is from 2006. This list contains 3886 species, based upon an evaluated area of mainland Norway, Norwegian oceans and Svalbard. It contains 31 marine species classed as extinct, endangered or vulnerable, including a number of whale and shark species, including the blue skate (*Dipturus batis*), thornback skate (*Raja clavata*), the ivory gull (*Pagophila eburnean*), common porpoise (*Phocoena phocoena*), sooty and Balearic shearwaters (*Puffinus griseus*, *Puffinus mauretanicus*). Since the 1998 list, the lesser black-backed gull (subspecies *Larus fuscus fuscus*) has been classed of "least concern". In addition to the species on the Red List, there are a number of species in the area for which Norway has a special responsibility.

Endangered exploited species are reflected in annual regulations, for example limits on the exploitation of coastal cod, and regulations that stop fishing on species of importance to the ecosystem (e.g. capelin). Regulations appear more limited for those species caught as bycatch, although the ecosystem management plan for the Barents Sea indicates that, following the identification of species, regulations are being evaluated.

The importance of the life history and population trends of bird species within the ecosystem of the Barents Sea, and their links to human activity, is recognised in the BSMP White Paper. However, information with which to examine the bycatch of birds within fishing operations is incomplete; scattered information about bycatches of various species is available, for example, from longline fisheries and some gill-net fisheries. At certain times and in certain areas, there can be relatively large bycatches of diving seabirds in gill nets. Although not directly related to the saithe-targeted fishery, large bird bycatches have been reported from the spring cod fishery in shallow waters near land and from the lumpsucker fishery.

To address this information need, the Norwegian Government has contributed to the development of the SEAPOP (Seabird Population Management and Petroleum Operations) programme. This programme aims to improve knowledge of seabirds through studies of distribution and population size, in order to help distinguish between natural variations and anthropogenic impacts. A new web-based mapping tool for seabirds in Norway is being established to make it easier to access up-to-date information. Several bird scaring devices has been tested for longlining, and a bird-scaring line has been found to reduces significantly bird by-catch, as well as increase fish catch due to the reduction in bait loss. The Barents Sea/Lofoten ecosystem management plan indicates "In the light of new knowledge, the Government will assess the need for restrictions on gear to reduce bycatches of vulnerable seabirds in certain areas and during certain periods. The Government will also take steps to reduce bycatches of seabirds through the development and adaptation of suitable gear. In this context, the Government will consider making it mandatory to implement measures that have proved effective in reducing bycatches (such as the "kjalkeskrema" bird-scaring device) which have proved effective in reducing bird bycatch in the longline fishery.

NAMMCO (the North Atlantic Marine Mammal Commission), along with IWC and ICES, have recommended that member countries, including Norway, should monitor and report by-catches of marine mammals and seabirds. For the coastal and inshore fisheries, vessel owners have provided information on effort, catch and by-catch over the period October-December 2005[10], in return for financial compensation. These concentrated on gillnet and trap fisheries and will be discussed within the sections on the relevant gears below. Further information on some by-catches is also collected by the 'reference fleet' operating in Norwegian waters.

[10] Bjørge, A., Godøy, H. and Nedreaas, K. (2006). A system for monitoring bycatches of marine mammals in Norwegian coastal and inshore waters. NAMMCO/15/MC/BC/8.

North East Arctic

Trawl
Little is known on the catches of PET fish species (e.g. skates and rays) in the trawl fishery.

Gill Net
From the study by Bjørge et al. (2006), gillnets operating inshore with 180mm mesh (larger than the mesh size specified by regulations in the saithe fishery) caught the majority of grey and harbour seals, and harbour porpoises, being 31 out of 40 incidences. See also Bjørge, A. and Kovacs, K.M[11]. Records exist of catches of seals within gillnets deployed in the Barents Sea, during the winter of 1987/88. This was felt to be a result of low capelin stock levels driving seals offshore in search of food.

From the data available, it appears that catches of harbour porpoises are greatest in large mesh size gillnets of a type not used in the saithe fishery. Observation of mesh size restrictions within the saithe gill net fishery will therefore limit any impact. The impact of the saithe gillnet fishery on the population, whilst not explicitly assessed, is therefore likely to be less than the impact of other fisheries. Harbour porpoise are not listed in Norway as Endangered, Threatened or Vulnerable, but it is a species for which Norway has accepted responsibility to maintain the population status (e.g. species which are globally threatened or over 25% of the total European population resides within Norwegian waters). Population sizes have been estimated (SCANS, SCANS-II projects, BSMP) suggesting that total population size in Norwegian waters is 37,000 (SCANS) plus 11,000 in the Barents Sea (PINRO/IMR 2006; BSMP Management Plan Fisheries Report). ASCOBANS report that additional fishery induced mortality of 1.7% of the population estimate may be sustained by harbour porpoise populations, which would equate to approximately 800 animals annually. However, although some estimates of harbour porpoise by-catch in gill nets of the type used in the saithe fishery have been made, the data do not appear to have been analysed so as to allow an assessment to be made on the relative impact of the saithe directed fishery. Impacts from gillnets in Norwegian waters are considered moderate to high (BSMP Supporting Document, "Utredning av konsekvenser av fiskeri I omrraadet Lofoten – Barentshavet", Fiskeridirektoratet, June 2004).

Purse Seine
Little information is known on the catches of PET species (e.g. dolphins, porpoises) in the purse seine fishery, but in general the method is felt reasonably species-specific.

Danish seine
Little information is known on the catches of PET species in the Danish seine fishery. However, interaction between young seals and 'bottom set nets' which may include Danish seines and gillnets, have been noted[12].

Hook and line
Little information is known on the catches of PET species in the hook and line fishery, but in general the method is felt reasonably species-specific and unlikely to interact with these species.

North Sea

The majority of studies on cetacean by-catch in the North Sea have been performed by the UK,

[11] Bjørge, A. and Kovacs, K.M., (sci. eds.). 'Report of the working group on seabirds and mammals. The Scientific Basis for Environmental Quality Objectives (EcoQOs) for the Barents Sea Ecosystem', (in prep.) Norway, 2005.
[12] Bekby, T. (2001) Dispersal and bycatch mortality in gray, *Halichoerus grypus*, and harbor, *Phoca vitulina*, seals tagged at the Norwegian coast. Marine Mammal Science, 18, 963-976.

Germany and Denmark[13], and hence largely concentrate on different areas to those in which the Norwegian fleet operate. Furthermore, the likelihood of by-catch is strongly influenced by the location of fishing – nearshore gillnets being more likely to result in by-catch than more offshore sets. Studies have concentrated upon gillnet fisheries, and little information is available on by-catches in other fisheries, or of cetacean species other than harbour porpoise, in the North Sea.

Within the North Sea region, ASCOBANS[14], The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas, operates. Norway is not a member of this group, but is a 'range state'. The results of the two abundance surveys for harbour porpoise (SCANS-I and SCANS-II) led this body to call for a conservation plan for this species within the North Sea at the end of 2006.

Trawl

Rays and skates are known to be one of the by-catches in demersal trawl fisheries in the North Sea, and impacts on ray populations have been identified[15]. Observations of discard rates between different gear types (e.g. otter trawls, beam trawls etc.) are limited to the results of observer programmes, the coverage of which is relatively limited.

Gill Net

Studies of harbour porpoise bycatch in coastal gillnet fisheries have been pursued by Difres[1617] (Danish fisheries institute). It must be noted that the region in which these studies were performed (Baltic Sea) is different from that in which the gill net fishery is said to operate. SCANS survey population estimates for harbour porpoise the North Sea and Skagerrak are 200,000. North sea catches are estimated at over 4000 per annum, and in the Skagerrak, annual bycatch probably exceeds 4% of the total population and coincides with a decline in stock size. There are no direct estimates of the contribution of the Norwegian gillnet fishery in the North Sea to these total estimates of bycatch, and consequently no direct assessment of the impact of the Norwegian fishery on sustainability of the population. However, if maximum catch rate reported for bottom-set gill nets of the appropriate mesh size, as used in the saithe fishery, is assumed for the Norwegian component of the total North Sea gill net fishery, then the likely catch of porpoises would not be a significant proportion of the total porpoise by-catch.

Purse Seine

Little information is known on the catches of PET species (e.g. dolphins, porpoises) in the purse seine fishery, but in general the method is felt reasonably species-specific.

Danish seine

Little information is known on the catches of PET species in the Danish seine fishery. However, interaction between young seals and 'bottom set nets' which may include Danish seines and gillnets, have been noted[18].

Hook and line

[13] http://ec.europa.eu/fisheries/publications/studies_reports/evaluation_bycatches_2000_en.htm
[14] http://www.ascobans.org/
[15] Walker, P. A. and Heessen, H. J. L. (1996). Long-term changes in ray populations in the North Sea. Fish. Res. 53, 1085-1093.
[16] Benke, H., Kremer, H. & Pfander, A. (1991) Incidental catches of harbour porpoises (Phoceona phocoena) in the coastal waters of Angeln and Schwansen (Schleswig – Holstein, FRG) from 1987-1990. In: European Research on Cetaceans – 5. (Evans, P.G.H., ed), pp. 54-57 Proc. 5th Ann. Conf. ECS, Sanderfjord, Norway, 21-23 February 1991. European Cetacean Society, Cambridge.
[17] Vinther, M. 1999. Bycatches of harbour porpoises (*Phocoena phocoena*, L.) in Danish set-net fisheries. J. Cetacean Res. Manage. 1(2):123-35
[18] Bekby, T. (2001) Dispersal and bycatch mortality in gray, *Halichoerus grypus*, and harbor, *Phoca vitulina*, seals tagged at the Norwegian coast. Marine Mammal Science, 18, 963-976.

Little information is known on the catches of PET species in the hook and line fishery, but in general the method is felt reasonably species-specific and unlikely to interact with these species.

2.5 Other Fisheries Relevant to this Assessment:

North East Arctic

The Norwegian catch comprises about 92% of the total catch of NEA saithe. A small catch is taken by EU and Faroese vessels in Division IIA and by Russian vessels in Division I. Most catches are coastal and restricted to the Norwegian EEZ. All non-Norwegian catches are taken into account in the assessments.

There are several other fisheries in the Northeast Arctic, the most important being cod, haddock and herring. Two cod stocks are targeted, NEA cod and Norwegian coastal cod. The latter is in a severe overfished state, and is the subject of restricted quotas and access regulations. The former has a biomass at about Bpa, but is subject to considerable IUU fishing. This IUU fishing is restricted to international and offshore Russian waters [WWF report; Norwegian Fisheries Ministry report] and takes cod and haddock. There are no reports that it takes saithe, which occurs in inshore waters in the Russian zone. Norwegian vessels targeting cod have a bycatch quota for saithe, and all saithe caught is reported.

By-catches of saithe in other fisheries are covered by the total saithe quota, and by-catches of other commercial species in the saithe fisheries are landed and counted against the quota for each species.

Saithe is an important predator of young herring, and some multispecies modelling has been undertaken to explore the consequences of that relationship, particularly in relation to the increasing saithe stock size (Mehl et al, 2006).

North Sea

North Sea saithe fishery management is subject to the 2004 EU-Norway Agreement. Norway has 52% of the allowable catch, and the EU the rest, although in recent years the TAC has not been fully taken. In 2005 111,000 tonnes was taken compared to the TAC of 145,000 t, 61% being taken by Norway. While the Norwegian fishery does include some catches in Norwegian coastal waters by other gears (13 % from gillnet and long-line, 9 % from purse seine and 1% from other fishing gears) the majority of the catches are taken by Norwegian, French and German trawlers operating in a directed trawl fishery in deep water near the Northern Shelf edge and the Norwegian Deeps. In the first half of the year, the fishery is directed towards mature fish, while immature fish dominate in the catches the rest of the year.

In addition to quota regulations there are regulations aiming at protecting immature fish. In Norwegian waters, the minimum landing size is 32 cm, and the minimum mesh size in trawl and Danish seine is 120 mm. Discarding of commercial species is prohibited. In EU waters, the minimum landing size is 35 cm and minimum mesh size 110 mm.

There is no prohibition on discarding in EU waters and. As a result, fishers in EU waters discard undersized fish fetching lower prices, and over quota fish. Significant discards appear only in Scottish trawlers, mainly due to TAC regulations (Stratoudakis et al 1999). However, as Scottish discarding rates are not representative of the majority of the saithe fishery, these have not been used by ICES in assessments (ICES 2006b). Saithe is also taken as unintentional by-catch in other North Sea fisheries.

Bycatch of other demersal fish species occurs in the trawl fishery for saithe. The stock of most concern is cod, for which there are specific management plans (the 1999/2005 EU-Norway agreements, and EU Council Regulation (EC) 423/2004. Bycatch in the Norwegian fishery is landed and counted against quota in the other fisheries. Bycatch in EU fisheries may be landed, in which case it counts against quota.

In common with all demersal fisheries in the North Sea, ICES advice is based on mixed-fishery considerations (ICES 2006b).

Fisheries in Division IIIa (Skagerrak-Kattegat), in Subarea IV (North Sea) and in Division VIId (Eastern Channel) should in 2004 be managed according to the following rules, which should be applied simultaneously:

- *with minimal bycatch or discards of cod;*
- *implement TACs or other restrictions that will curtail fishing mortality for those stocks for which reduction in fishing pressure is advised;*
- *within the precautionary exploitation limits for all other stocks.*
- *where stocks extent beyond the North Sea, e.g. into Division VI (saithe and anglerfish) or is widely migratory (Northern hake) taking into account the exploitation of the stocks in these areas so that the overall exploitation remains within precautionary limits*

3. ADMINISTRATIVE CONTEXT

3.1 Legislation

The basic legislation for regulation of Norwegian fisheries are the 1983 Saltwater Fisheries Act (Act of 3 June 1983 No 40) and the 1999 Act on Participation in fisheries (Act of 26 March 1999 No 15 concerning the right to participate in fisheries and hunting). These acts are the legal basis for the secondary legislation containing the actual regulatory provisions pertaining to fisheries.

The participation act fundamentally deals with restrictions on access to fisheries, and is the basis for a number of licensing arrangements. The salt water fisheries act constitutes the legal basis for quota regulations and various technical regulations (see below). In addition, these laws contain the legal basis for regulations setting out decision-making procedures for fisheries management and the enforcement of regulations.

A number of other laws are relevant to the regulation of fisheries, for example the legislation establishing the Economic Zone Act of 17 December 1976 No 91 on Norway's Economic Zone), and the Raw Fish Sales Act of 29 June 1951 No 31. The former provides the basis for Norwegian jurisdiction over fisheries. The latter sets up raw fish sales organisations controlled by fishers, and play an important role in regulating the execution of a fishery and in the control of landings.

The objectives of legislation is generally to provide the legal basis that the resources can be managed in a sustainable and responsible manner, to control and limit the access to fisheries in order to reduce overcapacity, and to enhance the economic efficiency of the industry.

The legislation has evolved over time as a response to the developments in the industry and the need to regulate resource use, on the one hand, and in response to the developments in international ocean law on the other. The growing complexity of fisheries, a need to streamline and modernize legislation, along with increasing environmental awareness led to the establishment of a committee in 2003 to develop more modern ocean resources legislation. The committee submitted a draft of a new oceans resources law in 2005 (NOU 2005:10: Lov om forvaltning av viltlevende marine ressurser. Statens forvaltninstjeneste, Oslo). The new law is in the process of being submitted to Parliament for adoption.

3.1.1 Regulation

The actual regulation of fisheries is contained in secondary legislation that can by updated by the Norwegian Government as needed. A usual distinction is between *access* regulations specifying criteria for permission to participate in a fishery, *output* regulations that deals with the amount of fish that can be caught, and *technical* regulations specifying how a given fishery shall be executed. Some regulations are generic and pertain to all Norwegian waters and/or to all Norwegian fishing vessels flying the Norwegian flag. Other regulations are limited to certain geographic areas and/or gear types.

The complexity of the regulatory system and the regulations is a consequence of the complexity of the activity to be regulated: some 20 fish stocks are exploited, by some 7000 Norwegian fishing vessels (either full or part time). In addition about 1200 foreign fishing vessels are licensed to fish in Norwegian waters. The oceans under Norwegian jurisdiction are about 2 million square kilometers, about six times the land area. Most important fish stocks, with the exception of Northeast Arctic saithe, are shared with other countries.

Norway has entered into agreements regarding joint fisheries management with all neighboring countries and the EU, and the annual TAC's for such shared fish stocks are arrived at through annual negotiations with these countries. While saithe fisheries in the south are regulated jointly by Norway and the EU under their 1981 agreement, the northern saithe stock is, as mentioned, an exclusive stock. A number of countries are however given quotas on saithe in the north, in exchange for quotas to Norwegian vessels on the fisheries of these countries.

Regulations generally provides for the authorities (the Directorate) to stop a fishery when the quota is taken, and to modify the regulations so as to ensure its rational and appropriate execution. Regulations also set out rules for penalties that apply in case of violation of regulations.

Access regulations are generally complex, with most vessels holding a number of licenses. Almost all Norwegian fisheries are now closed, in the sense that access to them is regulated by licenses and permits. A major distinction is between licenses with no time restrictions, and annual permits to participate in a fishery. The former usually applies to larger vessels, while vessels fishing with conventional gears often have their access to a fishery regulated by annual permits that are renewed each year as long as there is a fishery and the permit holder has not violated the conditions it is granted on.

Output regulations in the form of fish quotas basically establish that fishing for a given fish stock is prohibited, except for those vessel groups that have explicit permission to fish. They give the total quota available to Norwegian vessels and the area the quota is to be taken in, and provide for detailed arrangements for how the quota is to be shared by participants in the fishery. There are different types of allocation arrangements. The usual approach in whitefish fisheries is to divide the TAC among trawlers and conventional gears first. Then the quota for conventional gears is further divided among several pre-defined subgroups by gear.

The distinction between trawlers and vessels fishing with conventional gears is often referred to as trawlers vs coastal vessels, but the latter group contains many vessels that are ocean going. The conventional gears group contains vessels fishing with nets, Danish seine, handline and longline. Most vessels will participate in more than one fishery during the year.

Technical regulations are collected in one regulation (Regulation amending the regulations relating to sea-water fisheries of 21 December 2006). They include provisions for mesh size design and mesh size in trawls and Danish seines, restrictions on areas where such gears can be used, regulations concerning the construction of trawls and their use, restrictions on the use of conventional gear (purse seines, gill nets, longline and pots), bycatch regulations, minimum sizes, etc.

There is a prohibition on discards and release of catches that are dead or dying for a list of species (cod, haddock, saithe, redfish, mackerel, Norwegian spring-spawning herring, Trondheimsfjord herring, North Sea herring, greater argentine, capelin, Greenland halibut, whiting, blue whiting, angler (monkfish), shrimps, and snow crabs). In the major pelagic fisheries there is in addition a ban on the discard of fish waste (Regulation amending the regulations relating to sea-water fisheries of 21 December 2006, para 48).

There is a general prohibition on the use of explosives in fisheries (Salt water fisheries act para 24).

The Raw Fish Act and the Salt Water Fisheries Act provides for a role for the sales organisation in regulating fisheries. This is centred on a rational execution of a fishery, and by way of secondary legislation the sales organisations can for example establish weekly quotas for a given fishery, in order to prevent that too much is being fished in too short a time. The fish should remain in the ocean until there is capacity on shore to handle it.

North East Arctic
Access regulations for saithe fisheries North of 62° falls into two groups: the annual participation permits for vessels of 28 metres and below, and licenses for vessels above that size fishing with conventional gears. As to the first, there are three groups of vessels with annual permits: Purse seine below 90 feet, cod/haddock/saithe conventional gears, and combined participation permits. The latter group comprises 9 different types of combinations of fisheries involving saithe.

Purse seine: 184
Cod/haddock/saithe below 28 m: 2346
Cod/haddock/saithe above 28 m: 12 (saithe only)
Combined: 168

Trawlers may generally only fish outside the fisheries zone (12 nautical miles), but can in some instances also fish in the area between 6 and 12 nautical miles in the North. The trawler quota is divided on the vessels according to the type of license the vessel holds.

The quota regulation of the saithe fisheries N of 62° is contained in an annual omnibus regulation concerning for cod, haddock, saithe, and coastal cod. The 2007 regulation for cod, haddock and saithe N of 62° establish a TAC of 222,525 tons of saithe, of which 20,550 tons is given to third countries in exchange for quota to Norwegian vessels in their fisheries. This is the only major fish stock in the north for which Norway sets a TAC unilaterally. The Norwegian share of the TAC is allocated with a group quota to trawlers of 74,000 tons, 50,000 tons to purse seines, and 76,000 tons for conventional gears.

The group quota for trawlers is allocated to individual vessels on the basis of the type of license they hold (“vessel quotas”). Allowed bycatch of cod and haddock in the saithe fishery is set to 15%, and is counted against the vessels quota of these species. The group quota for purse seiners is allocated by way of a maximum quota for each vessel. Vessels fishing with conventional gears are regulated with vessel quotas, with a guaranteed quota according to the length of the vessel. In addition, a small quantity of the group quota for conventional gears is set aside for a so-called “open group”, where the fishery is not restricted.

For all groups the regulation also specifies rules for calculation of a vessel’s quota in case of replacement or modification of a vessel, in order to keep capacity development in the fleet under control.

For all groups of vessels, the regulations also include provisions on bycatch. The 2007 regulation also

contains a number of special provisions to protect coastal cod, which can be taken as bycatch in saithe fisheries (Forskrift om regulering av fisket etter torsk, hyse og sei nord for 62° N i 2007).

North Sea

For the North Sea and Skagerrak, a regulation of 20 December 2006 provides the quota arrangements for 2007. As the North Sea saithe stock is shared with the EU, the TAC is set in annual negotiations with the EU. For 2007 the TAC is set to 123.000 tons. The Norwegian share is 64,000 tons. It can be taken in the areas under Norwegian jurisdiction south of 62° N, and in EU waters in ICES statistical areas IV and IIIa. The Norwegian quota is divided into three group quotas, for purse seine (5,500 tons), conventional gears (8,000 tons), and trawlers (48,000 tons), and in addition allocation to third countries 2,000 tons.

The trawler quota is divided into vessel quotas on the basis of the type of license the vessels holds. The vessels fishing with conventional gears have a maximum quota of 600 tons. In addition, there are bycatch rules for different types of trawlers.

3.2 Management Responsibilities and Interactions

The overall responsibility for the management of the resources resides with the Minister of Fisheries. The Ministry of Fisheries and Coastal Affairs sets the policy for fisheries through reports to parliament that specify objectives for resource management and the measures to achieve those. Since most fish stocks are shared with other countries, and since Norway exports almost its entire production of fish, international relations is an important aspect of the work of the Ministry.

As regards saithe fisheries, the situation is very different in the North Sea and in the North. In the latter area, the stock is an exclusive Norwegian stock and resource management is decided on by Norway alone. The North Sea stock is shared with the EU, and the resource is managed jointly through annual negotiations on TAC's.

The point of departure for the international negotiations on TAC for different stocks and species is the scientific advice provided by the International Council for the Exploration of the Sea – ICES. ICES advice, which comes in the format of several options for TAC's with specified consequences for each, is developed in a comprehensive process where the Institute of Marine Research (IMR) plays an important role for stocks relevant to Norway. The mission of the IMR is to collect the data and develop the models necessary to provide scientific analysis and advice on the management of fish stocks in Norwegian waters. These activities are funded directly by the ministry. The IMR also engages in science that is not directly related to the provision of stock management advice, and in this case funding from the Norwegian Research Council, EU research programs and other is important.

The detailed work of developing regulations and implementing them after their approval by the Minister is the chief task of the Fisheries Directorate. The Directorate plays a key role in formulating the proposal for regulations and consulting with industry interests and others in this. The Directorate has 7 regional offices along the coast of Norway, and also plays an important role in the enforcement of fisheries regulation.

The Fisheries Directorate also has function to disseminate information, to inform and advise fishers on the regulations of the industry. This is done by the web, newspapers, and radio messages.

In the development of proposals for regulations, the Fisheries directorate consults with the fishing industry and other stakeholders. A Regulatory Council, where industry associations dominated, was in 2006 replaced with an open regulatory meeting where any one interested can meet and have a say. Meeting documents are posted on the web. Representatives for the fishing industry consult among themselves in advance of meetings and generally the Norwegian Fisherman's Association, which

consist of a number of fishers´ organisations as well as regional subsidiaries, has been able to agree to compromise solutions on most issues. When such compromises exist, the authorities will usually follow the stakeholder advice.

The 1938 Raw Fish Act provides for the establishment of fishermen's sales organisations (cooperatives) with control over the first hand sales of fish. These bodies can also play an important role in regulating fisheries, as well in the enforcement of fisheries regulations. Norges Råfisklag covers the fisheries from the boundary with Russia to the North to Nordmøre, a coastline of roughly 2.000 kilometres. To the south of that, several smaller sales organisations have a corresponding role. About 4.500 vessels operate in the region of Norges råfisklag, and 215 buyers of fish are approved. The latter gives an indication of the number of possible landing sites for fish in the region.

3.3. Enforcement and control

The broad outline the enforcement system is that operations at sea are controlled by the Coast Guard and the Fisheries Directorate, while landings control are carried out by the sales organisations and the Fisheries Directorate.

The inspection activities of the Coast Guard in 2006 amounted to 2185 inspections in total, with 44 resulting in a report to the police and 27 an arrest. The inspections by the Fisheries Directorate itself, in ports and inshore amounted to 1850 inspections, with 155 reports to the police (statistics provided by the Fisheries Directorate).

In addition to landings controls, the sales organisations and the Fisheries Directorate also perform subsequent checks on statistics. The various bodies involved in enforcement in the North coordinate in several meetings annually. The role of sales organisations in the control system is to ensure that the transaction between fisher and buyer is according to the rules regulating that. All fish shall be weighed upon landing. All landings shall be reported.

The cornerstone of the control activities of raw fish sales organisations is the *contract note* (landing receipt), giving among other things the fish species, weight landed, and time of landing. 99% of the contract notes are completed and submitted electronically in almost real time, so aggregate landings data are updated continuously. About 200,000 forms are completed annually. When the data are submitted, the sales organisation transfers them to the Fisheries Directorate.

4 STOCK ASSESSMENT:

Stock assessments for both species are undertaken by ICES with full cooperation and participation by Norway. The following information is primarily derived from the relevant ICES reports:

ICES 2006a Report of the Arctic Fisheries working Group (AFWG). ICES Advisory Committee on Fishery Management ICES CM 2006/ACFM:25

ICES 2006a Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK). ICES Advisory Committee on Fishery Management ICES CM 2006/ACFM:35

ICES 2006c Report of the ICES Advisory Committee on Fishery Management, Advisory Committee on the Marine Environment and Advisory Committee on Ecosystems, 2006

4.1 Management Unit

North East Arctic

Saithe is distributed throughout the Norwegian zone. It is caught along the coast by inshore vessels,

but offshore trawling is concentrated on a few southerly banks and from just south of the Lofoten Islands northwards in the Norwegian Sea (62-67 N) and in the Barents Sea.

The division of management into a North Sea stock and a NEA stock at 62ºN is artificial but reasonably sensible given the distribution of major effort. There is a substantial migration of immature saithe to the North Sea from the Norwegian coast between 62ºN and 66ºN. In some years, there are also examples of mass migration from northern Norway to Iceland and, to a lesser extent, to the Faroe Islands.

The effect of larval drift and adult migration and exchange between the two stocks was investigated by Jakobsen in the 1980s and modelled by ICES in the 1990s (Jakobsen 1981).

North Sea

Before 1999, saithe in Subarea VI and saithe in Subarea IV and Division IIIa were assessed as two separate stocks. However, there is no separation of saithe between these areas, adults moving freely between them. The ICES advice now applies to the combined Areas IIIa, IV, and VI.

This stock is not isolated from the NEA stock, considerable movement being undertaken between the two, with eggs and larvae from the NS stock drifting north and adults undertaking spawning migrations from the NEA to southern spawning grounds.

4.2 Monitoring of Stock Status

North East Arctic

The NEA assessment is tuned to an acoustic survey and CPUE data from one commercial fleet (Norwegian trawl). Until the 2005 WG the tuning was based on three data series: CPUE from Norwegian purse seine and Norwegian trawl and indices from a Norwegian acoustic survey. The 2005 WG found rather large and variable log q residuals and large S.E. log q for the purse seine fleet, strong year effects and in the combined tuning the fleet got low scaled weights. Since then only data from the Norwegian trawl fisheries (start 1994, age groups 4 to 8) have been used.

Since 1985 a Norwegian acoustic survey specially designed for saithe has been conducted annually in October-November (Nedreaas 1997, ICES 2006a). The survey covers the near coastal banks from the Varangerfjord close to the Russian border and southwards to 62° N. The whole area has been covered since 1992, and the major parts since 1988. The aim of conducting an acoustic survey targeting Northeast Arctic saithe has been to support the stock assessment with fishery-independent data of the abundance of the youngest saithe. The survey mainly covers the grounds where the trawl fishery takes place, normally dominated by 3 - 5(6) year old fish. 2-year-old saithe, mainly inhabiting the fjords and more coastal areas, are also represented in the survey, although highly variable from year to year. It is not known how well the survey covers the oldest age groups from year to year, but at least for precautionary reasons the 6+ group was kept in the tuning series.

Since 1995 a Norwegian acoustic survey for coastal cod has been conducted along the coast and in the fjords from Varanger to Stad in September, just prior to the saithe survey described above. This survey covers coastal areas not included in the regular saithe survey. Because saithe is also acoustically registered, this survey provides supplementary information, especially about 2- and 3-year-old saithe that have not yet migrated out to the banks. At the WG meeting in 2000, analyses were done on combining these indices with indices from the regular saithe survey in the tuning series, but it did not influence the assessment significantly. The WG therefore decided, for the time being [in 2006], to only apply indices from the regular saithe survey in the assessment since this series is longer.

Attempts at estimating recruitment abundance at age 0 or 1 have so far failed. The accuracy of the survey recruitment indices varies from year to year according to the extent to which 2 - 3 year old saithe have migrated out from the near coast areas and become available to the acoustic saithe survey on the banks. An observer program for establishing a 0-group index series started in 2000 (Borge and Mehl, WD 21 2002). This programme uses shore-based observers to estimate the relative number of juveniles in inshore waters. However, these observations do not seem to pick up the year class strength.

North Sea

Three commercial series of 'effort and catch at age' and two series of 'survey indices area' are used in the assessment of North Sea stocks of saithe

1. French fresh fish trawl, age range: 3-9 of target fish (FRAtrb)
2. German bottom trawl, age range: 3-9 of target fish (GERotb)
3. Norwegian bottom trawl, age range: 3-9 of target fish (NORtrl)

These fleets all target saithe along the Northern Shelf edge and along the western edge of the Norwegian deep, at depths of 150 - 250 m.

Surveys: Norwegian acoustic survey, age range 3-6, and International Bottom Trawl Survey quarter 3, age range: 3-5. The Norwegian acoustic survey is conducted in conjunction with the Norwegian part of the IBTS quarter 3 survey, covering the area north of 56°30 N up to 62° N. The time series from this survey extends back to 1995. Abundance indices of saithe in the North Sea are also available from the IBTS quarter 1 and IBTS quarter 3 surveys. It should be noted that data from the Norwegian acoustic survey and the English and Scottish Groundfish surveys are used in the calculation of the IBTS quarter 3 indices, but saithe is considered to be too poorly represented in these surveys and they are not themselves useful as tuning indices in the assessment.

Qualitative surveys of fisher's opinions on Saithe abundance are also available (ICES 2006b)

4.2.1 Current Stock Status

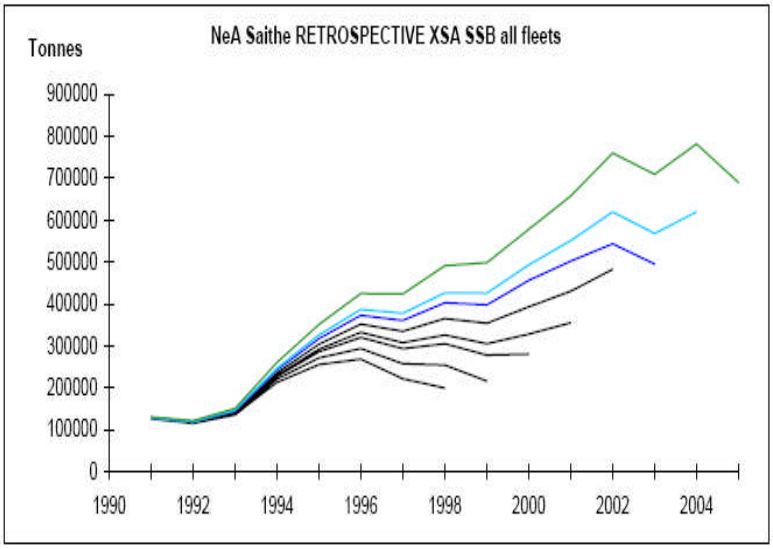
North East Arctic

A deterministic Virtual Population Assessment is conducted using catch at age data and tuned to the survey and CPUE indices described above. Software is XSA (Darby & Flatman 1994). Alternative assessments are not undertaken by Norwegian scientists.

Allegations of considerable discarding made in ICES (2006a) are disputed by Norwegian scientists, who attribute them to some early scientific observer data from non-Norwegian vessels. However, it is acknowledged that especially in years of strong juvenile year classes accidental bycatches of undersized fish are inevitable in the purse seine fishery, and that often these may be slipped. The level of this slippage (which is prohibited under regulation #48) is unknown and is not taken into account in the assessment.

Purse seine catches have a significant impact on the stock, particularly because the modal age in catches is 6 years for all gear types except purse seines where it is 3 years (newly recruited fish at or close to the minimum landing sizes of 35-42cm), and it is therefore important to understand the extent of slippage/discarding. Catches in 2005 are shown in Table 1.

A retrospective analysis of the assessment reveals considerable, consistent bias in estimates of SSB and fishing mortality, such that at the moment stock size is underestimated and fishing mortality overestimated by the assessment. This is not of particular concern at the moment, as stock size is rising, but should the reverse bias be present during a declining phase this would give cause for concern. The problem probably arises from inconsistencies within the catch at age data or the CPUE tuning data (Mehl, pers comm.). Sensitivity tests run by the working group revealed that the assessment is very sensitive to different combinations of the tuning series. The working group also noted trends in survey Qs with time.



The assessments suggest that the status of Saithe is good. Fishing mortality is stable and has since 1996 been below **F**pa. The SSB has since 1994 been well above **B**pa. After a long period of low stock size, the stock recovered during the 1990s with the recruitment of several above-average year classes (ICES 2006c).

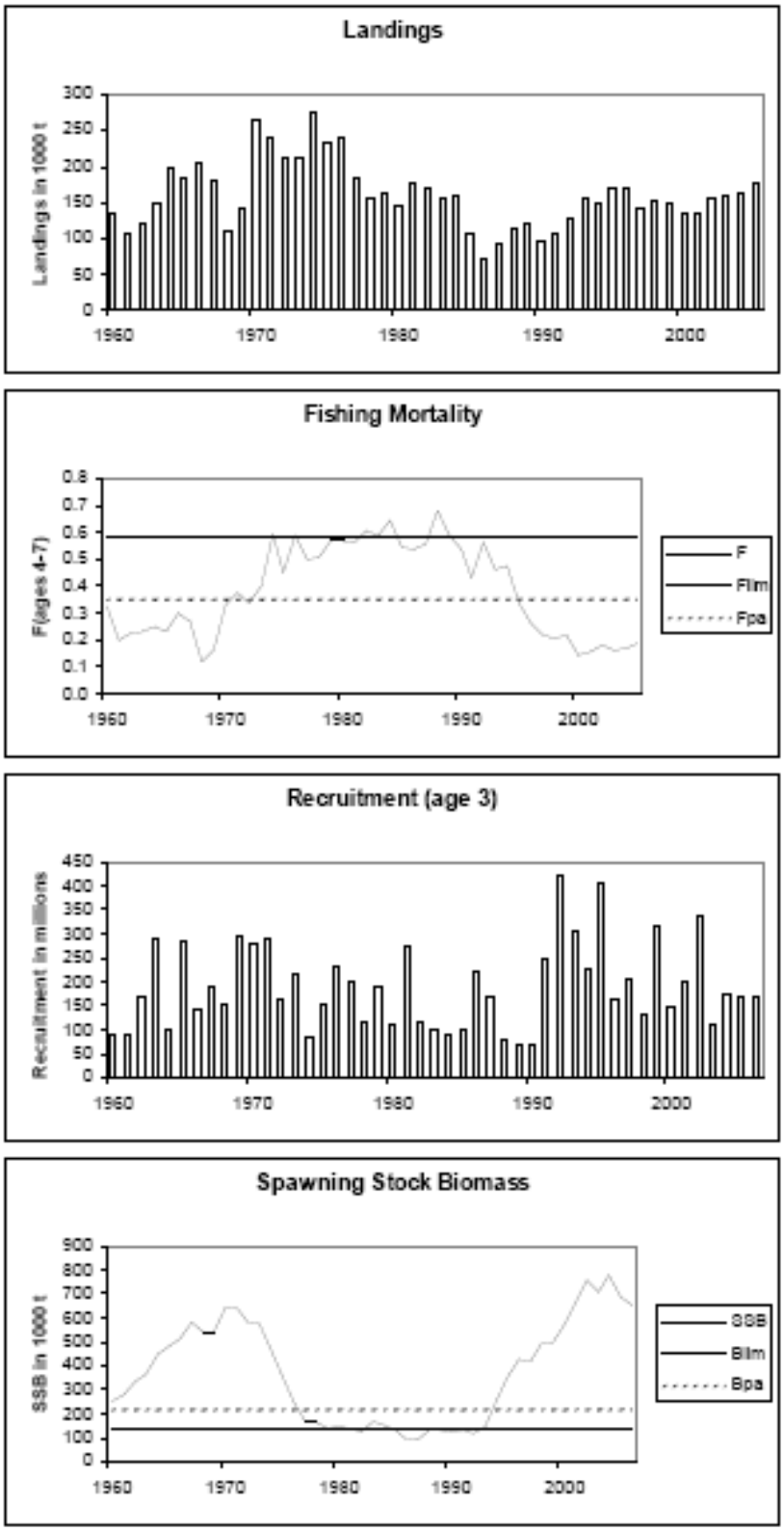


Figure 8. Key fisheries parameters for the assessment of north east Arctic Saithe (ICES 2006c). a) Landings, b) fishing mortality, c) recruitment (age 3), d) spawning stock biomass

The assessment methodology does not lend itself to estimating the uncertainty in the assessment, apart from the sensitivity analysis reported above. Some work has been done on the uncertainty surrounding estimates of catch at age of cod in Norwegian waters (Hirst et al 2005) but these techniques have not been extended to saithe nor applied to the assessments.

Apart from the uncertainty about current stock biomass introduced by the large retrospectives in the assessment, the most serious problem with stock forecasts for saithe is the lack of reliable information about year class strength before age 3. An annual 0-group survey has been conducted by IMR (Norway) since 1999 in the northern North Sea, but this will not be continued due to lack of relationship between the 0-group index and later XSA population estimates for the year classes 1999-2001 (ICES 2006b). IMR have started a new survey along the west coast of Norway to measure the relative abundance of saithe between 2 and 4 years old (when the saithe is distributed along the coast) but these results are not yet available.

The stock-recruit relationship includes the suggestion that recruitment is impaired at low stock sizes. At the 2005 WG reference point parameter values, including the change-point, were computed using segmented regression on the 1960-2000 time series of SSB-recruitment pairs. The maximum likelihood estimate of the spawning stock biomass at which recruitment is impaired was 136,055 t, and B_{lim} was set at 136,000 t (ICES 2006a).

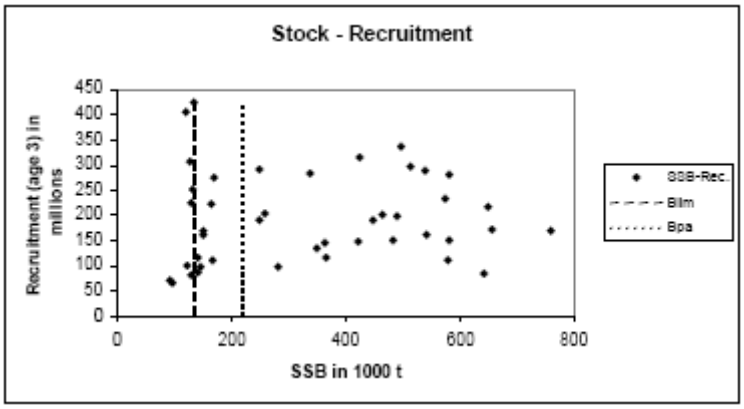


Figure 9. Saithe S-R relationship from the North east Artic (Hirst et al 2005).

North Sea

A deterministic Virtual Population Assessment is conducted using catch at age data and tuned to the survey and CPUE indices described above. Software is XSA (Darby & Flatman 1994). Alternative assessments are not undertaken by Norwegian scientists.

Whilst the same discard issues are likely to be relevant to the North Sea assessment the contribution of purse seine effort to total effort is much lower and is unlikely to be a significant problem.

A retrospective analysis of the assessment reveals considerable, consistent bias in estimates of SSB and fishing mortality, such that at the moment stock size is underestimated and fishing mortality overestimated by the assessment (Fig 10). This is not of particular concern at the moment, as stock size is rising, but should the reverse bias be present during a declining phase this would give cause for concern. The problem probably arises from inconsistencies within the catch at age data or the CPUE tuning data (Mehl, pers comm.). Sensitivity tests run by the working group revealed that the assessment is very sensitive to different combinations of the tuning series. The working group also noted trends in survey Qs with time. However, forecasts made by the working group show greater consistency.

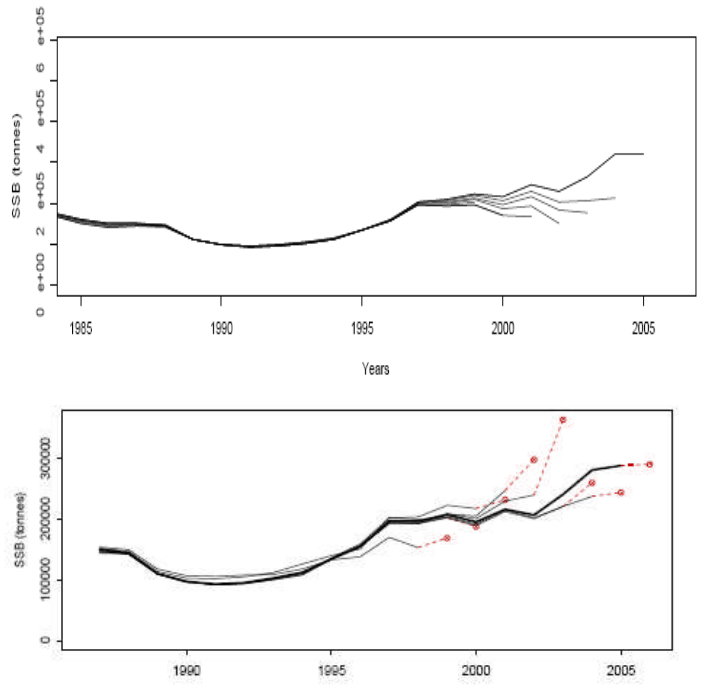


Figure 10. Retrospective analysis (top) and forecast performance (bottom) of NS saithe assessment (ICES 2006b).

The assessments suggest that the status of Saithe is good. Fishing mortality appears to be below Fpa and the spawning stock biomass appears to be above Bpa.

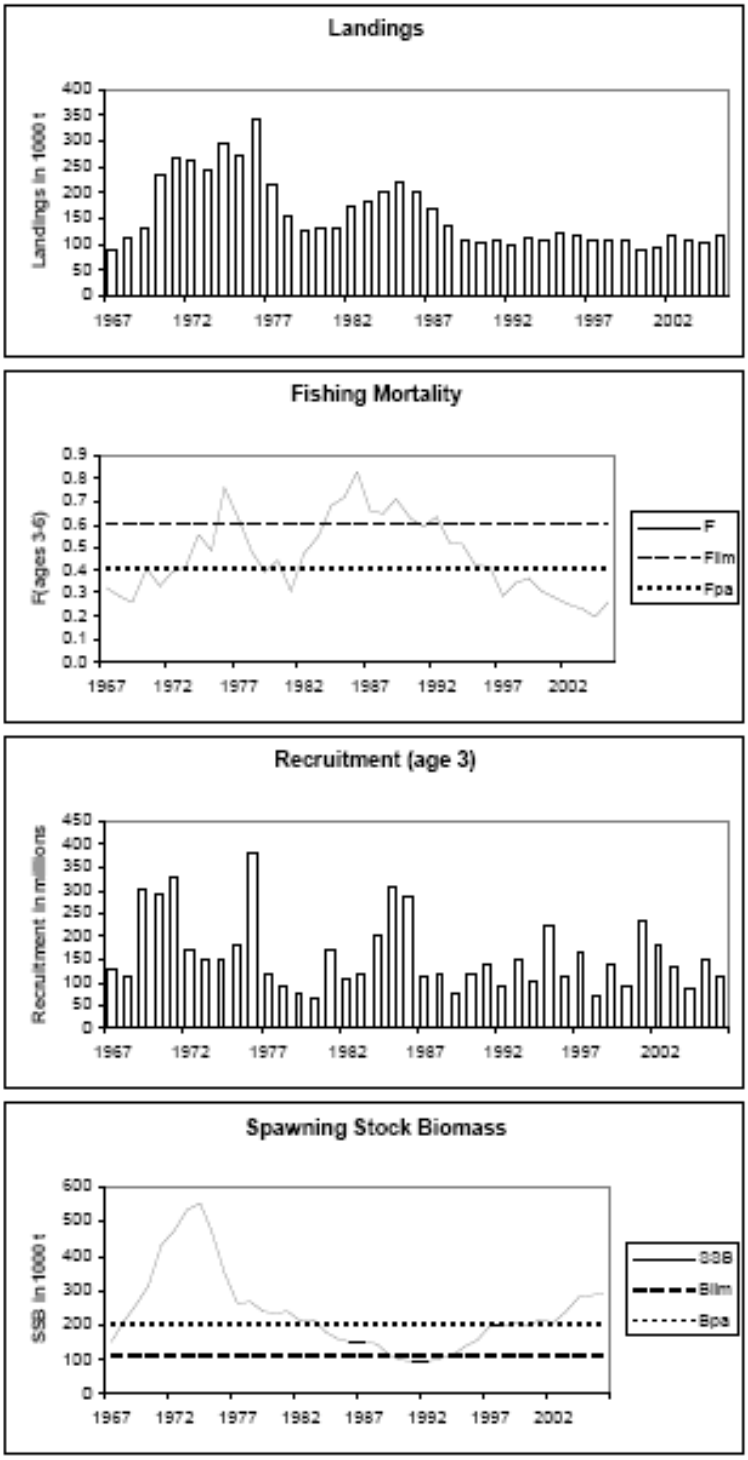


Figure 11. North Sea Saithe stock status. a) Landings, b) fishing mortality, c) recruitment (age 3), d) spawning stock biomass (ICES 2006c)

The most serious problem with stock forecasts for saithe is the lack of reliable information about year class strength before age 3. An annual 0-group survey has been conducted by IMR (Norway) since 1999 in the northern North Sea, but this will not be continued due to lack of relationship between the 0-group index and later XSA population estimates for the year classes 1999-2001 (ICES 2006). IMR have started a new survey along the west coast of Norway to measure the relative abundance of saithe between 2 and 4 years old (when the saithe is distributed along the coast) but these results are not yet available.

There appears to be no strong stock-recruit relationship

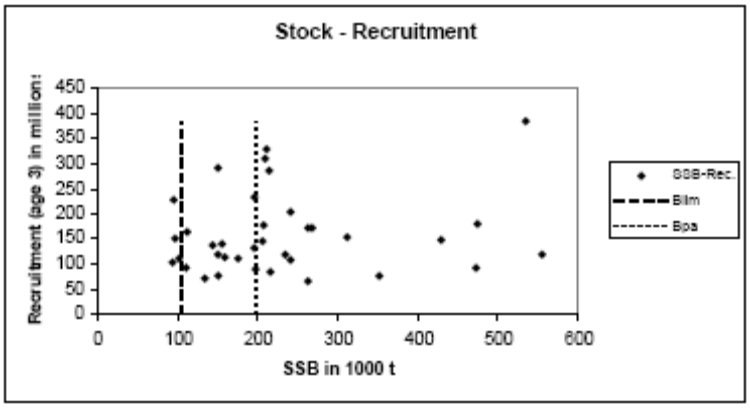


Figure 12. Saithe S-R relationship from the North Sea (ICES 2006c)

The assessment methodology does not lend itself to estimating the uncertainty in the assessment, apart from the sensitivity analysis reported above. Uncertainty is not estimated.

4.4 Management Advice

North East Arctic

Biological reference points for Northeast Arctic Saithe are (ICES 2006a)

F0.1 0.14	**F**lim 0.58
Fmax 0.32	**F**pa 0.35
Fmed 0.40	**B**lim 136 000 t
	Bpa 220 000 t

At the 2005 WG parameter values, including the change-point, were computed using segmented regression on the 1960-2000 time series of SSB-recruitment pairs. The maximum likelihood estimate of the spawning stock biomass at which recruitment is impaired was 136,055 t, and B_{lim} was set at 136,000 t. B_{pa} was calculated as the estimated (assessed) SSB level that would ensure that there was only a 10% (one-sided) probability that real biomass was below B_{lim} given an average CV in the assessment of 30% [$B_{pa} = B_{lim} \exp(1.645*\sigma)$, with a value of 0.3 for σ]. This resulted in a B_{pa} of 222,863 t, rounded to 220,000 t. This new B_{pa} for Northeast Arctic saithe was accepted by ACFM.

At the 2005 WG F_{lim} was set on the basis of B_{lim} (ICES CM 2003/ACFM:15). The functional relationship between spawner-per-recruit and F gave the F associated with the R/SSB slope derived from the B_{lim} estimate obtained from the segmented regression. R/SSB = 1.27 from the B_{lim} estimation gave SSB/R = 0.7874 and a $F_{lim} = 0.58$. Applying the "magic formula" $F_{pa} = F_{lim} \exp(-1.645*\sigma)$, gave a F_{pa} of 0.35. This new F_{pa} for Northeast Arctic saithe was accepted by ACFM.

The Norwegian Directorate of Fishery has proposed a management strategy for Northeast Arctic saithe

- The yearly TAC of NEA saithe shall, within safe biological limits, be determined so that the highest potential economical yield is realised both from the harvest of saithe and from the harvest of other species in interaction with saithe.

- To achieve the above mentioned objective the yearly TAC of NEA saithe shall, when exceptional circumstances do not order otherwise, be determined as follows:
  1. At spawning stock levels above the precautionary approach level (**B**pa = 220 000 tonnes), the TAC for NEA saithe shall be set as the average of the TAC's that a fishing mortality of 0.35 for reference ages 4-7 years would imply over the next three years.
  2. The annual change in the TAC shall not be more than +/-15%.
  3. Should the spawning stock level fall below **B**pa fishing mortality according to the above shall have a linear reduction from Fpa at Bpa to zero when spawning stock is zero. At spawning stock below Bpa there is no restriction on the maximum annual change of the TAC.

This management strategy is currently being evaluated by ICES on request (4 December 2006) of the Norwegian Fisheries Ministry.

In the absence of an agreed management plan which had been evaluated to be in agreement with the Precautionary Approach, in 2006 ICES proposed that in order to harvest the stock within precautionary limits, fishing mortality should be kept below **F**pa. This corresponds to landings of less than 247,000 t in 2007. Application of the proposed management plan would have implied a TAC of 194,000 t in 2007. The TAC was set between these two levels, at 220,000 t.

North Sea

Biological reference points for North Sea Saithe are (ICES 2006b)

$\mathbf{F}_0$.1 0.10	$\mathbf{F}_{lim}$ 0.60
$\mathbf{F}_{max}$ 0.22	$\mathbf{F}_{pa}$ 0.40
$\mathbf{F}_{med}$ 0.35	$\mathbf{B}_{lim}$ 106 000 t
$\mathbf{F}_{high}$ >0.49	$\mathbf{B}_{pa}$ 200 000 t

B_{lim} was set at 106,000 t in 1998 as the lowest biomass (at that time) that had produced average recruitment, and B_{pa} at a level that affords a high probability of maintaining SSB above B_{lim}. Flim is the fishing mortality estimated to lead to SSB falling below B_{lim} in the long term, and F_{pa} is the fishing mortality that in the long term should lead to only a 10% probability that SSB falls below B_{pa}.

In 2004 EU and Norway agreed to implement a long-term plan for the saithe stock in the Skagerrak, the North Sea and west of Scotland, which is designed to provide for sustainable fisheries and high yields. The plan consists of the following elements:

- Every effort shall be made to maintain a minimum level of Spawning biomass (SSB) greater than 106 000 tonnes (B_{lim}).
- Where the SSB is estimated to be above 200 000 tonnes the parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality rate of no more than 0.30 for appropriate age groups.
- Where the SSB is estimated to be below 200 000 tonnes but above 106 000 tonnes the TAC shall not exceed a level which, on the basis of a scientific evaluation by ICES, will result in a fishing mortality rate equal to 0.30- 0.20*(200 000-SSB)/94 000.
- Where the SSB is estimated by the ICES to be below the minimum level of SSB of 106 000 tonnes the TAC shall be set at a level corresponding to a fishing mortality rate of no more than 0.1.
- Where the rules in paragraphs 2 and 3 would lead to a TAC which deviates by more than 15% from the TAC the preceding year the Parties shall fix a TAC that is no more than 15% greater or 15% less than the TAC of the preceding year.

- Notwithstanding paragraph 5 the Parties may where considered appropriate reduce the TAC by more than 15% compared to the TAC of the preceding year.
- A review of this arrangement shall take place no later than 31 December 2007.
- This arrangement enters into force on 1 January 2005.

Although proposed to be consistent with a precautionary approach, the management plan has not been evaluated by ICES to see if it is sufficiently precautionary. For instance, if clause 6 was not invoked it might not be possible to meet the requirements of paragraph 3 in the case of a rapidly declining stock.

ICES management advice is precautionary. Options for fishing mortality are presented along with their likely level of precaution and effect on SSB in relation to the precautionary level B_{pa}.

In 2006 ICES (2006c) concluded that although it had not evaluated the agreed management plan, the target fishing mortality in the management plan was expected to give acceptable and precautionary long-term gains in the present situation that the stock is well above B_{pa}. ICES therefore recommended a limit on landings in 2007 of 136 000 t corresponding to a fishing mortality of 0.3 in accordance with the management plan.

Table 3. Saithe TACs for 2007. Units are tonnes

Saithe														
Zone	TAC	UE	BE	DK	DE	ES	FI	FR	IE	NL	PT	SE	UK	NR
I, II (Norwegian waters)	NA	3950			3160			508					282	
IIa(1), IIIa, IIIbcd(1), IV	123250	59160	43	5111	12906			30374		129		702	9895	
Norwegian waters south of 62° N	NA	880										880		
Vb(1), VI, XII(2), XIV(2)	12787	12787			798			7930	467				3592	
Vb (Faroese waters)	NA	2700	54		334			1632		54			626	
VII, VIII, IX, X, CECAF 34.1.1 (1)	3790	3790	10					2132	1066				582	
TOTAL	139827	83267	107	5111	17198			42576	1533	183		1582	14977	

5 FISHERY MANAGEMENT:

5.1 Management Objectives

Management objectives exist at various levels from general to specific. General objectives are set out in legislation, reports to Parliament and in annual budget documents.

While the legislation provides for the general objectives for management, more specific objectives are set out in the secondary legislation and in management plans. The overall goals for fisheries management in Norway is to conserve resources, enhance the economic performance of the industry, and contribute to the dispersed pattern of settlement in coastal Norway (Report to Parliament No 51 (1997-1998).

Management plans are adopted for most fish stocks targeted in major fisheries.

North East Arctic

For the saithe stock in the north, ICES have suggested an Fpa at 0.35 (Fiskeridirektoratet og Havforskningsinstituttet 2006: Beskatningsstrategi for nordøst-arktisk sei: 9). This objective is set without regard for the economic efficiency of the fishery, and the Fisheries Directorate has therefore

considered economic efficiency at other levels of fish mortality. Following discussions with the industry and others, the cost of predation of saithe on herring has been taken into account.

The current management strategy specifies that the "1. TAC for North East arctic saithe shall be set with basis in average fishing mortality of 0.35 for the next 3 years within the year-classes 4-7. 2) Annual change in the TAC shall not be more than 15%. 3) Should the spawning stock level fall below Bpa, fishing mortality according to the above shall have a linear reduction from Fpa to Bpa, to zero when spawning stock is zero. At spawning stock below Bpa, there is no restriction on the maximum annual change of the TAC." In December 2006, the Norwegian Ministry of Fisheries asked ICES to evaluate and give advice on the long-term strategy for the management of saithe (letter from Ministry of Fisheries 04.12.06).

North Sea

For the North Sea stocks, Norway and the EU in 1999 agreed to a management strategy for saithe (along with strategies for cod, haddock and rødspette) that specifies stock levels and reference points, as a basis for fish quotas. The management plan vas revised in 2005, following ICES advice that Fpa should be less than .40 (St.meld. nr 22 (2005-2006: om dei fiskeriavtalene Noreg har inngått med andre land for 2006 og fisket etter avtalene i 2004 og 2005).

Multiannual management plans have been adopted. The plan for saithe, as contained in annex 3 to the agreed records of the fisheries consultations by Norway and the EU for 2006 (Brussels, 2 December 2005), contains a number of elements:

i. the spawning stock biomass (SSB) shall be greater than 106.000 tons
ii. where the SSB is estimated above 200.000 tons, fishing mortality shall be less than 0.3
iii. where the SSB is less than 200.000 tons, but above 106.000 tons, should be 0.3 – 0.2
iv. where SSB is estimated by ICES to be below 106.000 tons, TAC should be set corresponding to a fishing mortality no more than 0.1
v. where the rules in para 2 and 3 would lead to a TAC that deviates by more than 15% from the TAC of the preceding year, the TAC should be within +/- 15% of the TAC the preceding year
vi. nothwitstanding para 5, the parties may reduce TAC by more than 15%
vii. This arrangement shall be reviewed by 31 December 2007

While in agreement on the management strategy, there is disagreement between Norway and the EU when it comes to technical regulations. While Norway has a discard ban, EU regulations actually promotes discards. And while Norwegian regulations stipulate a minimum mesh size in trawls of 120 mm, the community regulations are for 110mm.

5.2 Consultative Process

In the development of proposals for regulations, the Fisheries directorate consults with the fishing industry and other stakeholders.

A Regulatory Council, where industry associations dominated, was in 2006 replaced with an open regulatory meeting where interested parties can meet and offer their comments and suggestions. Meeting documents are posted on the web. Representatives for the fishing industry consult among themselves in advance of meetings and generally the Norwegian Fisherman´s Association has been able to agree to compromise solutions on most issues among its constituent groups. When such compromises exist, the authorities will usually follow the stakeholder advice. During the last decade, also environmental NGOs and indigenous populations (Saami) have become active stakeholders in fisheries.

In addition to the consultation via the regulatory meetings, stakeholders have numerous other ways of interactions and influence with the government. The major fisheries organisations interact with the authorities on a regular basis through participation in delegations to international negotiations, written hearings on relevant issues where the Norwegian Fishery Ministry seek the opinion of stakeholders (required by Norwegian law), direct meetings with the Ministry, written communication and industry meetings where the fishery authorities are represented.

The major organisations in the fishing industry have fairly elaborate decision-making processes where much emphasis is laid on building consensus on difficult issues such as the allocation of quotas among different gear groups.

There are two industry newspapers with 3 weekly issues which also constitute important channels for communication within the industry as well as between the industry and the authorities. New regulations are published in these papers.

5.3 Reviews of the management system

Three sets of external reviews can be identified:
Firstly, the fishery management system is subject to annual reviews by the parliament. The Ministry of Fisheries and Coastal Affairs has, since 1995, presented annual reports to the Parliament (latest: Stortingsmelding 22 2005-2006: Om dei fiskeriavtalene Noreg har inngått med andre land for 2006 og fisket etter avtalane i 2004 og 2005) on the performance of the fishery management system. Since most important fisheries are based on stocks shared with other countries, the emphasis is on how the agreements with other countries are implemented.

Secondly, the National Audit Office, which performs regular checks on the performance of all public service in Norway, has recently (2004) conducted a study on the public management of the fisheries sector (Riksrevisjonen Dokument nr 3:13 (2003-2004): Riksrevisjonens undersøkelse av forvaltningen av ressursene).

Third, Norway reports on its implementation of the FAO Code of Conduct for Responsible Fisheries, which covers almost every aspect of fisheries management, to the FAO Committee of Fisheries (COFI) every second year. An important task for COFI is to review countries implementation of the Code.

In addition, the process of formulating scientific advice in ICES can be viewed as a scientific review of the data, methods and analyses of the Institute of Marine Research.

Internally, a regular systematic review exists in the annual review by the Regulatory meeting (previously the Regulatory Council). The meeting examines the experiences gained in the regulatory arrangements for the previous year. Additional internal reviews can be found in Reports to the Norwegian Parliament where various aspects of the regulatory arrangements are examined as a basis for proposals for change (for example quota arrangements).

6 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.

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. [19]:

Intent:
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 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.

Intent:
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.

[19] The sequence in which the Principles and Criteria appear does not represent a ranking of their significance, but is rather intended to provide a logical guide to certifiers when assessing a fishery. The criteria by which the MSC Principles will be implemented will be reviewed and revised as appropriate in light of relevant new information, technologies and additional consultations

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.

Intent:

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 system[20].

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:

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

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:

12. 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.

13. Implement appropriate fishing methods designed to minimise adverse impacts on habitat, especially in critical or sensitive zones such as spawning and nursery areas.

14. Not use destructive fishing practices such as fishing with poisons or explosives;

15. Minimise operational waste such as lost fishing gear, oil spills, on-board spoilage of catch etc.

16. Be conducted in compliance with the fishery management system and all legal and administrative requirements.

17. 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.

7 BACKGROUND TO THE EVALUATION

7.1 Evaluation Team

Evaluation leader: Dr Andrew Hough: Moody Marine Limited. Dr Hough has a PhD in marine ecology from the University of Wales, Bangor and fourteen years post-doctoral experience in commercial marine and coastal environmental management projects. He is manager of Moody Marine operations within Moody International Certification with particular responsibility for the implementation of MSC Certification procedures and development of MSC methodologies. Dr. Hough has acted as lead assessor on the majority of Moody Marine MSC pre assessments and main assessments.

Expert advisor: David Agnew. David is currently head of a research group at Imperial College, London, and Fisheries Director for the independent fisheries consultancy MRAG Ltd. His technical expertise lies in fisheries assessment, statistical data analysis and modelling, and he has a particular interest in marine ecosystem and fisheries management issues worldwide, including the application of

effective enforcement solutions. He has been involved in Marine Stewardship Council certifications from the position of client organisation and certification panel for the Bering Sea Cod Longline Fishery. He was previously senior manager with the Secretariat of an international intergovernmental organisation concerned with the conservation and rational use of Antarctic marine living resources (CCAMLR), and before that was a project leader in marine fisheries with the Department for Agriculture for Northern Ireland. Other experience includes 3 years as project leader in the Northern Ireland Fisheries Department, participating in cod/hake/whiting projects and assessments, two reviews of the cod recovery plans for WWF and gadoid population modelling as part of the scientific basis for the UK Cabinet Office's Net Benefits report (2003). This included functional (model) units of 15 stocks and long-term projection modelling under different recruitment/ecosystem interaction scenarios.

Expert advisor: Alf Håkon Hoel. Alf Håkon is Associate Professor, Department of Political Science at the University of Tromsø specialising in management regimes for living marine resources. His experience includes acting as an advisor to the Royal Norwegian Ministry of Foreign Affairs on the management of living marine resources, a member of the Norwegian delegation to the United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks, member of Norwegian delegation to FAO Fisheries Committee, member of the Scientific Assessment Team of the Arctic Climate Impact Assessment, and a member of the Norwegian delegation to UN informal consultation process on oceans. He has carried out a number of research projects on international management of living marine resources and has published scholarly books and articles on the subject.

Expert advisor: Graham Pilling. Graham is Fisheries Biologist & Advisor with the Centre for Environment, Fisheries and Aquaculture Science, UK. His experience includes a review of the NMFS Gulf of Mexico red snapper stock assessment, a review of the NMFS Pacific hake stock assessment, development of a fisheries management plan for Lake Paliastomi, Republic of Georgia, review of bycatch in the US Atlantic pelagic longline fleet for the US National Marine Fisheries Service, and implementing review recommendations, growth parameter estimation and effect of fishing on the assessment and management of snappers and emperors in the Indian Ocean, including capacity building of local institutions to improve stock assessment techniques, assessment of squid and finfish resources on the Patagonian shelf, South Atlantic.

7.2 Previous certification evaluations

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

7.3 Inspections of the Fishery

Inspection of the fishery focused on the practicalities of fishing operations, the mechanisms and effectiveness of management agencies and the operation of the fleet. The landing and subsequent handling of fish was also investigated to determine the suitability of fish landed to enter into a subsequent chain of custody.

Meetings were held between the Certification body Moody Marine Ltd and other parties as follows. The key issues discussed have been identified for each meeting.

Name	Affiliation	Date	Key Issues
Webjorn Barstad Atle Vartdal Per Morten Aarseth Hans Sande Janita Arhaug Jorn E Pedersen	Fishing Industry	23 January 2007	Fishing industry structures Fishing practices Fishery management

Jan Erik Johnsen Jorulf Straume			
Liv Holmefjord Thorbjorn Thorvik Modulf Overvik Anne Marie Abotnes Ingolf Rottingen Sigbjorn Mehl Are Salthaug Otte Bjelland	Directorate of Fisheries Institute of Marine Research	24 January 2007	Fishery science and management Ecosystem science and management
Geir Martin Lerbukt Hans Olin Stensli Ivan A Helbak Nina Drange Lars Foyn	Ministry of Fisheries and Coastal Affairs	25 January 2007	Fishery governance Legislation and Regulation
Tor Edgar Ripman	Norges Råfisklag	To 13/7/07	Fishery Management and sales

8 STAKEHOLDER CONSULTATION

8.1 Stakeholder Consultation

An eventual total of 59 stakeholders were identified and consulted specifically by Moody Marine. Information was also made publicly available at the following stages of the assessment:

Table 1: Stakeholder Consultations Held

Date	Purpose	Media
21 February 2006	Notification of confirmation of assessment	Direct E-mail/letter Notification on MSC website Advertisement in press
20 July 2006	Notification of Assessment Team nominees	Direct E-mail Notification on MSC website
22 August 2006	Confirmation of Assessment Team	Direct E-mail Notification on MSC website
4 October 2006	Consultation on draft Performance Indicators and Scoring Guideposts	Direct E-mail Notification on MSC website
2 November 2006	Release of final Performance Indicators and Scoring Guideposts	Direct E-mail Notification on MSC website
27 November 2006	Notification of assessment visit and call for meeting requests	Direct E-mail Notification on MSC website
23-26 January 2007	Assessment visit	Meetings
13 September 2007	Notification of Proposed Peer Reviewers	Direct E-mail Notification on MSC website
18 April 2008	Notification of Draft Report	Direct E-mail Notification on MSC website
16 May 2008	Notification of Final Report	Direct E-mail Notification on MSC website

8.2 Stakeholder Issues

Feedback from stakeholders has not resulted in the identification of issues requiring specific investigation. Stakeholder comments were received from WWF Norway and are appended to this document.

Issues raised by WWF were based on the following points, the responses of Moody Marine are also included below:

- Improved recruitment estimation and correction in the uncertainty in stock projections. MML Comment: This was also an issue identified by the assessment team and is addressed under Condition 1 for both NEA and North Sea.
- A wide-ranging review of the effects of trawling for saithe should be undertaken, and any new findings related to trawl gear impacts should be considered at future surveillance audits. MML Comment: The impacts of mobile gear on benthic habitats (both trawl and Danish seine) were considered extensively by the assessment team. The initiatives taken by Norwegian authorities were considered to be in line with the requirements of the MSC standard, but of course, the implications of any future information in this area will be evaluated in future annual surveillance audits.
- A complete monitoring and reporting system should be initiated to provide estimates of the bycatch of all species, also non-commercial, and should include estimates of discards and slippage
- Appropriate measures should be developed and implemented to reduce bycatch to acceptable and precautionary levels.
- Measures should be taken to reduce the amount of discarding/slippage MML Comment: We have also identified these three issues as being important and have put in place a number of Conditions relating to the recording and managing of by-catches, discards etc, both for non-commercial species, PET species and depleted species (notably coastal cod and North Sea cod)

Also, as part of the standard MSC process, the meeting of all conditions will be closely monitored during the annual surveillance audits, together with the implications of any changes in the science or management of the fishery.

9 OBSERVATIONS AND SCORING

9.1 Introduction to scoring methodology

The MSC Principles and Criteria set out the requirements of certified fishery. The certification methodology adopted by the MSC involves the interpretation of these Principles and Criteria into specific Performance Indicators against which the performance of fishery can be measured according to pre-specified guideposts.

The Performance Indicators developed by the Moody Marine assessment team have been identified on the MSC website (Performance Indicators and Scoring Guideposts). In order to make the assessment process as clear and transparent as possible, these guideposts identify the level of performance necessary to achieve 100, 80 (a pass score), and 60 scores for each Performance Indicator.

These generic Performance Indicators and Scoring Guideposts have been the subject of stakeholder consultation and have been confirmed or modified following this process based on the judgement of the assessment team. Prior to scoring, the Indicators are also ‘weighted’ in relative importance according to the nature of the fishery undergoing certification.

At the top level, no weightings are assigned in terms of each MSC Principle; a fishery must 'pass' each of Principles 1, 2 and 3 in order to achieve certification and these are of equal importance.

Within each Principle, and related to each MSC Criterion, Sub-criteria and Performance Indicators are grouped in a hierarchy. Each level represents separate areas of important information (e.g. Indicator 1.1 requires a sufficient level of information on the target species and stock, 1.2 requires information on the effects of the fishery on the stock and so on).

At the level of the 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. Accordingly, 100 represents a theoretically ideal level of performance and 60 a measurable shortfall. 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, weighted average scores are rounded to the nearest whole number.

Weights and scores for the Fishery are presented in the scoring table. Weights for criteria, sub-criteria and Performance Indicators add to a total of 100 at each level of the hierarchy. Scores are allocated relative to the Scoring Guideposts.

9.2 Evaluation results

Observations are presented in the scoring table, together with any weighting applied to the Fishery and the scores allocated.

10 LIMIT OF IDENTIFICATION OF LANDINGS

The extent of the fishery certification is the landing of saithe (and resulting products) at registered ports where recording and reporting of landings takes place. To be eligible to carry the MSC logo, these fish must then enter into separate Chain of Custody certifications.

11 CERTIFICATION DETERMINATION

11.1 Certification Determination

The Performance of each Fishery in relation to MSC Principles 1, 2 and 3 is summarised below:

North East Arctic

Trawl

MSC Principle	Fishery Performance
Principle 1: Sustainability of Exploited Stock	Overall : 85 **PASS**
Principle 2: Maintenance of Ecosystem	Overall : 82 **PASS**
Principle 3: Effective Management System	Overall : 90 **PASS**

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicators. It is therefore determined that the Norwegian Saithe NE Arctic Trawl Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

Purse Seine

MSC Principle	Fishery Performance
Principle 1: Sustainability of Exploited Stock	Overall : 85 **PASS**
Principle 2: Maintenance of Ecosystem	Overall : 84 **PASS**
Principle 3: Effective Management System	Overall : 90 **PASS**

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicators. It is therefore determined that the Norwegian Saithe NE Arctic Purse Seine Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

Gill Net

MSC Principle	Fishery Performance
Principle 1: Sustainability of Exploited Stock	Overall : 85 **PASS**

Principle 2: Maintenance of Ecosystem	Overall : 81 **PASS**
Principle 3: Effective Management System	Overall : 90 **PASS**

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicators. It is therefore determined that the Norwegian Saithe NE Arctic Gill Net Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

Danish Seine

MSC Principle	Fishery Performance
Principle 1: Sustainability of Exploited Stock	Overall : 85 **PASS**
Principle 2: Maintenance of Ecosystem	Overall : 81 **PASS**
Principle 3: Effective Management System	Overall : 90 **PASS**

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicators. It is therefore determined that the Norwegian Saithe NE Arctic Danish Seine Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

Handline

MSC Principle	Fishery Performance
Principle 1: Sustainability of Exploited Stock	Overall : 85 **PASS**
Principle 2: Maintenance of Ecosystem	Overall : 84 **PASS**
Principle 3: Effective Management System	Overall : 90 **PASS**

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicators. It is therefore determined that the Norwegian Saithe NE Arctic Handline Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

North Sea

Trawl

MSC Principle	Fishery Performance
Principle 1: Sustainability of Exploited Stock	Overall : 85 **PASS**
Principle 2: Maintenance of Ecosystem	Overall : 81 **PASS**

Principle 3: Effective Management System	Overall : 90 **PASS**

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicators. It is therefore determined that the Norwegian Saithe North Sea Trawl Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

Purse Seine

MSC Principle	Fishery Performance
Principle 1: Sustainability of Exploited Stock	Overall : 85 **PASS**
Principle 2: Maintenance of Ecosystem	Overall : 83 **PASS**
Principle 3: Effective Management System	Overall : 90 **PASS**

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicators. It is therefore determined that the Norwegian Saithe North Sea Purse Seine Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

Gill Net

MSC Principle	Fishery Performance
Principle 1: Sustainability of Exploited Stock	Overall : 85 **PASS**
Principle 2: Maintenance of Ecosystem	Overall : 81 **PASS**
Principle 3: Effective Management System	Overall : 90 **PASS**

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicators. It is therefore determined that the Norwegian Saithe North Sea Gill Net Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

Danish Seine

MSC Principle	Fishery Performance
Principle 1: Sustainability of Exploited Stock	Overall : 85 **PASS**
Principle 2: Maintenance of Ecosystem	Overall : 81 **PASS**
Principle 3: Effective Management System	Overall : 90 **PASS**

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicators. It is therefore determined that the Norwegian Saithe North Sea Danish Seine Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

Handline

MSC Principle	Fishery Performance
Principle 1: Sustainability of Exploited Stock	Overall : 85 **PASS**
Principle 2: Maintenance of Ecosystem	Overall : 83 **PASS**
Principle 3: Effective Management System	Overall : 90 **PASS**

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicators. It is therefore determined that the Norwegian Saithe North Sea Handline Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

11.2 Scope of Certification

This assessment relates only to the fishery defined in Section 1.1 up to the point of landing as defined in Section 10.

Monitoring and control of fishing locations and methods is considered sufficient to ensure fish and fish products invoiced as such by the fishery originate from within the evaluated fishery.

Accordingly, a fishery certificate is issued that will allow fish and fish products from this fishery to enter into further chains of custody subject to appropriate assessment and certification.

11.3 Pre-conditions, Conditions or Recommendations Associated with Certification

11.3.1 *Pre-Conditions*

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicator. No pre-conditions are therefore required prior to certification being granted.

11.3.2 *Conditions*

The fishery attained a score of below 80 against a number of Performance Indicators. The assessment team has therefore set a number of conditions for continuing certification that Fiskebat, as 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.

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.

The conditions are associated with varying key areas of performance for the different fisheries, each addressing a number of Scoring Indicators. Conditions, associated timescales and relevant Scoring

Indicators are set out below. The headers below indicate which fishery the Condition relates to.

NEA – ALL GEARS

Condition 1. Uncertainties in assessment

Action required: The assessment was considered to display considerable retrospective bias, recruitment is poorly estimated and there is an unknown effect of variable migration of animals into, and out of, the stock. If not accounted for appropriately, these uncertainties could give rise to TACs being set above precautionary levels.

To address these areas, the potential causes of the retrospective bias should be examined, alternative assumptions and model structures should be explored and the impacts of the uncertainty in inputs quantified in terms of uncertainty over the current status, projections of future stock status, and consistency of the current reference points and harvest rules with a precautionary approach. It is acknowledged, however, that this may require extensive resource allocation (indeed, extensive work on recruitment variability has been undertaken by IMR in the past which has failed to resolve this particular issue).

Therefore, two options would be considered acceptable in addressing this uncertainty:
a) Ideally, a plan to address any areas of data collection or research required to quantify and reduce uncertainty, and/or to implement actions to ensure that management is sufficiently precautionary to deal with the observed levels of uncertainty, should be developed and initiated within 3 years of certification. The plan should include realistic timescales for completion.
b) Alternatively, and acknowledging the potential technical and resource difficulties in resolving the above issues, annual TAC setting should explicitly incorporate an appropriate degree of precaution (including for an evaluation of assessment uncertainty and error in light of historical patterns, and its impact on estimates of stock status).

Timescale: Under option a) the initial review of the assessment and its uncertainties and options for dealing with it should be carried out within 12 months of certification. Ensuing plan development should be completed and implementation initiated within 36 months of certification. Under option b), TAC's set each year should be reviewed according to their adherence with ICES advice and a precautionary harvest strategy.

Relevant Scoring Indicators: 1.1.5.2, 1.1.5.5

NORTH SEA – ALL GEARS

Condition 1. Uncertainties in assessment

Action required: The assessment was considered to display considerable retrospective bias, recruitment is poorly estimated and there is an unknown effect of variable migration of animals into, and out of, the stock. If not accounted for appropriately, these uncertainties could give rise to TACs being set above precautionary levels.

To address these areas, the potential causes of the retrospective bias should be examined, alternative assumptions and model structures should be explored and the impacts of the uncertainty in inputs quantified in terms of uncertainty over the current status, projections of future stock status, and consistency of the current reference points and harvest rules with a precautionary approach. It is acknowledged, however, that this may require extensive resource allocation (indeed, extensive work on recruitment variability has been undertaken by IMR in the past which has failed to resolve this particular issue).

Therefore, two options would be considered acceptable in addressing this uncertainty:

a) Ideally, a plan to address any areas of data collection or research required to quantify and reduce uncertainty, and/or to implement actions to ensure that management is sufficiently precautionary to deal with the observed levels of uncertainty, should be developed and initiated within 3 years of certification. The plan should include realistic timescales for completion.
b) Alternatively, and acknowledging the potential technical and resource difficulties in resolving the above issues, annual TAC setting should explicitly incorporate an appropriate degree of precaution (including for an evaluation of assessment uncertainty and error in light of historical patterns, and its impact on estimates of stock status).

Timescale: Under option a) the initial review of the assessment and its uncertainties and options for dealing with it should be carried out within 12 months of certification. Ensuing plan development should be completed and implementation initiated within 36 months of certification. Under option b), TAC's set each year should be reviewed according to their adherence with ICES advice and a precautionary harvest strategy.

Relevant Scoring Indicators: 1.1.5.2, 1.1.5.5

ALL FISHERIES

Condition 2. By-catches

Action required: Sampling programmes should be initiated to provide statistically robust estimates of the by-catch of all species, including estimates of discards and slippage. Information should be sufficient to allow an assessment of the impacts of by-catches in relation to the distribution, ecology and abundance of the species and populations affected (commercial and non-commercial fish, mammals and birds).

The potential impact of non-target species removals on the populations affected and the wider ecosystem should be evaluated.

Where assessments of impacts on by-catches are shown to be significant, and for all species identified as PET, appropriate measures to reduce by-catches to acceptable and precautionary levels shall be developed and implemented.

Timescale: Sampling programmes should be designed and initiated within 12 months of certification and an initial evaluation of any potential impacts completed within 3 years of certification. Where mitigation measures are required to reduce or avoid impacts, these should be identified within 3 years of certification and fully implemented within 5 years of certification.

Relevant Scoring Indicators: 2.1.2.1, 2.1.2.2, 2.1.4.1, 2.1.5.2, 2.1.5.4 (gear specific), 2.2.1.2 (gear specific), 2.2.1.3, 3A.3.4

NEA GILL NET / HANDLINE

Condition 3. Coastal Cod Bycatch

Action required: Interactions of this gear with coastal cod populations are expected to occur. Coastal cod is recognised as being in a depleted state and so MSC certified fisheries are required to be prosecuted so as to promote rebuilding. Accordingly, those vessels participating in the saithe-directed fishery should be identified and catches of coastal cod in these 'saithe-directed fisheries' recorded separately.

The coastal cod by-catch in the saithe directed fishery should then be evaluated in terms of its relative contribution to impacts on cod stocks.

It is recognised that new regulations have been introduced to achieve rebuilding of the coastal cod stocks, but that these have not yet been tested. If the new regulations are not effective in recovering stocks, restrictions on by-catches of coastal cod in saithe directed fisheries should be implemented, consistent with a recovery plan.

Timescale: Separate recording of coastal cod by-catches in saithe-directed fisheries, and evaluation of the significance of these, should be initiated within 6 months of certification. The effectiveness of costal cod rebuilding regulations should be evaluated within 3 years of certification (when sufficient data on the effectiveness of the regulations is available) and, if determined necessary, restrictions on coastal cod by-catches should be implemented within 3 years of certification.

Relevant Scoring Indicators: 2.3.1.3

NORTH SEA - ALL GEARS

Condition 3. North Sea Cod Bycatches

Action required: Interactions of this gear with North Sea cod populations are expected to occur and catches of North Sea cod in these 'saithe-directed fisheries' are currently recorded separately. North Sea cod is recognised as being in a depleted state and MSC certified fisheries are required to be prosecuted so as to promote rebuilding of depleted target and by-catch species.

The North Sea cod by-catch in the saithe directed fishery should be evaluated in terms of its relative contribution to impacts on cod stocks.

It is recognised that rebuilding measures (the cod recovery plan) have been implemented for North Sea cod. There are indications in the North Sea that the decline in cod stock status has recently stabilized, and that the recent year class could promote stock recovery if recruited into the fishery. Nevertheless, measures should be identified and implemented to minimise catches of North Sea cod and future catches should be reported in relation to the proportion of cod in saithe catches, data from previous years and the relative status of the cod stock. Measures should remain in force until cod recovery has been achieved.

Timescale: Evaluation of the extent and significance of cod catches in saithe directed fisheries should be initiated within 6 months of certification. If the evaluation indicates a significant effect, identification and testing of further measures to minimise cod bycatches should be completed within two years of certification. Measures should be fully implemented within 3 years of certification.

Relevant Scoring Indicators: 2.3.1.2, 2.3.1.3

NEA – all gear except trawl and Danish seine

Condition 4. Cold Water Coral Impacts

Action required: An assessment of the potential impact of saithe directed fishing within the coral protection areas should be undertaken. If a potentially significant impact is identified, and appropriate precautionary management action should be implemented.

Timescale: An assessment should be completed in 3 years of certification. The identification and implementation of appropriate management measures should be completed within the term of the current certification.

Relevant Scoring Indicators: 2.1.4.1, 2.1.5.4, 3A.3.4

Recommendations.

The following are not considered to be fundamental issues in terms of compliance with the MSC Principles and Criteria, but are considered to be appropriate management measures for consideration by the fishery concerned.

Recommendation 1. It is suggested that there be an evaluation as to whether the areas of coral currently protected are sufficient, in terms of population/habitat requirements to adequately protect associated biodiversity.

APPENDICES

Appendix A: Peer Review Reports

1. Peer Reviewer Biographies
2. Peer Review Report A
3. Peer Review Report B

Appendix B: Client Action Plan

Appendix C: Stakeholder Comments

Abbreviations.

The following abbreviations are used in the following tables

Abbreviation	Full title
NEA	North east Atlantic
NS	North Sea
Tr	Trawl
Gn	Gill net
Ps	Purse seine
Ds	Danish seine
Hl	Hand line

Stakeholders should also be aware that some Performance Indicators are scored jointly for all ten Units of Certification. Some are scored separately for North East Arctic and North Sea and some are scored individually by area or gear. These are indicated below with reference to these abbreviations.

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
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.**		**33.3**	
1.1 *(MSC Criterion 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.**		**85.7**	**-**
1.1.1		There should be sufficient information on the target species and stock separation to allow the effects of the fishery on the stock to be evaluated.		**17.6**	**-**
1.1.1.1		Are the species readily identified as adults and juveniles?		14.3	100
60	Misidentification is possible and increases recording errors of catches, but this does not compromise monitoring to unacceptable levels. Methods to improve identification are under development.	The species (*Pollachius virens*, Linneaus 1758) has long been described. Recruited adults are readily and easily identified by fishers and regulators (Wheeler, 1969). The species is well recorded on landing by logbooks and in landing declarations – all landings are declared. Landings are also sampled by Norges Rafisklag, confirming identifications. Scientific surveys on spawning and nursery areas indicate that juvenile saithe can be distinguished by scientists.	I1, I2, R41, R43, R100		
80	The target species is unlikely to be confused with any other species and is recorded appropriately.				
100	The species is readily identified by fishers and by regulators and is recorded appropriately.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.1.2		Is the life history of the species understood and the spawning and nursery areas described?		14.3	
60	There are gaps in information but the basis of the life history is understood. Information is adequate to support a general population model, but some assumptions are required. There is some information on spawning and nursery areas.	**North East Arctic** The life history of the species is well understood and documented, including spawning grounds and times, larval and adult distribution. Ecological interactions are known (prey and predators). However, there are known to be exchanges between the NEA and NS stocks (see main text). These are of the following categories: 1. Larval drift from the North Sea spawning areas to north of 62^{o}N. One of the main uncertainties in the assessment (and particularly projections) is the apparent inability of surveys to reliably predict year class strength of age 0 and 1. The stock-recruit plot is also uninformative. Because of this northwards drift, recruitment appears not to be linked closely with spawning stock size but is more influenced by oceanography, so that the recruitment of saithe may suffer in years with reduced inflow of Atlantic water to the Norwegian and Barent seas (Jakobsen 1986). 2. Juvenile movement from between 62 and 64o N southwards to the North Sea was established to be significant by Jakobsen (1978, 1981a), but this contradicted earlier (early 1960s) results which appeared to show a northward migration of fish in this area. The consequences of this were investigated by Jacobsen (1981b). 3. Adult movement from the Norwegian coast to the Faroe Islands and Iceland, which in some years may be considerable and augment the Icelandic stock (Jakobsen & Olsen 1987) Uncertainty about recruitment and subsequent migrations between the various stocks in the NE Atlantic (which may be variable from year to year) may be one of the factors underlying uncertainty in the assessment. This issue does not appear to have been investigated since the 1980's. While sufficient is known on the life history of the species to identify an appropriate model, uncertainties over migrations etc may compromise the outputs of the model, an issue considered further below. The effect of these migrations on the assessments was last evaluated in the early 1980's and, it is considered, should be continually reviewed. Closed areas are implemented north of 67^{o}N under the Barents Sea surveillance programme when Fisheries Directorate operated vessels detect high proportions of undersized fish. Closures are temporary, reflecting the variable distribution of juveniles from year to year. **North Sea** Life history of the species is well understood, including spawning grounds and times, larval and adult distribution. Ecological interactions are known (prey and predators) (ICES 2006b Quality Handbook). The	I2, R41, R54, R51	NEA NS	85 85
80	The life history of the species is clearly documented and understood. Information is adequate to support an appropriate population model. Spawning and nursery areas are adequately well described.				
100	The life history of the species is clearly documented and understood including behaviour and ecological interactions. Spawning and nursery areas are sufficiently well documented to support closed area / seasons where this is deemed necessary.				

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score
	west coast of Norway is an important nursery area for North Sea saithe. However, there are known to be exchanges between the NEA and NS stocks (see main text). These are of the following categories: 4. Larval drift from the North Sea spawning areas to north of 62^{o}N. 5. Juvenile movement from between 62 and 64° N southwards to the North Sea was established to be significant by Jakobsen (1978, 1981a). The consequences of this were investigated by Jacobsen (1981b). 6. Adult movement from the Norwegian coast to the Faroe Islands and Iceland, which in some years may be considerable and augment the Icelandic stock (Jakobsen & Olsen 1987). Tagging experiments by various countries have shown that exchange between all saithe stock components in the north-east Atlantic takes place to a variable extent (ICES 1995). This, however, is much less an issue than for the NEA stock – so while the risk arising from such movements is less, the amount of knowledge is the same as for NEA. Uncertainty about recruitment and subsequent migrations between the various stocks in the NE Atlantic (which may be variable from year to year) may be one of the factors underlying uncertainty in the assessment. Two areas in the Norwegian economic zone have been closed for fishing on Norway pout, sandeel and blue whiting. The approach has been to close areas were the probability of illegal by-catches of juveniles and non-targeted species, such as cod, saithe, haddock, are considered unacceptable high (ICES 2006b).			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.1.3		Is the geographical range of the target stock known and any seasonal migration described?		14.3	
60	A management unit approximating the stock is used with some biological justification. This is based upon a sufficiently robust estimation of the geographical range of the target stock.	**North East Arctic** Adult and larval distributions, spawning grounds and times are known. Information is available on migrations as discussed above. An abstract only paper (Jonsson 2001) suggests that in most years exchange between the various stocks (North Sea, Faroes, Iceland, Northeast Arctic) is small (<1%). This is unlikely to be large enough to affect the assessment, but there appear to be unpredictable large migrations occasionally. Migration exchanges are not taken into account in the assessment (ICES 2006a) and few studies have examined the impact of migration on the assessments (Jakobsen 1981, Jakobsen & Olsen 1987). None of these are recent. Results of the most pertinent study (Jakobsen 1981) were that assigning all catches of age 1-4 fish between 62 and 64 N to the North Sea stock increased estimates of recruitment in that stock and decreased them in the NEA stock (unsurprisingly). The study provided no information on goodness of fit of the model, and in any case would not be relevant to today's assessment since the status of saithe	NEA I2, R11, R39, R41, R51, R52, R53, R56 NS I2, R41, R52, R52, R53, R56,	NEA NS	80 80
80	A reliable estimate of the geographic range of the target stock is available including seasonal patterns of movement and availability. Stock assessment and management units are consistent with the majority distribution of the stock.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	The complete geographic range of the stock, including seasonal patterns of movement/availability, is estimated and documented and is kept under review.	is completely different to its status in 1981. Stock assessment and management units are consistent with the majority distribution of the stock. Seasonal patterns of availability are known, seasonal patterns of movement are qualitatively understood. Providing a reliable estimate of the geographical distribution of the target stock. However, seasonal movements are not kept under review. **North Sea** Adult and larval distributions, spawning grounds and times are known. Information is available on migrations as discussed above. An abstract only paper (Jonsson 2001) suggests that in most years exchange between the various stocks (North Sea, Faroes, Iceland, Northeast Arctic) is small (<1%). This is unlikely to be large enough to affect the assessment, but there appear to be unpredictable large migrations occasionally. Migration exchanges are not taken into account in the assessment (ICES 2006a) and few studies have examined the impact of migration on the assessments (Jakobsen 1981, Jakobsen & Olsen 1987). None of these are recent. Results of the most pertinent study (Jakobsen 1981) were that assigning all catches of age 1-4 fish between 62 and 64^{o}N to the North Sea stock increased estimates of recruitment in that stock and decreased them in the NEA stock. The study provided no information on goodness of fit of the model, and would not be relevant to today's assessment since the status of saithe is completely different to its status in 1981.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.1.4		Is there information on fecundity and growth?		14.3	
60	There is some appropriate information available on fecundity and growth.	**North East Arctic** Data on length and weight at age are routinely sampled and used in the assessment. Fecundity with size has been adequately established but does not appear to be under regular review to detect trends and shifts. Maturity is monitored routinely and presented in the working group report for the years 1985 – 2005. Maturity at age has shown considerable variation, and has decreased in the most recent years. The assessment uses a single natural mortality of 0.2 for all ages in the assessment. **North Sea** Data on length and weight at age are routinely sampled and used in the assessment. Fecundity with size has been adequately established but does not appear to be under regular review to detect trends and shifts. The assessment uses a single maturity ogive and natural mortality of 0.2.	NEA I2, R31, R32, R41 NS I2, R31, R32, R43	NEA NS	80 80
80	Reliable estimates are available of fecundity at size and/or weight and growth rates, and this information forms an adequate time series.				
100	There is comprehensive and reliable information on fecundity at size, growth rates, and length and weight at age, and these are monitored over time to detect trends and shifts.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.1.5		Is there an understanding of the relationship of recruitment to parental stock?		14.3	
60	Indices of recruitment levels and recruiting ages, and corresponding spawning stock levels are available.	**North East Arctic** ICES (2006a) state that: "Attempts at establishing year class strength at age 0 or 1 have so far failed. The accuracy of the survey recruitment indices varies from year to year according to the extent to which 2 - 3 year old saithe have migrated out from the near coast areas and become available to the acoustic saithe survey on the banks. An observer program for establishing a 0-group index series started in 2000 (Borge and Mehl, WD 21 2002. However, these observations do not seem to pick up the year class strength very well, and the program will be evaluated in the near future. " Recruitment is therefore currently estimated only by the assessment, which is tuned by the acoustic	NEA I2, R10, R42 NS I2, R43	NEA NS	80 80
80	Adequate estimates of recruitment and spawning stock are available. Sufficient years of data and contrast are available to establish a general relationship between stock and recruitment.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	The relationship between stock and recruitment is well understood with high statistical reliability.	survey (ages 3-7, but note the coverage issue raised above which leads to consistent trends in the catchability residuals at age 3) and influenced by catches made on ages 3-4 by the purse seine fleet (this is the only fleet to catch ages 3-4 animals in significant quantities, the others catching predominantly ages 5-7). Therefore although the assessments give information on stock and recruitment, estimates of recruitment may be particularly uncertain and this may contribute further to the uninformative nature of the S-R relationship. Therefore, the stock-recruitment relationship is sufficient to allow determination of limit reference points. with a long time series of data and contrast. There is therefore a general relationship, but uncertainty in the assessment reduces confidence that the relationship is estimated with high statistical reliability. **North Sea** Two surveys including estimating recruits at age 3 are available: the Norwegian acoustic survey, age range 3-6 (NORacu) and IBTS quarter 3, age range: 3-5 (IBTSq3). The WGNSSK appears to put more reliance on these than the AFWG does for the NEA stock, and indeed the residuals appear rather more consistent. However, there are still concerns in the working group and in ACFM, and the stock-recruit plot suggests no relationship between the two. ICES 2006b state that : “The most serious problem with stock forecasts for saithe is the lack of reliable information about year class strength before age 3. An annual 0-group survey has been conducted by IMR (Norway) since 1999 in the northern North Sea, but this will not be continued due to lack of relationship between the 0-group index and later XSA population estimates for the year classes 1999-2001 (the 0-group index for the 2000 year class is extremely high, while this year class is estimated to be around average for age 4 in this year s assessment). IMR have started a new survey along the west coast of Norway to measure the relative abundance of saithe between 2 and 4 years old (when the saithe is distributed along the coast).” Therefore, the stock-recruitment relationship is sufficient to allow determination of limit reference points. with a long time series of data and contrast,. There is therefore a general relationship, but uncertainty in the assessment reduces confidence that the relationship is estimated with high statistical reliability.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.1.6		Is information collected on the abundance/density of the stock?		14.3	
60	Either fishery dependent or fishery independent indices are available on the abundance of the stock biomass. Qualitative information exists on the appropriateness of the indices as proportional indicators of stock size.	**North East Arctic** Only two tuning indices are used, but they are of both fishery-dependent and fishery-independent origin. Multiple CPUE indices are considered and the trawl CPUE has been chosen as most indicative of stock status. • Fleet 12: CPUE data from the Norwegian trawl fisheries (start 1994, age groups 4 to 8) • Fleet 13: Indices from the Norwegian acoustic survey (start 1994, age groups 3 to 7). Uncertainties in these surveys are extensively reported and analysed by the working group each year, both *a priori* and as part of the diagnostic analysis of the fits to the assessment model XSA. The fishery independent survey is well designed and robust. A long time series of data available, allowing trends to be analysed in each index. Trends within residuals for both fitted indices are visible, but are not consistent, and are routinely investigated. These suggest that, in general, indices are proportionate to stock size, but with significant deviations from proportionality in some years.	NEA I2, R41 NS I2, R43	NEA NS	90 95
80	Fishery dependent and/or fishery independent indices are available on the abundance/density of the stock. Uncertainties have been analysed and any uncertainties reduced so as to allow trends to be determined from the indices. Indices are suitable to provide a high degree of confidence in the evaluation of stock abundance trends.				

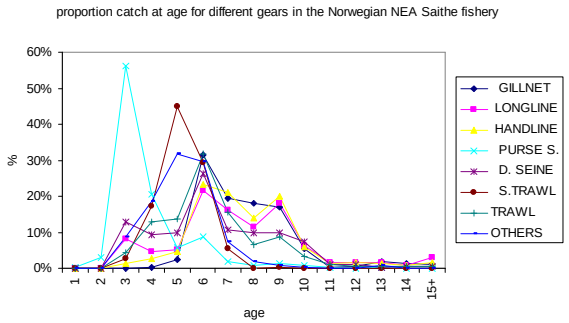
INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	Multiple fishery dependent and/or fishery independent indices are available on the abundance/density of the stock with sufficient time series to allow trends in abundance to be understood clearly. Where fishery independent surveys are used (for juveniles and/or adults) the design of the survey is statistically rigorous and robust, Indices are consistent and there is clear evidence that they are proportional to the stock size Uncertainties have been fully analysed.	**North Sea** The assessment uses the following fleets: Commercial fleets: • French fresh fish trawl, age range: 3-9 (FRAtrb) from 1990 • German bottom trawl, age range: 3-9 (GERotb) from 1995 • Norwegian bottom trawl, age range: 3-9 (NORtrl) from 1980 Surveys: • Norwegian acoustic survey, age range 3-6 (NORacu) from 1995 • IBTS quarter 3, age range: 3-5 (IBTSq3) from 1991 Uncertainties in these surveys are extensively reported and analysed by the working group each year, both *a priori* and as part of the diagnostic analysis of the fits to the assessment model XSA. A survey of fishermen's perception of the stock is also undertaken, and analytical assessments agree reasonably well with the results of this survey. The fishery independent survey is well designed and robust. A long time series of data is available, allowing trends to be analysed in each index. Trends within residuals for both fitted indices are visible, but are not consistent, and are routinely investigated. These suggest that, in general, indices are proportionate to stock size, but with only some deviations from proportionality in some years.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.1.7		Is information available on environmental influences on the stock dynamics?		14.3	
60	Some relevant studies have been undertaken on the effects of biological and physical factors which could affect the stock (including natural mortality). Research is encouraged and ongoing.	**North East Arctic** Natural mortality is estimated in the stock assessment (WG report) and MSVPA estimates are available on natural mortality. Studies on cannibalism have also been carried out in NEA saithe. Recruitment is known to vary with the strength of inflowing Atlantic waters (recruitment suffers in years of reduced inflow). The influence of temperature on saithe stock-recruitment has been determined for the North Sea, but is also applicable here. Projections (forecasts) use the long term geometric mean recruitment at age 3. There is also knowledge of the extent to which migrations affecting distribution, as discussed above. **North Sea** Natural mortality is estimated in the stock assessment and MSVPA estimates are available on natural mortality. The influence of temperature and the North Atlantic Oscillation on saithe stock-recruitment dynamics has been investigated in the North Sea. These results are not yet used in the assessment to modify recruitment expectations for the predictions. There is also knowledge of the extent to which migrations affecting distribution, as discussed above.	NEA I2, R41, R55 NS I2, R10, R12, R43	NEA NS	80 80
80	There is knowledge of biological and physical factors affecting distribution, survival and year class strength (including natural mortality). Some information is sufficiently robust for use in the stock assessment process.				
100	There is comprehensive knowledge of biological and physical factors affecting distribution, survival and year class strength (including natural mortality). Key information is sufficiently robust for use in the stock assessment process.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.2	There should be sufficient information on the fishery to allow its effects on the target stock to be evaluated			17.6	-
1.1.2.1		Are all major sources of fishery related mortality recorded/ estimated, including landings, discards and incidental mortality?		28.6	
60	Sufficient information is available to allow accurate estimates to be made of landings, broken down as required for an evaluation of the fishery to be made. Estimates of discards and incidental mortality are available. Levels of IUU fishing are being estimated, but with some uncertainty.	**North East Arctic** Landings are comprehensively recorded for all gear types, including post-landing inspections by Norges Rafislaget. Discarding of saithe is prohibited in all fisheries, and illegal slippage is thought to be rare for all gear types and is not expected to affect the stock assessment (also, there are no significant market incentives which would lead to discarding). However, there is no quantitative estimation of discard or slippage from sampling or inspection reports. Levels of IUU fishing are reliably considered to be negligible (NO Fisheries Ministry, interview Feb 2007). Saithe are mostly coastal and the main IUU fishing in the Barents sea affects cod and haddock in more offshore areas. Some saithe may be taken in northern blue whiting fisheries, but this would be in the high seas fishery, and outside the Norwegian EEZ, which is likely to be from a number of stocks (Icelandic, Faroese, Norwegian) (to check if purse seine catches and are recorded). A sampling programme is in place to estimate by-catches in other industrial fisheries, but these are currently not included in the assessment.	NEA I2, I4, 41 NS I2, I4, R43, R94	NEA NS	90 90
80	Landings are accurately recorded. Discards and incidental mortality are well estimated for major gear types. Levels of IUU fishing are well estimated and low.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	Landings, discards and incidental mortality are accurately estimated and monitored for all gear types. Levels of IUU fishing are reliably estimated to be negligible.	There is some possibility that some NEA saithe migrate to other areas and are caught (eg in Iceland). These are not accounted for but on the other hand they are general losses and probably low. **North Sea** Landings are comprehensively recorded for all gear types. ICES 2006b Quality Handbook: "Since the fish are distributed inshore until they are 2-3 years old, discarding of young fish is assumed to be a small problem in this fishery. Problems with by-catches in other fisheries when saithe quotas are exceeded may cause discarding. Data from SGDBI and Scotland indicate that the discard in the UK fleets in 2000 and 2001 was about 22 000 t and 15 000 t, respectively, mainly age 3 and age 4. Scottish discards are included in the assessment but their discard rates are not extrapolated across the fleet. French and German trawlers are targeting saithe and they have larger quotas, so the problem may be less in these fleets. The Norwegian trawlers move out of the area when the boat quotas are reached, and in addition the fishery is closed if the seasonal quota is reached". The Norwegian discard ban is effective on all vessels in Norwegian waters, and Norwegian trawlers retain their discard ban outside Norwegian waters. Levels of IUU fishing are considered to be negligible (NO Fisheries Ministry, interview Feb 2007). By-catch of herring, saithe, cod, haddock, whiting, and monkfish at various levels in the small meshed fishery in the North Sea and Skagerak directed towards Norway pout has been documented (Degel, Nedreaas, and Nielsen (2006), Work. Doc. No. 22, ICES WGNSSK, 2007). In the agreed EU Council and EU-Norway Bilateral Regulation of Fisheries, by-catch regulations in the Norway pout fishery have been established (e.g. EU Regulation No 850/98 (EU, 1998)). The by-catch regulations in force at present for small meshed fishery (16-31mm in mesh size) in the North Sea is that catch retained on board must consist of i) at least 90% of any mixture of two or more target species, or ii) at least 60% of any one of the target species, and no more than 5% of any mixture of cod, haddock, saithe, and no more than 15% of any mixture of certain other by-catch species. The by-catches in the industrial fisheries are included in the Saithe assessment.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.2.2		Are fleet descriptions, fishing methods and gear types known throughout the fishery?		23.8	
60	Significant fishing methods and gear types are known for the fishery with some information on geographical areas of use. Information is available on the size and composition of the fleets, but is not regularly updated.	**North East Arctic** All fleets are known and controlled, and described by ICES. Information is regularly updated by the Directorate. The majority of landings are Norwegian, but full landings are reported. Detailed composition of the Norwegian fleet sector and catches by area is known. Fishing practices are monitored through at-sea inspections and observations on reference fleets. Detailed data on the Norwegian saithe fleet by gear have been presented to the assessment team. **North Sea** All fleets are known and controlled by the EU Member States or Norway, and described by ICES. Information is regularly updated by the Directorate. The majority of landings are Norwegian, but full landings are reported. Catches by gear are presented and used in the assessments. Detailed composition of the Norwegian fleet sector and catches by area is known. Fishing practices are monitored through at-sea inspections and observations on reference fleets. Detailed data on the Norwegian saithe fleet by gear have been presented to the assessment team.	I1, I2, I4	NA NS	100 100
80	Significant fishing methods and gear types are known and information is available on the geographical areas of use. Recorded information is available on the size and composition of the fleets. This is reviewed and updated at appropriate intervals.				
100	All fishing methods and gear types employed in the fishery are known. *In-situ* observations are made of fishing practices. Comprehensive knowledge is recorded and regularly updated, on the size and composition of the fleets.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.2.3		Is gear selectivity known for the fishery?		23.8	
60	Appropriate information is available on selectivity and qualitative changes in selectivity.	**North East Arctic** Catches by size and age are known for different fleets and gear types, and these are monitored every year. Selectivity of different gears are established through the reference fleet, and IMR vessel sampling from landing sites up and down the coast, sampling fresh fish trawlers, handliners, gillnetters and purse seiners, for saithe, cod and haddock. Some of these vessels will also be in the reference fleet. Sampling aims to get good representation from each gear type per quarter for each area. Some gaps will exist in the data, but these are addressed through interpolation from adjacent areas, months etc. The stock assessment estimates individual catchabilities by age only for the tuning series, and estimates a combined selectivity (F at age profile) for all gears in any particular year.  Some information is available on the mortality of non-retained fish. **North Sea** Catches by size and age are known for different fleets and gear types, and are monitored every year. Catch at age data by fleet are supplied by Denmark, Germany, France, Norway, UK (England and Scotland) for Area IV and only UK (Scotland) for Area VI. FRS (Aberdeen) is responsible for the database of catch at age data from the different countries. The assessment estimates individual catchabilities by age only for the tuning series, and estimates a combined selectivity (F at age profile) for all gears in any particular year. Some information is available on the mortality of non-retained fish.	NEA I1, I2, R41 NS I1, I2, R43	NEA NS	80 80
80	Selectivities of gear types are well estimated by size. Information is sufficient to determine any changes in selectivity over time.				
100	Full selectivities have been accurately estimated for all gears, locations and times of fishing over time. Information is available on the mortality of individuals not retained by the gear.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.2.4		Is the target species taken in other fisheries in the area that are not subject to this certification, and are such catches recorded or estimated?		23.8	
60	There is an appropriate level of information relating to other fisheries in the area that are not subject to this certification, although these are not fully identified. The catches are estimated in the stock assessments.	**North East Arctic** All catches of saithe in other targeted fisheries in Norwegian waters are identified and reported. Allegations of considerable discarding made in ICES (2006a) are disputed by Norwegian scientists, who attribute them to some early scientific observer data from non-Norwegian vessels. However, it is acknowledged that, especially in years of strong juvenile year classes, accidental bycatches of undersized fish are inevitable in the purse seine fishery and that these may be slipped. The level of this slippage (which is prohibited under regulation #48) is unknown and is not taken into account in the assessment, but should this be a significant issue, it would be expected to be recorded, and is not. There is potential saithe by-catch in the Northern blue whiting fishery. However, these are larger and tend not to mix with saithe. Any estimates of saithe bycatch in the Norwegian blue whiting fishery is not currently included in the assessment, nor are estimates of bycatch in any other blue whiting fisheries taking place in Norwegian waters (some fishing takes place under Norway bilateral agreements with the EU and Faroes). There is also some uncertainty over whether saithe by-catches are from Norwegian, Icelandic or Faroese stocks. However, the expected levels of by-catch in these fisheries is not expected to present a threat to saithe stocks. **North Sea** All catches of saithe in other saithe-directed North Sea fisheries are reported, with the exception of discards, which are estimated. All catches of saithe in other fisheries should be reported, and are estimated in the stock assessment. There is some question over whether bycatches in the pout fishery are accurately included in the assessment. The estimated Norwegian industrial fishery bycatch of saithe is included in the assessment of saithe in the North Sea (through inclusion in Norwegian statistics). The only catches not included are bycatches in other industrial fisheries. However, the expected levels of by-catch in these fisheries is not expected to present a threat to saithe stocks.	NEA I2, R41, R53, R54, R56 NS I2, R43, R93	NEA NS	90 90
80	The main fisheries not subject to certification are identified. Significant catches of the target species are either recorded or reliably estimated in the stock assessments.				
100	All fisheries (and other sources of human-induced mortality) in the area that are not subject to this certification are identified and monitored. All the catches are recorded and used in the stock assessment.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.3	Appropriate reference levels have been developed for the stock			14.7	-
1.1.3.1		Are there appropriate limit and precautionary reference points based on stock biomass and fishing mortality?		100	
60	Limit and precautionary reference points have been chosen and are justified based on standard international practice.	**North East Arctic** Biological reference points are computed: Blim using segmented regression on the 1960-2000 time series of SSB-recruitment pairs and Bpa based on an estimated (assessed) SSB level that would ensure that there was only a 10% (one-sided) probability that real biomass was below Blim given an average CV in the assessment of 30%. Fishing mortality reference points are computed to generate these precautionary biomass levels. The Norwegian proposed management strategy uses Fpa as a target with a sliding scale of fishing mortality from Fpa when SSB>=Bpa to 0 when spawning stock is zero. The proposal is being examined by ICES, which should determine whether the proposed fishing mortalities when SSB<Blim are sufficient to generate recovery of the stock. However, the level of uncertainty in the assessment appears, from the retrospective, to be high. Under this circumstance, both the CV of the assessment used to calculate Bpa and the stock recruit relationship used to calculate Blim may be more uncertain. The effect of this uncertainty on the reference points has not yet been rigorously examined. **North Sea** Biological reference points are computed: Blim was set at 106,000 t in 1998 as the lowest biomass (at that time) that had produced average recruitment, and Bpa at a level that affords a high probability of maintaining SSB above Blim. Flim is the fishing mortality estimated to lead to SSB falling below Blim in the long term, and Fpa is the fishing mortality that in the long term should lead to only a 10% probability that SSB falls below Bpa. Fishing mortality reference points are computed to generate these precautionary biomass levels. The Norwegian-EU agreement management strategy uses Fpa as a target with a sliding scale of fishing mortality from Fpa when SSB>=Bpa to 0.1 when spawning stock is at or below Blim. The level of uncertainty in the assessment appears, from the retrospective, to be moderate. The effect of this uncertainty on the reference points has not yet been rigorously examined, however.	NEA I2, R41 NS I2, R43	NEA NS	80 85
80	Limit and precautionary reference points are justified based on stock biology (e.g. a stock-recruitment relationship) and are measurable given data and assessment limitations.				
100	Limit and precautionary reference points are justified based on stock biology, uncertainty, variability, data limitations and statistical simulations of these factors.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.4	**There is a well-defined and effective harvest strategy to manage the target stock.**			17.6	-
1.1.4.1		Is there a mechanism in place to contain harvest as required?		33.3	
60	Mechanisms are in place to monitor and (if necessary) reduce harvest, but do not fully contain harvest, or have not been tested. Measures provide a reasonable degree of confidence in stock management.	**North East Arctic** The basis of the harvest strategy is discussed above. There is in addition an implicit harvest strategy in which Bpa is a target consistent with the precautionary approach (as described for the North Sea by Kell et al, 2005). The new Norwegian harvest control strategy is currently being tested for robustness and uncertainty is accounted for in the reference points. Catches are constrained, within this harvest control strategy, through individual quotas allocated to vessels and/or sectors (for smaller vessels) within a global TAC. There is no explicit requirement for a recovery plan in the harvest control rules. However, there is an implicit assumption within ICES that when biomass declines below Blim, ACFM will advise the development of a recovery plan. Catches have been reduced in past which has led to reduced fishing mortality and stock recovery has been observed. There are, in addition, various technical controls including the protection of large concentrations of juveniles from all fishing. The advice on the state of this stock is based on reference points. The machinery is in place via the ICES ACFM advice and Norwegian management agencies to implement measures to reduce the harvest as and when required. **North Sea** The basis of the harvest strategy is discussed above. There is in addition an implicit harvest strategy in which Bpa is a target consistent with the precautionary approach (Kell et al, 2005). Uncertainty is accounted for in the reference points. Catches are constrained separately by each of the fishing nations, within a global TAC and nationally allocated quotas. There is no explicit requirement for a recovery plan in the harvest control rules. However, there is an implicit assumption within ICES that when biomass declines below Blim, ACFM will advise the development of a recovery plan. Catches have been reduced in past which has led to reduced fishing mortality and stock recovery has been observed. There are, in addition, various technical controls including the protection of large concentrations of juveniles from all fishing. The advice on the state of this stock is based on reference points. The machinery is in place via the ICES ACFM advice, the EU and the EU / Norway agreement to implement measures to reduce the harvest as and when required.	NEA I2, R41, R42 NS I2, R42, R43	NEA NS	80 80
80	Appropriate mechanisms are in place to contain harvest as and when required to maintain, or allow the target stock to return to, productive levels. These have been tested if/as appropriate for robustness against uncertainties in the assessment and management process.				
100	Mechanisms are in place to contain harvest as and when required to maintain (or allow the target stock to return to) productive levels. Measures are robust to uncertainty in data inputs or stock biology. Specific measures to demonstrate effectiveness are in place and their robustness has been examined against a wide range of uncertainties.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.4.2		Are clear, tested decision rules set out?		33.3	
60	It can be demonstrated that decision making, though not documented, is logical and appropriate. Rules may not have not been tested, but appear appropriate for management.	**North East Arctic** The decision rules are as given above (1.1.3.1 and in report) and include a provision for fishing mortality to decline to zero as spawning biomass declines to zero. They are reconciled with reference points. Also, the new Norwegian harvest control strategy is currently being tested for robustness. **North Sea** The decision rules are as given above, and include the provision that fishing mortality may decline to 0.1 when spawning biomass declines to Blim and below. These are reconciled with reference points. However, ICES has not tested the decision rules and, although they appear to ICES to be adequate under the current situation of an increasing stock, it is unclear whether the lower fishing mortality rate would generate a sufficient recovery should stock levels decline below Blim.	NEA R41, R42 NS R42, R43	NEA NS	80 80
80	Clear decision making rules exist, are fully documented, but may not have been fully tested. Decision rules are reconciled with reference points and with data and assessment limitations.				
100	Clear, documented and tested decision rules are fully implemented and have been fully reconciled with reference points and the data and assessment limitations, and have been periodically evaluated.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.4.3		Are appropriate management tools specified to implement decisions in terms of input and/or output controls?		33.3	
60	Management tools exist to implement decisions of input and/or output controls although these are not developed for the specific fishery, or management tools are not fully developed, but are specifically related to the fishery. Some evidence exists to show that tools can be effective in achieving management goals.	**North East Arctic** Input and output controls are used. Input controls limit the number of licence holders. Although the number of vessels has been declining over the last 15 years, the fishing power has been increasing for the Norwegian fleet as a whole. In addition, various technical measures also apply, such as minimum landing sizes, mesh sizes etc. Output controls (via quotas) appear adequate to limit catches. Furthermore, since 90% of the quota is held by Norway, extractions from the stock are easily controlled. The Fisheries Directorate is demonstrably able to close sectors when the sector quota is reached, a within-season measure. Close communication between the Directorate, Sales Organisations and fishers allow quota uptake to be monitored. Until 2001, landings were usually higher than the TAC but since 2001 they have been below or equal to the TAC. In the period of TAC reductions when the stock was at a low level (1978 – 1993) catches were slightly higher than TAC's, and this could be some cause for concern should stock status decline again. However, the system dealing with over-quota catches reduces the incentive to exceed quota and the value of over-quota landings is used to fund compliance enforcement. However, a systematic scientific evaluation of the performance of the tools has not been undertaken. **North Sea** For Norwegian vessels fishing in the North Sea, both input and output controls are used.	NEA I2, I3, R41 NS I2, I3, R43	NEA NS	95 95
80	Management tools have been specified to implement decisions of input and/or output controls. These are generic although some attempt has been made to relate them to the specific fishery OR tools are lacking in some details but are specifically related to the fishery. Evidence exists to show clearly that tools are effective in achieving long term sustainable management of the stock.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	Management tools, appropriate to the species and fishery, have been specified to implement decisions of input and/or output controls. Tools are responsive, relevant and timely. Performance of the tools has been evaluated and evidence exists to show clearly that the management system has a high probability of achieving its objectives.	Input controls limit the number of licence holders. Although the number of vessels has been declining over the last 15 years, the fishing power has been increasing for the Norwegian fleet as a whole. In addition, various technical measures also apply, such as minimum landing sizes, mesh sizes etc. Output controls (via quotas) appear adequate to limit catches. Furthermore, since 90% of the quota is held by Norway, extractions from the stock are easily controlled. The Fisheries Directorate is demonstrably able to close sectors when the sector quota is reached, a within-season measure. Close communication between the Directorate, Sales Organisations and fishers allow quota uptake to be monitored. For the Norwegian and EU fleets as a whole, output controls appear adequate to limit catches. Since 1987 landings have been lower than the TAC. Total extractions (including estimates of discards) have been in some years slightly higher than the TAC, but not since 2001. This was the case even when TAC's were being reduced in the early 1990s in the face of low stock sizes and high fishing mortality. In addition, the system dealing with over-quota catches (for Norwegian vessels) reduces the incentive to exceed quota and the value of over-quota landings is used to fund compliance enforcement. However, a systematic scientific evaluation of the performance of the tools has not been undertaken.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.5	**There is a robust assessment of stocks.**			17.6	-
1.1.5.1		Are assessment models used and are they appropriate to the biology of the target species and the type of fishery?		21.2	
60	Robust assessment models are used. These are generic and do not account for specific characteristics of either the biology of the species or the nature of the fishery.	**North East Arctic** The assessment is appropriate to the species and fisheries, but does not capture all major features of the biology of the species (e.g. M is not varied with age). In the last benchmark assessments, two alternative methods were tried, ICA and ADAPT. The results were quite similar to the adopted XSA-results. **North Sea** The assessment is appropriate to the species and fisheries, but does not capture all major features of the biology of the species (e.g. M is not varied with age and maturity at age is constant over time).	NEA I2, R41 NS I2, R43	NEA NS	85 85
80	Assessment models are used. Major criteria are related to the species and/or the fishery, but there are some areas of the assessment that are generic.				
100	Assessment models are used and capture all major features appropriate to the biology of the species and the nature of the fishery and the nature of the management questions being asked.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.5.2		Does the assessment take into account major uncertainties in data and have assumptions been evaluated?		21.2	
60	Major uncertainties are identified. Some attempt has been made to evaluate these in the assessment.	**North East Arctic** Assessments are rigorously examined each year and uncertainties explored. Assessments are rigorously examined each year and uncertainties explored by ACFM as well as the working group. However, the results are not presented in terms of uncertainty – i.e. as a Bayesian posterior or the like – and so projections only take future uncertainty into account and not uncertainty in the assessment. Some important uncertainties have not been fully evaluated, notably large retrospectives exist overestimating F in current year and trends in catchability. This is the case for single individual or both	NEA I2, R31, R32 NS I2, R43	NEA NS	75 75
80	The assessment takes into account major uncertainties in the data and functional relationships. The most important assumptions have been evaluated and the consequences are known.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	The assessment addresses all significant uncertainties in the data and functional relationships and evaluates the assumptions in terms of scope, direction and bias relative to management-related quantities. The assessment model has been shown to meet sufficient levels of precision and accuracy to allow the management process to achieve its objectives.	tuning indices and is presumed to be a problem within the catch at age matrix, or selectivity, but it may also be that recruitment is poorly estimated or that there is variable migration. The last investigation of the potential influence of migration was in the mid 1980's and estimates of annual migration between the North Sea and North East Arctic are not made and no account of them is incorporated in the assessment (although this is probably relatively minor and restricted to the southern end of the NE Arctic stock distribution). This could affect the retrospective problems in the VPA, but for the NEA saithe, the effect should be the opposite of the trend that is seen in later years. The same trend is seen in other saithe stocks simultaneously, e.g. in the North Sea stock, so the main explanations to the retrospective problems probably lies elsewhere. The assessment methodology does not lend itself to estimating the uncertainty in the assessment, apart from the sensitivity analysis reported above. Some work has been done on the uncertainty surrounding estimates of catch at age of cod in Norwegian waters but these techniques have not been extended to saithe nor applied to the assessments. **North Sea** Assessments are rigorously examined each year and uncertainties explored by ACFM and STECF as well as the working group. In 2006, the WG reviewed the assessment in the light of comments received from ACFM, particularly the trends in survey Q's and reliability of recruitment estimates. The retrospective bias is similar in direction to that in the NE Arctic, but lower in magnitude, and the historical forecasts suggest that past assessments have more or less been accurate. Uncertainties are presumed to be a problem within the catch at age matrix, or selectivity, but it may also be that recruitment is poorly estimated or that there is variable migration. The last investigation of the potential influence of migration was in the mid 1980's and estimates of annual migration between the North Sea and NE Arctic are not made and no account of them is incorporated in the assessment (although this is probably relatively minor and restricted to the southern end of the NE Arctic stock distribution). This could affect the retrospective problems in the VPA, but for the NEA saithe, the effect should be the opposite of the trend that is seen in later years and the same trend is seen in other saithe stocks simultaneously, e.g. in the North Sea stock. So the main explanations to the retrospective problems probably lies elsewhere.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.5.3		Are uncertainties and assumptions explored and reflected in management advice?		19.2	
60	Major uncertainties are recognised and are reported in management advice, as well as possible implications of those uncertainties on the management advice.	**North East Arctic** Major uncertainties, for instance recruitment, migration, catch/bycatch/discarding and problems with the tuning fleet, are raised in the WG reports. Bpa and Fpa are established to take account of uncertainties by establishing precautionary limits. ICES are currently reviewing the principles underlying precautionary limit setting. Uncertainty is only addressed within decision rules where it is assumed that the uncertainty in the assessment has an average CV of 30%. There is no testing of this hypothesis. Management advice is always presented as a series of harvest strategy options relative to precautionary limits. **North Sea** Major uncertainties, for instance recruitment, migration, catch/bycatch/discarding, problems with the tuning fleet, are raised in the WG reports. Bpa and Fpa are established to take account of uncertainties by establishing precautionary limits. ICES are currently reviewing the principles underlying precautionary limit setting. Uncertainty is only addressed within decision rules where it is assumed that the uncertainty in the assessment has an average CV of 30%. There is no testing of this hypothesis. Management advice is always presented as a series of harvest strategy options relative to precautionary limits.	NEA I2, R41 NS I2, R43	NEA NS	80 80
80	Major uncertainties and assumptions are addressed in the management advice and through the appropriate decision rules to address those limitations.				
100	All significant uncertainties and assumptions are addressed and reflected in the management advice, including appropriate decision rules.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.5.4		Does the assessment evaluate current stock status relative to reference points and make forecasts for the future?		19.2	
60	The stock status is estimated relative to reference points.	**North East Arctic** The assessment makes an evaluation of the stock status relative to the reference points. Both short and medium term forecasts are made. **North Sea** The assessment makes an evaluation of the stock status relative to the reference points. Both short and medium term forecasts are made.	NEA I2, R42 NS I2, R42	NEA NS	80 80
80	The assessment makes an evaluation of the stock status relative to the reference points. Both short and medium term forecasts are made.				
100	The assessment makes a reliable probabilistic evaluation of the stock status relative to the reference points and projects these into the future over appropriate timescales.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.5.5		Does the assessment include the consequences of current harvest strategies?		19.2	
60	The assessment makes an initial approximation of the consequences of current harvest strategies.	**North East Arctic** Advice is provided in relation to harvest strategies, and various options are presented, but all uncertainties in the model are not explicitly considered in the provision of precautionary advice. The current status of the stock is assumed to be known without error. Management advice is always presented as a series of harvest strategy options relative to precautionary limits. **North Sea** Advice is provided in relation to harvest strategies, and various options are presented, but all uncertainties in the model are not explicitly considered in the provision of precautionary advice. The current status of the stock is assumed to be known without error. Management advice is always presented as a series of harvest strategy options relative to precautionary limits.	NEA I2, R41, R42 NS I2, R42, R43	NEA NS	75 75
80	The assessment includes a robust approximation of the consequences of current harvest strategies. Uncertainties in the model are considered in harvest strategy evaluations.				
100	The assessment includes the consequences of current harvest strategies, forecasts future consequences of these and evaluates stock trajectories under decision rules.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.1.6	**The stock(s) is/are at appropriate reference level(s).**			14.7	-
1.1.6.1		Is the stock(s) at or above reference levels? **[YES - Criteria 1 is complete. NO - Answer Criteria 2]**		100	
60	The stock is likely to be above the limit reference levels and trends in the stock abundance are positive.	**North East Arctic** Given the current apparent bias in the assessment the stock is likely to be above precautionary reference levels for Biomass and below precautionary reference levels for Fishing mortality. Retrospective analysis for the past five years indicates that the stock has been above Bpa for over 10 years. Nevertheless, there is no means of attaching a statistical probability to this statement. Should stock size start to decline, there would be a concern that the bias in the assessment might reverse itself and in these circumstances it may not be the case that the assessment is capable of reliably estimating stock size in relation to precautionary reference points, an issue discussed for earlier performance indicators.. **North Sea** Given the current apparent bias in the assessment the stock is likely to be above precautionary reference levels for Biomass and below precautionary reference levels for Fishing mortality. Recent retrospective analysis indicates that the stock has been above Bpa since 1997. There is no means of attaching a statistical probability to this statement. Should stock size start to decline, there would be a concern that the bias in the assessment might reverse itself and in these circumstances it may not be the case that the assessment is capable of reliably estimating stock size in relation to precautionary reference points, an issue discussed for earlier performance indicators	NEA R42 NS R42	NEA NS	90 80
80	The stock is likely to be above precautionary reference levels.				
100	The stock is highly likely to be consistently above precautionary reference levels.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.2 *(MSC Criterion 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.**			-	-
1.2.1		If the stock is below the precautionary reference points, are measures to rebuild the stock specified?		**-**	-
60	Appropriate rebuilding measures through reduction in exploitation exist and are being implemented. Rebuilding measures other than reduction in exploitation are being considered. Measures are implemented but may not have not been tested.	**North East Arctic** As detailed above, no evidence of depletion is evident and so this Criterion is not applied to this fishery. **North Sea** As detailed above, no evidence of depletion is evident and so this Criterion is not applied to this fishery.			
80	Appropriate rebuilding measures are being implemented to promote recovery within reasonable time frames. Measures have been tested and can be shown to be rebuilding the stock.				
100	Appropriate rebuilding measures are being implemented to promote recovery within specified and reasonable timescales. These measures are being monitored and can be adjusted as necessary. Additional measures are being implemented to prevent problems in the future.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.3 *(MSC Criterion 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.**			14.3	-
1.3.1	**Fishing activity maintains the age, genetic structure or sex composition of the stock to a degree that does not impair reproductive capacity.**			100	-
1.3.1.1		Is the age/sex/genetic structure of the stock monitored so as to detect any impairment of reproductive capacity?		50.0	
60	There is some information available on the sub-population/sex/age structure of the stock, and the relationship of these to reproductive capacity. Some monitoring of sub-populations is available as necessary.	**North East Arctic** As described above, detailed sampling of the population is undertaken in Norwegian waters. Some work has been done on the uncertainty surrounding estimates of catch at age of cod in Norwegian waters (Hirst et al 2005) but these techniques have not been extended to saithe nor applied to the assessments. Maturity at age is monitored, which provides an index of population reproductive responses to changing population levels. Population structure is also monitored by the research surveys. There are no indications (e.g. from tagging studies) of any sub-populations in the saithe stock. Information on fecundity and SSB allows estimates of reproductive capacity to be made. **North Sea** Catches by size and age are known for different fleets and gear types, and monitored every year. Population structure is also monitored by the International Bottom-Trawl Surveys. There are no indications (e.g. from tagging studies) of any sub-populations in the saithe stock. Genetic studies of NS saithe do not show the presence of any sub-populations. Information on fecundity and SSB allows estimates of reproductive capacity to be made.	NEA I2, R31, R32 NS I2, R11	NEA NS	80 85
80	Estimates are available of the sub-population/sex/age structure of the stock, and the relationship of these to reproductive capacity. Population structure is monitored based on adequate sampling and verification for this stock. Ageing errors are estimated and included in the stock assessment. Sub-population/genetic studies have been carried out as appropriate.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	There is comprehensive and reliable information on the sub-population/sex/age structure of the stock, and the relationship of these to reproductive capacity as well as evaluations of the implications of shifts in these parameters on productivity and management quantities. Population structure is well estimated with only insignificant errors. Genetic studies have been conducted.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
1.3.1.2		Does information indicate any changes in structure that would alter reproductive capacity?		50.0	
60	Changes is stock structure have been detected but there is no evidence of negative effect on recruitment of the stock. Or potentially adverse changes in structure are identified and remedial measures are under consideration.	**North East Arctic** F has been well below Fpa since 1996 and age at maturity increased between 1995 and 1998, since when there has been a gradual decline to 1995 levels. This issue is reported annually by ICES (and has decreased slightly in last two years). Age structure has become increasingly robust in recent years with an increasing proportion of older adults in the population. These data indicate a robust age structure with no obvious changes in stock structure that would impair reproductive capacity, with no obvious declines in recruitment apparent from the stock assessment. **North Sea** F has been well below Fpa since 1997 and continues to drop. Age structure has become increasingly robust in recent years with an increasing proportion of older adults in the population. These data indicate a robust age structure with no obvious changes in stock structure that would impair reproductive capacity, and with no obvious declines in recruitment apparent from the stock assessment.	NEA I2, R42 NS I2, R42	NEA NS	90 90
80	Evidence exists that the fishery has not caused changes in stock structure that would affect recruitment. Or potentially adverse changes in structure are clearly identified and effective remedial measures are in place.				
100	Data strongly indicate a robust age, sex and genetic structure in the stock, such as would maintain reproductive capacity.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
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**		**33.3**	
2.1 *(MSC Criterion 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.**		43.8	-
2.1.1		**There is adequate understanding of ecosystem factors relevant to the distribution and life history strategy of the target species.**		23.4	-
2.1.1.1		Are the nature, sensitivity and distribution of habitats relevant to the fishing operations known?		33.3	
60	Appropriate information exists but may not be comprehensive or up to date. The seasonal distribution of fishing operations is mapped.	**North East Arctic** Knowledge of the ecosystem characteristics of the North East Arctic region fished for saithe can be divided into two separate areas: the Barents Sea to Lofoten, and the remainder of the Norwegian Sea to the south of this area. The characteristics of the marine ecosystem of the Barents Sea/Lofoten area are relatively well known. Numerous joint Norwegian/Russian ecosystem cruises have been performed in this area, examining oceanographic characteristics, as well as plankton, benthos, fish, bird and mammal distributions and abundance. Some of these data sets, particularly those examining temperature and salinity, for example, extend back to the 1930s. These surveys underpin the Barents Sea Management Plan (BSMP; "Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands"). Through the ecosystem management plan within the Barents Sea, the areas of vulnerable seabed habitat have been identified (habitat types are mapped both to the north and south of Lofoten) and assessed, including the determination of habitat sensitivity. Information is less well advanced for the Norwegian Sea area, although particularly key vulnerable habitats (notably cold water corals and sponge communities) have been identified in detail have been identified and closed areas put in place to protect them. In addition, programmes are underway (MAREANO programme) to perform studies of the seabed's physical, biological and chemical environment, and identify further key areas in greater detail. The Ecosystem Management Plan exercise performed for the Barents Sea is expected to be expanded into the Norwegian Sea. Information is recent and ongoing for all areas (MAREANO and other programmes underway through IMR and Polar Institute). Distribution of fishing vessel position (although not necessarily fishing effort, in particular in relation to specific habitat types) is recorded via vessel monitoring systems (VMS). In waters under the fishery jurisdiction of Norway, all vessels above 24 metres length are required to have and operate tracking equipment. This will be extended to cover all vessels above 21 metres from January 1st 2008, and all vessels above 15 metres from January 1st 2009. Currently, vessels over 13m record fishing positions in	I2, R26, R79, R81, R87, R90, R91	NEA NS	85 85
80	Nature, sensitivity and distribution of all main habitats are known in adequate detail. Information is recent. The distribution of fishing operations is monitored.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	The nature, sensitivity and the distribution of all habitats relevant to the fishing operations are known in detail. Information is recent. The distribution of fishing operations and their effort is monitored, and an appropriate time series of information is available.	logbooks, vessels below 13m (inshore vessels) are not required to complete logbooks. However, all landing records record the grid-square within which catch is taken for all vessel sizes and relevant effort. The grid-square system has squares of finer spatial scale closer to the coast. Information is continually updated **North Sea** The North Sea ecosystem is well studied, with the North Sea Task Force (NSTF), produced a Quality Status Report (QSR) for the North Sea ecosystem in 1993. Knowledge is continually updated using available information on oceanography, plankton, fish distribution and abundance, and the interactions between these fish components gathered during annual scientific research survey cruises. Certain types of data, notably those related to fisheries, physical oceanography, plankton and nutrients, are measured typically throughout the North Sea, with many programmes covering several decades of observation. Other data, including biological effects (ecotoxicology), sediment chemistry (contaminants), species introductions, hazardous algal blooms in coastal waters and benthos surveys, tend to be more localized (for example in coastal waters) or cover years rather than decades. These processes are being linked within the ICES regional ecosystems group, OSPAR and SAHFOS into an Integrated Ecosystem Approach. Information on the geographic distribution of particularly vulnerable habitats is being gathered through side-scan sonar tracks, dredging and benthic sampling programmes performed by fisheries and oceanographic institutions around the North Sea, all helping to identify these areas in greater detail. The Ecosystem Management Plan exercise performed for the Baltic Sea is expected to be expanded into the northern North Sea. Distribution of fishing vessel position (although not necessarily fishing effort, in particular in relation to specific habitat types) is recorded via vessel monitoring systems (VMS). For Norwegian vessels engaged in fishing in international waters and in the EEZs of other countries (for example in the North Sea), VMS is required and logbooks record fishing locations and effort.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.1.1.2		Is information available on the trophic position, status and relationships of the target species within the food web?		33.3	
60	Key prey, predators and competitors are known.	**North East Arctic** Knowledge of the food web related to saithe is reasonably well advanced for the Barents Sea, with good quantitative information as a result of stomach content research and other investigations that underpinned the development of the ecosystem management plan in the area. The predation on, and prey of, saithe is also reasonably well described in the Norwegian Sea, for ages 3 and over. Some studies have been carried out on juvenile saithe trophic relations, identifying feeding on juvenile herring, cod larvae and sandeel.	I2, R4, R9, R16, R22, R25, R61, R66, R74, R84, R88, R95, R29	NEA NS	90 90
80	Appropriate information is available on the position, relationships and importance of target species in the environment at key life stages.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	Quantitative information is available on the position and importance of the target species and their relationships within the food web at key life stages.	Saithe is predated upon by both seals and whales, particularly when capelin stocks are at a low level. The general picture of the diet of saithe has been developed under a University of Bergen MSc thesis, identifying krill, Norway pout, herring, blue whiting and haddock as the main prey species. A particular recent focus has been the predation of saithe on herring, the implications of a recovering saithe stock on herring abundance, and hence on the long term management of saithe. Multispecies models have been applied within the region (e.g. multi-species Virtual Population Analysis (MSVPA), GADGET) but their ability to derive multispecies fisheries advice is currently limited (as in almost all fisheries) by the need for further biological information. Detailed mass-balance trophic models of the Norwegian and Barents Sea have been developed using the Ecopath methodology. This allows the temporal and spatial simulation of alternative fishing and environmental change scenarios to be examined on ecosystem components, including saithe. **North Sea** The location of saithe within the food web is reasonably well described, due to data from the two 'years of the stomach' and annual research surveys. In the northern and northeastern North Sea, saithe is an important predator on sandeel, clupeids, Norway pout, and haddock. These food webs are generally on a gross-scale. Saithe has been modeled within the multi-species Virtual Population Analysis (MSVPA) for the North Sea (ICES Area IV), developed by the ICES multispecies assessment working group, which estimates the predation mortalities for 9 commercially important fish stocks based upon key fish predators, and by seabirds and seals. This includes quantitative information on saithe as a prey (predominantly by cod and seabirds) at different life stages (significant data are available, but this is now at least 5 years old). While the MSVPA is still under development, it is considered to be appropriately robust. Detailed mass-balance trophic models of the North Sea have also been developed using the Ecopath with Ecosim methodology. This allows the temporal and spatial simulation of alternative fishing and environmental change scenarios to be examined on ecosystem components, which include saithe. Juvenile saithe trophic relations have been established, with feeding on juvenile herring, cod and sandeel.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.1.1.3		Is there information on the potential for the ecosystem to recover from fishery related impacts?		33.3	
60	Key elements of the functioning of the ecosystem, relevant to the fishery, are identified.	**North East Arctic** The impact of commercial fishing on the spawning stock is studied through the stock assessment, which has demonstrated that reductions in fishing mortality have allowed the SSB to recover from relatively low levels in the 1980s, due to reductions in fishing mortality and some above-average recruitment events. The impacts of this depletion on the ecosystem interactions have not, however, been examined directly. Further potential ecosystem impacts of fishing, namely physical disturbance (section 2.1.3.1), ghost fishing (section 2.1.3.2) and impacts on key vulnerable species (section 2.1.5) are considered elsewhere. Trophic impacts may be determined through ECOPATH/ECOSIM analysis. Benthic sensitivities are established, (notably for the Barents Sea through the BSMP, but also for the area south of Lofoten with reasonable detail) and as a result particularly sensitive habitat areas are closed to bottom gear. It is noted that a Management Plan for the Norwegian Sea is to be commissioned soon, which would standardise this knowledge across the whole Norwegian EEZ area. **North Sea** The impact of commercial fishing on the spawning stock is studied through the stock assessment, which has demonstrated that saithe stocks have recovered from a state defined as over-exploited (SSB was below B_{lim} and F above F_{lim}) in the early 1990s, due to reductions in fishing mortality and some above-average recruitment events. The impacts of this depletion on the ecosystem interactions have not been examined directly, but the potential trophic impacts of stock biomass removal are available from MSVPA analyses. Further potential ecosystem impacts of fishing, being physical disturbance (section 2.1.3.1), ghost fishing (section 2.1.3.2) and impacts on key vulnerable species (section 2.1.5) are considered elsewhere. Trophic impacts may be determined through ECOPATH/ECOSIM analysis. Benthic sensitivities are established and recovery patterns established for habitat types, albeit with studies concentrated on beam trawl impacts.	I2, R9, R16, R22, R40, R43, R67, R73, R75, R86, R88, R89	NEA NS	90 90
80	The main elements of the functioning of the ecosystem, relevant to the fishery, have been documented and are understood, allowing reasonable assessment of recovery potential.				
100	Detailed information is available on the potential for affected elements of the ecosystem to recover from fishery related impacts.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.1.2	**General risk factors are adequately determined.**			23.4	-
2.1.2.1		Is information available on the nature and extent of by-catch (capture of non-target species)?		33.3	
60	The main non-target species affected have been identified and qualitative information is available on significant by-catch.	**North East Arctic** Cod and haddock represent the majority of "by catch" in the saithe fisheries. The vessels fishing for saithe also have quotas for cod and haddock and so these will be landed by the vessels and counted against the vessels' quotas for these species. However, on a relatively small scale, the vessels may also catch other types of fish as by catch in the saithe fisheries. This by catch could consist of Greenland halibut, redfish, ling, tusk, blue ling, catfish etc. Bycatches of the main commercial species listed under Directorate regulation #48 cannot be discarded, and are landed and counted against the specific quotas. The legal by catch of Greenland halibut amounts to 7% while the legal by catch of redfish is 15%. Bycatches of PET species are considered elsewhere (section 2.2.1). **Purse Seine** While a relatively clean fishery, non-target species affected by the purse seine fishery includes the incidental catch of pelagic fish, such as herring, mixing with saithe shoals. **Handline** Bycatch is expected to be limited as the fishing method is relatively species-specific. Main by-catch species will be other target species, notably cod and haddock (indeed, saithe is more likely a by-catch in a cod/haddock directed fishery). Bycatches of the main commercial species listed under Directorate regulation #48 cannot be discarded, and are landed and counted against the specific quotas. The main by-catch species are known, detailed quantitatively information is available for commercial species listed in Regulation 48 and good information is available on the distribution and ecology of these species. Independent observations of the by-catch of other species are limited to some irregular scientific observer studies, and so the extent and significance of non-commercial species by-catches are less well known, although the ecology of species concerned will be known in some detail. **North Sea** Cod and haddock represent the majority of "by catch" in the saithe fisheries. The vessels fishing for saithe also have quotas for cod and haddock and so these will be landed by the vessels and counted	I2, R41, R43	NEA NS	75 75
80	Information is available on non-target species directly affected by the fishery including their distribution and/or ecology. Quantitative information is available on significant by-catch. If obtained by sampling, this is considered sufficient to provide adequate information.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	Information is available on all non-target species directly affected by the fishery including the distribution and ecology. Accurate records are kept on the nature and extent of all by-catch species including species size and sex composition.	against the vessels' quotas for these species. However, on a relatively small scale, the vessels may also catch other types of fish as by catch in the saithe fisheries. This by catch could consist of redfish, ling etc. Bycatches of the main commercial species listed under Directorate regulation #48 cannot be discarded, and are landed and counted against the specific quotas. Bycatches of PET species are considered elsewhere (section 2.2.1). **Purse Seine** While a relatively clean fishery, non-target species affected by the purse seine fishery includes the incidental catch of pelagic fish, such as herring, mixing with saithe shoals. **Handline** Bycatch is expected to be limited as the fishing method is relatively species-specific. Main by-catch species will be other target species, notably cod and haddock (indeed, saithe is more likely a by-catch in a cod/haddock directed fishery). Bycatches of the main commercial species listed under Directorate regulation #48 cannot be discarded, and are landed and counted against the specific quotas. The main by-catch species are known, detailed quantitatively information is available for commercial species listed in Regulation 48 and good information is available on the distribution and ecology of these species. Independent observations of the by-catch of other species are limited to some irregular scientific observer studies, and so the extent and significance of non-commercial species by-catches are less well known, although the ecology of species concerned will be known in some detail.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.1.2.2		Is information available on the extent of discard and slippage (the proportion of the catch not landed)?		33.3	
60	Information is available of the extent of discarding and slippage, including an assessment of the main species represented.	**North East Arctic** Discarding of commercial species is prohibited within the fishery under Directorate regulation #48 (and the main by-catches will be cod and haddock), and so these species will be landed and counted against the specific quotas. Such by-catches are recorded and monitored through reference fleet data for the main fish species. Discarding is presumed to be insignificant. Slippage is unknown but is assumed to be rare (significant amounts would be observed and reported). Some assessment is available on the main by-catch species and those not listed in Regulation 48 would be assumed to represent the main discard. Some catches (particularly in trawl and Danish seine fisheries) and subsequent discarding is assumed to take place, but no routine recording of these occurs. **Purse Seine** Some prosecutions within the purse seine fishery have been raised where overly large catches have been released (slippage) to prevent loss of fishing gear. **Handline** Discarding is prohibited within the fishery under Directorate regulation #48. The fishing method is expected to lead to only small catches of other pelagic species, which will be recorded against quota. **North Sea** By-catches of commercial species will principally be cod and haddock and so these species will be landed and counted against the specific quotas. Such by-catches are recorded and monitored through reference fleet data for the main fish species and equivalent information provide through observer programmes in European fleets. Discarding is presumed to be insignificant. Slippage is not known but is assumed to be rare (significant amounts would be observed and reported). Some assessment is available on the main by-catch species and those not listed in Regulation 48 would be assumed to represent the main discard. Some catches (particularly in trawl and Danish seine fisheries) and subsequent discarding is assumed to take place, but no routine recording of these occurs. **Purse Seine** Some prosecutions have occurred within the purse seine fishery where overly large catches have been released to protect fishing gear (slippage).	I1, I2	NEA NS	75 75
80	Information is available to allow estimates of discard and slippage to be calculated and interpreted.				
100	Accurate and verifiable information is available on the extent of all discards and slippage (by age/size), and the consequences of these. Or the entire catch is landed.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.1.2.3		Is information available on other unobserved fishing mortality on target or other species?		33.3	
60	Sources of potential unobserved mortality have been identified.	**North East Arctic** **Trawl** Experiments on the degree of unobserved mortality within Norwegian trawl fisheries have been performed and estimates of mortality can be derived. Evidence suggest that saithe escape mortality is negligible and unrelated to any selection device used (e.g. codend meshes and sorting grid) or fishing intensity. This subject has been a study of a PhD student at Bergen University. **Gill Net** Experiments have not been performed for gill nets. However, those performed for trawls suggest that mortality from nets is likely to be minimal. **Purse Seine** Unobserved mortality is not expected from purse seine gear, unless a) fish are released because the catch is too large (see 'discarding/slippage') or excess catch is held in pens and suffer mortality that is not recorded.	I1, I2, R48	NEA Tr Gn Ps Ds Hl NS Tr Gn Ps Ds Hl	 100 90 90 90 95 100 90 90 90 95
80	Information is available to allow estimates to be made of unobserved mortality.	**Danish seine** Experiments have not been performed for Danish seines. However, those performed for trawls suggest that mortality from nets is likely to be minimal. **Handline** Experiments have not been performed for handline gear. However, experience suggests that mortality is likely to be minimal – fish would either be landed or would escape hooks. **North Sea** **Trawl** Experiments on the degree of unobserved mortality within Norwegian trawl fisheries have been performed and estimates of mortality can be derived. Evidence suggest that saithe escape mortality is negligible and unrelated to any selection device used (e.g. codend meshes and sorting grid) or fishing intensity. This subject has been a study of a PhD student at Bergen University.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	Information is available to allow quantitative estimates to be made.	**Gill Net** Experiments have not been performed for gill nets. However, those performed for trawls suggest that mortality from nets is likely to be minimal. **Purse Seine** Unobserved mortality is not expected from purse seine gear, unless a) fish are released because the catch is too large (see 'discarding/slippage') or excess catch is held in pens and suffer mortality that is not recorded. **Danish seine** Experiments have not been performed for Danish seines. However, those performed for trawls suggest that mortality from nets is likely to be minimal. **Handline** Experiments have not been performed for handline gear. However, experience suggests that mortality is likely to be minimal – fish would either be landed or would escape hooks.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.1.3	**There is adequate knowledge of the effects of gear-use on the receiving ecosystem and extent and type of gear losses.**			19.4	-
2.1.3.1		Is there adequate knowledge of the physical impacts on the habitat due to use of gear?		60.0	
60	Main impacts of gear use on the habitat are identified including extent, timing and location of use.	**North East Arctic** **Trawl** Trawl operations have the potential to impact on the bottom habitat All trawl areas and times are recorded accurately through VMS and logbook/landing declaration records. The total impact of trawling activities, requiring an extensive mapping of fishing effort and bottom habitat across the North East Arctic region, has not yet been assessed. However, the impacts of trawls are recognised, and research has been performed on the impacts within both the Barents and Norwegian Seas. The impacts of experimental trawling have been studied on a high seas fishing ground in the Barents Sea. In general, trawling is felt to affect the benthic assemblage mainly through resuspension of surface sediment and through relocation of shallow burrowing infaunal species to the surface of the seafloor. An aspect of particular concern are the impacts of mobile gear on areas of biogenic habitat, notably cold-water corals. A Study Group on Mapping the Occurrence of Cold Water Corals in the Northeast Atlantic [SGCOR] has been set up by ICES, following a European Commission request "to identify areas where cold-water corals may be affected by fishing." An initial report was delivered to the Commission in October 2001 and a more detailed report was produced in 2002. Physical impacts on coral/sponge etc have been quantified and irreversible changes studied. The coincidence of trawling activity with sponge communities has been specifically examined in the Barents Sea. Direct quantitative observations of how much of a reef or reef area had been impacted or destroyed was not possible, but particular areas, e.g. the shallowest part of Sørmannsneset, showed evidence that coral colonies have been affected. Suggestions of damage to coral reefs in Norway amounts to between 30 and 50 % of the total coral area. **Gill Net** Gill nets have the potential to impact on the bottom habitat, but for gill-nets this is most likely only in shallow waters. The gear used principally affects the water column but with anchors on the sea bed (nets would be set 5-6m above the seabed). Impacts would be restricted to dragging of anchors and dragging/entanglement of lost nets. Significant impacts would occur in areas of sensitive benthic communities such as corals and sponges. *Lophelia* reefs are considered good fishing places for net fishing, and evidence of lost gill nets and other types of fishery related equipment was found. Although these fishing techniques can cause breakage and disturbance of corals it was considered that the damage is of limited extent compared to the effect of bottom trawling. Studies have been carried out on coral community recovery. All fishing locations and times are recorded accurately through VMS and/or logbook/landing declaration records.	I2, R26, R27, R30, R37, R40, R47, R86	NEA Tr Gn Ps Ds Hl NS Tr Gn Ps Ds Hl	 90 85 95 85 95 90 85 95 85 95
80	All impacts of gear use on the habitat are adequately identified including extent, timing and location of use.				
100	The physical impacts on the habitat				

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score
	due to use of gear have been studied and quantified, including details of any irreversible changes.	**Purse Seine** Purse seine catching operations take place within the upper and mid-water column (interactions with the sea bed being specifically avoided by fishers) and are thus essentially pelagic in nature. The pelagic habitat can be defined by its (i) physico-chemical (i.e. water movement, mixing, temperature, salinity and nutrient content), the (ii) non-motile plankton component and (iii) the nekton component (i.e. free-swimming organisms). Of these, (i) and (ii) are highly variable and their dynamics within the North East Arctic is well understood, with 3D hydrodynamic-plankton linked models under development. Impacts of fishing activities on these two components of the pelagic habitat are negligible and transient. Impacts on the nekton component may be greater and are considered under both (a) non-target species (see 2.1.2.1) and (b) protected threatened or endangered species (2.2.1). Impacts are considered negligible and transient. All fishing locations and times are recorded accurately through VMS and/or logbook/landing declaration records. **Danish seine** Danish seine fishing operations have the potential to impact on the bottom habitat. The total impact of benthic fishing (trawl and Danish seine) activities, requiring an extensive mapping of fishing effort and bottom habitat across the North East Arctic region, has not yet been assessed. However, the impacts of trawls are recognised, and research has been performed on the impacts within both the Barents and Norwegian Seas. The impacts of experimental trawling have been studied on a high seas fishing ground in the Barents Sea. In general, trawling is felt to affect the benthic assemblage mainly through resuspension of surface sediment and through relocation of shallow burrowing infaunal species to the surface of the seafloor. An aspect of particular concern are the impacts of mobile gear on areas of biogenic habitat, notably cold-water corals. A Study Group on Mapping the Occurrence of Cold Water Corals in the Northeast Atlantic [SGCOR] has been set up by ICES, following a European Commission request "to identify areas where cold-water corals may be affected by fishing." An initial report was delivered to the Commission in October 2001 and a more detailed report was produced in 2002. Physical impacts on coral/sponge etc have been quantified and irreversible changes studied for trawl, a comparable situation to Danish seine fishing. The coincidence of trawling activity with sponge communities has been specifically examined in the Barents Sea. Direct quantitative observations of how much of a reef or reef area had been impacted or destroyed was not possible, but particular areas, e.g. the shallowest part of Sørmannsneset, showed evidence that coral colonies have been affected. Suggestions of damage to coral reefs in Norway amounts to between 30 and 50 % of the total coral area. All fishing areas and times are recorded accurately through VMS and logbook/landing declaration records.			

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score

Handline

Handline operations do have the potential to impact on the bottom habitat, but this is most likely only in shallow waters. The gear used is, however, essentially pelagic (interactions with the sea bed being specifically avoided by fishers) and so principally affects the upper and middle water column. Some gear may use a weight which could impacts the sea bed over limited areas. Impacts are considered negligible and transient. All fishing locations and times are recorded accurately through VMS and/or logbook/landing declaration records.

North Sea

Trawl

Trawl operations have significant potential to impact on the bottom habitat. The impact of fishing gears on the seabed of the North Sea has been the focus of many studies, both from the impact on benthos, and the geochemistry of the seabed. However, studies have generally been limited to beam trawls, where the fishing method is more likely to have significant adverse affects on the sea bed and vulnerable habitats. Trawling can have variable impacts on benthos, with physical fishery impacts and impacts on food availability interacting. Trawling reduces biomass, production, and species richness, with the 'bottom trawl' (beam trawl) fleet being estimated to have reduced benthic biomass and production by 56% and 21% respectively, compared with the unfished situation. While much information can be transferred from beam to otter trawls, this is more a 'worst-case' comparison. All trawl areas and times are recorded accurately through VMS and logbook/landing declaration records.

Gill Net

Gill net operations have the potential to impact on the bottom habitat, but the gear used principally affects the water column but with anchors on the sea bed (nets would be set 5-6m above the seabed). Impacts would be restricted to dragging of anchors and dragging/entanglement of lost nets, significant impacts could occur in areas of sensitive benthic communities such as corals and sponges, but these are not significantly present in Norwegian North Sea fishing areas. All fishing locations and times are recorded accurately through VMS and/or logbook/landing declaration records.

Purse Seine

The gear used is pelagic (interactions with the sea bed being specifically avoided by fishers) and so principally affects the upper and middle water column. Purse seine catching operations take place within the upper and mid-water column and are thus essentially pelagic in nature. The pelagic habitat can be defined by its (i) physico-chemical (i.e. water movement, mixing, temperature, salinity and nutrient content), the (ii) non-motile plankton component and (iii) the nekton component (i.e. free-swimming organisms). Of these, (i) and (ii) are highly variable and their dynamics within the North Sea is reasonably well understood. Impacts of fishing activities on these two components of the pelagic habitat

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score
	are negligible and transient. Impacts on the nekton component may be more profound and are considered further as both (a) non-target species (see 2.1.2.1) and (b) where the species are protected and/or considered threatened or endangered, under 2.2.1. Overall, however, impacts are considered negligible and transient. All fishing locations and times are recorded accurately through VMS and/or logbook/landing declaration records. **Danish seine** Benthic gear such as Danish Seine (and trawl)) operations have the potential to impact on the bottom habitat. The impact of fishing gears on the seabed of the North Sea has been the focus of many studies, both from the impact on benthos, and the geochemistry of the seabed. However, studies have generally been limited to beam trawls, where the fishing method is more likely to have significant adverse affects on the sea bed and vulnerable habitats. Trawling can have variable impacts on benthos, with physical fishery impacts and impacts on food availability interacting. Trawling reduces biomass, production, and species richness, with the 'bottom trawl' (beam trawl) fleet being estimated to have reduced benthic biomass and production by 56% and 21% respectively, compared with the unfished situation. While much information can be transferred from beam to otter trawls, this is more a 'worst-case' comparison. Physical impacts on coral/sponge etc have been quantified and irreversible changes studied for trawl, a comparable situation to Danish seine fishing. All fishing areas and times are recorded accurately through VMS and logbook/landing declaration records. **Handline** The gear used is pelagic (interactions with the sea bed being specifically avoided by fishers) and so principally affects the upper and middle water column. Some gear may use a weight which could impacts the sea bed over limited areas. Impacts are considered negligible and transient. All fishing locations and times are recorded accurately through VMS and/or logbook/landing declaration records.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.1.3.2		Is any gear lost during fishing operations and can 'ghost fishing' occur?		40.0	
60	Some recording of gear losses takes place and an assessment can be made of ecosystem impacts, including possible 'ghost fishing'.	**North East Arctic** In the Norwegian economic zone the problems over the last couple of decades have been addressed by retrieval surveys carried out on a yearly basis. **Trawl** Gear loss can potentially be caused through either (i) an excessive catch (although this usually results in the cod-end bursting rather than loss of the trawl) or (ii) through the gear snagging on the bottom, for example after an engine failure or some other power loss. When gear is lost, position is recorded and retrieval put in place. Gear retrieval surveys only identified three parts of a trawl in 2006 in 62 hauls. The ability of an abandoned trawl gear to continue to capture fish is limited, as the trawl gear only fully functions when under powered tow – estimates of impact can therefore be made. If a gear is lost with the doors it will remain in place. If lost without doors, it may drift with bottom currents, although the weight of the gear components will limit this. Eventually it will 'roll' and become covered with sand etc. Under this scenario, some localised damage to benthic structures and communities may be possible through smothering. **Gill Net** In the Norwegian economic zone, problems of lost gear over the last couple of decades have been addressed by net retrieval surveys carried out on a yearly basis. Lost gear, however, seems to arise predominantly from Greenland halibut fisheries (in 2005, 30 of 474 lost nets were from the saithe directed fishery. Norway has also introduced management measures on soak time and gill net length. Gill nets can be lost, although these events are generally reported to the Coastguard. Surveys of lost gear are carried out annually, which can provide estimates of percentage gear loss and gear loss by fishery. Programmes to reduce ghost fishing are underway – a recovery programme to retrieve lost nets commenced in 1980, more recent data on recovery covers the period 1991 onwards. These information allow an estimate of unobserved mortality to be derived. The catching efficiency of lost gill nets is indicated to depend upon depth, and has been examined for some species and areas, but at present no estimate of the total effect is available. Impacts can therefore be calculated from existing data on gear loss, catch rates etc. **Purse Seine** Nets are highly unlikely to be lost. The ability of a lost purse seine to continue to capture fish is limited, as the gear only fully functions when operated. Estimates of impact can therefore be made, with ghost	I1, I2, R36, R57, R71	NEA Tr Gn Ps Ds Hl NS Tr Gn Ps Ds Hl	 80 85 90 80 85 80 85 90 80 85
80	There is knowledge of the type, quantity and location of gear lost during fishing operations. Estimates can be made on the extent of adverse effects, including 'ghost fishing'.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	There is detailed knowledge of the type, quantity and location of gear types lost during fishing operations. The impact of gear loss on habitat, target and non-target species has been well estimated or recorded.	fishing likely to be minimal. **Danish seine** Gear loss can potentially be caused through the gear snagging on the bottom. When gear is lost, position is recorded and retrieval put in place. Gear retrieval surveys only identified one part of a Danish seine in 2006 in 62 hauls. The ability of abandoned gear to continue to capture fish is limited, as the gear only fully functions when under powered tow – estimates of impact can therefore be made. If a gear is lost it may drift with bottom currents, although the weight of the gear components will limit this. Under this scenario, some localised damage to benthic structures and communities may be possible through smothering. **Handline** Hooks can be lost if fishing occurs near the sea bed, due to snagging. Ghost fishing with hooks is unlikely, as the hooks are unbaited. However, lost gear could present some minor entanglement risks. **North Sea** **Trawl** Gear loss can potentially be caused through either (i) an excessive catch (although this usually results in the cod-end bursting rather than loss of the trawl) or (ii) through the gear snagging on the bottom, for example after an engine failure or some other power loss. When gear is lost, position is recorded and retrieval put in place. The ability of an abandoned trawl gear to continue to capture fish is limited, as the trawl gear only fully functions when under powered tow – estimates of impact can therefore be made. If a gear is lost with the doors it will remain in place. If lost without doors, it may drift with bottom currents, although the weight of the gear components will limit this. Under this scenario, some localised damage to benthic structures and communities may be possible through smothering. **Gill Net** The problems of ghost fishing in European Community waters have, during 2004, been addressed in meetings between the EU and Norway Parties, at the Conference on “Fast-tracking the development of environmentally friendly fishing methods” in Dundalk, Ireland in March, and through cooperation in the “Deepnet project”. EU projects have been completed (e.g. FANTARED 2) and are also underway that aim to address the problem of ghost fishing in Community waters, which include a retrieval system to remove lost gill net gears, gear adjustments that lessen the impact of lost gears and methods to reduce the losses of gears.			

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score
	Gill nets can be lost, and some recording/estimation of gear loss in gadoid fisheries (including saithe-specific fisheries) has been carried out (0.09% loss without retrieval in saithe fishery). The catching efficiency of lost gill nets is indicated to depend upon depth, and has been examined for some species and areas, but at present no estimate of the total effect is available. Impacts can, however, be estimated using data from similar studies elsewhere using existing data on gear loss, catch rates etc. Also, lost gear are quickly damaged or retrieved through interaction with other gear (especially trawls). **Purse Seine** Nets are highly unlikely to be lost The ability of a lost purse seine to continue to capture fish is limited, as the gear only fully functions when operated. Estimates of impact can therefore be made, with ghost fishing expected to be minimal. **Danish seine** Gear loss can potentially be caused through the gear snagging on the bottom. When gear is lost, position is recorded and retrieval put in place. The ability of abandoned gear to continue to capture fish is limited, as the gear only fully functions when under powered tow – estimates of impact can therefore be made. If a gear is lost it may drift with bottom currents, although the weight of the gear components will limit this. Under this scenario, some localised damage to benthic structures and communities may be possible through smothering. **Handline** Hooks can be lost if fishing occurs near the sea bed, due to snagging. Ghost fishing with hooks is unlikely, as the hooks are unbaited. However, lost gear could present an entanglement risk.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.1.4	**Strategies have been developed within the fisheries management system to address and restrain any significant negative impacts of the fishery on the ecosystem**			9.4	-
2.1.4.1		Are management strategies in place to address impact identification and avoidance/reduction?		100	
60	Management strategies include some appropriate consideration of ecosystem impact identification and avoidance/reduction, but may not be tested.	**North East Arctic** Objectives for the sustainable precautionary management of the saithe stock are in place through the Norwegian management system, with associated controls and reference point levels (although not yet harvest control rules, which are currently being tested by ICES). Saithe spawning takes place in January-March at about 200 m depth along the Northern Shelf edge and the western edge of the Norwegian Deeps. The impact of commercial fishing on the spawning stock is studied through the assessment, which indicates that the reductions in fishing mortality have allowed the SSB to recover. Significant trophic impacts due to removal of the target and commercial by-catch stocks can be detected through Ecopath/Ecosim analyses. Discarding is prohibited for specified commercial species (reportedly the main component of the by-catch), and levels of bycatch of commercial species are counted against quota. Other measures are in place to protect target and other species, such as temporary closures of areas of high juvenile fish concentrations. However, levels of non-commercial bycatch have not been studied in detail and so their significance has not been fully evaluated (and so strategies not considered), albeit records of catches could be made available from the reference fleet. Impacts on seabirds and PET species are examined separately (section 2.2.1). Closed areas are either in place or are being considered in order to protect some vulnerable species and habitats from fishing activity (notably the prohibition on trawling within the 12nm zone and in areas of cold water coral and sponge communities). The coast of Norway is an important nursery ground for saithe, with inshore nursery grounds and high juvenile saithe concentrations. Trawling restrictions within the coastal areas will limit direct impacts from these gears on juvenile populations in this key area. **Purse seine** Restrictions on the use of purse seines during the daytime can be put in place by the Directorate if there is a risk of killing herring unnecessarily, and catches of herring are anyway undesirable due to problems with interaction with the gear and the resultant cessation of fishing activities while the gear is cleared. As a result, handline gear is used to ground truth marks on fish finder gear to minimise this interaction. **Gill Net** Programmes to reduce the impacts of ghost fishing from lost gill nets are underway. Whilst many areas of ecosystem impact are addressed through existing strategies, a potentially significant question remain over the extent and significance of non-commercial by-catch, for all gear types.	I2, R13, R33, R72	NEA NS	75 75
80	Management strategies are in place to detect and reduce ecosystem impacts, although these may not have been fully tested. These are designed to adequately protect key aspects of the ecosystem within main fishing areas.				
100	Management strategies are in place to monitor, detect and reduce				

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score
	impacts. These are designed to adequately protect ecosystems, habitats and populations of target and non-target species and keep impacts within determined acceptable levels.	**North Sea** Objectives for the sustainable precautionary management of saithe are in place through the EU/Norway management system, with associated controls and reference point levels. The west coast of Norway is probably the most important nursery ground for saithe in the North Sea, with inshore nursery grounds and juvenile saithe mainly distributed along the west and south coast of Norway, the coast of Shetland and the coast of Scotland. In Norway, trawling and other gear restrictions within the coastal areas will limit the impacts on juvenile populations in this area prosecuted more by Norwegian fishing vessels. Significant trophic impacts due to removal of biomass of the target and commercial by-catch stocks can be detected through Ecopath/Ecosim analyses. Discarding is prohibited, and levels of bycatch of commercial species (reportedly the main component of the by-catch) are counted against quota. Levels of non-commercial bycatch within the Norwegian fishery have not been studied in great detail, but bycatch in other North Sea trawl fisheries can be identified through observer programme data, annual surveys (although commercial gear is not commonly used), and specific programmes such as the UK Fisheries-Science partnership. However, levels of non-commercial bycatch have not been studied in detail and so their significance has not been evaluated nor strategies considered, albeit records of catches could be made available from the reference fleet. Impacts on seabirds and PET species are examined separately (section 2.2.1). **Gill Net** Programmes to examine the impact of ghost fishing have been performed (e.g. EU project FANTARED 2) which have identified potential numbers and rates of net loss in different fisheries, including in the Norwegian North Sea. Gear loss in the Norwegian spawning fishery for saithe was 0.09% (431 nets), being more prevalent in deeper waters. Using wreck netting in the North Sea as an example, catch rates quickly declined to 18 per cent after 10 weeks and to zero in 10 – 12 months. Programmes to recover lost nets are not currently underway within the North Sea, apart from the efforts by the Norwegian programmes. **Purse seine** Restrictions on the use of purse seines during the daytime can be put in place by the Directorate if there is a risk of killing herring unnecessarily, and catches of herring are anyway undesirable due to problems with interaction with the gear and the resultant cessation of fishing activities while the gear is cleared. As a result, handline gear is used to ground truth marks on fish finder gear to minimise this interaction. Whilst many areas of ecosystem impact are addressed through existing strategies, a potentially significant question remain over the extent and significance of non-commercial by-catch, for all gear types.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.1.5	**Assessments of impacts associated with the fishery including the significance and risk of each impact, show no unacceptable impacts on the ecosystem structure and/or function, on habitats or on the populations of associated species.**			24.4	-
2.1.5.1		Does the removal of target stocks have unacceptable impacts on ecosystem structure and function?		25.0	
60	The removal of target stocks could lead to impacts upon ecological systems (applying the precautionary approach where necessary). A program is in development to identify these and, if appropriate, reduce these to acceptable, defined limits.	**North East Arctic** Ecosystem impacts stem from biomass removal and resultant changes in predator prey relationships, as well as potential physical impacts in geographic areas of key importance to the species. Food web studies (Ecopath) of saithe suggest that the species is not a critical prey species of any one predator species identified (rather it is a small component in the diet of several predator species). This suggests that removal of this species at current sustainable levels is unlikely to have a significantly large impact on the food web of the North East Arctic. Impacts might be more significant if the level of other species within the food web, for example the level of capelin, was low, as predator species have shown switching strategies between target prey in this situation. This has not specifically been examined using multispecies models, but is unlikely to be significant at current sustainable harvest levels. Impacts on nearshore nursery areas are reduced by restrictions on gear use (e.g. trawls), while impacts on spawning areas offshore appear to be limited to direct impacts of gear on the habitat (see section 2.1.3.1. Studies on saithe-herring interactions have also been carried out to determine whether saithe could depress herring populations. Results do not indicate significant effects of fishing at current levels on herring populations. **North Sea** Ecosystem impacts stem from biomass removal and resultant changes in predator prey relationships, as well as potential physical impacts in geographic areas of key importance to the species. Food web studies (Ecopath) of saithe suggest that the species is not a critical prey species of any one predator species identified (rather it is a small component in the diet of several predator species). This suggests that removal of this species at current sustainable levels is not likely to have a significantly large impact on the North Sea food web at current sustainable levels. However, this has not specifically been examined using multispecies models but is unlikely to be significant at current sustainable levels. Impacts on critical areas (inshore areas as nursery grounds) are unlikely to be affected by the Norwegian fleet, given the concentration of its activities to the north of the North Sea, while impacts on spawning areas offshore appear to be limited to direct impacts of gear on the habitat (see section 2.1.3.1), since population spawning stock biomass is currently at sustainable levels.	I2, R66, R88	NEA NS	85 85
80	Sufficient information is available on consequences of current levels of removal of target species to suggest no unacceptable impacts of the fishery on ecological systems within major fishing areas.				
100	The ecological consequences of current levels of removal of target stocks has been quantified and documented to be within acceptable, pre-determined, limits.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.1.5.2		Does the removal of non-target stocks have unacceptable impacts on ecosystem structure and function?		25.0	
60	The removal of non-target stocks could lead to impacts upon ecological systems (applying the precautionary approach where necessary). A program is in development to identify these and, if appropriate, reduce these to acceptable, defined limits.	**North East Arctic** Multispecies models for the key species have been applied within the region (e.g. multi-species Virtual Population Analysis (MSVPA) and GADGET as described in Section 2.1.1.2) but their ability to derive multispecies fisheries advice is limited by the need for further biological information. Knowledge of the bycatch of key non-target commercial species is considered well known, given the restrictions on discarding and the inclusion of these catches against specific species quotas. Key species would include major by-catch species such as cod and haddock. Such gadoid species are all included in Ecopath assessments and are the subject of separate (much larger) directed fisheries. Knowledge of the capture of other non-commercial non-target species remains limited, and the impacts on the population cannot be defined. Non-commercial species (i.e. those not listed in Norwegian regulations and hence that are not specifically required to be landed) such as skates and rays would not form significant parts of the demersal/pelagic ecosystem. However, the lack of detail on the species, and quantities, of by-catch is seen as a potentially important data gap. **Purse Seine** However, no unacceptable impacts have been identified due to the highly selective nature of the fishery. Capture of non-target species is at a very low level and these are subject to separate, specific, management measures. **Handline** No unacceptable impacts have been identified due to the highly selective nature of the fishery. Capture of non-target species is at a very low level and these are subject to separate, specific, management measures. **North Sea** The inter-relationship between saithe and both predator and prey species has been modelled as part of the ICES multi-species VPA model for the North Sea (section 2.1.1.2). The current sustainable status of the stock is likely to benefit predators. However, the level of coupling between predator prey-relationships, and opportunities for prey-switching, is less well known and are likely to increase uncertainty over the response of predators to diminished prey availability. Further development of the MSVPA model should allow the inter-relationships between saithe and other key North Sea species to be better established. Key species would include major by-catch species such as cod and haddock. Such gadoid species are all included in Ecopath assessments and are the subject of separate (much larger) directed fisheries. Non-commercial species such as skates and rays would not form significant parts of the demersal/pelagic ecosystem. However, the lack of detail on the species, and quantities, of by-catch is	I2, R9, R16, R89	NEA NS	75 75
80	Sufficient information is available on consequences of current levels of removal of non-target species to suggest no unacceptable impacts of the fishery on ecological systems within major fishing areas.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	The ecological consequences of current levels of removal of non-target stocks has been quantified and documented to be within acceptable, pre-determined, limits.	seen as a potentially important data gap. **Purse Seine** No unacceptable impacts have been identified due to the highly selective nature of the fishery. Capture of non-target species is at a very low level and these are subject to separate, specific, management measures. **Handline** No unacceptable impacts have been identified due to the highly selective nature of the fishery. Capture of non-target species is at a very low level and these are subject to separate, specific, management measures.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.1.5.3		Does the fishery have unacceptable impacts on habitat structure?		25.0	
60	There is no evidence that the fishery is having unacceptable impacts, although the issue has not been directly studied.	**North East Arctic** **Trawl** Trawling has been shown to impact upon sea bed structure and the abundance of cold-water corals etc. Impacts on habitat structure are expected to be reduced by the exclusion of trawling within 12 nm of the coast, trawl free zones (three designated zones, one at 63°N and two in the Barents Sea, although these were originally introduced to avoid gear conflict) and implementation of closed areas to protect vulnerable habitats (e.g. cold water corals from 59°N to 64°N). The BSMP (and forthcoming NSMP) process includes a process of Environmental Impact Assessment including fishing operations. No unacceptable impacts have been identified. The main impacts will occur where fishing moves to new areas, since existing fishing grounds (away from sensitive habitats) will have reached a new equilibrium state. However, sufficient data is collected to detect and evaluate any significant extensions of trawl areas. **Gill Net** Gill net gear is not expected to have a significant impact on habitat structure due to their relatively static nature. Minor damage due to dragging on the seabed, when fishing in shallow areas, may be expected, but is expected to be relatively minimal. Smothering of habitat could occur where nets are lost (as discussed in section 2.1.3.2). The BSMP (and forthcoming NSMP) process includes a process of Environmental Impact Assessment including fishing operations. Investigations of damage from fishing gear to coral areas show considerably less impact from static gears than mobile gear. No unacceptable impacts are anticipated from this gear type and there is no suggestion from evidence collected to date of any significant impacts occurring. **Purse Seine** Pelagic purse seine gear is not expected to have impacts on benthic habitat structure. The fishery will have a negligible impact upon the structure and function of the pelagic habitat. The BSMP (and forthcoming NSMP) process includes a process of Environmental Impact Assessment including fishing operations. No unacceptable impacts are anticipated from this gear type and there is no suggestion from evidence collected to date of any significant impacts occurring. **Danish seine** Danish seine gear has been shown to impact upon sea bed structure and the abundance of cold-water corals etc. Impacts on habitat structure are expected to be reduced by the exclusion of Danish seines from Fjords and implementation of closed areas to protect vulnerable habitats (e.g cold water corals from 59°N to 64°N). The BSMP (and forthcoming NSMP) process includes a process of Environmental	I2, R27, R79	NEA Tr Gn Ps Ds Hl NS Tr Gn Ps Ds Hl	 80 80 90 80 90 80 80 90 80 90
80	No unacceptable impacts of the fishery on habitat within major fishing areas have been demonstrated.				
100	Effects on habitat structure are well documented and are within				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
	acceptable tested/justified limits.	Impact Assessment including fishing operations and no unacceptable impacts identified. The main impacts will occur where fishing moves to new areas, since existing fishing grounds (away from sensitive habitats) will have reached a new equilibrium state. However, sufficient data is collected to detect and evaluate any significant extensions of trawl areas. **Handline** Handline gear is not expected to have impacts on benthic habitat structure. The fishery will have a negligible impact upon the structure and function of the pelagic habitat. The BSMP (and forthcoming NSMP) process includes a process of Environmental Impact Assessment including fishing operations. No unacceptable impacts are anticipated from this gear type and there is no suggestion from evidence collected to date of any significant impacts occurring. **North Sea** **Trawl** Trawling has been shown to impact upon sea bed structure. The main impacts will occur where fishing moves to new areas, since existing fishing grounds (away from sensitive habitats) will have reached a new equilibrium state. However, sufficient data is collected to detect and evaluate any significant extensions of trawl areas and trawl grounds are extremely well established. **Gill Net** Gill net gear is not expected to have a significant impact on habitat structure due to their relatively static nature. Minor damage due to dragging on the seabed when fishing in shallow areas may be expected, but is expected to be relatively minimal. Smothering of habitat could occur where nets are lost (as discussed in section 2.1.3.2). Such impacts are expected to be substantially less than in the trawl fisheries. No unacceptable impacts are anticipated from this gear type and there is no suggestion from evidence collected to date of any significant impacts occurring. **Purse Seine** Pelagic purse seine gear is not expected to have impacts on benthic habitat structure. The fishery will have a negligible impact upon the structure and function of the pelagic habitat. No unacceptable impacts are anticipated from this gear type and there is no suggestion from evidence collected to date of any significant impacts occurring. **Danish seine** Danish seine gear has been shown to impact upon sea bed structure The main impacts will occur where fishing moves to new areas, since any impacts on existing fishing grounds (away from sensitive habitats) will already have occurred. Data is collected sufficient to detect any significant extensions of fishing			

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score
	areas. **Handline** Handline gear is not expected to have impacts on benthic habitat structure. The fishery will have a negligible impact upon the structure and function of the pelagic habitat. No unacceptable impacts are anticipated from this gear type and there is no suggestion from evidence collected to date of any significant impacts occurring.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.1.5.4		Are associated biological diversity, community structure and productivity affected to unacceptable levels?		25.0	
60	There is no evidence that the fishery is having unacceptable impacts, although the issue has not been directly studied.	**North East Arctic** Biodiversity, in terms of impacts on rare, protected or threatened species is considered separately in Section 2.2.1. The development of Ecopath/Ecosim ecosystem models for the Barents Sea allow the overall community level impacts of the fishery to be determined. Analyses do not indicate a major influence of saithe on associated ecosystem components, although the importance of saithe is predicted to vary with corresponding population levels of other species such as capelin or herring. Following rebuilding of saithe stock and biomass increases, there is no evidence to suggest that productivity of the system has been impaired. **Trawl** There is the potential for trawl gear to affect the productivity of benthic communities. Although scientific research has been performed to examine this, conflicting results suggest that while certain communities will be adversely affected, others might benefit from increased availability of particular organisms, and that productivity may overall be increased. Following rebuilding of the saithe stock and biomass increase, there is no evidence to suggest that productivity of the system has been impaired. Impacts on commercial bycatch species are understood through the resulting stock assessments. Impacts on non-commercial bycatch species are not well understood, an issue of potential relevance in terms of biological diversity and community structure. **Gill Net** Gill nets are unlikely to have significant direct impacts on benthic or pelagic community structure. The pelagic ecosystem is unlikely to be affected. Impacts on the demersal community are not well understood, but are not expected to be significant in geographic distribution. Impacts on commercial bycatch species are understood through the resulting stock assessments. Impacts on non-commercial bycatch species are not well understood, an issue of potential relevance in terms of biological diversity and community structure. **Purse Seine** No major impacts on benthic habitats are expected from the use of this gear. The largely single-species catch will avoid direct impacts on biological diversity, while any impacts on commercial bycatch species are understood through the relevant stock assessments.	I2, R9, R16	NA Tr Gn Ps Ds Hl NS Tr Gn Ps Ds Hl	 75 75 80 75 80 75 75 80 75 80
80	Information is available on the effects of the fishery on biological diversity, community structure and productivity. This does not indicate any unacceptable impacts.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	The effects of the fishery on biological diversity, community structure and productivity have been quantified and are within acceptable tested/justified limits.	**Danish seine** Danish seines may have some direct impacts on benthic community structure. However, they are not expected to be significant in geographic distribution. Within affected areas there is the potential for gear to affect the productivity of benthic communities. Although scientific research has been performed to examine this, conflicting results suggest that while certain communities will be adversely affected, others might benefit from increased availability of particular organisms, and that productivity may overall be increased. Following rebuilding of saithe stock and biomass increase, there is no evidence to suggest that productivity of the system has been impaired. Impacts on commercial bycatch species are understood through the resulting stock assessments. Impacts on non-commercial bycatch species are not well understood, an issue of potential relevance in terms of biological diversity and community structure. **Handline** No major impacts on benthic habitats are expected from the use of this gear. The largely target species catch (notably cod, haddock, saithe) will reduce direct impacts on biological diversity, while any impacts on commercial species are understood through the relevant stock assessments. **North Sea** Biodiversity, in terms of impacts on rare, protected or threatened species is considered separately in Section 2.2.1. The development of Ecopath/Ecosim ecosystem models for the North Sea allow the overall community level impacts of the fishery to be determined. Analyses do not indicate a major influence of saithe on associated ecosystem components, even for Norway pout, for which saithe is a major predator in the North Sea. For key fish species, including saithe, this is also examined through MSVPA. Following stock rebuilding and biomass increases, there is no evidence to suggest that productivity of the system has been impaired directly through fishing for saithe. **Trawl** There is the potential for trawl gear to affect the productivity of benthic communities. Although scientific research has been performed to examine this, conflicting results suggest that while certain communities will be adversely affected, others might benefit from increased availability of particular organisms, and that productivity may overall be increased. Impacts on commercial bycatch species are understood through the relevant stock assessments. Impacts on non-commercial bycatch species are not well understood, an issue of potential relevance in terms of biological diversity and community structure.			

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score

		Gill Net Gill nets are unlikely to have significant direct impacts on benthic or pelagic community structure. The pelagic ecosystem is unlikely to be affected. Impacts on the demersal community are not well understood, but are not expected to be significant in geographic distribution. Impacts on commercial bycatch species are understood through the relevant stock assessments. Impacts on non-commercial bycatch species are not well understood, an issue of potential relevance in terms of biological diversity and community structure. **Purse Seine** No major impacts on benthic habitats are expected from the use of this gear. The largely single-species catch will reduce direct impacts on biological diversity, while any impacts on commercial bycatch species are understood through the relevant stock assessments. **Danish seine** Danish seines may have some direct impacts on benthic community structure. However, they are not expected to be significant in geographic distribution. Within affected areas there is the potential for gear to affect the productivity of benthic communities. Although scientific research has been performed to examine this, conflicting results suggest that while certain communities will be adversely affected, others might benefit from increased availability of particular organisms, and that productivity may overall be increased. Following rebuilding of saithe stock and biomass increase, there is no evidence to suggest that productivity of the system has been impaired. Impacts on commercial bycatch species are understood through the resulting stock assessments. Impacts on non-commercial bycatch species are not well understood, an issue of potential relevance in terms of biological diversity and community structure. **Handline** No major impacts on benthic habitats are expected from the use of this gear. The largely target species catch (notably cod, haddock, saithe) will reduce direct impacts on biological diversity, while any impacts on commercial species are understood through the relevant stock assessments.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.2 *(MSC Criterion 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.**			43.8	-
2.2.1	**Fishing is conducted in a manner, which does not have unacceptable impacts on recognised protected, endangered or threatened species.**			50.0	-
2.2.1.1		Is there information on the presence and populations of protected, endangered or threatened (PET) species?		33.3	
60	There is a program in place to identify protected, threatened and endangered species directly related to the fishery. There is periodic monitoring of the main population trends and status of protected, endangered and threatened species.	**North East Arctic** The taxa included within the IUCN Red List are "the bearers of genetic diversity and the building blocks of ecosystems, and information on their conservation status and distribution provides the foundation for making informed decisions about conserving biodiversity from local to global levels". Information available from the Norwegian red list indicates 31 marine species which are considered PET. **Sea mammals**. IMR have a programme examining the ecology and ecosystem dynamics of *Lagenorhynchus* dolphins, following a recommendation from the North Atlantic Marine Mammal Commission (NAMMCO). The programme is investigating the exposure of mammalian top predators to environmental contaminants and is studying effects on their health status. In addition to sightings, this programme involves the capture and post-mortem examination of specimens. For the coastal and inshore fisheries, vessel owners have provided information on effort, catch and by-catch over the period October-December 2005, in return for financial compensation. These concentrated on gill net and trap fisheries. **Fish** A number of elasmobranch species are included in the Red List. However, information on the incidence of skates and rays as bycatch within the saithe fisheries is not readily available. The ecosystem management plan for the Barents Sea indicates that, following the identification of vulnerable species, regulations will be evaluated. **Seabirds**. The BSMP White Paper notes the importance of the life history and population trends of bird species within the ecosystem of the Barents Sea. Information on bird bycatch within fisheries is incomplete, however. Scattered information about bycatches of various species is available, for example, from longline fisheries and some gill-net fisheries. At certain times, and in certain areas, there can be relatively large bycatches of diving seabirds in gill nets, although whether this is within the saithe gill net fishery is unclear. The SEAPOP (Seabird Population Management and Petroleum Operations) programme has been developed to examine this further, among other factors.	I2, R4, R7, R8, R26, R33, R76, R91	NEA NS	95 95
80	Key protected, threatened and endangered species directly related to the fishery have been identified. The populations of key protected, threatened and endangered species directly related to the fishery are monitored on a regular basis.				
100	There is knowledge of all				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
	populations of protected species directly or indirectly related to the fishery including their dynamics. Regular monitoring of protected, endangered and threatened species is undertaken, supported by research programmes to assess threats and promote their conservation. The type and distribution of critical habitats have been identified.	**Other Species**. Surveys of the sea bed have identified a number of vulnerable species, including cold water corals, within the Northeast Arctic region. Oil and gas activities have been forbidden in key areas of the Barents Sea, as a result of the ecosystem management plan, and some marine protected areas have been established. More areas are under consideration for establishment in 2008. The BSMP also specifically lists Barents Sea species, which includes bowhead whale, lesser black-backed gull, guillemot and puffins as endangered or vulnerable according to IUCN criteria. Similar analyses will be undertaken for the NSMP. Notwithstanding these management plans, the majority of PET species (but not necessarily all), which may directly or indirectly interact with the fishery, are identified. Populations are monitored and threats to populations, and measures necessary to promote conservation are identified. Critical habitats are essentially understood in terms of cold water corals, but further research is needed to fully understand and identify these for all PET species. This issue forms part of the on-going research of many organisations around the North Sea. **North Sea** The taxa included within the IUCN Red List are "the bearers of genetic diversity and the building blocks of ecosystems, and information on their conservation status and distribution provides the foundation for making informed decisions about conserving biodiversity from local to global levels". Information available from the Norwegian red list indicates 31 marine species which are considered PET. **Sea mammals**. The populations of seals in the North Sea are monitored by a number of organisations including NERC's Special Committee on Seals (SCOS) and the Sea Mammal Research Unit, which since 2000 has carried out investigations of the level of bycatch of sea mammals in UK fisheries. In addition to these studies, harbour seals are surveyed annually in the Kattegat/Skagerrak by Swedish scientists and in the Wadden Sea by Dutch scientists. Elsewhere surveys are less frequent but data are relatively complete for most harbour seal populations in the region of the North Sea. Grey seals are also surveyed intermittently along the Norwegian coast and in the Baltic but there are no systematic surveys of abundance. A major international survey was conducted in 1994 (known as SCANS) to estimate the abundance of harbour porpoises and other small cetaceans in the North Sea and adjacent waters. The current plan is to repeat the survey in the North Sea and to extend the survey area to include shelf waters to the west of the British Isles where there are not yet any robust estimates of cetacean abundance. **Fish** The angel shark (*Squatina squatina*) is now extinct in the North Sea and has been declared critically endangered elsewhere, while the common skate (*Raja batis*) is now extremely rare in Area IVc. This demonstrates the vulnerability of skates and rays to direct and indirect exploitation. Skates and rays are			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
		of critical concern due to their long-lived life histories and limited reproductive potential and information on the status of stocks is available. **Seabirds**. Seabirds at sea are monitored by the seabirds at sea unit of JNCC. The ICES Working Group on Seabird Ecology (WGSE) reviews of current approaches for identifying offshore seabird aggregations and delineating Important Bird Areas (IBAs) and Special Protection Areas (SPAs), develops recommendations for a comprehensive monitoring programme for seabirds and details of dietary studies in seabirds. Interactions of seabirds with gears are also anecdotally reported. **Other Species**. Surveys of the sea bed through specific side-scan sonar surveys and benthic surveys have provided information to identify vulnerable areas and species such as cold water corals within the North Sea. The majority of PET species (but not necessarily all), which may directly or indirectly interact with the fishery, are identified. Populations are monitored and threats to populations, and measures necessary to promote conservation are identified. Critical habitats are understood.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.2.1.2		Are interactions of the fishery with such species adequately determined?		33.3	
60	The main interactions directly related to the fishery are known.	**North East Arctic** **Trawl** Interactions of trawl gear with sea mammals is expected to be limited. Norway observers spent 3700 hrs on demersal trawls (target spp unspecified) and no marine mammal interactions reported (Nammco 2005). Contracted commercial vesselshave also made direct observations and no marine mammal interactions were reported. Evidence therefore supports an estimation that the occasional interaction can occur, but rarely. Information on the distribution of seabirds is being collected through the SEAPOP programme. There is some consideration in the BSMP of indirect interactions of birds and fisheries (trophic effects due to removal of biomass and provision of food through discarding). Direct interactions of seabirds and trawls does not appear to have been reliably estimated, but issues associated with other gear types (nets and long lines) have been considered.	I2, R13, R46, R49	NA Tr Gn Ps Ds Hl NS Tr Gn Ps Ds Hl	 75 75 80 75 80 75 75 80 75 80
80	Quantitative estimates are made of the effects of interactions directly related to the fishery.	Limited information is available on the catches of PET fish species (e.g. skates and rays) in the trawl fishery. Dolgov et al examined the bycatch of skates in trawl and longline fisheries in the Barents Sea, but studies remain sporadic. The ICES WG on Elasmobranch Fisheries has gathered landings (not discard) information for skates and rays in the region for the years 1973–2005. Overall, landings throughout time have been low and totalling around 200–300 t per year for all fishing countries, with moderate fluctuations and one massive temporal peak in the late 1980s where Russian fisheries landed over 1900 t of skates and rays in 1987, subsequently dropping to low levels again two years later. Russia and Norway are the most prominent and constant countries landing skates and rays from the Norwegian Sea. Information on bycatch in the trawl fishery remains limited, but the University of Tromsø, Norway has initiated a study for a master degree with the title: “Elasmobranchs along the North-Norwegian coast- Diversity, distribution and density”. Impacts on sensitive benthic habitats (coral and sponge communities) are directly evaluated with some areas being closed to trawling as a response. Whilst most interactions are well estimated, by-catches of skates and rays (and possibly other non-commercial PET fish species) are not currently estimated. **Gill Net** Studies have shown that gill nets set inshore with varying mesh sizes (notably those larger than the mesh size specified by regulations in the saithe fishery) may interact with sea mammal populations. Interactions are possible with harp, common and harbour seals, although these are not PET in Norway. Interactions of seals with gill nets are well estimated. Harbour porpoise interactions with gill nets are well monitored through sampling of the fleet and specific commissioning of vessels to record interactions.			
100	Reliable quantitative estimates are made of the interactions of all				

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score
	populations directly related to the fishery, and qualitative information is available on indirect impacts. Incidental mortalities are recorded and reported.	Seabird interactions have been recorded through the commissioned vessel scheme and have been considered under the BSMP. Seabird interactions have been investigated by the Institute of Nature Research (NINA) as to the significance of such interactions on seabird populations. Available information suggests that bird catches are very low in the gillnet fishery and do not include species of high PET concern. Records of interactions with PET fish species (again notably skates and rays) is not established. Effects of fishing gear on corals have been estimated, although principally for mobile gear. **Purse Seine** Studies in saithe directed fisheries (Nammco) have not identified any significant interactions with marine mammals and, in general, the method is considered to be more specific on targeted shoals. Records of interactions with PET fish species (again notably skates and rays) is not established, but is not expected to be significant. Information on the distribution of seabirds is being collected through the SEAPOP programme. There is some consideration in the BSMP of indirect interactions of birds and fisheries (trophic effects due to removal of biomass and provision of food through discarding). Direct interactions of seabirds and purse seines is not expected to represent any significant impact on populations. Issues associated with other gear types (nets and long lines) have been, and continue to be, considered. Effects of fishing gear on corals have been estimated, although principally for mobile gear, and this is not expected to be an issue of any significance for purse-seine gear. **Danish seine** Interactions of Danish seine gear with sea mammals is expected to be limited. Norway observers witnessed 355 hauls on seine vessels (target species unspecified), and no marine mammal interactions reported (Nammco 2005). Also contracted commercial vessels have made direct observations (30 hauls) also reported no marine mammal interactions. Evidence therefore supports the estimation that the occasional interaction could occur, but rarely. Information on the distribution of seabirds is being collected through the SEAPOP programme. There is some consideration in BSMP on indirect interactions of birds and fisheries (trophic effects due to removal of biomass and provision of food through discarding). Direct interactions of seabirds and Danish seines does not appear to have been reliably estimated, but issues associated with other gear types (nets and long lines) have been considered. Whilst most interactions are well estimated, by-catches of skates and rays (and possibly other non-commercial PET species) are not estimated. Impacts on sensitive benthic habitats (coral and sponge communities) are monitored with areas closed to mobile bottom gear.			

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score
	Handline In general, the method is felt reasonably species-specific. Negative interactions with sea mammals would not be anticipated with this gear. Information on the distribution of seabirds is being collected through the SEAPOP programme. There is some consideration in BSMP on indirect interactions of birds and fisheries (trophic effects due to removal of biomass and provision of food through discarding). Direct interactions of seabirds and handlines do not appear to have been reliably estimated, but issues associated with other gear types (nets and long lines) have been considered. Records of interactions with PET fish species (again notably skates and rays) is not established, but again the gear type is highly specific. Effects of fishing gear on corals have been estimated, although principally for mobile gear, and this is not expected to be an issue of any significance for handline gear. **North Sea** There are several programmes of data collection and review in the North Sea, particularly for Marine Mammals the NAMMCO annual reviews and for birds the ICES Working Group on Seabird Ecology. The majority of studies on cetacean by-catch in the North Sea have been performed by the UK, Germany and Denmark, and hence largely concentrate on different areas to those in which the Norwegian fleet operate, but there are also several additional Norwegian studies. Several EU fleets have observer programmes which monitor seabirds and cetacean interactions in addition to fish bycatch. Furthermore, the likelihood of by-catch is strongly influenced by the location of fishing – for example nearshore gill nets being more likely to result in by-catch than more offshore sets. EU regulations currently require the reporting of mammal catches (Council Regulation (EC) 812/2004) and are likely to require reporting of seabird deaths from 2009. Sufficient information on sensitive/rare sea bed communities (cold water corals) is available to identify no areas of significant interaction with fishing gear in areas where the Norwegian fleet operates in the North Sea. **Trawl** Interactions of trawl gear with sea mammals is reported to be limited. Observer programmes have operated on different gear types, including trawls. Pelagic trawl observations (more of a worst-case than demersal trawls) were considered to have a negligible effects on sea mammal populations. Evidence therefore supports estimation that the occasional interaction could occur, but rarely. Direct interactions of seabirds and trawls does not appear to have been directly estimated in Norwegian vessels. However, several observer programmes do operate in the North Sea with other, comparable fleets and issues associated with various gear types (including trawls) have been considered. Interactions of seabirds are reported as being very rare in trawls, with occasional birds being caught in nets.			

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score
	Rays and skates are known to be one of the by-catches in demersal trawl fisheries in the North Sea, and impacts on ray populations have been identified. The ICES WG on Elasmobranch Fisheries has collected landings information for the North Sea. ICES advised that target fisheries for common skate *R. batis* and thornback ray *R. clavata* should not be permitted, and by-catch in mixed fisheries should be reduced to the lowest possible level. Information on discards in the different demersal fisheries is being collected by several countries. Length frequency distributions of discarded and retained elasmobranchs, covering the period from 1998 to 2006, are available from the UK, but observations of discard rates between different gear types (e.g. otter trawls, beam trawls etc.) are limited to the results of observer programmes and ad-hoc specific studies. Observations from these programmes could therefore be extrapolated to the Norwegian trawl fleet, although no direct data are available. Therefore, whilst most interactions are well estimated, by-catches of skates and rays (and possibly other non-commercial PET fish species) are not currently estimated. **Gill Net** Estimates are available of harbour porpoise catches in the Norwegian and other national fleets (by NAMMCO, and the coastal reference fleet data for Norwegian fleet). By-catches in the Norwegian fleet appear lower than in other fleets, and saithe directed nets appear to have lower impact than other fisheries (notably Greenland halibut). Studies of seal bycatch levels within the gill net fishery have largely been performed by Danish and UK agencies. Reports of seabird interactions with gear do not identify gill nets as having significant interaction with PET seabirds but records of interactions with PET fish species (notably skates and rays) is not established. **Purse Seine** Studies in saithe directed fisheries (NAMMCO) have not identified any obvious interactions with marine mammals and, in general, the method is felt reasonably species-specific. Reports of seabird interactions with gear do not identify purse seines as having significant interaction with PET seabirds but records of interactions with PET fish species (notably skates and rays) is not established. **Danish seine** Interactions of gear with sea mammals is limited, the occasional interaction can occur, but rarely. Direct interactions of seabirds and Danish seines does not appear to have been directly estimated in Norwegian vessels. However, several observer programmes do operate in the North Sea with other, comparable fleets. Interactions of seabirds are reported as being very rare in trawls (presumably including Danish seines), with very occasional birds being caught in nets. Whilst most interactions are well estimated, by-catches of skates and rays (and possibly other non-commercial PET species) are not estimated.			

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score
	Handline Studies in saithe directed fisheries (NAMMCO) have not identified any obvious interactions with marine mammals and, in general, the method is felt reasonably species-specific. Reports of seabird interactions with gear do not identify handlines as having significant interaction with seabirds. Records of interactions with PET fish species (notably skates and rays) is not established, however.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.2.1.3		Do interactions pose an unacceptable risk to such species?		33.3	
60	Known effects are within acceptable limits of national and international legislative requirements and are believed to create no biological threats to the species concerned.	**North East Arctic** Reviewing all the data noted above, of the various categories of PET that might be impacted by fisheries: the only mammal species identified as being of potential concern is the harbour porpoise; no bird PET species has been identified as interacting significantly with any gear; the potential impact of gears on bycatch fish is unknown, and potentially of concern with respect to elasmobranchs; and whilst gear impacts with sensitive benthos are known to occur, 5 areas of potentially high impact on coral biodiversity are protected from trawl and Danish seine gears. ECOSIM modelling of indirect effects is possible, this suggests that there are no major trophic consequences (notably on cetaceans) of changing harvest rates of saithe within the boundaries of established sustainable limits. **Trawl** Significant potential impacts have only been identified with benthos. These impacts are mitigated to a certain extent by the closed areas, but apart from the report that 30-50% of Lophelia beds throughout the Norwegian zone have been damaged, we are unaware of studies of whether the size and composition of the areas under protection is considered sufficient to reduce to an acceptable level the probability that affected populations remain at risk.	I2, R4, R7, R14, R21, R35, R77, R83, R94, R96, R97, R98	NEA Tr Gn Ps Ds Hl NS Tr Gn Ps Ds Hl	 70 65 85 70 85 75 75 85 75 85
80	Critical interactions are well estimated. Available information suggests interactions are below a level at which PET species populations would be at risk.	The potential impact on elasmobranch populations is unknown. Little is known on the catches of PET species (e.g. skates and rays) in the trawl fishery. Although some studies have occurred in the Barents Sea, knowledge of the impacts on populations remains relatively limited. However, information from the ICES WG on Elasmobranch Fisheries does include details from the Barents Sea (largely based upon Russian data) and Norwegian Sea (although data are highly limited). Information is insufficient to provide reasonable stock estimates at this time, although projects are underway to address this. Information on seabird interactions is being developed but is not yet available. **Gill Net** Numbers and catch rates of seals (predominantly harp seals) caught in nets of different mesh sizes are available. However, the rates were dependent upon mesh sizes and are affected by ecosystem considerations and the location of the nets relative to the shore. Estimates of catch rates (BSMP) suggest that they are significantly lower than the allowable sustainable harvest of harp seals. Population status for harp seals are well monitored and catches would not exert any significant population impacts. From the data available, it appears that catches of harbour porpoises are greatest in large mesh size gillnets of a type not used in the saithe fishery. Observation of mesh size restrictions within the saithe			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	It is established that the direct and indirect effects of fishing on threatened and endangered species are within acceptable pre-defined limits.	gill net fishery will therefore limit any impact. The impact of the saithe gillnet fishery on the population, whilst not explicitly assessed, is therefore likely to be less than the impact of other fisheries. Harbour porpoise are not listed in Norway as Endangered, Threatened or Vulnerable, but it is a species for which Norway has accepted responsibility to maintain the population status (e.g. species which are globally threatened or over 25% of the total European population resides within Norwegian waters). Population sizes have been estimated (SCANS, SCANS-II projects, BSMP) suggesting that total population size in Norwegian waters is 37,000 (SCANS) plus 11,000 in the Barents Sea (PINRO/IMR 2006; BSMP Management Plan Fisheries Report). ASCOBANS report that additional fishery induced mortality of 1.7% of the population estimate may be sustained by harbour porpoise populations, which would equate to approximately 800 animals annually. However, although some estimates of harbour porpoise by-catch in gill nets of the type used in the saithe fishery have been made, the data do not appear to have been analysed so as to allow an assessment to be made on the relative impact of the saithe directed fishery. Impacts from gillnets in Norwegian waters are considered moderate to high (BSMP Supporting Document, "Utredning av konsekvenser av fiskeri I omrraadet Lofoten – Barentshavet", Fiskeridirektoratet, June 2004). There is no information to assess the likely impact on PET fish species. Gillnets are known to have relatively minor potential impacts on corals. They are not prohibited from fishing in the areas closed to protect coral, and there are no studies on whether this situation will create negligible long-term acceptable impacts on sensitive habitats and biodiversity. **Purse Seine** Given the reasonably species-specific nature of the fishery, this gear is not expected to pose an unacceptable risk to PET species. Specifically NAMMCO report does not register any interaction with marine mammals. No other issues with PET are reasonable expected to occur. **Danish seine** Significant potential impacts have only been identified with benthos. These impacts are mitigated to a certain extent by the closed areas, but apart from the report that 30-50% of *Lophelia* beds throughout the Norwegian zone have been damaged, we are unaware of studies of whether the size and composition of the areas under protection is considered sufficient to reduce to an acceptable level the probability that affected populations remain at risk. The potential impact on elasmobranch populations is unknown. Little is known on the catches of PET species (e.g. skates and rays) in the Danish seine fishery. Although some studies have occurred in the Barents Sea, knowledge of the impacts on populations remains relatively limited. However, information from the ICES WG on Elasmobranch Fisheries does include details from the Barents Sea (largely based upon Russian data) and Norwegian Sea (although data are highly limited. Information is insufficient to			

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score
	provide reasonable stock estimates at this time, although projects are underway to address this. Information on seabird interactions is being developed but is not yet available. **Handline** Given the reasonably species-specific nature of the fishery, this gear is not expected to pose an unacceptable risk to PET species. No other issues with PET are reasonable expected to occur. **North Sea** Reviewing all the data noted above, of the various categories of PET that might be impacted by fisheries: the only mammal species identified as being of potential concern is the harbour porpoise; no bird PET species has been identified as interacting significantly with any gear; the potential impact of gears on bycatch fish is unknown, and potentially of concern with respect to elasmobranchs; and no gear impacts with sensitive benthos have been identified for the area fished by the Norwegian fleet. **Trawl** Rays and skates are known to be one of the by-catches in demersal trawl fisheries in the North Sea, and impacts on ray populations have been identified, although not directly from the Norwegian trawl fishery. Information on discards in the different demersal fisheries is being collected by several countries. Length frequency distributions of discarded and retained elasmobranchs, covering the period from 1998 to 2006, are available from the UK, but observations of discard rates between different gear types (e.g. otter trawls, beam trawls etc.) are limited to the results of observer programmes and other specific studies (e.g. Cotter et al., 2004). Observations from these programmes would therefore need to be extrapolated to the Norwegian trawl fleet. In addition, assumptions of comparability between EU and Norwegian trawl fleets would be required, along with the assumption of a uniform catch rate across areas. Status of elasmobranchs in the North Sea have been examined (e.g. Dann et al., 2005; ICES Working Group on Elasmobranchs) and ICES has advised that target fisheries for common skate *D. batis* and thornback ray *R. clavata* should not be permitted, and by-catch in mixed fisheries should be reduced to the lowest possible level. No significant interactions of trawl gear with cetacean (harbour porpoise) populations are reported. **Gill Net** SCANS survey population estimates for harbour porpoise the North Sea and Skagerrak are 200,000. North sea catches are estimated at over 4000 per annum, and in the Skagerrak, annual bycatch probably exceeds 4% of the total population and coincides with a decline in stock size. There are no direct estimates of the contribution of the Norwegian gillnet fishery in the North Sea to these total estimates of bycatch, and consequently no direct assessment of the impact of the Norwegian fishery on sustainability of the population. However, if maximum catch rate reported for bottom-set gill nets of the appropriate			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
		mesh size, as used in the saithe fishery, is assumed for the Norwegian component of the total North Sea gill net fishery, then the likely catch of porpoises would not be a significant proportion of the total porpoise by-catch. The catch of PET fish species is unknown, so although population estimates are available for rajids in the North Sea the impact of the Norwegian gillnet fishery on these populations cannot be assessed. **Purse Seine** Given the reasonably species-specific nature of the fishery, this gear is not expected to pose an unacceptable risk to PET species. Specifically NAMMCO report does not register any interaction with marine mammals. No other issues with PET are reasonable expected to occur. ECOSIM modelling of indirect effects is possible, this suggests that there are no major trophic consequences on PET species (notably on cetaceans) of changing harvest rates of saithe within the boundaries of established sustainable limits. **Danish seine** Rays and skates are known to be one of the by-catches in demersal fisheries in the North Sea, and impacts on ray populations have been identified, although not directly from the Norwegian trawl fishery. Information on discards in the different demersal fisheries is being collected by several countries. Length frequency distributions of discarded and retained elasmobranchs, covering the period from 1998 to 2006, are available from the UK, but observations of discard rates between different gear types (e.g. otter trawls, beam trawls etc.) are limited to the results of observer programmes, the coverage of which is relatively limited when compared to the fleets, and are generally present upon EU country vessels, and specific studies (e.g. Cotter et al., 2004). Observations from these programmes would therefore need to be extrapolated to the Norwegian trawl fleet. In addition, assumptions of comparability between EU and Norwegian trawl fleets would be required, along with the assumption of a uniform catch rate across areas. Status of elasmobranchs in the North Sea have been examined and ICES has advised that target fisheries for common skate *D. batis* and thornback ray *R. clavata* should not be permitted, and by-catch in mixed fisheries should be reduced to the lowest possible level. No significant interactions of gear with cetacean (harbour porpoise) populations are reported. **Handline** Given the reasonably species-specific nature of the fishery, this gear is not expected to pose an unacceptable risk to PET species. No other issues with PET are reasonable expected to occur.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.2.2	**Strategies have been developed within the fisheries management system to address and restrain any significant impacts of the fishery on protected, endangered or threatened species.**			50.0	-
2.2.2.1		Are management objectives and accompanying strategies in place in relation to impact identification and avoidance/reduction?		100	
60	Management systems are in place to address key areas of impact identification and avoidance/reduction.	**North East Arctic** Norway has ratified a number of conventions on species protection and management, including the Convention on Biological Diversity, Bern, Bonn and CITES Conventions, these establish overarching objectives for PET species conservation. The Norwegian Red List is updated regularly. Regulations for non-commercial fish by-catches appear more limited (including fish, mammals and birds). However, the ecosystem management plan for the Barents Sea indicates that, following the identification of affected species, regulations are being evaluated. There is also a division of IMR working on the development of technical measures to address by-catch etc issues.	I2, R35, R81	NEA NS	80 80
80	Management objectives are set to detect and reduce impacts. Accompanying strategies are designed to adequately protect recognised protected, endangered or threatened species.	In general, where there is an identified requirement for strategies to be enacted, appropriate actions appear to be put in place, including monitoring of potential interactions with PET species. For example, areas of cold water coral have been identified as an issue in Norwegian waters and then appropriate protection measures rapidly implemented and enforced. **North Sea** Norway has ratified a number of conventions on species protection and management, including the Convention on Biological Diversity, Bern, Bonn and CITES Conventions, these establish overarching objectives for PET species conservation. The Norwegian Red List is updated regularly. Regulations for non-commercial fish by-catches appear more limited (including fish, mammals and birds), although there is also a division of IMR working on the development of technical measures to address by-catch etc issues.			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	Tested management objectives are set to detect and reduce impacts. Accompanying strategies are designed to adequately protect recognised protected, endangered or threatened species.	If issues relating to protected, endangered or threatened species were to be identified, various mechanisms have been developed internationally (via OSPAR strategy) and within EU jurisdiction to initiate action. These include i) the ASCOBANS Agreement that sets the 1.7% maximum allowed removal rate for harbour porpoises; (ii) the EC Habitats Directive that provides protection for key habitats and species; (iii) Biodiversity Action Plans that provides action plans for the protection of key and threatened species and habitats; (iv) the OSPAR Strategy on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area. ICES has advised that target fisheries for common skate *D. batis* and thornback ray *R. clavata* should not be permitted, and by-catch in mixed fisheries should be reduced to the lowest possible level. This has implications for EU/Norway advice on fisheries management. In general, where there is an identified requirement for strategies to be enacted, appropriate actions appear to be put in place, including monitoring of potential interactions with PET species. For example, areas of cold water coral have been identified as an issue in Norwegian waters and then appropriate protection measures rapidly implemented and enforced. Norway could implement EU designed measures as part of the EU-Norway agreement or on its own volition (although there are no obvious examples of this arising).			

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.3 *(MSC Criterion 3)*	**Where exploited populations (of non-target species) 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.**			12.5	-
2.3.1	**There are management measures in place that allow for the rebuilding of affected populations.**			100	-
2.3.1.1.		Is there sufficient information to allow determination of necessary changes in fishery management to allow recovery of depleted populations?		33.3	
60	There is some information on functional relationships, sufficient to allow alterations to be made to fishing to recover and rebuild depleted species.	**North East Arctic** Identified depleted populations which could be by-catches in saithe directed fisheries would notably include coastal cod. Stock assessments are carried out annually which identify appropriate fishing levels to rebuild populations. A rebuilding plan is in place for the coastal cod stocks. All catches of cod are reported by vessels fishing for saithe. There is the potential for saithe directed fisheries to impact vulnerable species such as skates and rays, (which are considered under Criterion 2.2 above. No other by-catch species (with the possible exception of redfish) is known to be depleted, although this will be subject to further evaluation as detailed under Criterion 2.1 above. Functional relationships are clear, but effects of by-catch catches versus directed catches has not been clearly established. **North Sea** Identified depleted populations which could be by-catches in saithe directed fisheries would notably include North Sea cod. Stock assessments are carried out annually which identify appropriate fishing levels to rebuild populations. A rebuilding plan is in place for North Sea cod. All catches of cod are reported by vessels fishing for saithe. There is the potential for saithe directed fisheries to impact vulnerable species such as skates and rays, (which are considered under Criterion 2.2 above). No other by-catch species (with the possible exception of redfish) is known to be depleted, although this will be subject to further evaluation as detailed under Criterion 2.1 above. Functional relationships are clear, but the effects of by-catches versus directed catches has not been clearly established.	I2, R20	NEA NS	90 90
80	There is adequate information, combined with a precautionary approach wherever necessary, to allow alterations to be made to fishing that would be expected to recover and rebuild depleted species to specified levels within appropriate timeframes.				
100	There is a clear understanding of functional relationships between the impacted population and the fishery. Intervention measures based on this understanding have been tested and /or are known to be effective in promoting recovery of depleted species to specified levels within appropriate timeframes.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.3.1.2		Are management measures in place to modify fishery practices in light of the identification of unacceptable impacts?		33.3	
60	A mechanism exists for the modification of fishing practices in light of the identification of unacceptable impacts.	**North East Arctic** Coastal cod bycatches in saithe directed fisheries are set against the TAC for coastal cod. For this stock, a variety of regulations are in force to promote recovery, including annual stock assessments and limits on exploitation. Measures to protect coastal cod (closed seasons, extensive area closures to particular gear types and sampling of trawl catches to determine coastal versus North East Arctic cod stock catches) all apply, as an omnibus regulation, to cod, haddock and saithe fisheries. A new regulation has been implemented in 2007 containing these provisions, and so its effectiveness has yet to be demonstrated. Areas of high juvenile cod density would also be closed. **North Sea** For North Sea cod, a recovery plan is in force including annual stock assessments and limits on exploitation, setting objectives and limits guiding operational practices. Cod by-catches in saithe directed fisheries are set against the TAC for North Sea cod (19,957t). All Norwegian cod quota in the North Sea (3,000t) is reserved for by-catches in other-species directed fisheries including saithe. Additional management measures can be implemented under the terms of the EU-Norway agreement. Cod by-catches in Norwegian saithe directed fisheries are low. Discarding is prohibited in Norwegian saithe directed fisheries and so all catches are reported. Norwegian saithe fishery by-catches are well known and relatively minor. Nevertheless, this is a recognised depleted species and any available means of minimising cod bycatches should be explored and implemented.	I2, R20	NEA NS	85 70
80	Effective and timely management measures are in place to modify fishery practices in light of the identification of unacceptable impacts.				
100	Monitoring programs are in place within the management system to allow modification of fishery practices in light of the identification of unacceptable impacts. Objectives and limits for environmental change are used to guide operational practices. It is demonstrated that these are effective.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
2.3.1.3		Do management measures allow for recovery of affected populations?		33.3	
60	Rebuilding measures exist and are fully implemented. Measures may not have been tested.	**North East Arctic** Rebuilding measures have been implemented for coastal cod. Testing of the regulations implemented in 2007 is now underway. However, the saithe directed fisheries represent only a relatively small component of total fishing pressure (with cod by-catches being reportedly low). Fishing with all gears is prohibited within fjords for vessels over 15m.	I2, R20	NEA Tr Gn Ps Ds Hl	 80 75 80 80 75
80	Appropriate rebuilding measures are being implemented. Measures have been tested and can be shown to be promoting the rebuilding of affected populations.	**Trawl** Catches of coastal cod in trawl fisheries (freezer trawlers) is limited by the exclusion of trawling within the 12nm coastal zone (and 4 nm for a limited number of fresh fish trawlers). Exclusion zones are set from the base line which includes the Lofoten Fjord). Also, catches are inspected to identify coastal versus offshore components of cod by-catches. These measures would be expected to promote rebuilding of the population. **Gill Net** Fishing is allowed to take place in coastal waters and so by-catches of coastal cod in the saithe directed		NS	70

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	Appropriate rebuilding measures are being implemented to promote recovery as quickly as is possible. Additional measures are being implemented to prevent problems in the future.	fishery could be expected to occur. Measures have recently been fully implemented to promote recovery of coastal cod stocks but these have yet to be tested. **Purse Seine** Fishing is allowed to take place in coastal waters and so by-catches of coastal cod in the saithe directed fishery could be expected to occur. However, the gear is very selective by species and so cod by-catches would be low and readily controlled through quotas. Measures have recently been fully implemented to promote recovery of coastal cod stocks but these have yet to be tested. **Danish Seine** Catches of coastal cod in Danish seine fisheries is limited by the exclusion of vessels from fjords and a designated zone within the Lofoten area. These measures would be expected to promote rebuilding of the population. **Handline** Fishing is allowed to take place in coastal waters and so by-catches of coastal cod in the saithe directed fishery could be expected to occur. Measures have recently been fully implemented to promote recovery of coastal cod stocks but these have yet to be tested. **North Sea** Rebuilding measures (the cod recovery plan) have been implemented for North Sea cod. There are indication in the North Sea that the decline in stock status has recently stabilized, and that the recent year class could promote stock recovery if recruited into the fishery. It is recognised that the saithe directed fisheries represent only a minor component of total fishing pressure, the Norwegian by-catch quota has proportionally reduced with reductions in the TAC and measures and by-catches in the saithe directed fishery could promote recovery if universally adopted. Nevertheless, North Sea cod remains depleted and appropriate measures to minimise by-catches are required.			

INDICATORS AND GUIDEPOSTS	Comments	Audit Trace Ref.	Weight	Score

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**		**33.3**	
3.A		**Management System Criteria**		50.0	-
3A.1 (*MSC Principle 3 Intent and Criterion 3*)		**A management system containing an institutional and operational framework exists with clear lines of responsibility.**		16.7	-
3A.1.1		Are organisations with management responsibility clearly defined including areas of responsibility and interactions?		25.0	
60	Organisations with management responsibility are known. Responsibilities and interactions require clarification and occasional issues may arise.	**North East Arctic** This stock is entirely within Norwegian waters and is managed according to the legislation that applies to Norwegian fisheries. Organizations, management responsibilities and interactions are clearly defined within the three core areas of resource management: developing the knowledge base, preparing and implementing regulations, and enforcing them. The knowledge base for resource management is developed by the Institute of Marine Research, and this is the basis for scientific advice for resource management provided by ICES. Additional scientific inputs on nature conservation issues is provided through other research institutions (for example NINA, the Norwegian Polar Research Institute). The overall responsibility for resource management resides with the Ministry of Fisheries and Coastal	I2, I3, R18, R62, R63, R70, R82	NE A NS	95 95
80	Organisations with management responsibility have been defined including key areas of responsibility and interaction. In general, interactions are effective and operate without serious difficulties.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
100	Organisations with management responsibility are clearly defined including all areas of responsibility and interaction. Interactions are demonstrably effective.	Affairs, while the Fisheries Directorate acts as a technical body preparing secondary legislation containing regulations and implementing it. Interactions between the Ministry, Directorate and IMR appear to function well. This is significant as these are key management organisations. Enforcement of regulations is the responsibility of the Coast Guard (at sea), the Fisheries Directorate (nearshore waters and upon landings) and the sales organizations (upon landing). These organisations have set procedures governing joint activities and regularly meet to coordinate actions. Linkages between fisheries management agencies/departments and their nature conservation equivalents do not appear to be as clearly established. Although development of management plans (currently the BSMP, but with the NSMP also in development) strengthens these linkages. Divisions of responsibility in all cases seem clear cut. Decision-making procedures allow for rapid and effective interactions. **North Sea** The North Sea saithe fisheries occur on a stock that is shared between Norway and the EU. The division of the saithe stock between these has been agreed since 1981, since when the TAC has been set with no ensuing issues regarding allocation of National quotas. TAC's are set on the basis of ICES advice. The bilateral cooperation has been functioning for almost 3 decades (EU-Norway cooperation beginning in 1978). Following the outcome of the annual bilateral talks, the observations regarding the NEA stock apply.			

3A.1.2		Is the management system consistent with the cultural context, scale and intensity of the fishery?		25.0	
60	Inconsistencies arise in some key areas but a programme is in place to address these.	**North East Arctic** The management system is comprehensive and encompasses the entire fishery and those participating in it at an appropriate scale and intensity (including recognition of a small degree of historical participation of other national fishers). An ecosystem scale management plan has been implemented in the Barents Sea and is being developed for the Norwegian Sea (planned for 2009) and North Sea (no date set as yet). Management is considered to be consistent with the cultural context, scale and intensity of the fishery. **North Sea** The EU-Norway agreement recognising historical participation of Norwegian and EU member states in shared waters. Within Norway, the management system is comprehensive and encompasses the entire fishery and those participating in it at an appropriate scale and intensity.	I1, I2, I3, R23, R62, R79	NEA NS	95 95
80	The system is consistent with key elements of the cultural context, scale and intensity of the fishery.				
100	The system is entirely consistent with the cultural context, scale and intensity of the fishery.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.1.3		Is the management system subject to internal review?		25.0	90
60	There are mechanisms in place to allow for internal review.	The management is subject to annual internal reviews at various levels. Annual regulatory meetings are hosted by the Directorate and attended by industry and other stakeholders. Significant preparatory documents are made publicly available to stakeholders prior to the meeting. At these meetings, the regulatory program – quota and technical regulations - (for each fishery individually, e.g. North Sea Saithe fisheries) that is implemented in any one year is subject to comprehensive review by the Regulatory meeting the following year. Recommendations on modifications to regulation are proposed to the Ministry and subsequent decisions are subject to ongoing testing and monitoring. Regulations are also subject to continuous public debate and review. This applies to rules regulating access, output, and technical regulations. Data and assessment methodology is subject to continuous internal scientific review within ICES. Methodologies are subject to continuous development, such as ICES Working Groups on Arctic Fisheries and Limit and Target Reference Points and Study Group on Management Strategies (SGMAS).There is no evidence, however, of an established stock assessment quality control procedure within Norway, outside of the ICES framework.	I2, I3, R41, R43		
80	The management system is subject to internal review at appropriate intervals.				
100	The management system is subject to regular and frequent internal review. This includes evidence that the assessment methodology has been evaluated extensively and that any recommended changes have been made. Monitoring and evaluation are ongoing and improvements quickly tested and implemented.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.1.4		Is the management system subject to external review?		25.0	90
60	There are mechanisms in place to allow for external review.	External review of regulations and enforcement aspects occurs annually (since 1995) through a report to Parliament addressing the outcomes of international agreements and their implementation. The parliamentary committee may then comment upon the ministerial report and the minister will act on comments made. A major review of the management system was also carried out by the National Audit Office in 2003-2004. This was a review of the effectiveness of the management system (in terms of resource management, capacity handling, enforcement and Ministerial management of subsidiary bodies – Directorate, IMR etc), and was reported to Parliament. The overall aim of these reviews is to ensure that the executive is achieving the overall objectives endorsed by Parliament. The Institute of Marine Research has also been subject to two major scientific reviews over the last decade or so by independent committees (one commissioned by the Research Council covering a number of institutions, one specifically commissioned by IMR itself). ICES involves external scientists in reviews of its methodologies on a regular basis. In particular, the decision rules proposed for the saithe stock by Norway are currently being reviewed externally by ICES to confirm conformance with the precautionary approach. STECF carries out reviews of ICES advice to the EC, which includes both North Sea and NE Arctic stocks. Norway reports bi-annually on the performance of its management system to the Committee of Fisheries of FAO, which reviews countries performance relative to the standards set in the 1995 Code of Conduct for Responsible Fisheries. The management system is subject to thorough external review, although the depth of the review varies with different aspects of the management system (the Parliamentary review being annual). Reviews apply to the scientific basis, regulatory approach as well as enforcement aspects.	I2, I3, R41, R43, R58, R85, R92		
80	The management system is subject to external review at appropriate intervals.				
100	The management system is subject to regular and frequent external review. Monitoring and evaluation are ongoing and improvements quickly tested and implemented				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3 A.2 (*MSC Criteria 1, 2, 4*)	**The management system has a clear legal basis.**			16.7	-
3A.2.1		Is the fishery consistent with International Conventions and Agreements?		40.0	100
60	The management system operates under relevant international conventions and agreements, but some management actions may be questionable in relation to the terms of these.	Saithe fisheries are consistent with relevant international conventions and agreements. The fisheries related provisions of the 1982 Law of the Sea Convention, that fisheries are managed sustainably, that they are optimally used and that states cooperate on the management of shared stocks is considered to be complied with. There are no controversial exemptions to international agreements. The fisheries are carried out according to the principles set out in the Code of Conduct for Responsible Fisheries, which includes the application of a precautionary approach. Also, the requirements in the 1995 UN Fish Stocks Agreement regarding reference points and application of the precautionary approach are complied with. Norway has implemented actions on IUU fishing in accordance with the FAO Code of Conduct. Fishing is considered to be consistent with relevant provisions of international nature conservation agreements (e.g. Bonn, Bern Conventions). **North Sea** The fishery falls under the international cooperative agreement between Norway and the EU, and is in compliance with that.	I2, I3, R62, R70, R80, R85		
80	The management system is generally consistent with relevant international conventions and agreements. The management system does not operate under any controversial exemption to an international fisheries or environment-related agreement.				
100	The management system is demonstrably compliant with all relevant international conventions and agreements.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.2.2		Is the fishery consistent with national legislation?		40.0	100
60	The management system operates under relevant national legislation, but some management actions may be questionable in relation to the terms of these.	Fisheries in Norway are subject to a comprehensive legislative/regulatory framework. The management system is consistent with national legislation. Secondary legislation providing for actual regulations and enforcement provisions builds on overarching fisheries laws (notably the Participation Act and Saltwater Fisheries Act). The management system is subject to occasional legal reviews usually resulting in the resource management being found to be consistent with legislation.	I3, R1, R2, R20, R63, R82, R85		
80	The management system makes consistent, good faith efforts to be consistent with relevant national legislation. Management organisations have not been found to be repeatedly in violation of national law.				
100	The management system is demonstrably compliant with all relevant national legislation.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.2.3		Does the system observe the legal and customary rights of people dependent upon fishing?		20.0	100
60	The customary and legal rights of the people dependent upon fishing are known and no major conflicts have occurred.	Rights are clearly codified in legislation concerning participation in fisheries. Rights have been developed through legal, democratic processes.	I2, I3, R18, R62, R63		
80	The system observes the legal and customary rights of people dependent upon fishing but does not necessarily have a formal codified system.				
100	The system observes all legal and customary rights of people dependent upon fishing under a formal codified system.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.3 *(MSC Criteria 2, 5, 7)*	**The management system includes strategies to meet objectives including consultative procedures and dispute resolutions.**			11.1	-
3A.3.1		Does the management system contain clear short and long-term objectives?		16.7	90
60	Short and long-term resource and environment objectives are implicit within the management system	Long-term, overall goals for fisheries management are set out in legislation and in white papers to the Parliament. These objectives are based upon sustainable management, economic efficiency and regard for regional objectives (e.g. specification of landing points). Environmental objectives are also in place and observed, e.g. in relation to protection of coral reefs and sea-based management plans (e.g. Barents Sea Management Plan and other forthcoming plans). Ecological quality objectives are also developed through OSPAR cooperation, but fully developed measures to measure environmental performance are not yet in place. **North East Arctic** Long-term objectives for the stock are set out in a domestic management plan for the North East Arctic saithe stock. Short-term objectives are represented by annual TACs, the performance against which can be measured on an annual basis. The TACs are based on ICES advice, which build on the precautionary approach. Specific environmental control measures are in place (e.g concerning prevention of discarding of many species and protection of coral areas), but do not yet fully address all potential interactions of the fishery. **North Sea** Long-term objectives for the stock are set out in the bilateral agreements between Norway and the EU. Short-term objectives are represented by annual TACs, the performance against which can be measured on an annual basis. The TACs are based on ICES advice, which build on the precautionary approach. Specific environmental control measures are in place (e.g concerning prevention of discarding of many species and protection of coral areas), but do not yet fully address all potential interactions of the fishery.	I2, I3, R1, R2, R6, R20, R24, R62, R79		
80	The management system contains clear short and long-term resource and environment objectives.				
100	The management system contains clear and explicit short and long-term resource and environment objectives that can be measured by performance indicators.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.3.2		Do operational procedures exist for meeting objectives?		16.7	100
60	Operational procedures exist which are applied to the meeting of objectives.	For the resource, national TAC's are allocated to fleet groups. Within each group, the quota is allocated according to set procedures. Vessels record catches in logbooks, and catches and landings are recorded and checked against the quota of each vessel (where vessel quotas exist) and/or sector quotas. The fisheries authorities can close a fishery where by-catch levels are too high (this is subject to continuous monitoring), or when the total quota for a particular group of vessels is reached. The procedures for doing so is well understood in the industry, and closure of areas in practice constitutes almost real-time management. In addition, vessels carry out specific trial fisheries providing for effective application of this by-catch control mechanism – e.g. in cases of too high incidence of undersize fish, a fishery is closed. When bycatch/undersize fish etc levels falls below a given level, the fishery is re-opened. Relevant environmental objectives are applied through regulation and enforcement activities as for fishery controls, for example closures of areas of cold water coral, measures for the protection of coastal cod and lost net retrieval. The regulations of fisheries activities are reviewed annually in the Regulatory Council/Regulatory Meeting, ensuring transparency of operations and providing for testing and review of regulatory mechanisms. Regulations are very clearly communicated to operatives and fishers are required to be aware of relevant regulation.	I2, R1, R2, R20		
80	Transparent operational procedures are applied to the meeting of objectives. These procedures can be shown to support the objectives.				
100	Operational procedures are transparent and clearly applied. There is a feedback mechanism testing effective application.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.3.3		Are there procedures for measuring performance relative to the objectives?		16.7	85
60	Operational procedures exist which can be used to measure performance relative to the objectives.	Performance relative to resource and fishery-related environmental objectives is closely monitored through landing records and regulatory enforcement. The overall performance of the management regime for the resource is measured annually by assessing the status of stocks. This is a tested procedure that is repeated annually under the purview of ICES, resulting in new stock assessments and scientific advice for the following year. Monitoring activity of overall ecosystem status is also carried out through comprehensive implementation of management plans (for Barents Sea), Ministerial declarations (for North Sea) etc. IMR carry out ecosystem surveys annually and fishery independent stock surveys. Some measures are difficult to fully enforce, however, such as the ban on discarding, which can influence the meeting of objectives. The economic performance of the fleet (against the objective of economic efficiency) is monitored annually through a survey ("Lønnsomhetsundersøkelser" – profitability survey) of a representative sample of vessels in the fleet.	I2, R18, R41, R43, R60, R82, R85		
80	There are procedures used for measuring performance relative to the objectives.				
100	Tested procedures are used for regular measurement of performance relative to the objectives.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.3.4		Do procedures include for a precautionary approach in the absence of sufficient information?		16.7	70
60	Measures exist to implement a precautionary approach in the absence of sufficient information. There is some evidence that this is occurring.	**North East Arctic** The precautionary approach is formalised and implemented in the management of all major fish stocks and ICES advice is based on established precautionary and limit reference points. This is supported by an additionally precautionary management strategy, which would be applied should the stock fall below Blim. This applies to both saithe and main commercial by-catch species such as cod and haddock. Uncertainties in the assessment (as discussed under Principle 1) might suggest that additional precaution could be considered, but does not appear to have been examined. Some ecosystem interactions however, such as by-catches of non-commercial species and restriction on all gear fishing in areas of coral (areas where information is lacking in some respects), do not, however, appear to be constrained by formalised precautionary procedures. **North Sea** The precautionary approach is formalised and implemented in the management of all major fish stocks and ICES advice is based on established precautionary and limit reference points. This applies to both saithe and main commercial by-catch species such as cod and haddock. Uncertainties in the assessment (as discussed under Principle 1) might suggest that additional precaution could be considered, but does not appear to have been examined. Some ecosystem interactions however, such as by-catches of non-commercial species (an area where information is lacking in some respects), do not, however, appear to be constrained by formalised precautionary procedures.	I2, R41, R43		
80	Formalised measures exist to implement a precautionary approach in the development and application of operational procedures in the absence of sufficient information.				
100	All procedures include for evaluation of uncertainty and application of precaution at an appropriate level.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.3.5		Does the system include a consultative process including relevant and affected parties?		16.7	100
60	The system includes a consultative process including key stakeholders within the fishery.	The management system includes a comprehensive consultative process where stakeholders can have their say regarding the regulatory approach. The key arena for this is an open Regulatory meeting (previously Regulatory Council) chaired by the Directorate of Fisheries, where the regulatory measures for the previous year are reviewed and proposals for regulatory measures the coming year are discussed. Meeting papers are posted on the web. The meeting are open and all relevant stakeholders have an opportunity to attend and make representations. When new legislation is developed, comprehensive hearings are mandated by law, providing industry, as well as other stakeholders, with an opportunity to comment upon and influence new legislation. The views presented in commentary to draft legislation would be reflected in the Ministries comment to draft legislation presented to Parliament. Also, annual meetings of fishers´ organisations are important venues for presentation of science and policy developments and debate between fisheries and scientists and administrators. **North Sea** Stakeholders also have the opportunity to participate in preparatory meetings before the negotiations with the EU. Representatives from the fisheries organizations can also participate in the delegations to the talks. Norway participates in the North Sea RAC as an observer.	I1, I2, I3, R18, R62, R63		
80	The system includes an appropriate consultative process including all main public and private stakeholders and can demonstrate consideration of representations made.				
100	The system includes an appropriate consultative process including all affected stakeholders. Decisions specifically discuss and/or address stakeholder concerns.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.3.6		Is there an appropriate mechanism for the resolution of disputes within the system?		16.7	100
60	Mechanisms are theoretically adequate but have not been consistently applied or tested.	Disputes can be resolved in the first instance by negotiations within the system (e.g. at annual regulatory meetings). Following representations, the Minister would make a decision on a particular issue. Further dispute could then be resolved through law. Disputes over resource allocation between groups in the industry are normally resolved within the industry, by way of negotiation of compromises in the Norwegian Fishers Union. More serious disputes between actors in the industry are also usually resolved in the courts. Legal systems have been tested. Ultimately, any Norwegian citizen or organisation can take legal action to the Council of Europe Court.	I1, I2, I3		
80	There is an appropriate and established mechanism for the resolution of disputes within the system.				
100	There is an appropriate and tested mechanism within the system for the documentation and resolution of disputes of varying magnitude.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.4 *(MSC Criterion 6)*	**The management system operates in a manner appropriate to the objectives of the fishery.**			11.1	-
3A.4.1		Does the system include subsidies that contribute to unsustainable fishing?		50.0	100
60	Subsidies exist that may contribute indirectly to unsustainable fishing. These are short-term and are in the process of being removed within acceptable timescales.	The system has no subsidies that contribute to unsustainable fishing or ecosystem degradation. Subsidies were terminated in 1990 through an agreement between the European Free Trade Area signatories, negotiated in preparation for the EEA agreement.	I1, I2		
80	The system is essentially free from subsidies that contribute to unsustainable fishing or ecosystem degradation.				
100	The system has no subsidies that contribute to unsustainable fishing or ecosystem degradation.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.4.2		Does the system include economic/social incentives that contribute to sustainable fishing?		50.0	90
60	Measures to allocate fishing opportunities and/or entry to the fishery, or other incentives, are generally supportive of achieving fishery objectives.	All major fisheries in Norway are closed, in the sense that access to the fishery is limited to vessels that have a permit to participate. Removal of permits, in the event of serious breaches of management requirements, provides an incentive to promote sustainable fishing. All quotas are allocated to specific groups of vessels. Quotas are allocated to vessels, or there is a maximum quota for what a single vessel can take of its group quota. In addition to the regulations of access and output, technical regulations also contribute to the achievement of the goals of fishery management: sustainable use and economic efficiency. Procedures to allow for a managed reduction in capacity are established and tested, but may be subject to political priorities. Ecosystem concerns are also taken into account: the regulations prohibit fishing in areas with coral reefs with specified gear, allow for closing of areas with high levels of juvenile fish, and prevents discarding of specified species. Economic gain of landing quota overshoots is also removed (values are taken through the management agencies). Overfishing and fishing in breach of regulations results in economic penalties. Such breaches are generally considered negatively within the industry. These measures will indirectly contribute to sustainable fishing and ecosystem management.	I1, I2, R1, R2, R62		
80	Allocations of fishing opportunities and/or entry to the fishery, and/or other incentives, promote fishery and ecosystem management goals.				
100	The system has established economic and social incentives that contribute to sustainable fishing and ecosystem management.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.5 *(MSC Criterion 8)*	**A research plan exists in line with the management system to address information needs.**			11.1	-
3A.5.1		Have key research areas requiring further information been identified?		33.3	90
60	Some major areas requiring further research have been identified.	The Norwegian Research Council plays an important role in developing strategies for research in Norway in general, and have a number of research programs that are geared at following up on these. More specifically to fisheries management, the strategic plan of the Marine Research Institute, which is a body under the Ministry of Fisheries and Coastal Affairs, points to critical areas for marine research for fisheries management. This is followed up upon with annual research plans that are developed in consultation with the Ministry. The Ministry review the issue of research needs in a relatively detailed manner in the annual budget propositions to the Parliament. On the basis of this, a detailed set of instructions as to research priorities are sent to the Institute of Marine Research. These priorities are arrived at in dialogue between the institute and the fisheries authorities. Some areas of information do not, however, appear to have been fully addressed as yet, although these may well be recognised within the management agencies.	I2		
80	The key areas requiring further research have been identified.				
100	A comprehensive review of necessary information requirements has been undertaken.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.5.2		Is research planned/undertaken by the scientific advisers to meet the specific requirements of the management plan?		33.3	95
60	Research is planned for highest priority information needs.	Research is planned and undertaken to collect the data that are needed to perform stock assessments and provide scientific advice. There is a long-term commitment to fisheries research and related ecosystem science in the Research Council as well as in the Institute of Marine Research. Substantial resources are committed to this over time. The annual budget of the IMR is about USD 100 million. The activities of IMR are closely related to the needs of the management system, including routine research surveys etc and addressing more particular scientific questions. The science funded by the Research Council is also directed towards both applied and developmental marine science. Clear research programmes are implemented to address the identified research requirements.	I2		
80	Research is planned and undertaken to provide necessary scientific support to the plan. There are demonstrable resources to allow implementation of the programme.				
100	There is an ongoing, funded, comprehensive and balanced research programme, linking research to the management plan.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.5.3		Is relevant research carried out by other organizations (e.g. Universities) and is this taken into consideration?		33.3	100
60	The management system is aware of research carried out by other organisations and elements of this are taken into consideration.	Relevant research is also carried out by other organizations, and there is some coordination of activities between the researchers of the Institute of Marine Research and those at the universities and other research institutions both within and outside Norway. The use of research vessels is coordinated among institutions, and PhD students from universities often work for periods with the IMR. Relevant research is taken into account in management. Research Council plans and projects provide important platforms for cooperation between institutions. Increasingly, research is executed through large plans and programmes wherein a number of institutions participate, but with central coordination, tied in with management system requirements (e.g. MAREANO and BSMP). ICES also provides a forum for integration of research from a variety of sources. Norwegian researchers are fully engaged with ICES.	I2, R62, R70, R79, R84		
80	Appropriate research carried out by other organisations is taken into consideration, although there is not necessarily any proactive co-ordination between organisations.				
100	Relevant research carried out by other organisations is taken into account for management considerations. This research is often co-ordinated with existing research plans of the management system.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.6 *(MSC Criteria 7, 9, 10)*	**The management system includes measures to achieve objectives for the stock**			11.1	-
3A.6.1		Are the resource and effects of the fishery monitored?		33.3	100
60	A monitoring programme is in place that addresses some aspects of resource and effects and which can be extended.	The resource is monitored annually through fishery dependent and independent indices (as described under Principle 1). This includes the reference fleet which generates information on by-catches and associated species and is coordinated by research organisations. Logbook and/or landing records are kept at close geographical and temporal scales and are immediately transmitted to management and research organisations. VMS data etc is held by the Directorate	I2, R41, R43		
80	A monitoring programme is in place that addresses all key aspects of resource and effects at appropriate intervals and results are recorded.				
100	The resource and effects of the fishery are closely monitored over appropriate geographical areas and time periods. Full records are kept of monitoring results and these are made available to relevant research and management bodies.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.6.2		Are results evaluated against precautionary target and limit reference points?		33.3	100
60	Target and limit reference points exist and some level of evaluation against these is possible. These take account of the precautionary approach, but this may not be explicit.	Monitoring results are evaluated quantitatively within the stock assessment process, on an annual basis, against the precautionary target and limit reference points within ICES.	R41, R43		
80	Results of monitoring are regularly interpreted in relation to precautionary, target and limit reference points.				
100	Results of monitoring are quantitatively evaluated against precautionary target and limit reference points on a regular and timely basis.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.6.3		Do procedures exist for reductions in harvest in light of monitoring results and how quickly and effectively can these be implemented?		33.3	90
60	Practical procedures exist to reduce harvest. Programmes to link these with monitoring results are underway.	The fisheries are continuously monitored. At sea surveillance of the fisheries can close an area on very short notice (hours) should the amount of undersized fish or bycatch be too high. Such areas closures are frequently used. Areas are re-opened when bycatches and other incidences reach acceptable levels. Landings data, almost all of which are electronic, is transmitted to the Fisheries Directorate within a few days. The authorities, and the sales organizations in their districts, therefore have an almost real time overview over the development of fisheries and can stop them when quota limits are approached. This applies also to vessels in fisheries where vessel quotas are used. The catch control rules have, in recent years, maintained total extractions at or below the TAC level, but the harvest strategy is still being tested.	R62, R80, R82, R85		
80	Practical procedures exist to reduce harvest in the light of monitoring results and provide for stock recovery to specified levels. Measures can be implemented speedily.				
100	Practical procedures exist to reduce harvest in light of monitoring results and provide for stock recovery to specified levels within specified time frames. There are well documented procedures to implement changes and these can be introduced with immediate effect.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.7*(MSC Criterion 10)*	**The management system includes measures to pursue objectives for the affected ecosystem.**			11.1	-
3A.7.1		Are measures in place to address (avoid or minimise) significant environmental impacts?		66.7	80
60	Significant environmental impacts are known and measures are being applied to reduce key impacts.	**North East Arctic** As described in Section 2.1, a review of the environmental impacts of fishing has been carried out, principally within the BSMP. A number of measures are in place to address significant environmental impacts of the fishery. Notably, discarding of commercial by-catches are prohibited, areas of cold water coral community are protected, larger vessels and mobile gear are excluded from inshore areas, measures to allow rebuilding of coastal cod, retrieval of lost gear to prevent ghost fishing. Some areas of potential significance have not been fully investigated such as by-catches and potential impacts on PET species, as discussed under Sections 2.1 and 2.2. When implemented, measures are all subject to regular review and monitoring as to their effectiveness and are expected to be effective in avoiding or minimising impacts. **North Sea** As described in Section 2.1, a review of the environmental impacts of fishing has been carried out through various mechanisms such as ICES, OSPAR, North Sea Cooperation framework and internal programmes within Norwegian institutions. A number of measures are in place to address significant environmental impacts of the fishery. Notably, discarding of commercial by-catches are prohibited in the Norwegian fleet, larger vessels and mobile gear are excluded from inshore areas. Some areas of potential significance have not been fully investigated such as by-catches and potential impacts on PET species, as discussed under Sections 2.1 and 2.2. These measures are all subject to regular review and monitoring as to their effectiveness and are expected to be effective in avoiding or minimising impacts.	R33, R79, R100		
80	Environmental impacts are known. Measures are being applied to minimise all significant ones and there is evidence that the measures are working.				
100	Measures are in place to avoid all significant environmental impacts and are subject to monitoring and periodic review.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.7.2		Are no take zones, Marine Protected Areas or closed areas for specific periods appropriate and, if so, are these established and enforced?		33.3	90
60	Suitability of no-take zones and/or closed areas / seasons has been reviewed against objective biological criteria. Plans are in place to implement some or all of these as appropriate.	**North East Arctic** No requirement for closed areas specific to the saithe resource has been identified. A network of proposed MPA's have, however, been identified within Norwegian waters for general conservation purposes to protect biodiversity (resulting from OSPAR). Closed areas to mobile gear are in force to protect areas with coral reefs and numerous permanent and temporary closures are put in place for specific gear in specific areas. Flexible area closures are also frequently used. These have been in use for a long time, and a dedicated service operating under the Fisheries Directorate (Overvåkningstjenesten for fiskefelt – "The surveillance service") is responsible for administering it. The service was established in 1984 and employs some 20 people. It operates by hiring commercial fishing vessels for trial fisheries and by participating on board regular fishing vessels. In 2006 about 2300 trawl hauls and inspections were carried out .When a closed area is established, the developments in the area is monitored, and the fishery is re-opened when the occurrence of undersize fish reaches acceptable levels. **North Sea** Several reviews of the need for closed areas have been conducted. No requirement for closed areas specific to the saithe resource has been identified, although areas have been implemented in the past for other gadoid-directed fisheries (notably cod).	R2, R18, R20, R23		
80	Suitability of no-take zones and closed areas / seasons has been reviewed and these have been or are currently being implemented and enforced if and where appropriate.				
100	No-take zones and closed areas / seasons are established and enforced if and where appropriate and, if implemented, the consequences are being monitored.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3 A.8 *(MSC Criterion 11)*	**There are control measures in place to ensure the management system is effectively implemented.**			11.1	-
3A.8.1		Are information, instruction and/or training provided to fishery operatives in the aims and methods of the management system?		33.3	95
60	Mechanisms exist for the dissemination of information, instruction and/or training of fishery operatives. Implementation of these mechanisms may not be universally implemented.	Fishery operatives would in Norway in most cases be fishers, as the participation act requires vessel owners to be active fishers (loosely interpreted, so a land-based operative would also fall under the definition). Information on the management system and its functioning is communicated to fishery operatives in a number of ways. Generally, there is considerable interaction between the fishing industry and the authorities on a number of areas, such as the Regulatory meeting, annual meetings of the fisheries organizations, preparations to international negotiations, hearings to documents preparing for new legislation or policy developments, etc. Generally, the level of understanding of how the management system works and the grounds for its structure and functions is high in the Norwegian fishing industry. This is important given the number and complexity of regulations applying to the fishery. Information on regulations is communicated to operatives directly through Directorate and Sales Organisation staff, through Fishermen's organisations, through two fishery newspapers, radio broadcasts and the websites of the Directorate, Sales Organisations and Fishermen's Organisation. Fishers are considered to be well aware of the management requirements and regulations.	I1, I2		
80	Information, instruction and/or training are provided to fishery operatives in the aims and methods of the management system allowing effective management of the system.				
100	Information, instruction and/or training are provided to fishery operatives in the aims and methods of the management system allowing effective management of the fishery and operatives demonstrate comprehensive knowledge of this information.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.8.2		Is surveillance and monitoring in place to ensure that requirements of the management system are complied with?		33.3	95
60	An enforcement system has been implemented; however, its effectiveness and/or compliance has not been fully demonstrated relative to conservation objectives.	A comprehensive enforcement scheme is in place, with inspections at sea as well as at landings. All vessels above 25 meters (currently, although this is to be extended in future) are part of a satellite based vessel monitoring system. All vessels >13m are required to keep detailed logbooks, which are checked upon during inspections. The key document in landings control is the contract note, which is completed for all landings. All contract notes are checked against the central register of landings in the Fisheries Directorate. Misreporting is subject to strict penalties, and there is generally a high degree of compliance with regulations. Enforcement systems are in place involving Directorate staff in inshore waters and on landing. Coastguard enforce regulations in more offshore waters. Sales Organisations also have an enforcement role regarding landings, checking contract notes against vessel quotas. Compliance if good with regulation.	I1, I2, R18, R62, R63, R82		
80	An effective enforcement system has been implemented and there is an appropriate degree of control and compliance. Enforcement systems include measures to control misreporting.				
100	An effective enforcement system has been implemented and there is a high degree of control and compliance. Robust enforcement systems are in place to control misreporting.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3A.8.3		Can corrective actions be applied in the event of non-compliance and is there evidence of their effectiveness?		33.3	95
60	Mechanisms exist or are being developed which can be implemented or applied to deal with non-compliance.	In cases of non-compliance, a range of penalties can be applied by the authorities, with loss of fishing license and heavy economic sanctions as the most severe measures. For minor infringements a series of warnings can be issued. Corrective actions are consistently applied and severe infractions are tried in the courts. Corrective actions are well established, codified, understood and tested.	I1, I2		
80	There are set measures that can be applied in the event of non-compliance although these may not be included in a formal or codified system. These have been tested if/as appropriate as to their effectiveness.				
100	Agreed and tested corrective actions can be applied in the event of non-compliance.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3 B	**Operational Criteria**			50.0	-
3B.1*(MSC Criterion 12)*	**There are measures that include practices to reduce impacts on non-target species and inadvertent impacts upon target species.**			18.1	-
3B.1.1		Do measures, principally through the use of gear and other fishing practices, include avoidance of impacts on non-target species and inadvertent impacts upon target species? These would include by-catch, discard, slippage and high grading.		100	80
60	Measures have been implemented as appropriate that are intended to reduce the major impacts on non-target species and inadvertent impacts on target species, but their effectiveness is uncertain.	In all fisheries there is a ban on discarding which imposes penalties for discarding of specified commercial by-catch species and highgrading of the target species (but not all by-catch species). Minimum mesh sizes are specified, with strong enforcement and good compliance. Slippages are not allowed. For some gears, measures can be taken to avoid by-catches such as the avoidance of setting gill-nets in areas of porpoise activity. Also, restrictions on the use of purse seines during the daytime can be put in place by the Directorate if there is a risk of killing herring unnecessarily. As a result, handline gear is used to ground truth marks on fish finder gear to minimise this interaction. Areas with high densities of juveniles are closed to reduce by-catches and there are closures of coastal waters to specific gear. These measures appear effective. Specific measures have recently been implemented to protect depleted coastal cod stocks, but their effectiveness has yet to be demonstrated.	R1, R2, R20, R62, R82		
80	Measures have been implemented as and when appropriate to avoid or reduce the major impacts on non-target species and inadvertent impacts on target species and there is evidence that they are having the desired effect.				
100	Measures have been implemented to avoid or reduce the major impacts on non-target species and inadvertent impacts on target species, and their effectiveness is clearly demonstrated.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3B.2 *(MSC Criterion 13)*	**There are systems in place that encourage fishing methods that minimise adverse impacts on habitat.**			18.1	-
3B.2.1		Do fishing operations implement appropriate fishing methods designed to minimise adverse impacts on habitat, especially in critical or sensitive zones such as spawning or nursery areas?		100	80
60	Fishing operations use measures to reduce major impacts on habitat, especially in critical or sensitive zones such as spawning or nursery areas.	**North East Arctic** Inshore areas are closed to mobile gear, including the use of Danish seines in Fjords and a designated area within Lofoten to protect spawning areas. Some areas of sensitive habitat, notably cold-water coral, are excluded to mobile gear. The closure of areas of high juvenile fish densities also protect nursery areas. **North Sea** No sensitive habitat relevant to this fishery have been identified. Overall technical restrictions control the type of gear employed.	R20		
80	There is evidence that fishing operations are effective in avoiding significant adverse effects on the environment, especially in critical or sensitive zones such as spawning or nursery areas.				
100	There is direct evidence that fishing operations implement appropriate methods to avoid significant adverse impacts on all habitats.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3B.3 *(MSC Criterion 14)*	**The management system incorporates measures that discourage destructive practices.**			2.2	-
3B.3.1		Does the fishery employ destructive fishing practices (such as poisons or explosives)?		100	95
60	The fishery does not allow any such destructive fishing practices.	Destructive fishing practices, such as the use of explosives, are prohibited in Norwegian fisheries.	I1, I2		
80	The fishery does not employ any such destructive fishing practices and enforcement is considered sufficient to prevent their use.				
100	The fishery does not employ any destructive fishing practices. There is a code of conduct for responsible fishing, prohibiting these, that is fully supported by fishers.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3B.4 *(MSC Criterion 15)*	**The management system incorporate measures that reduce operational waste.**			18.1	-
3B.4.1		Do measures exist to reduce operational waste?		100	90
60	Measures/facilities are in place to reduce sources of operational waste that are known to have detrimental environmental consequences, but further reductions may be possible.	Discarding is prohibited of specified species, and measures exist to reduce catches of juvenile fish. Some offal is returned to shore for processing into meal and roe and livers are landed. Six factory trawlers also have on-board meal plants. Garbage must be returned to shore and waste reception facilities are in place in ports. There is an obligation to retrieve lost gear, which also has economic benefits to fishers. This is supported by gear recovery programmes. NOx emissions are under consideration with a view to controlled these through levies, contributing to research programmes to further address this issue. CO2 is also subject to a levy (refunded to date as Kyoto targets are considered to have been met through fleet reductions). Refrigerant gases are controlled by regulation (CFC's are not allowed). Fleet reductions have already accounted for many CFC and NOx reductions. Many measures are put in place and/or supported by many fishers.	I1, R20		
80	Measures/facilities are in place to reduce all sources of operational waste that are known to have detrimental environmental consequences, and there is evidence they are effective.				
100	Measures/facilities are in place to reduce all sources of operational waste that are known to have detrimental environmental consequences, and there is evidence they are effective and these measures are supported by the fishers.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3B.5 *(MSC Criterion 16)*	**Fishing operations are conducted in compliance with the management system and legal and administrative requirements.**			25.5	-
3B.5.1		Are fishers aware of management system, legal and administrative requirements?		33.3	95
60	Fishers are aware of key management and legal requirements.	Fishers in Norway are generally well aware of the various aspects of the management system and its requirements. Regulations are developed in close cooperation with the fishers´ organisations, so at that level there is an intimate understanding of the rules that the industry are expected to play by. A lot of effort is put into communication of regulations to fishers: the Fisheries Directorate post them on their website and publish them in the 2 industry newspapers (both have three issues per week). Also the fishers organisations communicate regulations to their members. Regulations that are to apply immediately, as for example the closure of a fishery, is also communicated by the Norwegian broadcasting company in conjunction with news.	I1		
80	Fishers are aware of management and legal requirements upon them and are kept up to date with new developments.				
100	All fishers are aware of management legal requirements through a clearly documented and communicated mechanism such as a code of conduct.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3B.5.2		Do fishers comply with management system, legal and administrative requirements?		33.3	85
60	Fishers appear generally to comply with requirements, but there is incomplete information on the actual extent of compliance.	The level of compliance is relatively high. Data from inspections at sea and of landings indicate that the number of serious infractions is low. The management system in general has a high level of legitimacy among fishers, and the need to manage resources through restrictions on access and execution of the fishery is well understood. On the other hand, the number of infractions is not insignificant, indicating that even though the need for management is well understood, rules are not always abided with, albeit with no indication of consistent violation.	I1, I2		
80	Fishers appear compliant with relevant management and legal requirements and there are no indications of consistent violations.				
100	Fishers are fully compliant with, and fully supportive of, legal, and administrative requirements, such as through a code of conduct.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3B.5.3		What is the record of enforcement of regulations in the fishery: quota control, by-catch limits, MLS, mesh regulations and closed areas?		33.3	95
60	There is information on breaches of regulations and on corrective action to prevent or curtail.	The saithe fisheries are relatively strictly controlled. All vessels above 25 meters are obliged to carry satellite transponders. Operations at sea are subject to inspections by the Coast Guard, and nearshore operations and landings are inspected by the Fisheries Directorate in cooperation with the sales organizations. Buyers of fish have to be recognized by the sales organizations. Of coastguard inspections in 2006 (1,847 inspections), 44 (2%) were reported to the police and 21 involved bringing a vessel to port. In addition, 104 warnings were issued. These statistics include foreign vessels. Similar statistics are available from Directorate inspections in inshore waters and port inspections. The various actors involved in enforcement coordinate their activities in several meetings annually. Increasingly, a strategic approach is taken where enforcement activities are directed towards areas where the effect is expected to be largest. In the event of infractions, there is a standard set of penal actions that apply, corresponding to the severity of the breaches.	R18, R20, R62, R82		
80	Evidence of rigorous monitoring of all the enforcement measures and evidence of effective actions taken in the event of breaches is available.				
100	Strong evidence of rigorous monitoring and control of the enforcement measures through for example satellite monitoring, shipboard observers and nominated landing ports. Strong evidence of firm and effective action taken in the event of breaches.				

INDICATORS AND GUIDEPOSTS		Comments	Audit Trace Ref.	Weight	Score
3B.6 *(MSC Criterion 17)*	**The management system involves fishers in data collection.**			18.1	-
3B.6.1		Do fishery operatives assist in the collection of catch, discard and other relevant data?		100	85
60	Fishery operatives are involved in the collection of some catch, discard and other information.	Fishery operatives assist in the collection of data from the fisheries. All catches and landings are reported. Fishers may assist in identifying areas of high juvenile fish densities. With some variation according to the type of fishery, a number of data items are registered. Discards of specified commercial species are banned in Norway. A "reference fleet" consisting of a representative group of vessels is engaged in more comprehensive collection of data for research purposes.	I1, I2		
80	Fishery operatives are regularly involved in the collection and recording of relevant catch, discard and other information.				
100	Fishery operatives assist significantly in the collection and recording of all appropriate catch, discard and other information.				

Appendix A1

Norwegian Fishing Vessel Owners Association (Fiskebat)
North East Arctic and North Sea Saithe Fisheries

Marine Stewardship Council Certification

Certification Body: Moody Marine Ltd

Notification of Proposed Peer Reviewers

A Peer Review panel has been proposed for this fishery. Potential peer reviewers have been approached on the basis of their experience of one or more of the following; the fishery under assessment, fishery management, stock assessment issues and relevant ecosystem interactions.

Brief details of each reviewer are provided below. All stakeholders (including the applicant fishery) are now given the opportunity to state any objections to the selection of a proposed member of the peer review panel, on the basis of any conflicts of interest, accompanied by a statement on the basis of any objection.

Comments on the suitability of any of the persons listed below should be forwarded, **before 5:00 p.m. GMT on 24 September 2007**, to Dr Andrew Hough at Moody Marine Ltd as follows:

E-mail: ahough@moodymarine.com
Fax: +44 (0) 1633 401092
Address: Moody Marine Ltd
Merlin House
Stanier Way
Wyvern Business Park
Derby DE21 6BF
UK

Proposed Peer Reviewers:

Dr Stephen Lockwood. Stephen is an independent marine environment consultant and chairman of the Welsh Minister's fishing industry consultation group. Until 1999 he was Head of the UK Ministry of Agriculture, Fisheries and Food laboratory at Conwy, which undertook research and development work in the fields of fish and shellfish cultivation, and the environmental effects of fishing. At a personal level, he was responsible for providing advice to MAFF policy divisions, and through them to ministers, across the broad field of coastal zone management. Previously, he led research and providing scientific advice on the conservation of fish stocks and the management of fisheries, including the Western mackerel stock, Celtic Sea and Bay of Biscay Demersal fisheries, Pilchard (*Sardina pilchardus*) stocks and Western English Channel herring and sprats. He has published on stock assessment, fishery management and coastal development issues.

Dr Graham Pierce. Graham is a Reader in Zoology at the University of Aberdeen, and currently holds the Marie Curie Chair at the Centro Oceanográfico de Vigo, Instituto Español de Oceanografía. His current research is mainly in marine

biology and fisheries in the NE Atlantic, particularly the ecology of marine mammals and cephalopods, but also on biodiversity, aquaculture, coastal zone management, and the distribution and ecology of fish in the Mediterranean and SW Atlantic. He has co-ordinated three European research projects on marine mammal ecology (bioaccumulation of contaminants, fishery by-catch) and two on cephalopod biology and fisheries. His research group has worked on habitat modelling for a range of marine species and he has published approximately 130 papers in peer-reviewed journals. In addition, he is Secretary of the European Cetacean Society, a Council member of the Cephalopod International Advisory Council and Member and former Chairman of the *International Council for the Exploration of the Seas Working Group on Cephalopod Fisheries and Life History* and member of the *ICES Working Group on Marine Mammal Ecology*.

Annex a.1 Peer Review A

Marine Stewardship Council

Peer Review of Norwegian Saithe Fishery Assessment December 2007

The assessment of this fishery comprises four key sections: the Certification Report; the numeric scoring for Principal 1, Principal 2 and Principal 3; and the recommendation – which is the concluding part of the certification report. Broadly speaking, this review follows the same pattern.

The Certification Report

Overall, the certification report presents all the key information to understand the fishery, its assessment, ecology and management in a clear and logical fashion. There are instances, however, when fishery scientists' familiarity with the subject may lead to confusion or misunderstandings by readers who are less familiar with the subject or this fishery in particular. Some may be deemed relatively trivial, e.g. the extent to which a particular fishing method may or may not interact with other species or habitats, others might be more fundamental. Arguably, the most significant of these is the use and meaning of the term 'stock' – a definition that can be of key significance to the award or withholding of MSC certification.

At its simplest, a 'stock' is "the part of a fish population which is under consideration from the point of view of potential or actual utilization".[1] This definition embraces the notion of an exploited stock, i.e. the population of fish to which a fleet has access, and fishes, within a defined area. It is a relatively relaxed definition and one that allows for pragmatic interpretation by institutions charged with managing fisheries by practical and sensible management units. Implicitly, and not unreasonably, it is the definition adopted in this assessment of the Norwegian saithe fishery.

A biologically more rigorous scientific definition of a stock is "a population of a species of fish which is isolated from other stocks of the same species and does not interbreed with them and can therefore be managed independently of other stocks".[2] Thus, North Sea cod are a separate stock from cod found off Canada, for example, but, by the criteria of this definition of stock and from information presented in this report and assessment, saithe in Norwegian waters may not be a biologically separate stock from those off Iceland or in the North Sea. Inevitably, this occasionally raises questions as to how independent the Norwegian saithe fishery can be from other fisheries on the same species. Such questions arise immediately in the description of the species' biology, distribution and migration.

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[1] Ricker, W.E., 1978, Computation and interpretation of biological statistics of fish populations. *Fisheries Research Board of Canada Bulletin* 191.

[2] Holden, M.J., 1994, *The Common Fisheries Policy* (update by D Garrod). Oxford, Blackwell Science, Fishing News Books,

Biology of the Target Species

The report presents as a *fait accompli* that there are two separate stocks under consideration – the North-east Arctic (NEA) and North Sea. From a management perspective this is both a pragmatic and sensible approach but, from the information provided, it is not necessarily biologically well found.

The interpretation of saithe distribution, migrations and spawning appears to be based almost exclusively on traditional fishery assessment methods with, as yet, little application of modern molecular techniques for stock discrimination. Thus, in the figure on p12 of the report, we are shown saithe spawning west of Scotland, which is upstream of the spawning shown in the northern North Sea which, in turn, is upstream of spawning described at various locations along the Norway coast. Not surprisingly, therefore, we are told that when there is a strong northward incursion of Atlantic water (i.e. a surge in the North Atlantic Drift or Shelf Edge current) there is an associated increase in juvenile fish abundance in southern-mid Norwegian waters. Conversely, however, it might be adduced that years of lesser inflow result in average or 'normal' recruitment to the area rather than the "reduced recruitment" referred to in the Assessment Scoring Comments (§ 1.1.1.7).

In due course, some, quite possibly the majority but not necessarily all, of these juvenile fish must make a contra-natant migration. (Without such a migration the stock as a whole would 'drift' upstream over time.) Thus, at the administrative boundary separating the NEA and North Sea saithe, if not over a wider area, there is a constant to and fro of fish up to 3–4 years' of age, if not older. From a biological perspective it seems little wonder that there is no apparent saithe stock–recruitment relationship. It also raises the question whether these are two biologically separate stocks or whether there is just the one, pan-NE Arctic stock.

An analogous picture is provided by plaice in the North Sea which has numerous, relatively discrete, coastal spawning grounds from the Humber Estuary of eastern England to the Moray Firth of NE Scotland. Although each of these spawning areas is relatively stable year on year, adults mix on these summer feeding grounds with plaice from other, more dominant spawning areas (Southern Bight and German Bight). Consequently, meaningful, separate assessments cannot be made and they are all deemed to be part of the North Sea plaice stock. Although there are sound practical reasons for managing NEA saithe separately from North Sea saithe, can we really be certain that they represent separate biological stocks? Furthermore, when one takes into account the information that mature 'Norwegian' NEA saithe are known to migrate to Icelandic waters, should there be a single assessment for saithe in all NE Atlantic waters, even if management is partitioned into EU, Norwegian, Icelandic and Faroese components?

In connection with lack of data indicating any useful stock–recruitment relationship it is not particularly surprising that the Norwegians have been unable to establish a reliable survey method providing an index of 0-group abundance. From personal experience on the NE coast of England, I know that 0–2 group saithe frequent very shallow, typically rocky areas and harbours. While this provides children with ideal opportunities for catching

saithe with little more than a bent pin, quantitative sampling of such distributions is virtually impossible.

With respect to the state of the (NEA) stock, the report tends to follow the standard ICES management line by relating everything to limit reference points and gross spawning stock biomass. Whilst this approach provides a convenient shorthand it misses a key point of importance that is illustrated by the NEA saithe stock. Not only does this stock have a substantial spawning stock biomass, it is based on seven or eight significant year classes rather than the two or three in many other species' stocks. In the long term, this spread of age classes is no less important for the spawning population as a buffer against the effects of one or two years' poor recruitment than is spawning stock biomass. MML Comment: The assessment team worked on the basis of ICES assessment boundaries – i.e. an operational definition of stocks rather than a specifically ecological or evolutionary one. However, the issues that result from this decision in terms of recruitment and assessment uncertainty are picked up within the discussions under principle 1 and within condition 1. The point on the diversity of the age structure is a good one, a point already noted under Performance Indicator 1.3.1.2.

Fishing Methods

Five methods of fishing are identified for both the NEA and North Sea fisheries: demersal trawl, gill nets, purse seines, Danish seine and hook and line. The description offered for each of these fisheries is succinct to the point it assumes that the reader has a more detailed knowledge or understanding of each of the methods. In general, this may be a reasonable assumption but when some of the details of the assessments are taken into account it raises uncertainties.

For example, is the 'gill-net' fishery strictly limited to just gill nets; i.e. curtains of netting with a uniform mesh size throughout in which saithe of a certain size are trapped by enmeshing of the gills. MML Comment: Yes. If this is the case, are the frequent references of concern for harbour porpoise (*Phocoena phocoena*) greater than they need to be? While it is possible that porpoise might become entangled in gill nets, it has been my understanding that it is tangle nets that pose a significantly greater risk than gill nets. MML Comment: this is true, but it remains an issue for the fishery nonetheless, as noted by the other peer reviewer. Indeed, this is what may be meant by "catches of harbour porpoise are greatest in large mesh size gill nets of a type not used in the saithe fishery (§ 2.2.1.3). If these "large mesh" gill nets are actually tangle nets, the distinction should be made explicit. MML Comment: These are not tangle nets, merely (as stated) gill nets with larger mesh sizes.

Further clarification may also be necessary with respect to descriptions of and references to Danish-seine fisheries. Traditionally, this has always been a relatively lightweight fishing gear with a correspondingly light seabed footprint. Simply speaking, it is a trawl-shaped net but, as the report states, is shot somewhat in the manner of a purse seine, i.e. by encirclement. Once shot, the net is hauled back towards the anchored boat

rather than being towed like a conventional trawl. Not only is the net construction lightweight, but the warps are typically made of rope rather than wire. The lightweight construction and method of operation mean that, in general, it is not suited for use other than across a level or relatively level (i.e. smooth) seabed. This being the case, it is difficult to reconcile the frequent references made in the scoring assessments to adverse interactions between Danish seines and cold-water coral reefs (e.g. § 2.1.3.1; 2.1.5.3). If this is a real interaction causing genuine cause for concern it suggests a form of Danish seine construction and deployment that differs from the (historic) norm and one for which a more detailed description would be helpful. MML Comment: The comments above are accepted, but this issue has necessarily been treated by the assessment team in a precautionary manner, i.e. in the absence of specific information, the team considered Danish seines as having the same potential impact as trawls.

Discards, By-catch and Non-target Species Interactions

The interaction the saithe fishery with cod is well understood and given appropriate consideration, as are potential concerns for marine mammals, even if porpoise–gill-net interactions are overstated (see above). The picture with respect to skates and rays, however, is somewhat confused in its presentation. For example, in § 2.1.5.2 it states: "*Non-commercial* species such as skates and rays …." but elsewhere (§ 2.2.1.2) "Russia and Norway are the most prominent and constant countries *landing* skates and rays from the Norwegian Sea", albeit as by-catch (in trawl, Danish seine, hook and line, and tangle nets if these are used rather than just gill nets – but highly improbable for purse seines, § 2.2.1.2). MML Comment: This is as noted in the report. If "Red List" species or ecosystem management plans (§ 2.2.1.1) are to be implemented effectively for vulnerable species, including skates and rays, it is essential that both the quantity and quality of by-catch data from all Norwegian (and EU) fisheries is improved. MML Comment: Agreed, and identified in Condition 2. (In this context, however, the relevance of the reference to status of common skate *Dipturus/Raja batis* in the southern North Sea (ICES Division IVc) seems something of a *non sequitur* (§ 2.2.1.1). MML Comment: Under Norwegian regulations, discard prohibitions apply to designated 'commercial species', which do not include skates and rays. *Raja batis* was used as an example to demonstrate the vulnerability of the group to fishery impacts. These points have been further clarified in the scoring comments.

Management Regime

The implied criticism that "linkages between fisheries management agencies/ departments and their nature conservation equivalents do not appear to be clearly established" (§ 3A.1.1) must not be taken as being something unique to Norway. It is a statement of fact that is no less true of (some) EU member states, but is a situation that is probably improving, albeit slowly.

Similarly, the comment that "there is no evidence, however, of an established stock assessment quality control procedure within Norway, outside of the ICES framework" (§ 3A.1.3) is not unique to Norway, but it seems to miss part of ICES' *de facto* role. Each member country's scientists take their work to ICES stock assessment meetings where it is subject to a two-tier quality control procedure. The first is by immediate peers at individual stock assessment meetings and then subsequently the quality and reliability of each assessment group's work is assessed, not least by comparison with other stock assessments, at meetings of ICES' Advisory Committee on Fishery Management (ACFM). Year on year, this process is likely to provide a more rigorous measure of quality control than anything that might be done by Norway in-house. MML Comment: Agreed. There is a very close interaction between IMR and ICES, and this functions as stated here.

Overall Conclusions

As indicated above, there are aspects of the report and assessment that raise questions that might influence the way this fishery could, or even should be viewed, not least the question of stock definition and structure. On balance, however, none is of sufficient significance to affect the Report's primary findings and recommendations. Where the fishery has been awarded a high score, high scores are justified. Similarly, where there are low scores, these are also justified and serve to highlight shortcomings in either knowledge or practice. The more significant shortcomings have been picked up in the recommended conditions that should be attached to certification, conditions that are demanding but not unreasonable. Only with Condition 1is there cause for some misgiving.

Condition 1, for all gears in both NEA and North Sea fisheries, is less transparent than it might be and Fiskebat would undoubtedly find it much easier to prepare the action plan demanded if the aspects of uncertainty were identified more explicitly. If one assumes that a significant cause for uncertainty in stock projections is the lack of a recruitment index for fish younger than age 3, is it reasonable to expect Fiskebat to resolve this particular problem? If there were a viable solution, it is no less reasonable to assume that the Norwegian fishery research institute would have found it and implemented an appropriate monitoring programme. The fact that the natural distribution 0–1, if not 0–2 year old saithe means they are inaccessible to quantitative monitoring techniques is something we must live with. It is not something that will alter or be resolved just because we think it would result in better stock assessments. MML Comment: This issue remains a significant potential source of uncertainty under current assessment and management approaches and hence is relevant to IMR and ultimately Fiskebat. It may be unnecessary to look into this when the stock is in good health (and hopefully it will stay that way), but if one or all of the stocks start to decline than this will become significant. Therefore there is a need to investigate the issue and a number of possible approaches may be available.

If Condition 1 could be redrafted and aspects of fishing gear usage clarified it would be helpful but, as with the rest of the comments presented above, none is sufficient to

confound the Report's conclusions. I support the recommendation that the Norwegian saithe fishery receives MSC certification.

Annex a.3 Peer Review B

Norwegian saithe fishery

This is generally an authoritative report and the scoring of the fishery has been appropriately justified. The conditions proposed for award of an MSC certificate cover almost all of the main noted issues (e.g. by-catches and discards of non-commercial species) and uncertainties. These Norwegian fisheries score particularly highly under principle 3 (management system), with the notable exception of formalised precautionary procedures for by-catch species and fishing in areas of coral. Additional specific comments appear below.

The presentation of the report suffers from various minor inconsistencies of style and the frequent repetition of the same blocks of text for NE Arctic and North Sea fisheries, both within the main report and the tables of comments, while possibly inevitable, is irritating. To avoid the repetition, perhaps the text could instead be divided into (a) comments pertinent to both fishery areas, (b) comments specific to the NEA fisheries, (c) comments on North Sea fisheries. Another issue is that, due to careless formatting of the tables, several large chunks of text are hidden from view. MML Comment: The report is prepared so as to avoid having to read 10 separate reports. The intention, as there are 10 separate 'Units of Certification' is to avoid excessive repetition.

Is this a discrete stock?

The NE Arctic and North Sea saithe fisheries exploit saithe that may or may not constitute discrete populations (it is implied on P31 that they are separate) but there is movement of fish between them (P35) and this lack of real separation is taken into account in assessment (P34). The saithe "stocks" in areas VIa and IVa are variously referred to as being the same (top of page 12) or different (P14). They are in any case assessed together (page 35). Section 1.1.1.3 also mentions Faroes and Icelandic stocks: a definitive statement about stocks is needed at the start of the report. MML Comment: This issue is considered in the response to Peer Review A.

The saithe fisheries seeking certification are not the only fisheries exploiting the stock(s) in question, given that various other countries take saithe in the North Sea and the North Sea (IVa) stock is not considered to be separate from the west of Scotland (VIa) stock.

General monitoring and assessment

The report expresses some reservations about assessments in both areas, due to possible biases and unmeasured uncertainty (although the term "large retrospectives", page 38, needs explanation).

There appear to be data quality issues in the NE Arctic saithe assessment: one tuning fleet (purse seine) is no longer used, leaving only one (trawl) and this is recognised as an issue by the relevant ICES WG. However stock status appears to be healthy, although this may be largely due to some recent years of good recruitment.

Recruitment estimation appears to be poor, related to (a) issues of pre-recruit survey coverage and (b) known but unquantified movement of juveniles between areas. The need to review the effect of migrations on the assessments has been noted (1.1.1.2).

These issues are adequately covered by Conditions 1 and 1 (both are numbered "1") on Page 57.

Fecundity at size is, as noted, not currently under review. The maturity ogive for North Sea saithe is not being monitored. A constant M is assumed for all post-recruit age classes. These aspects could be improved. In other gadids, the effect of condition on fecundity has been documented and this may be worthy of study for saithe.

By-catches of juvenile saithe in other fisheries are apparently monitored in both areas but not taken into account in assessment of the NE Arctic stock.

By-catch and discards

Discarding (slippage) of undersized saithe in the Norwegian purse seine saithe fishery (which is illegal) seems to be ignored at present. The argument that it is rare (e.g. 1.1.2.4) is unconvincing in the absence of data. MML Comment: We note this also under Performance Indicator 2.1.2.2 stating that "Some prosecutions within the purse seine fishery have been raised where overly large catches have been released (slippage) to prevent loss of fishing gear." It is acknowledged to be a rare event but can be known to occur. This issue is addressed under Condition 2.

There is little said on the effects of other fisheries on saithe in the main report text. Under 1.1.1.2 and 1.1.2.1 it is noted that other fisheries, e.g. in the NE Arctic for Norway pout, sandeels and blue whiting, may take juvenile gadoids. Data on such by-catches appear to be poor for the NE Arctic (1.1.2.4) and the inference that the issue is unimportant is not justified in the absence of monitoring. Monitoring of saithe by-catch in other fisheries in EU waters appears to be adequate. MML Comment: It is agreed that data on such by-catches can be deficient, but it is considered sufficient to evaluate the overall likely impacts on saithe stocks.

Norwegian vessels are not allowed to discard commercial fish species, although it is noted that this regulation is difficult to enforce. However, compliance with regulations is thought to be high. There is apparently no current observer programme for by-catches in Norwegian waters although log-book records appear to be rigorously monitored. By-catches of PET species such as sharks and skates are mentioned and in general by-catches of non-commercial species in the NE Arctic appear to be unquantified. By-catch and discarding of non-commercial species in saithe fisheries could thus be a serious issue. MML Comment: This appears unlikely on the basis of selectivity of gear and information provided by stakeholders, but further verification is required - hence Condition 2.

There are possible impacts of saithe fishing on cod in EU waters. As noted, EU regulations encouraging discarding are a hindrance to effective fishery management in the North Sea and presumably EU vessels discard some saithe. We know something about discards by the Scottish demersal whitefish fleet in the mid-1990s from the work of Stratoudakis but I doubt that we can be sure (as the report implies) that the problem was/is not as common in other fleets. MML Comment: Discarding in the Scottish fishery is thought to be high; French and

German trawlers targeting saithe (for example) have larger quotas, so discarding due to quota limitation is likely lower in the North Sea. Indeed, the German quota was never fully used in the last 5 years.

Marine mammal by-catches

The system for recording marine mammal by-catches in the various saithe fisheries, which could be a major issue, appears to be essentially non-existent. There was a project-based system in the NE Arctic, dependent on financial incentives to fishermen, but it ran for only 3 months. Gill nets are acknowledged to have a high impact on porpoises.

Conditions 2 (by-catches), 3 (coastal cod by-catches) and 3 (North Sea cod by-catches) (there are two condition 3s) address these points. Lack of data on by-catch of non-commercial species is flagged as an important issue in several sections of the report. By-catch of non-target commercial species is considered to be relatively well known but lack of detail on species and quantities is identified as a data gap (2.1.5.2).

Section 2.2.1.1 of the report mentions a study based at IMR on the ecology and dynamics of *Lagenorhynchus* dolphins, which involves lethal sampling. Any data on marine mammal by-catch of fisheries needs to be considered in the context of mortality to marine mammals due to hunting and research. MML Comment: Noted

In the case of marine mammals in North Sea, section 2.2.1.1 refers to plans to repeat the 1994 survey for small cetaceans. This repeat survey took place in 2005 and preliminary results are already available on the SMRU website. The outdated statement in the present report should therefore be updated. MML Comment: As this data were not available when the report was produced, this is not included. However, it is correct that SCANS II has now ended, and a new project (Cetacean Offshore Distribution and Abundance (CODA)) began in January 2007. We can therefore now say that "The populations of seals in the North Sea are monitored by a number of organisations including NERC's Special Committee on Seals (SCOS) and the Sea Mammal Research Unit, which since 2000 has carried out investigations of the level of bycatch of sea mammals in UK fisheries. In addition to these studies, harbour seals are surveyed annually in the Kattegat/Skagerrak by Swedish scientists and in the Wadden Sea by Dutch scientists. Elsewhere surveys are less frequent but data are relatively complete for most harbour seal populations in the region of the North Sea. Grey seals are also surveyed intermittently along the Norwegian coast and in the Baltic but there are no systematic surveys of abundance. A major international survey was conducted in 1994 and 2005 (known as SCANS and SCANS II) to estimate the abundance of harbour porpoises and other small cetaceans in the North Sea and adjacent waters. A new project (Cetacean Offshore Distribution and Abundance (CODA)) began in January 2007. This project will undertake surveys of offshore waters (beyond the continental shelf edge) west of UK, Ireland, France and Spain."

The statement at the end of section 2.2.1.1 that "critical habitats" are understood (apparently for all PET species) sounds somewhat over-optimistic and is not true, for example, for cetaceans. MML Comment: Modified in text. Also, Condition 4 covers cold water corals, which appear (currently) to be the PET of most concern, based on available information.

Pelagic trawls have been documented as causing significant dolphin mortality in the Celtic Sea and it is perhaps therefore unwise to dismiss them as a possible cause of cetacean mortality (2.2.1.2). MML Comment: This appears unlikely, but would be confirmed by monitoring required in the Conditions of Certification.

Ecosystem effects

Section 2.4 begins with the statement that ICES has adopted an ecosystem approach to fisheries management – perhaps further explanation is needed to provide some context to the description of ecosystem effects. This section refers to various possible ecosystem-levels impacts of fishing but suggests a lack of specific knowledge about the impact of saithe fishing. However it is noted that some saithe fishing takes place in areas with important seabird colonies or coldwater corals (pages 19-20). The latter point is addressed in detail in section 2.1.3.1 and 2.1.5.3 and it is evident that some vulnerable areas are already protected but that a full precautionary approach to protecting coldwater corals is not yet in place.

Substantial effects of trawling on benthic biodiversity are documented elsewhere (as noted on pages 23-24 of this report), so the absence of any such impact studies in the NE Arctic is arguably a gap. However, some known vulnerable habitats in the NE Arctic are already closed to bottom gear. Impacts of trawling on the benthos are evidently better documented in the North Sea but impacts on non-commercial by-catch species are noted to be "not well understood" (2.1.5.4). It is also noted that Danish seine may have adverse effects on benthic biodiversity.

Do we know which species are important to the ecosystem (e.g. capelin), as implied on page 25? While ECOPATH with ECOSIM modelling is widely used to examine the structure of food webs and to explore implications of species removals, the scientific community is divided on the merits and validity of the whole approach. MML Comment: Details of key species (the basis of the ECOPATH (e.g. Blanchard, J.L., Pinnegar, J.K. and Mackinson, S. (2002); Daskalov, G. and Mackinson, S. (2004).) and MSVPA models) are provided in section 2.4 of the report, 2.1.1.2 of the scoring table. On the issue of ECOPATH/ECOSIM validity, this is a fair comment, but these provide the best available tools to investigate such linkages.

Condition 4 addresses possible impacts on cold-water corals but I would have liked to have seen a more wide-ranging review of the effects of trawling for saithe. While it might be unfair to single out the bottom trawl saithe fishery, since trawling for all demersal species potentially has similar impacts, the saithe fishery is the one presently being considered for MSC certification. MML Comment: Research on trawl impacts is on going, as noted in section 2.1.3.1. Beam trawls (rather than otter trawls used for saithe) are likely to have the major impact on the North Sea seabed, and it is this gear that most research focuses on. Key impacts of saithe trawls are likely to be on cold water corals (addressed through conditions and recommendations), and through bycatch (condition also raised). Any implications of new findings related to trawl gear impacts would be considered at future surveillance audits. Also, Recommendation 1 talks about "whether areas of coral currently protected are sufficient… to adequately protect associated biodiversity". This requires the mapping of key habitats and trawl activities, and so will inform on the wider impacts of trawling, even if it is not specifically focusing on them.

Editorial comments

Although it can be overdone, where possible, factual statements should be supported by citations (e.g. saithe diet, page 11).

Some text about the Arctic fishery (e.g. page 15) is repeated in the description on the North Sea fishery. This occurs throughout the report and could be avoided.

There is a cut-and-paste feel to some of the text. For example, on page 24, a paragraph about ICES WGSE seem to be entirely unconnected with anything around it! The presentation of calculations of precautionary and limit reference points for the NEA stock on pages 41 and 42 (e.g. use of the phrase "magic formula") conveys the impression (correct or otherwise) that the author of the report does not understand the figures.

Aspects of the formatting need to be corrected. MML Comment: The editorial comments below have been considered in the report.

1. The Latin name of saithe should be given as early as possible (e.g. page iii).
2. Formatting of the bibliography should be harmonised (e.g. using a common format for journal names, author lists, publication year, etc). I would prefer to see the bibliograpgy at the end, with an alphabetical rather than numerical system since this makes it easier to trace specific sources.
3. Latin names of species should be italicised.
4. Use of "." As a separator for thousands should be avoided (page 12 and elsewhere); indeed it is better to avoid using a separator for thousands altogether.
5. Figures should be numbered with adequate legends, in English (e.g. pages 12, 14, 19, etc), in a consistent format (not with the same format as section headings, e.g. P39, 40).
6. Table legends should include units and tables should be cited in the text rather than floating free (e.g. page 13).
7. A common system of citations is needed, not a mixture of numerical (e.g. P20, P23), author/date (elsewhere) and freeform (e.g. P39 reference to Hirst et al 2005, P41 reference to ICES 2003, etc) formats. Even the number system is internally inconsistent with a different numbering system in the front of the report and in the footnotes, and the same reference receiving more than one number in the footnotes.
8. All abbreviations should be defined, including ones that may be obvious to assessment scientists (e.g. base of P41.
9. Font size should be harmonised.
10. Use of UK/US spelling (e.g. metre, meter) should be harmonised.
11. Subscripts and superscripts should be used instead of lowering or raising text placement since the latter upsets line spacing (e.g. P41).
12. There are some inconsistencies in numbering (e.g. of the Conditions, and numbered points in the tables of "scoring comments".
13. Several tables in the tabulated "scoring comments" contain text that is not visible on screen or printable. I was able to view this text only by copying it into another document - this should be addressed.

Conclusions

The scoring of the fishery has been appropriately justified. The conditions proposed for award of an MSC certificate cover the main noted issues and uncertainties. As indicated under the proposed conditions, recording of by-catches and discards is at present incomplete and inadequate and there is also a need to monitor wider ecosystem effects of the fisheries. These Norwegian fisheries score particularly highly under principle 3 (management system), with the exception of formalised precautionary procedures for by-catch species and fishing in areas of coral.

Appendix B

Action Plan for Meeting the Conditions for Continued Certification of the Norwegian North East Arctic and North Sea Saithe Fisheries

The Norwegian Seafood Industry (NSI) submits this Action Plan for meeting the Conditions for Continued Certification of the Norwegian North East Arctic Saithe Fisheries and the Norwegian North Sea Saithe Fisheries. NSI agrees to make a good faith effort to meet the intent of the Conditions set forth in the certifier's March 2008 Final Report determining that the NSI saithe fisheries are sustainably managed under the MSC Principles and Criteria.

NSI has set up a national working group for work associated with eco-labelling and sustainability documentation. In order to structure the follow-up of actions required, NSI will task the national working group with monitoring and following up the actions required to meet the Conditions for Continued Certification of the Norwegian North East Arctic Saithe Fisheries and the Norwegian North Sea Saithe Fisheries.

Action 1:

The Norwegian Cross-Sectoral National Industry Working Group on Eco-labelling and Documentation of Sustainably Managed Fisheries shall immediately following the final certification of the Norwegian Saithe Fisheries be tasked with monitoring and following up actions required, within the time frames given in the report and this action plan. Progress reports shall be submitted to the certifier at surveillance audits.

Condition 1:

NEA and NORTH SEA – ALL GEARS

Condition 1. Uncertainties in assessment

Action required: The assessment was considered to display considerable retrospective bias, recruitment is poorly estimated and there is an unknown effect of variable migration of animals into, and out of, the stock. If not accounted for appropriately, these uncertainties could give rise to TACs being set above precautionary levels.

To address these areas, the potential causes of the retrospective bias should be examined, alternative assumptions and model structures should be explored and the impacts of the uncertainty in inputs quantified in terms of uncertainty over the current status, projections of future stock status, and consistency of the current reference points and harvest rules with a precautionary approach. It is acknowledged, however, that this may require extensive resource allocation (indeed, extensive work on recruitment variability has been undertaken by IMR in the past which has failed to resolve this particular issue).

Therefore, two options would be considered acceptable in addressing this uncertainty:
a) Ideally, a plan to address any areas of data collection or research required to quantify and reduce uncertainty, and/or to implement actions to ensure that management is sufficiently

precautionary to deal with the observed levels of uncertainty, should be developed and initiated within 3 years of certification. The plan should include realistic timescales for completion.
b) Alternatively, and acknowledging the potential technical and resource difficulties in resolving the above issues, annual TAC setting should explicitly incorporate an appropriate degree of precaution (including for an evaluation of assessment uncertainty and error in light of historical patterns, and its impact on estimates of stock status).

Timescale: Under option a) the initial review of the assessment and its uncertainties and options for dealing with it should be carried out within 12 months of certification. Ensuing plan development should be completed and implementation initiated within 36 months of certification. Under option b), TAC's set each year should be reviewed according to their adherence with ICES advice and a precautionary harvest strategy.

Relevant Scoring Indicators: 1.1.5.2, 1.1.5.5

NSI comments and action plan:

As a general observation NSI would point to the fact that, as a private sector applicant, there are clear limits to what influence industry can (and should) exert on national and international ocean research procedures and methodology. Our powers only stretch as far as private sector bodies can reach by influencing national and international institutions to modify methodology and seek further clarification to issues as those raised under Condition 1. At the same time we would underline that management of the saithe stocks are well within precautionary limits, and the relevant national and international institutions have for several years been working seriously with methodology improvements, and as such do not need any push from industry to work towards that goal. In addition, NSI would underline that stock assessments both at IMR and ICES

- do take into account major uncertainties in the data and functional relationships
- does include an evaluation of the most important assumptions and known consequences
- does include analysis of consequences of current harvest strategies

Having stated that, NSI accepts there is some merit to the issue of uncertainty in the saithe assessments, a factor mainly caused by the nature/behaviour of the species at different life stages. As noted above and in the revised formulation of the condition, significant scientific effort has been allocated to reduce uncertainty and improve recruitment data both for the North East Arctic and the North Sea Saithe stocks. However, it has not been possible to develop methodology that predicts stock development on the basis of recruitment data. For several years large year classes has come into the stock/fishery which scientists have not been able to see at recruitment stage. On the basis of this uncertainty it has been concluded that management policy should be to keep a relatively low F in the fishery.

NSI do however declare our interest to seek further improvements to methodology and reduce certainty under Condition 1 by all means available. The certifier therefore should remain flexible and adaptive with respect to Condition 1, mindful of the limitations mentioned.

In fact, NSI would argue that there is a very strong case for re-scoring the relevant scoring indicators for Condition 1 (1.1.5.2 and 1.1.5.5). The basis for this is that only ICES Working group reports up to 2006 are included in the CBs assessment report. However, the 2007 working group reports contains new and very relevant information in relation to performance indicators 1.1.5.2 and 1.1.5.5, information that NSI believe addresses the assessment team's concerns to such an extent that a score above 80 would be reasonable.

As a basis for arguing for a re-scoring, it must be demonstrated that the assessment:

1) *takes into account major uncertainties in the data and functional relationships,*

2) *that the most important assumptions have been evaluated and the consequences are known*

3) that the assessment includes analysis of the consequences of current harvest strategies

4) if more supporting information could be found then this would present stronger arguments.

For **North East Arctic Saithe** NSI would argue that the WGAF report 2007 shows that data and functional relationships are carefully reviewed by the working group every year. This led for example to the exclusion of less reliable indices (purse seiners) as input, and adaptation in the maturity at age estimates. This demonstrates that the assessment of North East Arctic Saithe does take into account major uncertainties in the data and functional relationships**.** Further examples of this are:

- Catch numbers at age: data are updated and reviewed annually based on commercial catches and the Norwegian acoustic survey. This data is considered reliable at this stage and as such no major uncertainties are thought to be present.
- Weight at age: data are updated and reviewed annually based on commercial catches and the Norwegian acoustic survey. No major uncertainties are considered present.
- Maturity at age: a constant maturity ogive was used until the 2005 WG, when these estimates were evaluated. It was found that in later years the maturity at age had decreased somewhat, and the WG decided to use a 3-year running average for the period from 1985 and onwards (2-year average for the first and last year).

Secondly, the WGAF report 2007 shows that an annual evaluation of the assessment model does take place. This can be considered an evaluation of the most important assumptions from which consequences of different model input and setup are to an extent known. Examples of this are:

- The assessment model for North East Arctic Saithe has been evaluated by running the model based on various data sets, based on various assumptions.
- The WGAF report 2007 speaks of "sensitivity analyses" of the final assessment run (all data up to 2006 and two fleets). This run is compared to runs with different levels of F-shrinkage, catchability plateau and combinations of tuning fleets.
- A comparison of the various runs and model setups and conclusions are presented, for example: "The alternate runs represent moderate deviances from the final run, with the choice of different shrinkage levels contributing the most".

Thirdly, we would point to the fact that the Norwegian Directorate of Fisheries Autumn 2004 proposed a management strategy for North East Arctic Saithe, and the Norwegian Ministry of Fisheries and Coastal Affairs February 2007 asked ICES to evaluate whether the harvest control rule (HCR) for setting the annual fishing quota (TAC) is consistent with the precautionary approach. AFWG 2007 evaluated the HCR and found it to be consistent with the precautionary approach for all simulated data and settings, included a rebuilding situation (AFWG Report 2007, page 3). Consequently NSI would be of the opinion that it has been demonstrated that the assessment includes analysis of the consequences of current harvest strategies.

Finally, NSI would maintain the position that the uncertainties that the assessment team points to in Condition 1 is known to ICES, and as such has been part of the work with formulating harvest rules for the Saithe stocks. As such, we would conclude that the uncertainties already are incorporated in the set harvest rules. In addition Norway is already working on improving recruitment estimates. This is demonstrated by the following quotes from the WGAF 2007 report:

- "*Difficulties in estimating initial stock size are the major problem in the forecast*". The causes for this difficulty are known: *"This is due to widely divergent indices of abundance used in the tuning of the XSA, in addition to lack of reliable recruitment estimates. Prediction of catches beyond the TAC year will, to a large extent, be dependent on assumptions of average recruitment*".
- "*In the present assessment a changing retrospective pattern was observed, i.e. from underestimating stock size in the assessment year to an overestimation"*. The report went on to note that "*This calls for extra precaution when setting the quota*". This additional precaution was demonstrated by the advice and the TAC set.

Conclusion:

There is substantial additional information available on the North East Arctic Saithe assessment and management in 2007 as compared to 2006. The assessment team did not use the 2007 material. The harvest control rule has been recently evaluated and found to be

sufficiently precautionary. Based on the 2007 WGAF reports and evaluation of the harvest control rule the above shows that the assessment does take into account major uncertainties in data and functional relationships. It can also be shown that the assessment model was evaluated since it was run for various datasets. Finally the assessment evaluates the consequences of the current harvest strategy. Precaution in setting the advised F level and TAC can be demonstrated as a result of known and evaluated uncertainties. Given this, a score for PI 1.1.5.2 and PI 1.1.5.5 above the 80 level would seem reasonable.

For **North Sea Saithe** NSI similarly would argue that the WGNSSK 2007 report shows that the data and functional relationships are carefully reviewed by the working group every year. This demonstrates that the assessment of North Sea Saithe does take into account major uncertainties in the data and functional relationships. Examples are:

- For the North Sea Saithe assessment a review group has been set up. The review group signals the most important uncertainties in the data and functional relationships. These issues are subsequently addressed by the working group.
    - Example; age composition data. There seems to be a discrepancy between the Sum of Products. This was signalled by the review group and the working group plans to look into this when a new data coordinator has been appointed (as it has looked at the age composition estimates in the past). This ongoing work demonstrates a clear commitment to address data and model weaknesses on an ongoing basis.
    - Example; Weight at age data. Data from individual countries all show a consistent decrease in weight at age in the catch during recent years. In addition, the other saithe stocks in the Northeast Atlantic show similar patterns in weight at age. This indicates that the observed pattern is not a consequence of biased sampling.

Secondly, the WGNSSK 2007 report shows that the evaluation of the most important assumptions occurs and that consequences are known. Examples of this are:

- The major uncertainty is the lack of information on year-class strength for ages 1-3. To improve knowledge on year class strength, IMR began an acoustic survey along the west coast of Norway in 2006 to measure the relative abundance of saithe between age 2 and 4. In addition a shore based observation programme was initiated. This again demonstrates that there is an ongoing process of continuous improvement present to address major uncertainty in this stock assessment, that action is taken to limit the uncertainty, and that the uncertainty is taken into account in the assessment.
- The 2007 WGNSSK report also states that: *"Although this year's assessment is classified as an update assessment, the data analyses are more extensive than last year. The consistency in the input data is analysed using catch curves, separable VPA, correlation plots and standardised tuning indices".*
    - Example: *"Both the catch curves of the total landings data and the residuals from the separable VPA indicate changes in the relative exploitation of age 3 with time.*

A likely explanation of this apparent change in exploitation pattern is that the proportion of catches taken by purse seine decreased significantly in the early 1990s, and purse seiners mainly target young saithe. It may now be more appropriate to use a reference-F that does not include age 3 and this will be investigated further in the forthcoming evaluation of the EU-Norway management plan".

- Example: *"The explorations of the within and between consistencies in the available tuning series indicate that the abundance indices of age 3 are uncertain, and that age 4 indices seem to give more reliable information about year class strength"*. (i.e. the consequences of this uncertainty has been evaluated and are known).

- Example: *"The working group suggested removing the NORTRL tuning series from the assessment based on the recent diverging pattern in log-cpue curves and the large log catchability residuals from the XSA runs. In addition, the working group suggests the removal of the first year in both the survey series (1991 in IBTSq3 and 1995 in NORACU) because of the large negative logcatchability residuals (in the SPALY run)"*.

These examples again demonstrate that there is an ongoing commitment to improve the modelling used to reduce uncertainty.

Thirdly, we would point to the fact that although in the 2006-2007 assessments harvest strategies (as defined by the management plan) were not evaluated, there has been an evaluation of the EU-Norway management plan in October 2007. Results are expected in the 2008 assessment. Consequently NSI would argue that it is demonstrated that the assessment includes analysis of the consequences of current harvest strategies.

Conclusion:

There is substantial additional information available in the North Sea Saithe assessment and management in 2007 as compared to 2006. The assessment team did not use the 2007 material. Based on the 2007 WGNSSK report it can be demonstrated that the assessment does take into account major uncertainties in data and functional relationships, and that data and relationships are reviewed annually. It can also be shown that the assessment model was evaluated since it was run for various datasets. Finally there has been an evaluation of the management plan in October 2007, to determine consequences of the current harvest strategy, though this is not available yet publicly, its outcomes will no doubt be used in assessment and advice by ICES. Recent precaution in setting the advised F and TAC can be demonstrated as a result of known and evaluated uncertainties. Given this, a score for PI 1.1.5.2 and PI 1.1.5.5 above 80 would seem reasonable.

Nonetheless, and as noted previously, NSI does acknowledge that there is validity to the concern raised on uncertainty in assessments, particularly under stock situations very different from the extremely positive situation the stocks are under currently. We also

acknowledge, as of course does Norwegian authorities, IMR and ICES, that one should always strive to improve fish management and scientific methodology.

Noting that this very relevant new information on both stocks was unavailable to the assessment team at the time of the information gathering stages of the main assessment, and the procedural constraints of conducting a rescoring of the relevant indicators, combined with the client's interest in bringing the main assessment to a completion, NSI would therefore be prepared to examine whether further work aimed at addressing the issue of retrospective bias and uncertainty is feasible, or in the absence of such further studies, manage the fisheries and set TACs within the framework of the precautionary approach and based on best available scientific advice. New information could then be evaluated during the first annual surveillance audit.

Our action plan on Condition 1 would therefore consist of a combination of reviewing existing and new information, a consideration of vitalising or re-vitalising past and present work, and intermediate management policy to meet the intent of the condition.

The issues are:

- Retrospective bias in stock assessment
- Poor recruitment estimation
- Unknown effect of varying migration between the two stocks

Action 2:

During the first annual surveillance audit NSI will, together with relevant stakeholders, present to the certifier work undertaken within IMR/ICES addressing the issues raised under Condition 1, particularly addressing ICES Working group reports for 2007 and later. On the basis of this and the CBs assessment of the condition in light of new information, plans for vitalising or re-vitalising past and present work will be developed as appropriate.

Action 3

As long as the condition stands (and indeed beyond) and acknowledging the technical and resource difficulties in the issues concerned, NSI commits to an annual TAC setting that incorporates an appropriate degree of precaution, takes into consideration assessment uncertainties and error in light of historical patterns, and their impact on estimates of stock status, through annually reviewing TAC's according to their adherence with ICES advice and a precautionary harvest strategy.

Condition 2

ALL FISHERIES

Condition 2. By-catches

Action required: Sampling programmes should be initiated to provide statistically robust estimates of the by-catch of all species, including estimates of discards and slippage. Information should be sufficient to allow an assessment of the impacts of by-catches in relation to the distribution, ecology and abundance of the species and populations affected (commercial and non-commercial fish, mammals and birds).

The potential impact of non-target species removals on the populations affected and the wider ecosystem should be evaluated.

Where assessments of impacts on by-catches are shown to be significant, and for all species identified as PET, appropriate measures to reduce by-catches to acceptable and precautionary levels shall be developed and implemented.

Timescale: Sampling programmes should be designed and initiated within 12 months of certification and an initial evaluation of any potential impacts completed within 3 years of certification. Where mitigation measures are required to reduce or avoid impacts, these should be identified within 3 years of certification and fully implemented within 5 years of certification.

Relevant Scoring Indicators: 2.1.2.1, 2.1.2.2, 2.1.4.1, 2.1.5.2, 2.1.5.4 (gear), 2.2.1.2 (gear),

NSI comments and action plan

From the MML response to NSIs comments to the draft report, we draw the conclusion that this general issue of by-catches relates to non-commercial species by-catches, in particular PET species (protected, endangered and threatened).

Action 4

Within 12 months following final certification NSI shall propose further developments of the reference fleet programme to include a programme of registration of non-target species removals in the saithe directed fisheries. Non-target species in this context being non-commercial species, in particular any PET species that may occur, and not catches of other commercial species that by the nature of the fishery occurs in the normal course of the fishery.

Within 3 years potential impacts of such non-target removals shall be assessed. Where negative impacts are found, potential mitigating measures shall be identified.

Within 5 years identified necessary mitigating measures should be implemented.

Condition 3

NEA GILL NET / HANDLINE

Condition 3. Coastal Cod Bycatch

Action required: Interactions of this gear with coastal cod populations are expected to occur. Coastal cod is recognised as being in a depleted state and so MSC certified fisheries are required to be prosecuted so as to promote rebuilding. Accordingly, those vessels participating in the saithe-directed fishery should be identified and catches of coastal cod in these 'saithe-directed fisheries' recorded separately.

The coastal cod by-catch in the saithe directed fishery should then be evaluated in terms of its relative contribution to impacts on cod stocks.

It is recognised that new regulations have been introduced to achieve rebuilding of the coastal cod stocks, but that these have not yet been tested. If the new regulations are not effective in recovering stocks, restrictions on by-catches of coastal cod in saithe directed fisheries should be implemented, consistent with a recovery plan.

Timescale: Separate recording of coastal cod by-catches in saithe-directed fisheries, and evaluation of the significance of these, should be initiated within 6 months of certification. The effectiveness of costal cod rebuilding regulations should be evaluated within 3 years of certification (when sufficient data on the effectiveness of the regulations is available) and, if determined necessary, restrictions on coastal cod by-catches should be implemented within 3 years of certification.

Relevant Scoring Indicators: 2.3.1.3

NORTH SEA - ALL GEARS

Condition 3. North Sea Cod Bycatches

Action required: Interactions of this gear with North Sea cod populations are expected to occur and catches of North Sea cod in these 'saithe-directed fisheries' are currently recorded separately. North Sea cod is recognised as being in a depleted state and MSC certified fisheries are required to be prosecuted so as to promote rebuilding of depleted target and by-catch species.

The North Sea cod by-catch in the saithe directed fishery should be evaluated in terms of its relative contribution to impacts on cod stocks.

It is recognised that rebuilding measures (the cod recovery plan) have been implemented for North Sea cod. There are indications in the North Sea that the decline in cod stock status has recently stabilized, and that the recent year class could promote stock recovery if recruited into the fishery. Nevertheless, measures should be identified and implemented to minimise catches of North Sea cod and future catches should be reported in relation to the proportion of cod in saithe catches, data from previous years and the relative status of the cod stock. Measures should remain in force until cod recovery has been achieved.

Timescale: Evaluation of the extent and significance of cod catches in saithe directed fisheries should be initiated within 6 months of certification. If the evaluation indicates a significant effect, identification and testing of further measures to minimise cod bycatches should be completed within two years of certification. Measures should be fully implemented within 3 years of certification.
Relevant Scoring Indicators: 2.3.1.2, 2.3.1.3

NSI comments and action plan

With respect to coastal cod by-catches for two gear types it should be recognized that significant regulatory measures have been introduced in recent years, and work is continuously going on in a joint industry-government working group to assess further measures.

With respect to North Sea Cod by-catches we again draw the attention to the extremely low Norwegian North Sea Cod catches in general, catches that over the last years due to the very stringent management measures have fallen well short of the Norwegian TAC. Catches of cod during saithe fisheries represent a negligible part of the (low) overall Norwegian North Sea Cod catches.

Action 5

Within 6 months following final certification NSI shall propose further developments to the reference fleet programme to obtain adequate recording of coastal cod by-catches in the North East Arctic directed fishery for saithe with gill net and handline.

Within 12 months the significance of such by-catches shall be evaluated and, if necessary, an appraisal of opportunities for by-catch reductions completed.

Within 3 years the effectiveness of costal cod rebuilding regulations should be evaluated, and, if necessary, further restrictions on coastal cod by-catches in the saithe directed fisheries should be implemented.

Action 6

Within 2 years following final certification NSI shall propose further developments to the fleet reference programme to include an examination of the extent of North Sea Cod catches in the North Sea Saithe directed fisheries.

Within 2 years an appraisal of opportunities for further reductions in North Sea Cod by-catches shall be conducted if findings in the above examination leads to the conclusion that reductions are needed (by-catches are of significance). Such measures shall, if needed, be implemented within 3 years.

Condition 4

NEA – all gear except trawl and Danish seine

Condition 4. Cold Water Coral Impacts

Action required: An assessment of the potential impact of saithe directed fishing within the coral protection areas should be undertaken. If a potentially significant impact is identified, and appropriate precautionary management action should be implemented.

Timescale: An assessment should be completed in 2 years of certification. The identification and implementation of appropriate management measures should be completed within the term of the current certification.

Relevant Scoring Indicators: 3.A.3.4

NSI comments and action plan

It is suggested that any impact on cold water corals from gear types other than those prohibited from fishing in coral protection zones should be assessed. We find the suggestion valid and would be prepared to suggest assessments to this effect as an integrated part of ongoing coral examination projects by IMR. However, we would suggest a 3 year timeframe for completion.

Action 7

Within 2 years following final certification NSI shall propose further developments to the IMR coral reef mapping programme to include an assessment of fishing effort and impacts from fishing with gear other than trawl and Danish seine, in areas protected from fishing with these two gear types as a measure to protect cold water corals.

Within 3 years, if significant negative impacts from these other gear types are found to exist, appropriate management measures shall be developed and implemented.

Recommendations.

The following recommendation is not considered to be fundamental in terms of compliance with the MSC Principles and Criteria, but is considered by the certifier to be an appropriate management measure for consideration by the fishery concerned.

Recommendation 1. It is suggested that there be an evaluation as to whether the areas of coral currently protected are sufficient, in terms of population/habitat requirements to adequately protect associated biodiversity.

Action 8

As an ongoing task, NSI will commit itself to participate constructively in a recently developed informal industry-government "working group" considering issues of vulnerable habitat protection.

Within this framework NSI also commits to providing IMR with data from the fishing fleet to aid a speedy mapping of vulnerable habitats, with the aim of developing a system where the use of protection zones is supplemented by mapped "caution" areas.

As a further concrete measure, NSI will within 6 months following final certification consider the establishment of new coral protection zones.

Submitted April 2008, by the Norwegian Seafood Industry Joint Working Group, appointed by the national industry organizations representing all fleet and shore based industry groups of Norwegian fisheries.

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MSC Certification of NEA Saithe and North Sea Saithe

Comments on the draft assessment report

WWF refers to the invitation for commenting on the draft assessment report for the North East Arctic and North Sea Saithe Fisheries, and hereby provide our comments.

WWF wants to compliment the working group on their thorough work with the assessment report, and it is encouraging to see that the North East Arctic and North Sea Saithe Fisheries attain such high scores on the performance indicators.

WWF supports the report's primary findings and recommendations. A number of conditions are set by the assessment team for continuing certification, and Fiskebåt should address them accordingly. When the conditions are met WWF supports the recommendation that the North East Arctic and North Sea Saithe Fisheries receive MSC certification.

The main points of concern and need for adjustments are:

- Improved recruitment estimation and correction in the uncertainty in stock projections
- A wide-ranging review of the effects of trawling for saithe should be undertaken, and any new findings related to trawl gear impacts should be considered at future surveillance audits
- A complete monitoring and reporting system should be initiated to provide estimates of the bycatch of all species, also non-commercial, and should include estimates of discards and slippage
- Appropriate measures should be developed and implemented to reduce bycatch to acceptable and precautionary levels
- Measures should be taken to reduce the amount of discarding/slippage

Stock assessment
The stocks in question appear to be healthy, and have shown a robust growth in recent years, probably due to a combination of favorable environmental conditions, good recruitment to the stock and strict regulations of the fishery.

However, recruitment estimation appears to be poor, related to both issues of pre-recruit surveys, the lack of reliable information about year class strength before age 3 and movement of juveniles between areas. There appears to be considerable, consistent bias in estimates of SSB and fishing mortality, such that at the moment stock size is underestimated and fishing mortality overestimated by the assessment. This is not of concern at the moment, but should the reverse bias be present during a declining phase it could result in the TACs being set above precautionary levels. As a consequence there is a need for improving the models used for the stock assessments. WWF acknowledges that this is no easy task, but thinks this would provide for a much more complete stock assessment. The issue is a significant source of uncertainty under current assessment and management approaches, and a resolution may be of significant importance should the stocks start to decline. Fiskebåt should in collaboration with the Institute of Marine Science (IMR) try to correct the uncertainty in stock projections.

Fishing methods
Five methods of fishing are identified for both the NEA and North Sea fisheries: demersal trawl, gill nets, purse seines, Danish seine and hook and line.

The methods raising the most concern are trawl and purse seine. Saithe in the North Sea are mainly taken in a directed trawl fishery in deep water near the Northern Shelf edge and the Norwegian Deeps, and in a typical year, about 78 % of the Norwegian catch originates from bottom trawl. However, the total impact of trawling activities has not yet been performed. Models for the North Sea suggest that trawling reduces biomass, production, and species richness. The bottom trawl fleet has reduced benthic biomass and production by 56 % and 21 %, respectively, compared with an unfished situation. Some saithe fishing takes place in areas with important seabird colonies or coldwater corals, and substantial effects of trawling have been documented elsewhere. Some vulnerable areas, like coldwater corals, are already protected but a full precautionary approach to protecting coldwater corals is not yet in place. A more wide-ranging review of the effects of trawling for saithe would be useful, and any new findings related to trawl gear impacts should be considered at future surveillance audits.

Discards, Bycatch and "Slipping"
There is no information on the bycatch and discarding of non-commercial species, and this is a pressing issue. It may have a significant impact on the populations in question, although this is not specifically a problem for the saithe fisheries, more as for the entire fishing community.

The Norwegian Red List (2006) contains 31 marine species, including the blue skate (*Dipturus batis*) and the thornback skate (*Raja clavata*). Unfortunately, little is known on the catches of these and other PET fish species (e.g. sharks and rays) in most of the fisheries for saithe in both the North Sea

and NEA. Rays and skates are known to be taken as bycatch in demersal trawl fisheries in the North Sea, and impacts on ray populations have been identified.

The system for recording marine mammal by-catches in the various saithe fisheries, which could be a major issue, appears to be essentially non-existent. Gill nets are acknowledged to have a high impact on harbor porpoises, but there are no direct assessments of the impact of the Norwegian fishery on sustainability of the harbor porpoise population. North Sea catches are estimated at over 4 000 per annum, and in the Skagerrak, annual bycatch probably exceeds 4 % of the total population and coincides with a decline in stock size. The harbour porpoise is not on the Norwegian Redlist, but it is a species for which Norway has accepted responsibility to maintain the population status (e.g. species which are globally threatened or over 25% of the total European population resides within Norwegian waters).

Information to examine the bycatch of birds is also incomplete. However, it is know that at certain times and in certain areas, there can be relatively large bycatch of diving seabirds in gill nets. There is urgent need for restrictions on gear to reduce bycatch of vulnerable seabirds in certain areas and during certain periods

Bycatch of other fish species also occurs. The stock of most concern is cod, and there are possible impacts of saithe fishing on cod in EU waters. There is no prohibition on discarding in EU waters and as a result, fishers in EU waters discard undersized fish fetching lower prices, and over quota fish. This hinders effective fishery management in the North Sea. The purse seine fleet apparently occasionally slips catches of undersized fish, even though this is illegal, and there are no reliable statistics on the volume so slipped.

WWF thinks that a complete monitoring and reporting system should be initiated to provide estimates of the bycatch of all species, also non-commercial, and should include estimates of discards and slippage. The potential impact of non-target species removals on the populations affected and the wider ecosystem should be evaluated. Appropriate measures should be developed and implemented to reduce bycatch to acceptable and precautionary levels. It should be mandatory to implement measures that have proved effective in reducing bycatches (such as the “kjalkeskrema” bird-scaring device) which have proved effective in reducing bird bycatch in the longline fishery.

Best regards,

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