

FINAL REPORT AND DETERMINATION

MSC Final Report and Determination
for
DFPO Limfjord Mussel and Cockle Fishery



MRAG Americas, Inc.

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FINAL REPORT AND DETERMINATION

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FINAL REPORT AND DETERMINATION

Glossary

CF	Central Fishers' Association of Limfjord (Centralforeningen for Limfiorden)
CFP	Common Fisheries Policy
DFPO	Danish Fishermen's Producer Organisation (Danmarks Fiskeriforening Producent Organisation)
DHI	Danish Hydraulic Institute
DMU NERI	National Environmental Research Institute (Danmarks Miljoundersogelser)
DN	Danish Society for Nature Conservation (Danmarks Naturfredningsforening)
DTU-Aqua	Danish Technical University Aquatic Sciences (Danmarks Tekniske Universitet – Aqua)
EEZ	Exclusive Economic Zone
EFF	European Fisheries Fund
EIA	Environmental Impact Assessment
ETP	Endangered, Threatened and Protected Species
EU	European Union
GPS	Global Positioning System
GSM	Global System for Mobile Communications
IA	Impact Assessment
ICZM	Integrated Coastal Zone Management
MFPA	Mussel Fishers and Producers Association
MFLF	Ministry for Food, Agriculture and Fisheries (Ministeriet for Fødevarer, Landbrug og Fiskeri)
MLS	Minimum landing size
MoE	Ministry of Environment
MSC	Marine Stewardship Council
PI	Performance Indicator
SG	Scoring Guideline
SI	Scoring Issue
SPICOSA	Science and Policy Integration for Coastal System Analysis
SUSTAINEX	National Danish project focusing on the Impact of mussel dredging
TAC	Total Allowable Catch
UOC	Unit of Certification
VMS	Vessel Monitoring System
WFD	Water Framework Directive
WWF Danmark	WWF Denmark
WWII	World War II

FINAL REPORT AND DETERMINATION

Contents

1	Executive Summary	8
2	Authorship and Peer Reviewers	10
2.1	Assessment Team.....	10
2.2	Peer Reviewers	12
3	Description of the Fishery	13
3.1	Unit(s) of Certification	13
3.1.1	Scope of Assessment	15
3.2	Overview of the fishery	16
3.2.1	History and context of the fishery	16
3.2.2	Life history characteristics.....	16
3.2.3	Vessels and fishing gear	18
3.2.4	Landings	19
3.3	Principle One: Target Species Background	20
3.3.1	Mussel stock status.....	20
3.3.2	Management of mussel stocks.....	30
3.3.3	Other fishery removals.....	31
3.3.4	Mussel cultivation	31
3.3.5	Cockle stock status	31
3.4	Principle Two: Ecosystem Background.....	35
3.4.1	Introduction.....	35
3.4.2	Retained and discarded non-target species	36
3.4.3	Endangered, threatened and protected (ETP) species.....	43
3.4.4	Habitats	43
3.4.5	Ecosystem	54
3.5	Principle Three: Management System Background	55
3.5.1	Overview of jurisdiction, responsible agencies, stakeholders and decision-making process.....	55
3.5.2	Overview of objectives	56
3.5.3	Overview of fleet, rights and licensing	57
3.5.4	Summary of management measures (harvest controls)	58
3.5.5	Overview of monitoring, control and enforcement	59
3.5.6	Overview of the fishery's research plan.....	60
4	Evaluation Procedure	62
4.1	Harmonised Fishery Assessment	62
4.2	Previous assessments.....	63

FINAL REPORT AND DETERMINATION

4.2.1	Limfjord fisheries.....	63
4.2.2	Other MSC Certified mussel and/or cockle fisheries in Europe	63
4.2.3	Previous assessments	64
4.3	Assessment Methodologies.....	72
4.4	Evaluation Processes and Techniques.....	72
4.4.1	Site Visits.....	72
4.4.2	Consultations.....	72
4.4.3	Evaluation Techniques.....	73
4.5	Assessment of the Units of Certification	74
5	Traceability.....	75
5.1	Eligibility Date.....	75
5.1.1	Mussel Unit of Certification	75
5.1.2	Cockle Unit of Certification.....	75
5.2	Traceability within the Fishery	75
5.3	Eligibility to Enter Further Chains of Custody.....	77
5.4	Eligibility of Inseparable or Practically Inseparable (IPI) stock(s) to Enter Further Chains of Custody	77
6	Evaluation Results.....	78
6.1	Principle Level Scores	78
6.2	Summary of Scores.....	78
6.3	Summary of Conditions	78
6.4	Recommendations	79
6.5	Determination, Formal Conclusion and Agreement	79
6.6	Changes in the fishery prior to and since Pre-Assessment.....	79
7	References.....	81
7.1	Documents and Publications cited.....	81
7.2	Legislation cited.....	88
7.2.1	EC Legislation.....	88
7.2.2	Danish Legislation	88
	Appendix 1: Scoring and rationales.....	89
	Principle 1 Evaluation Tables	89
	UoC 1: Mussel fishery	89
	UoC 2: Cockle fishery	105
	Principle 2 Evaluation Tables	118
	UoC 1: Mussel fishery	118
	UoC 2: Cockle fishery	150

FINAL REPORT AND DETERMINATION

Principle 3 Evaluation Tables	184
Appendix 1.2 Risk Based Framework (RBF) Outputs	201
Appendix 1.2.1 Scale Intensity Consequence Analysis (SICA).....	202
Appendix 1.2.2 Productivity-Susceptibility Analysis (PSA)	204
Appendix 1.3 Conditions of certification	207
Unit of Certification 2: Cockle Fishery	207
Appendix 2. Peer Review Reports.....	209
Appendix 2.1 Peer reviewer 1	209
Appendix 2.2 Peer reviewer 2.....	225
Appendix 3. Stakeholder submissions.....	249
Site visit.....	249
Record of meetings conducted during site visit	249
Written submissions received during site visit / assessment.....	256
Written submissions received during consultation on report	257
Technical Oversight Comments from Marine Stewardship Council	257
MRAG Americas response to MSC Comments	260
Appendix 4. Surveillance Frequency	261
Appendix 5. Client Agreement.....	263
Appendix 6. Objections Process	264

FINAL REPORT AND DETERMINATION

List of Tables

Table 1:	List of vessels included in proposed units of certification	14
Table 2:	Number of stations sampled in mussel stock assessments in the Limfjord between 1993 and 2014 (NB no sampling occurred in 2002 and 2005).	22
Table 3:	Landings of cockles (<i>Cerastoderma edule</i> , Hjertmsling) from shellfish production areas in the Limfjord, between 2009 and 2013. Production areas that contributed more than 5% of the total catch for this 5 year period are highlighted. [Data from NaturErhvervstyrelsen fish landings database].	32
Table 4:	Cockle landings from the Limfjord by month, 2009-14. Shaded cells show the months that contribute more than 20% to annual landings. [Source: NaturErhvervstyrelsen]	34
Table 5:	Mussel catch analysis derived from the catch composition of shellfish survey samples taken during the 2014 stock survey in the Limfjord. The catch composition for the single sample with over 100kg of mussels is likely to be typical of commercial catches, which require a catch rate of 1 kg per m ² dredged. Catches of more than 10 kg of mussels per sample station (a catch rate of less than 0.1 kg/m ²) are shown, as well as the catch composition from all sample stations.	39
Table 6:	Cockle catch analysis derived from the catch composition of shellfish survey samples in the Limfjord. Catch composition is shown for all samples and subsets of samples where more than 1 kg and more than 10 kg of cockles were present in the catch. Commercial tows are likely to contain more than 10 kg per 100 m tow distance.....	40
Table 7:	Annual quantity of stones removed (tonnes) from Løgstør Bredning and Lovns Bredning Natura 2000 sites between 2009/10 and 2013/14 fishing seasons.....	48
Table 8:	Summary of assessment of cumulative effect of mussel fishing within the Løgstør Bredning and the Lovns Bredning Natura 2000 sites for fishing proposals in 2014-15 (translated from Nielsen et al, 2014 and Canal-Vergés et al, 2014 respectively).....	49
Table 9:	Summary of Previous Assessment Conditions for the Limfjord cockle fishery in 2015	65
Table 10:	Summary of Previous Assessment Conditions for the Limfjord mussel fishery in 2010	68
Table 11:	Summary of Assessment methodology used	72
Table 12:	List of meetings carried out during the site visit, with date, activity and attendance.....	72
Table 13:	Scoring components and elements considered in this assessment. Decisions on whether or not a particular PI is data deficient have been taken using the guidance set out in Table AC2 of the MSC Certification Requirements v 1.3. ...	73
Table 14:	Summary of rationale for assessment of the two units of certification	74
Table 15:	Points of landing (with official port code) where shellfish can be landed in the Limfjord and that are included within the scope of this assessment	76
Table 16:	Summary of MSC Principle level scores for the Limfjord mussel fishery (UoC1) and cockle fishery (UoC2).....	78
Table 17:	Summary of conditions	79

FINAL REPORT AND DETERMINATION

Table 18:	Scores for the Limfjord Blue Mussel and Cockle Fishery. Scores shaded green attain the unconditional pass level. Yellow shading indicates a conditional pass, and red shading would indicate a fail.	80
Table 19:	Condition 1: Research plan.....	207
Table 20:	Surveillance Score for the Fishery	261
Table 21:	MSC Fishery Surveillance levels (from MSC Certification Requirements v1.3, Table C4).....	262
Table 22:	Fishery Surveillance Plan for the Limfjord Mussel and Cockle Fishery Units of Certification.....	262

List of Figures

Figure 1:	Map of designated shellfish production areas in the Limfjord, northern Denmark. The unit of certification includes all of the production areas 1-42. Inset map shows the location of the Limfjord in Denmark. [Source: DFU website GIS viewer: http://gis.dfu.min.dk/website/Limfjord/viewer.htm]	14
Figure 2:	Picture of the mussel dredger <i>FV Jenssund</i> used in both units of certification. .	18
Figure 3:	Picture of a commercial light-weight mussel dredge.....	19
Figure 4:	Landings of blue mussels in the Limfjord, 1993-2012. [Source: Poulsen <i>et al.</i> , 2013]. Landings in 2013 and 2014 were reported to be 22,743t and 22,449t respectively.....	19
Figure 5:	Picture of a standardised dredge gear used in DTU-Aqua research surveys showing top mesh panel (25 mm).	22
Figure 6:	Average distribution and density of mussels (kg/m ²) derived from recent mussel surveys in the Limfjord [Source: DFU website GIS viewer: http://gis.dfu.min.dk/website/Limfjord/viewer.htm).	23
Figure 7:	Mussel stock biomass in the Limfjord west of Løgstør in areas deeper than 3 metres, which were open to fishing in 1993-2014. Surveys were not carried out in 2002 and 2005. Note that data gathered between 2000 and 2010 are from late summer surveys (see text). Stocks in Nissum Bredning (management areas 1-4) are not included in stock assessments carried out since 1995. [Source: Jens Kjerulf Petersen, DTU-Aqua, pers. comm.]	24
Figure 8:	Biomass of mussels in surveys of the Lovns Bredning Natura 2000 site, 1993-2014. Surveys were not undertaken in 1998, 2000, 2002, 2004 and 2005. [Source: Canal-Vergés <i>et al.</i> , 2014]	25
Figure 9:	The distribution and abundance of mussel at depths greater than 3m in Lovns Bredning in March 2014. (Source: Canal-Vergés <i>et al.</i> , 2014)	26
Figure 10:	Time series of maps of mussel density (kg/m ²) in the Lovns Bredning Natura 2000 site between 1993 and 2013. Surveys were not undertaken in 1998, 2000, 2002, 2004 and 2005. [Source: Canal-Vergés <i>et al.</i> , 2013].....	27
Figure 11:	Biomass of mussels in surveys of the Løgstør Bredning Natura 2000 site, 1993-2014. Surveys were not undertaken in 1998, 2000, 2002 and 2005. [Source: Nielsen <i>et al.</i> 2014]	28
Figure 12:	The distribution and abundance of mussel at depths greater than 3m in Løgstør Bredning in March 2014. [Source: Nielsen <i>et al.</i> , 2014].....	28

FINAL REPORT AND DETERMINATION

- Figure 13: Time series of maps of mussel density (kg/m²) in the Løgstør Bredning Natura 2000 site between 1993 and 2013. Surveys were not undertaken in 1998, 2000, 2002 and 2005. [Source: Poulson et al., 2013]..... 29
- Figure 14: Abundance of starfish in the Limfjord in waters >3m deep, 1993-2014. Shading indicates the estimated tonnage of starfish in each production area. [Source: Nielsen et al. 2014] 42
- Figure 15: Distribution of marine habitats within (a) Løgstør Bredning and (b) Lovn Bredning Natura 2000 sites. [Source: Nielsen et al. 2014 and Canal-Vergés et al. 2014 respectively]..... 44
- Figure 16: Time series of the abundance of empty shells in dredged areas in the Lovns Bredning (top) and Løgstør Bredning (bottom) Natura 2000 sites, 1993 - 2006. Neither correlation is significant [Source: Poulsen et al. 2013]. 48
- Figure 17: Map of fishing controls within (a) Løgstør Bredning Natura 2000 site where dredging is only permitted in waters deeper than 5 m and outside the shaded areas and (b) Lovn Bredning Natura 2000 site, where fish boxes applicable to fishing season 2014/2015 are shaded with black and eelgrass boxes with red. 50
- Figure 18: Map showing the location of nature conservation sites in the Limfjord (Natura 2000 sites, Ramsar sites, and eelgrass beds). The main Natura 2000 sites referred to in this report are labelled. [Source: DFU website GIS viewer: <http://gis.dfu.min.dk/website/Limfjord/viewer.htm>]. 51
- Figure 19: Map showing the location of eelgrass beds in the Limfjord (green). [Source: DFU website GIS viewer: <http://gis.dfu.min.dk/website/Limfjord/viewer.htm>]. 52
- Figure 20: Map showing the location of areas closed to dredging in the Limfjord. [Source: DFU website GIS viewer: <http://gis.dfu.min.dk/website/Limfjord/viewer.htm>]. 53

1 Executive Summary

1. This report sets out the results of the assessment of the DFPO Limfjord Mussel and Cockle Dredge Fishery against the Marine Stewardship Council (MSC) Principles and Criteria for Sustainable Fishing (MSC FCR v1.3). The assessment started in March 2015.
2. The assessment was carried out by a team of three assessors: Robert Wakeford, Julian Addison and Chris Grieve. A full account of the assessment team members' relevant experience is set out in section 2.1 of this report.
3. The evaluation process for this assessment involved gathering information relevant to the fishery during a site visit in March 2015; discussions with experts and stakeholders; and reviewing relevant literature. The assessment team then compiled a draft report, and met to evaluate the performance of the fishery against the MSC Standard. The draft report that was produced by the team has been considered by the client, subject to peer review, and was then published for stakeholder comment in 27 October 2015 before being published as a Final Report on the MSC website.
4. This assessment is somewhat unusual in that both units of certification (Danish Limfjord mussel and cockle dredge fishery) have both very recently been assessed and passed the MSC Standard for a different client group (March 2015). As such, the results of this assessment are required to be harmonised with the former. During this process, it was discovered that new information about the fishery now changed the scores of two Performance Indicators that previously scored below 80 for the cockle fishery (PI 2.1.3 and PI 2.2.3). The latest assessment does not include a condition for these two PIs, which will also be updated and removed from the previous assessment in the next surveillance audit.
5. The main strengths of this fishery are that there is a well-founded management system in place under both Danish and EU legislation, and that the stock status is good and consistent with the MSY. The fishery has a limited number of vessels licensed to catch mussels and cockles using a daily TAC system of output control. Bycatch and discards are minimal due to fishing practices that use a single vessel to first identify areas of high target species abundance. There are no known interactions with endangered, threatened or protected species. Habitat impacts within the Limfjord region are carefully managed on a regular basis through habitat impact assessments that also help manage Natura 2000 sites and other protected areas. Recent developments in electronic monitoring of vessels provide confidence that the management measures are effective and implemented.
6. There were very few weaknesses identified in the fishery. This is a reflection of the work previously carried out by DTU Aqua based on previous assessments of the mussel fishery. Some areas of concern remain, including the development of a research plan for the cockle fishery, and a single condition has been drawn up in response to these findings. The client has produced an action plan to ensure that progress is made to address this weakness.
7. MSC certification requires that each of the three MSC Principles have aggregated scores of 80 or higher; that no individual performance indicator score less than 60; and that the client provides a "client action plan" to improve the performance of indicators with scores less than 80 for which a condition has been prescribed. The fishery has met these three requirements. The assessment team has therefore recommended that this fishery **should be certified** according to the Marine Stewardship Council Principles and Criteria. The MSC Principle scores were calculated according to the procedures set out in the MSC Certification Requirements v1.3 and are set out in the table below.

FINAL REPORT AND DETERMINATION

Overall weighted Principle-level scores	UoC1: Mussels	UoC2: Cockles
Principle 1 – Target Species	89.4	84.8
Principle 2 – Ecosystem	88.0	85.0
Principle 3 – Management System	92.5	91.5

8. A score of less than 80 and more than 60 was awarded for a single Performance Indicator. A condition of certification was identified by the assessment team that would lead to an improvement in performance to a level consistent with or better than a score of 80 for this Performance Indicator. The client has produced an Action Plan that should lead to this score being attained within the 5 year period of certification for this fishery. The full condition and Action Plan is listed in section 0 of this report. The conditions of certification are summarised in the table below.

Number	Condition	Performance Indicator
Unit of certification 2: Cockles		
1	Research Plan A research plan should be prepared for the Limfjord cockle fishery that is designed to provide the management system with reliable and timely information about the effects of the fishery on the cockle stock and the components of the marine environment.	3.2.4

2 Authorship and Peer Reviewers

2.1 Assessment Team

A brief biography of the assessment team members is given below. Full CVs of the team members can be downloaded from the MSC website or obtained on request from MRAG Americas.

Dr Robert Wakeford (Assessment Team Leader)

Robert Wakeford is a Director at MRAG and has over nineteen years' experience with a broad range of multi-disciplinary skills in fisheries resource management and policy, including fish stock assessment, eco-labelling, survey design and analysis, statistical and empirical modelling, international observer programmes, database design and project management. He has gained considerable experience with the Marine Stewardship Council and associated Certification Requirements, and has conducted numerous MSC pre-assessments for a number of private clients. In addition to pre-assessments, he was Lead Assessor and P2 expert for the successful Mexican Caribbean spiny lobster fishery (Banco Chinchorro and Sian Ka'an fishery), and was responsible for testing the MSC's original Risk Based Framework (RBF) in 2006/07, prior to becoming P2 expert for the certification of the Cornwall sardine fishery. Since 2007, he has worked closely with WWF to develop a framework for implementing Fisheries Improvement Projects (FIPs) based on the Marine Stewardship Council Standard. Robert has previously conducted assessments on freshwater fish populations, and was Team Leader to conduct a fish biodiversity and fisheries survey in Sierra Leone as part of an EIA during 2006. More recently, he is working in Liberia and Sierra Leone as part of the World Bank Funded Regional Fisheries Programme (WARFP) on scientific research, stock assessment and curriculum development and is currently Project Director and Principal Investigator on numerous EU-funded projects to conduct retrospective and prospective evaluations of the Common Fisheries Policy.

Robert has completed MSC training in the use of the RBF methodology and MSC assessment team leader.

Ms Chris Grieve

Chris has 25+ years' experience in fisheries management and policy-making from local to global levels. She was first a research assistant to Australian stock assessment scientists, then as manager of complex Australian demersal fisheries. She moved to the UK in 2000 to lead the Sustainable Fisheries Policy Research Programme for IEEP, a London-based think tank where the vision was to influence change in the EU's Common Fisheries Policy. In 2002, Chris became the International Policy Director for the MSC, leading the organisation's work on standards, certification and accreditation, governing bodies and developing world fisheries. From 2005-2010, Chris's role evolved to Associate Director after she established Meridian Prime as a consulting company with a diverse portfolio of work. Chris led and participated in work on the development, evolution and implementation of the MSC standard and certification requirements. She also led and participated in sustainable fisheries projects for client organisations in Europe and the USA. As a consultant, Chris is Executive Director of EDGE Certified Foundation: a Swiss-based, global certification scheme dedicated to gender equality in Fortune 500 companies. Chris is Director of the GrowHouse Initiative Ltd: a UK company that helps businesses explore beyond the boundaries of their current practice to create compelling, unique and sustainable futures. Chris is a member of the Board of Directors for WOCAN (a non-profit focusing on gender equality in natural resource management in the global south) and on the Advisory Board of Ocean Outcomes (a US-based non-profit focusing on sustainable fisheries). Chris was a founding Trustee and Vice Chair of the ISEAL Alliance, the global sustainability standards organization; and a statutory-appointed member of two Australian fisheries management public boards.

FINAL REPORT AND DETERMINATION

Dr Julian Addison

Julian Addison is an independent fisheries consultant with 30 years' experience of stock assessment and provision of management advice on shellfish fisheries, and a background of scientific research on shellfish biology and population dynamics and inshore fisheries. Until December 2010 he worked at the Centre for Environment, Fisheries and Aquaculture Science (Cefas) in Lowestoft, England where he was Senior Shellfish Advisor to Government policy makers, which involved working closely with marine managers, legislators and stakeholders, Government Statutory Nature Conservation Organisations and environmental NGOs. He has also worked as a visiting scientist at DFO in Halifax, Nova Scotia and at NMFS in Woods Hole, Massachusetts where he experienced shellfish management approaches in North America. For four years he was a member of the Scientific Committee and the UK delegation to the International Whaling Commission providing scientific advice to the UK Commissioner. He has worked extensively with ICES and was Chair of the Working Group on the Biology and Life History of Crabs, a member of the Working Group on Crangon Fisheries and Life History and a member of the Steering Group on Ecosystems Function. He was a member of the assessment team for MSC full assessments for the Newfoundland and Labrador snow crab fishery, the Ireland and Northern Ireland bottom grown mussel fisheries, both the Estonia and Faroe Islands Barents Sea cold water prawn fisheries and the Nephrops fishery in the Skagerrak and Kattegat, and current assessments include the Eastern Canada offshore lobster fishery and the Sweden Skagerrak, Kattegat and Norwegian Deep cold water prawn fishery. He has also undertaken MSC pre-assessments and peer reviews of MSC assessments of lobster, cold water prawn, razorfish, cockle and scallop fisheries. Other recent work includes a review of the stock assessment model for blue crabs in Chesapeake Bay, USA, and an assessment of three Alaskan crab fisheries under the FAO-based Responsible Fisheries Management scheme.

FINAL REPORT AND DETERMINATION

2.2 Peer Reviewers

Reviewer 1: Dr Jo Akroyd

Jo is a fisheries management and marine ecosystem consultant with extensive international and Pacific experience. She has worked at senior levels in both the public and private sector as a fisheries manager and marine policy expert. Jo was with the Ministry of Agriculture and Fisheries in New Zealand for 20 years. Starting as a fisheries scientist, she was promoted to senior chief fisheries scientist, then Fisheries Management Officer, and the Assistant Director, Marine Research. She was awarded a Commemoration Medal in 1990 in recognition of her pioneering work in establishing New Zealand's fisheries quota management system. Among her current contracted activities, she is involved internationally in fishery certification of offshore, inshore and shellfish fisheries as Fisheries Management Specialist and Lead Assessor for the Intertek Fisheries Certification audit team. She has carried out the Marine Stewardship Councils' (MSC) certification assessment for sustainable fisheries. Examples include NZ (hoki, southern blue whiting, albacore, hake, scallops), Fiji (longline albacore) Japan (pole and line tuna, flatfish, snowcrab, scallops), China (scallops), Antarctica (Ross Sea toothfish fishery).

Reviewer 2: Prof Gavin Burnell

Professor Gavin Burnell is the current Head of the Aquaculture Research Group of the Aquaculture and Fisheries Development Centre (<http://afdc.ucc.ie>) at University of Cork. He is also Vice Head of the School of Biological Earth and Environmental Sciences (BEES). The central theme to his research has related to shellfish (mollusc, echinoderm and crustacean) aquaculture and fisheries, including scallop and mussel fisheries. Recently his research has concentrated on the interactions between aquaculture/fisheries and the environment, artificial diets and nutrition of gastropod molluscs, restoration of shellfisheries and mesocosms as alternative bivalve hatcheries. Examples of these projects include a Marine Institute project (2003 – 2006) that proposed management scenarios for Irish Sea mussel seed and coordinating the Marine Institute “Beaufort Project” (2007 –2013) that is concerned with an ecosystem approach to fisheries and aquaculture management. These and other projects have resulted in over 55 papers in refereed scientific journals, 5 books and over 70 technical or magazine articles.

3 Description of the Fishery

3.1 Unit(s) of Certification

The MSC define a unit of certification as:-

“The target stock(s) combined with the fishing method/gear and practice (including vessel/s) pursuing that stock.”

[Source: MSC Certification Requirements v1.3]

This assessment considers two potential units of certification. The difference between the two units of certification lies in the target species and fishing method. A description of the fishing methods is given in section 3 of this report.

The proposed units of certification are:

Unit of Certification 1: Mussel Fishery	
Species:	Mussel, <i>Mytilus edulis</i>
Geographical Area:	Limfjord, Northern Denmark (Shellfish Production Areas 1 - 42)
Method of Capture:	Mussel dredge
Stock	Limfjord
Management:	Danish Government
Eligible Fishers	All licensed fishing vessels nominated by DFPO.

Unit of Certification 2: Cockle Fishery	
Species:	Cockles, <i>Cerastoderma edule</i>
Geographical Area:	Limfjord, Northern Denmark
Method of Capture:	Mussel dredge modified to catch cockles
Stock	Limfjord
Management:	Danish Government
Eligible Fishers	All licensed fishing vessels nominated by DFPO.

FINAL REPORT AND DETERMINATION

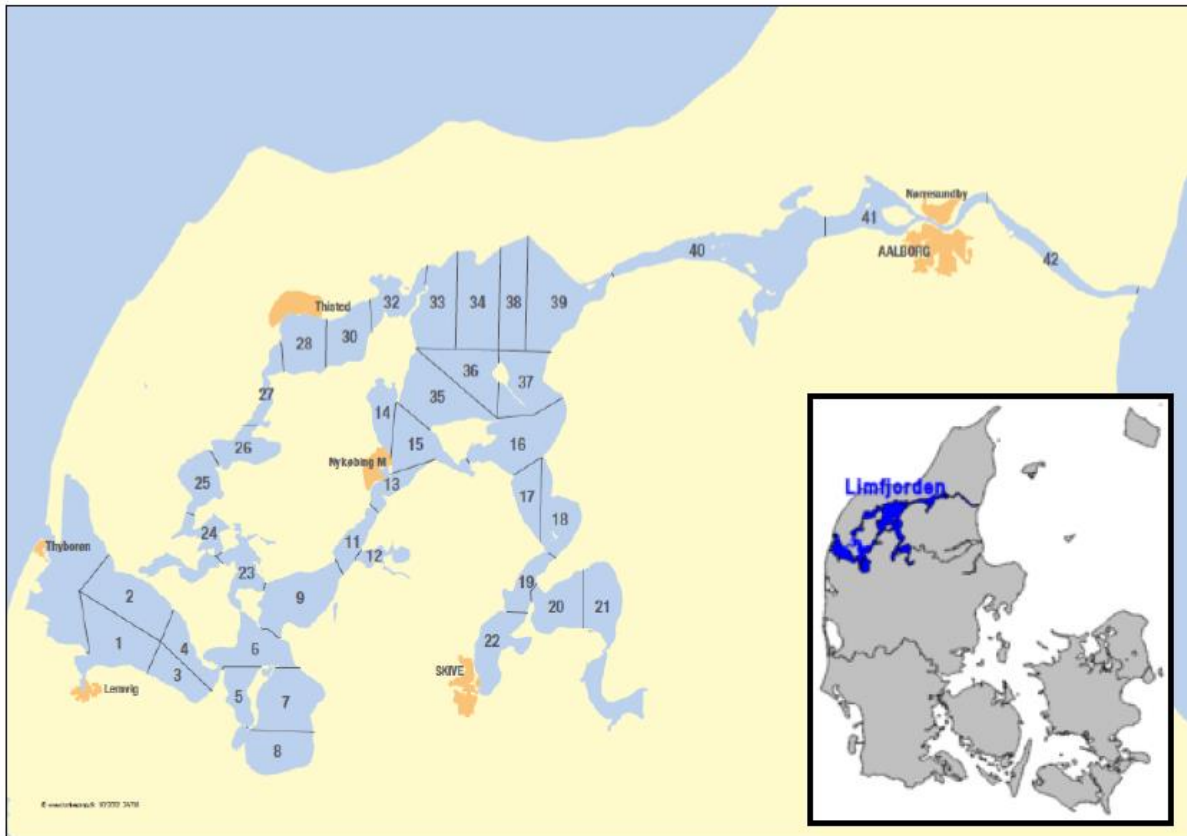


Figure 1: Map of designated shellfish production areas in the Limfjord, northern Denmark. The unit of certification includes all of the production areas 1-42. Inset map shows the location of the Limfjord in Denmark. [Source: DFU website GIS viewer: <http://gis.dfu.min.dk/website/Limfjord/viewer.htm>]

The fishery is restricted by a limited number of licences and therefore vessels is restricted to 50. In practice, there are fewer than 30 (cf. Table 1) vessels licensed to operate in the Limfjord fishery in 2015 (pers comm., A. Gadegaarde Boye, AgriFish Agency).

Table 1: List of vessels included in proposed units of certification

No.	Registration	Vessel Name
1	A60	Frida
2	E63	Sine
3	L154	Tambosund
4	L158	Heidi Bach
5	L253	Laura
6	L491	Berit
7	L500	Jens Sund
8	L54	Mads Vester
9	L560	Elektra
10	L908	Maurice
11	L929	Micthokon

FINAL REPORT AND DETERMINATION

No.	Registration	Vessel Name
12	L933	Blackie
13	L935	Sandra Pedersen
14	L941	Musse II
15	SK100	Morten Thomas
16	SK919	Margrethe P
17	SK920	Nitsen
18	SK925	Joan Kiss
19	T121	Maj
20	T132	Frk S�e
21	T192	Elly
22	T194	Rikke
23	T229	Liden Kirsten
24	T257	Lilli Helene
25	T300	Betina K�ergaard
26	T301	Edith K�ergaard

3.1.1 Scope of Assessment

MRAG Americas considers that both potential units of certification in the fishery are within the scope set out in the MSC Certification Requirements v.1.3 at §27.4.

Specifically:

- **Controversial unilateral exemptions §27.4.4.1** – the fishery is not subject to any “*controversial unilateral exemption to an international agreement*”.
- **Destructive fishing practices §27.4.4.2** – no destructive fishing practices (explosives or poisons) are used in this unit of certification.
- **Controversial disputes §27.4.5** – there are mechanisms in place for resolving disputes between the fishery and the management system.
- **Previous failed assessments / certificate withdrawals §27.4.7** – neither UoC has failed a previous assessment nor had a certificate withdrawal.
- **Inseparable or practically inseparable catches §27.4.9** – there are no non-target IPI species in the fishery.
- **Enhanced fishery §27.4.12** – these are not enhanced fisheries.
- **Introduced Species Based Fisheries §27.4.14** – these are not introduced species.

The fishery is therefore eligible for assessment against the MSC Standard.

FINAL REPORT AND DETERMINATION

3.2 Overview of the fishery

3.2.1 History and context of the fishery

The blue mussel (*Mytilus edulis*) is an important resource in the Danish fisheries and the most important fishing area for mussels in Denmark is the Limfjord. The mussel fishery in the Limfjord can be dated back to the start of the 20th century. At that time, the mussels were primarily fished for use as bait in long-line fisheries. During WWII the fishery landings increased to 85,000 tonnes for a couple of years as the mussels were exported canned to the German army.

After WWII the landing decreased to <20,000 tonnes per annum during the 1950s and 1960s. Since the late 1970s the landings of mussels increased from approximately 20,000 tonnes pa to more than 60-100,000 tonnes pa in the period 1993-2004. Landings have subsequently been reduced as a more precautionary approach to management has been introduced.

At certain times mussel dredging vessels will incorporate a smaller mesh net in their dredges to target cockles (*Cerastoderma edule*) in the Limfjord mussel fishery. Catches are highest during the spring and autumn months, when the cockles (which are normally buried in the seabed) may emerge on to the surface of the seabed and become amenable to capture in mussel dredges.

Whilst the mussel dredging vessels are clearly targeting cockles at certain times of the year, the Danish AgriFish Agency does not permit a directed fishery solely for cockles and mussel dredging vessels are only permitted to retain cockles providing that they weigh no more than 49% of the total landings from a vessel per day.

The mussel fishery was assessed against the MSC standard and certified in January 2015.

3.2.2 Life history characteristics

3.2.2.1 Mussels

The blue mussel, *Mytilus edulis* (Bivalvia: Mytilidae), has a wide distribution in the North Atlantic from Iceland and Novaya Zemlya to the Atlantic coast of southern France. *Mytilus edulis* is a sessile bivalve attached to the substratum by a byssus. Mussels can withstand wide variation in salinity, desiccation, temperature and oxygen concentration, resulting in the ability to occupy a large variety of microhabitats. Mussels can be found on any substratum providing a secure anchorage such as rocks, stones, gravel, shingle, dead shells, and even mud and sand if these substrates are stable and contain hard surfaces for settlement. In areas where there is a paucity of rocks or other hard surfaces, mussel larvae can settle on live cockle shells (Ramon, 1996). In soft bottom areas like the Limfjord, the mussels form stabilised mussel beds of interconnected mussels and dead shells. Mussel beds are often dominant in terms of biomass, and form a key component of many marine communities. These beds support their own diverse communities as the mussel matrix, composed of layers of mussels with accumulated sediments and debris provides numerous microhabitats and an organically enriched environment.

Mytilus edulis is a filter-feeding bivalve filtering primarily on micro-algae and organic detritus but at lower rates also on zooplankton (Maar et al., 2008). The tidal range in Limfjorden is low (~0.2 m) and the water circulation is forced by the predominantly eastern-directed wind. This low energy system is eutrophic, receiving nutrients from surrounding farmland areas and the primary production is high, locally exceeding 1000 mg C m⁻² day⁻¹ in summer. In periods with low wind forcing, the mixing of the water column is reduced. First, as no microalgae are transported down to the benthic mussels, the bottom water is depleted of food and the mussels stop filter feeding (Møhlenberg, 1995). Second, the combination of a

FINAL REPORT AND DETERMINATION

high algal biomass and a low mixing rate of the water column may induce oxygen depletion and mass mortality of benthic animals, especially in the more enclosed parts of the area.

Mussels follow a reproductive strategy of producing a very large number of gametes and hence planktonic larvae, of which a small proportion survive to settle and establish on the seabed. Mussels can adapt their reproductive strategy depending on environmental conditions; hence the reproductive cycle depends on the population's geographical situation. Blue mussels release gametes (approx. 3 million eggs) into the surrounding water where fertilisation takes place. After fertilisation occurs, the fertilised zygotes undergo several larval stages before settling on the seabed.

The duration of planktonic life of *Mytilus edulis* varies with temperature, food supply and availability of suitable settlement substratum; hence it can take 10 and more weeks between fertilisation and the settlement of the mussel (Seed, 1976). The maximum settlement period is in June – July, although a cohort of larvae and settlement are often observed in September.

The growth rate of mussels varies greatly and is dependent largely on the availability of food. Suspended mussels are reported to grow from settlement to a marketable size in 10-14 months. The quality of the mussels, measured as the ratio between the cooked weight of the meat and the total weight of the mussel, range from approximately 10 to 30 %.

3.2.2.2 Cockles

The cockle *Cerastoderma edule* is a common shallow-burrowing bivalve with a wide distribution along the north-eastern coastline of the Atlantic Ocean from the western region of the Barents Sea and the Baltic, and southwards to Senegal on the coast of West Africa and into the Mediterranean (Tebble, 1966). It is common in the intertidal and shallow subtidal, forming aggregated populations in a variety of sediments, notably clean sand, muddy sand, mud and muddy gravels.

Cockles can tolerate salinities down to some 10 ppt, but the normal salinity range is 15 – 35 ppt. Lifespan is typically 2-4 years in most populations, but individuals can live up to 9-10 years or more. The sexes are separate with no external morphological differences, and there is generally a 1:1 sex-ratio in any given population (Boyden, 1971). Spawning normally occurs in the summer, following rapid development of the gonads in April and May. First sexual maturity and spawning occurs at a length of around 15 – 20 mm and an age of about 18 months, but large (>15mm) 1-year-old individuals can also spawn. In the Limfjord *C. edule* undergoes a single spawning event in a short space of time (Ivell, 1981). Fecundity is extremely high (in the range 200,000 - 700,000 per animal, maximum 1.7 million (Honkoop and van der Meer, 1998). Cockle larvae are planktonic, and typically spend around 3-5 weeks in the plankton. Settlement of small cockles, known as spat, normally occurs during the summer, sometimes in densities as high as 10,000m⁻². Survival and subsequent recruitment of cockles into the adult population can be influenced by a number of factors including predation, climate, larviphagy and sediment dynamics (e.g. André & Rosenberg, 1991; Bouma et al., 2001; Flach, 2003; Beukema & Dekker, 2005). Episodic mass mortality events of unknown cause are a commonly reported feature of cockle populations (Burdon et al., 2014).

Cockles are generalist, opportunistic filter feeders; they have very short siphons and generally live within the top 5 cm of the substrate so that they can maintain contact with the overlying water for feeding and respiration. In this position they can be washed out en-masse during storms but they can also actively move to the surface of the sediment. Emergence behaviour has been linked to the occurrence of digenean parasites in the cockles which makes them more vulnerable to predation and aids the transmission of parasites to the final host. In Limfjord, seasonal emergence behaviour is very important as it

FINAL REPORT AND DETERMINATION

makes cockles available to capture in mussel dredges. In this fishery, emergence behaviour has been associated with a high frequency of the digenean trematode *Monorchis parvus* (Jens Kjerulf Petersen, personal communication) but other factors such as density-dependent processes (crowding), bacterial infections, and environmental stressors like oxygen depletion may also be involved and this is currently under investigation. Cockles have many predators at different stages in their life history (Malham et al, 2012), including brown shrimp, shore crabs, starfish, gastropods, polychaetes, fish such as flounder and plaice and wading birds, particularly oystercatchers and knot (O'Connor & Brown, 1977).

Although cockles and mussels have differing life habits, abundant populations of cockles and mussels can occur in close proximity, as in the Limfjord. Under these circumstances, competitive interactions can occur between these two filter-feeding bivalves. For example, in areas where there is a paucity of rocks or other hard surfaces, mussel larvae can settle on live cockle shells (Ramon, 1996) and cockle populations can become smothered by developing mussel beds (Meixner, 1979). However there appears to have been little study of the ecology of cockles or cockle-mussel interactions in the Limfjord.

3.2.3 Vessels and fishing gear

All vessels within the Unit of Certification are mussel dredgers, all of a similar size and power, and all of which are required to use the same type of fishing gear. A new lightweight type of fishing gear was introduced in the fishery in 2010 and is now used throughout the fishery (see Figure 2).



Figure 2: Picture of the mussel dredger *FV Jenssund* used in both units of certification.

The same dredges are used in both the mussel and cockle fisheries (see Figure 3). Because cockles are smaller than mussels, a smaller mesh net (30 mm mesh) is attached to the dredge when fishing for cockles. This net is attached to the dredge using karabiners. No other modifications are made to the fishing gear when fishing for cockles.

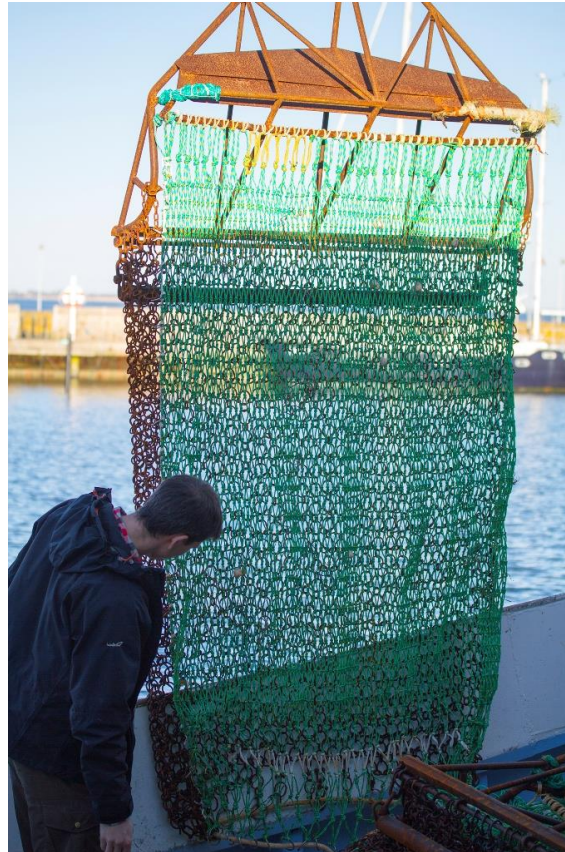


Photo: Chris Grieve

Figure 3: Picture of a commercial light-weight mussel dredge.

3.2.4 Landings

The Limfjord mussel fishery accounts for between 50-90% of the Danish mussel fishery at present. Landings of mussels in the Limfjord have declined from around 100,000t in 1990 to around 25,000t per year since 2006 (see Figure 4). Landings in 2013 and 2014 were reported to be 22,743t and 22,449t, respectively (AgriFish 2015)

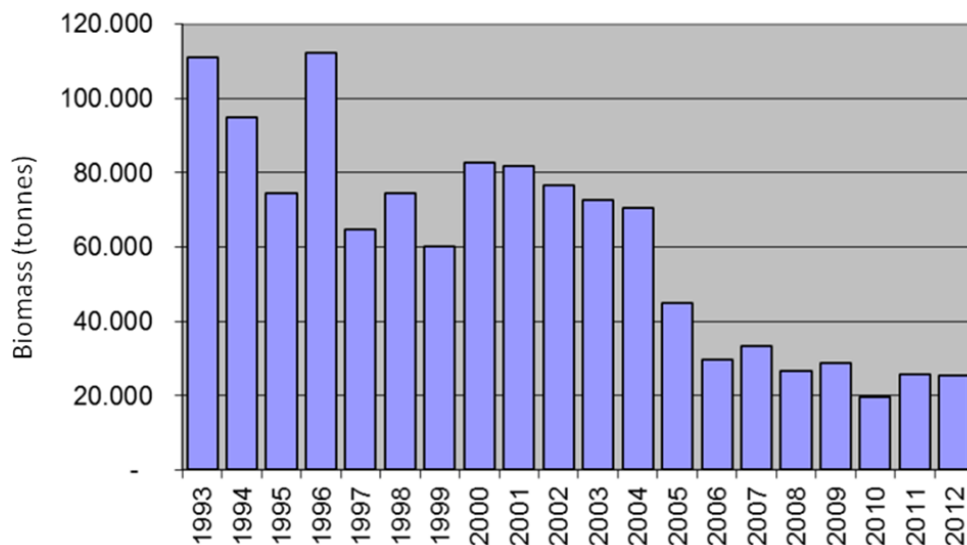


Figure 4: Landings of blue mussels in the Limfjord, 1993-2012. [Source: Poulsen *et al.*, 2013]. Landings in 2013 and 2014 were reported to be 22,743t and 22,449t respectively.

FINAL REPORT AND DETERMINATION

The fall in mussel landings is attributed to economic factors rather than a decline in the stock abundance. Mussel sales have been in decline, and there is a limited availability of mussels of a good size with a good meat yield in the Limfjord (Poulsen *et al.*, 2013). There is no evidence of a link between landings (Figure 4) and stock status (Figure 7).

3.3 Principle One: Target Species Background

3.3.1 Mussel stock status

3.3.1.1 Management Unit

The Limfjord is divided into 42 mussel production areas for food safety purposes (see

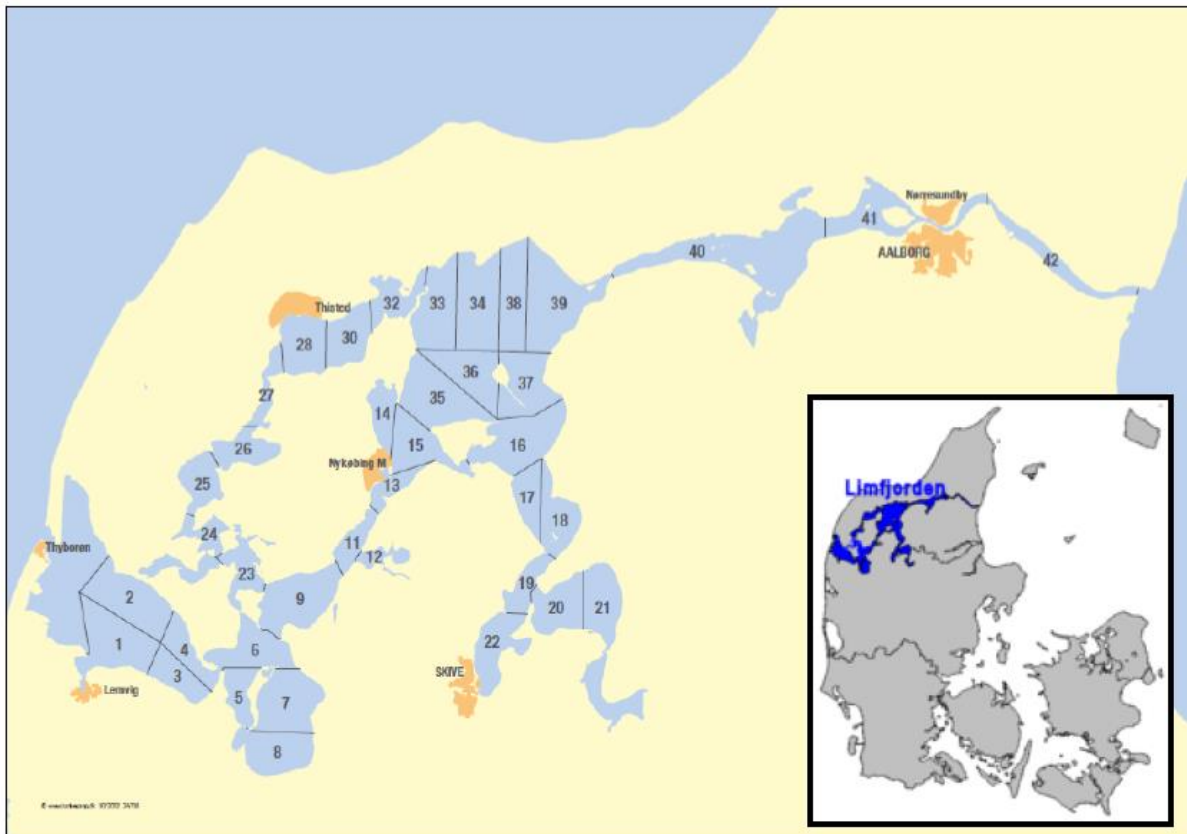


Figure 1). The status of mussels in relation to algal toxins and microbiology has to be documented before authorities allow fishing to commence. Landings of mussels (in tonnes) from the wild fishery are reported in relation to each production area, and closures are applied at this scale as well, so these areas therefore serve as the *de facto* management units for the fishery.

For management purposes, the Limfjord mussel stock is regarded as a single stock unit. There is a flow of water from the west to the eastern end of the Limfjord through the narrow entrances connecting it to the North Sea and the Kattegat, and thus a possible connection to the wider distribution of mussels outside the Limfjord. Nevertheless, all management decisions for the mussel fisheries in the Limfjord are based on the assumption that the stock is isolated, which leads to a more precautionary approach to management.

3.3.1.2 Assessments and stock status

FINAL REPORT AND DETERMINATION

Limfjord mussel stock

The Limfjord is the most important area for mussel fishing in Denmark. Since 1993, DTU-Aqua has estimated the stock of mussels in the Limfjord every year except in 2002 and 2005 (Figure 7). In the period 1993-1999 the study of the stock was carried out in the spring, from 2000-2010 the surveys were conducted in the late summer months, and then from 2011 onwards the survey has reverted to the spring. The standardised dredging gear used for research surveys is described by Dolmer (1999), which includes a bottom net mesh size of 55 mm, and a top mesh size of 25 mm (Jens Kjerulf Petersen, personal communication, 18 June 2015) (Figure 5).

Stock assessments of blue mussels in the Limfjord are based on experimental dredging in production areas 5-39 (see

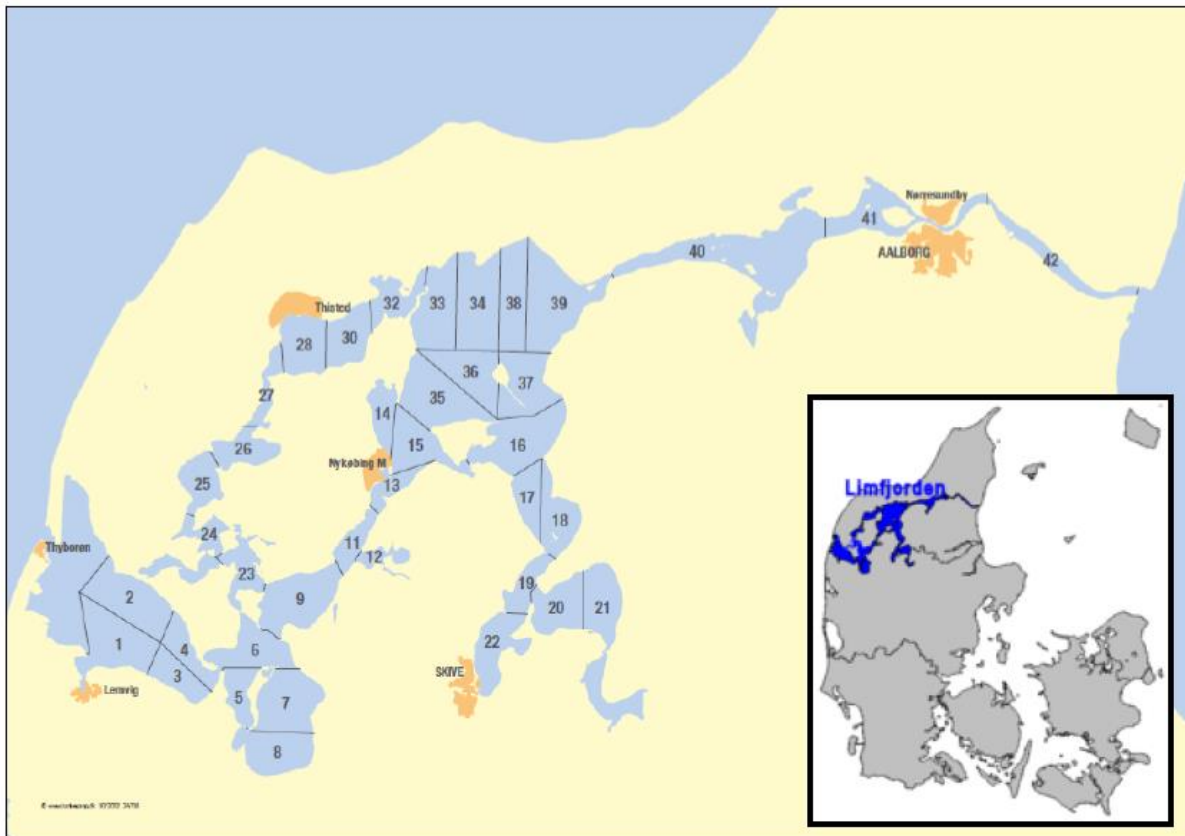


Figure 1), in the parts of these areas which are not closed by national regulation and at water depths > 3 metres. The stock size of blue mussels is estimated by annual experimental dredging undertaken at stations randomly distributed across the management areas of the Limfjord. Table 2 below displays the numbers of stations that have been surveyed annually during 1993-2014 (73-388 stations sampled annually during this time period). At each station, one dredge track of approximately 100 m² is collected. The catch is then recalculated to record the exact mussel biomass using a formula based upon a study of efficiency of the mussel dredge as a function of biomass Dolmer et al. 1999). A map illustrating the average distribution and density of mussels in the Limfjord in recent years is shown in Figure 6.

FINAL REPORT AND DETERMINATION



Photo: Danish Shellfish Centre

Figure 5: Picture of a standardised dredge gear used in DTU-Aqua research surveys showing top mesh panel (25 mm).

Table 2: Number of stations sampled in mussel stock assessments in the Limfjord between 1993 and 2014 (NB no sampling occurred in 2002 and 2005).

Year	Number of sample stations
1993	388
1994	339
1995	73
1996	154
1997	183
1998	82
1999	185
2000	77
2001	172
2002	-
2003	214
2004	131
2005	-
2006	195
2007	198
2008	186
2009	210

FINAL REPORT AND DETERMINATION

Year	Number of sample stations
2010	204
2011	204
2012	199
2013	217
2014	235

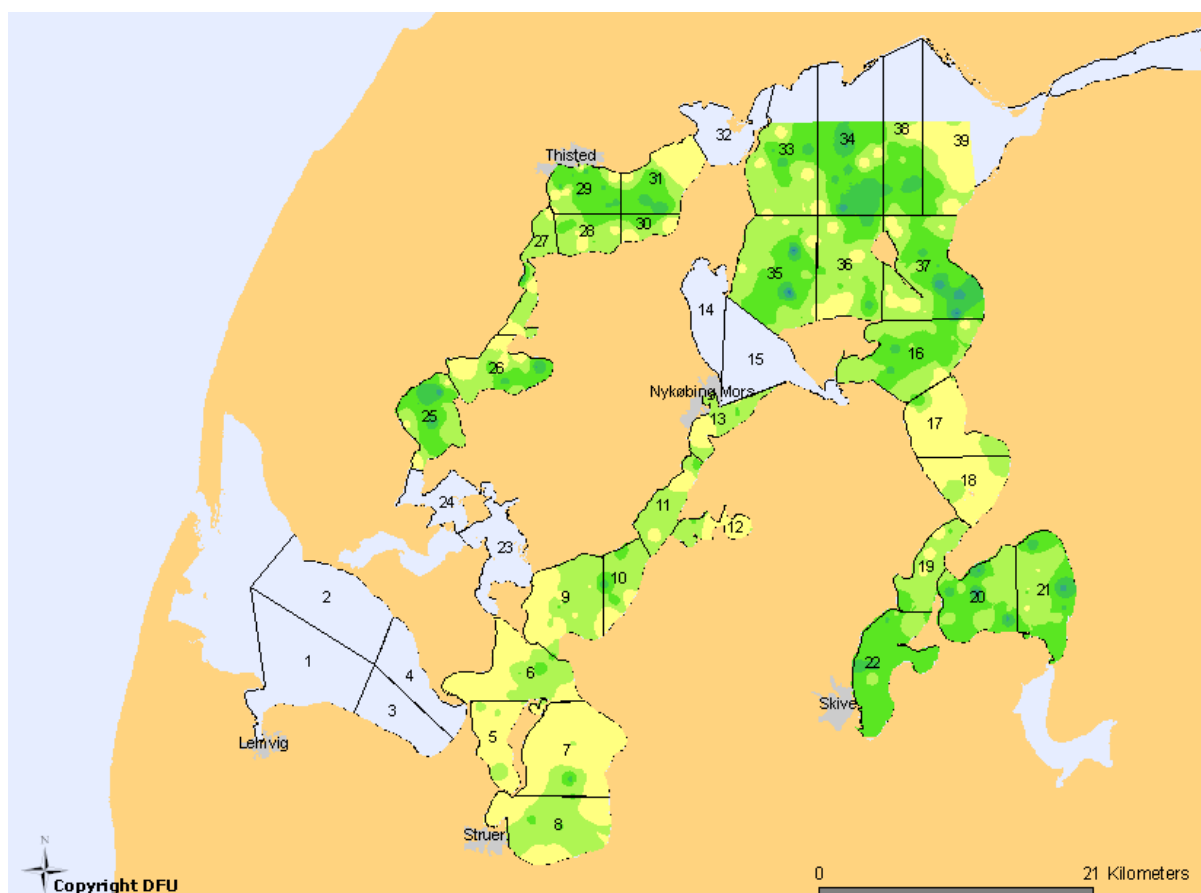


Figure 6: Average distribution and density of mussels (kg/m²) derived from recent mussel surveys in the Limfjord [Source: DFU website GIS viewer: <http://gis.dfu.min.dk/website/Limfjord/viewer.htm>].

DTU-Aqua stock assessment monitoring does not include areas with water depths less than 3 metres (as these areas are closed to the fishery), but the counties around the Limfjord have estimated that the mussel stocks lying in water depths less than 3 metres represent 325,000 tonnes in total on average from 1998 to 2002) (Data from County of Viborg; DTU-Aqua, 2006).

The estimated biomass of mussels in waters more than 3 m deep over the period 1993-2014 is shown in Figure 7. The stock in these waters was estimated to be between 400,000 and 500,000 tonnes between 2009 and 2013, but the most recent survey in 2014 estimated stock biomass to be 265,000 tonnes, a level previously observed in 2007 to 2008.

DTU-Aqua has advised that the time series of data are regarded with some caution for several reasons:-

FINAL REPORT AND DETERMINATION

- From 1993-99 and from 2011-14 the stock surveys were carried out in the spring. Between 2000 and 2009 the mussel surveys were conducted in August and in 2010 in June. The August surveys were therefore conducted after the mussels have grown in size, but during the period when summertime hypoxic conditions can reduce the stock size; while the springtime surveys represent a stock of smaller mussels that was assessed before hypoxic conditions may have had an effect on the mussels.
- To complicate matters further, the 2013 stock survey was carried out in March 2013, while previous springtime stock assessments have been carried out in May.
- The 1993 and 1994 surveys include Nissum Bredning (production areas 1-4, see Figure 6) but subsequent surveys do not.

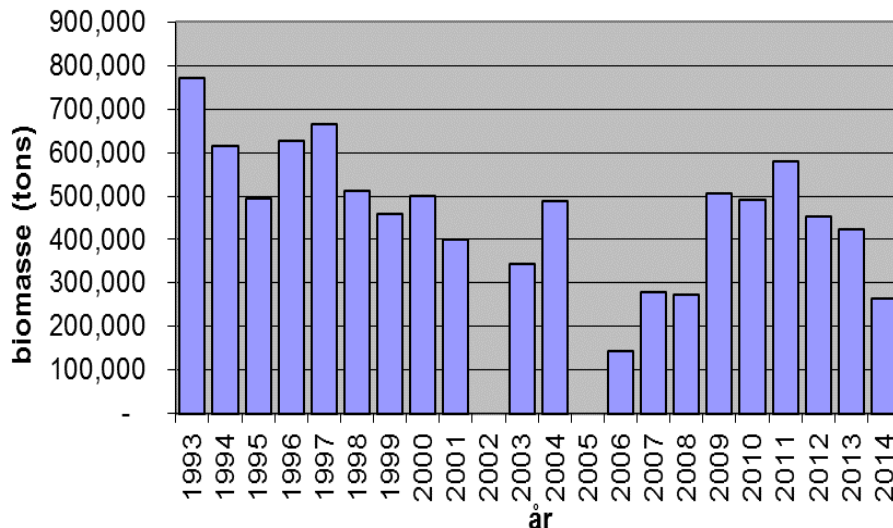


Figure 7: Mussel stock biomass in the Limfjord west of Løgstør in areas deeper than 3 metres, which were open to fishing in 1993-2014. Surveys were not carried out in 2002 and 2005. Note that data gathered between 2000 and 2010 are from late summer surveys (see text). Stocks in Nissum Bredning (management areas 1-4) are not included in stock assessments carried out since 1995. [Source: Jens Kjerulf Petersen, DTU-Aqua, pers. comm.]

Mussel stocks in Natura 2000 sites

Annual mussel stock assessments are carried out for the Løgstør Bredning and Lovns Bredning Natura 2000 sites within the UOC area (Figure 18 of this report shows the location of these areas). These stock surveys are carried out as part of the requirement set out in Article 6 of the EC Habitats Directive to assess the potential impacts of human activities on nature conservation features.

The procedure for these surveys and assessments is that the fishing industry submits a fishing plan to NaturErhvervstyrelsen. The plan proposes fishing for a specified quantity of mussels within the Natura 2000 site. NaturErhvervstyrelsen then asks DTU-Aqua to assess this proposal and to advise whether (or not) it is compatible with the nature conservation features of the site. As part of the assessment, DTU-Aqua carries out a stock assessment of the mussels within the Natura 2000 sites. The estimate of stock biomass provides an estimate of the annual production of the stock which is defined as 40-50% of the stock biomass based upon long term studies of the Limfjord mussel stock (DTU-Aqua, 2006). From a purely mussel stock perspective, a harvest rate equivalent to annual production is considered sustainable. Within the Natura 2000 sites, however, a lower harvest rate that takes into account the food requirements of shellfish-eating birds is required to ensure compatibility with the nature conservation features of the Natura 2000 site, and DTU-Aqua

FINAL REPORT AND DETERMINATION

therefore assesses the fishing industry's proposal in relation to this lower harvest rate. The advice of DTU-Aqua is presented at the Advisory Committee on Mussel Production, and then NaturErhvervstyrelsen subsequently decides on how best to manage the fishery in response to the DTU-Aqua advice and feedback from the Advisory Committee.

Lovns Bredning Natura 2000 site

The March 2014 stock survey within the Lovns Bredning Natura site found a stock of around 47,000t of blue mussels, a decrease of 58% over the 2013 stock estimate, and a return to biomass levels similar to those observed in 2006 to 2008.

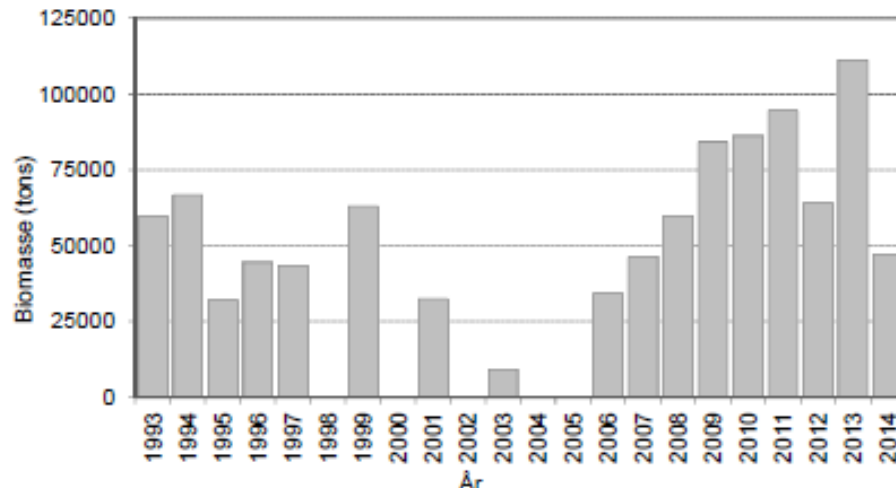


Figure 8: Biomass of mussels in surveys of the Lovns Bredning Natura 2000 site, 1993-2014. Surveys were not undertaken in 1998, 2000, 2002, 2004 and 2005. [Source: Canal-Vergés et al, 2014]

Landings of mussels from Lovns Bredning have been very low over recent years. In 2006 and 2007 landings were just over 2,500t of mussels from this area. Since then, less than 1,000t of mussels have been landed per year, and only 53.6t were landed in 2012. More recently, no reported catches (zero) were landed in 2013 and 2014, according to AgriFish statistics.

The 2013 stock assessment considered three different fishing proposals: catches of 20,000t, 15,000t or 10,000t (each including 5,000t of mussels that would be relayed elsewhere in the site for on-growing). Each scenario was considered to be compatible with the stock status, and also with the nature conservation features of the site. The quota was set at 10,000t of mussels for consumption and 5,000t for relaying, but following the observed decline in estimates of stock biomass in the 2014 survey, DTU-Aqua was asked for advice on whether this quota is sustainable.

The distribution and abundance of mussel at depths greater than 3m in Lovns Bredning in March 2014 are shown in Figure 9, and a time series of mussel density maps from 1993 to 2013 is available for the mussel stock in Lovns Bredning (see Figure 10).

FINAL REPORT AND DETERMINATION

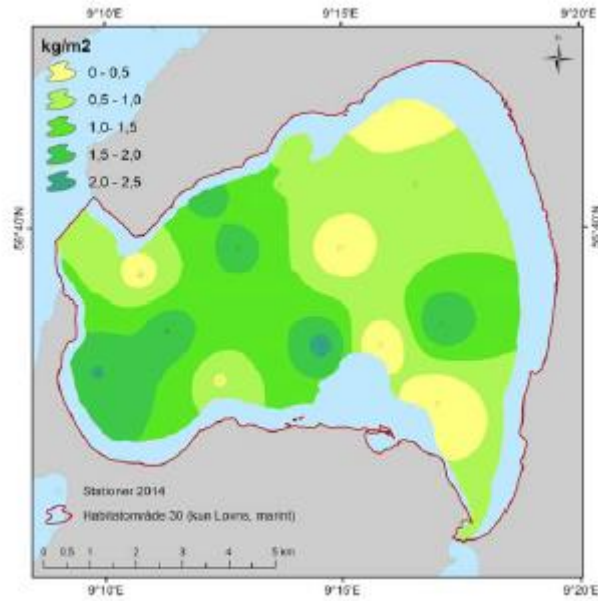


Figure 9: The distribution and abundance of mussel at depths greater than 3m in Lovns Bredning in March 2014. (Source: Canal-Vergés et al., 2014)

FINAL REPORT AND DETERMINATION

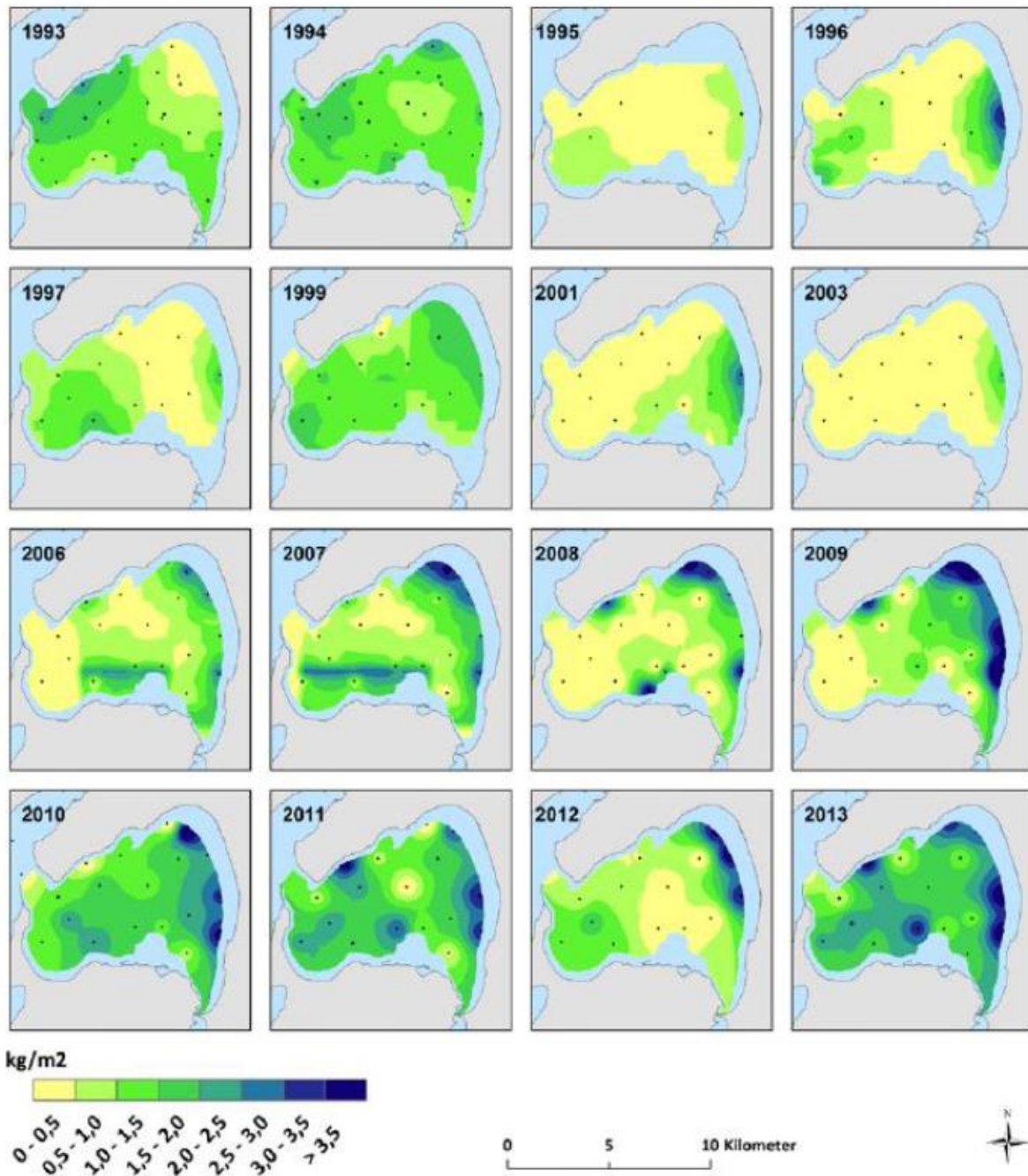


Figure 10: Time series of maps of mussel density (kg/m²) in the Lovns Bredning Natura 2000 site between 1993 and 2013. Surveys were not undertaken in 1998, 2000, 2002, 2004 and 2005. [Source: Canal-Vergés et al., 2013]

Løgstør Bredning Natura 2000 site

The March 2014 survey of Løgstør Bredning found a stock of around 49,000t of mussels in this area in waters shallower than 3m (Figure 11). This is a fall of 19% from the 2013 stock biomass. Fishery removals in 2014 from this area were 6,697 tonnes.

FINAL REPORT AND DETERMINATION

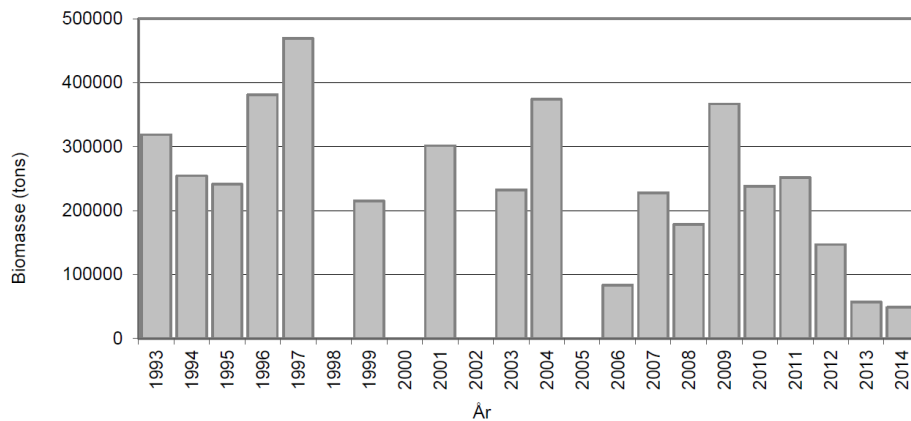


Figure 11: Biomass of mussels in surveys of the Løgstør Bredning Natura 2000 site, 1993-2014. Surveys were not undertaken in 1998, 2000, 2002 and 2005. [Source: Nielsen et al. 2014]

As a result of the 2013 stock assessment, DTU-Aqua recommended a TAC of no more than 10,000t for the Løgstør Bredning fishery, to be taken in waters deeper than 5m (and in waters deeper than 6m in some parts of the site). 5,000t of this TAC would be landed, and the other 5,000t transplanted as part of a process of stock husbandry within the site. The TAC was set in response to the stock status, and the depth restrictions were imposed to protect eelgrass beds within the site. Following the observed decline in estimates of stock biomass in the 2014 survey, DTU-Aqua was asked for advice on whether this quota is sustainable.

The distribution and abundance of mussel at depths greater than 3m in Løgstør Bredning in March 2014 are shown in Figure 12, and a time series of mussel density maps from 1993 to 2013 is available for the mussel stock in Løgstør Bredning (see Figure 13).

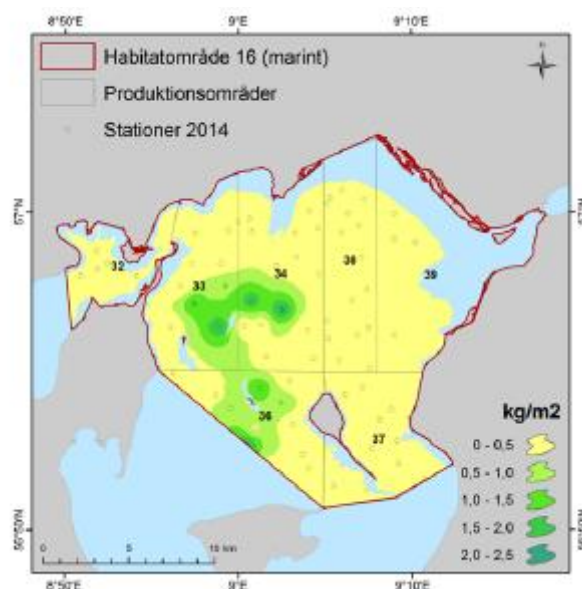


Figure 12: The distribution and abundance of mussel at depths greater than 3m in Løgstør Bredning in March 2014. [Source: Nielsen et al, 2014]

FINAL REPORT AND DETERMINATION

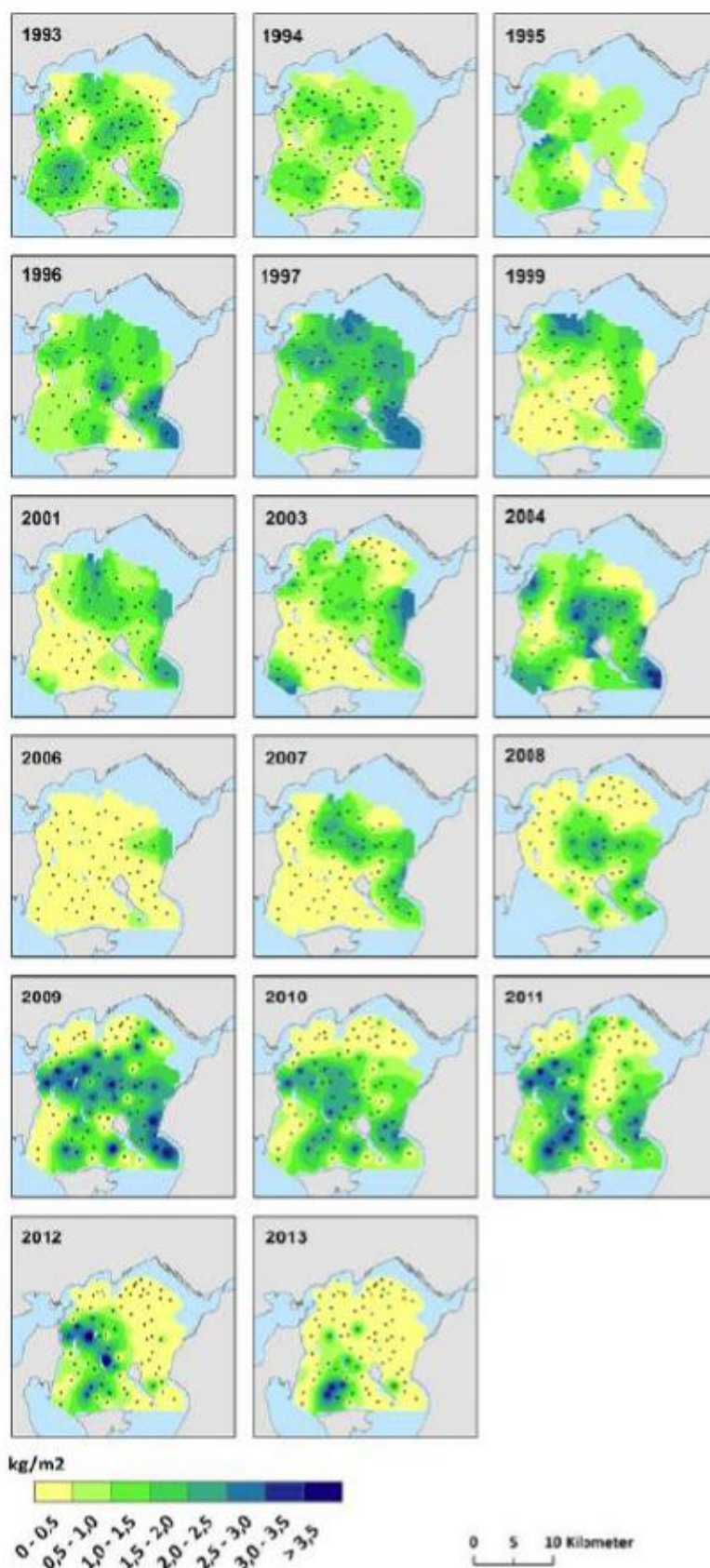


Figure 13: Time series of maps of mussel density (kg/m²) in the Løgstør Bredning Natura 2000 site between 1993 and 2013. Surveys were not undertaken in 1998, 2000, 2002 and 2005. [Source: Poulson et al., 2013]

FINAL REPORT AND DETERMINATION

3.3.2 Management of mussel stocks

Detailed information about the management of the fishery is set out in Section 4.7 of this report. To summarise for the mussel stocks, however: management advice on fishing activity is provided to the Danish Government by DTU-Aqua, resulting in a limited entry licensing scheme for mussel dredging vessels in the Limfjord, with weekly quota restrictions for each vessel, area and depth restrictions that dredgers can fish in, and the type of dredge that they can use.

In addition to the government regulations, the Limfjord fishers' association (CF) applies its own more precautionary controls to mussel fishing. Since 2005, CF has applied a voluntary quota to the fishery of 30 tonnes per day compared to the statutory government quota of 45 tonnes. This action was taken in response to a 2004 report that raised concerns about the long-term sustainability of the fishery. By 2006 it was concluded that the management measures in place would be sustainable in the long term (DTU-Aqua, 2006). CF also manages the fishery by refraining from taking shellfish hygiene samples in areas where there is a high abundance of juvenile mussels, or where mussels have a low meat yield (<14%). Although CF does not have statutory powers, in the absence of shellfish hygiene samples, these areas effectively become statutorily closed to fishing.

Within Natura 2000 sites the main focus of management advice is to ensure that mussel dredging will not adversely affect nature conservation features (seabed habitats, marine wildlife and wild birds). Management advice is based upon any area of habitat that might be dredged, and also on the possible effect the mussel fishery may have on food available for birds that feed on shellfish.

Throughout the Limfjord, dredging is not permitted in any waters shallower than 3m (and this restriction is increased to 5m throughout Natura 2000 sites, and 6m in parts of these sites close to eelgrass beds). Dredging is only permitted in the western Limfjord, and is not permitted in the vicinity of harbours or close to bathing beaches (see Figure 20). Overall, more than 50% of the Limfjord is closed to shellfish dredging.

Taken together, the management advice and the subsequent regulations result in a regime that limits shellfish dredging to a small area and secures large reserves of mussels as brood stock to safeguard ongoing recruitment to the fishery.

FINAL REPORT AND DETERMINATION

3.3.3 Other fishery removals

The only other commercial fishery in the Limfjord that catches mussels is the oyster fishery. This fishery is in the very westernmost end of the Limfjord in production areas 1-9 (see

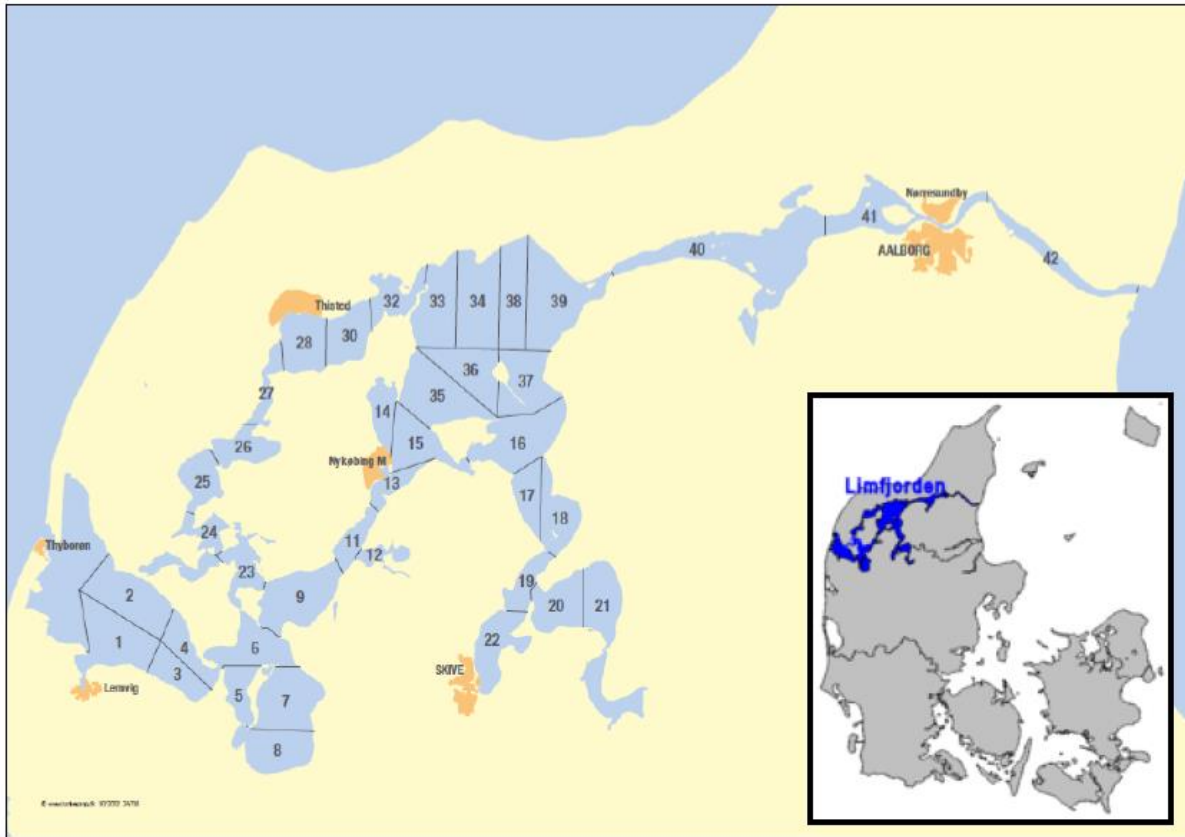


Figure 1). The oyster fishers are permitted to retain mussels up to a limit of 10% of their total catch per day.

Landings of oysters from the Limfjord are low. Oyster landings from the Limfjord peaked in 2008 when 1,500t of oysters were landed, which would equate to 150t of mussels. In the past few years, oyster landings have fallen to just a few hundred tonnes per year, which equates to just a few tens of tonnes of mussels.

The Limfjord oyster dredge fishery was MSC certified in 2011.

3.3.4 Mussel cultivation

There is a growing mussel farming industry in the Limfjord. Cultivated mussels are grown on ropes suspended in the water column. The cultivated stock is obtained from spat collectors, and there is no evidence of any adverse interaction with the wild mussel fishery.

The Limfjord mussel farming industry was MSC certified in 2011.

3.3.5 Cockle stock status

3.3.5.1 Landings data

All cockle landings from the Limfjord are reported to NaturErhvervstyrelsen and can be accessed on the NaturErhvervstyrelsen on-line database of landings (NaturErhvervstyrelsen, 2014) for the period from 2001 to the present day. Data for the past 5 complete years are shown in Table 3 overleaf.

FINAL REPORT AND DETERMINATION

Over the past 5 years, just over 5,500t of cockles have been landed from the Limfjord, with landings in the range of 0t (2009) to nearly 5,000t in 2013. Over 6,000 tonnes of cockles were landed in 2014. Most of the cockles were caught in production areas 9 (45% of landings in this period), followed by areas 11 (26%), 35 (17%), and 6 (9%). There is evidence of cockle landings from 21 production areas over the past 5 years, from area 8 in the very south of the Limfjord to area 39 which is more than 50km to the north.

Seasonal variations in cockle landings are shown for the Limfjord in Table 4. Over the past few years, the bulk of cockle landings have been made in September, October and November (contributing 79% of all landings).

3.3.5.2 Stock assessment

There is no stock assessment for cockles in the Limfjord. Information about cockle distribution and abundance in the Limfjord can be inferred from the landings data for the different production areas (reported above), which shows that cockles can be present in densities that are economically viable for fishing over a large part of the Limfjord but abundant populations are patchily distributed, both spatially and temporally. The occurrence of cockles in parts of the Limfjord is mentioned in various ecological studies (e.g. Jørgensen, 1980; Ivell 1981; Christensen et al. 2006) but there has been no detailed survey of the cockle stocks.

3.3.5.3 Fishing gear

Cockles are caught using the standard “light” mussel dredges that are used in the mussel fishery. This gear is not designed to penetrate the seabed, and can only catch cockles when they emerge onto the surface of the seabed. Emergence behaviour of cockles has been described in several other European cockle populations and has been variously associated with the presence of digenean parasites, bacteria, high cockle densities, oxygen depletion and other environmental stresses. Because cockles are smaller than mussels, a net liner is used to reduce the mesh size of the dredge when fishing for cockles to improve the retention of cockles. This results in a dredge mesh size of 30 mm. No other modifications are made to the gear.

3.3.5.4 Fishing practice

Licensed fishing vessels are permitted to land a catch containing up to 49% (by weight) of cockles (10% in Natura 2000 sites). The practice of the fishers during the cockle fishing season is to start the day by fishing for mussels. Once they have caught a quantity of mussels, they reduce the mesh size of their dredges with a small mesh liner, and then catch a quantity of cockles. They conclude their fishing day by removing the mesh lining from the dredge and fishing for mussels to ensure that they have achieved the correct catch composition (no more than 49% cockles and at least 51% mussels) before returning to port to land their catch. Because it is impossible to weigh the cockles and mussels whilst at sea, and because the catch composition is reported to NaturErhvervstyrelsen by the shellfish processors, fishers are reported to ensure that they do not land more than 45% cockles on any one day.

Table 3: Landings of cockles (*Cerastoderma edule*, Hjertmsling) from shellfish production areas in the Limfjord, between 2009 and 2013. Production areas that contributed more than 5% of the total catch for this 5 year period are highlighted. [Data from NaturErhvervstyrelsen fish landings database].

FINAL REPORT AND DETERMINATION

Area	Description	Landings (t)					Total Landings 2009-13	
		2009	2010	2011	2012	2013	Tonnes	%
1	Muslingeområde 1: nissum bredning, sydvest						0	0%
6	Muslingeområde 6: venø sund, lavbjerg, nor		11	326	47	97	482	9%
7	Muslingeområde 7: venø bugt, nord			0			0	0%
8	Muslingeområde 8: venø bugt, syd			62	6		68	1%
9	Muslingeområde 9: kås bredning, vest			9	54	2454	2517	45%
10	Muslingeområde 10: kås bredning, øst				2	36	39	1%
11	Muslingeområde 11: salling sund, syd					1442	1442	26%
13	Muslingeområde 13: salling sund, nord				0		0	0%
14	Muslingeområde 14: dråby vig						0	0%
15	Muslingeområde 15: sønder bredning			1	1	1	2	0%
16	Muslingeområde 16: øster bredning		2	1			2	0%
17	Muslingeområde 17: risgårde bredning, nord			2			2	0%
19	Muslingeområde 19: hvalpsund						0	0%
20	Muslingeområde 20: lovens bredning, vest						0	0%
21	Muslingeområde 21: lovens bredning, øst						0	0%
22	Muslingeområde 22: skive fjord						0	0%
24	Muslingeområde 24: nees sund						0	0%
25	Muslingeområde 25: visby bredning			1	0		1	0%
26	Muslingeområde 26: dragstrup vig			8			8	0%
27	Muslingeområde 27: vilsund			32			32	1%
28	Muslingeområde 28: thisted bredning, sydve				0		0	0%
29	Muslingeområde 29: thisted bredning, nordv						0	0%
30	Muslingeområde 30: Vest for Tunø						0	0%
30	Muslingeområde 30: thisted bredning, sydøst			0			0	0%
31	Muslingeområde 31: Vest for Endelave						0	0%
31	Muslingeområde 31: thested bredning, nordø						0	0%
32	Muslingeområde 32: feggesund/hovsør havn		42				42	1%
33	Muslingeområde 33: løgstør brening, vest				3		3	0%
34	Muslingeområde 34: løgstør bredning						0	0%
35	Muslingeområde 35: livø bredning, vest			0	6	918	924	17%
36	Muslingeområde 36: livø bredning, øst				0		0	0%
37	Muslingeområde 37: bjørnsholm bugt						0	0%
38	Muslingeområde 38: løgstør bredning, øst						0	0%
39	Muslingeområde 39: Lillebælt syd						0	0%
39	Muslingeområde 39: løgstør grunde						0	0%
?	Limfjorden					4	4	0%
TOTAL		0	55	442	120	4952	5568	

FINAL REPORT AND DETERMINATION

Table 4: Cockle landings from the Limfjord by month, 2009-14. Shaded cells show the months that contribute more than 20% to annual landings. [Source: NaturErhvervstyrelsen]

Month	Landings (t)						Total Landings 2009-2014	
	2009	2010	2011	2012	2013	2014	Tonnes	%
January	0			36	5		41	0.4
February				7			7	0.1
March			11	20			31	0.3
April			54	5		1,155	1,214	10.4
May			185	51		1,698	1,934	16.6
June		43	131	0		806	980	8.4
July			0				0	0
August				0			0	0
September				0	1,331		1,331	11.4
October		11		0	1,878	1,143	3,032	26.0
November			37	0	1,122	1,090	2,249	19.3
December			23	0	615	188	826	7.1
Total	0	54	441	119	4,951	6,081	11,645	100.0

FINAL REPORT AND DETERMINATION

3.4 Principle Two: Ecosystem Background

3.4.1 Introduction

The Limfjorden is the largest fjord in Denmark. It has a surface area of approximately 1,575 km² and has connections to the North Sea in the west and the Kattegat in the east (

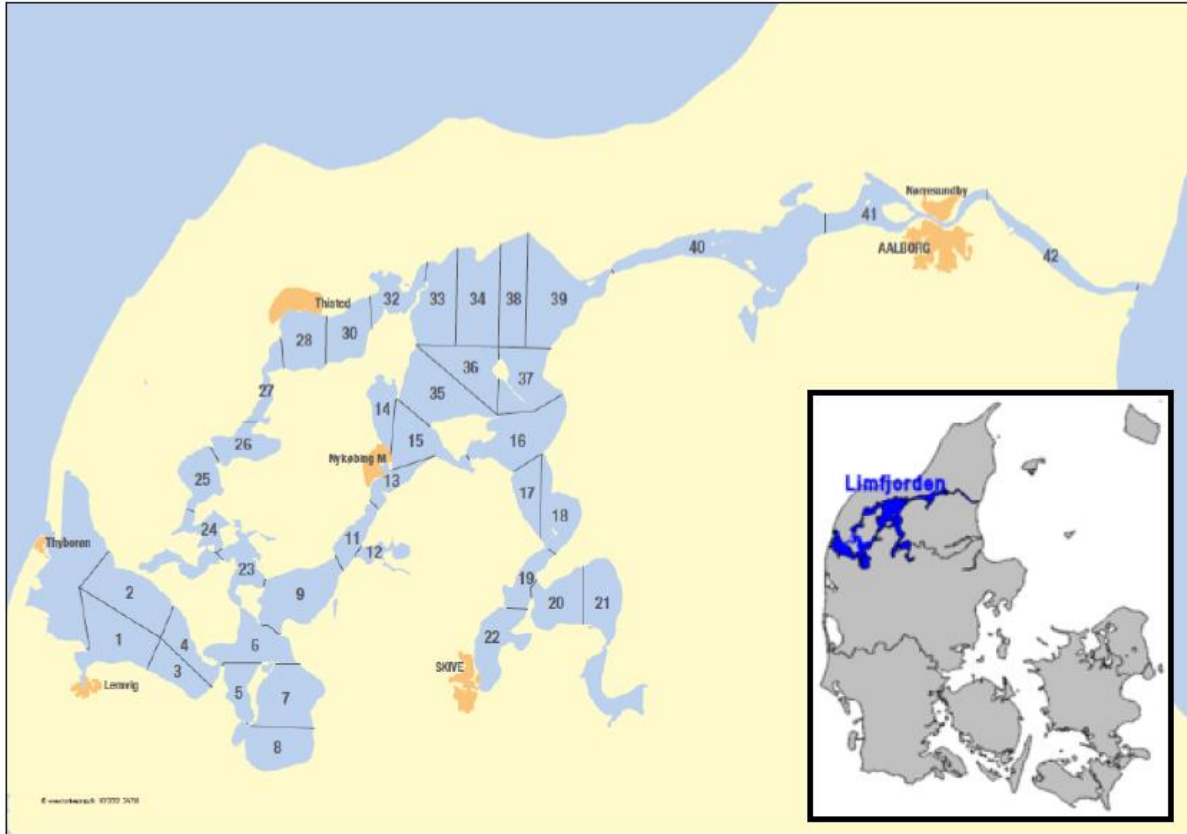


Figure 1). The connection to the North Sea has been open since 1825, following a flood that penetrated the Agger Tange isthmus. Prior to that flood the western end of the fjord consisted of a series of freshwater lakes draining eastward into the Kattegat. The Limfjorden receives salt water from both the west (salinity of 32-34 ‰) and from the Kattegat (19-25 ‰), although the net flow within the fjord is strongly from west to east. The average depth of the Limfjorden is only around 7 m and there are extensive areas of less than around 5 m. The fjord is essentially composed of a series of shallow broads (5-8 m) linked by deeper sounds (18-22 m).

The catchment consists primarily of flat agricultural land, and provides on average 2.7 km³ of freshwater runoff annually, equal to approximately one third of the volume of the fjord. As a consequence there is a high nutrient input to the fjord system that results in frequent oxygen depletion. Deoxygenation events occur to at least some degree every year and large-scale deoxygenation events are frequent particularly in certain basins. Dolmer and Frandsen (2002) point out that as much as 20% of the fjord may be affected on average. On occasion hundreds of thousands of tonnes of mussels are reportedly killed during these events. There is a complex relationship between mussels, phytoplankton and eutrophication/ oxygen levels which is discussed in further detail in section 3.4.4.2 below.

This section of the assessment considers the effect that the mussel dredge fishery may have on different components of the marine ecosystem in the unit of certification areas.

FINAL REPORT AND DETERMINATION

3.4.2 Retained and discarded non-target species

There is little or no discarding of non-target species in the fishery. Test dredging is undertaken by a single dedicated licensed vessel to locate suitable mussel beds using underwater video cameras and sonar equipment. Dredging does not occur indiscriminately, but concentrates on areas where the mussel or cockle density is high, the shellfish are larger than the MLS and where the catch of non-target species is low. The fishing and sorting process is summarised below.

When the dredges are hauled to the surface after each tow the fishers will typically “wash” the dredges by dipping them repeatedly up and down at the surface of the water; this dislodges some smaller shell, stones sand and some undersized mussels. At this stage the catch may be rejected (for instance if there are too many undersized mussels in the catch or if it contains a lot of starfish), and everything therefore released back to the seabed. Due to the regular surveying activities using sonar and video equipment this is unusual.

Once deposited in the boat’s hold, very little of the catch may be returned to the seabed, with the exception of any large stones, fish or oysters lying on the surface of the catch in the hold. To minimise the impact of the fishery on the habitat, stones greater than 2kg in weight must be returned to the seabed and since the fishers’ income is adjusted according to the proportion of good quality mussels in the landed catch there is clearly an incentive for them to do so. The weight of stones landed is recorded and logged (see section 3.4.4.2).

Fishers are required to report any landings of non-target species making up 50 kg or more of the catch as part of their licence conditions. The quantity of retained species in the catch is monitored during processing at the factories. Local fishers and factory operators report¹ that the main bycatch species are:

- Starfish, *Asterias rubens* – these are occasionally very abundant, and are avoided by dredgers. Any starfish caught form a small (<5%) part of the catch, and are landed with the catch. They are removed from the mussels and cockles during processing (for disposal with empty shells to farmland).
- Crabs, *Carcinus maenas* – these are also caught and landed, and separated from the target catch (cockles and mussels) during processing for disposal ashore. Again, abundance was considered to be far less than 5% by weight of the catch.
- Flatfish – between 10 and 30 flatfish (mostly flounder, *Platichthys flesus*) were reported by fishers to be caught per day, and those that can be reached in the vessel hold by the fishers are thrown back in the sea.

Independent information on the catch of non-target species associated with the shellfish dredge fishery² is available from the annual mussel surveys that are conducted throughout the Limfjord. These surveys are carried out using commercial fishing vessels and mussel dredges, with DTU-Aqua scientists aboard. The scientists record the quantity of mussels in each 100 m dredge tow, and also record the quantity of other species in the catch.

The annual mussel survey data provides quantitative information about the total catch of target and non-target species obtained when using a shellfish dredge when fishing for mussels, because a commercial mussel dredge is used to carry out the survey. The survey

¹ Stakeholder interviews held 11th March, 2015.

² The gear used in the surveys is a downscaled version of the ‘old’ dredge (the so-called Dutch dredge). It has remained unchanged since the 1990’s and includes a 25 mm mesh on the upper side of the dredge.

FINAL REPORT AND DETERMINATION

also provides qualitative and some quantitative information about the catch that is likely to be obtained when fishing for cockles, since the design of the survey dredge includes a 25mm mesh which is smaller than the 30mm mesh used when targeting cockles in the commercial fishery.

The results of an analysis of catch composition from the most recent Limfjord shellfish stock survey (2014) are presented in Table 5 (for mussels) and Table 6 (for cockles). This information has been derived by sub-sampling the stock survey results to show the catch associated with mussels or with cockles. Of the 235 stations sampled, mussels were only caught at 79 stations, and cockles were only caught at 7 stations. The catch composition associated with cockles and mussels are considered in turn below.

Looking at the mussel data, at most of the stations where mussels were caught, the mussel catch was very low (an average of 14.1 kg per 100 m tow). DTU-Aqua estimated that the minimum economic catch rate for mussels is 1 kg per m² dredged (which is equivalent to around 2.1 kg/m² owing to the catch efficiency of the gear). The gear used in the stock survey is the standard dredge (1.45 m wide) that is towed for 100 m to produce a sample (i.e. an area of 145 m²). On this basis, only dredge hauls in the sample data of over 145 kg of blue mussels would be economically viable. None of the samples contained this quantity of mussels (the closest was a haul of nearly 124 kg, which was the only sample with more than 100 kg of mussels).

The data shown in Table 5 include the mean weight of the catch components from all 235 sample stations, from the sample stations where more than 10 kg of mussels were caught (this is less than 1/10 of the economically viable catch limit) and for the sample station where a catch of over 100 kg was taken, which is more typical of commercial activity.

The data from all of the samples provides an indication of the high abundance of starfish in the Limfjord at present, as they make up around 22% of the total weight sampled (starfish abundance is considered further in section 3.4.2.1 of this report). It is also evident that even in areas where the mussel catch rate is much less than the minimum commercial limit, the abundance of non-target species is very low, with the most abundant non-target species (starfish) making up 3% of the catch. In the single sample where more than 100 kg of mussels was caught, starfish made up 0.5% of the catch.

A similar pattern is evident from the cockle catch data (Table 6). At the 7 stations where cockles were caught, the catch was also quite low (an average of 18.5 kg per tow). Although cockles command a higher price than mussels, the peak catch recorded in the survey results was just 64 kg for a single 100 m (145 m²) tow. DTU-Aqua has not estimated the economically viable catch rate for a cockle tow.

The catch composition data indicate that starfish make up the greatest non-target catch component when cockles are caught (around 9% of the catch). All of the other catch components are caught in much lower quantities. Shore crabs represent around 1% of the catch, and the main catch component in the survey data were unidentified material (reported to be mostly old shells).

The cockle catch analysis (Table 6) suggests that starfish could make up around 8% of the cockle proportion of the catch, whereas they make up around 0.5% of the catch in areas where mussels are most abundant (Table 5). In reality, a catch of cockles containing 8% starfish is unlikely to be acceptable to processors, and fishers would avoid areas with such a high starfish density. Nevertheless, the rules on catch composition (49% cockles: 51 % mussels) would result in the catch of starfish being less than 5% of total catch even in the “worst case scenario” of the cockle catch containing up to 9% starfish (arithmetically, $(49\% \times 9\%) + (0.5\% \times 51\%) = 4.6\%$).

FINAL REPORT AND DETERMINATION

With respect to discarding from the fishery, the only species that has been reported as a discard are flounder (*Platichthys flesus*) which fishers report are thrown back to the sea, alive, immediately after capture. Fishers report a catch rate of between 10 - 30 flounder per day of fishing, and the DTU-Aqua survey indicates a catch rate of around 0.8 g of flounder per tonne of mussels caught (and a lower value for cockles). Assuming typical landings of around 25,000 tonnes of mussels per year, then around 2 tonnes of flounder may be discarded annually.

ICES report that there is not sufficient information available to determine the status of the North Sea and Skagerrak flounder stocks with respect to biologically based limits, and that the TAC should be set at 3,160 tonnes (ICES, 2014). This figure excludes discarded flounder. The North Sea flatfish fisheries are reported to be the main source of flounder discards.

FINAL REPORT AND DETERMINATION

Table 5: Mussel catch analysis derived from the catch composition of shellfish survey samples taken during the 2014 stock survey in the Limfjord. The catch composition for the single sample with over 100kg of mussels is likely to be typical of commercial catches, which require a catch rate of 1 kg per m² dredged. Catches of more than 10 kg of mussels per sample station (a catch rate of less than 0.1 kg/m²) are shown, as well as the catch composition from all sample stations.

	All samples		Samples with >10kg mussels		Samples with >100kg mussels	
Number of samples	235		28		1	
Item	Mean Weight (kg)	Proportion of catch (%)	Mean Weight (kg)	Proportion of catch (%)	Mean Weight (kg)	Proportion of catch (%)
Mussels <i>Mytilus edulis</i>	4.7	66.6	37.5	96.5	123.9	99.5
Cockles <i>Cerastoderma edule</i>	0.55	7.7	0	0	0	0
Starfish <i>Asterias rubens</i>	1.6	22.5	1.16	3.0	0.6	0.5
Shore crabs <i>Carcinus maenas</i>	0.1	1.5	0.16	0.4	0	0
Oysters <i>Ostrea edulis</i>	0.04	0.6	0.02	0.06	0	0
Fish						
Flounder <i>Platichthys flesus</i>	0.0003	0.01	0	0	0	0
Hake <i>Merluccius merluccius</i>	0.02	0.3	0	0	0	0
Sand gobies <i>Pomatoschistus minutus</i>	0.00004	0.001	0	0	0	0
Scorpion fish / Sculpin <i>Myoxocephalus scorpius</i>	0.0007	0.01	0	0	0	0
Other fish	0.003	0.05				
Other invertebrates						
Leathery sea-squirts <i>Styela clava</i>	0.001	0.02	0	0	0	0
Queen scallops <i>Aequipecten opercularis</i>	0.0002	0.003	0	0	0	0
Seaweed	0.036	0.5	0	0	0	0
Other material						
Stone and wood	0.63		0.3		0	
Metal	0.001		0		0	
Plastic	0.0007		0		0	
Unidentified (mostly empty shells)	37.3		41.3		26.6	

[Source: DTU-Aqua].

FINAL REPORT AND DETERMINATION

Table 6: Cockle catch analysis derived from the catch composition of shellfish survey samples in the Limfjord. Catch composition is shown for all samples and subsets of samples where more than 1 kg and more than 10 kg of cockles were present in the catch. Commercial tows are likely to contain more than 10 kg per 100 m tow distance.

	All samples		Samples with >1kg cockles		Samples with >10kg cockles	
Number of samples	235		6		3	
Item	Mean Weight (kg)	Proportion of mean catch (%)	Mean Weight (kg)	Proportion of mean catch (%)	Mean Weight (kg)	Proportion of mean catch (%)
Mussels <i>Mytilus edulis</i>	0.55	7.7	21.50	88	38.1	91.3
Cockles <i>Cerastoderma edule</i>	4.7	66.6	0.82	3.3	0.003	0.01
Starfish <i>Asterias rubens</i>	1.6	22.5	1.84	7.5	3.24	7.8
Shore crabs <i>Carcinus maenas</i>	0.1	1.5	0.19	0.8	0.213	0.51
Oysters <i>Ostrea edulis</i>	0.04	0.63	0.07	0.3	0.13	0.32
Fish						
Flounder <i>Platichthys flesus</i>	0.0003	0.01	0	0	0	0
Hake <i>Merluccius merluccius</i>	0.02	0.34	0	0	0	0
Sand gobies <i>Pomatoschistus minutus</i>	0.00004	0.001	0.001	0.01	0.003	0.01
Scorpion fish / Sculpin <i>Myoxocephalus scorpius</i>	0.0007	0.01	0	0	0	0
Other fish	0.003	0.5	0.0185	0.08	0.04	0.09
Other invertebrates						
Leathery sea-squirts <i>Styela clava</i>	0.001	0.02	0	0	0	0
Queen scallops <i>Aequipecten opercularis</i>	0.0002	0.03	0	0	0	0
Seaweed	0.036	0.5	0	0	0	0
Other material						
Stone and wood	0.63		0.19		0	
Metal	0.001		0		0	
Plastic	0.0007		0		0	
Unidentified (mostly empty shells)	37.3		5.9		4.33	

[Source: DTU-Aqua].

FINAL REPORT AND DETERMINATION

3.4.2.1 Starfish

Starfish (*Asterias rubens*) are the main mussel predator in sublittoral areas. Information on the abundance of starfish in the Limfjord is available from environmental monitoring programmes undertaken by the counties bordering the Limfjord, and also from the records of starfish bycatch in the annual DTU-Aqua mussel surveys. Trends in these data have recently been examined and reported by DTU-Aqua.

Survey data from environmental monitoring work over the period 1979-2005 was collated and reviewed by Holtegaard et al (2008). Starfish abundance was highest in these samples in the late 1970s, early 1990s and early 2000s. The survey information suggests a biomass of 122-170,000t of starfish in Løgstør Bredning and 26-37,000t at Lovns Bredning.

DTU-Aqua has estimated the biomass of starfish in the shellfish production areas in the Limfjord in each of the past 20 years (see Figure 14). These estimates are taken from the quantity of starfish caught in dredges during mussel surveys. This time-series shows a high abundance of starfish from 1997-2002 and that current (2013) abundance is the highest in the time series.

The impact assessments for fishing in Natura 2000 sites during 2013-14 included an assessment of the possible impact of a directed starfish fishery. This is intended to be a trial fishery, with the aim of gaining some economic benefit from the starfish resource (the starfish can be used to produce a pigment that is used in food for cultivated salmonids). DTU-Aqua has concluded that a trial fishery of 2,000t of starfish in Lovns Bredning and 7,000t in Løgstør Bredning would be compatible with the nature conservation features of each site (Canal-Vergés et al, 2014; Nielsen et al, 2014).

The starfish fishery is being managed as a separate fishing activity to the mussel fishery. Because there is no catch sorting equipment aboard the fishing vessels, fishers will avoid starfish swarms as much as possible when fishing for mussels and cockles, to avoid filling the hold with starfish. Likewise, vessels fishing for starfish are likely to target the starfish and avoid the mussels.

It was highlighted above that that starfish could make up as much as 8% of the cockle proportion of the catch, whereas they make up around 0.5% of the catch in areas where mussels are most abundant (cf. Table 5). Due to the reasons previously explained, it is unlikely that fishers will operate in areas with high starfish density.

FINAL REPORT AND DETERMINATION

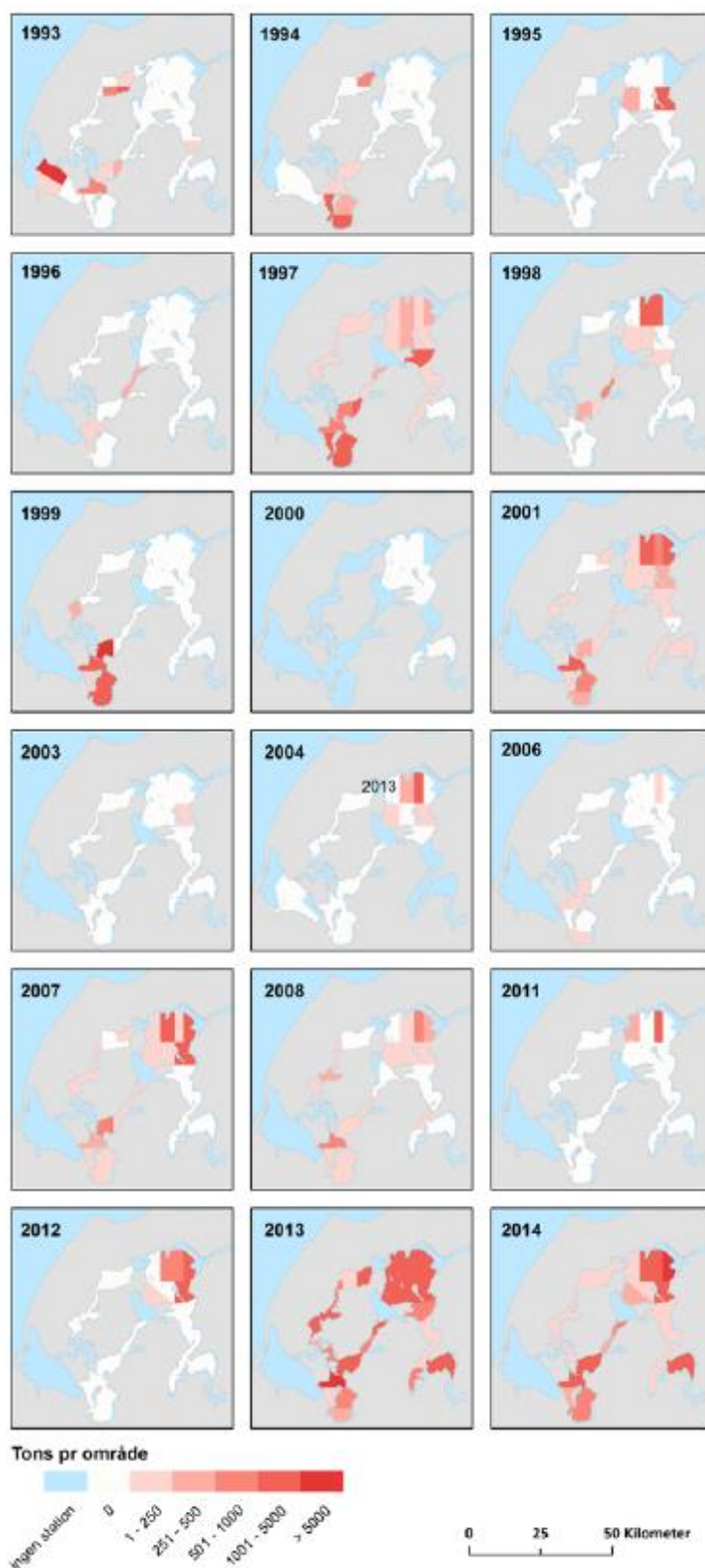


Figure 14: Abundance of starfish in the Limfjord in waters >3m deep, 1993-2014. Shading indicates the estimated tonnage of starfish in each production area. [Source: Nielsen et al. 2014]

FINAL REPORT AND DETERMINATION

3.4.3 Endangered, threatened and protected (ETP) species

The MSC define Endangered Threatened & Protected (ETP) species as those that are recognised by national ETP legislation and those species that are listed in Appendix 1 of the Convention on International Trade in Endangered Species (CITES)³.

Appendix 1 of CITES has been accessed at the CITES website (CITES, 2014). There are no species listed in this Appendix that are affected by the fishery under assessment.

Bird species which are the main shellfish feeders in Limfjord are goldeneye *Bucephala clangula*, principally in Lovns Bredning. There are no large populations of other shellfish feeding birds such as eiders in the fjord, although there are other important populations of birds that feed on small fish species, principally two Merganser species; red-breasted Merganser *Mergus serrator*, found in both Løgstør Bredning and Lovns Bredning, and Common Merganser *Mergus merganser*, concentrated in Lovns Bredning. All three of the above species are of importance as interest features in the designation of the Løgstør Bredning and Lovns Bredning areas as Special Protected Areas (SPAs).

Wild birds are protected by Danish and EC legislation. The potential impact of the mussel fishery in the Limfjord on wild birds is assessed every year for the Natura 2000 sites that are vital for the protection of these species, using the most up to date information about the species, mussel stock and the mussel fishery.

Mussel fishing is only permitted if it is considered to be unlikely to impact the ETP bird species (through depletion of food) and the habitats that support these birds. In recent years, dredging has been permitted in the Lovns Bredning and Løgstør Bredning Natura 2000 sites after favourable assessments of fishing proposals for these areas with respect to both shellfish and fish eating birds (Canal-Vergés et al, 2014; Nielsen et al, 2014).

The assessments carried out for the Natura 2000 sites take account of changes in fishing practice and the current status of ETP species and their supporting habitats. These assessments provide an annual review of whether these sites are achieving their management objectives. The overall success of the Natura 2000 programme throughout the EU is kept under review by the EU, and is readily accessed via the Natura 2000 barometer (EU, 2014).

In a previous assessment of a Danish mussel fishery, concerns were raised about the possible disturbance of cetaceans by mussel dredgers. In 2011, ICES provided advice to the EC on “the impact of fisheries on other components of the ecosystem including small cetaceans and other marine mammals, seabirds and habitats.” This advice has identified a need to mitigate and investigate the effects of static nets on harbour porpoise in the Kattegat and Belt Seas (ICES Area IIIa and Subdivisions 21-23). ICES have not identified mussel dredging as a fishing activity with the potential to adversely affect ETP species in the Limfjord (ICES, 2011).

3.4.4 Habitats

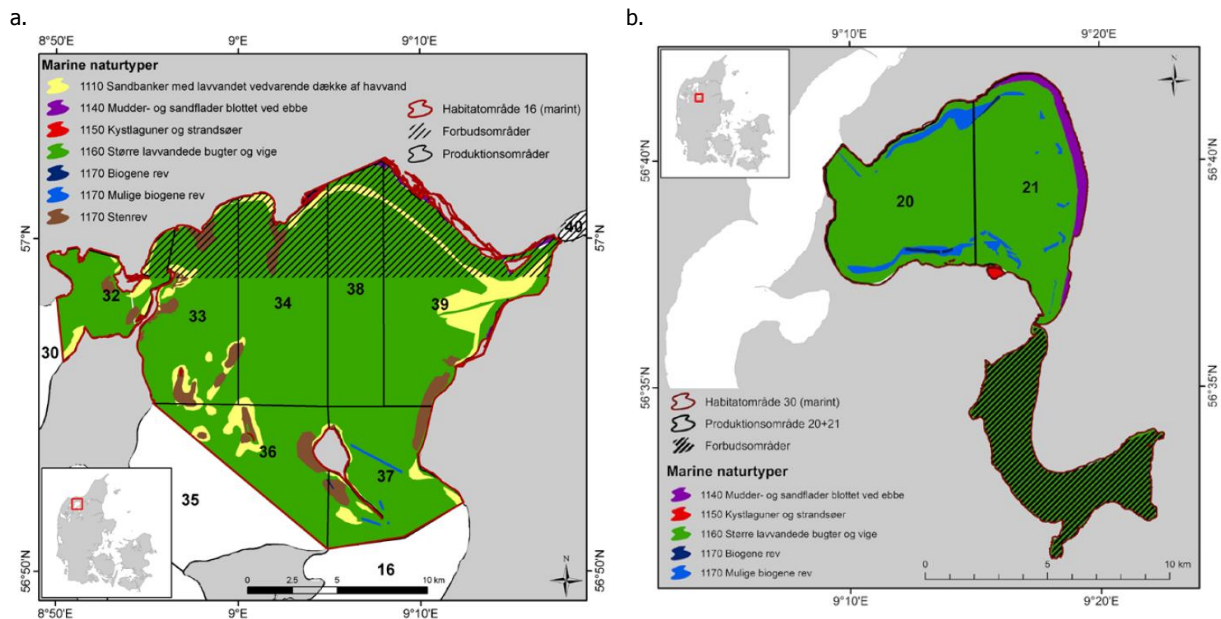
Important habitats in the Limfjord include intertidal and subtidal sandbanks and mudflats, and the location and extent of this is known and has been used to identify Natura 2000 sites, where these areas have been mapped (see Figure 15). Information about the type and extent of marine habitats from survey work has enabled the beds of eelgrass *Zostera* spp. in the shallow areas to have been mapped throughout the Limfjord (Figure 19).

³ MSC Certification Requirements v1.3 at §CB3.11.1.

FINAL REPORT AND DETERMINATION

In much of the rest of the Limfjord the seabed consists of sands and gravels with various amounts of stones. It is known that boulder reefs have been deliberately exploited for building materials for centuries, but there is no quantitative information on this. The importance of structural complexity of seabed habitats (which is increased by the presence of shell, stones and boulders) for mussel settlement and survival, as well as for other benthos, is recognised (see Dolmer and Frandsen, 2002).

Information about habitat distributions in the Limfjord has been used to identify areas where natural habitats may be vulnerable to human impacts, either under Danish legislation or EC legislation. Examples of the level of detail of habitat mapping are shown in Figure 15 and Figure 19.



Key to habitat types

- 1110 (yellow)** Sandbanks that are slightly covered by seawater at all times.
- 1140 (purple)** Mudflats and sandflats not covered by seawater at low tide.
- 1150 (red)** Coastal lagoons and lagoons.
- 1160 (green)** Large shallow inlets and bays.
- 1170 (blue/brown)** Biogenic reefs

Figure 15: Distribution of marine habitats within (a) Løgstør Bredning and (b) Lovn Bredning Natura 2000 sites. [Source: Nielsen et al. 2014 and Canal-Vergés et al. 2014 respectively].

3.4.4.1 Habitats protection

Six areas of the Limfjord have been designated as Natura 2000 areas based on the nature conservation features “Large shallow inlets and bays” (Annex IV code 1160) and 1170 “Reefs”, and including as interest features birds, rocky reefs, and eelgrass (*Zostera*) beds. In the future it is anticipated that biogenic reefs will also be included within the designation. The two larger areas (Løgstør Bredning and Lovns Bredning) are also Special Protection Areas (SPAs) for birds, and Limfjord Ramsar site is encompassed within these areas. These designated areas are shown in Figure 18.

Special Protection Areas

Denmark has designated 113 Special Protection Areas (SPAs). The basis of these areas is the Birds Directive of 1979, which aims to protect and improve conditions for wild birds in

FINAL REPORT AND DETERMINATION

Europe. The Directive also contains provisions on which bird species are able to be hunted and the hunting methods that must be used. The Birds Directive was transposed into Danish legislation by the Environment Ministry Order No. 408 of 25 May 1994, as amended.

Many of the SPAs in Denmark are at sea, often close to shore, where they also include marshes or other natural areas. Each area is designated to protect certain species.

Danish SPAs have a total area of around 14,700 km², of which approx. 12,100 km² are in marine areas and approx. 2,600 km² of land. The area of land within SPAs is equivalent to approx. 6% of Denmark's land area and the SPA area at sea is approx. 11% of Danish marine space. About 9,200 km² of SPA areas are also designated as SAC.

Special Areas of Conservation

In Denmark there are 254 Special Areas of Conservation (SACs), which were designated in the period 1998 - 2004. These areas have been established under the EC Habitats and Species Directive of 1992, which was transposed into Danish law by Statutory Order No. 782 of 1st November 1998, as amended.

The SACs cover a total area of approximately 11,100 km², which is divided into approx. 7,950 km² in marine areas and approx. 3,150 km² of land.

Ramsar Sites

Denmark has designated 27 Ramsar sites, under the 1972 Ramsar Convention, which has been transposed into Danish Law by Environment Ministry Order No. 26 dated 4 April 1978 Convention on Wetlands.

Danish Ramsar sites cover a total area of approx. 7,400 km². The total area is divided into approximately 6,000 km² as marine areas and approx. 1,400 km² of land, as the Danish Ramsar sites often include salt marshes or other areas adjacent to wetlands.

3.4.4.2 Habitat Impact Assessment

Before fishing takes place in any Natura 2000 site, it is subject to an Impact Assessment (IA) that is carried out by DTU-Aqua, who provides independent scientific advice to the Danish Government. This advice determines whether or not the Government approves the annual fishing plan for the area proposed by the fishers operating in that area, and also the conditions (such as spatial and temporal closures) that should apply in that area.

This system of impact assessment was implemented for the mussel fishery in the Limfjord in 2008 (Dolmer et al. 2009) and has been developed and refined in annual assessments to the present day assessments for Løgstør Bredning and Lovns Bredning for the 2014-15 fishing season (Nielsen et al. 2014 and Canal Vergés et al. 2014). These IAs examine how fishing proposals for the coming fishing year might affect both the marine habitats (such as eelgrass beds) and species (particularly wild birds) within each site.

Mussel dredging is permitted within the Løgstør Bredning and Lovns Bredning Natura 2000 sites, subject to an annual quota (currently 10,000t for Løgstør Bredning and 10,000t for Lovns Bredning). This quota exceeds the average total landings for the whole region. It is considered highly unlikely that the entire quota will be fished. The impact assessment of the fishery has nevertheless been based upon the implications for marine wildlife of fishing the entire quota. Total quota uptake would result in a maximum of 8% of the Natura 2000 site areas being subject to dredging. Dredging is prohibited in all of the sensitive habitat areas in each site and throughout the Limfjord.

The results of the most recent IA's for the Lovns Bredning and Løgstør Bredning Natura 2000 area are summarized below.

FINAL REPORT AND DETERMINATION

DTU-Aqua's assessment has looked at the following topics: birds; eelgrass; turbidity; benthos; community effects; and Annex IV species (EU Habitats and Species Directive). The assessment has made conclusions for each ecosystem component.

Birds

The region is an important area for bird feeding, including the Goldeneye, pink-footed geese, light bellied Brent Geese and Red-breasted merganser. Goldeneye is the main bivalve feeding species in the fjord. Impacts on other bird species within the Natura 2000 site have also been evaluated and are considered to be negligible.

For the bivalve eating birds, this assessment considers biomass available to these species with the following conservative assumptions – the mussel biomass available for feeding is calculated only from those areas deeper than 3 metres; the shallower areas actually carry considerable mussel biomass and this method therefore ignores a large proportion of the biomass accessible to the birds. Prey size preference of the birds, which are known to take mussels up to 12mm in length, is not taken into account however. As a further precaution, bird food requirements are multiplied by a factor of 7.2 (based upon studies of bird foraging behaviour), to arrive at an estimate of the quantity of mussels that the local bird population is likely to require per year. This equates to providing approximately 1 tonne of mussels for each eider duck in the area (cited in Brand et al. 2015). It is estimated that the Goldeneye in Løgstør Bredning require 16,667t of mussels per year, and 6,580t in Lovns Bredning.

The fishing plan for the mussel fishery is assessed in the light of these estimates. The decision on whether or not to approve the plan is based upon a reference point for the fishery. If the quantity of food required by the birds plus the quantity that will be removed by the fishery is less than the annual production of the stock (estimated by DTU-Aqua to be 50% of the standing biomass (DTU-Aqua, 2006)) then the fishing plan can be approved. If that quantity is more than the annual production, then the plan cannot be approved.

The risk of fishing vessels causing disturbance to birds that may disrupt their feeding has been evaluated. It is considered that this is highly unlikely to occur, given the low number of vessels operating in the areas and the relatively small area fished.

This approach to assessing impacts on Natura 2000 sites has resulted in the fishing plan for the Lovns Bredning and Løgstør Bredning Natura 2000 site being approved. Fishing is not permitted in other Natura 2000 sites (including Hjarbæk Fjord (part of Lovns Bredning), Skibsted Fjord and Harbore Tange).

Eelgrass

Mussel dredging is limited according to depth so that the fishing does not presently impact directly on eelgrass areas. The distribution of eelgrass within Limfjord is well known, as shown in Figure 19.

It has been noted in the Limfjord that twenty years of no fishing in certain areas where eelgrass (*Zostera* sp) beds have been mapped annually has not resulted in any extension of eelgrass into deeper waters. Modelling has suggested that at present turbidity levels there is no likelihood of extension of *Zostera* beds into areas where it would conflict with mussel dredging. The depth restriction on dredging was recently increased to 5 m in Natura 2000 sites and 6 m in the vicinity of eelgrass beds following analysis of data suggesting that improved water quality and turbidity would allow eelgrass to grow to this depth.

Turbidity

Tests have suggested that mussel dredging does not have any significant influence on turbidity on nearby *Zostera* beds, thought to be the most sensitive receptor to turbidity.

FINAL REPORT AND DETERMINATION

Modelling has also shown that high density mussel beds have a limited ability to filter particles due to a relatively low rate of transport of particles to the seabed, i.e. a lower density of mussels would have the same filtration capacity. Thus removal of mussels would have a limited ability to reduce the overall filtration capacity of the community (Dolmer 2000b).

Benthos and seabed habitat structure

Studies of the effects of mussel dredging on epifauna and infauna have been made by experimental dredging in areas subject to regular dredging and areas closed to dredging for four years prior to the experiments (Dolmer et al, 2001; Dolmer, 2000). Short term (four months) impacts on epifauna and infauna were significant, involving reduced numbers, or even loss of, polychaetes, sponges, echinoderms, anthozoans, molluscs, crustaceans and ascidians. Longer term (four year) impacts were detectable on selected species in some of the experiments.

Since long term effects of trawling and dredging on epifauna have the potential to last for some years, as has been suggested by a wide variety of literature (e.g. Kaiser and Spencer, 1996; Lart 2003) that repeat dredging has the potential to considerably compound effects. However, comparison of the same dredged and long-term closed areas (but with no experimental dredging) within the Limfjord mussel fishery suggested that there was no overall long term impoverishment in the dredged areas compared to the un-dredged areas (Hoffman & Dolmer, 2000). However, in all of these experiments, caution is needed as the comparability of the areas used is subject to some doubt. Moreover, Dolmer and Frandsen (2002) have pointed out that frequent anoxic/hypoxic events associated with eutrophication may, along with natural variability, presently be overwhelming any potential long term effects of dredging; indeed such events are considered to have had a major effect on the benthic communities in the area (Karlson et al, 2002); and may also be responsible for the complete disappearance of some bivalve species in certain areas (Oeschger & Pedersen, 1994)

Concerns have been raised about the effect of the removal of stones from the seabed by the dredge fishery. To address concerns about habitat degradation, in 2008 a requirement was introduced for all mussel dredgers operating within Natura 2000 sites to return all rocks weighing more than 2 kg to the sea immediately. The quantity of rocks and boulders retained by the fishery are recorded by processing factories and reported to NaturErhvervstyrelsen (Table 7). Records indicate that 1.2 tonnes of stones were removed from the Løgstør Bredning Natura 2000 site during 2013-14 (range is between 0 and 1.2t). No stones were reported to be removed from the Lovns Bredning site during 2013-14 (the historical range for this site is between 0 and 2.3t).

Since the mussel fishery was first certified in 2010 there has been a change in the dredges used throughout the Limfjord. The new "light dredges" were adopted following gear trials carried out by DTU-Aqua (Poulsen, 2009). They are lighter than the "Dutch dredges" used previously (around 50 kg compared to 200 kg) and have a narrower width (1.45 m compared to 2 metres). The gear trials found that these light dredges caught much less mud than the Dutch dredges, and that vessel fuel consumption fell per kg of mussel caught, indicating that the light dredge had less impact on the seabed. The light dredges have a much less robust construction than the Dutch dredges, and cannot be used near to any boulder areas without sustaining damage

The cumulative effect of the mussel fishery on the marine habitats within Natura 2000 sites is monitored and evaluated in the annual impact assessments for these sites. Cumulative effects are assessed by taking account of the maximum possible extent of mussel dredging over previous seasons (the period being based up on the habitat recovery time) as well as the fishing anticipated for the coming season. Fishing is only permitted at present if the cumulative impact on a habitat (in terms of the total proportion of a habitat that has been

FINAL REPORT AND DETERMINATION

fished within the habitat recovery time) is less than 15%. An example of the result of the assessment of cumulative effect from the 2014-15 Løgstør Bredning and Lovns Bredning Natura 2000 IA reports is shown in Table 8. All of the proposed scenarios would impact less than 10% of each marine habitat within the Natura 2000 sites.

The most recent Natura 2000 assessments conducted in the Limfjord also report evidence from earlier studies that there have been no significant changes in habitat character (measured in terms of the abundance of empty shells) in dredged areas between 1993 and 2006 (see Figure 16). Excessive dredging would be expected to remove empty shells, and they thus provide an indicator of habitat character.

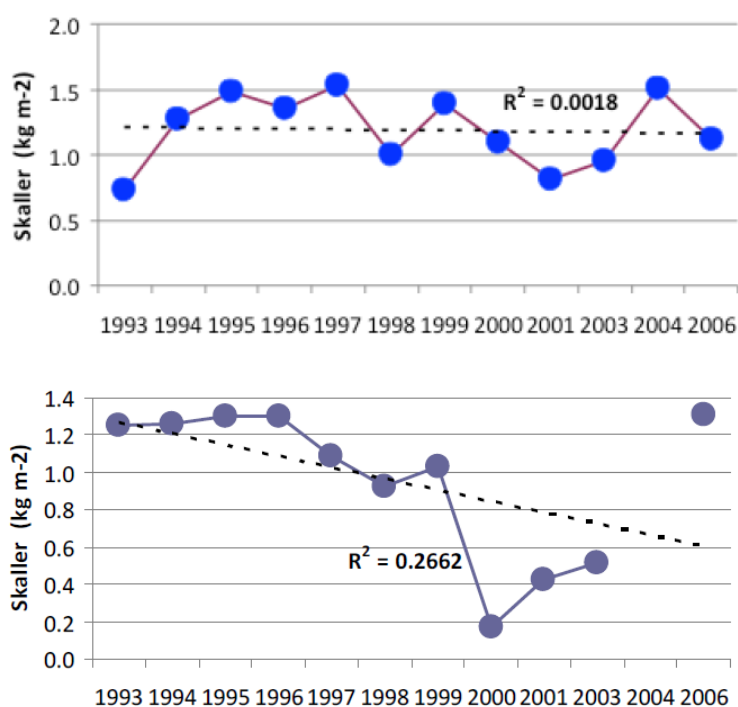


Figure 16: Time series of the abundance of empty shells in dredged areas in the Lovns Bredning (top) and Løgstør Bredning (bottom) Natura 2000 sites, 1993 - 2006. Neither correlation is significant [Source: Poulsen et al. 2013].

Table 7: Annual quantity of stones removed (tonnes) from Løgstør Bredning and Lovns Bredning Natura 2000 sites between 2009/10 and 2013/14 fishing seasons

Natura 2000 site	2009/10	2010/11	2011/12	2012/13	2013/14
Løgstør Bredning	0	2.0	4.7	0.5	11.8
Lovns Bredning	1.1	2.3	0.3	0	0

[Data source: Nielsen et al, 2014 and Canal-Vergés et al, 2014 respectively].

FINAL REPORT AND DETERMINATION

Table 8: Summary of assessment of cumulative effect of mussel fishing within the Løgstør Bredning and the Lovns Bredning Natura 2000 sites for fishing proposals in 2014-15 (translated from Nielsen et al, 2014 and Canal-Vergés et al, 2014 respectively).

Habitat	Recovery Time (y)	Proportion of habitat fished (%)					Cumulative area + 2014-15 proposal (%)		Starfish
		2009-10	2010-11	2011-12	2012-13 + 2013-14		Scenario 1	Scenario 2	
Løgstør Bredning									
Proposed scale of mussel fishery, 2014-15 (t)							15,000	10,000	
Blue mussels	3			1.7	1.5		6.8	5.1	0.2
Macroalgae	>5	0.5	1.1	1.3	1.1		7.5	6.2	1.7
Benthic fauna	2-4			1.7	1.5		8.5	6.8	1.2
Eelgrass	>20	0	0	0	0	0	0	0	0
Lovns Bredning									
Proposed scale of mussel fishery, 2014-15 (t)							15,000	10,000	
Blue mussels	3				3.7		13.6	10.3	0.3
Macroalgae	>5	0.02	0.2	0.04	1.6		6.2	4.8	1.3
Benthic fauna	2-4				0		11.9	8.6	1.5
Eelgrass	>20	0	0	0	0	0	0	0	0

FINAL REPORT AND DETERMINATION

3.4.4.3 Fishing restrictions

Dredging for shellfish is restricted in much of the Limfjord in order to protect marine habitats. The location of all of the dredging restrictions is shown in Figure 20. More detailed maps of the localised area closures within both Natura 2000 sites are shown in Figure 17. The closures within the Natura 2000 sites have been put in place to ensure that sensitive marine habitats (such as eelgrass beds) are protected from the risk of fishing impacts. The location and extent of these closures is reviewed in response to new information about the extent of vulnerable habitats and considered to be appropriate with respect to the current scale and intensity of the fishery (Nielsen et al. 2014; Canal-Vergés et al. 2014).

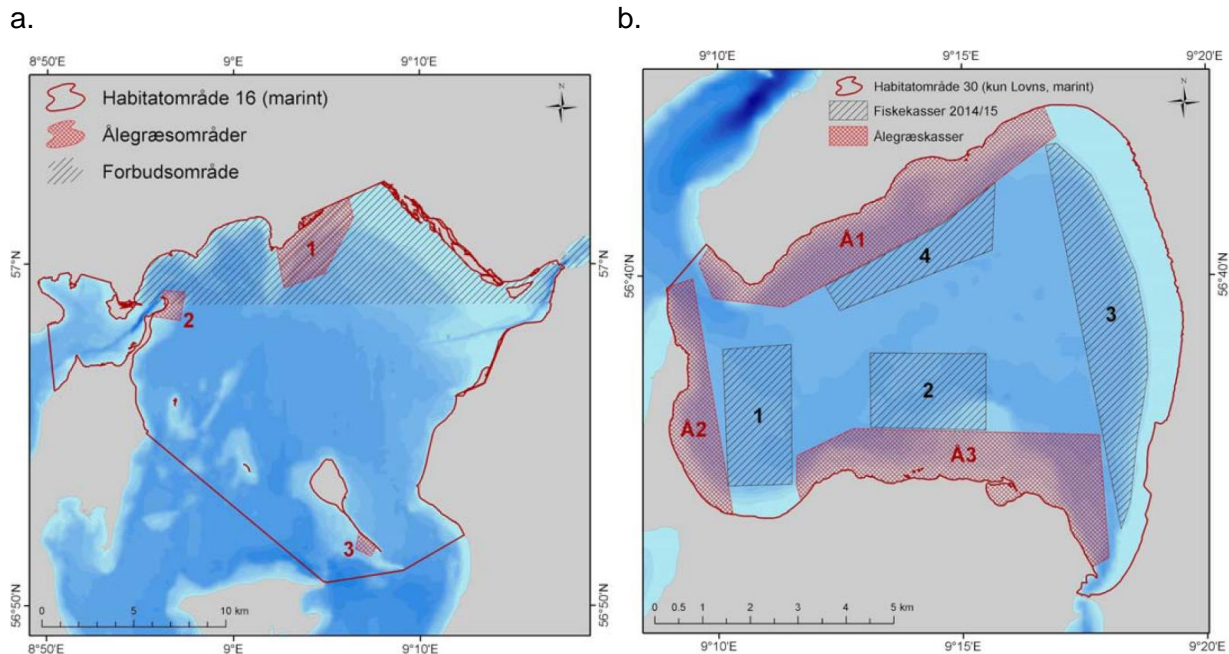


Figure 17: Map of fishing controls within (a) Løgstør Bredning Natura 2000 site where dredging is only permitted in waters deeper than 5 m and outside the shaded areas and (b) Lovn Bredning Natura 2000 site, where fish boxes applicable to fishing season 2014/2015 are shaded with black and eelgrass boxes with red.

[Source: Nielsen et al. 2014 and Canal-Vergés et al. 2014 respectively]

Document: MSC Full Assessment DFPO Limfjord Mussel and Cockle Fishery	page 51
Date of issue: 15.12.2015	MRAG Americas Inc.

FINAL REPORT AND DETERMINATION

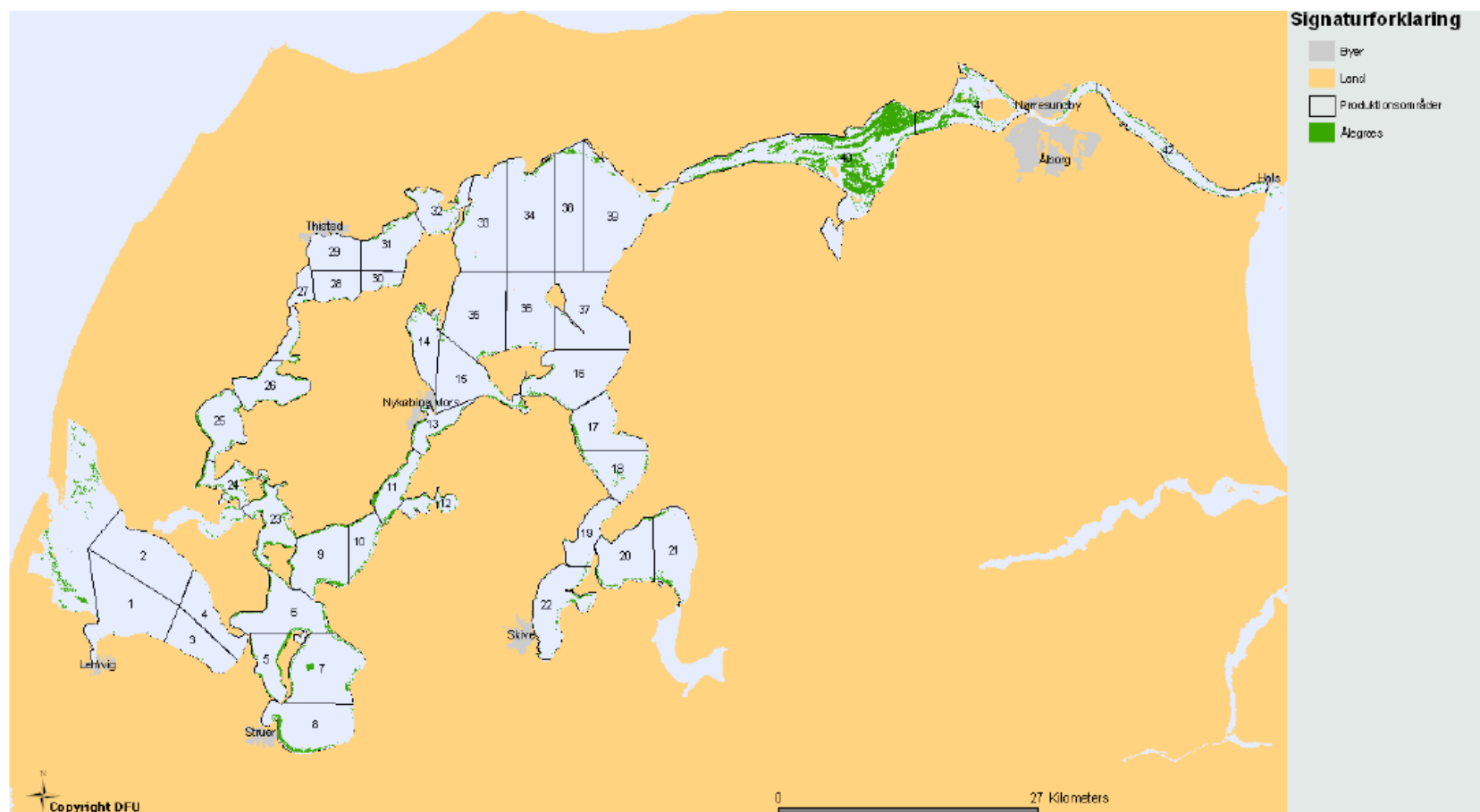


Figure 19: Map showing the location of eelgrass beds in the Limfjord (green). [Source: DFU website GIS viewer: <http://gis.dfu.min.dk/website/Limfjord/viewer.htm>].

FINAL REPORT AND DETERMINATION

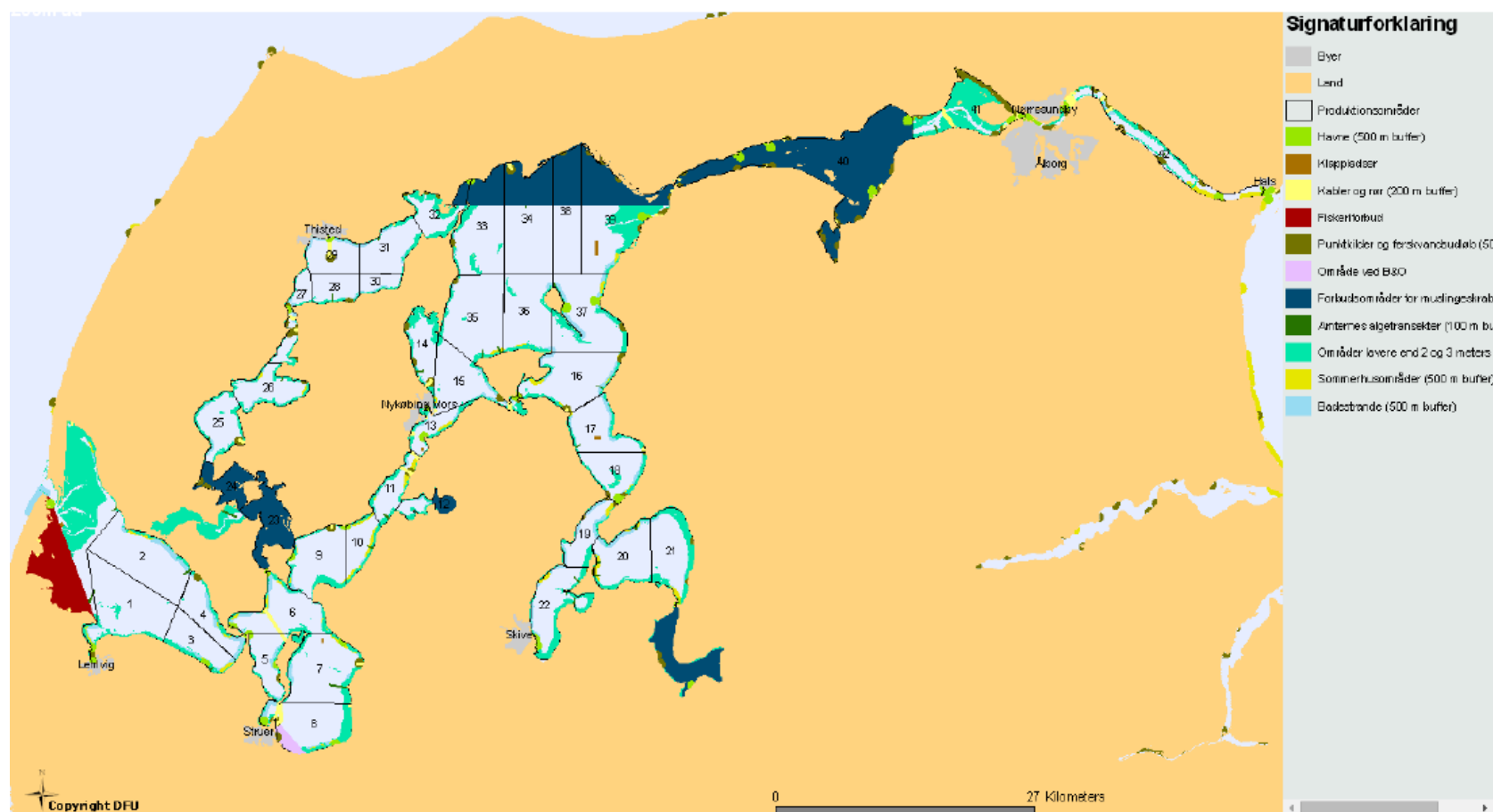


Figure 20: Map showing the location of areas closed to dredging in the Limfjord. [Source: DFU website GIS viewer: <http://gis.dfu.min.dk/website/Limfjord/viewer.htm>].

FINAL REPORT AND DETERMINATION

3.4.5 Ecosystem

The ecosystem of the Limfjord is well monitored and carefully studied. A recent report (Markager et al, 2006) provided a review of the ecosystem and trends, focussing on the effects of human activities on water quality and hence on the biota of the Limfjord.

Mussel dredging has the potential to adversely affect marine ecosystems in a number of ways, including:

- Removal of prey – mussels are an important food item for certain species of wildlife, notably birds such as Goldeneye (*Bucephala clangula*);
- Removal of habitat – mussel beds create a habitat that is colonized by a range of other animals including both invertebrates and small fish;
- Physical damage to the seabed – mussel dredges can catch boulders and cobbles from the seabed, and their removal can change its physical character.

There are a number of restrictions on the fishery that influence, or aim to influence, the impact of all human activities (including but not limited to fishing) on the ecology of the both units of certification, and in particular the Natura 2000 sites that have been designated to protect natural habitats and various species of wildlife (see section 3.4.4.1 and illustrated in Figure 18).

The assessments of mussel stocks in the Limfjord and the more detailed investigations of ecosystem impacts of mussel fishing on the Natura 2000 sites in the Limfjord indicate that the current level of fishing does not adversely impact the Limfjord ecosystem through either the removal of prey, removal of habitats, or physical damage to habitats. Other indirect impacts, such as the re-suspension of sediment and impacts on water quality, are also evaluated in these assessments and considered to be insignificant (see Canal-Vergés et al. 2014; Nielsen et al. 2014). Mussel fishery impacts on these Natura 2000 sites have been evaluated annually since 2008.

Mussel dredging was shown to release phosphorous (P) bound to iron particles from the sediment during a field study in the Limfjorden (Holmer et al. 2003). However, these particles are not directly available and were shown to eventually sink and resettle on the bottom again. During hypoxia in summer time, iron bound-P can be transformed to PO₄ and potentially fuel the microorganisms. However, the overall release of phosphorous during dredging was much less in August due to lower pools of sedimentary iron bound phosphorous that were already depleted by hypoxia due to eutrophication. Sediment pools and fluxes of dissolved phosphorous were not affected by dredging in this study (Holmer et al. 2003). Other studies showed that dissolved nutrient concentrations increased in the water column immediately after dredging (Riemann and Hoffmann 1991, Dyekjær et al. 1995), but this corresponded to less than 1% of the nutrient loads from land and atmosphere (Dyekjær et al. 1995). Oxygen consumption increased less than 4 days after dredging and can contribute to promote hypoxia (Riemann and Hoffmann 1991, Holmer et al. 2003). The effects of dredging on water quality are potentially highest during the warm summer months with little wind, where oxygen consumption is highest and nutrients are depleted. However, the summer closure for fishing, the limited number of boats in an area and the use of lighter gear will contribute to reduce these impacts.

FINAL REPORT AND DETERMINATION

3.5 Principle Three: Management System Background

3.5.1 Overview of jurisdiction, responsible agencies, stakeholders and decision-making process

The fishery operates exclusively in the brackish waters of the Limfjorden in Denmark's territorial waters

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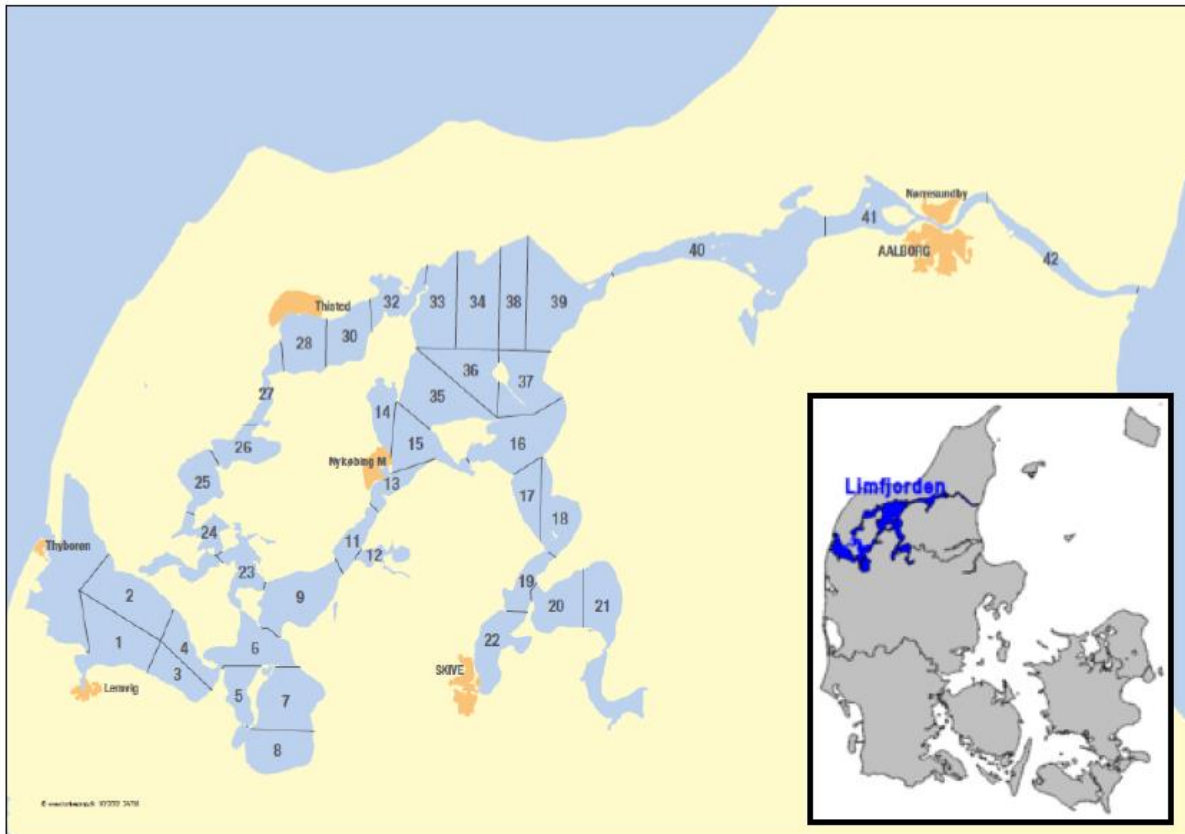


Figure 1). This makes it a single jurisdiction fishery with the Danish government responsible for its management. The fishery is, however, managed within a broader legal and policy context: as Denmark is a member of the European Union, the Danish government must ensure that the management of all Denmark's fisheries resources is consistent with the objectives of the European Union's Common Fisheries Policy (the CFP) (OJ, 2013).

The Danish government department responsible for management of shellfish fisheries is the Ministeriet for Fødevarer, Landbrug og Fiskeri (Ministry for Food, Agriculture and Fisheries). Within the Ministry, NaturErhvervstyrelsen (the Danish AgriFish Agency) is responsible for the operational management of Denmark's fisheries, including this fishery.

While the Fisheries Director has the regulatory power to make fishery management decisions, the Director's decisions are based on the recommendations of a statutory Advisory Committee on Mussel Production – in English sometimes referred to as the Mussel Advisory Committee, despite it also being responsible for other shellfish species including cockles and oysters. This committee was established under the Fisheries Act, 2006 (FA, 2006) as the ongoing multi-stakeholder forum for discussing and developing the management arrangements for the fishery under assessment.

There are a number of groups with recognised interests in the management of the fishery that are represented in the Mussel Advisory Committee and/or actively engaged in the

FINAL REPORT AND DETERMINATION

management process. Both the Limfjord mussel fishers' association Centralforeningen for Limfjorden (abbreviated previously to CF) and the Danmarks Fiskeriforening Producent Organisation (Danish Fishermen's Producer Organisation, DFPO) represent the shellfish fishers' interests. Danmarks Tekniske Universitet – Aqua (DTU-Aqua) represents science interests, conducts scientific monitoring and research, and provides technical advice for the management process. The nature conservation groups WWF Danmark (WWF) and the Danmarks Naturfredningsforening (Danish Society for Nature Conservation, DN) have represented environmental interests during policy development and ongoing management consultations. Fishing processing interests, local councils and consumer interests are involved in the Advisory Committee, as are shellfish farming interests.

Within Denmark's Ministry for the Environment, Naturstyrelsen (the Nature Agency) and Miljøstyrelsen (the Environmental Protection Agency) are responsible for implementing the government's policies concerning nature and the environment. Of particular interest and responsibility are the establishment of environmental benchmarks for water quality (which influence shellfish hygiene), and the conservation and/or protection of habitats and non-fish species, as well as the administration of Natura 2000 sites in Denmark's seas, inlets and waterways. This includes the Natura 2000 sites within the Limfjord mussel fishery area: Løgstør Bredning and Lovns Bredning.

Annual management arrangements are informed by an overarching Mussel Policy – a fisheries management framework for fishing in the Natura 2000 areas that was developed through multi-stakeholder consultation and published in June 2013 (MFLF, 2013). The framework also guides the management of the fishery beyond the boundaries of the Natura 2000 sites.

Each year DFPO, on behalf of the mussel fishers, submits a fishing plan, including proposed mussel quotas, for the key Limfjord Natura 2000 sites to the AgriFish Agency. The Agency commissions an environmental impact assessment of the proposal from DTU-Aqua. Scientists from DTU-Aqua seek input and data from the Nature Agency to supplement their own research and survey findings. The stock assessment and scientific advice are compiled into an impact assessment report that is considered by the Mussel Advisory Committee, whose recommendations and opinions are forwarded to the AgriFish Agency Director. After considering the scientific advice, the various recommendations and opinions, the Director decides the following year's fisheries management arrangements and license conditions. Stakeholders are advised directly about the decisions, including the reasoning. Decisions are also publicised on the Agency's website.

There is a good level of co-management in the fishery with the well-established local fishers' association that works in partnership with Government to assist with the informal management of the timing, location and intensity of fishing activities within the Limfjord. Anecdotal reports from both the fishers and the government representatives, interviewed separately during the 2015 site visit by the MRAG Americas assessment team, agree that the fishers have in the past proposed more precautionary, i.e., lower TACs and other more conservative arrangements, than the science suggests could be sustainable.

3.5.2 Overview of objectives

The overarching fisheries legal and policy framework, as well as the fishery-specific management decisions in the mussel and cockle fishery are influenced by a nested suite of objectives that begin with the CFP and end with the Limfjord fishers' association (CF). This fishery's objectives can be characterised as a combination of statutory laws and policies that seek to ensure maximum stock health and minimum adverse impacts on non-target species, habitat and sensitive ecological features, and to secure the livelihoods of the mussel and cockle fishers.

FINAL REPORT AND DETERMINATION

At a European level, Article 2, paragraphs 1-4, of the CFP establish a range of objectives for managing fisheries in the EU, including: long-term environmental sustainability; being consistent with achieving economic, social and employment benefits; using a precautionary approach and restoring resources above levels that will produce MSY; implementing an ecosystem approach; and contributing to the collection of scientific data (OJ, 2013). Also influencing the management of the shellfish fishery are the EU's Habitats Directive (OJ, 1992), Birds Directive (OJ, 2010) and the Water Framework Directive (OJ, 2000), and potentially, the Marine Strategy Framework for water-related issues not covered by the Water Framework Directive (OJ, 2008). The objectives and purposes of these Directives combine to guide the Danish government about the maintenance or restoration of favourable conservation status to habitats and species, particularly within the system of protected sites that make up the Europe-wide Natura 2000 network, or set water quality objectives that seek to ensure 'good ecological status and good chemical status' in Europe's surface and coastal waters.

Denmark's fisheries are governed by the Fisheries Act 2006 (FA, 2006), the overarching objectives of which are to ensure: the protection and restoration of living marine and freshwater resources; the protection of other animals and plants; and manage sustainable commercial fishing and related industries, and recreational fishing. The Act also sets out the purpose of the Mussel Advisory Committee:

"...to provide advice to the Minister on initiatives to promote the sustainable and commercial development of fishing and farming of mussels, oysters and other molluscs, including establishing rules on fishing and farming..."

Both the Nature Protection Act, 1992 (NPA, 1992) and the Planning Act, 2007 (PA, 2007) contain objectives that seek to preserve and protect nature and wildlife in coastal waters and ensure that the public may participate in relevant governing processes as much as possible.

The previously mentioned Mussel Policy states that one of its key purposes is to ensure a balance between the development of the fishing industry by enabling sustainable resource use and achieving the nature protection and water quality objectives established by the EU Directives cited above (MFLF, 2013).

Finally, the local fishers themselves, within the context of their association, have agreed upon an informal set of objectives that seek not only to maintain shellfish stocks in Limfjord and minimise the impact of dredging upon sensitive or protected elements of the environment, but are also precautionary in practice (pers comm., CF).

3.5.3 Overview of fleet, rights and licensing

The fishery is a limited entry fishery: the number of licences and therefore vessels is restricted to 50. As licences are associated with a named individual rather than a boat, some vessels may be eligible to carry two licences; meaning up to two quota shares may be attached to an individual vessel. In practice, there are fewer than 30 (Table 1) vessels licensed to operate in the Limfjord fishery in 2015 (pers comm., A. Gadegaarde Boye, AgriFish Agency).

Licences are re-granted annually, and only fishers with a record of fishing in the Limfjord are eligible to be granted a licence. Licences are transferable to eligible fishers.

Each licence specifies the type of gear a vessel may use, the areas a vessel may fish and a weekly Total Allowable Catch (TAC). Licenses also require fishers to report their catch while at sea, declaring an estimate of the weight of shellfish they intend to land.

FINAL REPORT AND DETERMINATION

3.5.4 Summary of management measures (harvest controls)

The following is based on sources including the Mussel Policy (MFLF, 2013), the 2015 Limfjord mussel fishing licence regulation (Fødevareministeriet, 2015), the Intertek fishery assessment report (Brand *et al*, 2015) and information provided onsite by members of the fishing industry and representatives of the scientific and management agencies (in person and via MF, 2014).

In addition to the limited entry licensing arrangements, the management measures (or harvest controls) that aim to achieve the ecological and economic objectives for the fishery include the following:

Output controls:

The Danish government sets a weekly and a daily TAC for each licensed fisherman operating in the Limfjord: currently 30t gross landings of any species, including non-target species such as cockles, per licence per day. In addition:

- The government also sets an annual TAC for each of the two Natura 2000 sites: currently 10,000t for Løgstør Bredning and 15,000t for Lovns Bredning (2014-2015 season).
- A bycatch of up to 1% by weight of oysters is permissible.

Cockles are not considered a 'directed fishery' rather they are considered and managed by NaturErhvervstyrelsen as bycatch.

- Cockles must be no more than 49% of the total landed catch (the remaining 51% must be composed of mussels).

Effort limitation:

Within the fishing areas in the Løgstør Bredning and Lovns Bredning Natura 2000 sites, there is a limit on the total number of vessels that can fish in each Natura 2000 production area (15 and 10 vessels per production area, respectively).

Spatial measures:

The whole of Limfjord is divided into designated (numbered) shellfish production areas. Within production areas, smaller areas may also be designated.

- Vessels are required to observe area closures, such as those in place for habitats in Natura 2000 sites.
- Fishing is prohibited in depths of less than three metres.
- NaturErhvervstyrelsen may adjust area boundaries within season if eelgrass depths change.

Temporal measures:

There is a range of formal and customary daily, weekly and monthly closures employed:

- Regulations prohibit fishing between the hours of sunset and sunrise and on Sundays.
- Elevated temperatures in the summer months cause oxygen depletion and transport issues affecting mussel health and quality. The fishery is therefore closed during July and August.
- Self-management by the Limfjord fishers usually means the fishery is also closed between Christmas and the end of February.

Technical measures:

- *Dredges* – light dredges must be used (these must weigh no more than 50kg and be no more than 1.8m long and 1.5m wide).

FINAL REPORT AND DETERMINATION

- *Vessel size* – the maximum length, power and draft of the boats is limited. Boats are limited to 175hp and maximum length of 12m, with the exception of four larger boats for historical reasons.
- *Sorting gear* - the boats are not allowed to install gear that sorts the catch on board the vessel.

Minimum Legal Size:

The minimum legal size for mussels in the Limfjord is 50mm. No more than 10% of the total catch on a given day may be smaller than this. For vessels participating in relaying activities, a smaller minimum legal size of 45mm is in place, and no more than 30% of the catch may be smaller than this.

Monitoring:

Licences require fishers to comply with a comprehensive monitoring regime.

- *At sea* - all vessels are required by their fishing licences to carry a “black box” recorder that monitors the position of the vessel, its speed and course and whether or not it has deployed its fishing gear via sensors on the dredge winch. Data is logged in the black box every 10 seconds. When navigating in areas where fishing is not permitted, vessels are required to maintain a minimum speed of at least 5 knots (i.e. too fast to allow fishing to take place). Vessels may not leave port if the equipment is not functioning correctly, and skippers are required to report any malfunction of the black box system to NaturErhvervstyrelsen, stop fishing and return to port immediately.
- *Data transfer* – licence holders must ensure the data are sent electronically to the NaturErhvervstyrelsen servers once per day.
- *Landings* – vessels must inform NaturErhvervstyrelsen of any landings at least one hour in advance. Catch data must be reported in electronic logbooks, and catch estimates must be within 10% of actual landed weight, which is later reported by onshore processing facilities.
- *Discarding of oysters* – any discarding of oysters must be recorded in the vessel’s logbook.

Other measures:

Stones weighing 2kg or more must be removed from the catch and returned to the sea in the immediate vicinity of where they were caught.

3.5.5 Overview of monitoring, control and enforcement

All fishing activity is closely scrutinised by NaturErhvervstyrelsen at sea, at points of landing and at processing facilities. Catch declarations, landings data and sales records are cross-referenced and monitored electronically to ensure compliance with TAC allocations to individual vessels, as well as the overall TAC. Sources of information include Brand *et al*, 2015 and MF, 2014.

NaturErhvervstyrelsen employs 175 fishery officers, who are based at 7 manned fishery offices throughout Denmark. They patrol and inspect fisheries on land, at points of landing, and also at sea. NaturErhvervstyrelsen has 2 large offshore Fisheries Patrol Vessels for work in the North Sea and Baltic, and one smaller (20m) inshore patrol vessel. Nineteen smaller craft (inflatable, aluminium and fibreglass vessels) are also used for inshore fishery inspections. The Fiskeridirektoratet is also trialling the use of new fisheries management equipment, including Electronic Monitoring (currently installed on 22 trawlers and 2 mussel dredgers).

Electronic Logbooks:

FINAL REPORT AND DETERMINATION

Electronic logbooks are compulsory for all boats under EU and Danish regulation. Compulsory information provided from the logbooks includes estimated gross landings by area and time. Logbook information is submitted to NaturErhvervstyrelsen. The exact GPS position of fishing is required within the Food safety regulations and in the two Natura 2000 areas GPS positions must be recorded every half hour to comply with the fishing plans for these areas.

Electronic monitoring:

In April 2012, NaturErhvervstyrelsen introduced a new approach to vessel monitoring at sea. All shellfish dredging vessels working in the Limfjord must now use a “black box” recorder. This “black box” uses GPS units and the GSM network to provide accurate tracks of all vessel movements during every day that they spend fishing. Other data, such as the use of the vessel’s net winches, is also recorded by the system. The vessel’s position is recorded every few seconds to create the vessel track, and this information is transmitted automatically to NaturErhvervstyrelsen every evening. The information can then be interrogated to see where the vessel has been fishing relative to production areas, Natura 2000 sites and any closed areas.

Inspections:

The vessels have to inform the fishery inspectors of their intention to land mussels no later than 1 hour before landings to allow for ad hoc inspections of catch. Inspectors allow a margin of error of up to 5% between declared and actual landings (owing to the difficulty of estimating weights from volumes of shellfish in the hold, particularly as shellfish condition changes over the year), and will also tolerate up to 10% undersized mussels in landings (or up to 30% if the mussels are due to be relayed in other parts of the Limfjord).

Landings and related data:

Information on mussel landings estimated by the fisherman for each day for each boat, and the exact net weight after cleaning of the mussels (removal of stones, shells, undersized mussels), is provided by the processors to both the fishers and the Ministry, normally within a period of 24 hours. The Ministry crosschecks this information against logbook data, normally within 48 hours. No significant discrepancies have been found in recent years.

Data are also recorded with regard to the meat yield of mussels and the amounts of undersized mussels that are re-laid. Bycatch quantity of the catch is recorded in the landings data as is the amount of substratum e.g. boulders which is recorded in weight (kilograms).

Infringements:

Since introduction of the black box, compliance by fishers with management measures is considered to be high. No infringements have been detected recently in this fishery. The high level of compliance overall in the Limfjord fishery was reconfirmed by enforcement staff in March 2015 during the MRAG Americas assessment team’s site visit.

3.5.6 Overview of the fishery’s research plan

DTU-Aqua is implementing an EU-backed research plan funded by the European Fisheries Fund (EFF) directed at shellfish fisheries in the Limfjord. Priority areas for research in this plan include studies of the impact of shellfish dredging on marine habitats and infaunal species (which are being investigated through long-term comparison and unfished production areas) (Brand *et al*, 2015).

The primary driver of research efforts is DTU-Aqua with an interdisciplinary team headed by Dr Jens Kjerulf Petersen. According to the website, the focus of shellfish research is mainly on mussels, including mussel production, impact assessments of mussel fishing in conservation areas and on water quality, and stock assessment studies. Shellfish, as a

FINAL REPORT AND DETERMINATION

generic term, is mentioned. Cockles are not singled out for particular mention as the focus or priority for research activities (DTU-Aqua website).

4 Evaluation Procedure

4.1 Harmonised Fishery Assessment

The Danish Vilsund Blue a/s Limfjord Mussel and Cockle Dredge Fishery was recently certified in January 2015⁴. The Vilsund Blue assessment includes two identical UoCs (mussel and cockle fishery components) with exception to the definition of eligible fishers. The current UoCs include all fishing vessels affiliated to the Danish Fisheries Producer Organisation (DFPO).

Under these circumstances, this assessment is required to carefully review and make efforts to harmonise the fishery assessments. The previous Vilsund Blue assessment triggered use of the RBF methodology for Performance Indicator 1.1.1 – status of Limfjord cockles (*Cerastoderma edule*). Given that the fishery has only recently been awarded certification, it was deemed unnecessary to repeat the RBF analysis at this time⁵. Instead, the assessment team reviewed the results of the previous RBF with local stakeholders to ensure the outcome remained appropriate.

Further efforts to harmonise both fisheries included consultation with one or more vessel owners that were part of the original Vilsund Blue assessment in addition to previous stakeholders from government institutions, AgriFish Agency and DTU-Aqua. Details of the stakeholder consultation process are provided in section 4.4.1 below.

One outcome of harmonization pertains to the information conditions on PI 2.1.3 and PI 2.2.3 for cockles. New information on the design of the dredge used for the scientific mussel and cockle survey became available between the Vilsund Blue and present assessment of this fishery. The new information (details are given in the relevant PI rationales below) means there is no longer a condition needed on PI 2.1.3 or 2.2.3 for cockles, because the scientific survey dredge uses a mesh that is comparable to that which results from the liner inserted in the mussel dredge mesh for targeting cockles. This means that the catch composition information resulting from the survey dredge can be regarded as ‘some quantitative information’ regarding catch composition in the commercial cockle fishery, allowing an 80 score. The assessment team for the Vilsund Blue cockle fishery will remove the condition on PI 2.1.3 at the next scheduled surveillance audit, accordingly.

⁴ <http://www.msc.org/track-a-fishery/fisheries-in-the-program/certified/north-east-atlantic/vilsund-blue-a-s-limfjord-mussel-and-cockle-dredge>

⁵ See log entry on harmonization of exact duplicate fisheries and use of the RBF: <http://msc-info.accreditation-services.com/questions/harmonisation-of-exact-duplicate-fisheries-and-use-of-rbf/>

Question: Fishery A was certified using the RBF to score PI 1.1.1. Fishery B is an exact duplicate of Fishery A and is now under assessment. Does the CAB for Fishery B need to conduct the RBF for PI 1.1.1, or can the CAB just reference the results from Fishery A's RBF?

Answer: In the case of an exact duplicate assessment, adopting the results of the previous assessment (and stating as much) would be consistent with the harmonisation requirements in PB3.3.1. Fishery B's CAB would be expected to review the details of the previous assessment and any surveillance reports to confirm that they appear consistent with the MSC requirements and are still current. Any proposed differences should be reviewed with Fishery A's CAB (PB3.3.2b) and included in a subsequent surveillance report for Fishery A, if agreed (PB3.4).

FINAL REPORT AND DETERMINATION

4.2 Previous assessments

4.2.1 Limfjord fisheries

In addition to the harmonised fishery described in section 4.1 above, there are two other MSC-Certified fisheries in the Limfjord at present:

- Limfjord Oyster Dredge Fishery – this fishery was certified in May 2012. The fishery is based in the western Limfjord (mainly in shellfish production areas 1-9). The oyster fishery is mainly fished by mussel dredging vessels, which have to use oyster dredges (a different design to mussel dredges) when operating in the fishery. A bycatch of mussels is permitted in this fishery. The foundations of the management system are very similar to the mussel and cockle dredge fishery, although there are some species-specific differences in the technical measures and regulations for the oyster dredge fishery.
- Limfjord blue shell mussels (rope grown) - this fishery was certified in April 2012. The certified fishery is for mussel cultivation. Mussel spat are collected in the water column and then grown on ropes suspended in the water.

The management system is very similar for both the oyster, mussel and cockle fisheries. The team has taken account of these similarities in the scoring of the current assessment, particularly with regard to the “management” Performance Indicators in Principles 1, 2, and 3.

4.2.2 Other MSC Certified mussel and/or cockle fisheries in Europe

There are 12 other MSC certified mussel and/or cockle fisheries in the north-east Atlantic area. These are briefly described below:

- Burry Inlet Cockle Fishery – this is a hand gathering fishery for cockles in the UK. There is little in common between the Burry Inlet fishery and the UoCs under assessment in this report.
- Dee Estuary Cockle Fishery – this is another hand gathering fishery for cockles in the UK. There is also very little similarity between this fishery and the UoCs under assessment here.
- Exmouth Mussel Fishery – this is an enhanced mussel fishery in the UK. Again there is little similarity with the UoCs under assessment here.
- Germany Lower Saxony Mussel Dredge and Mussel Culture Fishery – there are two UoCs in this fishery, one of which is a mussel dredge fishery.
- Ireland Bottom Grown Mussel (*Mytilus edulis*) Fishery – this is another enhanced mussel fishery from the UK with little in common with the fisheries under assessment here.
- Netherlands Blue Shell Mussel Fishery – this is an enhanced mussel fishery in the Netherlands. There is little similarity with the fisheries under assessment here.
- Netherlands suspended culture mussel fishery – this is an enhanced mussel fishery in the Netherlands. There is little similarity with the fisheries under assessment here.
- North Menai Strait Mussel Fishery – this is an enhanced mussel fishery in the UK. There is little similarity with the UoCs under assessment here, although some of the studies of dredge impacts on the seabed from this fishery are relevant to this and other dredge fisheries.

FINAL REPORT AND DETERMINATION

- Northern Ireland Bottom Grown Mussel (*Mytilus edulis*) Fishery – this is another enhanced mussel fishery from the UK with little in common with the fisheries under assessment here.
- OHV Dutch Waddenzee and Oosterschelde Hand Raked cockle – this is an intertidal shellfishery where cockles are gathered from the shore. It has little in common with the fishery under assessment.
- Shetland and Scottish Mainland Rope Grown Mussel Enhanced Fishery – this is another enhanced mussel fishery from the UK with little in common with the fisheries under assessment here.
- SSPO Swedish West Coast rope grown mussel fishery - this is an enhanced mussel fishery in Sweden. There is little similarity with the fisheries under assessment here.

These fisheries are all quite different from the UoCs under assessment in this report, and the assessment team has concluded that there is no need for close harmonisation with the assessment outcomes.

4.2.3 Previous assessments

The current UoC is identical (albeit the client group is different) to the Vilsund Blue mussel and cockle fishery (see section 4.1 above). The Vilsund Blue assessment was awarded an MSC certificate in January 2015 subject to three conditions. Details of these conditions, and a summary of progress to address them, are set out in Table 9 below.

Previous to this, the mussel fishery UoC of the Vilsund Blue assessment had been awarded an MSC certificate in January 2010 subject to 3 conditions of certification for the mussel fishery. Details of these conditions, are set out in Table 10 below.

FINAL REPORT AND DETERMINATION

Table 9: Summary of Previous Assessment Conditions for the Limfjord cockle fishery in 2015

Condition	Closed? (Y/N)	Justification
<p>Condition 1: Retained non-target species: Information</p> <p>Recommended Actions: Quantitative information should be gathered about the catch composition obtained during commercial dredging for cockles (using the modified light mussel dredge equipped with a mesh sleeve to reduce mesh size) to provide a better understanding of the effect of retaining non-target species in the fishery on the status of these species, and to determine any increase in risk to these species.</p> <p>Timescale: A monitoring programme should be developed in the first year that will allow the quantity of non-target species retained in the fishery to be determined. The monitoring programme should be implemented within 2 years of certification and the results reported within 3 years. Results must be presented at annual surveillance audits.</p> <p>Relevant Scoring Indicators: 2.1.3</p>	N	<p>The full scoring rationale is given in the evaluation table for this PI.</p> <p>The scoring issues (SI) that do not attain the SG80 standard are SIa, SIb and SIc. The rationale for these are:</p> <p>SIa</p> <p><i>Information about the quantity of non-target species caught in mussel dredges in the Limfjord are available from the annual mussel surveys that are conducted throughout the unit of certification. This information gives an indication of the non-target species that are likely to be caught when fishing for cockles. However, because the mesh of the dredges is reduced in size by a net liner when fishing for cockles, it is considered that these data provide qualitative rather than quantitative information about the retained species.</i></p> <p><i>Qualitative information has also been provided by the main processor in the Limfjord to confirm that the proportion of non-target species in the landed catch is low.</i></p> <p><i>The qualitative information available meets the SG60 requirements for this SI. The SG80 and 100 requirements are not met because there is no quantitative information available about catch composition from the dredges with a reduced mesh size that are used when cockling.</i></p> <p>SIb</p> <p><i>Biologically based limits have not been set for the non-target retained species in the Limfjord (starfish). There is qualitative information available on the catch of non-target species in shellfish dredges and some quantitative information available about the current status of the population of the most abundant non-target species (starfish). Information is also available on the life history of the most abundant non-target species (both shore crabs and starfish are highly fecund and precocious).</i></p>

FINAL REPORT AND DETERMINATION

Condition	Closed? (Y/N)	Justification
		<p><i>Taken together, this information is adequate to allow the impact of the fishery on the status of non-target species to be assessed, meeting the SG60 requirements. The absence of quantitative catch data for the cockle fishery prevents the SG80 and 100 requirements from being met.</i></p> <p>Sld</p> <p><i>Some data about the proportion of non-target species in the cockle catch are collected by processors. There is currently no evidence that catch composition taken with a cockle dredge has been examined or is monitored on an ongoing basis. This SI is not considered to be met.</i></p>
<p>Condition 2: Bycatch (discarded) species: Information</p> <p>Recommended Actions: Quantitative information should be gathered about the catch composition obtained during commercial dredging for cockles (using the modified light mussel dredge equipped with a mesh sleeve to reduce mesh size) to provide a better understanding of the effect of discarding of non-target species from the fishery on the status of these species, and to determine any increase in risk to these species.</p> <p>Timescale: Within the first year a monitoring programme should be developed that will allow the quantity of non-target species retained in the fishery to be determined. The monitoring programme should be implemented within 2 years of certification and the results reported within 3 years. Results must be presented at annual surveillance audits.</p> <p>Relevant Scoring Indicators: 2.2.3</p>	N	<p>The full scoring rationale is given in the evaluation table for this PI.</p> <p>The scoring issues that do not attain the SG80 standard are Sla, Slb and Sld. The rationale for these are:</p> <p>Sla</p> <p><i>Qualitative information is available from the fishing industry and survey data, to describe the amount of bycatch (discarding) from the fishery, and also on the catch of all non-target species (as noted previously, the survey data can only be considered to be qualitative for the cockle fishery due to the practice of reducing the mesh size of the fishing gear when fishing for cockles). There is no accurate or verifiable information available on the consequence of discarding on the status of all of the species concerned.</i></p> <p><i>The information available is adequate to meet the SG60 requirements, but SG80 and 100 are not currently met.</i></p> <p>Slb</p> <p><i>Biologically based limits have not been set for the only bycatch species reported in the Limfjord shellfisheries, which are reported to be flounder.</i></p> <p><i>There is qualitative information available on discarding from the cockle and mussel fisheries. There is also good information available on the extent of the fishery with respect to the range of the non-target species This</i></p>

FINAL REPORT AND DETERMINATION

Condition	Closed? (Y/N)	Justification
		<p><i>information is adequate to broadly understand that the cockle fishery is very unlikely to affect flounder stock status, meeting the SG60 requirements. The absence of quantitative catch data for the cockle fishery prevents the SG80 and 100 requirements from being met.</i></p> <p>Sld</p> <p><i>Although good qualitative catch and landings data are available, as well as quantitative information about the distribution of fishing effort, the absence of quantitative information about catch composition in cockle dredges prevents the SG80 standard from being met.</i></p>
<p>Condition 3: Research Plan</p> <p>Recommended Actions: A research plan should be prepared for the Limfjord cockle fishery that is designed to provide the management system with reliable and timely information about the effects of the fishery on the cockle stock and the components of the marine environment.</p> <p>Timescale: A draft research plan should be prepared in collaboration with relevant organisations and institutions within the first year. The research plan should be agreed and implemented within 2 years of certification. Evidence of implementation of the research plan and initial research results should be provided within years 3-4 of certification. Results must be presented at annual surveillance audits.</p> <p>Relevant Scoring Indicators: 3.2.4</p>	N	<p>The full scoring rationale is given in the evaluation table for this PI.</p> <p>The scoring issue that does not attain the SG80 standard is Sla. The rationale for this is:</p> <p>Sla</p> <p><i>Research into the status of shellfisheries, their management and development is being carried out by DTU-Aqua under a European Fisheries Fund project that provides a strategic approach to research work and sets a timetable for action. The priority areas of research are the possible impacts of the dredge fisheries on seabed habitats, particularly eelgrass and benthic infauna.</i></p> <p><i>In addition to this work, DTU-Aqua also carry out ad-hoc into issues as they arise. An example of this is research being carried out into the “surfacing” of cockles on the seabed.</i></p> <p><i>Although research is being carried out into the cockle fishery that is consistent with MSC Principles 1 & 2, there is no evidence of a research plan in place specifically for this fishery. The SG60 requirements are therefore met, but not SG80 or 100.</i></p>

FINAL REPORT AND DETERMINATION

Table 10: Summary of Previous Assessment Conditions for the Limfjord mussel fishery in 2010

Condition	Closed? (Y/N)	Justification
<p>Condition 1: Harvest Strategy</p> <p>Harvest control tools are available and the harvest strategy is responsive to the state of the stock and there is evidence that it is achieving its objectives; however, the strategy is only fully applied to the Natura 2000 areas (where the majority of the fishery occurs- 80%) and does not fully address fishing locations outside these areas (and thus the fishery as a whole).</p> <p>Recommended Actions: Fishery management plans (as implemented within the Natura 2000 areas) could be extended across the entire fishery. This may be implemented at a broader level rather than specifying quotas for individual zones.</p> <p>Timescale: Within first year of certification.</p> <p>Relevant Scoring Indicators: 1.2.1</p>	Y	<p>This condition was closed at the first surveillance audit. At that audit the surveillance team found that:</p> <p><i>There is an overall strategy in place for the fishery, which uses data from an annual stock assessment to identify geographic areas of concern.</i></p> <p><i>Fishing plans are generated to manage these areas proactively, and the management system is also capable of reacting to localised stock management issues.</i></p> <p><i>On this basis, the assessment team conclude that the requirements of the condition are met. Management of fishing outside Natura 2000 sites, as well as within them, responds to current information about stock status.</i></p> <p>The performance of the harvest strategy has been reviewed at all subsequent site visits and continues to meet the PI 1.2.4 requirements.</p>
<p>Condition 2: ETP Species</p> <p>There is a lack of information on the extent to which the mussel fishery may impact directly or indirectly upon food (i.e. small fish) availability for fish eating birds such as Mergansers (<i>Mergus serratus</i> and <i>M. merganser</i>). It cannot therefore be stated with confidence that the indirect effects are thought to be unlikely to create unacceptable impacts.</p> <p>Recommended Actions: Indirect effects of the fishery upon populations of fish eating birds within the SPA and the potential for unacceptable impacts on these species should be determined through an appropriate research programme</p> <p>Timescale: Action plan for research should be prepared within the first year of certification (and made available for review at the first</p>	Y	<p>This condition was closed at the first surveillance audit. At that audit the surveillance team found that:</p> <p><i>The potential effect of the mussel fishery on fish eating birds has been researched by DTU-Aqua. No plausible link between mussel fishing activity and bird abundance has been identified.</i></p> <p><i>It is also noted that the potential for the fishery to impact upon fish eating birds (and indeed on other bird species) has to be kept under review as a statutory obligation. The assessments carried out in 2010 will be repeated annually, and will ensure that any potential effects are identified and addressed.</i></p> <p><i>Progress with this condition is ahead of target, and its requirements have been met already. The assessment team conclude that this condition can</i></p>

FINAL REPORT AND DETERMINATION

Condition	Closed? (Y/N)	Justification
<p>surveillance audit). Research programme must be implemented within 2 years of certification and completed within the period of certification (5 years).</p> <p>Relevant Scoring Indicators: 2.3.1, 2.3.3</p>		<p><i>be closed.</i></p> <p>The effect of the fishery on ETP species has been reviewed at all subsequent site visits and continues to meet the PI 2.3.1 & 2.3.3 requirements.</p>
<p>Condition 3: Possible Changes to Habitat</p> <p>It is not presently possible to conclude that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm. Mussel dredging removes stones and shells and boulders from mussel fishing grounds and although some of the stones and shells are returned to the Limfjord during mussel relaying, this may impact upon the structure and stability of the substrate. Some areas of benthic habitat may therefore be significantly altered in the short and long term as a direct result of mussel dredge fishing and further information is required to determine the risk posed to habitat types by the fishery.</p> <p>Recommended Actions: An appropriate research programme should be implemented to provide further information to determine the risk posed to habitat types as a direct result of the mussel fishery. This should investigate how detrimental mussel dredge associated habitat change is and, to provide further information if necessary, to investigate and implement appropriate methods for mitigation.</p> <p>Timescale: Action plan for investigation should be prepared within the first year of certification and made available for review at the first surveillance audit. Research programme must be implemented within 2 years of certification and completed within the period of certification (5 years). Results must be presented at annual surveillance audits.</p>	Y	<p>This condition was closed at the fourth annual surveillance audit. The rationale is presented below:</p> <p>PI 2.4.1 – Habitat Status</p> <p><i>At the initial certification of the fishery in 2009 there were concerns about a lack of information on the interaction of mussel dredging with seabed habitats in the Limfjord.</i></p> <p><i>Since that time the potential impacts of the fishing industry on the seabed habitats in the most sensitive areas of the Limfjord (the Lovns Bredning and Løgstør Bredning Natura 2000 sites) have been assessed in detail on an annual basis by DTU-Aqua. These reports have been produced to satisfy the requirements of Article 6 of the EC Habitats Directive, which requires that activities do not adversely affect the integrity of the site in question.</i></p> <p><i>All of the Natura 2000 site assessments carried out in the Limfjord have concluded that mussel fishing (subject to existing management constraints) can be carried out without adversely affecting the integrity of these sites and the habitats within them.</i></p> <p><i>On a wider basis, the interaction between the seabed and mussel dredges has been examined in a dedicated study. This concluded that new “lightweight” mussel dredges would minimise the risk of adverse impacts on the seabed. These dredges were adopted by all of the mussel fishers operating in the Limfjord in 2011.</i></p> <p><i>Other concerns that were raised in the initial assessment report have also been addressed. These were uncertainty about the requirement to fit bars to exclude boulders from dredges (these are a statutory requirement) and uncertainty about the quantity of stones that were caught in the fishery</i></p>

FINAL REPORT AND DETERMINATION

Condition	Closed? (Y/N)	Justification
<p>Relevant Scoring Indicators: 2.4.1, 2.4.3</p>		<p><i>(records of stone landings have subsequently been reported).</i></p> <p><i>Taken together, this information meets all of the SG60 and SG80 requirements throughout the unit of certification. For the Natura 2000 site areas, the SG100 requirements are met by the evidence that has been presented in the annual assessment of fishery impacts in these areas. These areas have been selected on the basis of the sensitivity and importance of their habitats, and this evidence strongly suggests that impacts in the Limfjord as a whole would not cause serious or irreversible harm to any benthic habitats. This view is strengthened by the findings of the research into dredge design and performance.</i></p> <p><i>On this basis, the Assessment team consider that the SG60 and SG80 requirements are fully met, and the SG100 is partially met because there is evidence available for the key habitats in the Limfjord but not for all areas. A score of 90 is therefore appropriate.</i></p> <p>PI 2.4.3 – Habitat information / management</p> <p><i>At the initial certification of the fishery in 2009 there were concerns about a lack of information on the interaction of mussel dredging with seabed habitats in the Limfjord and the amount of information available on the distribution of vulnerable habitat types.</i></p> <p><i>Since that time the potential impacts of the fishing industry on the seabed habitats in the most sensitive areas of the Limfjord (the Lovns Bredning and Løgstør Bredning Natura 2000 sites) have been assessed in detail on an annual basis by DTU-Aqua. These reports have resulted in an improved understanding of the distribution of vulnerable habitats within these areas, and the likely scale and significance of any interactions between the fishery and these habitats.</i></p> <p><i>On a wider basis, the interaction between the seabed and mussel dredges has been examined in a dedicated study. This concluded that new “lightweight” mussel dredges would minimise the risk of adverse impacts on the seabed. These dredges were adopted by all of the mussel fishers</i></p>

FINAL REPORT AND DETERMINATION

Condition	Closed? (Y/N)	Justification
		<p><i>operating in the Limfjord in 2011.</i></p> <p><i>A further change since the initial certification of the fishery has been the introduction of “black box” recorders on all fishing vessels. These monitor the position of vessels and whether or not they have deployed their dredges. This information is sent to NaturErhvervstyrelsen on a daily basis and examined to ensure that fishing has not taken place in vulnerable areas (such as eelgrass beds or areas where macroalgae are protected).</i></p> <p><i>This research and monitoring work provides a much improved level of understanding of the distribution of habitats and the impacts of the fishery upon them. This information satisfies all of the SG80 requirements.</i></p> <p><i>The detailed studies of the Natura 2000 sites, which focus on the most vulnerable and sensitive habitats in the Limfjord satisfy the first of the SG100 requirements. Although habitat distributions are monitored within these areas as well, they are not measured throughout the Limfjord; nor have physical impacts been fully quantified. The second and third SG100 requirements are therefore not met. A score of 85 is therefore appropriate.</i></p> <p>Conclusion</p> <p><i>The repeated assessment and ongoing monitoring of fishing impacts provides strong evidence that the performance of the fishery against the two Performance Indicators relevant to this condition have now been met. The condition can be closed.</i></p>

FINAL REPORT AND DETERMINATION

4.3 Assessment Methodologies

The MSC Certification Requirements (v1.3 at §27.8.11-27.8.13) specify that the assessment methodology shall be stated in the assessment report. This information is set out in the table below.

Table 11: Summary of Assessment methodology used

Item	Detail	
	UoC1: Mussels	UoC2: Cockles
Version of MSC Certification Requirements	Version 1.3, 14th January 2013	
Version of Full Assessment Reporting Template	Version 1.3	
Default Assessment Tree Used	Yes	
Adjustments made to Assessment Tree	Not Applicable	
Risk Based Framework	Not used	Used for Performance Indicator 1.1.1

4.4 Evaluation Processes and Techniques

4.4.1 Site Visits

A site visit was carried out Copenhagen and in Jegindø, a fishing port on the Limfjord, on the 11th – 12th March 2015. Meetings were held with key stakeholders. Attendance at the meetings is detailed below.

Table 12: List of meetings carried out during the site visit, with date, activity and attendance

Date	Activity	Attendance
11 th March, 2015	Meeting with Client, Karup, Denmark	Jonathan B. Jacobsen, DFPO
11 th March, 2015	Stakeholder meeting, Jegindø, Denmark.	Niels Jensen (Vessel Owner) Bo Husted Kjeldgaard (Vessel Owner, Chairman of Centralforeningen) Kaj Møller Jensen (Vessel Owner, Vice-chairman)
12 th March, 2015	Stakeholder meeting, Copenhagen, Denmark.	Anja Gadegaard Boye (AgriFish Agency) Søren Palle Jensen (AgriFish Agency) Jens Kjerulf Petersen, DTU-Aqua

4.4.2 Consultations

A record of meetings held is included in Appendix 3. All aspects of the fishery and its management were discussed at these meetings.

FINAL REPORT AND DETERMINATION

4.4.3 Evaluation Techniques

This assessment used the Standard Assessment Tree set out in MSC Certification Requirements v1.3. The MSC Risk Based Framework (RBF) was used to enable the assessment of data-deficient aspects of the fishery (see section 4.4.3.1). Use of this assessment tree has been the subject of stakeholder consultation (direct e-mail from MRAG Americas; notification on the MSC website; and notification via the MSC Fishery Updates). No comments were received from any stakeholders.

The MSC Principles and Criteria set out the requirements of a certified fishery. The certification methodology adopted by the MSC involves the interpretation of these Principles and Criteria into specific Performance Indicators and Scoring Guideposts against which the performance of Fishery can be measured. In order to make the assessment process as clear and transparent as possible, these identify the level of performance necessary to achieve 100, 80 (a pass score), and 60 scores for each Indicator.

For each Performance Indicator, the performance of the fishery is assessed as a 'score'. In order for the fishery to achieve certification, an overall score of 80 is considered necessary for each of the three Principles, 100 represent ideal best practice and 60 a measurable shortfall. A fishery cannot be certified if a score below 60 is recorded. As it is not considered possible to allocate precise scores, a scoring interval of five is therefore used in evaluations. Scores are allocated based on the consensus opinion of the assessment team.

4.4.3.1 Risk Based Framework

A fishery with the same UoC was awarded MSC certification on 7th January 2015. The assessment required use of the RBF methodology for PI1.1.1 for cockles (see Table 13).

Due to the very recent application of the RBF methodology in this previous assessment it was deemed not necessary to undertake a full stakeholder consultation during the current assessment. Instead, it was agreed that the *outputs* from the previous RBF assessment be *confirmed* with key stakeholders during the current analysis. Confirmation of the outputs from the previous RBF assessment has been included in this report.

Table 13: Scoring components and elements considered in this assessment. Decisions on whether or not a particular PI is data deficient have been taken using the guidance set out in Table AC2 of the MSC Certification Requirements v 1.3.

Component	Scoring elements	Main/not main	Data-deficient or not
UoC 1			
1.1.1 - Stock Status	<i>Mytilus edulis</i>	Main	No
UoC 2			
1.1.1 - Stock Status	<i>Cerastoderma edule</i>	Main	Yes. The status of the stock relative to biological limits has not been determined.
Both UoCs			
2.1.1	<i>Asterias rubens</i>	Not main	No
2.1.1	<i>Carcinus maenas</i>	Not main	No
2.3.1	Goldeneye, <i>Bucephala bucephala</i>	NA	NA
	Mergansers, <i>Mergus spp</i>	NA	NA

FINAL REPORT AND DETERMINATION

Component	Scoring elements	Main/not main	Data-deficient or not
2.4.1	Stony reef habitats	NA	NA
	Sandbanks and mudflats	NA	NA
	Eelgrass	NA	NA
	Algae	NA	NA
2.5.1	Water quality	NA	NA

4.4.3.2 Consultations

Invitations to participate in the assessment process were sent to all of the stakeholders that had been identified during the previous 2015 MSC assessment in Denmark. The assessment team met with all stakeholders that indicated a desire to participate in meetings. A list of the meetings held with stakeholders is given in Table 12 above. Stakeholder interviews from the site visit are presented in Appendix 3 of this report.

4.5 Assessment of the Units of Certification

This report sets out an assessment of two units of certification. The key difference between these units of certification is the target species. In all other respects, the fisheries are identical: they are in the same geographic area; the target species are caught with the same fishing gear and by the same fleet of vessels; and are subject to the same management regime.

To simplify the assessment process, the team has combined the assessment of Principle 3 for the two fisheries (with the exception of PI 3.2.4), whilst keeping the Principle 1 and 2 assessments separate. This approach is summarised and explained in Table 14 below.

Table 14: Summary of rationale for assessment of the two units of certification

Principle	UoC1: Mussels	UoC2: Cockles
Principle 1 – Target species	Assessed separately – the P1 assessment must reflect the stock status and management of each species alone.	Assessed separately – the P1 assessment must reflect the stock status and management of each species alone
Principle 2 – Marine Environment	Assessed separately – although there are many similarities between the two fisheries, the cockle fishery uses a different dredge mesh size to the mussel fishery, and this has implications for the scoring under several of PIs.	Assessed separately – although there are many similarities between the two fisheries, the cockle fishery uses a different dredge mesh size to the mussel fishery, and this has implications for the scoring under several of PIs.
Principle 3 – Management & Governance	Assessed together – both fisheries are subject to the same management regime (subject to minor species-specific differences). Only one PI requires separate assessment, which is PI 3.2.4 (Research Plan). In order to simplify the report, only this PI has been assessed separately in P3.	

5 Traceability

5.1 Eligibility Date

5.1.1 Mussel Unit of Certification

The target eligibility date for the mussel unit of certification in this assessment is December 2015. This is in line with the proposed timeline outlined in the MSC Fishery Announcement.

5.1.2 Cockle Unit of Certification

The target eligibility date for the cockle unit of certification in this assessment is December 2015. This is in line with the proposed timeline outlined in the MSC Fishery Announcement.

5.2 Traceability within the Fishery

a. Tracking & tracing systems

MRAG Americas has evaluated the key elements of traceability within the fishery as required by MSC Certification Requirements at §27.12.1, below.

The traceability of the fishing activity for this fishery is provided by the statutory requirement to report all fishing activity to NaturErhvervstyrelsen and to record all catches in e-logbooks.

There is additional traceability through the specific opening and closing of the mussel areas based upon testing of shellfish quality. Fishers can therefore only fish in these open areas and must prove so by having documented proof of location e.g. GPS and e-log book records. Further traceability is provided by the client who records receipt of sales and landings by weight at their factory. This information is also submitted to the authorities and compared to the logbook information received from the fishers.

There is a high degree of confidence that all of the fishing activity carried out by the vessels under assessment is tracked and recorded by cross-referenced and verifiable mechanisms.

b. Catch segregation

The only species retained and landed by the vessels in the Unit of Certification are mussels, cockles and (for some of the vessels), oysters. These species are readily identified and are segregated aboard the vessels. The vessels in the UoC are not permitted to fish outside the Limfjord, so cannot catch non-MSC product. There is no need to segregate non-MSC catch from MSC catches of any species of shellfish aboard the vessels.

c. Risk of vessels fishing outside the unit of certification

The vessels operating in the fishery are only permitted to fish within the Limfjord. The movements of vessels are closely monitored, and the risk of fishing outside the unit of certification is considered to be negligible.

Some of the vessels that are licensed to fish for mussels and cockles are also licensed to fish for oysters using dredges. The oyster fishery is located within the geographic area of the UoC under assessment. A bycatch of up to 10% mussels is permitted from the oyster fishery (which has equated to a few tens of tonnes of mussels per year). The oyster dredge fishery is MSC certified. There is no risk of mixing of oysters and mussels (they are readily distinguished species).

To date, all vessels within the oyster fishery and associated landing sites are included within the mussel UoC, and therefore all mussel bycatch is eligible to be sold as MSC

FINAL REPORT AND DETERMINATION

certified. A list of all mussel and cockle fishing vessels is maintained online so that the buyers can check that they have purchased MSC certified mussels and cockles⁶. There is thus a high degree of confidence that operations in the oyster dredge fishery will not result in non-certified product mussels entering the chain of custody.

d. On-board processing and labelling

There is no on-board processing in this fishery. Mussels and cockles are landed on the day of catch to the specified points of landing, for onward transport within the MSC Chain of Custody.

e. Transshipment and first point of landing

There is no transshipment of shellfish at sea.

f. Risk of substitution of certified fish with non-certified fish prior to and at the point of landing

The risk of substitution of certified shellfish with non-certified shellfish has been evaluated and is considered to be very low because of the strict controls imposed throughout the chain of custody by NaturErhvervstyrelsen. These controls combine monitoring of vessel movements, at-sea catch reporting, monitoring of landings and cross-referencing to processor's records to guarantee the provenance of all shellfish caught in the Limfjord.

Table 15: Points of landing (with official port code) where shellfish can be landed in the Limfjord and that are included within the scope of this assessment

Code	Harbour
13015	Rønbjerg Havn
13024	Ålborg Havn
13025	Løgstor Havn
13026	Nibe Havn
13030	Gjøl Havn
14014	Sundstrup Havn
22011	Lemvig Havn
22012	Struer Havn
25001	Jegindø Havn
25010	Øst Vilsund Havn
25012	Sillersley Havn
25014	Nykøbing Havn
25015	Limfjordskompagniet
25016	Fur Havn
25028	Glyngøre Havn
25029	Branden Havn
25034	Skive Havn
25035	Hvalpsund Havn
27019	Oddesund Havn
27028	Agger Havn
27030	Amtøft Havn
27033	Thisted Havn
27034	Vest Vilsund Havn

⁶ <http://mscfiskere.fiskeriforening.dk/opkoeber-forhandler/danske-msc-fartoejer/>

FINAL REPORT AND DETERMINATION

5.3 Eligibility to Enter Further Chains of Custody

MRAG Americas has evaluated the eligibility of shellfish from this fishery to enter into further chains of custody as required by MSC Certification Requirements at §27.12.2, below.

a. Eligibility to enter further certified chains of custody

Tracking and traceability information for this fishery is considered sufficient for product to be eligible to enter further chains of custody.

b. Parties eligible to use the fishery certificates

The only party eligible to use the fishery certificate is the client (DFPO) and the vessels nominated by DFPO (listed in Table 1 of this report).

c. Eligible points of landing

The points of landing for this fishery are listed in Table 15.

Shellfish are only landed by the fleet at these ports, where they are subject to random inspections. Vessels have to inform NaturErhvervstyrelsen in advance of landing to facilitate inspection and monitoring of catches.

Landings are declared and cross-referenced to sales notes. There is therefore a very low risk of MSC and non-MSC product becoming mixed at the point of landing.

d. Point of change of ownership from which Chain of Custody certification is required

The point of change of ownership for product from the fishery will be acceptance of fish by customers into their own storage and processing facilities. While transport by truck may occur between the port of landing and the factory this is arranged by the factory and thus retains full control over movement of MSC certified product prior to processing.

All merchants and processors wishing to sell MSC certified fish that has been purchased from this fishery will therefore require their own Chain of Custody certification.

5.4 Eligibility of Inseparable or Practically Inseparable (IPI) stock(s) to Enter Further Chains of Custody

No IPI stocks are involved in this assessment.

6 Evaluation Results

6.1 Principle Level Scores

The performance of this fishery in relation to MSC Principles 1, 2, and 3 is summarised in the table below.

Table 16: Summary of MSC Principle level scores for the Limfjord mussel fishery (UoC1) and cockle fishery (UoC2)

Overall weighted Principle-level scores	UoC1: Mussels	UoC2: Cockles
Principle 1 – Target Species	89.4	84.8
Principle 2 – Ecosystem	88.0	85.0
Principle 3 – Management System	92.5	91.5

6.2 Summary of Scores

The scores assigned to each Performance Indicator for this fishery are shown in Table 18.

6.3 Summary of Conditions

The mussel fishery (UoC 1) attained a score of more than 80 for all Performance Indicators. There are no conditions for this UoC.

The cockle fishery (UoC 2) attained a score of below 80 against one Performance Indicator. The assessment team has therefore set a condition for continuing certification that the client for certification is required to address. The condition is 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 has developed an 'Action Plan' for Meeting the Condition for Continued Certification', which has been approved by MRAG Americas.

As a standard requirement of the MSC certification methodology, the fishery shall be subject to (as a minimum) annual surveillance audits. Progress towards the milestones set out in the conditions shall be reviewed at these annual audits. The annual surveillance audits shall be publicised and reports made publicly available.

The Condition, associated timescales and relevant Scoring Indicator are summarised in the table below, and set out in detail in section 0 of this report.

FINAL REPORT AND DETERMINATION

Table 17: Summary of conditions

Condition number	Condition	Performance Indicator
Unit of Certification 2 - Cockles		
1	Research Plan A research plan should be prepared for the Limfjord cockle fishery that is designed to provide the management system with reliable and timely information about the effects of the fishery on the cockle stock and the components of the marine environment.	3.2.4

6.4 Recommendations

The assessment team has no recommendations for this fishery.

6.5 Determination, Formal Conclusion and Agreement

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.

The assessment team has concluded that the Limfjord Mussel and Cockle Dredge Fishery (as defined in this report) should therefore be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

6.6 Changes in the fishery prior to and since Pre-Assessment

This section is not applicable to this fishery. There has been no pre-assessment prior to this assessment.

FINAL REPORT AND DETERMINATION

Table 18: Scores for the Limfjord Blue Mussel and Cockle Fishery. Scores shaded green attain the unconditional pass level. Yellow shading indicates a conditional pass, and red shading would indicate a fail.

Prin- ciple	Wt (L1)	Component	Wt (L2)	PI No.	Performance Indicator (PI)	Wt (L3)	Weight in Principle	UoC1: Mussels	UoC2: Cockles
One	1	Outcome	0.5	1.1.1	Stock status	0.5	0.25	90	97
				1.1.2	Reference points	0.5	0.25	100	80
				1.1.3	Stock rebuilding		0.333 0.1667	NA	0
Two		Management	0.5	1.2.1	Harvest strategy	0.25	0.125	85	85
				1.2.2	Harvest control rules & tools	0.25	0.125	90	80
				1.2.3	Information & monitoring	0.25	0.125	80	80
				1.2.4	Assessment of stock status	0.25	0.125	80	80
	1	Retained species	0.2	2.1.1	Outcome	0.333	0.0667	80	80
				2.1.2	Management	0.333	0.0667	80	80
				2.1.3	Information	0.333	0.0667	80	80
		Bycatch species	0.2	2.2.1	Outcome	0.333	0.0667	80	80
				2.2.2	Management	0.333	0.0667	80	80
				2.2.3	Information	0.333	0.0667	80	80
		ETP species	0.2	2.3.1	Outcome	0.333	0.0667	100	100
				2.3.2	Management	0.333	0.0667	95	95
				2.3.3	Information	0.333	0.0667	85	85
		Habitats	0.2	2.4.1	Outcome	0.333	0.0667	100	80
				2.4.2	Management	0.333	0.0667	100	90
				2.4.3	Information	0.333	0.0667	90	90
		Ecosystem	0.2	2.5.1	Outcome	0.333	0.0667	90	90
				2.5.2	Management	0.333	0.0667	90	85
				2.5.3	Information	0.333	0.0667	90	80
Three	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.25	0.125	100	100
				3.1.2	Consultation, roles &	0.25	0.125	100	100
				3.1.3	Long term objectives	0.25	0.125	90	90
				3.1.4	Incentives for sustainable fishing	0.25	0.125	90	90
		Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.2	0.1	90	90
				3.2.2	Decision making processes	0.2	0.1	90	90
				3.2.3	Compliance & enforcement	0.2	0.1	100	100
				3.2.4	Research plan	0.2	0.1	80	70
				3.2.5	Management performance	0.2	0.1	90	90

	UoC1: Mussels	UoC1: Cockles
Overall weighted Principle-level scores		
Principle 1 - Target species	89.4	84.8
Principle 2 - Ecosystem	88.0	85.0
Principle 3 - Management	92.5	91.5

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7.2.1 EC Legislation

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Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC. *Official Journal of the European Union*, L354/22-L354/61, 28.12.2013. Available from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:354:0022:0061:EN:PDF>

7.2.2 Danish Legislation

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FINAL REPORT AND DETERMINATION

Appendix 1: Scoring and rationales

Principle 1 Evaluation Tables

UoC 1: Mussel fishery

Evaluation Table for PI 1.1.1 Mussels

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	It is likely that the stock is above the point where recruitment would be impaired.	It is highly likely that the stock is above the point where recruitment would be impaired.	There is a high degree of certainty that the stock is above the point where recruitment would be impaired.
	Met?	Y	Y	Y
	Justification	<p>Stock status of mussels in the Limfjord has been assessed annually since 1993 and the fishery has been managed by controlling the exploitation rate through a TAC, but there are no formally defined reference points against which the current status of the stock can be assessed. However the MSC guidance for assessment of PI 1.1.1 anticipates such circumstances and states:</p> <p><i>“GCB 2.2.7 There may be situations where well-managed stocks do not have target reference points or do not have limit reference points. The stock will still need to be assessed in terms of the overall outcome objectives, i.e. for SG80 that the stock status is highly likely to be above the point at which there is an appreciable risk that recruitment is impaired, and will be at or around a level consistent with BMSY.”</i></p> <p>MSC Guidance on CR v1.3</p> <p>The assessment team considers that the mussel fishery can be assessed in relation to this guidance as the stock is clearly well-managed with fishing effort limited through the use of a TAC.</p> <p>The fishery is managed on the basis that removal of mussels equivalent to the annual production of the stock is considered to be sustainable. Studies of the Limfjord mussel stock estimates the production biomass ratio (P/B) to be 40-50%, and the annual stock survey provides an estimate of stock biomass thereby allowing an estimate of annual production. This estimate of annual production provides therefore an implicit reference point for managing the exploitation rate in the fishery through the setting of a precautionary TAC.</p> <p>Annual stock surveys between 2009 and 2013 estimated that there were over 400,000 tonnes of mussels in areas to which fishing is limited, i.e. the waters deeper than 3m. However the most recent stock survey in 2014 estimated that there were 265,000 tonnes in the areas open to fishing. In addition the stock of mussels in the waters shallower than 3m which are not covered by the annual survey is estimated to be around 325,000 tonnes.</p> <p>Taking the lower end of the production biomass ratio of 40% and the relatively low stock biomass observed in 2014, this would imply that an annual harvest of approximately 106,000 tonnes from the areas opened to fishing would be sustainable and would therefore be consistent with a Bmsy approach. If the estimate of the total mussel stock of approximately 600,000 tonnes (including those in waters less than 3m deep) is taken into account, then an annual harvest of approximately 240,000 tonnes would be sustainable. Current management regulations within the Limfjord fishery have limited landings of</p>		

FINAL REPORT AND DETERMINATION

PI 1.1.1	The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
		<p>mussels to around 25,000 tonnes per annum in recent years. This level of landings equates to 24% of the estimated current annual production in waters deeper than 3m and approximately 10% of current annual production in the Limfjord area as a whole. Mussel mortalities are common in the Limfjord due to hypoxia events and such mortalities are likely to be higher than fishery removals, but even when such mortalities are taken into account, fishery removals on the scale of the whole fishery would not be expected to affect the mussel stocks.</p> <p>In addition to the very low exploitation rate in the fishery, there are a number of other factors that contribute to the protection of recruitment in the fishery. There are large parts of the Limfjord area that are closed to fishing. All waters less than 3m deep are closed to fishing, and within Natura 2000 sites this depth limit is increased to 5m, and further increased to 6m in areas where eelgrass may be present. In addition no fishing is permitted in Natura 2000 sites where the effect of mussel fishing has not been considered in an environmental impact assessment, or in areas where the fishing industry has not taken shellfish hygiene samples. These areas closed to fishing represent approximately 50% of the Limfjord, and effectively act as MPAs from which there may be spillover of recruits into the fishing areas. In practice, fishing occurs in much less than 50% of the Limfjord. For example, analysis of data from the black box system mandatory on all vessels shows that mussel fishing activity occurred in less than 2% of the Løgstør Bredning Natura 2000 site from 2012 to 2014 (Søren Palle Jensen, NaturErhvervstyrelsen, pers. comm.).</p> <p>A key component of the management plan for the mussel fishery is that small mussels are dredged from commercial mussel beds and re-laid on high production areas where hypoxia events are rare. Survival of re-laid mussels is high and so this relaying strategy is likely to enhance recruitment.</p> <p>In addition to the overall management strategy within the mussel fishery, there are aspects of the biology of the species which suggest that recruitment will not be impaired by the fishery. Mussels are a highly fecund species with each female producing approximately 3 million eggs, and will quickly establish new populations where suitable substrates are available for settlement. Settlement of seed mussel appears to occur over the whole Limfjord system, so seed mussel is not limited in the area. Dead shells and pebbles are important for settlement of mussels, but there is no evidence in the Natura 2000 sites at least that mussel dredging has impacted such substrates. However mussel beds are found on a whole range of substrates, so settlement is not confined to particular substrates.</p> <p>On the basis that (a) the management strategy for the mussel fishery has maintained the stock at a high level and is consistent with maintaining the stock at Bmsy, i.e. significantly above the point at which recruitment would be impaired, (b) there are large areas of the mussel distribution in the Limfjord that are closed to fishing, (c) recruitment to the fishery is enhanced by the relaying of small mussels in high production areas, and (d) mussels have a natural high fecundity, the assessment team considers that there is strong evidence that there is a high degree of certainty that the stock is above the point where recruitment would be impaired and so the fishery meets the SG100.</p>	
b	Guidepost		<p>The stock is at or fluctuating around its target reference point.</p> <p>There is a high degree of certainty that the stock has been fluctuating around its target reference point, or has been above its target reference point, over recent years.</p>

FINAL REPORT AND DETERMINATION

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
	Met?		Y	N
	Justification	As noted above, MSC CR Guidance GCB 2.2.7 acknowledges that there may be circumstances in which a well-managed fishery may have no target reference point. As such the assessment team needs to determine whether or not the stock is at a level that is consistent with Bmsy. On the basis that annual stock surveys since 1993 show that the stock has been stable for over 20 years, there is a highly precautionary management regime in which recruitment is safeguarded in both the Natura 2000 sites and the wider fishery, large areas of the Limfjord are closed to fishing, and the mussel has a high natural fecundity, it is reasonable to conclude that the stock is fluctuating around a level that is consistent with a target reference point that would deliver MSY. The assessment team concluded that the fishery meets the SG80 standard, but in view of the lower stock biomass estimate from the latest stock survey in 2014, the fishery does not meet the SG100.		
References		MSC Certification Requirements v 1.3; MSC Guidance on Certification Requirements v 1.3; Mussel survey results 2014 (Jens Kjerulf Petersen, DTU Aqua, pers. comm.); Nielsen et al., 2014; Canal-Vergés et al., 2014; DTU-Aqua 2006.		
Stock Status relative to Reference Points				
		Type of reference point	Value of reference point	Current stock status relative to reference point
Target reference point		Fishing mortality based on annual assessment of stock biomass and estimates of annual production (estimated from observations of the stock to be 40-50% of stock biomass).	Annual fishing mortality is set at a level less than annual production of the mussel stock (40-50% of stock biomass), indicating that landings of up to 106,000 tonnes per annum from the stock in waters deeper than 3m would be sustainable.	Fishery landings are monitored and are consistently less than annual production. In recent years, landings have been around 25,000 tonnes per annum which equates to 24% of current annual production of the fishable stock, and approximately 10% of the whole Limfjord mussel stock.
Limit reference point				
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 1.1.2 Mussels

PI 1.1.2		Limit and target reference points are appropriate for the stock		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Generic limit and target reference points are based on justifiable and reasonable practice appropriate for the species category.	Reference points are appropriate for the stock and can be estimated.	
	Met?	Y	Y	
	Justification	<p>There are no explicitly defined reference points for the Limfjord mussel fishery. However the management of the fishery requires the adjustment of fishing effort in response to the estimate of overall stock biomass based on the annual stock surveys and the observation that the annual production of the mussel stock is 40-50% of the stock biomass. This estimate of annual production provides an implicit reference point for the fishery which is used to define a precautionary TAC for the fishery. This approach is different from the formal limit and target reference points approach based on analytical determinations of biomass and fishing mortality used conventionally, for example, for many fish species within the ICES framework, but the implicit reference point approach used in the management of the Limfjord mussel fishery can be accommodated within the MSC Certification Requirements (CR) as set out in detail below.</p> <p>The MSC Guidance for assessment of PI 1.1.2 states that:-</p> <p>“GCB2.3.3 All management systems should have reference points, and even if these are not stated explicitly they should be implicit within the decision rules or management procedures, and the fishery should be assessed on these implicit reference points. [...]”</p> <p>GCB2.3.9 Writing the PISGs in terms of biomass and fishing rate metrics creates an appearance that the MSC Principles and Criteria are not well suited for other than large industrial fisheries with formalised stock assessments and biomass based reference points. This is not the intent.</p> <p>GCB2.3.9.1 Examples of qualitative interpretation include analogy with similar situations, plausible argument, empirical observation of sustainability and qualitative risk assessment.</p> <p>Examples of quantitative interpretation include the use of measured data from the relevant fishery, statistical analysis, quantitative risk assessment and quantitative modelling. One example of surrogate measures given in the MSC CR Guidance is as follows:</p> <p>“GCB2.3.9.2 <i>Relatively sedentary bivalves often have fishery management trigger points based on population densities collected through systematic surveys, where these index densities are established based on the species population dynamics and the inherent productivity of the habitat and environmental conditions. There may be no formal stock assessment but yield is calculated on a proportion of the observed biomass and the harvested fraction determined on empirical evidence from historical catches and their consequences.</i>” (MSC CR Guidance v1.3)</p> <p>The management procedure for the Limfjord mussel fishery uses a pre-defined reference point of the annual production of the mussel stock (defined as 50% of the stock biomass as estimated from the annual stock survey) to limit fishing effort through the setting of a precautionary TAC for the fishery. At present the management authorities, NaturErhvervstyrelsen, set a weekly TAC of 45</p>		

FINAL REPORT AND DETERMINATION

PI 1.1.2		Limit and target reference points are appropriate for the stock		
		<p>tonnes per fishing licence (voluntarily reduced to 30 tonnes by the fishing industry body) which is well within the implicit reference point of 50% of the stock biomass. (It should be noted that weekly TACs include both mussels and cockles and are gross figures of unsorted catch.) Within the Natura 2000 sites, the approach is even more precautionary setting an annual TAC which must be lower than the annual production of the stock 50% and reduced further by taking into account the food requirements of the birds within the Natura 2000 site. In practice the TAC in the Natura 2000 sites is set at a level well below the pre-determined reference point. These are surrogate measures that are based on long-term studies of the productivity of the Limfjord mussel stock and have proven to be effective for over 20 years in this fishery. The approach is therefore appropriate for the mussel stock and the reference points are estimated from studies of its productivity and annual stock estimates, and therefore the SG80 requirements are met.</p>		
b	Guidepost		The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity.	The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity following consideration of precautionary issues.
	Met?		Y	Y
	Justification	<p>Management of the mussel fishery in the Limfjord uses a reference point that fishery removals should be lower than the annual production of the stock, defined as 40-50% of the stock biomass estimated from annual stock surveys. This reference point is precautionary in that it is based on the productivity of only part of the stock because it considers the stock only in areas where fishing activity can take place (water depths of more than 3m) and there is therefore a large unfished stock of mussels which is not taken into account in the setting of the reference point. Additional precautionary measures are taken in Natura 2000 sites where the depth limit is 5m (6m in areas where eelgrass is present) and the food requirements of fish-eating birds are also taken into account.</p> <p>This reference point is based on observations of the productivity of the stock and is considered to be consistent with Bmsy and is therefore much higher than any limit reference point that would be set for the mussel stock. The assessment team considers therefore that the setting of the reference point will ensure that there is no appreciable risk of impairing reproductive capacity, and that precautionary measures have been fully considered. The fishery therefore meets the SG100.</p>		
c	Guidepost		The target reference point is such that the stock is maintained at a level consistent with B _{MSY} or some measure or surrogate with similar intent or outcome.	The target reference point is such that the stock is maintained at a level consistent with B _{MSY} or some measure or surrogate with similar intent or outcome, or a higher level, and takes into account relevant precautionary issues such as the ecological role of the stock with a high degree of certainty.

FINAL REPORT AND DETERMINATION

PI 1.1.2		Limit and target reference points are appropriate for the stock		
	Met?		Y	Y
	Justification	<p>Management of the Limfjord mussel fishery uses a clearly defined reference point to determine fishing effort through the use of a TAC. The reference point is that the fishery should not remove more than the annual production of the stock, defined as 40-50% of the stock biomass estimated from the annual stock surveys. This reference point is based on studies of productivity in the mussel stock and is designed to ensure that over time the mussel stock biomass is not reduced by fishery removals. In that way the reference point can be considered to be consistent with Bmsy.</p> <p>This target reference point (below which the TAC must be set) considers only the stock biomass in those areas where fishing takes place, i.e. in waters which are deeper than 3m in the overall fishery, 5m in Natura 2000 sites and 6m in areas where eelgrass is present. On that basis, the target reference point can be considered to be precautionary. In the Natura 2000 sites the target reference point, below which the TAC must be set, is set at a more precautionary level through considering the ecological role of the mussel stock. In these areas the target reference point is determined by the annual estimated production of the stock and reduced further by taking into account the food requirements of the birds which feed on mussels. The intent of the mussel fishery management within the Natura 2000 sites is to ensure that there is a higher stock biomass and lower fishing mortality than the level consistent with Bmsy thereby ensuring with a high degree of certainty that the mussels fulfil their ecological role.</p> <p>The assessment team considers that the target reference point used in this fishery is a suitable surrogate and has similar intent to Bmsy. The precautionary way in which the reference point is calculated by considering only mussels in the areas where fishing takes place and by taking the mussel's ecological role into account ensures that the SG100 is met.</p>		
	Guidepost		For key low trophic level stocks, the target reference point takes into account the ecological role of the stock.	
	Met?		Not relevant	
	Justification	<p>Mytilus edulis is not a key low trophic level species, as it does not meet all the criteria set out in paragraph CB2.3.13 of the MSC Certification Requirements v1.3.</p>		
References		<p>MSC Certification Requirements v 1.3; MSC Guidance on Certification Requirements v 1.3; Mussel survey results 2014 (Jens Kjerulf Petersen, DTU Aqua, pers. comm.); Nielsen et al., 2014; Canal-Vergés et al., 2014; DTU Aqua 2006</p>		
OVERALL PERFORMANCE INDICATOR SCORE:				100
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 1.1.3 Mussels

PI 1.1.3		Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Where stocks are depleted rebuilding strategies, which have a reasonable expectation of success, are in place.		Where stocks are depleted, strategies are demonstrated to be rebuilding stocks continuously and there is strong evidence that rebuilding will be complete within the specified timeframe.
	Met?	N/A		N/A
	Justification	The stock is not considered to be depleted and so this PI is not scored.		
b	Guidepost	A rebuilding timeframe is specified for the depleted stock that is the shorter of 30 years or 3 times its generation time. For cases where 3 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	A rebuilding timeframe is specified for the depleted stock that is the shorter of 20 years or 2 times its generation time. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	The shortest practicable rebuilding timeframe is specified which does not exceed one generation time for the depleted stock.
	Met?	N/A	N/A	N/A
	Justification	The stock is not considered to be depleted and so this PI is not scored.		
c	Guidepost	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within a specified timeframe.	There is evidence that they are rebuilding stocks, or it is highly likely based on simulation modelling or previous performance that they will be able to rebuild the stock within a specified timeframe.	
	Met?	N/A	N/A	
	Justification	The stock is not considered to be depleted and so this PI is not scored.		
References		None		
OVERALL PERFORMANCE INDICATOR SCORE:				NA
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 1.2.1 Mussels

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	The harvest strategy is expected to achieve stock management objectives reflected in the target and limit reference points.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving management objectives reflected in the target and limit reference points.	The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in the target and limit reference points.
	Met?	Y	Y	Y
	Justification	<p>As Denmark is a member of the European Union, the mussel fishery is managed within the Framework of the Common Fisheries Policy (CFP). The long term objectives for the mussel fishery were established by the Danish Government through the setting up in 2005 of the Advisory Committee on Mussel Production following amendments to the Fisheries Act. The Advisory Committee facilitates co-management of the fishery by providing the formal link between the fishery managers, NaturErhvervstyrelsen, and the Limfjord fishers' association, the CF. All mussel fishing vessels are covered by the DFPO code of conduct. In addition, a Mussel Policy document was published in 2013, which sets out the management strategy based on consultation with WWF and Danish Nature Conservation NGOs – a key component of harvest strategy.</p> <p>The overall harvest strategy is to limit mussel dredging to a small proportion of the total distribution of mussels, and to ensure that recruitment to the fishery is safeguarded. In addition, within Natura 2000 sites, the harvest strategy is designed to ensure that mussel dredging does not adversely affect the conservation features.</p> <p>The harvest strategy is composed of a number of elements, including a robust monitoring, control and surveillance policy. The fishery is a limited entry fishery with a maximum of 50 licences, although two licences can be aggregated on a single vessel, and there are currently therefore only 26 vessels in the fishery. There is a minimum landing size of 50 mm, restrictions on the weight and size of dredge, restrictions on vessel size and power, limits on the depth in which fishing is permitted, closed seasons and areas, and no fishing is permitted on Sundays and during the hours of darkness. There is a weekly TAC in the general fishery of 45 tonnes per licence, although the fishers' association, CF, voluntarily reduces this to 30 tonnes. The TAC covers total catch of both mussels and cockles, and the landings must contain a minimum of 51% mussels, and 1% bycatch of oysters is permitted. No sorting of the catch is permitted on board the vessel, although stones over 2 kg in weight must be returned to the sea. Within the Natura 2000 sites, there is an annual TAC, and individual landings must contain a minimum of 90% mussels, and there is a limit on vessel numbers allowed in the Natura 2000 sites at any one time. To further safeguard recruitment, there is a relaying strategy for the fishery. A communal vessel, "Limfjord", has a licence to dredge seed mussel and relay it in more productive areas.</p> <p>In summary, the harvest strategy is designed to ensure that fishery removals are less than the annual production of the mussels in the fished area of the Limfjord, and more restrictive in the Natura 2000 sites, and uses information from annual stock surveys to determine an appropriate level of fishing effort. The assessment team concludes that the harvest strategy is responsive to the</p>		

FINAL REPORT AND DETERMINATION

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
		state of the stock, and is designed to achieve stock management objectives and so meets the SG100.		
b	Guidepost	The harvest strategy is likely to work based on prior experience or plausible argument.	The harvest strategy may not have been fully tested but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	Y	Y	N
	Justification	<p>The use of TACs, effort limitation, technical conservation measures and robust monitoring and enforcement are a proven method for controlling exploitation rates, ensuring that the reproductive potential of the stock is not impaired by the fishery. Data from the “black box” system on board all vessels provide evidence that all spatial controls in the fishery are being complied with. Stock surveys and closely monitored landings data over the last 20 years provide evidence that the harvest strategy is achieving its objective of ensuring that fishery removals do not exceed the annual production of the standing stock. .</p> <p>There is evidence that the harvest strategy is achieving its objectives and is able to maintain stocks at target levels. The SG80 is clearly met, but there is no evidence that the harvest strategy has been fully evaluated through, for example, a Management Strategy Evaluation (MSE), and therefore the SG100 is not met.</p>		
c	Guidepost	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Y		
	Justification	<p>Landings are closely monitored through log books (ERS on larger vessels and paper records on smaller vessels) and through catch declarations on landing. Fishing activity is monitored through the installation on all vessels of a “Black box” system which provides positional information every 10 seconds. In addition, vessels must “hail in” before landing and provide details of fishing area and estimated weight of landings, and there is a strong enforcement presence in harbours and at the processors to ensure compliance with regulations. All these elements of the monitoring programme are capable of showing whether the harvest strategy is working, and cross-checks of the various components of the monitoring programme show no systematic mis-reporting.</p>		
d	Guidepost			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			N
	Justification	<p>Elements of the harvest strategy are regularly reviewed through, for example, the Advisory Committee on Mussel Production, but the assessment team found no evidence that the harvest strategy as a whole is regularly reviewed. The SG100 is not met therefore.</p>		
e	Guidepost	It is likely that shark finning is not taking	It is highly likely that shark finning is not	There is a high degree of certainty that shark finning

FINAL REPORT AND DETERMINATION

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
		place.	taking place.	is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
	Justification	Sharks are not a target species in this fishery, so this scoring issue is not scored.		
References		MFLF 2013; Mussel survey results 2014 (Jens Kjerulf Petersen, DTU Aqua, pers. comm.); Nielsen et al. 2014; Canal-Vergés et al. 2014.		
OVERALL PERFORMANCE INDICATOR SCORE:				85
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 1.2.2 Mussels

PI 1.2.2		There are well defined and effective harvest control rules in place		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Generally understood harvest rules are in place that are consistent with the harvest strategy and which act to reduce the exploitation rate as limit reference points are approached.	Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached.	
	Met?	Y	Y	
	Justification	<p>The key harvest control rule in place is that the exploitation rate is controlled through the setting of a TAC for the Limfjord mussel fishery that is compatible with the annual production of the mussel stock, defined as 40-50% of the stock biomass. Stock biomass is estimated annually through a stock survey so that the weekly TAC allocated to each fishing licence is adjusted to be compatible with stock status allowing a reduction in the TAC if the stock should decline. The weekly TAC was set initially at 85 tonnes when first introduced in the 1990s when the stock biomass was estimated at over 700,000 tonnes, but was then reduced to 45 tonnes per week when stock estimates fell in later years. The weekly TAC has remained at 45 tonnes, and although the 2014 stock survey provided a lower estimate of stock biomass than that estimated in the last 4 years, the current TAC is still compatible with the annual production of the mussel stock, and there is therefore no requirement currently to reduce the TAC. A separate annual TAC is set for the Natura 2000 sites at a lower exploitation rate which takes into account the food requirements of the birds within the Natura 2000 sites. This annual TAC in the Natura 2000 sites is responsive to stock status. For example, the TAC in Løgstør Bredning Natura 2000 site was reduced from 20,000 tonnes of mussels in 2012-13 to 10,000 tonnes for 2013-14 in response to a decline in stock biomass, and at the same time the TAC in the Lovns Bredning Natura 2000 site was increased from 2,000 tonnes to 15,000 tonnes because of an increase in stock biomass.</p> <p>An additional harvest control rule requires that a large proportion of the mussel stock should be left unfished in shallow waters and there are other spatial controls which prevent dredging in much of the Limfjord.</p> <p>It should be noted also that the fishers' association, CF, imposes additional voluntary controls on landings. The self-imposed weekly TAC of 30 tonnes is lower than the statutory level set by NaturErhvervstyrelsen, and the fishers also avoid fishing in areas where there is a high proportion of juvenile mussels or areas that are thought to act as a broodstock for the fishery.</p> <p>These harvest control rules are considered to be well-defined and ensure that the exploitation rate is reduced as the surrogate reference points are approached. The fishery therefore meets the SG80.</p>		
b	Guidepost		The selection of the harvest control rules takes into account the main uncertainties.	The design of the harvest control rules takes into account a wide range of uncertainties.
	Met?		Y	N
	Justification	The main uncertainties for the mussel stock are the variation in and		

FINAL REPORT AND DETERMINATION

PI 1.2.2		There are well defined and effective harvest control rules in place		
		<p>unpredictability of recruitment, and mortality of post-recruits due to predation and hypoxia events. The harvest control rule uses stock biomass estimates from annual stock surveys to ensure that fishery removals do not exceed annual production. These uncertainties are taken into account in the selection of the harvest control rules by using precautionary estimates of stock biomass, i.e. estimates based only on the stock in waters deeper than 3m. The stock of mussels in the shallower waters that is not open to fishing, and which is not included in the estimate of annual production, is estimated to be 325,000 tonnes. In the Natura 2000 sites, a wider range of uncertainties are taken into account in the selection of the harvest control rules. Mussel stocks in waters less than 5m depth are not open to fishing, the ecological role of mussels as food for shellfish-eating birds is included in the setting of the annual TAC, and the potential indirect effects of fishing on marine habitats is also considered by closing potentially vulnerable areas to fishing.</p> <p>The harvest control rules in place for the whole Limfjord fishery take the main uncertainties into account and therefore the SG80 is met. A wide range of uncertainties including the ecological role of the mussels is taken into account in the Natura 2000 sites, which meets the SG100 requirements in those areas, but a score of 80 is appropriate for the whole Limfjord area.</p>		
c	Guidepost	There is some evidence that tools used to implement harvest control rules are appropriate and effective in controlling exploitation.	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules.	Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules.
	Met?	Y	Y	Y
	Justification	Evidence from the fishery in terms of the level of fishing effort and the annual landings data show clearly that the input and output controls in the fishery have ensured that the exploitation rate has been maintained at a level much below that required by the harvest strategy. The TACs for the whole Limfjord area and for the individual Natura 2000 sites are never fully utilised. Stock surveys provide an annual estimate of stock biomass from which annual production can be estimated, and then it can be determined whether the exploitation rate is compatible with this annual production. Landings from the fishery in recent years have been no higher than 24% of the fishable stock, and around 10% of the overall mussel stock in the Limfjord. The SG100 is met therefore.		
References		Annual landings data (Figure 4); Mussel survey results 2014 (Jens Kjerulf Petersen, DTU Aqua, pers. comm.)		
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 1.2.3 Mussels

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.	A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, fishery removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Y	Y	N
	Justification	<p>Annual mussel stock surveys provide detailed information about stock abundance and structure of mussels and provide an estimate of annual production of the stock. Comprehensive information on fleet composition is available, fishery removals are monitored rigorously, and the “black box” system provides detailed records of all fishing activity within the whole Limfjord fishery. In the Natura 2000 sites, in addition to the mussel surveys, environmental impact assessments are required prior to the commencement of fishing and in these areas there is a comprehensive range of information available that is well above that required to support the harvest strategy. For example, there are eelgrass distribution surveys in the Natura 2000 sites.</p> <p>Although the SG100 requirements are met for those areas of the fishery within Natura 2000 sites, a score of 80 is considered appropriate reflecting the level of information available for the whole Limfjord fishery.</p>		
b	Guidepost	Stock abundance and fishery removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.	All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Y	Y	N
	Justification	<p>Annual stock surveys provide estimates of stock biomass and annual production at a level of accuracy and coverage consistent with the harvest control rule. Within Natura 2000 sites stock status is monitored in greater detail to inform the stricter management requirements of these areas.</p> <p>Fishery removals are rigorously monitored at a high level of accuracy through the “black box” system which monitors fishing vessel position every 10 seconds, fishers’ log books and landings declarations. Cross-referencing of landings declarations with processor records and fishers’ logbooks are</p>		

FINAL REPORT AND DETERMINATION

PI 1.2.3		Relevant information is collected to support the harvest strategy		
		<p>supported by NaturErhvervstyrelsen inspection activities both on vessels and on shore.</p> <p>Whilst all the information required by the harvest control rules is monitored with a high frequency and a high degree of certainty, there is no evidence that the robustness of assessment and management to uncertainty in this information has been investigated. The fishery therefore meets the SG80, but not the SG100.</p>		
c	Guidepost		There is good information on all other fishery removals from the stock.	
	Met?		Y	
	Justification	<p>All fishery removals from the directed mussel fishery are monitored rigorously. The oyster fishery is the only other fishery in the Limfjord that catches mussels. The oyster fishery occurs only in the westernmost part of the Limfjord and fishers are permitted to land mussels up to 10% of the total daily catch in the fishery. In the last few years, oyster landings have been below 1000 tonnes per annum, so mussel bycatch in this fishery is less than 100 tonnes per annum, a very low figure in comparison with the directed fishery of around 25,000 tonnes per annum.</p>		
References		<p>Annual landings data (Figure 4); Mussel survey results 2014 (Jens Kjerulf Petersen, DTU Aqua, pers. comm.); Nielsen et al., 2014; Canal-Vergés et al., 2014.</p>		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 1.2.4 Mussels

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost		The assessment is appropriate for the stock and for the harvest control rule.	The assessment is appropriate for the stock and for the harvest control rule and takes into account the major features relevant to the biology of the species and the nature of the fishery.
	Met?		Y	Y
	Justification	The assessment is based on an annual stock survey which provides an estimate of stock biomass, and hence an estimate of annual production of the mussel stock, and is therefore appropriate for the harvest control rule. This assessment takes account of the biology of the species and the nature of the fishery by surveying the fished area using commercial fishing gear, and raw survey data are raised up to stock biomass estimates using dredge efficiency studies. More detailed surveys of the mussel stock are undertaken in the Natura 2000 sites.		
b	Guidepost	The assessment estimates stock status relative to reference points.		
	Met?	Y		
	Justification	The Limfjord mussel fishery is not managed using conventional stock-based reference points (see rationales for scoring PIs 1.1.1 and 1.1.2), but by using information from annual stock surveys about stock biomass and annual stock production. The key reference point for this mussel fishery is the annual stock production which observations indicate is 40-50% of stock biomass. Estimates of annual production permit a determination of whether the exploitation rate is compatible with stock production. Landings from the fishery in recent years have been no higher than 24% of the fishable stock, and around 10% of the overall mussel stock in the Limfjord, which is significantly lower than the 40-50% reference point level. The SG60 is met therefore for this scoring issue.		
c	Guidepost	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.
	Met?	Y	Y	N
	Justification	The main uncertainties for the mussel stock are the variation in and unpredictability of recruitment, and mortality of post-recruits due to predation and hypoxia events. The assessment takes these uncertainties into account by basing the stock biomass estimate (and hence the annual production estimate) on the stock of mussels only in waters greater than 3m depth. The stock of mussels in the shallower waters that is not open to fishing, and which is not included in the estimate of annual production, is estimated to be 325,000 tonnes. The assessment therefore estimates stock status relative to reference points in a precautionary manner. Within the Natura 2000 sites, there is a more precautionary harvest strategy which takes into account the ecological role of		

FINAL REPORT AND DETERMINATION

PI 1.2.4		There is an adequate assessment of the stock status		
		the mussels in providing food for shellfish-eating birds, thereby taking a wider range of uncertainties into account. Whilst the assessment does take uncertainty into account meeting the SG80, stock status is not evaluated in relation to reference points in a probabilistic way, and so SG100 is not met.		
d	Guidepost			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			N
	Justification	The assessment of the mussel stock appears to be robust, but there is no evidence that alternative hypotheses and assessment approaches have been explored and so the SG100 is not met.		
e	Guidepost		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		Y	N
	Justification	The stock assessment methodology has been published within a peer-reviewed journal (Dolmer et al., 1999) and essentially the same methodology is used currently for the surveys. Both the survey methodology and the results of the stock surveys are reviewed annually within the Advisory Committee on Mussel Production, and so the SG80 is met. There is no regular external review through for example, the ICES framework, and so the SG100 is not met.		
References		Dolmer et al., 1999; DTU Aqua, 2006; Mussel survey results 2014 (Jens Kjerulf Petersen, DTU Aqua, pers. comm.); Nielsen et al., 2014; Canal-Vergés et al., 2014		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

UoC 2: Cockle fishery

Evaluation Table for PI 1.1.1 Cockles

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	It is likely that the stock is above the point where recruitment would be impaired.	It is highly likely that the stock is above the point where recruitment would be impaired.	There is a high degree of certainty that the stock is above the point where recruitment would be impaired.
	Met?	NA (RBF used)	NA (RBF used)	NA (RBF used)
	Justification	It is not possible to determine the status of the stock relative to biologically-based limits for sustainability. The Risk Based Framework has therefore been used to assess stock status. During the assessment of the Vilsund Blue A/S Limfjord Mussel and cockle dredge fishery certified in January 2015, a Scale Intensity Consequence Analysis (SICA) was conducted at a workshop with stakeholders during the site visit. This returned a score of 1, equivalent to an MSC score of 100. As this fishery is an exact duplicate assessment, the MSC confirmed the interpretation of the harmonisation of exact duplicate fisheries and use of RBF that enables the assessment team to use the previous results from the SICA workshop from the Vilsund Blue A/S assessment (see section 4 of this report). However during the site visit for the current assessment, all relevant stakeholders were appraised of the results of the original SICA workshop, and were given the opportunity to provide any new information that might change the outcome of the analysis. All stakeholders agreed that the outcome of the original analysis was still valid. A Productivity Susceptibility Analysis (PSA) was subsequently conducted during the assessment of the Vilsund Blue A/S fishery, and returned a score of 96.8. The assessment team reviewed this PSA and concurred with the outcome, which has been used to determine the score for this PI.		
b	Guidepost		The stock is at or fluctuating around its target reference point.	There is a high degree of certainty that the stock has been fluctuating around its target reference point, or has been above its target reference point, over recent years.
	Met?		NA (RBF used)	NA (RBF used)
	Justification	The RBF has been used to score this Performance Indicator.		
References		Brand et al., 2015.		
Stock Status relative to Reference Points				
	Type of reference point	Value of reference point		Current stock status relative to reference point
Target reference point	NA	NA		NA
Limit reference point	NA	NA		NA
OVERALL PERFORMANCE INDICATOR SCORE:				96.8

FINAL REPORT AND DETERMINATION

PI 1.1.1	The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing	
CONDITION NUMBER (if relevant):		NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 1.1.2 Cockles

PI 1.1.2		Limit and target reference points are appropriate for the stock		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Generic limit and target reference points are based on justifiable and reasonable practice appropriate for the species category.	Reference points are appropriate for the stock and can be estimated.	
	Met?	NA (RBF used)	NA (RBF used)	
	Justification	When the RBF is used for PI 1.1.1, PI 1.1.2 is given a score of 80 (CC3.2.1 in MSC CR v1.3).		
b	Guidepost		The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity.	The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity following consideration of precautionary issues.
	Met?		NA (RBF used)	NA (RBF used)
	Justification	When the RBF is used for PI 1.1.1, PI 1.1.2 is given a score of 80 (CC3.2.1 in MSC CR v1.3).		
c	Guidepost		The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome.	The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome, or a higher level, and takes into account relevant precautionary issues such as the ecological role of the stock with a high degree of certainty.
	Met?		NA (RBF used)	NA (RBF used)
	Justification	When the RBF is used for PI 1.1.1, PI 1.1.2 is given a score of 80 (CC3.2.1 in MSC CR v1.3).		
d	Guidepost		For key low trophic level stocks, the target reference point takes into account the ecological role of the stock.	
	Met?		NA (RBF used)	
	Justification	When the RBF is used for PI 1.1.1, PI 1.1.2 is given a score of 80 (CC3.2.1 in MSC CR v1.3).		

FINAL REPORT AND DETERMINATION

PI 1.1.2	Limit and target reference points are appropriate for the stock	
References	MSC Certification Requirements v1.3, paragraph CC3.2.1	
OVERALL PERFORMANCE INDICATOR SCORE:		80
CONDITION NUMBER (if relevant):		NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 1.1.3 Cockles

PI 1.1.3		Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Where stocks are depleted rebuilding strategies, which have a reasonable expectation of success, are in place.		Where stocks are depleted, strategies are demonstrated to be rebuilding stocks continuously and there is strong evidence that rebuilding will be complete within the specified timeframe.
	Met?	NA (RBF used)		NA (RBF used)
	Justification	When the RBF is used for PI 1.1.1, PI 1.1.3 is not scored (CC3.3.1 in MSC CR v1.3).		
b	Guidepost	A rebuilding timeframe is specified for the depleted stock that is the shorter of 30 years or 3 times its generation time. For cases where 3 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	A rebuilding timeframe is specified for the depleted stock that is the shorter of 20 years or 2 times its generation time. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	The shortest practicable rebuilding timeframe is specified which does not exceed one generation time for the depleted stock.
	Met?	NA (RBF used)	NA (RBF used)	NA (RBF used)
	Justification	When the RBF is used for PI 1.1.1, PI 1.1.3 is not scored (CC3.3.1 in MSC CR v1.3).		
c	Guidepost	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within a specified timeframe.	There is evidence that they are rebuilding stocks, or it is highly likely based on simulation modelling or previous performance that they will be able to rebuild the stock within a specified timeframe.	
	Met?	NA (RBF used)	NA (RBF used)	
	Justification	When the RBF is used for PI 1.1.1, PI 1.1.3 is not scored (CC3.3.1 in MSC CR v1.3).		
References		MSC Certification Requirements v1.3, paragraph CC3.3.1		
OVERALL PERFORMANCE INDICATOR SCORE:				NA
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 1.2.1 Cockles

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	The harvest strategy is expected to achieve stock management objectives reflected in the target and limit reference points.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving management objectives reflected in the target and limit reference points.	The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in the target and limit reference points.
	Met?	Y	Y	Y
	Justification	<p>It is not possible to determine the status of the cockle stock relative to biologically-based limits for sustainability (reference points) and the RBF was therefore used to score PI 1.1.1. Under these circumstances, the MSC Guidance on the Certification Requirements states that -</p> <p>"Assessment of data-deficient fisheries against this indicator (PI 1.2.1) should consider how elements of the harvest strategy combine to manage impact, such that susceptibility is maintained at or below acceptable levels given the productivity of the species."</p> <p style="text-align: right;">(MSC CR Guidance v1.3, paragraph GCB2.5)</p> <p>It is appropriate therefore to consider how the harvest strategy manages the fishery to ensure that the susceptibility scores (for areal overlap, vertical overlap, selectivity and post capture mortality) are maintained at acceptable levels.</p> <p>The harvest strategy is composed of a number of elements, including a robust monitoring, control and surveillance policy. The fishery is a limited entry fishery with a maximum of 50 licences, although two licences can be aggregated on a single vessel, and there are currently therefore only 26 vessels in the fishery. There are restrictions on the weight and size of dredge, restrictions on vessel size and power, limits on the depth in which fishing is permitted, and closed seasons and areas. There is a weekly TAC in the general fishery of 45 tonnes per licence, although the fishers' association, CF, voluntarily reduces this to 30 tonnes. The TAC covers total catch of both mussels and cockles, and the landings must contain a maximum of 49% cockles. Within Natura 2000 sites, the landings must contain a maximum of only 10% cockles. No sorting of the catch is permitted on board the vessel, although stones over 2 kg in weight must be returned to the sea.</p> <p>These management controls combine to maintain the susceptibility of cockles to the dredge fishery at or below acceptable levels. In particular the light dredge used in the fishery is only capable of catching emergent cockles that are on the surface of the seabed. Buried cockles are not vulnerable to the dredge, and so most of the cockles in the Limfjord are not susceptible to capture in this fishery confirming that the vertical overlap between the target species and the fishing gear is low. The harvest strategy ensures therefore that the susceptibility of cockles to the fishery is maintained at a low level of risk and thus achieves stock management objectives consistent with the low risk defined in the RBF.</p> <p>Given the high scores for this fishery returned from the SICA and PSA, the assessment team concluded that the level of susceptibility is consistent with the SG100 requirements for this scoring issue.</p>		

FINAL REPORT AND DETERMINATION

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
b	Guidepost	The harvest strategy is likely to work based on prior experience or plausible argument.	The harvest strategy may not have been fully tested but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	Y	Y	N
	Justification	<p>A limited entry licensing scheme, limitations on the quantity of cockles that can be removed from the fishery (weekly TACs for vessels), spatial and temporal closures of the fishery and robust monitoring and enforcement are a proven method for controlling exploitation rates, thereby limiting the susceptibility of the target species to fishing. Data from the “black box” system on board all vessels and catch reporting and monitoring of landings provide evidence that catch limitations and all spatial controls in the fishery are being complied with. In addition the light dredge used in the fishery is only capable of catching emergent cockles that are on the surface of the seabed. Buried cockles are not vulnerable to the dredge, and so most of the cockles in the Limfjord are not susceptible to capture in this fishery confirming that the vertical overlap between the target species and the fishing gear is low.</p> <p>There is evidence therefore that the harvest strategy is achieving its objective of limiting the susceptibility of the target species to fishing. The SG80 is clearly met, but there is no evidence that the harvest strategy has been fully evaluated through, for example, a Management Strategy Evaluation (MSE), and therefore the SG100 is not met.</p>		
c	Guidepost	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Y		
	Justification	<p>Landings are closely monitored through log books (ERS on larger vessels and paper records on smaller vessels) and through catch declarations on landing. Fishing activity is monitored through the installation on all vessels of a “Black box” system which provides positional information every 10 seconds. In addition, vessels must “hail in” before landing and provide details of fishing area and estimated weight of landings, and there is a strong enforcement presence in harbours and at the processors to ensure compliance with regulations. All these elements of the monitoring programme are capable of showing whether the harvest strategy is working, and cross-checks of the various components of the monitoring programme show no systematic mis-reporting.</p>		
d	Guidepost			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			N
	Justification	<p>Elements of the harvest strategy are regularly reviewed through, for example, the Advisory Committee on Mussel Production which considers cockles as well as mussels, but the assessment team found no evidence that the harvest strategy as a whole is regularly reviewed. The SG100 is not met therefore.</p>		

FINAL REPORT AND DETERMINATION

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
e	Guidepost	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
	Justification	Sharks are not a target species in this fishery, so this scoring issue is not scored.		
References		MSC Certification Requirements v 1.3; MSC Guidance on Certification Requirements v 1.3; MFLF 2013; Jens Kjerulf Petersen, DTU Aqua, pers. comm.		
OVERALL PERFORMANCE INDICATOR SCORE:				85
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 1.2.2 Cockles

PI 1.2.2		There are well defined and effective harvest control rules in place		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Generally understood harvest rules are in place that are consistent with the harvest strategy and which act to reduce the exploitation rate as limit reference points are approached.	Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached.	
	Met?	Y	Y	
	Justification	<p>It is not possible to determine the status of the cockle stock relative to biologically-based limits for sustainability (reference points) and the RBF was therefore used to score PI 1.1.1. It is appropriate therefore to consider how the harvest control rules manage the fishery to ensure that the susceptibility scores (for areal overlap, vertical overlap, selectivity and post capture mortality) remain acceptable. When the RBF is used it is not necessary for exploitation rates to be reduced as reference points are approached.</p> <p>The MSC Guidance on the Certification Requirements states that - .</p> <p>"CABs should assess the extent to which there are management tools and measures in place that are consistent with ensuring that susceptibility of the target species to removal is no higher than that which would cause the risk to the target species to be above an acceptable risk range. Measures could be spatial, temporal, or changes to gear overlap.</p> <p>Assessments should also consider measures in place to respond to changes in the fishery. For example, by reducing susceptibility of target species when the fishery is not heading in the direction of its objectives."</p> <p style="text-align: center;">(MSC CR Guidance v1.3, paragraph GCB2.6)</p> <p>The main harvest control rule for the cockle fishery that maintains the susceptibility level at acceptable levels is a consequence of the harvest strategy for the fishery. The harvest controls for the cockle fishery are based upon restrictions on the number of vessels permitted to operate in the fishery and a restriction on the quantity of cockles that can be landed per vessel per week which limit the exploitation rate, a relatively large mesh size in relation to the length at maturity, and there are also spatial controls in place that prevent dredging for cockles in much of the Limfjord which thereby limits the areal overlap.</p> <p>As noted in PI 1.2.1 above, the statutory licence conditions permit only light mussel dredges to be used in this fishery. These dredges are designed to minimise interactions with the seabed, and do not penetrate the substrate. Only emergent cockles are caught in these dredges, and buried cockles are not susceptible to capture. Thus the "vertical overlap" between the gear and the target species is limited.</p> <p>The effect of these controls is to ensure that only a small proportion of the cockle stock is susceptible to fishing. The majority of the cockles in the Limfjord cannot be caught because of the gear restrictions and spatial controls; thus the harvest control rule is an emergent property of the harvest strategy.</p> <p>These control rules are in place and ensure that the susceptibility of the target stock to fishing is limited. The SG80 is therefore met.</p>		

FINAL REPORT AND DETERMINATION

PI 1.2.2		There are well defined and effective harvest control rules in place		
b	Guidepost		The selection of the harvest control rules takes into account the main uncertainties.	The design of the harvest control rules takes into account a wide range of uncertainties.
	Met?		Y	N
	Justification	<p>The main uncertainties underlying the cockle stock in the Limfjord are the stock biomass and size composition, and variation in recruitment and natural mortality. The harvest control rules take into account these uncertainties by restricting the number of vessels that can enter the fishery and restricting the quantity of cockles that can be harvested from the fishery, thereby limiting the impact of the fishery on the stock and safeguarding recruitment to the fishery. In addition there are extensive areas of the Limfjord within the distribution and depth range for cockles which are closed to fishing, and fishing is permitted using only light dredges ensuring that only emergent cockles on the surface of the seabed are susceptible to the gear, with a large stock of buried cockles left invulnerable to the dredge.</p> <p>These harvest control rules take account of the main uncertainties and so the SG80 is met. However there is no evidence that the harvest controls have been designed to take into account a wide range of uncertainties and so the SG100 is not met.</p>		
c	Guidepost	There is some evidence that tools used to implement harvest control rules are appropriate and effective in controlling exploitation.	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules.	Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules.
	Met?	Y	Y	N
	Justification	The available evidence from the fishery shows that there is good compliance with the harvest controls in place, and that the weekly TAC limits are respected. The desired exploitation rates are therefore being achieved and the SG80 is met. As there is no annual assessment of cockle stock status, there is not sufficiently clear evidence to meet the SG100.		
References		MSC Certification Requirements v 1.3; MSC Guidance on Certification Requirements v 1.3.		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 1.2.3 Cockles

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.	A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, fishery removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Y	Y	N
	Justification	<p>The RBF has been used to assess stock status of this fishery because of the lack of information about stock structure and productivity for this fishery. For PIs 1.2.1 and 1.2.2 the MSC have issued formal guidance that the harvest strategy and harvest control rules and tools for data-deficient fisheries should ensure that the susceptibility of the target species to the fishery is maintained at an acceptable level. No guidance is offered on this PI, but it would be consistent with the MSC guidance for PIs 1.2.1 and 1.2.2 to consider that the information required by the harvest strategy is that relating to the susceptibility attributes considered in the SICA and PSA assessments carried out as required under the RBF.</p> <p>There is very good information available from the fishery concerning all cockle fishing activities. The fishery is limited entry and detailed information is available on the composition of the fleet. The “Black box” system records all fishing vessel movements every 10 seconds, and all fishery removals are recorded in log books and landings declarations.</p> <p>The information available supports the harvest strategy, which aims to limit the exploitation rate through a restrictive licensing scheme and catch limits, and to limit the temporal and spatial extent of fishing activity. The available information meets the SG80 requirements, but is not sufficiently comprehensive to meet the SG100.</p>		
b	Guidepost	Stock abundance and fishery removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.	All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Y	Y	N
	Justification	The RBF has been used for this fishery because stock abundance is not		

FINAL REPORT AND DETERMINATION

PI 1.2.3		Relevant information is collected to support the harvest strategy		
		<p>known and it is not possible to determine the status of the cockle stock relative to biologically-based limits for sustainability (reference points). However fishing activity of the fleet is monitored with a very high degree of accuracy through the “black box” system, and all fishery removals of more than 50 kg are recorded. Information from log books, landings declarations and processor records are cross-referenced, and are supported by NaturErhvervstyrelsen inspections of vessel catches and landings both at sea and on shore.</p> <p>The SG80 is therefore fully met, but no evidence has been presented of the uncertainties in the data and the robustness of management to this uncertainty.</p>		
c	Guidepost		There is good information on all other fishery removals from the stock.	
	Met?		Y	
	Justification	All commercial fishery removals from the stock are fully monitored and recorded. The SG80 requirements are met therefore.		
References		MSC Certification Requirements v 1.3; MSC Guidance on Certification Requirements v 1.3; MFLF 2013.		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 1.2.4 Cockles

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost		The assessment is appropriate for the stock and for the harvest control rule.	The assessment is appropriate for the stock and for the harvest control rule and takes into account the major features relevant to the biology of the species and the nature of the fishery.
	Met?		NA (RBF)	NA (RBF)
	Justification	When the RBF is used for PI 1.1.1, PI 1.2.4 is given a score of 80 (CC3.4.1 in MSC CR v1.3).		
b	Guidepost	The assessment estimates stock status relative to reference points.		
	Met?	NA (RBF)		
	Justification	When the RBF is used for PI 1.1.1, PI 1.2.4 is given a score of 80.		
c	Guidepost	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.
	Met?	NA (RBF)	NA (RBF)	NA (RBF)
	Justification	When the RBF is used for PI 1.1.1, PI 1.2.4 is given a score of 80.		
d	Guidepost			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			NA (RBF)
	Justification	When the RBF is used for PI 1.1.1, PI 1.2.4 is given a score of 80.		
e	Guidepost		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		NA (RBF)	NA (RBF)
	Justification	When the RBF is used for PI 1.1.1, PI 1.2.4 is given a score of 80.		
References				
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Principle 2 Evaluation Tables

UoC 1: Mussel fishery

Evaluation Table for PI 2.1.1 Mussels

PI 2.1.1		The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Main retained species are likely to be within biologically based limits (if not, go to scoring issue c below).	Main retained species are highly likely to be within biologically based limits (if not, go to scoring issue c below).	There is a high degree of certainty that retained species are within biologically based limits and fluctuating around their target reference points.
	Met?	Y	Y	N
	Justification	<p>'Retained' species are defined by the MSC as those species that are caught by the fishery and are landed by the vessel. Species are classed as retained even if they have no commercial value.</p> <p>'Main' retained species are defined by the MSC as those that make up 5% or more of the total catch (in weight), unless the retained species have a high value, are vulnerable or the total volume retained is large (MSC GCR at §GCB3.5.2). In addition, the MSC specify that only those parts of the retained catch that are not assessed under Principle 1 should be assessed under Principle 2 (MSC CR at §CB3.5.1). Thus cockles are not considered as a retained species for the mussel UoC (and vice-versa).</p> <p>From the available evidence provided by DTU-Aqua annual research surveys (that use similar gear to the fishery lightweight dredge gear) and corroborated with the opinions of local stakeholders, there are no 'main' retained species in the mussel fishery.</p> <p>The most abundant non-target species caught during the DTU-Aqua surveys were starfish (<i>Asterias rubens</i>; 3% of total catch) and shore crab (<i>Carcinus maenus</i>; 0.4% of total catch). Both species are landed in the commercial fishery and removed after sorting and cleaning at the processing plants.</p> <p>Available evidence on <i>A.rubens</i> shows the population to be highly abundant and widely distributed within Limfjord region (Figure 14). No information is available on the abundance of each species in the Limfjord in relation to either limit or target reference points.</p> <p>The information available from the fishery is sufficient to meet both SG60 and SG80. The fishery does not meet SG100 because neither limit or target reference points are known for starfish and shore crabs retained in the fishery.</p>		
b	Guidepost			Target reference points are defined for retained species.
	Met?			N
	Justification	Target reference points have not been defined for retained species		
c	Guidepost	If main retained species are outside the limits there are measures in place that	If main retained species are outside the limits there is a partial strategy of	

FINAL REPORT AND DETERMINATION

PI 2.1.1		The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species		
		are expected to ensure that the fishery does not hinder recovery and rebuilding of the depleted species.	demonstrably effective management measures in place such that the fishery does not hinder recovery and rebuilding.	
	Met?	NA	NA	
	Justification	There are no main retained species in the fishery (i.e. making up more than 5% of the total catch in weight). This PI is not scored.		
d	Guidepost	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the retained species to be outside biologically based limits or hindering recovery.		
	Met?	Y		
	Justification	<p>It has been noted under Sla above that the status of starfish and shore crab populations has not been assessed in relation to limit or target reference points.</p> <p>Management measures prohibit shellfish dredging in much of the Limfjord region, including those within Natura 2000 sites (see Figure 20). These restricted fishing areas protect starfish and shore crab habitat, which have a wide distribution.</p> <p>Fishing practices target high density mussel beds and specifically avoid areas where there is a high likelihood of retaining a high proportion of non-target species, including starfish and shore crabs. In addition, industrial vessels are unable to dredge in shallow waters below 3 m, further limiting the impact of the fishery on starfish and shore crab populations.</p> <p>These measures and practices are sufficient to meet SG60.</p>		
References		Canal-Vergés et al, 2014; Nielsen et al, 2014; DTU-Aqua, 2014; ICES, 2014; section 3.4.2 of this report.		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.1.2 Mussels

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place, if necessary, that are expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a partial strategy in place, if necessary, that is expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing retained species.
	Met?	Y	Y	N
	Justification	<p>As this fishery has no main retained species, this PI meets the 80 scoring threshold. Additional information pertaining to retained species management is given below.</p> <p>“Measures” are defined by the MSC as individual management actions or tools which may manage impacts either deliberately or coincidentally; a “partial strategy” is a cohesive set of measures that work together (either deliberately or coincidentally) to achieve a management outcome; and a “strategy” is a cohesive, deliberate and effective management approach designed to addressing unacceptable impacts (further details are given in the MSC GCR at §GCB3.3).</p> <p>Specific actions are undertaken by the fleet to avoid high density areas of non-target species, including starfish and shore crab. Incentives to avoid high catches of non-target species are created because vessels have no facility to sort the catch and they are required to land all catches. The catch is then sorted at the processor and all non-target species discarded – there is no commercial market for starfish or shore crab.</p> <p>Measures are also undertaken by the fishery to reduce the likelihood retaining high catches of non-target species. Underwater video cameras and sonar equipment are used with test dredging by a dedicated vessel within the fleet to identify areas of high mussel abundance and quality (and low non-target species). This information is relayed back to the rest of the fleet to facilitate specific targeted areas.</p> <p>In addition to the industry-led initiatives, there are a number of statutory management measures that prevent dredging activities in much of the Limfjord region. These include prohibition of fishing in less than 3 m, which has been extended to 5 m within Natura 2000 sites (and 6 m in the vicinity of eelgrass beds, which are important nursery habitats for shore crabs). Compliance with spatial controls is monitored through vessel ‘black box’ recorders (vessel monitoring system) fitted to all shellfish vessels in the Limfjord region.</p> <p>The specific actions undertaken by the fleet combined with the statutory controls for spatial management represent a partial strategy. SG100 is not met as there is no evidence of a strategy to specifically manage catches of all</p>		

FINAL REPORT AND DETERMINATION

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species		
		non-target species.		
b	Guidepost	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Y	Y	N
	Justification	<p>As this fishery has no main retained species, this PI meets the 80 scoring threshold. Additional information pertaining to retained species management is given below.</p> <p>There is an objective basis for confidence that the fishery does not pose a risk of serious or irreversible harm to retained species from information provided by industry (fishers and processors) and independent government sources (research survey results). A high level of compliance exists with statutory spatial controls to avoid dredging in shallow waters less than 3 m depth and other restricted areas in Limfjord, demonstrated analysis of individual vessel tracks collected from the 'black box'.</p> <p>The partial strategy in place from both industry and statutory controls is sufficient to meet SG 60 and SG80. No testing of a formal strategy has been made to meet SG100.</p>		
c	Guidepost		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	N
	Justification	<p>As this fishery has no main retained species, this PI meets the 80 scoring threshold. Additional information pertaining to retained species management is given below.</p> <p>Information obtained from DTU-Aqua research surveys helps to demonstrate that bycatch from other non-target species is low in the Limfjord region. This coupled with the fleet strategy to target areas of high mussel density and quality (size), results in reported low landing of non-target species.</p> <p>Analysis of individual vessel tracking using the 'black box' clearly demonstrates compliance with statutory spatial controls both within Natura 2000 sites and the wider Limfjord region.</p> <p>The wide distribution and high abundance of starfish provides further evidence that the partial strategy is being implemented successfully.</p> <p>The supporting evidence is sufficient to meet SG80, although in the absence of a management strategy for non-target species, the SG100 is not met.</p>		
d	Guidepost			There is some evidence that the strategy is achieving its overall

FINAL REPORT AND DETERMINATION

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species		
				objective.
	Met?			N
	Justification	The absence of a management strategy or overall objective for non-target species prevents the fishery from meeting SG100.		
e	Guidepost	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
	Justification	There is no evidence that sharks are captured in this fishery. This scoring issue is not relevant and has not been scored.		
References		Canal-Vergés et al, 2014; Nielsen et al, 2014; DTU-Aqua, 2014; ICES, 2014; section 3.4.2 of this report.		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.1.3 Mussels

PI 2.1.3		Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Qualitative information is available on the amount of main retained species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main retained species taken by the fishery.	Accurate and verifiable information is available on the catch of all retained species and the consequences for the status of affected populations.
	Met?	Y	Y	N
	Justification	<p>As this fishery has no main retained species, this PI meets the 80 scoring threshold. Additional explanation pertaining to retained species information is given below.</p> <p>Quantitative information about the level of non-target species caught in mussel dredges in the Limfjord is available from independent annual research surveys that use similar gear to the shellfish fleet.</p> <p>In addition, qualitative and some quantitative information has been provided from the main processor to confirm the level of bycatch is low. This was further corroborated by stakeholder interviews with fishers.</p> <p>The combination of qualitative and some quantitative information are sufficient to meet both SG60 and SG80. Insufficient information is available on all retained species to determine the consequences for the status of affected populations to meet SG100.</p>		
b	Guidepost	Information is adequate to qualitatively assess outcome status with respect to biologically based limits.	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with a high degree of certainty.
	Met?	Y	Y	N
	Justification	<p>As this fishery has no main retained species, this PI meets the 80 scoring threshold. Additional explanation pertaining to retained species information is given below.</p> <p>No biologically based limits have been set with respect to non-target species, as their high abundance and wide distribution of the main species retained does not yet warrant this type of management intervention. However, although they have no commercial value, all non-target species must be landed by the shellfish fleet.</p> <p>There is information on both the level of catch of non-target species and the current status of starfish, which is the most abundant non-target species. Further information is also available on the life-history of the most abundant non-target species, which indicates both starfish and shore crabs are highly fecund animals.</p> <p>This information is sufficient to conclude that the fishery does not adversely affect the status of non-target species with respect to biologically based limits. There is not sufficient information to quantitatively estimate the outcome status of all retained species with a high degree of certainty to meet SG100.</p>		

FINAL REPORT AND DETERMINATION

PI 2.1.3		Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species		
c	Guidepost	Information is adequate to support measures to manage main retained species.	Information is adequate to support a partial strategy to manage main retained species.	Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	Y	Y	N
	Justification	<p>As this fishery has no main retained species, this PI meets the 80 scoring threshold. Additional explanation pertaining to retained species information is given below.</p> <p>As all shellfish vessels must land their entire catch (including target and bycatch species), which is sorted and weighted at the processing facilities, information is available on catch rates for non-target species. In addition, there is detailed information on closed areas and a high level of compliance with statutory controls.</p> <p>The SG100 requirements are not met as there is no strategy in place to manage all non-target species.</p>		
d	Guidepost		Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator score or the operation of the fishery or the effectiveness of the strategy)	Monitoring of retained species is conducted in sufficient detail to assess ongoing mortalities to all retained species.
	Met?		Y	N
	Justification	Data continue to be collected by industry through the processors and also by independent annual stock surveys from DTU-Aqua. The ongoing collection of data from both sources is sufficient to detect any increase in the risk level to non-target species to meet SG80. However, data are not available to assess ongoing mortalities of all retained species to meet SG100.		
References		Canal-Vergés et al, 2014; Nielsen et al, 2014; DTU-Aqua, 2014; ICES, 2014; section 3.4.2 of this report.		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.2.1 Mussels

PI 2.2.1		The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Main bycatch species are likely to be within biologically based limits (if not, go to scoring issue b below).	Main bycatch species are highly likely to be within biologically based limits (if not, go to scoring issue b below).	There is a high degree of certainty that bycatch species are within biologically based limits.
	Met?	Y	Y	N
	Justification	<p>For the purposes of an MSC assessment “bycatch” are those species that are caught in the fishing gear and are then thrown back into the sea (either alive or dead). In many parts of the world, the term “discards” is used in preference to “bycatch” to describe this element of the catch.</p> <p>‘Main’ bycatch species are defined by the MSC as those that make up 5% or more of the total catch (in weight), unless the retained species have a high value, are vulnerable or the total volume retained is large (MSC GCR at §GCB3.5.2). In addition, the MSC specify that only those parts of the catch are discarded and not assessed under Principle 1 or other components of Principle 2 (i.e. as retained species) should be assessed under Principle 2 (MSC CR at §CB3.8.1). Thus cockles are not considered as a retained species for the mussel UoC.</p> <p>There are considered to be no ‘main’ bycatch species in the mussel fishery that make up more than 5% or more of the catch). This is because there is a very low proportion of non-target species in the catch, and there is no sorting on board the vessels. Most of the catch is retained and landed. As such, all impacts on retained non-target species have been addressed in PI2.1.1 above.</p> <p>It has been noted that the only bycatch species reported to be discarded are flatfish, in particular flounder (<i>Platichthys flesus</i>). Available information suggests that between 10 and 30 live fish are discarded per vessel per day. These small volumes have been estimated to be below 5% of the total annual catch and therefore do not qualify as ‘main’ species.</p> <p>There is currently no ICES stock assessment to determine the status of flounder in the North Sea and Skagerrak region with respect to biologically based limits, although an annual TAC has been set at 3,160t.</p> <p>As there is evidence that no ‘main’ bycatch species are caught, both SG60 and SG80 requirements are met. Although it is highly unlikely that the fishery has a direct effect on the status of flounder, SG100 is not met due to current level of uncertainty around the status of flounder.</p>		
b	Guidepost	If main bycatch species are outside biologically based limits there are mitigation measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding.	If main bycatch species are outside biologically based limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding.	

FINAL REPORT AND DETERMINATION

PI 2.2.1		The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups		
	Met?	NA	NA	
	Justification	There are no 'main' bycatch species caught in the fishery and therefore this scoring issue is not scored.		
c	Guidepost	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the bycatch species to be outside biologically based limits or hindering recovery.		
	Met?	Y		
	Justification	The status of flounder in the North Sea and Skagerrak is poorly known. However, the discarding of a small number of live flatfish in shallow water, mainly flounder, makes it highly unlikely to impact the status of this stock. SG60 requirements are met.		
References		ICES 2014, in addition to section 3.4.2 of this report.		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.2.2 Mussels

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place, if necessary, that are expected to maintain the main bycatch species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a partial strategy in place, if necessary, that is expected to maintain the main bycatch species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing and minimizing bycatch.
	Met?	Y	Y	N
	Justification	<p>There are considered to be no 'main' bycatch species in the mussel fishery that make up more than 5% or more of the catch, thus the 80 scoring threshold is achieved. Additional information pertaining to management of non-target catch is given below.</p> <p>"Measures" are defined by the MSC as individual management actions or tools which may manage impacts either deliberately or coincidentally; a "partial strategy" is a cohesive set of measures that work together (either deliberately or coincidentally) to achieve a management outcome; and a "strategy" is a cohesive, deliberate and effective management approach designed to addressing unacceptable impacts (further details are given in the MSC GCR at §GCB3.3).</p> <p>At a fishery level, management measures and industry led actions have been established to reduce the level of non-target species retained in the catch, and therefore a very low level of discarding from the fishery. Management measures include statutory controls on the design of fishing gear and spatial distribution of fishing activities, enforced using a vessel 'black box', whereas industry-led initiatives are taken to identify and retain mussels from high density areas, which coincide with low levels of other non-target species.</p> <p>At the EU level, the new Common Fisheries Policy (CFP) regulation has introduced a 'landing obligation' that specifically manages discarding. This is currently being introduced on a fishery-by-fishery basis and with exception to the Mediterranean Sea, will only apply to species managed with a TAC. To date, the mussel fishery has not been assessed under the landing obligation, and there is no evidence to indicate this will be required. However, due to implementation being made on a fishery-by-fishery basis, the outcome of this scoring issue may need to be reviewed in future.</p> <p>Combined the industry-led actions and other management measures at both a national and EU level constitute a partial strategy for managing bycatch species.</p> <p>If new evidence were to become available that the fishery had been considered under the new EU landing obligation, this may be sufficient to meet the SG100 requirement.</p>		
b	Guidepost	The measures are considered likely to	There is some objective basis for	Testing supports high confidence that the

FINAL REPORT AND DETERMINATION

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations		
		work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).	confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.	strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Y	Y	N
	Justification	<p>There are considered to be no 'main' bycatch species in the mussel fishery that make up more than 5% or more of the catch, thus the 80 scoring threshold is achieved. Additional information pertaining to management of non-target catch is given below.</p> <p>There is an objective basis for confidence that the fishery does not pose a risk of serious or irreversible harm to bycatch species from information provided by industry (fishers and processors) and independent government sources (research survey results).</p> <p>Much of the Limfjord is closed to fishing and fishing operations occur within finite areas that yield high densities of high quality mussels and further reduce the impact of the fishery on discarded (bycatch) species.</p>		
c	Guidepost		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	N
	Justification	<p>There are considered to be no 'main' bycatch species in the mussel fishery that make up more than 5% or more of the catch, thus the 80 scoring threshold is achieved. Additional information pertaining to management of non-target catch is given below.</p> <p>There is evidence to demonstrate that the partial strategy of industry led actions and statutory controls are being implemented correctly. The evidence is provided through reported catch data from independent research surveys using the same lightweight gear types that demonstrate low bycatch rates, and the high level of compliance by the shellfish fleet with spatial controls restricting their fishing opportunities within the Limfjord region, which are monitored through the vessel's 'black box'.</p> <p>In the absence of a management strategy for all non-target species, the SG100 is not met.</p>		
d	Guidepost			There is some evidence that the strategy is achieving its overall objective.
	Met?			N
	Justification	To date there is no evidence of a management strategy under the EU		

FINAL REPORT AND DETERMINATION

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations	
		landings obligation. The absence of a management strategy or overall objective for non-target species prevents the fishery from meeting SG100 but may be revised in future if there is evidence that the fishery / species that are discarded have been included as part of a management strategy.	
References		See section 3.4.2 of this report.	
OVERALL PERFORMANCE INDICATOR SCORE:			80
CONDITION NUMBER (if relevant):			NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.2.3 Mussels

PI 2.2.3		Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Qualitative information is available on the amount of main bycatch species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main bycatch species taken by the fishery.	Accurate and verifiable information is available on the catch of all bycatch species and the consequences for the status of affected populations.
	Met?	Y	Y	N
	Justification	<p>There are considered to be no 'main' bycatch species in the mussel fishery that make up more than 5% or more of the catch, thus the 80 scoring threshold is achieved. Additional information pertaining to data available on non-target catch is given below.</p> <p>Qualitative and some quantitative information about the level of bycatch species caught in mussel dredges in the Limfjord is available from independent annual research surveys that use similar gear to the shellfish fleet and information from the fishing industry to describe the amount and type of bycatch species caught in the fishery. To date, there is no accurate and verifiable information on the consequences of discarding on the status of all bycatch species concerned.</p>		
b	Guidepost	Information is adequate to broadly understand outcome status with respect to biologically based limits	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with respect to biologically based limits with a high degree of certainty.
	Met?	Y	Y	N
	Justification	<p>There are considered to be no 'main' bycatch species in the mussel fishery that make up more than 5% or more of the catch, thus the 80 scoring threshold is achieved. Additional information pertaining to data available on non-target catch is given below.</p> <p>No biologically based limits have been set with respect to the only discarded (bycatch) species reported from the Limfjord shellfish fleet, flounder.</p> <p>Information available from the DTU-Aqua shellfish research surveys indicate a catch of 0.8g of flounder per tonne of mussels caught. If this value is scaled up to the typical annual landings from the fishery, this indicates that approximately 2 tonnes of flounder are discarded per year.</p> <p>While the level of incidental mortality from discarding live flounder is unknown, the estimated total annual number of flounder discarded is small relative to the annual TAC of 3,160 t for the North Sea and Skagerrak region.</p> <p>This information is deemed sufficient to estimate that the fishery will not adversely impact the status of discarded (bycatch) species with respect to biologically based limits. Sufficient quantitative information on all bycatch species is not available directly from the fishery to meet SG100.</p>		
c	Guidepost	Information is adequate to support measures to manage	Information is adequate to support a partial strategy to manage	Information is adequate to support a strategy to manage retained

FINAL REPORT AND DETERMINATION

PI 2.2.3		Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch		
		bycatch.	main bycatch species.	species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	Y	Y	N
	Justification	<p>There are considered to be no 'main' bycatch species in the mussel fishery that make up more than 5% or more of the catch, thus the 80 scoring threshold is achieved. Additional information pertaining to data available on non-target catch is given below.</p> <p>Information available from the annual shellfish surveys conducted by DTU-Aqua using similar gear to the shellfish fleet in Limfjord, reports on the fishery (including vessel movement and distribution of fishing activities) and observations from the fishers are deemed sufficient to support a partial strategy to manage bycatch species.</p> <p>The requirements at SG100 are not met as there is no strategy in place to manage all bycatch species.</p>		
d	Guidepost		Sufficient data continue to be collected to detect any increase in risk to main bycatch species (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy).	Monitoring of bycatch data is conducted in sufficient detail to assess ongoing mortalities to all bycatch species.
	Met?		Y	N
	Justification	<p>There are considered to be no 'main' bycatch species in the mussel fishery that make up more than 5% or more of the catch, thus the 80 scoring threshold is achieved. Additional information pertaining to data available on non-target catch is given below.</p> <p>Ongoing annual shellfish research surveys are conducted by DTU-Aqua using similar lightweight fishing gear to the shellfish fleet in Limfjord, sufficient to detect any increase in the risk to discarded (bycatch) species. Further to this, changes in the pattern of fishing behavior is likely to be reported through the spatial distribution of fishing activities, controlled through the use of black boxes. Information from fishers report changes to the characteristics of the fishery adequate to sufficient to monitor changes.</p> <p>Data is not collected for all bycatch species to meet the requirements at SG100.</p>		
References		ICES 2014; section 3.4.2 of this report (in particular Table 6).		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.3.1 Mussels

PI 2.3.1		<p>The fishery meets national and international requirements for the protection of ETP species</p> <p>The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species</p>		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Known effects of the fishery are likely to be within limits of national and international requirements for protection of ETP species.	The effects of the fishery are known and are highly likely to be within limits of national and international requirements for protection of ETP species.	There is a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species.
	Met?	Y	Y	Y
	Justification	<p>The MSC define Endangered Threatened & Protected (ETP) species as those that are recognised by national ETP legislation and those species that are listed in Appendix 1 of the Convention on International Trade in Endangered Species (CITES) (MSC CR §CB3.11.1).</p> <p>Species within Appendix 1 of CITES have been reviewed from the CITES website (CITES, 2014). There are no species listed in this Appendix that are affected by the fishery under assessment or the fishing gear used in this fishery.</p> <p>Wild birds are protected by Danish and EC legislation and are the only ETP species considered. While there are no numerical limits for fishery impacts on birds, mussel fishing is only permitted if it is considered to be unlikely to impact the ETP bird species (through depletion of food) and the habitats that support these birds. The direct and indirect impacts of the mussel fishery in the Limfjord on wild birds are assessed every year for the Natura 2000 sites that are vital for the protection of these species. The results of the analysis conclude that dredging activities for shellfish will not adversely affect ETP species and the fishery therefore meets national and international requirements.</p> <p>The information provided about the fishery, the impact of the lightweight fishing gear and distribution and abundance of ETP species within the Limfjord provides a high degree of certainty that the effects of the fishery are within limits of national and international requirements for the protection of ETP species, meeting SG60, SG80 and also SG100.</p>		
b	Guidepost	Known direct effects are unlikely to create unacceptable impacts to ETP species.	Direct effects are highly unlikely to create unacceptable impacts to ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species.
	Met?	Y	Y	Y
	Justification	<p>The direct and indirect effects of the fishery have been assessed on an annual basis by DTU-Aqua and are described in Sla above. They provide a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species within Limfjord. The fishery meets the requirements for SG60, SG80 and SG100.</p>		
c	Guidepost		Indirect effects have been considered and	There is a high degree of confidence that there are

FINAL REPORT AND DETERMINATION

PI 2.3.1		<p>The fishery meets national and international requirements for the protection of ETP species</p> <p>The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species</p>		
			are thought to be unlikely to create unacceptable impacts.	no significant detrimental indirect effects of the fishery on ETP species.
	Met?		Y	Y
	Justification	<p>The Natura 2000 sites are key areas for ETP species within the Limfjord region. The assessment of indirect impacts of the fishery (e.g. competition for prey, disturbance of critical habitat) is assessed on an annual basis within the Natura 2000 sites by DTU-Aqua. The outcome from these annual assessments determines whether the fishery is permitted to operate within these areas each year.</p> <p>There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species sufficient to meet the requirements at both SG80 and SG100.</p>		
References		Canal-Vergés et al. 2014; Nielsen et al. 2014; section 3.4.3 of this report.		
OVERALL PERFORMANCE INDICATOR SCORE:				100
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.3.2 Mussels

PI 2.3.2		<p>The fishery has in place precautionary management strategies designed to:</p> <ul style="list-style-type: none"> • Meet national and international requirements; • Ensure the fishery does not pose a risk of serious harm to ETP species; • Ensure the fishery does not hinder recovery of ETP species; and • Minimise mortality of ETP species. 		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place that minimise mortality of ETP species, and are expected to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a comprehensive strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species.
	Met?	Y	Y	N
	Justification	<p>Within Europe, the EC has established a network of sites to protect key habitats and species under the Natura 2000 programme. This has been transposed into Danish legislation and implemented throughout Denmark as a series of Natura 2000 sites, which occur in Limfjord.</p> <p>The impact of the fishery on ETP species is tightly controlled through management of Natura 2000 sites to minimize mortality on these species. The EU wide Natura 2000 programme and associated national sites within Denmark has been designed to be highly likely to achieve national and international requirements for the protection of ETP species. The requirements for SG60 and SG80 are met.</p> <p>The SG100 level is not met as there is no evidence available to demonstrate that a comprehensive strategy has been in place which is designed to achieve above national and international requirements for the protection of ETP species.</p>		
b	Guidepost	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).	There is an objective basis for confidence that the strategy will work, based on information directly about the fishery and/or the species involved.	The strategy is mainly based on information directly about the fishery and/or species involved, and a quantitative analysis supports high confidence that the strategy will work.
	Met?	Y	Y	Y
	Justification	<p>An impact assessment is carried out each year with Natura 2000 sites by DTU-Aqua and includes an analysis of the direct and indirect impacts of the shellfish fishery on ETP bird species within the Limfjord.</p> <p>The management strategy is based on information directly about the fishery and ETP species affected, and is based on the precautionary approach.</p>		

FINAL REPORT AND DETERMINATION

PI 2.3.2		<p>The fishery has in place precautionary management strategies designed to:</p> <ul style="list-style-type: none"> • Meet national and international requirements; • Ensure the fishery does not pose a risk of serious harm to ETP species; • Ensure the fishery does not hinder recovery of ETP species; and • Minimise mortality of ETP species. 		
		<p>Quantitative analysis within the impact assessments has been used to determine that the mussel fishery should not take place within certain Natura 2000 sites (cockle fishing has not been assessed as this takes place outside Natura 2000 sites). This quantitative analysis supports a high confidence that the strategy will work, meeting the requirements for SG60, SG80 and SG100.</p>		
c	Guidepost		There is evidence that the strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	Y
	Justification	<p>There is clear evidence from the results of the annual impact assessments conducted within the Natura 2000 sites by DTU-Aqua that the management strategy is being implemented successfully to meet both SG80 and SG100.</p>		
d	Guidepost			There is evidence that the strategy is achieving its objective.
	Met?			Y
	Justification	<p>The annual review of fishing impacts and the conservation status of ETP species within the Natura 2000 sites demonstrate that the strategy is achieving its objective to meet SG100.</p>		
References		<p>EC Directive 92/43/EC (the "Habitats Directive"); Canal-Vergés et al, 2014; Nielsen et al. 2014; section 3.4.3 of this report.</p>		
OVERALL PERFORMANCE INDICATOR SCORE:				95
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.3.3 Mussels

PI 2.3.3		Relevant information is collected to support the management of fishery impacts on ETP species, including: <ul style="list-style-type: none"> • Information for the development of the management strategy; • Information to assess the effectiveness of the management strategy; and • Information to determine the outcome status of ETP species. 		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Information is sufficient to qualitatively estimate the fishery related mortality of ETP species.	Sufficient information is available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species.	Information is sufficient to quantitatively estimate outcome status of ETP species with a high degree of certainty.
	Met?	Y	Y	Y
	Justification	The potential impacts of the mussel fishery on ETP species within Natura 2000 sites are monitored regularly through annual impact assessments and the results considered by DTU-Aqua to be sufficient to allow the outcome status to be determined with a high degree of certainty, meeting the SG60, SG80 and SG100 requirements.		
b	Guidepost	Information is adequate to broadly understand the impact of the fishery on ETP species.	Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species.	Accurate and verifiable information is available on the magnitude of all impacts, mortalities and injuries and the consequences for the status of ETP species.
	Met?	Y	Y	N
	Justification	There is sufficient information available from studies of the fishery and fishing gear and the monitoring of ETP species within the Limfjord to determine that the fishery is not a threat to the protection or recovery of ETP species. This meets the SG60 and 80 requirements, but in the absence of information about all impacts, the SG100 requirements are not met.		
c	Guidepost	Information is adequate to support measures to manage the impacts on ETP species.	Information is sufficient to measure trends and support a full strategy to manage impacts on ETP species.	Information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives.
	Met?	Y	Y	N
	Justification	The information available is sufficient to measure trends in ETP species abundance. Annual monitoring of national Natura 2000 sites occurs, including impact assessments, to ensure the success of measures put in place to protect ETP species and habitats and support the overall management objectives of the Natura 2000 programme at an EU level.		

FINAL REPORT AND DETERMINATION

PI 2.3.3		Relevant information is collected to support the management of fishery impacts on ETP species, including: <ul style="list-style-type: none">Information for the development of the management strategy;Information to assess the effectiveness of the management strategy; andInformation to determine the outcome status of ETP species.
		There is sufficient evidence to meet the requirements at both SG60 and SG80. There is no evidence to demonstrate that the information and monitoring at a national level is adequate to support a comprehensive EU-wide strategy to meet SG100.
References		Canal-Vergés et al. 2014; Nielsen et al. 2014; section 3.4.3 of this report.
OVERALL PERFORMANCE INDICATOR SCORE:		85
CONDITION NUMBER (if relevant):		NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.4.1 Mussels

PI 2.4.1		The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	The fishery is unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	There is evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.
	Met?	Y	Y	Y
	Justification	<p>Historically, concerns have been raised over the impact of shellfish dredging within the Limfjord and elsewhere in Denmark. The main issue has been that the use of dredges over time will result in the disturbance and removal of cobbles and boulders on the seabed; and that in areas where there may be a lack of rocky benthic substrata for marine species to colonise, the loss of cobble and boulder habitat areas could result in changes to seabed habitat structure.</p> <p>In 2009, Danmarks Naturfredningsforening (the Danish Society for Nature Conservation, DN) issued a complaint about their concerns to the European Union. In particular, DN considered that dredging for mussels within Natura 2000 sites is inappropriate because of the effect that it will have on seabed habitats in these areas. These concerns have been evaluated at the EU level, and following changes in the approach to shellfish dredging (e.g. lightweight gear, non-retention of large stones, and spatial restrictions) it has been concluded that the impacts within Natura 2000 sites in Denmark is now acceptable (European Parliament Committee on Petitions, Petition 1486/2009).</p> <p>The effects of dredging on seabed habitats within the Løgstør Bredning and Lovns Bredning Natura 2000 sites have been independently assessed for the Danish Government by DTU-Aqua, who has advised that there will be no significant adverse effect on the marine habitats in these areas providing that certain management measures are implemented. These measures include prohibition of fishing in waters shallower than 5 m (or 6 m in the vicinity of eelgrass beds), a restriction on the quantity of mussels that can be fished from the sites (controlled through TACs) and restrictions on the gear that can be used.</p> <p>In addition to understanding the effects of dredging on the marine habitat, DTU-Aqua has assessed the cumulative impacts of shellfish dredging on vulnerable habitats. This has been based on the proportion of known habitats fished on in recent years and the known recovery times of each habitat.</p> <p>For each of the habitats within the Natura 2000 sites, fishing is only permissible if the cumulative impact (by area) is 15% or less. To date, the highest level of fishing in both Løgstør Bredning and Lovns Bredning Natura 2000 sites proposed for 2014-15 (i.e. 15,000t) would cover less than 1% of each site and would result in a cumulative impact on habitats of less than 10%, with no dredging at all permitted within eelgrass beds.</p> <p>Following the trials conducted in 2009, a new lightweight dredge is now used in the Limfjord shellfish fishery. The new gear is now lighter in weight, and thus does less damage to the seabed whilst requiring less fuel to tow, and also narrower (weight of new dredges must not exceed 50 kg and 1.8 m long and 1.5 m wide).</p>		

FINAL REPORT AND DETERMINATION

PI 2.4.1		The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function
		<p>Concerns have been raised about the potential effect of the fishery on eelgrass and macroalgae growing on the seabed in Limfjord, which are vulnerable to the effects of dredging. In response to these concerns, the Danish Government has introduced depth restrictions on dredging activity. These restrictions are based upon water turbidity and the maximum depth that marine plants at which they are able to grow. In the Limfjord Natura 2000 sites, mussel dredging is prohibited in waters shallower than 5 m in all areas, and in waters shallower than 6 m in the vicinity of eelgrass beds (the distribution of eelgrass beds in the Limfjord is shown in Figure 19 and the extent of restrictions on dredging are shown in Figure 20). No dredging is permitted in the eelgrass beds throughout the Limfjord.</p> <p>In addition to concerns over macroalgae and eelgrass additional concerns have been raised over the removal of large boulders and cobbles from the seabed, all shellfish dredgers are now required to report all landings of stones from Natura 2000 sites and to return stones heavier than 2 kg immediately after capture. Records demonstrate that 1.2 tonnes of stones were removed from the Løgstør Bredning Natura 2000 site during 2013-14. No stones were reported to be removed from the Lovns Bredning site during 2013-14 (the historical range for this site is between 0 and 2.3t).</p> <p>The information available about the impact of mussel dredges on seabed habitats, coupled with the management measures in place, and the spatial controls limiting the extent of shellfish dredging relative to the marine habitats in the Unit of Certification area, provides available evidence that the fishery is highly unlikely to affect either the boulder, eelgrass or macroalgal habitats that occur in the unit of certification areas to the extent that there would be serious or irreversible harm to them on the regional or bioregional basis. The availability of evidence about the habitat impacts of the mussel fishery meets the requirements at SG100.</p>
References		Section 3.4.4 of this report; EC Directive 92/43/EC; Poulsen, 2009; Nielsen et al. 2014; Canal-Vergés et al. 2014 ; EP Petition 1486/2009.
OVERALL PERFORMANCE INDICATOR SCORE:		100
CONDITION NUMBER (if relevant):		NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.4.2 Mussels

PI 2.4.2		There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a strategy in place for managing the impact of the fishery on habitat types.
	Met?	Y	Y	Y
	Justification	<p>There is a strategy in place for managing the impact of the fishery on habitat types, as set out in EC legislation under the Habitats and Birds Directives. These Directives have established the Natura 2000 programme that has been transposed into Danish legislation. The strategy is based upon information about the natural habitats in the area, and its implementation takes account of the potential effect of fishing activity on those habitats. In Denmark, the strategy has been implemented through a number of Natura 2000 sites in Limfjord and other key habitats in Denmark.</p> <p>In addition to the Natura 2000 sites, potentially sensitive marine plant (eelgrass and macroalgal) habitats have been protected from fishing activities outside these sites, by introducing statutory controls on fishing areas and depth.</p> <p>The strategy in place meets the requirements of SG60, SG80 and SG100.</p>		
b	Guidepost	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/habitats).	There is some objective basis for confidence that the partial strategy will work, based on information directly about the fishery and/or habitats involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or habitats involved.
	Met?	Y	Y	Y
	Justification	<p>The Danish government conducts an annual impact assessment (IA) within both Natura 2000 sites, which includes the impact of fishing activities within the area.</p> <p>Qualitative information obtained from local fishers helps to confirm they avoid sensitive habitats during fishing operations throughout the Limfjord, and coupled with the Natura 2000 IA documents, provide an objective basis that the partial strategy will work.</p> <p>Testing of the management measures, through monitoring of habitat impacts associated with fishing and changes in the extent of sensitive habitats with in Natura 2000 sites provides a high level of confidence that the strategy is working.</p> <p>The requirements for SG60, SG80 and SG100 are all met.</p>		
c	Guidepost		There is some evidence that the partial strategy is being implemented	There is clear evidence that the strategy is being implemented successfully.

FINAL REPORT AND DETERMINATION

PI 2.4.2		There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types		
			successfully.	
	Met?		Y	Y
	Justification	<p>There is clear evidence available to demonstrate that both EC and Danish legislation for habitat protection is being implemented successfully. All shellfish dredging activities from the fleet under this unit of certification are carefully monitored and controlled to ensure that any habitat impacts are within acceptable limits set by national and international legislation.</p> <p>There is clear evidence that the fishery is in good compliance with the control measures imposed to protect natural habitats (i.e. annual TAC, gear type restrictions, spatial and depth restrictions on fishing activity to protect sensitive habitats).</p> <p>This evidence meets both the SG80 and SG100 requirements.</p>		
d	Guidepost			There is some evidence that the strategy is achieving its objective.
	Met?			Y
	Justification	<p>Information available from annual DTU-Aqua reviews of fishing impacts provide evidence that fishing within the Natura 2000 sites is compatible with the favourable conservation status of these sites, which is their management objective.</p> <p>There is also evidence that Denmark is making its contribution to the overall objectives of the Natura 2000 programme through the designation and management of protected sites both on land and at sea (evidenced through the EC Natura 2000 barometer).</p> <p>This evidence meets the requirements for SG100.</p>		
References		Section 3.4.4 of this report; EC Directive 92/43/EC; Poulsen, 2009; Nielsen et al. 2014; Canal-Vergés et al. 2014.		
OVERALL PERFORMANCE INDICATOR SCORE:				100
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.4.3 Mussels

PI 2.4.3		Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There is basic understanding of the types and distribution of main habitats in the area of the fishery.	The nature, distribution and vulnerability of all main habitat types in the fishery are known at a level of detail relevant to the scale and intensity of the fishery.	The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types.
	Met?	Y	Y	Y
	Justification	<p>The distribution of habitats within the Limfjord is known over their range, and the distribution of vulnerable biotopes is known at the EU (bioregional) level.</p> <p>Within Limfjord, particular attention is paid to detailed distribution of vulnerable habitats (e.g. eelgrass and marcoalgal beds). These areas have been carefully mapped such that specific areas have been designated within Natura 2000 sites to protect specific vulnerable habitat types.</p> <p>The combination of knowledge of habitat distributions at the bioregional and local level meets the SG60, 80 and 100 requirements.</p>		
b	Guidepost	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear.	Sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified and there is reliable information on the spatial extent of interaction, and the timing and location of use of the fishing gear.	The physical impacts of the gear on the habitat types have been quantified fully.
	Met?	Y	Y	N
	Justification	<p>Data collection from annual research surveys provides good information about the nature of the impacts of the shellfish dredge fishery on habitats and the distribution and location of habitat types. This information is used to inform a precautionary management approach that limits the maximum permissible cumulative impact on habitat area (to 0% in the case of eelgrass beds, and to a limit of 15% for other habitats).</p> <p>The spatial location and timing of each vessel within the shellfish fleet is monitored and recorded through individual 'black boxes' which provide reliable information. This evidence is sufficient to meet the requirements for SG60 and SG80.</p> <p>Although the fishing gear used in the mussel and cockle dredge fisheries has been studied, its impacts on habitat types have not been fully quantified. The fishery does meet SG100.</p>		
c	Guidepost		Sufficient data continue to be collected to detect any increase in risk to habitat (e.g. due	Changes in habitat distributions over time are measured.

FINAL REPORT AND DETERMINATION

PI 2.4.3		Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types		
			to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	
	Met?		Y	Y
	Justification	<p>Data continue to be collected and recorded on a regular basis through the 'black box' recorded fitted to each fishing vessel in the UoC. This provides detail GPS information about the location and movements of the fleet and provides clear evidence where fishing activities occur. These data enable the spatial extent and cumulative impact of fishing on habitats to be monitored continuously. The individual vessel tracking device enables any increase in risk to habitat to be identified for the vessels within the UoC.</p> <p>Information presented within impact assessments demonstrates clearly how changes in the extent of key habitats are measured; eelgrass beds are monitored throughout the UoC, while all habitats are monitored within Natura 2000 sites.</p> <p>The monitoring systems put in place are sufficient to meet the SG100 requirements.</p>		
References		Section 3.4.4 of this report; Figure 15; Figure 19; Nielsen et al. 2014; Canal-Vergés et al. 2014.		
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.5.1 Mussels

PI 2.5.1		The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	The fishery is unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is evidence that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Y	Y	Partial
	Justification	<p>Fishing activity concentrates in areas where mussels and cockles are of high density and quality, found using underwater video and sonar equipment. This limits the area of fishing to very specific locations and not widely distributed across the entire certification area. Thus, over the long term, dredging will not affect the entire area in Limfjord. A small proportion (less than 2% by area) of the whole unit of certification area is affected annually by shellfish dredging.</p> <p>The exploitation of mussels is deemed very low in comparison to the productivity of the stock. The results of the PSA analysis indicate that the cockle stock is similarly robust. Key habitat areas (notably eelgrass beds) are protected from any dredging activity by depth restrictions, and other potentially sensitive areas are closed to dredging altogether.</p> <p>Research survey data and simulation modelling of eelgrass (<i>Zostera</i> spp.) and counts of bird numbers provides evidence that the fishery is highly unlikely to cause serious or irreversible disruption to the ecosystem. The management and modelling of the Natura 2000 sites ensures that there is a surplus of mussels in the ecosystem in these areas, to meet the energy requirements of shellfish eating birds.</p> <p>There is evidence to show that there is a low risk of harm from the removal of stones using the new lightweight mussel dredges in the Limfjord, which all vessels are required to use. The removal of empty shells during fishing activities are sorted during processing and re-deposited on the seabed. Research has demonstrated that the fishery does not affect the abundance of empty shells, which are an important micro-habitat for the colonisation by mussels and other epibenthos.</p> <p>Dredging has the potential to release nutrients from the seabed, causing nutrient remobilisation in the Limfjord. Research provides evidence that a temporary and localised increase in nutrient concentrations in the water after dredging, but these effects are very small (less than 1% of the nutrient loading to the Limfjord from land and atmospheric sources).</p> <p>There is some evidence, although this is not comprehensive, that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. The SG60 and 80 requirements are fully met, and the availability of evidence partially meets the SG100 requirements.</p>		
References		Section 3.4 of this report; Nielsen et al. 2014; Canal-Vergés et al. 2014, Dyekjær et al. 1995, Riemann and Hoffmann 1991, Holmer et al. 2003		
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.5.2 Mussels

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place, if necessary.	There is a partial strategy in place, if necessary.	There is a strategy that consists of a plan, in place.
	Met?	Y	Y	N
	Justification	<p>Within the Limfjord region, there is a strategy in place to ensure the fishery does not pose a risk of serious risk or irreversible harm in the form of the network of Natura 2000 sites. On a broader scale, a partial strategy exists to protect elements of the ecosystem through a number of statutory controls.</p> <p>Within Natura 2000 sites, a clear strategy is in place to manage ecosystem impacts and the management measures that restrict or prohibit dredging activity within them in order to protect marine habitats and birds. Measures are in place such as the depth restrictions on dredging activity that are implemented to protect eelgrass, and other restrictions to minimise the capture of boulders and stones in dredges.</p> <p>Outside Natura 2000 sites, there are a range of measures in place in the form of statutory restrictions on the spatial extent of dredging activity, the number of vessels that are permitted to work in the UoC, and the TAC limits imposed on vessels, as well as the constraints on fishing gear specification, which ensures that the fishery does not pose a risk of irreversible harm to the ecosystem. This partial strategy meets the SG60 and 80 requirements for the whole UoC.</p> <p>Although the SG100 requirements are met by the managements approach applied to the Natura 2000 sites, these represent just part of the UoC area. A score of 80 is therefore appropriate.</p>		
b	Guidepost	The measures take into account potential impacts of the fishery on key elements of the ecosystem.	The partial strategy takes into account available information and is expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	<p>The strategy, which consists of a plan, contains measures to address all main impacts of the fishery on the ecosystem, and at least some of these measures are in place. The plan and measures are based on well-understood functional relationships between the fishery and the Components and elements of the ecosystem.</p>
				<p>This plan provides for development of a full strategy that restrains impacts on the ecosystem to ensure the fishery does not cause serious or irreversible harm.</p>

FINAL REPORT AND DETERMINATION

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
	Met?	Y	Y	N
	Justification	<p>Within the Limfjord area, including Natura 2000 sites, the partial strategy in place for the fishery ensures that fishing effort, location and intensity of fishing activity is managed to restrain impacts on the ecosystem.</p> <p>This partial strategy uses all available information about the location and sensitivity of ecosystem components to fishing activity, and is part of an adaptive management regime for the fishery that responds to changes in stock size, ecosystem information, and new information about the fishery.</p> <p>The available evidence is sufficient to meet the requirements at SG60 and SG80. However, in the absence of a plan for the whole UoC, the SG100 requirements cannot be met.</p>		
c	Guidepost	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The partial strategy is considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The measures are considered likely to work based on prior experience, plausible argument or information directly from the fishery/ecosystems involved.
	Met?	Y	Y	Y
	Justification	<p>The partial strategy is considered likely to work based on evidence from annual impact assessments of mussel fishing impacts and ecosystem monitoring within Natura 2000 sites over the past 6 years.</p> <p>Although the extent of habitats and monitoring of ecosystem impacts are monitored less closely in the wider Limfjord, and the benthic impacts of the mussel dredges on cockle habitats in the Limfjord have not been studied directly, there is a plausible argument (based on the evidence from the Natura 2000 sites, generic studies and the very limited spatial extent of cockle dredging) that the partial strategy and measures in place for this fishery and the Limfjord ecosystem are likely to work.</p> <p>The available evidence is deemed sufficient to meet the requirements at SG60, SG80 and SG100.</p>		
d	Guidepost		There is some evidence that the measures comprising the partial strategy are being implemented successfully.	There is evidence that the measures are being implemented successfully.
	Met?		Y	Y
	Justification	<p>Evidence of a good level of compliance with the management measures in place is available from monitoring the activities of the fishing fleet using the 'black box' recorders. In addition, the entire shellfish fleet has adopted the new lightweight dredge, which is now part of the fishing licence condition.</p> <p>Detailed monitoring of the Natura 2000 sites provides evidence that the management measures in place for the fishery within these areas are working successfully as well.</p> <p>The supporting evidence shows that the requirements for both SG80 and 100 are met.</p>		

FINAL REPORT AND DETERMINATION

PI 2.5.2	There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function	
References	Section 3.4 of this report; Nielsen et al. 2014; Canal-Vergés et al. 2014; Dolmer et al, 2009.	
OVERALL PERFORMANCE INDICATOR SCORE:		90
CONDITION NUMBER (if relevant):		NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.5.3 Mussels

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Information is adequate to identify the key elements of the ecosystem (e.g., trophic structure and function, community composition, productivity pattern and biodiversity).	Information is adequate to broadly understand the key elements of the ecosystem.	
	Met?	Y	Y	
	Justification	<p>Research information is available to identify the key elements of the ecosystem, such as the distribution and character of seabed habitats, and the role of mussels in the trophic function of the Limfjord.</p> <p>Information is available to enable the key elements of the ecosystem and potential interactions with the mussel fishery to be understood, including the effect of shellfish dredging on seabed habitats and the food requirements of shellfish-eating birds within Natura 2000 sites.</p> <p>The SG60 and 80 requirements are therefore met.</p>		
b	Guidepost	Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, and have not been investigated in detail.	Main impacts of the fishery on these key ecosystem elements can be inferred from existing information and some have been investigated in detail.	Main interactions between the fishery and these ecosystem elements can be inferred from existing information, and have been investigated in detail.
	Met?	Y	Y	Y
	Justification	<p>Information is available on the potential impact of the fishery on ecosystem elements such as non-target species, marine habitats, and shellfish-eating birds in the ecosystem have been investigated in detail. In addition, the main ecosystem impacts on marine habitats and shellfish eating birds have been investigated in the UoC area.</p> <p>The supporting evidence is sufficient to meet the requirements at SG60, SG80 and SG100.</p>		
c	Guidepost		The main functions of the Components (i.e., target, Bycatch, Retained and ETP species and Habitats) in the ecosystem are known.	The impacts of the fishery on target, Bycatch, Retained and ETP species are identified and the main functions of these Components in the ecosystem are understood.
	Met?		Y	N
	Justification	<p>The impacts of the fishery on target, non-target and ETP species and habitats are understood and are subject to ongoing and continuous monitoring.</p> <p>The main functions of all of these components in the ecosystem are known, and some (such as the interaction between birds and shellfish) have been</p>		

FINAL REPORT AND DETERMINATION

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
		<p>modelled and are understood. The SG80 requirements are therefore fully met.</p> <p>The information about the impacts of the fishery and the functions of all ecosystem components is not sufficiently detailed or comprehensive to meet the SG100 requirements.</p>		
d	Guidepost		Sufficient information is available on the impacts of the fishery on these Components to allow some of the main consequences for the ecosystem to be inferred.	Sufficient information is available on the impacts of the fishery on the Components and elements to allow the main consequences for the ecosystem to be inferred.
	Met?		Y	N
	Justification	<p>Sufficient information is available on the components and elements of the ecosystem to allow the main consequences for some of these components to be inferred and the effect of the fishery on overall ecosystem function to be understood.</p> <p>All of the available information indicates that under the current management regime the fishery has very little impact on ecosystem components, elements and function.</p> <p>The information available is sufficient to meet the SG80 requirements because some of the main consequences for the ecosystem can be inferred.</p> <p>The information available is not sufficiently detailed or comprehensive to meet the SG100 requirements.</p>		
e	Guidepost		Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	Information is sufficient to support the development of strategies to manage ecosystem impacts.
	Met?		Y	Y
	Justification	<p>All fishing activity in the Limfjord is monitored continuously using “black box” recorders fitted to every vessel. This information is capable of detecting any change in risk level, and has also been used to develop strategies to manage ecosystem impacts (e.g. through the depth restrictions in place to protect eelgrass, and the measures in place to ensure that adequate shellfish stocks are reserved for birds).</p> <p>Information about the fishery and its effects on ecosystem components and elements is assessed annually for Natura 2000 sites. This includes independent research cumulating in an impact assessment for Natura 2000 sites. This information is sufficient to meet SG80 and SG100.</p>		
References		Section 3.4 of this report; Nielsen et al. 2014; Canal-Vergés et al. 2014;		
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

UoC 2: Cockle fishery

Evaluation Table for PI 2.1.1 Cockles

PI 2.1.1		The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Main retained species are likely to be within biologically based limits (if not, go to scoring issue c below).	Main retained species are highly likely to be within biologically based limits (if not, go to scoring issue c below).	There is a high degree of certainty that retained species are within biologically based limits and fluctuating around their target reference points.
	Met?	Y	Y	N
	Justification	<p>'Retained' species are defined by the MSC as those species that are caught by the fishery and are landed by the vessel. Species are classed as retained even if they have no commercial value.</p> <p>'Main' retained species are defined by the MSC as those that make up 5% or more of the total catch (in weight), unless the retained species have a high value, are vulnerable or the total volume retained is large (MSC GCR at §GCB3.5.2). In addition, the MSC specify that only those parts of the retained catch that are not assessed under Principle 1 should be assessed under Principle 2 (MSC CR at §CB3.5.1). Thus mussels are not considered as a retained species for the cockle UoC (and vice-versa).</p> <p>The available evidence indicates that where there are significant catches of cockles, starfish (<i>Asterias rubens</i>) may make up around 8% of the catch, and shore crabs just under 1% (see Table 6) (on the basis of the catch data provided from the DTU-Aqua 2014 mussel stock survey which was carried out using the light dredge gear that is used to catch both cockles and mussels in the Limfjord). The catch from the mussel survey is considered to be representative of the catch likely to be obtained when fishing for cockles (see PI2.1.3).</p> <p>The most abundant non-target species caught during the DTU-Aqua surveys were starfish (<i>Asterias rubens</i>) and shore crab (<i>Carcinus maenus</i>). Both species are landed in the commercial fishery and removed after sorting and cleaning at the processing plants.</p> <p>Available evidence on <i>A. rubens</i> shows the population to be highly abundant and widely distributed within Limfjord region (Figure 14). No information is available on the abundance of each species in the Limfjord in relation to either limit or target reference points.</p> <p>The information available from the fishery is sufficient to meet both SG60 and SG80. The fishery does not meet SG100 because neither limit or target reference points are known for starfish and shore crabs retained in the fishery.</p>		
b	Guidepost			Target reference points are defined for retained species.
	Met?			N
	Justification	Target reference points have not been defined for retained species (starfish and shore crabs) and does not meet the requirements for SG100.		
c	Guidepost	If main retained	If main retained	

FINAL REPORT AND DETERMINATION

PI 2.1.1		The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species		
		species are outside the limits there are measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding of the depleted species.	species are outside the limits there is a partial strategy of demonstrably effective management measures in place such that the fishery does not hinder recovery and rebuilding.	
	Met?	Y	Y	
	Justification	<p>As highlighted under Sla above, starfish (<i>Asterias rubens</i>) are known to make up around 8% of the catch and are thus the only “main” retained species.</p> <p>There is good information available on the status of starfish in the Limfjord (see section 3.4.2.1 of this report). Starfish are widely distributed and highly abundant in the Limfjord; abundance has also increased in recent years. There is no evidence that starfish are outside biological limits.</p> <p>The practice of the fishing industry is to avoid fishing for cockles in areas where starfish are abundant, because they cannot be sorted from the catch at sea and have to be landed. There is a strong economic incentive to avoid landing starfish; they have no economic value, and add to processing costs.</p> <p>The evidence that starfish are abundant and thriving in the Limfjord, coupled with the practice of avoiding areas where starfish are abundant meet the SG60 and 80 requirements.</p>		
d	Guidepost	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the retained species to be outside biologically based limits or hindering recovery.		
	Met?	Y		
	Justification	<p>It has been noted under Sla above that the status of starfish and shore crab populations has not been assessed in relation to limit or target reference points.</p> <p>Management measures prohibit shellfish dredging in much of the Limfjord region including those within Natura 2000 sites (see section 3.5 on management). These restricted fishing areas protect starfish and shore crab habitat, which have a wide distribution.</p> <p>Fishing practices target high density mussel beds and specifically avoid areas where there is a high likelihood of retaining a high proportion of non-target species, including starfish and shore crabs. In addition, industrial vessels are unable to dredge in shallow waters below 3 m, further limiting the impact of the fishery on starfish and shore crab populations.</p> <p>These measures and practices are sufficient to meet SG60.</p>		
References		Holtegaard et al (2008); Neilsen et al 2014; section 3.6.2 of this report		
OVERALL PERFORMANCE INDICATOR SCORE:				80

FINAL REPORT AND DETERMINATION

PI 2.1.1	The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species	
CONDITION NUMBER (if relevant):		NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.1.2 Cockles

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place, if necessary, that are expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a partial strategy in place, if necessary, that is expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing retained species.
	Met?	Y	Y	N
	Justification	<p>“Measures” are defined by the MSC as individual management actions or tools which may manage impacts either deliberately or coincidentally; a “partial strategy” is a cohesive set of measures that work together (either deliberately or coincidentally) to achieve a management outcome; and a “strategy” is a cohesive, deliberate and effective management approach designed to addressing unacceptable impacts (further details are given in the MSC GCR at §GCB3.3).</p> <p>Specific actions are undertaken by the fleet to avoid high density areas of non-target species, including starfish and shore crab. Incentives to avoid high catches of non-target species are created because vessels have no facility to sort the catch and they are required to land all catches. The catch is then sorted at the processor and all non-target species discarded – there is no commercial market for starfish or shore crab.</p> <p>The use of mesh liners to reduce the dredge mesh size and increase the retention of cockles (which are smaller than mussels) could alter catch composition from that obtained using a mussel dredge (addressed under PI2.1.3). Nevertheless, the incentive to avoid capture of the non-target species applies equally to the cockle fishery. Fishers and processors report that the quantity of non-target species in cockle landings is low.</p> <p>Measures are also undertaken by the fishery to reduce the likelihood retaining high catches of non-target species. Underwater video cameras and sonar equipment are used with test dredging by a dedicated vessel within the fleet to identify areas of high mussel abundance and quality (and low non-target species). This information is relayed back to the rest of the fleet to facilitate specific targeted areas.</p> <p>In addition to the industry-led initiatives, there are a number of statutory management measures that prevent dredging activities in much of the Limfjord region. These include prohibition of fishing in less than 3 m, which has been extended to 5 m within Natura 2000 sites (and 6 m in the vicinity of eelgrass beds, which are important nursery habitats for shore crabs). Compliance with spatial controls is monitored through vessel ‘black box’ recorders (vessel monitoring system) fitted to all shellfish vessels in the Limfjord region.</p> <p>The specific actions undertaken by the fleet combined with the statutory</p>		

FINAL REPORT AND DETERMINATION

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species		
		controls for spatial management represent a partial strategy. These elements are sufficient to meet both SG60 and SG80. SG100 is not met as there is no evidence of a strategy to specifically manage catches of all non-target species.		
b	Guidepost	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Y	Y	N
	Justification	<p>There is an objective basis for confidence that the fishery does not pose a risk of serious or irreversible harm to retained species from information provided by industry (fishers and processors) and independent government sources (research survey results). A high level of compliance exists with statutory spatial controls to avoid dredging in shallow waters less than 3 m depth and other restricted areas in Limfjord, demonstrated analysis of individual vessel tracks collected from the 'black box'.</p> <p>The partial strategy in place from both industry and statutory controls is sufficient to meet SG 60 and SG80. No testing of a formal strategy has been made to meet SG100.</p>		
c	Guidepost		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	N
	Justification	<p>The low catch of non-target species in the Limfjord mussel survey associated with significant cockle landings, coupled with the reports of low abundance of non-target species in cockle landings and the evidence of the wide distribution and sustained high abundance of starfish in the Limfjord provides evidence that the partial strategy is being implemented successfully.</p> <p>Analysis of individual vessel tracking using the 'black box' clearly demonstrates compliance with statutory spatial controls both within Natura 2000 sites and the wider Limfjord region. The wide distribution and high abundance of starfish provides further evidence that the partial strategy is being implemented successfully.</p> <p>The supporting evidence is sufficient to meet SG80, although in the absence of a management strategy, the SG100 is not met.</p>		
d	Guidepost			There is some evidence that the strategy is achieving its overall objective.
	Met?			N
	Justification	The absence of a management strategy or overall objective for the retained		

FINAL REPORT AND DETERMINATION

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species		
		non-target species prevents the fishery from meeting SG100.		
e	Guidepost	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
	Justification	There is no evidence that sharks are captured in this fishery. This scoring issue is not relevant and has not been scored.		
References		See section 3.4.2 of this report; Bedini, 2002;		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.1.3 Cockles

PI 2.1.3		Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Qualitative information is available on the amount of main retained species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main retained species taken by the fishery.	Accurate and verifiable information is available on the catch of all retained species and the consequences for the status of affected populations.
	Met?	Y	Y	N
	Justification	<p>Quantitative information about the level of non-target species caught in mussel dredges in the Limfjord is available from fisheries independent annual research surveys that use similar gear to the shellfish fleet.</p> <p>The mesh size of the gear used in the independent research surveys is similar gear to that used by the mussel dredgers when fishing commercially for mussels and cockles. The netting in the upper side of the survey gear dredge has a mesh-size of 25 mm, and this is what determines the selectivity of the dredge. This mesh size is comparable to the mesh size of the 'liner net' used in the mussel dredge when targeting cockles (i.e., 30 mm). There is netting in the bottom of the dredge with a mesh-size of 55 mm as stated in Dolmer (1999) but because this net is tied up during use, it has no influence on what is caught/retained (Kjerulf 2015). Therefore the catch composition data from survey dredges is thought to provide some quantitative information on the amount and type of retained species taken in the fishery.</p> <p>In addition, qualitative information has been provided from the processor to confirm the level of bycatch is low. This was further corroborated by stakeholder interviews with fishers.</p> <p>The qualitative and quantitative information is sufficient to meet the requirement for SG60 and 80. Given that the quantitative information is not obtained directly from the fishery, it is not sufficient to meet SG100.</p>		
b	Guidepost	Information is adequate to qualitatively assess outcome status with respect to biologically based limits.	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with a high degree of certainty.
	Met?	Y	Y	N
	Justification	<p>No biologically based limits have been set with respect to the main retained species in this assessment, starfish.</p> <p>Available evidence on <i>A.rubens</i> shows the population to be highly abundant and widely distributed within Limfjord region. DTU-Aqua has estimated the biomass of starfish in the shellfish production areas in the Limfjord in each of the past 20 years (see Figure 14). These estimates are taken from the quantity of starfish caught in dredges during mussel surveys. This time-series shows a high abundance of starfish from 1997-2002 and that current (2013) abundance is the highest in the time series. So although, there are no biologically based limits set for starfish, given the current and historic high abundance of the species and regular stock assessments conducted, information is considered to be sufficient to determine that the status of the</p>		

FINAL REPORT AND DETERMINATION

PI 2.1.3		Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species		
		<p>species is within safe biological limits (above the point of recruitment impairment equivalent to a limit reference point). This is sufficient to meet both SG60 and SG80. No information is provided on the level of uncertainty in the assessments sufficient to meet SG100.</p> <p>There is both qualitative and quantitative information on the level of catch of non-target species and the current status of starfish, which is the most abundant non-target species. Further information is also available on the life-history of the most abundant non-target species, which indicates both starfish and shore crabs are highly fecund animals.</p>		
c	Guidepost	Information is adequate to support measures to manage main retained species.	Information is adequate to support a partial strategy to manage main retained species.	Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	Y	Y	N
	Justification	<p>As all shellfish vessels must land their entire catch (including target and bycatch species), which is sorted and weighted at the processing facilities, information is available on catch rates for non-target species. In addition, detailed information on closed areas and level of compliance with statutory controls is sufficient to meet both SG60 and SG80.</p> <p>The SG100 requirements are not met as there is no strategy in place to manage non-target species.</p>		
d	Guidepost		Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator score or the operation of the fishery or the effectiveness of the strategy)	Monitoring of retained species is conducted in sufficient detail to assess ongoing mortalities to all retained species.
	Met?		Y	N
	Justification	<p>Only some data about the proportion of non-target species in the cockle catch are collected by processors. There is currently no evidence that catch composition taken with a commercial cockle dredge has been examined or is monitored on an ongoing basis. However, the gear used in the independent surveys is similar to that used by the mussel dredgers when fishing commercially for mussels and cockles. The netting in the upper side of the dredge has a mesh-size of 25 mm, and this is what determines the selectivity of the dredge. This mesh size is comparable to the mesh size of the 'liner net' used in the mussel dredge when targeting cockles. There is netting in the bottom of the dredge with a mesh-size of 55 mm as stated in Dolmer 1999– but because this net is tied up during use, it has no influence on what is caught/retained (Kjerulf 2015). Therefore the continued collection of data via the mussel survey is considered sufficient to detect any increase in risk level</p>		

FINAL REPORT AND DETERMINATION

PI 2.1.3		Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species	
		to starfish. This meets the SG 80 requirement, however because there is no direct monitoring of the commercial cockle fishery with respect to catch composition, the SG100 is not met.	
References		Holtegaard et al (2008); Neilsen et al 2014; section 3.6.2 of this report.	
OVERALL PERFORMANCE INDICATOR SCORE:			80
CONDITION NUMBER (if relevant):			N/A

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.2.1 Cockles

PI 2.2.1		The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Main bycatch species are likely to be within biologically based limits (if not, go to scoring issue b below).	Main bycatch species are highly likely to be within biologically based limits (if not, go to scoring issue b below).	There is a high degree of certainty that bycatch species are within biologically based limits.
	Met?	Y	Y	N
	Justification	<p>For the purposes of an MSC assessment “bycatch” are those species that are caught in the fishing gear and are then thrown back into the sea (either alive or dead). In many parts of the world, the term “discards” is used in preference to “bycatch” to describe this element of the catch.</p> <p>‘Main’ bycatch species are defined by the MSC as those that make up 5% or more of the total catch (in weight), unless the retained species have a high value, are vulnerable or the total volume retained is large (MSC GCR at §GCB3.5.2). In addition, the MSC specify that only those parts of the catch are discarded and not assessed under Principle 1 or other components of Principle 2 (i.e. as retained species) should be assessed under Principle 2 (MSC CR at §CB3.8.1). Thus cockles are not considered as a retained species for the mussel UoC.</p> <p>There are considered to be no ‘main’ bycatch species in the fishery that make up more than 5% or more of the catch). This is because there is a very low proportion of non-target species in the catch, and there is no sorting on board the vessels. Most of the catch is retained and landed. As such, all impacts on retained non-target species have been addressed in PI2.1.1 above, and PIs pertaining to bycatch species receive at least an 80 score. Additional information pertaining to the status of discarded species in the cockle dredge fishery is given below.</p> <p>It has been noted that the only bycatch species reported to be discarded are flatfish, in particular flounder (<i>Platichthys flesus</i>). Available information suggests that between 10 and 30 live fish are discarded per vessel per day. These small volumes have been estimated to be below 5% of the total annual catch and therefore do not qualify as ‘main’ species. These estimates have been calculated from the DTU-Aqua surveys and not directly from the commercial fishery. However, since the research dredge uses a comparable mesh size to that used in the cockle fishery, catch composition is expected to be comparable. This is addressed specifically under PI2.1.3 below.</p> <p>There is currently no ICES stock assessment to determine the status of flounder in the North Sea and Skagerrak region with respect to biologically based limits, although an annual TAC has been set at 3,160t.</p> <p>As there is evidence that no ‘main’ bycatch species are caught, both SG60 and SG80 requirements are met. Although it is highly unlikely that the fishery has a direct effect on the status of flounder, SG100 is not met due to current level of uncertainty around the status of flounder.</p>		
b	Guidepost	If main bycatch species are outside biologically based	If main bycatch species are outside biologically based limits there is a	

FINAL REPORT AND DETERMINATION

PI 2.2.1		The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups		
		limits there are mitigation measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding.	partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding.	
	Met?	NA	NA	
	Justification	There are no 'main' bycatch species caught in the fishery and therefore this scoring issue is not scored.		
c	Guidepost	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the bycatch species to be outside biologically based limits or hindering recovery.		
	Met?	Y		
	Justification	The status of flounder in the North Sea and Skagerrak is poorly known. However, the discarding of a small number of live flatfish in shallow water, mainly flounder, makes it highly unlikely to impact the status of this stock. SG60 requirements are met.		
References		ICES 2014, in addition to section 3.4.2 of this report.		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.2.2 Cockles

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place, if necessary, that are expected to maintain the main bycatch species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a partial strategy in place, if necessary, that is expected to maintain the main bycatch species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing and minimizing bycatch.
	Met?	Y	Y	N
	Justification	<p>There are considered to be no 'main' bycatch species in the fishery that make up more than 5% or more of the catch). This is because there is a very low proportion of non-target species in the catch, and there is no sorting on board the vessels. Most of the catch is retained and landed. As such, all impacts on retained non-target species have been addressed in PI2.1.1 above, and PIs pertaining to bycatch species receive at least an 80 score. Additional information pertaining to the management of discarded species in the cockle dredge fishery is given below.</p> <p>"Measures" are defined by the MSC as individual management actions or tools which may manage impacts either deliberately or coincidentally; a "partial strategy" is a cohesive set of measures that work together (either deliberately or coincidentally) to achieve a management outcome; and a "strategy" is a cohesive, deliberate and effective management approach designed to addressing unacceptable impacts (further details are given in the MSC GCR at §GCB3.3).</p> <p>At a fishery level, management measures and industry led actions have been established to reduce the level of non-target species retained in the catch, and therefore a very low level of discarding from the fishery. Management measures include statutory controls on the design of fishing gear and spatial distribution of fishing activities, enforced using a vessel 'black box', whereas industry-led initiatives are taken to identify and retain mussels from high density areas, which coincide with low levels of other non-target species.</p> <p>At the EU level, the new Common Fisheries Policy (CFP) regulation has introduced a 'landing obligation' that specifically manages discarding. This is currently being introduced on a fishery-by-fishery basis and with exception to the Mediterranean Sea, will only apply to species managed with a TAC. To date, the mussel fishery has not been assessed under the landing obligation, and there is no evidence to indicate this will be required. However, due to implementation being made on a fishery-by-fishery basis, the outcome of this scoring issue may need to be reviewed in future.</p> <p>If new evidence were to become available that the fishery had been considered under the new EU landing obligation, this may be sufficient to meet the SG100 requirement.</p>		

FINAL REPORT AND DETERMINATION

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations		
b	Guidepost	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).	There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Y	Y	N
	Justification	<p>There are considered to be no 'main' bycatch species in the fishery that make up more than 5% or more of the catch). This is because there is a very low proportion of non-target species in the catch, and there is no sorting on board the vessels. Most of the catch is retained and landed. As such, all impacts on retained non-target species have been addressed in PI2.1.1 above, and PIs pertaining to bycatch species receive at least an 80 score. Additional information pertaining to the status of discarded species in the cockle dredge fishery is given below.</p> <p>There is an objective basis for confidence that the fishery does not pose a risk of serious or irreversible harm to bycatch species from information provided by industry (fishers and processors) and independent government sources (research survey results).</p> <p>Much of the Limfjord is closed to fishing and fishing operations occur within finite areas that yield high densities of high quality mussels and cockles and further reduce the impact of the fishery on discarded (bycatch) species.</p> <p>No testing of a formal strategy has been made to meet SG100.</p>		
c	Guidepost		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	N
	Justification	<p>There are considered to be no 'main' bycatch species in the fishery that make up more than 5% or more of the catch). This is because there is a very low proportion of non-target species in the catch, and there is no sorting on board the vessels. Most of the catch is retained and landed. As such, all impacts on retained non-target species have been addressed in PI2.1.1 above, and PIs pertaining to bycatch species receive at least an 80 score. Additional information pertaining to the status of discarded species in the cockle dredge fishery is given below.</p> <p>There is evidence to demonstrate that the partial strategy of industry led actions and statutory controls are being implemented correctly. The evidence is provided through reported catch data from independent research surveys using the same lightweight gear types that demonstrate low bycatch rates, and the high level of compliance by the shellfish fleet with spatial controls restricting their fishing opportunities within the Limfjord region, which are monitored through the vessel's 'black box'.</p> <p>In the absence of a management strategy for all non-target species, the SG100 is not met.</p>		

FINAL REPORT AND DETERMINATION

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations		
d	Guidepost			There is some evidence that the strategy is achieving its overall objective.
	Met?			N
	Justification	To date there is no evidence of a management strategy under the EU landings obligation. The absence of a management strategy or overall objective for non-target species prevents the fishery from meeting SG100 but may be revised in future if there is evidence that the fishery / species that are discarded have been included as part of a management strategy.		
References		ICES, 2014; section 3.4.2 of this report.		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.2.3 Cockles

PI 2.2.3		Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Qualitative information is available on the amount of main bycatch species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main bycatch species taken by the fishery.	Accurate and verifiable information is available on the catch of all bycatch species and the consequences for the status of affected populations.
	Met?	Y	Y	N
	Justification	Qualitative information and some quantitative information are available from the fishing industry and survey data, to describe the amount of bycatch (discarding) from the fishery, and also on the catch of all non-target species. Given there are no 'main' bycatch species from PI2.1.1, the information available is sufficient to meet the requirements at SG60 and SG80. However, there is no accurate or verifiable information available on the consequence of discarding on the status of all of the species concerned. The SG100 is not met.		
b	Guidepost	Information is adequate to broadly understand outcome status with respect to biologically based limits	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with respect to biologically based limits with a high degree of certainty.
	Met?	Y	Y	N
	Justification	Qualitative information is available on discarding from the cockle and mussel fisheries. There is also good information available on the extent of the fishery with respect to the range of the non-target species. No biologically based limits have been set with respect to the only discarded (bycatch) species reported from the Limfjord shellfish fleet, flounder. However, this has not been classed as a main species, and therefore the fishery meets both SG60 and SG80. Sufficient quantitative information is not available directly from the fishery to meet SG100 requirements.		
c	Guidepost	Information is adequate to support measures to manage bycatch.	Information is adequate to support a partial strategy to manage main bycatch species.	Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	Y	Y	N
	Justification	Information available from the annual shellfish surveys conducted by DTU-Aqua using similar gear to the shellfish fleet in Limfjord, reports on the fishery (including vessel movement and distribution of fishing activities) and observations from the fishers are deemed sufficient to support a partial		

FINAL REPORT AND DETERMINATION

PI 2.2.3		Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch		
		<p>strategy to manage bycatch species. The requirements at SG60 and SG80 are met.</p> <p>The requirements at SG100 are not met as there is no strategy in place to manage bycatch species.</p>		
d	Guidepost		Sufficient data continue to be collected to detect any increase in risk to main bycatch species (e.g., due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy).	Monitoring of bycatch data is conducted in sufficient detail to assess ongoing mortalities to all bycatch species.
	Met?		Y	N
	Justification	<p>Estimates of bycatch from the cockle fishery have been obtained from qualitative information from the fishery and some quantitative information from research surveys.</p> <p>Given the commercial cockle fishery uses a slightly larger mesh size on the upper side of the dredge (30 mm) to that used in the DTU-Aqua research surveys (25 mm), the results of ongoing research surveys are considered precautionary and sufficient to detect any increase in risk to the main bycatch species to meet SG80. No evidence is available to demonstrate information is sufficient to monitor all bycatch species to meet the requirements at SG100.</p>		
References		ICES 2014; section 3.4.2 of this report (in particular Table 6).		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.3.1 Cockles

PI 2.3.1		<p>The fishery meets national and international requirements for the protection of ETP species</p> <p>The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species</p>		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Known effects of the fishery are likely to be within limits of national and international requirements for protection of ETP species.	The effects of the fishery are known and are highly likely to be within limits of national and international requirements for protection of ETP species.	There is a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species.
	Met?	Y	Y	Y
	Justification	<p>The MSC define Endangered Threatened & Protected (ETP) species as those that are recognised by national ETP legislation and those species that are listed in Appendix 1 of the Convention on International Trade in Endangered Species (CITES) (MSC CR §CB3.11.1).</p> <p>Species within Appendix 1 of CITES have been reviewed from the CITES website (CITES, 2014). There are no species listed in this Appendix that are affected by the fishery under assessment or the fishing gear used in this fishery.</p> <p>Wild birds are protected by Danish and EC legislation. The direct and indirect impacts of the shellfish fishery in the Limfjord on wild birds are assessed every year for the Natura 2000 sites that are vital for the protection of these species. The results of the analysis conclude that dredging activities for shellfish will not adversely affect ETP species and the fishery therefore meets national and international requirements.</p> <p>The information provided about the fishery, the impact of the lightweight fishing gear and distribution and abundance of ETP species within the Limfjord provides a high degree of certainty that the effects of the fishery are within limits of national and international requirements for the protection of ETP species, meeting SG60, SG80 and also SG100.</p>		
b	Guidepost	Known direct effects are unlikely to create unacceptable impacts to ETP species.	Direct effects are highly unlikely to create unacceptable impacts to ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species.
	Met?	Y	Y	Y
	Justification	<p>The direct and indirect effects of the fishery have been assessed on an annual basis by DTU-Aqua and are described in Sla above. They provide a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species within Limfjord. The fishery meets the requirements for SG60, SG80 and SG100.</p>		
c	Guidepost		Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts.	There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species.

FINAL REPORT AND DETERMINATION

PI 2.3.1		<p>The fishery meets national and international requirements for the protection of ETP species</p> <p>The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species</p>		
	Met?		Y	Y
	Justification	<p>The Natura 2000 sites are key areas for ETP species within the Limfjord region. The assessment of indirect impacts of the fishery (e.g. competition for prey, disturbance of critical habitat) is assessed on an annual basis within the Natura 2000 sites by DTU-Aqua. The outcome from these annual assessments determines whether the fishery is permitted to operate within these areas each year.</p> <p>There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species sufficient to meet the requirements at both SG80 and SG100.</p>		
References		Canal-Vergés et al. 2014; Nielsen et al. 2014; section 3.4.3 of this report.		
OVERALL PERFORMANCE INDICATOR SCORE:				100
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.3.2 Cockles

PI 2.3.2		<p>The fishery has in place precautionary management strategies designed to:</p> <ul style="list-style-type: none"> • Meet national and international requirements; • Ensure the fishery does not pose a risk of serious harm to ETP species; • Ensure the fishery does not hinder recovery of ETP species; and • Minimise mortality of ETP species. 		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place that minimise mortality of ETP species, and are expected to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a comprehensive strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species.
	Met?	Y	Y	N
	Justification	<p>Within Europe, the EC has established a network of sites to protect key habitats and species under the Natura 2000 programme. This has been transposed into Danish legislation and implemented throughout Denmark as a series of Natura 2000 sites, which occur in Limfjord.</p> <p>The impact of the fishery on ETP species is tightly controlled through management of Natura 2000 sites to minimize mortality on these species. The EU wide Natura 2000 programme and associated national sites within Denmark has been designed to be highly likely to achieve national and international requirements for the protection of ETP species. The requirements for SG60 and SG80 are met.</p> <p>The SG100 level is not met as there is no evidence available to demonstrate that a comprehensive strategy has been in place which is designed to achieve above national and international requirements for the protection of ETP species.</p>		
b	Guidepost	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).	There is an objective basis for confidence that the strategy will work, based on information directly about the fishery and/or the species involved.	The strategy is mainly based on information directly about the fishery and/or species involved, and a quantitative analysis supports high confidence that the strategy will work.
	Met?	Y	Y	Y
	Justification	<p>An impact assessment is carried out each year with Natura 2000 sites by DTU-Aqua and includes an analysis of the direct and indirect impacts of the shellfish fishery on ETP bird species within the Limfjord.</p> <p>The management strategy is based on information directly about the fishery and ETP species affected, and is based on the precautionary approach.</p>		

FINAL REPORT AND DETERMINATION

PI 2.3.2		<p>The fishery has in place precautionary management strategies designed to:</p> <ul style="list-style-type: none"> • Meet national and international requirements; • Ensure the fishery does not pose a risk of serious harm to ETP species; • Ensure the fishery does not hinder recovery of ETP species; and • Minimise mortality of ETP species. 		
		<p>Quantitative analysis within the impact assessments has been used to determine that the mussel fishery should not take place within certain Natura 2000 sites (cockle fishing has not been assessed as this takes place outside Natura 2000 sites). This quantitative analysis supports a high confidence that the strategy will work, meeting the requirements for SG60, SG80 and SG100.</p>		
c	Guidepost		There is evidence that the strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	Y
	Justification	<p>There is clear evidence from the results of the annual impact assessments conducted within the Natura 2000 sites by DTU-Aqua that the management strategy is being implemented successfully to meet both SG80 and SG100.</p>		
d	Guidepost			There is evidence that the strategy is achieving its objective.
	Met?			Y
	Justification	<p>The annual review of fishing impacts and the conservation status of ETP species within the Natura 2000 sites demonstrate that the strategy is achieving its objective to meet SG100.</p>		
References		<p>EC Directive 92/43/EC (the "Habitats Directive"); Canal-Vergés et al, 2014; Nielsen et al. 2014; section 3.4.3 of this report.</p>		
OVERALL PERFORMANCE INDICATOR SCORE:				95
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.3.3 Cockles

PI 2.3.3		<p>Relevant information is collected to support the management of fishery impacts on ETP species, including:</p> <ul style="list-style-type: none"> • Information for the development of the management strategy; • Information to assess the effectiveness of the management strategy; and • Information to determine the outcome status of ETP species. 		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Information is sufficient to qualitatively estimate the fishery related mortality of ETP species.	Sufficient information is available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species.	Information is sufficient to quantitatively estimate outcome status of ETP species with a high degree of certainty.
	Met?	Y	Y	Y
	Justification	The potential impacts of the mussel fishery on ETP species within Natura 2000 sites are monitored regularly through annual impact assessments and the results considered by DTU-Aqua to be sufficient to allow the outcome status to be determined with a high degree of certainty, meeting the SG60, SG80 and SG100 requirements.		
b	Guidepost	Information is adequate to broadly understand the impact of the fishery on ETP species.	Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species.	Accurate and verifiable information is available on the magnitude of all impacts, mortalities and injuries and the consequences for the status of ETP species.
	Met?	Y	Y	N
	Justification	There is sufficient information available from studies of the fishery and fishing gear and the monitoring of ETP species within the Limfjord to determine that the fishery is not a threat to the protection or recovery of ETP species. This meets the SG60 and 80 requirements, but in the absence of information about all impacts, the SG100 requirements are not met.		
c	Guidepost	Information is adequate to support measures to manage the impacts on ETP species.	Information is sufficient to measure trends and support a full strategy to manage impacts on ETP species.	Information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives.
	Met?	Y	Y	N
	Justification	The information available is sufficient to measure trends in ETP species abundance. Annual monitoring of national Natura 2000 sites occurs, including impact assessments, to ensure the success of measures put in place to protect ETP species and habitats and support the overall management objectives of the Natura 2000 programme at an EU level.		

FINAL REPORT AND DETERMINATION

PI 2.3.3		Relevant information is collected to support the management of fishery impacts on ETP species, including: <ul style="list-style-type: none">• Information for the development of the management strategy;• Information to assess the effectiveness of the management strategy; and• Information to determine the outcome status of ETP species.
		There is sufficient evidence to meet the requirements at both SG60 and SG80. There is no evidence to demonstrate that the information and monitoring at a national level is adequate to support a comprehensive EU-wide strategy to meet SG100.
References		Canal-Vergés et al. 2014; Nielsen et al. 2014; section 3.4.3 of this report.
OVERALL PERFORMANCE INDICATOR SCORE:		85
CONDITION NUMBER (if relevant):		NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.4.1 Cockles

PI 2.4.1		The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	The fishery is unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	There is evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.
	Met?	Y	Y	N
	Justification	<p>Historically, concerns have been raised over the impact of shellfish dredging within the Limfjord and elsewhere in Denmark. The main issue has been that the use of dredges over time will result in the disturbance and removal of cobbles and boulders on the seabed; and that in areas where there may be a lack of rocky benthic substrata for marine species to colonise, the loss of cobble and boulder habitat areas could result in changes to seabed habitat structure.</p> <p>In 2009, Danmarks Naturfredningsforening (the Danish Society for Nature Conservation, DN) issued a complaint about their concerns to the European Union. In particular, DN considered that dredging for mussels within Natura 2000 sites is inappropriate because of the effect that it will have on seabed habitats in these areas. These concerns have been evaluated at the EU level, and following changes in the approach to shellfish dredging (e.g. lightweight gear, non-retention of large stones, and spatial restrictions) it has been concluded that the impacts within Natura 2000 sites in Denmark is now acceptable.</p> <p>The effects of dredging on seabed habitats within the Løgstør Bredning and Lovns Bredning Natura 2000 sites have been independently assessed for the Danish Government by DTU-Aqua, who has advised that there will be no significant adverse effect on the marine habitats in these areas providing that certain management measures are implemented. These measures include prohibition of fishing in waters shallower than 5 m (or 6 m in the vicinity of eelgrass beds), a restriction on the quantity of mussels that can be fished from the sites (controlled through TACs) and restrictions on the gear that can be used.</p> <p>In addition to understanding the effects of dredging on the marine habitat, DTU-Aqua has assessed the cumulative impacts of shellfish dredging on vulnerable habitats. This has been based on the proportion of known habitats fished on in recent years and the known recovery times of each habitat.</p> <p>For each of the habitats within the Natura 2000 sites, fishing is only permissible if the cumulative impact (by area) is 15% or less. To date, the highest level of fishing in both Løgstør Bredning and Lovns Bredning Natura 2000 sites proposed for 2014-15 (i.e. 15,000t) would cover less than 1% of each site and would result in a cumulative impact on habitats of less than 10%, with no dredging at all permitted within eelgrass beds.</p> <p>Following the trials conducted in 2009, a new lightweight dredge is now used in the Limfjord shellfish fishery. The new gear is now lighter in weight, and thus does less damage to the seabed whilst requiring less fuel to tow, and also narrower (weight of new dredges must not exceed 50 kg and 1.8 m long and 1.5 m wide).</p> <p>Concerns have been raised about the potential effect of the fishery on</p>		

FINAL REPORT AND DETERMINATION

PI 2.4.1		The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function
		<p>eelgrass and macroalgae growing on the seabed in Limfjord, which are vulnerable to the effects of dredging. In response to these concerns, the Danish Government has introduced depth restrictions on dredging activity. These restrictions are based upon water turbidity and the maximum depth that marine plants at which they are able to grow. In the Limfjord Natura 2000 sites, mussel dredging is prohibited in waters shallower than 5 m in all areas and in waters shallower than 6 m in the vicinity of eelgrass beds (the distribution of eelgrass beds in the Limfjord is shown in Figure 19 and the extent of restrictions on dredging are shown in Figure 20). No dredging is permitted in the eelgrass beds throughout the Limfjord.</p> <p>In addition to concerns over macroalgae and eelgrass, additional concerns have been raised over the removal of large boulders and cobbles from the seabed, all shellfish dredgers are now required to report all landings of stones from Natura 2000 sites and to return stones heavier than 2 kg immediately after capture. Records demonstrate that 1.2 tonnes of stones were removed from the Løgstør Bredning Natura 2000 site during 2013-14. No stones were reported to be removed from the Lovns Bredning site during 2013-14 (the historical range for this site is between 0 and 2.3t).</p> <p>Although benthic impacts of mussel dredging have been studied in some detail, the effect of these same dredges on benthic habitats when dredging for cockles has not been studied in the Limfjord. Generic studies of the impacts of fishing gear on marine habitats indicate that it is highly likely that the impacts of this gear on seabed habitats favoured by cockles (sand and muddy sand areas) would be less than on the areas favoured by mussels (which may contain stones and shells that are more vulnerable to physical impacts). The cockle fishery is therefore likely to have a lesser benthic impact than the mussel fishery, but there is no evidence to confirm this.</p> <p>The management measures in place, the limited extent of cockle dredging relative to the marine habitats in the Unit of Certification area, and generic information about impacts of fisheries on different benthic habitats indicate that the fishery is highly unlikely to affect benthic habitats that occur in the unit of certification areas to the extent that there would be serious or irreversible harm to them on the regional or bioregional basis. The fishery therefore meets the SG80 standard. The SG 100 standard is not met because (unlike the mussel fishery) there is no direct evidence from the fishery about the effect of the dredges on the marine habitats inhabited by cockles.</p>
References		Section 3.4.4 of this report; EC Directive 92/43/EC; Poulsen, 2009; Nielsen et al. 2014; Canal-Vergés et al. 2014.
OVERALL PERFORMANCE INDICATOR SCORE:		80
CONDITION NUMBER (if relevant):		NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.4.2 Cockles

PI 2.4.2		There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a strategy in place for managing the impact of the fishery on habitat types.
	Met?	Y	Y	Y
	Justification	<p>There is a strategy in place for managing the impact of the fishery on habitat types, as set out in EC legislation under the Habitats and Birds Directives. These Directives have established the Natura 2000 programme that has been transposed into Danish legislation. The strategy is based upon information about the natural habitats in the area, and its implementation takes account of the potential effect of fishing activity on those habitats. In Denmark, the strategy has been implemented through a number of Natura 2000 sites in Limfjord and other key habitats in Denmark.</p> <p>In addition to the Natura 2000 sites, potentially sensitive marine plant (eelgrass and macroalgal) habitats have been protected from fishing activities outside these sites, by introducing statutory controls on fishing areas and depth.</p> <p>The strategy in place meets the requirements of SG60, SG80 and SG100.</p>		
b	Guidepost	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/habitats).	There is some objective basis for confidence that the partial strategy will work, based on information directly about the fishery and/or habitats involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or habitats involved.
	Met?	Y	Y	N
	Justification	<p>The Danish government conducts an annual impact assessment (IA) within both Natura 2000 sites, which includes the impact of fishing activities within the area.</p> <p>Qualitative information obtained from local fishers helps to confirm they avoid sensitive habitats during fishing operations throughout the Limfjord, and coupled with the Natura 2000 impact assessment documents, provide an objective basis that the partial strategy will work. This evidence is sufficient to meet the requirements at SG60 and SG80.</p> <p>There is no evidence of testing of the management measures in cockle fishing areas, so SG100 is not met.</p>		
c	Guidepost		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.

FINAL REPORT AND DETERMINATION

PI 2.4.2		There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types		
	Met?		Y	Y
	Justification	<p>There is clear evidence available to demonstrate that both EC and Danish legislation for habitat protection is being implemented successfully. All shellfish dredging activities from the fleet under this unit of certification are carefully monitored and controlled to ensure that any habitat impacts are within acceptable limits set by national and international legislation.</p> <p>There is clear evidence that the fishery is in good compliance with the control measures imposed to protect natural habitats (i.e. annual TAC, gear type restrictions, spatial and depth restrictions on fishing activity to protect sensitive habitats).</p> <p>This evidence meets both the SG80 and SG100 requirements.</p>		
	Guidepost			There is some evidence that the strategy is achieving its objective.
d	Met?			N
	Justification	<p>While there is evidence available to demonstrate that the management of the Natura 2000 sites is achieving its objects, and that habitats in regions of the Limfjord (eelgrass and macroalgae beds) are being well maintained, there is no clear evidence that the cockle fishery is achieving its strategic objectives. The SG100 requirements are not therefore met.</p>		
References		Section 3.4.4 of this report; EC Directive 92/43/EC; EC Directive 2009/147/EC; Poulsen, 2009; Nielsen et al. 2014; Canal-Vergés et al. 2014.		
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.4.3 Cockles

PI 2.4.3		Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There is basic understanding of the types and distribution of main habitats in the area of the fishery.	The nature, distribution and vulnerability of all main habitat types in the fishery are known at a level of detail relevant to the scale and intensity of the fishery.	The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types.
	Met?	Y	Y	Y
	Justification	<p>The distribution of habitats within the Limfjord is known over their range, and the distribution of vulnerable biotopes is known at the EU (bioregional) level.</p> <p>Within Limfjord, particular attention is paid to detailed distribution of vulnerable habitats (e.g. eelgrass and marcoalgal beds). These areas have been carefully mapped such that specific areas have been designated within Natura 2000 sites to protect specific vulnerable habitat types.</p> <p>The combination of knowledge of habitat distributions at the bioregional and local level meets the SG60, 80 and 100 requirements</p>		
b	Guidepost	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear.	Sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified and there is reliable information on the spatial extent of interaction, and the timing and location of use of the fishing gear.	The physical impacts of the gear on the habitat types have been quantified fully.
	Met?	Y	Y	N
	Justification	<p>Data are collection from annual research surveys provides good information about the nature of the impacts of the shellfish dredge fishery on habitats and the distribution and location of habitat types. This information is used to inform a precautionary management approach that limits the maximum permissible cumulative impact on habitat area (to 0% in the case of eelgrass beds, and to a limit of 15% for other habitats).</p> <p>The spatial location and timing of each vessel within the shellfish fleet is monitored and recorded through individual 'black boxes' which provide reliable information. This evidence is sufficient to meet the requirements for SG60 and SG80.</p> <p>Although the fishing gear used in the mussel and cockle dredge fisheries has been studied, its impacts on habitat types have not been fully quantified. The fishery does meet SG100.</p>		
c	Guidepost		Sufficient data continue to be collected to detect any increase in risk to habitat (e.g. due	Changes in habitat distributions over time are measured.

FINAL REPORT AND DETERMINATION

PI 2.4.3		Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types		
			to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	
	Met?		Y	Y
	Justification	<p>Data continue to be collected and recorded on a regular basis through the 'black box' recorded fitted to each fishing vessel in the UoC. This provides detail GPS information about the location and movements of the fleet and provides clear evidence where fishing activities occur. These data enable the spatial extent and cumulative impact of fishing on habitats to be monitored continuously. The individual vessel tracking device enables any increase in risk to habitat to be identified for the vessels within the UoC.</p> <p>Information presented within impact assessments demonstrates clearly how changes in the extent of key habitats are measured; eelgrass beds are monitored throughout the UoC, while all habitats are monitored within Natura 2000 sites.</p> <p>The monitoring systems put in place are sufficient to meet the SG100 requirements.</p>		
References		Section 3.4.4 of this report; Figure 15; Figure 19; Nielsen et al. 2014; Canal-Vergés et al. 2014.		
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.5.1 Cockles

PI 2.5.1		The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	The fishery is unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is evidence that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Y	Y	Partial
	Justification	<p>Fishing activity concentrates in areas where mussels and cockles are of high density and quality, found using underwater video and sonar equipment. This limits the area of fishing to very specific locations and not widely distributed across the entire certification area. Thus, over the long term, dredging will not affect the entire area in Limfjord. A small proportion (less than 2% by area) of the whole unit of certification area is affected annually by shellfish dredging.</p> <p>The exploitation of mussels is deemed very low in comparison to the productivity of the stock. The results of the PSA analysis indicate that the cockle stock is similarly robust. Key habitat areas (notably eelgrass beds) are protected from any dredging activity by depth restrictions, and other potentially sensitive areas are closed to dredging altogether.</p> <p>Research survey data and simulation modelling of eelgrass (<i>Zostera</i> spp.) and counts of bird numbers provides evidence that the fishery is highly unlikely to cause serious or irreversible disruption to the ecosystem. The management and modelling of the Natura 2000 sites ensures that there is a surplus of mussels in the ecosystem in these areas, to meet the energy requirements of shellfish eating birds.</p> <p>There is evidence to show that there is a low risk of harm from the removal of stones using the new lightweight mussel dredges in the Limfjord, which all vessel are required to use. The removal of empty shells during fishing activities are sorted during processing and re-deposited on the seabed. Research has demonstrated that the fishery does not affect the abundance of empty shells, which are an important micro-habitat for the colonisation by mussels and other epibenthos.</p> <p>Dredging has the potential to release nutrients from the seabed, causing nutrient remobilisation in the Limfjord. Research provides evidence that a temporary and localised increase in nutrient concentrations in the water after dredging, but these effects are very small (less than 1% of the nutrient loading to the Limfjord from land and atmospheric sources).</p> <p>There is some evidence, although this is not comprehensive, that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. The SG60 and 80 requirements are fully met, and the availability of evidence partially meets the SG100 requirements.</p>		
References		Section 3.4 of this report; Nielsen et al. 2014; Canal-Vergés et al. 2014, Dyekjær et al. 1995, Riemann and Hoffmann 1991, Holmer et al. 2003		
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.5.2 Cockles

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place, if necessary.	There is a partial strategy in place, if necessary.	There is a strategy that consists of a plan, in place.
	Met?	Y	Y	N
	Justification	<p>Within the Limfjord region, there is a strategy in place to ensure the fishery does not pose a risk of serious risk or irreversible harm in the form of the network of Natura 2000 sites. On a broader scale, a partial strategy exists to protect elements of the ecosystem through a number of statutory controls.</p> <p>Within Natura 2000 sites, a clear strategy is in place to manage ecosystem impacts and the management measures that restrict or prohibit dredging activity within them in order to protect marine habitats and birds. Measures are in place such as the depth restrictions on dredging activity that are implemented to protect eelgrass, and other restrictions to minimise the capture of boulders and stones in dredges.</p> <p>Outside Natura 2000 sites, there are a range of measures in place in the form of statutory restrictions on the spatial extent of dredging activity, the number of vessels that are permitted to work in the UoC, and the TAC limits imposed on vessels, as well as the constraints on fishing gear specification, which ensures that the fishery does not pose a risk of irreversible harm to the ecosystem. This partial strategy meets the SG60 and 80 requirements for the whole UoC.</p> <p>Although the SG100 requirements are met by the management approach applied to the Natura 2000 sites, these represent just part of the UoC area. A score of 80 is therefore appropriate.</p>		
b	Guidepost	The measures take into account potential impacts of the fishery on key elements of the ecosystem.	The partial strategy takes into account available information and is expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	<p>The strategy, which consists of a plan, contains measures to address all main impacts of the fishery on the ecosystem, and at least some of these measures are in place. The plan and measures are based on well-understood functional relationships between the fishery and the Components and elements of the ecosystem.</p> <p>This plan provides for development of a full strategy that restrains impacts on the ecosystem to ensure the fishery does not cause serious or irreversible harm.</p>

FINAL REPORT AND DETERMINATION

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
	Met?	Y	Y	N
	Justification	<p>Within the Limfjord area, including Natura 2000 sites, the partial strategy in place for the fishery ensures that fishing effort, location and intensity of fishing activity is managed to restrain impacts on the ecosystem.</p> <p>This partial strategy uses all available information about the location and sensitivity of ecosystem components to fishing activity, and is part of an adaptive management regime for the fishery that responds to changes in stock size, ecosystem information, and new information about the fishery.</p> <p>The available evidence is sufficient to meet the requirements at SG60 and SG80. However, in the absence of a plan for the whole UoC, the SG100 requirements cannot be met.</p>		
c	Guidepost	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The partial strategy is considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The measures are considered likely to work based on prior experience, plausible argument or information directly from the fishery/ecosystems involved.
	Met?	Y	Y	N
	Justification	<p>The partial strategy is considered likely to work based on evidence from annual impact assessments of mussel fishing impacts and ecosystem monitoring within Natura 2000 sites over the past 6 years.</p> <p>Although the extent of habitats and monitoring of ecosystem impacts are monitored less closely in the wider Limfjord, and the benthic impacts of the mussel dredges on cockle habitats in the Limfjord have not been studied directly, there is a plausible argument (based on the evidence from the Natura 2000 sites, generic studies and the very limited spatial extent of cockle dredging) that the partial strategy and measures in place for this fishery and the Limfjord ecosystem are likely to work.</p> <p>The available evidence is deemed sufficient to meet the requirement at SG60 and SG80. SG100 is not currently met.</p>		
d	Guidepost		There is some evidence that the measures comprising the partial strategy are being implemented successfully.	There is evidence that the measures are being implemented successfully.
	Met?		Y	Y
	Justification	<p>Evidence of a good level of compliance with the management measures in place is available from monitoring the activities of the fishing fleet using the 'black box' recorders. In addition, the entire shellfish fleet has adopted the new lightweight dredge, which is now part of the fishing licence condition.</p> <p>Detailed monitoring of the Natura 2000 sites provides evidence that the management measures in place for the fishery within these areas are working successfully as well.</p> <p>The supporting evidence shows that the requirements for both SG80 and 100 are met.</p>		

FINAL REPORT AND DETERMINATION

PI 2.5.2	There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function	
References	Section 3.4 of this report; Nielsen et al. 2014; Canal-Vergés et al. 2014; Dolmer et al, 2009.	
OVERALL PERFORMANCE INDICATOR SCORE:		85
CONDITION NUMBER (if relevant):		NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 2.5.3 Cockles

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Information is adequate to identify the key elements of the ecosystem (e.g., trophic structure and function, community composition, productivity pattern and biodiversity).	Information is adequate to broadly understand the key elements of the ecosystem.	
	Met?	Y	Y	
	Justification	<p>Research information is available to identify the key elements of the ecosystem, such as the distribution and character of seabed habitats, and the role of mussels in the trophic function of the Limfjord.</p> <p>Information is available to enable the key elements of the ecosystem and potential interactions with the mussel fishery to be understood, including the effect of shellfish dredging on seabed habitats and the food requirements of shellfish-eating birds within Natura 2000 sites.</p> <p>The SG60 and 80 requirements are therefore met.</p>		
b	Guidepost	Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, and have not been investigated in detail.	Main impacts of the fishery on these key ecosystem elements can be inferred from existing information and some have been investigated in detail.	Main interactions between the fishery and these ecosystem elements can be inferred from existing information, and have been investigated in detail.
	Met?	Y	Y	N
	Justification	<p>Information is available on the potential impact of the fishery on ecosystem elements such as non-target species, marine habitats, and shellfish-eating birds in the ecosystem have been investigated in detail. In addition, the main ecosystem impacts on marine habitats and shellfish eating birds have been investigated in the UoC area.</p> <p>The supporting evidence is sufficient to meet the requirements at SG60 and SG80 but the level of investigation in the fishery does not meet SG100.</p>		
c	Guidepost		The main functions of the Components (i.e., target, Bycatch, Retained and ETP species and Habitats) in the ecosystem are known.	The impacts of the fishery on target, Bycatch, Retained and ETP species are identified and the main functions of these Components in the ecosystem are understood.
	Met?		Y	N
	Justification	<p>The impacts of the fishery on target, non-target and ETP species and habitats are understood and are subject to ongoing and continuous monitoring.</p> <p>The main functions of all of these components in the ecosystem are known, and some (such as the interaction between birds and shellfish) have been</p>		

FINAL REPORT AND DETERMINATION

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
		modelled and are understood. The SG80 requirements are therefore fully met. The information about the impacts of the fishery and the functions of all ecosystem components is not sufficiently detailed or comprehensive to meet the SG100 requirements.		
d	Guidepost		Sufficient information is available on the impacts of the fishery on these Components to allow some of the main consequences for the ecosystem to be inferred.	Sufficient information is available on the impacts of the fishery on the Components and elements to allow the main consequences for the ecosystem to be inferred.
	Met?		Y	N
	Justification	<p>Sufficient information is available on the components and elements of the ecosystem to allow the main consequences for some of these components to be inferred and the effect of the fishery on overall ecosystem function to be understood. All of the available information indicates that under the current management regime the fishery has very little impact on ecosystem components, elements and function.</p> <p>The information available is sufficient to meet the SG80 requirements because some of the main consequences for the ecosystem can be inferred. The information available is not sufficiently detailed or comprehensive to meet the SG100 requirements.</p>		
e	Guidepost		Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	Information is sufficient to support the development of strategies to manage ecosystem impacts.
	Met?		Y	N
	Justification	<p>All fishing activity in the Limfjord is monitored continuously using “black box” recorders fitted to every vessel. This information is capable of detecting any change in risk level, and has also been used to develop strategies to manage ecosystem impacts (e.g. through the depth restrictions in place to protect eelgrass, and the measures in place to ensure that adequate shellfish stocks are reserved for birds).</p> <p>Information about the fishery and its effects on ecosystem components and elements is assessed annually for Natura 2000 sites. This includes independent research cumulating in an impact assessment for Natura 2000 sites. This information is sufficient to meet SG80. In comparison to the Natura 2000 sites, less detailed information is collected on ecosystem impacts in the wider Limfjord region, and is not deemed sufficient to meet the requirements for SG100.</p>		
References		Section 3.4 of this report; Nielsen et al. 2014; Canal-Vergés et al. 2014;		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Principle 3 Evaluation Tables

Evaluation Table for PI 3.1.1 (applies to both UoCs)

PI 3.1.1		<p>The management system exists within an appropriate legal and/or customary framework which ensures that it:</p> <p>Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and</p> <p>Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and</p> <p>Incorporates an appropriate dispute resolution framework.</p>		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There is an effective national legal system and a framework for <u>cooperation</u> with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and <u>organised and effective cooperation</u> with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and <u>binding procedures governing cooperation with other parties</u> which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	Y	Y	Y
	Justification	<p>As the area of fishery is entirely within Denmark's territorial waters, the Limfjord mussel and cockle fishery is managed under a single jurisdiction: Danish national law. There is therefore no need for cooperation with other Coastal States or internationally recognised parties.</p> <p>As a member of the European Union, Denmark is bound by the requirements set out in the EU's Common Fisheries Policy (CFP). The CFP creates binding legal requirements on EU member states for the pursuit and achievement of sustainable fisheries consistent with MSC's Principles 1 and 2. Denmark also adheres to the EU's Habitats, Birds and Water Framework Directives which complement fisheries management in relation to Natura 2000 nature conservation sites and other ecosystem components of importance to the fishery.</p> <p>Denmark manages fisheries through its Fisheries Act, 2005 as amended in 2006, which creates binding procedures via the Advisory Committee for Mussel Production, governing cooperation with shellfish stakeholder organisations to deliver management outcomes.</p> <p>The Danish Nature Protection Act, 1992 and Planning Act, 2007, national fisheries management legislation and the overarching CFP and EU Directives combine to create an effective national system and binding procedures governing cooperation with other parties which deliver management outcomes consistent with MSC Principles 1 and 2.</p>		
b	Guidepost	The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a <u>transparent mechanism</u> for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the	The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective.

FINAL REPORT AND DETERMINATION

PI 3.1.1		<p>The management system exists within an appropriate legal and/or customary framework which ensures that it:</p> <p>Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and</p> <p>Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and</p> <p>Incorporates an appropriate dispute resolution framework.</p>		
			context of the fishery.	
	Met?	Y	Y	Y
	Justification	<p>Section 19 of the Fisheries Act, 2006 incorporates transparent mechanisms for resolution of appeals and complaints (i.e., disputes) about fisheries management decisions made by delegated authorities and/or the Fisheries Minister.</p> <p>The EU also has transparent dispute mechanisms relevant to this fishery, as evidenced by the Danish Nature Conservation Society (DN) lodging a complaint about the impact of mussel dredging in Natura 2000 sites to the European Parliament Committee on Petitions. The Committee referred the complaint to the European Commission for assessment. Following consideration and a review of Denmark's impact assessment and management procedures, the complaint was resolved.</p> <p>Therefore, the management system incorporates and is subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery, and has been tested and proven to be effective.</p>		
d	Guidepost	The management system has a mechanism to generally respect the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	Y	Y	Y
	Justification	<p>Commercial fishers depend on this fishery for their livelihoods. The management system has mechanisms to allocate a limited number of licenses to eligible fishers with a history of shellfish fishing in the Limfjord. Overarching and site-specific quota allocations are equally shared among license holders, and spatial and temporal controls are self-managed equitably by the members of the Limfjord mussel fishers association, CF.</p> <p>The management system demonstrates that it has mechanisms to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for their livelihoods in a manner that is consistent with the objectives of MSC Principles 1 and 2.</p>		
References		CF, 2015; FA, 2006; MFLF, 2013; NPA, 1992; OJ, 1992; OJ, 2000; OJ, 2010; OJ, 2013; PA, 2007; Brand <i>et al</i> , 2015		
OVERALL PERFORMANCE INDICATOR SCORE:				100
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 3.1.2

PI 3.1.2		<p>The management system has effective consultation processes that are open to interested and affected parties.</p> <p>The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties</p>		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.
	Met?	Y	Y	Y
	Justification	<p>Management processes for the cockle and mussel fishery are straightforward and explicitly defined in the Fisheries Act, 2006.</p> <p>Shellfish management in Denmark is under the competence of the Ministry for Food, Agriculture and Fisheries (Ministeriet for Fødevarer, Landbrug og Fiskeri). Within this Ministry, the NaturErhvervstyrelsen (the AgriFish Agency) is responsible for the management of fisheries in Denmark. Fisheries management decisions are made by the Fisheries Director after formal environmental impact assessment and stock status advice is sought, and after consideration of that advice, as well as relevant recommendations and opinions from the legislatively mandated consultative body.</p> <p>The Danish Technical University Aquatic Sciences department (Danmarks Tekniske Universitet – Aqua, abbreviated to DTU-Aqua) provides environmental impact assessment and scientific advice about stock status.</p> <p>The key consultative body for Danish shellfisheries is the Advisory Committee on mussel production. This Committee is established by the Fisheries Act 2006 with the aim of promoting the sustainable management of the mussel fisheries in Denmark. Members are drawn from the fishing and shellfish processing industries, the government agencies, DTU-Aqua, key environmental groups, local government and consumer groups.</p> <p>Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.</p>		
b	Guidepost	The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not

FINAL REPORT AND DETERMINATION

PI 3.1.2		<p>The management system has effective consultation processes that are open to interested and affected parties.</p> <p>The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties</p>		
				used.
	Met?	Y	Y	Y
	Justification	<p>An integral component of the management system for this fishery is the Advisory Committee on mussel production (which has a remit that includes cockle, oyster and clam fisheries). This Committee provides a mechanism for wide stakeholder consultation and involvement in the management of the Danish shellfisheries and ensures that all relevant information, including local knowledge (from both fisheries representatives and other stakeholders) informs management of the fishery.</p> <p>The minutes of the Committee provide evidence that they regularly seek and accept relevant information that has been considered. Following decisions by the Fisheries Director, the Advisory Committee and the fishers' association, CF are provided with written advice explaining the reasons (or not) for decisions.</p> <p>For the Natura 2000 sites within the fishery there is a further level of consultation about management, with the industry being invited to propose the level of fishing activity, and this then being subject to impact assessment before a management decision is taken, which further demonstrates how local knowledge and assessment recommendations have been considered.</p> <p>The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used.</p>		
c	Guidepost		The consultation process provides opportunity for all interested and affected parties to be involved.	The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.
	Met?		Y	Y
	Justification	As has already been demonstrated, the consultation process, via the legally mandated Advisory Committee, provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.		
References		Brand <i>et al</i> , 2015; CF, 2015; FA, 2006; MFLF, 2013; pers. comm. Anja Gadegaard Boye (NaturErhvervstyrelsen)		
OVERALL PERFORMANCE INDICATOR SCORE:				100
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 3.1.3

PI 3.1.3		The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Long-term objectives to guide decision-making, consistent with the MSC Principles and Criteria and the precautionary approach, are implicit within management policy	Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach are explicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are explicit within and required by management policy.
	Met?	Y	Y	Partial
	Justification	<p>As a member of the EU, the Danish government is required to ensure that the management of all fisheries resources is consistent with the requirements of the CFP. The objectives of the CFP are described in Section 3.5.1 of this report and are demonstrably consistent with MSC Principles and Criteria, as well as the precautionary approach.</p> <p>Long-term objectives for managing Danish fisheries are set out in Section s6a of the Fisheries Act, 2006, and are established in the context of the clear and explicit terms of reference for the Advisory Committee for mussel production (described in detail in Section 3.5.1 of this report).</p> <p>Complementing these objectives are the requirements laid out in national legislation under Denmark's Nature Protection Act, 1992 and the Planning Act, 2007 which create the legal framework for implementing the EU's Habitats, Birds, Water Framework Directive and, if not covered by the Water Framework Directive, the Marine Strategy Framework Directive, for achieving 'good ecological status' and 'good chemical status'.</p> <p>The combination of national and EU-level legislation set out clear and explicit long-term objectives that guide decision-making that are consistent with MSC Principles and Criteria. While the CFP is explicit about the precautionary approach, there is no evidence that the national management policy requires such explicit consideration of the precautionary in its objectives for fisheries management.</p>		
References		Brand <i>et al</i> , 2015; FA, 2006; NPA, 1992; OJ, 2000; OJ, 2008; OJ, 2013; PA, 2007.		
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 3.1.4

PI		The management system provides economic and social incentives for sustainable fishing and does not operate with subsidies that contribute to unsustainable fishing		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and seeks to ensure that perverse incentives do not arise.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and explicitly considers incentives in a regular review of management policy or procedures to ensure they do not contribute to unsustainable fishing practices.
	Met?	Y	Y	Partial
	Justification	<p>The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2.</p> <p>In accordance with explicit MSC guidance on this PI, positive incentives are provided by system attributes that tend to incentivise fishers to fish sustainably:</p> <ul style="list-style-type: none"> the system, through its legislatively mandated consultative and scientific process, provides for reducing information gaps and uncertainties for fishers; the system provides for strategic and statutory management planning to give certainty about the rules and goals of management; the system provides mechanisms and opportunities to gain support for the management system from fishers, and enables collective action while pursuing individual choice – as evidenced by the fishers association's (CF) attitude and active approach to equitably sharing access and quota amongst members, and investing in the long-term viability of their fishery with a dedicated fishing vessel engaged in re-laying and monitoring activities in support of the health of the fishery; the system provides for a legislatively mandated participatory approach and clear roles and responsibilities that engender a sense of stewardship in the long-term sustainability of the fishery; the system provides for rights of exclusion – a limit on the number of licenses and only granting licenses to those with a history of fishing in Limfjord. <p>There is also a well-documented customary approach adopted by the fishers demonstrating the social beliefs around responsible behaviour and evidenced through the actions and decisions of the CF (the fishers' association): for example, adopting more precautionary measures than the science and managing authorities suggest, like consistently lower TACs and not opening mussel grounds to fishing by virtue of not seeking hygiene samples from identified juvenile mussel reefs (mussels may not be sold without passing a hygiene inspection).</p> <p>The system has no direct subsidies, or subsidies or incentives that could be</p>		

FINAL REPORT AND DETERMINATION

PI		The management system provides economic and social incentives for sustainable fishing and does not operate with subsidies that contribute to unsustainable fishing	
		said to contribute to unsustainable fishing. There is no evidence of explicit consideration of incentives in a regular review of management policy to ensure they do not contribute to unsustainable fishing practices.	
References		Brand <i>et al</i> , 2015; CF, 2015; FA, 2006; MFLF, 2013; MSC, 2012.	
OVERALL PERFORMANCE INDICATOR SCORE:			
			90
CONDITION NUMBER (if relevant):			
			NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 3.2.1

PI 3.2.1		The fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are implicit within the fishery's management system	Short and long-term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.	Well-defined and measurable short and long-term objectives, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.
	Met?	Y	Y	Partial
	Justification	<p>The long-term objectives set out by the EU's CFP and the Danish Fisheries Act for mussel fisheries nationally are applicable at the local level to this fishery. As are the objectives of the Nature Protection and Planning Acts that serve to protect aquatic, wildlife and water quality within the Natura 2000 sites (thereby giving effect to the EU Habitats, Birds and Water Framework Directives and, if not covered by the Water Framework Directive, the Marine Strategy Framework Directive).</p> <p>The Mussel Policy of 2013 translates those objectives further to more fishery specific objectives and evidence of their local application can be seen in the suite of harvest controls that have been established in the Limfjord fishery to deliver sustainable development of mussels and cockles and appropriate protection of the two specific Natura 2000 sites within the area of the fishery.</p> <p>However, as the short and long-term objectives are more explicitly defined and measurable in relation to fishing in the Natura 2000 sites, and not as well-defined across the remaining area of the Limfjord, the fishery only partially meets the requirements of SG100.</p>		
References		Brand <i>et al</i> , 2015; FA, 2006; MFLF, 2013; NPA, 1992; OJ, 2000; OJ, 2008; OJ, 2013; PA, 2007.		
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 3.2.2

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are some decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	Y	Y	
	Justification	The key decision-making processes that result in measures and strategies to achieve the fishery-specific objectives are those established by the Fisheries Act, 2006 that set out the remit of the Advisory Committee on mussel production (which also covers management of all bivalve fisheries including cockles and oysters) and the delegated decision-making powers of the AgriFish Agency and the relevant Minister.		
b	Guidepost	Decision-making processes respond to serious issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	Y	Y	N
	Justification	<p>Explanations of the recommendations of the Advisory Committee on mussel production are published as minutes on the NaturErhvervstyrelsen (AgriFish Agency) website (http://naturerhverv.dk/fiskeri/erhvervsfiskeri/muslinger-og-oesters/muslingeudvalget/) along with supporting information that was taken into account when decisions were made.</p> <p>The minutes demonstrate that the Committee is able to respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation in a transparent, timely and adaptive manner.</p> <p>There is no evidence that all issues are taken into account, nor that the wider implications of decisions are considered.</p>		
c	Guidepost		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		Y	
	Justification	The management system for the fishery is precautionary: dredging for		

FINAL REPORT AND DETERMINATION

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.		
		cockles and mussels is not permitted in waters shallower than 3m throughout the entire Limfjord, leaving a large stock of both species and significant areas of the fishery unfished. Within the Natura 2000 sites there is a highly precautionary approach to decision-making that ensures there is an excess supply of prey for shellfish-eating birds and that the cumulative impacts of fishing on marine habitats do not exceed 15%. Decisions on all aspects of the fishery, from the determination of closed areas to the setting of TACs and specification of fishing gear use the best available information supplied by DTU-Aqua.		
d	Guidepost	Some information on fishery performance and management action is generally available on request to stakeholders.	Information on fishery performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders provides comprehensive information on fishery performance and management actions and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Y	Y	Y
	Justification	<p>Information about fishery performance (landings of shellfish for each production area) are available on the NaturErhvervstyrelsen website for all fishing years since 2001, including the current fishing year. A summary of fishing activity throughout the Limfjord is provided in the annual impact assessment reports on the Natura 2000 sites and is available from the DTU-Aqua website – these contain the management recommendations (often generated by the fishers themselves), and is based on monitoring of shellfish and natural habitats in these areas.</p> <p>Meetings of the Advisory Committee are provided with reports of fishery performance and progress with research on other issues that are relevant to its management (for example, the agenda for the meeting in February 2014 included an update on the resolution of the DN complaint about impacts of dredging in the mussel fishery, the management of fishing in a Natura 2000 site, and reports on a range of research projects and initiatives associated with the management and development of the industry).</p> <p>The minutes of the meetings of the Committee are published publically, distributed to members and record how the management system has responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.</p>		
e	Guidepost	Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by	The management system or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.

FINAL REPORT AND DETERMINATION

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.		
		repeatedly violating the same law or regulation necessary for the sustainability for the fishery.		
	Met?	Y	Y	Y
	Justification	<p>There is no evidence that the management authority or fishery has shown disrespect or defiance of the law, nor repeatedly violated the same law or regulation necessary for the sustainability of the fishery. There is also no evidence of any legal challenges through the courts, nor any judicial action.</p> <p>The complaint made to the European Parliament about the management of the fishery within Natura 2000 sites resulted in timely and significant improvements to the assessment processes, and therefore the management system, that addressed concerns raised by the European Commission in their review of the complaint by DN. The Commission closed the complaint in 2014. Proactive action by Danish authorities, in collaboration with stakeholders resulted in the Mussel Policy (MFLF, 2013). This is said to have resolved the complaint and avoided a legal dispute between the government and other parties over the matter.</p>		
References		MFLF, 2013; pers. comm. Anja Gadegaard Boye, 2015		
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 3.2.3

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Monitoring, control and surveillance mechanisms exist, are implemented in the fishery under assessment and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A comprehensive monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	Y	Y	Y
	Justification	<p>NaturErhvervstyrelsen implements a comprehensive monitoring, control and surveillance system.</p> <p>This system requires that all fishing vessels report their catch and landings, which are cross-referenced to processor records. The movements and activities of all fishing vessels are monitored using electronic "black box" recorders that use GPS data and sensors attached to vessel winch gear to determine the vessel location, speed, and whether or not its fishing gear is deployed.</p> <p>NaturErhvervstyrelsen fishery officers are locally based around the Limfjord and carry out patrols on land and at sea to verify the accuracy of catch and landings records, inspect processing facilities, and inspect fishing gear and vessels. This information is collected and analysed by NaturErhvervstyrelsen to determine that every fishing trip and dredge tow carried out by every fishing vessel in the Limfjord is recorded and checked for compliance with regulations.</p> <p>The level of monitoring of fishing activity using electronic equipment, coupled with verification of remote surveillance by on-site fishery officers demonstrates a consistent ability to enforce relevant management measures, strategies and rules.</p>		
b	Guidepost	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and demonstrably provide effective deterrence.
	Met?	Y	Y	Y
	Justification	<p>In cases of non-compliance, the authorities can apply a range of penalties, including heavy economic sanctions and even the loss of a fishing licence. In the past, corrective actions have been consistently applied and severe infractions have been tried in the courts.</p> <p>There is currently reported to be a very high level of compliance with regulations.</p> <p>The combination of sanctions and their consistent application can be said to demonstrably provide effective deterrence.</p>		
c	Guidepost	Fishers are generally thought to comply with	Some evidence exists to demonstrate fishers	There is a high degree of confidence that fishers

FINAL REPORT AND DETERMINATION

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with		
		the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	Y	Y	Y
	Justification	<p>Enforcement staff members consistently report that compliance with regulations is very good. Indeed, no infringements have been detected recently. There is a high degree of confidence that fishers comply with the management system.</p> <p>The monitoring of all fishing trips by all fishing vessel using the NaturErhvervstyrelsen "black box" electronic equipment provides both a deterrent to non-compliance and a mechanism for detecting any transgressions with respect to spatial and temporal controls, which are key aspects of the fishery management system in the Limfjord.</p> <p>The fishing industry provide information to NaturErhvervstyrelsen about the abundance and character of mussels in different shellfish production areas as the fishing season progresses, and provide samples of shellfish for hygiene analysis before the production areas are opened.</p>		
d	Guidepost		There is no evidence of systematic non-compliance.	
	Met?		Y	
	Justification	Enforcement staff confirmed that there is no evidence of systematic non-compliance by fishers in the Limfjord mussel and cockle fishery.		
References		MF, 2014; Pers. comm. Søren Palle Jensen, 2015		
OVERALL PERFORMANCE INDICATOR SCORE:				100
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 3.2.4 (MUSSELS)

PI 3.2.4		The fishery has a research plan that addresses the information needs of management		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Research is undertaken, as required, to achieve the objectives consistent with MSC's Principles 1 and 2.	A research plan provides the management system with a strategic approach to research and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.	A comprehensive research plan provides the management system with a coherent and strategic approach to research across P1, P2 and P3, and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.
	Met?	Y	Y	N
	Justification	<p>Research into the status of shellfish fisheries, their management and development is being carried out by DTU-Aqua under a European Fisheries Fund project that provides a strategic approach to research and each year provides reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.</p> <p>The priority areas are the possible impacts of dredge fisheries on seabed habitats, particular eelgrass and benthic infauna, including cumulative impacts over time on ecosystem components. Other aspects of the mussel fishery under investigation include the re-stocking of mussel beds to improve production and minimise dredge impacts.</p> <p>The introduction of the black box recorder for compliance purposes has offered researchers the opportunity to improve the quality of fishery dependent data in stock biomass models. Part of the wider plan is to research how statistical models may be revised and integrate this vast new data set into dynamic stock models that also incorporate the fishery independent pulse survey data.</p> <p>In addition to this work, DTU-Aqua also carry out ad-hoc research into issues as they arise.</p> <p>The research plan is not comprehensive, nor does it provide the management system with a coherent and strategic approach to research across all three Principles.</p>		
b	Guidepost	Research results are available to interested parties.	Research results are disseminated to all interested parties in a timely fashion.	Research plan and results are disseminated to all interested parties in a timely fashion and are widely and publicly available.
	Met?	Y	Y	N
	Justification	Research results are disseminated to all interested parties in a timely fashion, both through the Advisory Committee for mussel production process and more widely via the DTU-Aqua website. Although results are widely and publicly available, the research plan itself is not published.		
References		Brand <i>et al</i> , 2015; pers. Comm. Jens Kjerulf Petersen, DTU-Aqua; DTU-Aqua website.		

FINAL REPORT AND DETERMINATION

PI 3.2.4	The fishery has a research plan that addresses the information needs of management	
OVERALL PERFORMANCE INDICATOR SCORE:		80
CONDITION NUMBER (if relevant):		NA

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 3.2.4 (COCKLES)

PI 3.2.4		The fishery has a research plan that addresses the information needs of management		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Research is undertaken, as required, to achieve the objectives consistent with MSC's Principles 1 and 2.	A research plan provides the management system with a strategic approach to research and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.	A comprehensive research plan provides the management system with a coherent and strategic approach to research across P1, P2 and P3, and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.
	Met?	Y	N	N
	Justification	<p>Research in the fishery is directed at shellfish, however the priority species is mussel. The research into the status of shellfish, their management and development is being carried out by DTU-Aqua under a European Fisheries Fund project that provides a strategic approach to research work and sets a timetable for action. Priority areas within the planned project are the impacts of dredge fisheries on seabed habitats, particularly eelgrass and benthic infauna.</p> <p>In addition to this work, DTU-Aqua also conducts ad-hoc research into issues as they arise. An example of this is research into the "surfacing" of cockles on the seabed: i.e., emergence behaviours; as well as stock-related distribution and density studies.</p> <p>Research into cockles is undertaken that is consistent with that required to achieve the objectives of MSC's Principles 1 and 2. However, there is no evidence of a research plan for cockles that would provide the management system with a strategic approach to research or reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.</p>		
b	Guidepost	Research results are available to interested parties.	Research results are disseminated to all interested parties in a timely fashion.	Research plan and results are disseminated to all interested parties in a timely fashion and are widely and publicly available.
	Met?	Y	Y	N
	Justification	Research results are disseminated to all interested parties in a timely fashion on the DTU-website. Although this makes the results widely and publicly available, there is no evidence that has research plan has been published.		
References		Brand <i>et al</i> , 2015; pers. Comm. Jens Kjerulf Petersen, DTU-Aqua; DTU-Aqua website.		
OVERALL PERFORMANCE INDICATOR SCORE:				70
CONDITION NUMBER (if relevant):				1

FINAL REPORT AND DETERMINATION

Evaluation Table for PI 3.2.5

PI 3.2.5		<p>There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives</p> <p>There is effective and timely review of the fishery-specific management system</p>		
Scoring Issue		SG 60	SG 80	SG 100
AI	Guidepost	The fishery has in place mechanisms to evaluate some parts of the management system.	The fishery has in place mechanisms to evaluate key parts of the management system	The fishery has in place mechanisms to evaluate all parts of the management system.
	Met?	Y	Y	Y
	Justification	<p>An independent committee was appointed by the government in 2004 to formally review all parts of the management system for shellfish fisheries in Denmark. This led to a major revision of the fisheries legislation including the creation of the statutory stakeholder body called the Advisory Committee for mussel production with a remit for all shellfish management, including Limfjord. This committee conducts regular (annual) evaluations of the management system.</p> <p>At a European level, there are a number of mechanisms in place to review the overarching CFP legislation and supporting mechanisms. The European Commission reviews the CFP every ten years. The most recent outcomes of a new EU regulation are stronger ecosystem based management principles; reduction of discarding and more stakeholder engagement in fisheries management.</p> <p>The level of scrutiny of the fishery management system demonstrates that there are mechanisms in place to evaluate all parts of the management system.</p>		
b	Guidepost	The fishery-specific management system is subject to occasional internal review.	The fishery-specific management system is subject to regular internal and occasional external review.	The fishery-specific management system is subject to regular internal and external review.
	Met?	Y	Y	N
	Justification	<p>The fishery-specific management system is subject to regular internal review by the Advisory Committee on mussel production that involves the wide range of interested stakeholder representatives described earlier in section 3.5.1 of this report and in relation to the evaluation of the fishery for PI 3.1.2.</p> <p>The fishery-specific management system is also subject to occasional external review, as evidenced by the 2004 independent legislative review commissioned by the government that made specific shellfish fishery-related recommendations that were implemented in the new legislation.</p> <p>However, there is no evidence that the fishery-specific management system is subject to both regular internal <i>and</i> external review.</p>		
References		Brand <i>et al</i> , 2015; MF, 2004a; MF 2004b; OJ, 2013		
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				NA

FINAL REPORT AND DETERMINATION

Appendix 1.2 Risk Based Framework (RBF) Outputs

For the cockle fishery, it is not possible to determine the status of the stock relative to biologically-based limits for sustainability. The Risk Based Framework has therefore been used to assess stock status for cockles and to score Performance Indicator 1.1.1. During the assessment of the Vilsund Blue A/S Limfjord Mussel and cockle dredge fishery certified in January 2015, a Scale Intensity Consequence Analysis (SICA) was conducted at a workshop with stakeholders during the site visit. This returned a score of 1, equivalent to an MSC score of 100. As this fishery is an exact duplicate assessment, the MSC confirmed the interpretation of the harmonisation of exact duplicate fisheries and use of RBF that enables the assessment team to use the previous results from the SICA workshop from the Vilsund Blue A/S assessment (see section 4 of this report). However during the site visit for the current assessment, all relevant stakeholders were appraised of the results of the original SICA workshop, and were given the opportunity to provide any new information that might change the outcome of the analysis. All stakeholders agreed that the outcome of the original analysis was still valid.

A Productivity Susceptibility Analysis (PSA) was subsequently conducted during the assessment of the Vilsund Blue A/S fishery (Table 1.2.2), and returned a score of 96.8. The assessment team reviewed this PSA and concurred with the outcome, which has been used to determine the score for this PI.

FINAL REPORT AND DETERMINATION

Appendix 1.2.1 Scale Intensity Consequence Analysis (SICA)

Table 1.2.1.a: Principle 1 SICA Scoring Table for Cockle Fishery

Performance Indicator	Risk-causing activities	Spatial scale of activity	Temporal scale of activity	Intensity of activity	Relevant subcomponents	Consequence score	MSC Score
Target species outcome	Fishing activities from all fisheries including: <ul style="list-style-type: none">• Direct capture• Unobserved mortality (e.g. gear loss)• Capture as bycatch in other fisheries• Other identified risk-causing activities (please specify)	2	3	3	Population size	1	100
					Reproductive capacity		
					Age/size/sex structure		
					Geographic range		
Rationale for selecting worst plausible case scenario	<p>The only source of fishing-related mortality for sublittoral cockles in the Limfjord is the dredge fishery. There is no demersal trawling for finned fish in the Limfjord, nor any other use of mobile fishing gear that could impact on the cockle stock.</p> <p>Although cockles can only be caught by mussel dredgers as a bycatch species making up no more than 49% of the catch on any given day, the capture of cockles is deliberate and directed. There are no other fishing activities in the Limfjord that might generate a bycatch of cockles. Direct capture is therefore the only risk causing activity for cockles in the Limfjord.</p>						
Rationale for Spatial scale of activity	<p>Cockles are caught mainly in production areas 6, 9, 11, 15, 26 and 35. They are widely distributed in the Limfjord, from the intertidal zone into the shallow sublittoral. Cockles can occur in densities that are economically viable for fishing over a large part of the Limfjord but abundant populations are patchily distributed, both spatially and temporally. The fishery is limited to waters at least 3m deep, which means that most of the species' range in the Limfjord cannot be fished. Throughout the Limfjord, dredging is not permitted in any waters shallower than 3m (and this restriction is increased to 5m throughout Natura 2000 sites, and 6m in parts of these sites). Dredging is only permitted in the western Limfjord, and is not permitted in the vicinity of harbours or close to bathing beaches. Overall, more than 50% of the Limfjord area is closed to cockle or mussel dredging.</p>						

FINAL REPORT AND DETERMINATION

Rationale for Temporal scale of activity	<p>There are legal and practical constraints on fishing activity that limit the number of days per year when cockles can be caught.</p> <p>Dredging in the Limfjord is only permissible on weekdays, and cockle fishing can only take place in the spring and autumn when the cockles are amenable to capture in mussel dredges because they are at the surface of the seabed (either because the cockles are under stress or have been washed out of the seabed by water movements).</p>
Rationale for Intensity of activity	<p>Stakeholders report that when a patch of fishable cockles is located (i.e. cockles at the surface of the seabed that can be caught with mussel dredges), the catch rate gradually diminishes within that area over time as the cockles are caught. There is therefore evidence of local detection of fishing activity. There is, however, no suggestion that the scale of fishing affects the cockle stock at a larger scale.</p>
Rationale for choosing most vulnerable sub-component	<p>Cockles are fast maturing and highly fecund. They are widely distributed in the Limfjord and throughout north-western Europe. Cockles generally mature in their second year (or even in their first year in warmer parts of Europe). The dredges used in the fishery have a mesh size that means that only larger individuals are retained, which will have already reproduced. The fishery is limited in its spatial extent to a small part of the Limfjord and a limited depth range for just a short period of time when the cockles are amenable to capture.</p> <p>The fishery is therefore considered highly unlikely to affect the geographic range of the cockle population, the age / size / sex structure, or the reproductive capacity of the cockle stock. The only subcomponent of the stock that could be affected by the fishery would be the population size, even though this also seems very unlikely to occur.</p>
Rationale for Consequence score	<p>The view of stakeholders at the workshop (which included representatives from DTU-Aqua as well as the fishing industry) was that the scale of fishery removals and the spatial scale of the fishery were so small relative to the Limfjord cockle stock that impacts on the overall population were likely to be insignificant. Local effects were detectable, but at the stock level it was considered that environmental variations (and in particular low oxygen levels) have a far greater effect on benthic marine infauna such as cockles. A score of 1 was felt appropriate because changes in population size were likely to be insignificant, and undetectable against background variability of the Limfjord cockle population.</p>
Rationale for selecting worst plausible case scenario	<p>The only source of fishing-related mortality for sublittoral cockles in the Limfjord is the dredge fishery. There is no demersal trawling for finned fish in the Limfjord, nor any other use of mobile fishing gear that could impact on the cockle stock.</p> <p>Although cockles can only be caught by mussel dredgers as a bycatch species making up no more than 49% of the catch on any given day, the capture of cockles is deliberate and directed. There are no other fishing activities in the Limfjord that might generate a bycatch of cockles. Direct capture is therefore the only risk causing activity for cockles in the Limfjord.</p>

FINAL REPORT AND DETERMINATION

Appendix 1.2.2 Productivity-Susceptibility Analysis (PSA)

Table 1.2.2.a PSA Principle 1 Rationale Table

PI number	1.1.1	Stock Status	
Productivity	Rationale		Score
Average age at maturity.	18 months but can be less than 12 months in areas with high growth rates		1
Average maximum age	8-10 years		1
Fecundity	Egg production is usually in the range 200,000 to 700,000 per annum but a maximum of 1.7 million has been reported (Honkoop and van der Meer, 1998)		1
Average maximum size	Cockles of 5.08 cm shell length would be considered very large (Tebble, 1966)		1
Average size at maturity	15-20 mm		1
Reproductive strategy	Broadcast spawner		1
Trophic level	Suspension feeder, trophic level less than 2.75		1
Fishery			
Susceptibility	Rationale		Score
Areal Overlap	<p>Cockles are an intertidal species that extend into the subtidal. In Limfjord, there is little tide so intertidal area is small and most cockle populations are subtidal. Cockles are widespread throughout Limfjord but patchy and cannot live in oxygen depleted areas. Although a bycatch of mussel fishery, cockles have different life habits and the main cockle beds are adjacent to mussel beds, not on them. Throughout the Limfjord, dredging is not permitted in any waters shallower than 3m (and this restriction is increased to 5m throughout Natura 2000 sites, and 6m in parts of these sites). Dredging is only permitted in the western Limfjord, and is not permitted in the vicinity of harbours or close to bathing beaches. Overall, more than 50% of the Limfjord area is closed to dredging.</p> <p>The exact degree of overlap of dredge fishery with cockle species distribution is not known but is likely to be small (<10%). As a precautionary measure the team has used a</p>		2

FINAL REPORT AND DETERMINATION

	higher estimate of areal overlap of 10-30%.	
Vertical Overlap	<p>The team has considered two aspects of vertical overlap:-</p> <p>Bathymetry – cockles have a depth range extending from the intertidal zone into shallow subtidal areas. The depth constraints imposed on the fishery mean that only part of the bathymetric range of the species can be fished in the Limfjord.</p> <p>Burrowing habit – cockles are an infaunal species, and live buried in sandy and muddy seabed habitats. The fishing gear used in this fishery is not designed to penetrate the sediment, and can only capture emergent cockles. The vertical overlap in terms of habitat preference is therefore very small.</p> <p>Overall susceptibility of cockles to capture will be a combination of both the bathymetric distribution of cockles relative to the depth range of the fishery and the overlap between the burrowing habit of the species and the penetration depth of the fishing gear.</p> <p>The assessment team has concluded that this overlap is likely to be low/medium, which indicates a score of 1/2</p>	2
Selectivity	<p>The selectivity of the dredges has not been tested. The length at maturity of cockles is 15mm. The mesh size used when fishing for cockles is 30mm. The gear used does not penetrate the seabed, so only cockles lying at the surface are selected by the gear.</p> <p>The combination of mesh size and limited gear penetration depth are considered by the team to be consistent with the MSC definition of “medium” selectivity.</p>	2
Post capture mortality	The species is retained, so MSC CR v1.3 stipulates that post capture mortality must be scored at 3.	3

The scores from Table 1.2.2a are then entered into the Excel spreadsheet provided by the MSC for the calculation of PSA scores (Table 1.2.2b). The values in Table 1.2.2.b are derived as follows:-

Productivity and Susceptibility Scores: these are the scores taken from Table 1.2.2a and input into the table by the assessment team.

Catch: these figures are the catch data from the most recent fishing year, input by the assessment team.

All other figures in the table are calculated values derived from the figures input by the assessment team.

The PSA spreadsheet can be downloaded from the MSC website here:
<http://www.msc.org/documents/scheme-documents/forms-and-templates/msc-productivity-susceptibility-analysis-worksheet-v1.1-1-1.html>

FINAL REPORT AND DETERMINATION

Table 1.2.2b. Productivity-Susceptibility Analysis for cockle (*Cerastoderma edule*)

				Productivity Scores [1-3]							Susceptibility Scores [1-3]					1.1.1 only				PSA scores (automatic)				
PI	Scientific Name	Common Name	Gear Type (1.1.1)	Average age at maturity	Average max age	Fecundity	Average max size	Average size at Maturity	Reproductive strategy	Trophic level (fishbase)	Total Productivity (average)	Areal Overlap	Vertical overlap	Selectivity	Post-capture mortality	Total (multiplicative)	Catch (tons) (1.1.1)	Weighting (1.1.1)	Weighted Total	Weighted average	PSA Score	MSC Score	Risk Category Name	MSC scoring guidepost
1.1.1	<i>Cerastoderma edule</i>	Cockles	Drege	1	1	1	1	1	1	1	1.00	2	2	2	3	1.58	4000	1.00	1.58	1.58	1.87	96.8	Low	>80

FINAL REPORT AND DETERMINATION

Appendix 1.3 Conditions of certification

The score awarded for one performance indicator was above 60 and below the MSC unconditional pass level of 80. The MSC Certification Requirements specify that conditions of certification shall be raised for all of the Performance Indicators that score between 60 and 80, with the aim of improving the score to 80 or more during the period of certification (5 years).

The condition of certification for the Performance Indicator that scored between 60 and 80 in this assessment is set out below, along with the associated client action plan which is designed to bring about the required improvements in the fishery.

Unit of Certification 2: Cockle Fishery

Table 19: Condition 1: Research plan

Performance Indicator	PI 3.2.4: The fishery has a research plan that addresses the information needs of management
Score	70
Rationale	<p>The full scoring rationale is given in the evaluation table for this PI.</p> <p>The scoring issue that does not attain the SG80 standard is Sla. The rationale for this is:</p> <p><i>Sla</i></p> <p><i>Research in the fishery is directed at shellfish, however the priority species is mussel. The research into the status of shellfish, their management and development is being carried out by DTU-Aqua under a European Fisheries Fund project that provides a strategic approach to research work and sets a timetable for action. Priority areas within the planned project are the impacts of dredge fisheries on seabed habitats, particularly eelgrass and benthic infauna.</i></p> <p><i>In addition to this work, DTU-Aqua also conducts ad-hoc research into issues as they arise. An example of this is research into the “surfacing” of cockles on the seabed: i.e., emergence behaviours; as well as stock-related distribution and density studies.</i></p> <p><i>Research into cockles is undertaken that is consistent with that required to achieve the objectives of MSC’s Principles 1 and 2. However, there is no evidence of a research plan for cockles that would provide the management system with a strategic approach to research or reliable and timely information sufficient to achieve the objectives consistent with MSC’s Principles 1 and 2.</i></p>
Condition	A research plan should be prepared for the Limfjord cockle fishery that is designed to provide the management system with reliable and timely information about the effects of the fishery on the cockle stock and the components of the marine environment.
Milestones	<p>Year 1 – a draft research plan should be prepared in collaboration with relevant organisations and institutions. Resulting score: 70</p> <p>Year 2 – the research plan should be agreed and implemented. Resulting score: 70</p> <p>Years 3-4 – evidence of implementation of the research plan and initial research results should be provided. Resulting score: 80</p>

FINAL REPORT AND DETERMINATION

Performance Indicator	PI 3.2.4: The fishery has a research plan that addresses the information needs of management
Client action plan	<p>The DFPO will ensure that a research plan for the cockle fishery is developed and implemented. Work plan:</p> <p>Year 1: A draft research plan will be produced in collaboration with DTU-Aqua.</p> <p>Year 1 or year 2: The research plan will be agreed and implemented.</p> <p>Year 2 to year 4: Evidence of implementation will be provided, as well as results of research carried out as according to the plan.</p>
Consultation on condition	DTU-Aqua/The Shell-fish Centre has been consulted.

FINAL REPORT AND DETERMINATION

Appendix 2. Peer Review Reports

Appendix 2.1 Peer reviewer 1

Overall Opinion

<i>Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?</i>	Yes	Conformity Response	Assessment	Body
<u>Justification:</u> Yes – it is a professional well written report and evidence provided leads to appropriate conclusions				
<i>Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?</i>	Yes	Conformity Response	Assessment	Body
<u>Justification:</u> The condition is the same as for the Vilsund Blue a/s Limjord Mussel and Cockle Dredge Fishery which is appropriate				

If included:

<i>Do you think the client action plan is sufficient to close the conditions raised?</i>	Yes	Conformity Response	Assessment	Body
<u>Justification:</u> Yes				

FINAL REPORT AND DETERMINATION

General Comments on the Assessment Report (optional)

This assessment is unusual in that it is “an exact duplicate” of the Vilsund Blue a/s Limfjord Mussel and Cockle Dredge Fishery. The assessment team has harmonized with this fishery as required. New information has been incorporated and justifications provided for scoring that is similar but not identical. Below are a few comments on the text in the report

P15 - Sect 3.1: The report says “Cockles (*Cerastoderma edule*) are a bycatch species in the Limfjord mussel fishery” I would suggest changing the word “bycatch” as the CR definition for bycatch is organisms that have been taken incidentally and are not retained, this isn’t the case for cockles.

CAB response: We agree that the text used in section 3.1 which states that “cockles are a **bycatch** species in the Limfjord mussel fishery”, and “mussel dredging vessels are permitted to **retain** cockles...” are confusing because of the MSC definition of bycatch and retained species. The text has been modified to clarify that cockles are targeted at certain times by the mussel dredging vessels, but that the Danish AgriFish Agency does not permit a directed fishery solely for cockles and that landings of cockles are restricted to 49% of the total landings per vessel per day.

P13- Table 1: List of vessels included in proposed units of certification. There are 26 vessels but P17- 3.3 says “there are 31 vessels in the Unit of Certification”.

CAB Response: This has been clarified in the text on p.17 and section 4.7.3 of the report: ‘the fishery is a limited entry fishery: the number of licences and therefore vessels is restricted to 50. As licences are associated with a named individual rather than a boat, some vessels may be eligible to carry two licences; meaning up to two quota shares may be attached to an individual vessel. In practice, there are fewer than 30 (cf. Table 1) vessels licensed to operate in the Limfjord fishery in 2015 (pers comm., A. Gadegaarde Boye, AgriFish Agency).’

P18- Sect 3.4: Landings. Report says that falls in landings are attributed to economic factors but p28- Sect 3.5.2 Management of the mussel stocks: suggests concerns about the sustainability of the fishery.

CAB response: Section 3.5.2 on “Management of the mussel stocks” notes that in 2004 concerns were raised over the long term sustainability of the stock, but also notes that DTU Aqua (2006) concluded that the current management regulations should ensure sustainability of the stock. Recent stock surveys confirm that the current management regime appears to be working. The fall in landings reflects a decline in fishing activity due to economic factors and not due to a decline in stock abundance. In section 3.4 the report notes that there is no evidence of a link between stock status and landings.

P 32. Sect 3.6.2. Some confusion in that fishers are required to retain all the catch, exceptions being large stones and some oysters But some flatfish are returned to water.

FINAL REPORT AND DETERMINATION

CAB Response: The text has been updated to indicate that little or no bycatch or discarding occurs in the fishery. This can be explained by the test fishing that identifies areas of high mussel or cockle abundance.

P42. Birds – should they be included in the “habitat” section? Maybe not

CAB Response: Information presented in this section on birds refers to a summary of the habitat impact assessment, of which birds, turbidity, distribution of eelgrass and others are monitored on a regular basis. Bird interactions are included elsewhere in the report and it is therefore deemed appropriate to retain this information in this section.

P57 Harmonization. This is certainly an unusual situation in that it is “an exact duplicate assessment”. The justification for not using RBF could be applied to all the scoring?? I don’t think the question asked re RBF was fully answered rather a generic answer was provided. However I do agree that the team made a sensible decision.

The answer refers to PB 3.3.1 and PB 3.3.2b which of course is FCR v2. For this assessment CRv1.3 is being used and the references should be CI3.2.3.1 and CI3.2.3.2

CAB Response: Text has been updated to reflect these changes.

P113. Sect 8.2 remove “(both UoCs)”. An evaluation table for Principle 2 has been completed separately for UoC 1 and UoC 2

CAB Response: Text has been updated to reflect these changes.

Performance Indicator Review

UoC 1: Mussel dredge fishery

Document: MSC Full Assessment DFPO Limfjord Mussel and Cockle Fishery	page 211
Date of issue: 15.12.2015	MRAG Americas Inc.

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
1.1.1	Yes	No	NA	A score of 90 is given. In particular Sla scores a Y at SG100 ie There is a high degree of certainty that the stock is above the point where recruitment would be impaired. To met this there needs to be evidence that there is a 95% probability that the true status of the stock is higher than the point at which there is an appreciable risk of recruitment being impaired. This may be the case but I don't think there is enough evidence.	We note the peer reviewer's comment that to meet SG100a there needs to be evidence that there is a 95% probability that the true status of the stock is higher than the point at which there is an appreciable risk of recruitment being impaired. However we disagree that there is insufficient evidence to meet the SG100. The management strategy for the mussel fishery has maintained the stock at a high level and is consistent with maintaining the stock at Bmsy. If the stock is at or fluctuating around Bmsy, there is a high degree of certainty that the stock is above the point where recruitment would be impaired. In addition there are large areas that are closed to fishing, recruitment to the fishery is enhanced by the relaying of small mussels in high production areas, and mussels have a natural high fecundity,

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
1.1.2	Yes	Yes	NA	There is only an implicit reference point for this fishery however the target reference point used in this fishery is a suitable surrogate and has similar intent to Bmsy. It is precautionary and considers only mussels in the areas where fishing takes place and by taking the mussel's ecological role into account means that the SG100 is met	
1.1.3	NA	NA	NA	NA	
1.2.1	Yes	Yes	NA	There is a responsive harvest strategy in place but it has not been fully evaluated. And has not been reviewed in its entirety. A score of 85 is appropriate	
1.2.2	Yes	Yes	NA	Well defined harvest control rules are in place and are effective but agree with team that some uncertainties have not been taken into account. The score is appropriate	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
1.2.3	Yes	Yes	NA	Agree with the team that there is sufficient information but it can't be considered "comprehensive".	
1.2.4	Yes	Yes /??	NA	Sle. The stock assessment methodology published within a peer-reviewed journal is very old (1999). Surely there has been some changes in 16 years. I would recommend that this be updated. The fact that the stock surveys are reviewed annually within the Advisory Committee on Mussel Production probably means a score of 80 can probably be awarded	We note that the published survey methodology is 16 years old, but essentially the same methodology is used currently. The survey methodology and results are reviewed annually by the Advisory Committee on Mussel Production, and we agree that this annual review constitutes a peer review and so SG80 is met. We have revised the rationale accordingly.
2.1.1	Yes	Yes	NA	In Sla it should restated what % of the catch is made up of starfish <i>Asterias rubens</i> and shore crab (<i>Carcinus maenus</i>). So that these are not considered "main" retained	The report has been updated to include relevant information of bycatch levels in the scoring rationale.
2.1.2	Yes	Yes	NA	Agree	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.1.3	Yes	Yes	NA	Agree	
2.2.1	Yes	Yes	NA	Agree	
2.2.2	Yes	Yes	NA	Agree	
2.2.3	Yes	Yes	NA	Agree	
2.3.1	Yes	Yes	NA	Agree - There is no risk to ETP species	
2.3.2	Yes	Yes	NA	Agree with score of 95. There is no comprehensive strategy but its probably not necessary!	
2.3.3	Yes	Yes	NA	Agree	
2.4.1	Yes	Yes	NA	The research carried out by DTU-Aqua and the management measures in place allow for SG100 to be met	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.4.2	Yes	Yes	NA	Agree	
2.4.3	Yes	Yes	NA	Agree	
2.5.1	Yes	Yes	NA	Agree with the logic for a partial score at SG 100	
2.5.2	Yes	Yes	NA	Agree	
2.5.3	Yes	Yes	NA	Agree	
3.1.1	Yes	Yes	NA	The fishery is carefully regulated, and managed under Danish and EU legislation, which is both precautionary and meets the requirements of international conventions. A score of 100 is appropriate	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
3.1.2	Yes	Yes	NA	<p>The management system has effective consultation processes that are open to interested and affected parties.</p> <p>The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties, A score of 100 is appropriate</p>	
3.1.3	Yes	Yes	NA	<p>Agree but suspect that the national management policy requires consideration of the precautionary in its objectives for fisheries management which would score 100 but if no evidence then 90 is correct</p>	<p>Evidence was not provided by the client or stakeholders about how the national policy requires consideration of the precautionary approach.</p>
3.1.4	Yes	Yes	NA	<p>Agree with justification and score</p>	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
3.2.1	Yes	Yes	NA	I agree as the short and long-term objectives are more explicitly defined and measurable in relation to fishing in the Natura 2000 sites, and not as well-defined across the remaining area of the Limfjord, the fishery only partially meets the requirements of SG100.	
3.2.2	Yes	Yes	NA	There are effective decision making processes but There is no evidence that all issues are taken into account, nor that the wider implications of decisions are considered. Score of 90 is appropriate	
3.2.3	Yes	Yes	NA	Agree a well regulated fishery with good enforcement and very good compliance by fishers.	
3.2.4	Yes	Yes	NA	Score 80 is ok	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
3.2.5	Yes	Yes/??	NA	Not sure that evidence is provided to prove that the fishery has in place mechanisms to evaluate ALL parts of the management system	The review mechanisms are multi-faceted and multi-layered: periodic review of the whole management system at national level; periodic review of the EU management regime at an overarching level; and annual review of the management system by the Advisory Committee for Mussel Production. Combined, this level of scrutiny covers all parts of the management system – enough to satisfy the audit team that this guidepost is fully met.

Any Other Comments

Comments	Conformity Assessment Body Response
None	

FINAL REPORT AND DETERMINATION

For reports using the Risk-Based Framework:

Performance Indicator	Does the report clearly explain how the process used to determine risk using the RBF led to the stated outcome? Yes/No	Are the RBF risk scores well-referenced? Yes/No	Justification: Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response:
1.1.1	Y	Y		
2.1.1	<u>NA</u>			
2.2.1	<u>NA</u>			
2.4.1	<u>NA</u>			
2.5.1	<u>NA</u>			

FINAL REPORT AND DETERMINATION

UoC 2: Cockle Dredge Fishery

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
1.1.1	Yes	Yes	NA	Appropriate that RBF is used.	
1.1.2	Yes	Yes	NA	RBF used for PI 1.1.1 so default score is 80 for this PI	
1.1.3	Yes	Yes	NA	RBF used for PI 1.1.1 – not scored by default	
1.2.1	Yes	Yes	NA	There is a responsive harvest strategy in place but it has not been fully evaluated. And has not been reviewed in its entirety. A score of 85 is appropriate	
1.2.2	Yes	Yes	NA	The score of 80 is appropriate	
1.2.3	Yes	Yes	NA	There is regular surveying and monitoring to inform the harvest strategy but it cannot be considered comprehensive, Score 80 is appropriate	
1.2.4	Yes	Yes	NA	RBF used for PI 1.1.1 – default 80 score	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.1.1	Yes	Yes	NA	Agree. Starfish is a "main" retained so the score is appropriate	
2.1.2	Yes	Yes	NA	Agree	
2.1.3	Yes	Yes	NA	Agree	
2.2.1	Yes	Yes	NA	Agree	
2.2.2	Yes	Yes	NA	Agree	
2.2.3	Yes	Yes	NA	Agree	
2.3.1	Yes	Yes	NA	Agree as above	
2.3.2	Yes	Yes	NA	Agree	
2.3.3	Yes	Yes	NA	Agree	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.4.1	Yes	No	NA	P168 the SG 100 is scored Y. However the justification says "The SG 100 standard is not met because (unlike the mussel fishery) there is no direct evidence from the fishery about the effect of the dredges on the marine habitats inhabited by cockles." The SG score should be changed to N at SG100	The SG100 has been adjusted from 'Y' to 'N'. The overall score for this PI remains the same at 80.
2.4.2	Yes	Yes	NA	Agree	
2.4.3	Yes	Yes	NA	Agree	
2.5.1	Yes	Yes	NA	Agree	
2.5.2	Yes	Yes	NA	Agree	
2.5.3	Yes	Yes	NA	Agree	
3.1.1	Scoring as for UoC 1- see comments above				
3.1.2	Scoring as for UoC 1- see comments above				

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
3.1.3	Scoring as for UoC 1- see comments above				
3.1.4	Scoring as for UoC 1- see comments above				
3.2.1	Scoring as for UoC 1- see comments above				
3.2.2	Scoring as for UoC 1- see comments above				
3.2.3	NA				
3.2.4	Yes	Yes	Yes	Agree are in harmony with Vilsnun Blue a/s Limfjord Mussel and Cockle Dredge Fishery	
3.2.5	Scoring as for UoC 1- see comments above				

Any Other Comments

Comments	Conformity Assessment Body Response
None	

FINAL REPORT AND DETERMINATION

Appendix 2.2 Peer reviewer 2

UoC 1: Mussel dredge fishery

Overall Opinion

<i>Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?</i>	Yes	Conformity Response	Assessment	Body
<u>Justification:</u> The fishery for both species falls well within the carrying capacity of the dredged areas and there are strong management plans supported by an annual audit by DTU-Aqua and oversight by the Danish Government. The three Principles of MSC are clearly met.				
<i>Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?</i>	N/A	Conformity Response	Assessment	Body
<u>Justification:</u>				

If included:

<i>Do you think the client action plan is sufficient to close the conditions raised?</i>	N/A	Conformity Response	Assessment	Body
<u>Justification:</u>				

General Comments on the Assessment Report

The assessment team had a wide range of experience appropriate to this application for renewal of the MSC for the mussel fishery and its extension to the associated cockle fishery. The Assessment Report was presented clearly and concisely and the relevant MSC guidelines and practices were appended so that reasons for scores and decisions were easy to follow and understand. Any editorial and content queries were swiftly addressed by the team.

Document: MSC Full Assessment DFPO Limfjord Mussel and Cocker Fishery	page 225
Date of issue: 15.12.2015	MRAG Americas Inc.

FINAL REPORT AND DETERMINATION

Both fisheries are well monitored, regulated and managed under Danish and EU legislation. The new electronic surveillance regime will help to ensure that good compliance and good governance continue to underpin the management of both fisheries.

Performance Indicator Review

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
1.1.1	YES	YES	N/A	The low level (<i>circa</i> 10%) of exploitation over the whole stock area should not result in any impairment of recruitment but the low stock biomass estimate from the 2014 survey justifies the precautionary score of SG90.	
1.1.2	YES	YES	N/A	A precautionary target reference point based upon an annual survey, the requirements of the Natura 2000 sites and 20 years of management experience justifies the SG100 score	
1.1.3	N/A	N/A	N/A	There is no evidence, as presented, that the stock is depleted, therefore the decision to not score this indicator is justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
1.2.1	YES	YES	N/A	There is a robust harvesting strategy but since it is not reviewed regularly by a Management Strategy Evaluation (MSE) the SG85 is justified.	
1.2.2	YES	YES	N/A	There are strong harvest control rules but since the controls for the whole Limfjord area are less stringent than for the Natura 2000 sites, the SG90 is justified.	
1.2.3	YES	YES	N/A	There is an annual survey to support harvesting strategies but the SG80 is justified since the robustness of assessment has not been investigated.	
1.2.4	YES	YES	N/A	The assessment estimates stock in a robust precautionary manor but is not internally or externally peer reviewed. Therefore the SG80 is justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.1.1	YES	YES	N/A	Management measures prohibit the fishing in much of the Limfjord this protecting all species but the score of SG80 is justified because there is a lack of knowledge about the status of starfish and crabs, the main retained species.	
2.1.2	YES	YES	N/A	There is only a partial strategy for the management of retained species and so the SG80 is justified.	
2.1.3	YES	YES	N/A	As this fishery has no main retained species the score of SG80 is appropriate.	
2.2.1	YES	YES	N/A	There are no major bycatch species. Small numbers of flounder (10 – 30 per vessel) are discarded per day and because there is some uncertainty about their stock status a score of SG80 is justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.2.2	YES	YES	N/A	There is a partial strategy in place to manage bycatch and so a score of SG80 is justified.	
2.2.3	YES	YES	N/A	There is no bycatch that constitutes more than 5% of the catch. DTU-AQUA surveys have quantified a small flounder bycatch and although there is no information on its mortality once released the catch is insignificant compared to the TAC of flounder in this region. A score of SG80 is therefore justified.	
2.3.1	YES	YES	N/A	There is no risk to ETP species and the SG100 score is therefore justified	
2.3.2	YES	YES	N/A	Although there is no risk to ETP species the strategy to reduce the impact of the fishery does not go beyond the EU or Danish level. A score of SG95 is therefore justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.3.3	YES	YES	N/A	There is adequate information to ascertain that the fishery is not a threat to ETP species locally but there is no evidence that monitoring a national level is adequate to support an EU level plan. A score of SG85 Is justified.	
2.4.1	YES	NO	N/A	According to the assessment report the complaint to the EU by the Danish Society for Nature Conservation has been assessed at EU level. In the light of a change to a lighter dredge, non retention of large stones and more spatial restrictions on dredging they concluded that the impacts within Natura 2000 sites in Denmark is now acceptable. I could not find any reference to this report and since it is the basis for a SG 100 score it needs to be quoted. Failing this the SG should be reduced to SG 80	Details of the complaint and the assessment are given for European Parliament Committee on Petitions (Petition 1486/2009). Reference to this document is provided in the scoring rationale to justify SG100.

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.4.2	YES	YES	N/A	There is a strategy in place to ensure that the fishery does not harm the habitat. The score of SG100 is justified.	
2.4.3	YES	YES	N/A	Although information to determine the risk of habitat damage is adequate the physical impacts of the gear on all habitat types has not been fully quantified. Therefore a score of SG90 is justified.	
2.5.1	YES	YES	N/A	Any disruptions to ecosystem structure and function caused by dredging are temporary. However the evidence is not comprehensive and so a score of SG90 is justified.	
2.5.2	YES	YES	N/A	Although the Natura 2000 sites within the dredged areas are fully protected there is only a partial strategy for all other sites within the UoC. A score of SG90 is therefore justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.5.3	YES	YES	N/A	The information on the interactions between mussels and other ecosystem components have been modelled but the impacts of the fishery and the functions of all the ecosystem components is not sufficiently detailed or comprehensive to meet the SG 100 requirements. The score of SG 90 is therefore appropriate.	
3.1.1	YES	YES	N/A	The combination of National and EU mechanisms for legislation, dispute management and inclusivity of all stakeholders justifies a score of SG100 for this indicator.	
3.1.2	YES	YES	N/A	The Advisory Committee on mussel production(it includes cockles) provides opportunity and facilitates consultation of all stakeholders. A score of SG 100 is justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
3.1.3	YES	YES	N/A	There are long term precautionary management objectives. However since there is no evidence that they are required by management policy, a score of SG90 is justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
3.1.4	YES	NO	N/A	There are penalties for NOT complying with regulations that encourage sustainability and there are no subsidies that encourage damage of the ecosystem. However since there are no explicit incentives given in the assessment to encourage sustainable fishing the score of SG 90 is NOT justified. A score of SG80 is suggested.	<p>SG100 is partially met, as explained in the justification for the score, which is derived directly from MSC's own guidance on interpreting how the "management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2".</p> <p>The second half of SG100 requires that "...the management system explicitly considers incentives in a regular review..." This element of SG100 was not met. Hence the score of 90.</p> <p>None of the SGs require "explicit incentives ...to encourage sustainable fishing", as suggested by the peer reviewer. Respectfully, the suggestion to downgrade the score on this PI to 80 is rejected. To do so would be a misinterpretation of the SG100 requirement. Therefore the score of 90 should stand.</p>

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
3.2.1	YES	YES	N/A	The fishery has clear, specific objectives for achieving MSC Principles 1 and 2, but since they only pertain to the Natura 2000 sites and not the whole Limfjord the score of SG90 is appropriate.	
3.2.2	YES	YES	N/A	Decision making processes apply to serious local issues but there is no evidence that ALL issues or their wider implications are considered. The score of SG90 is therefore justified.	
3.2.3	YES	YES	N/A	These are effective, well regulated fisheries with transparent enforcement, surveillance and very good compliance by the fishers. A score of SG100 is therefore justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
3.2.4	YES	YES	N/A	There is a research plan but since it is not comprehensive (it does not provide strategic approaches to all three MSC Principles) and it is not published the score of SG80 is justified.	
3.2.5	YES	YES	N/A	There is good evidence that the performance of Management of both fisheries is subject to evaluation at national and EU level. However there is no evidence of regular internal and external auditing A score of SG90 is therefore justified.	

Any Other Comments

Comments	Conformity Assessment Body Response
In the assessment report there are no explicit comments on "zero" biomass levels in Figures 7, 8 and 11 and no explanation is given for the missing years in Figures 10 and 13. This needs to be addressed.	The zero biomass levels in Figures 7, 8 and 11, and the missing years in Figures 10 and 13 are because the stock biomass survey was not carried out in 2002 and 2005 (Figure 7), there were no surveys in 1998, 2000, 2002 and 2004-2005 in Lovns Bredning Natura 2000 site (Figures 8 & 10),

FINAL REPORT AND DETERMINATION

On page 46 (last line of para1) it states “The location and extent of these closures is reviewed in response to new information about the extent of vulnerable habitats”. The conclusion of the review should be given along with a reference.	and there were no surveys in 1998, 2000, 2002 and 2005 in Løgstør Bredning Natura 2000 site (Figures 11 &13). The figure legends have been annotated accordingly. A conclusion of the review and reference has been added to the text.
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UoC 2: Cockle dredge fishery

<i>Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?</i>	YES	Conformity Response	Assessment	Body
<u>Justification:</u>				
<i>Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?</i>	YES	Conformity Response	Assessment	Body
<u>Justification:</u> There is NO comprehensive research plan specifically for this fishery (it is targeted at mussels). And so the score of SG70 is justified. The Condition (1) is appropriate and is to be delivered in a reasonable timescale				

If included:

<i>Do you think the client action plan is sufficient to close the conditions raised?</i>	YES	Conformity Response	Assessment	Body
<u>Justification:</u> The proposed course of action is appropriate.				

General Comments on the Assessment Report

As for the mussel fishery report (see above).

Document: MSC Full Assessment DFPO Limfjord Mussel and Cockle Fishery	page 237
Date of issue: 15.12.2015	MRAG Americas Inc.

FINAL REPORT AND DETERMINATION

Performance Indicator Review

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
1.1.1	YES	YES	N/A	The use of the same PSA score as for the Vilsund BlueA/S/fishery is valid and therefore the SG of 96.8 is valid.	
1.1.2	YES	YES	N/A	The use of the Risk Based Framework (RBF) is deemed suitable and the decision to use the same stakeholders as in the recent MSC (2015) assessment of the Vilisund fishery was valid. Therefore the SG score of 80 is appropriate.	
1.1.3	N/A	N/A	N/A	When the RBF is used PI 1.1.3 is not scored	
1.2.1	YES	YES	N/A	There is a robust harvest strategy but because there is no evidence that this strategy has been evaluated or reviewed regularly, a score of SG 85 is justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
1.2.2	YES	NO	N/A	I disagree that the cockle fishery is "not essentially a directed fishery" and that catches are a "bycatch of the mussel fishery". Special nets are fitted in order to capture the cockles. The score of SG80 is justified but the rationale used to obtain it is flawed.	At certain times of the year mussel dredging vessels will incorporate a smaller mesh net in their dredges to target cockles in the Limfjord mussel fishery. Whilst we agree therefore that the mussel dredging vessels are clearly targeting cockles, the Danish AgriFish Agency does not permit a directed fishery solely for cockles and mussel dredging vessels are only permitted to retain cockles providing that they weigh no more than 49% of the total landings from a vessel per day. We agree that this issue is not central to the rationale underlying the score, and so the rationale for SGc has been modified.
1.2.3	YES	YES	N/A	All licensed boats are now fitted with the "black box", and these records, plus the fishery landings feedback to support the harvest strategy. However the assessment and management are not robust enough to cover all uncertainties. A score of SG 80 is therefore appropriate.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
1.2.4	YES	YES	N/A	When RBF is used a score of SG 80 is given for assessment of stock status under MSC guidelines.	
2.1.1	YES	YES	N/A	Management measures prohibit the fishing in much of the Limfjord thus protecting all species but the score of SG80 is justified because there is a lack of knowledge about the population status of starfish and crabs, the main retained species.	
2.1.2	YES	YES	N/A	There is only a partial strategy for the management of retained species and so the SG80 is justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.1.3	YES	NO	N/A	Guidepost b has been incorrectly scored in the report since the text declares that: "there is not sufficient quantitative information to estimate the outcome of these species to meet either SG80 or SG100". The score for this guide post should therefore be SG60 giving a mean score for this parameter of SG75. A condition therefore needs to be raised for this parameter.	The text in the scoring rationale has been updated to take into account new information received from DTU Aqua on the gear type used during their mussel research surveys. The mesh size used during each survey (25 mm) is equivalent to that used in the cockle fishery (30 mm), and would therefore retain similar species composition (see sections 3.3 and 3.5.1.2). The quantitative information and results obtained from the annual research surveys are deemed sufficient to estimate the outcome of retained species in the cockle fishery. The score of SG80 therefore remains appropriate and no condition is required.
2.2.1	YES	YES	N/A	There are no major bycatch species. Small numbers of flounder (10 – 30 per vessel) are discarded per day and because there is some uncertainty about their stock status a score of SG80 is justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.2.2	YES	YES	N/A	There is a partial strategy in place to manage bycatch and so a score of SG80 is justified	
2.2.3	YES	YES	N/A	There is no bycatch that constitutes more than 5% of the catch. DTU-AQUA surveys have quantified a small flounder bycatch and although there is no information on its mortality once released, the catch is insignificant compared to the TAC of flounder in this region. A score of SG80 is therefore justified.	
2.3.1	YES	YES	N/A	There is no risk to ETP species and the SG100 score is therefore justified	
2.3.2	YES	YES	N/A	Although there is no risk to ETP species the strategy to reduce the impact of the fishery does not go beyond the EU or Danish level. A score of SG95 is therefore justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.3.3	YES	YES	N/A	There is adequate information to ascertain that the fishery is not a threat to ETP species locally but there is no evidence that monitoring a national level is adequate to support an EU level plan. A score of SG85 is justified.	
2.4.1	YES	YES	N/A	Although the cockle fishery is highly unlikely to impact the benthic environment there is no direct evidence on the effect of the dredges on the marine habitats inhabited by cockles. The SG80 score is therefore justified.	
2.4.2	YES	YES	N/A	Since there is no evidence of testing the efficacy of management measures there is no clear evidence that the cockle fishery is achieving its strategic objectives. The score of SG90 is therefore appropriate	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.4.3	YES	YES	N/A	Although information to determine the risk of habitat damage is adequate the physical impacts of the gear on all habitat types has not been fully quantified. Therefore a score of SG90 is justified.	
2.5.1	YES	YES	N/A	Any disruptions to ecosystem structure and function caused by dredging are temporary. However the evidence is not comprehensive and so a score of SG90 is justified.	
2.5.2	YES	YES	N/A	Although the Natura 2000 sites within the dredged areas are fully protected there is only a partial strategy for all other sites within the UoC. A score of SG85 is therefore justified.	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.5.3	YES	YES	N/A	The information on the interactions between mussels and other ecosystem components have been modelled but the impacts of the fishery and the functions of all the ecosystem components is not sufficiently detailed or comprehensive to meet the SG 100 requirements. The score of SG 80 is therefore appropriate	
3.1.1				See mussel report	
3.1.2				ditto	
3.1.3				ditto	
3.1.4				ditto	
3.2.1				ditto	
3.2.2				ditto	

FINAL REPORT AND DETERMINATION

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
3.2.3				ditto	
3.2.4	YES	YES	YES	There is NO comprehensive research plan specifically for this fishery (it is targeted at mussels). And so the score of SG70 is justified. The Condition (1) is appropriate and is to be delivered in a reasonable timescale.	
3.2.5				See mussel report	

FINAL REPORT AND DETERMINATION

Any Other Comments

Comments	Conformity Assessment Body Response
There is some ambiguity in the text of the assessment report as to whether the cockle fishery is targeted or not. On page 15, para 3 it states that “cockles are a bycatch species in the Limfjord mussel fishery” and (para 4) that “mussel dredging vessels are permitted to retain cockles providing that they weigh no more than 49% of the total landings from a vessel per day”. However on page 26 (last para) it states that “Because cockles are smaller than mussels, a smaller mesh net (30 mm mesh) is attached when fishing for cockles”. Cockles are clearly being targeted and so this confusion needs to be cleared up in the report.	<p>We agree that cockles may also be targeted in the mussel fishery. At certain times of the year mussel dredging vessels will incorporate a smaller mesh net in their dredges to target cockles in the Limfjord mussel fishery. Whilst the mussel dredging vessels are clearly targeting cockles, the Danish AgriFish Agency does not permit a directed fishery solely for cockles and mussel dredging vessels are only permitted to retain cockles providing that they weigh no more than 49% of the total landings from a vessel per day.</p> <p>The text in section 3.1 has been revised to clarify the nature of the cockle fishery.</p>

For reports using the Risk-Based Framework:

Performance Indicator	Does the report clearly explain how the process used to determine risk using the RBF led to the stated outcome? Yes/No	Are the RBF risk scores well-referenced? Yes/No	Justification:	Conformity Assessment Body Response:
1.1.1	YES	YES	The use of the Risk Based Framework approach was justified. The resulting Productivity Susceptibility Scores were calculated appropriately and translated to an MSC score of 96.8 (Table 1.2.2b). There is a	

FINAL REPORT AND DETERMINATION

			low risk of recruitment overfishing.	
2.1.1	<u>N/A</u>	N/A	<i>RBF not used for this parameter.</i>	
2.2.1	<u>N/A</u>	N/A	<i>DITTO</i>	
2.4.1	<u>N/A</u>	N/A	<i>DITTO</i>	
2.5.1	<u>N/A</u>	N/A	<i>DITTO</i>	

Appendix 3. Stakeholder submissions

Site visit

Record of meetings conducted during site visit

Interviews were conducted with the stakeholders that expressed a wish to meet the team during the site visit. After each meeting, the team compiled a note of the meeting that was sent to the interviewee for review. The agreed notes of these interviews (including editorial changes made by the interviewee) are reproduced below.

Interview with Jonathan Jacobsen, Danish Fishermen's Producer Organisation (Client)

<i>MSC Fishery Assessment Stakeholder Interview Record</i>		
Assessment Team	Name	
Lead Assessor	Robert Wakeford	
P1 Team Member	Julian Addison	
P2 Team Member	Robert Wakeford	
P3 Team Member	Chris Grieve	
Meeting Location	Karup, Denmark	
Date	11 th March, 2015	
Stakeholders name		Affiliation
Jonathan Jacobsen		DFPO

a. Status

DFPO is the client for the assessment.

b. Stakeholder key issues

A discussion related to the organisation of stakeholder meetings and specific information requirements.

FINAL REPORT AND DETERMINATION

Interview with local fishers

<i>MSC Fishery Assessment Stakeholder Interview Record</i>	
Assessment Team	Name
Lead Assessor	Robert Wakeford
P1 Team Member	Julian Addison
P2 Team Member	Robert Wakeford
P3 Team Member	Chris Grieve
Meeting Location	Jegindø, Denmark
Date	11 th March, 2015
Stakeholders name	Affiliation
Niels Jensen	Vessel owner
Bo Husted Kjeldgaard	Chairman of Centralforeningen, CF
Kaj Møller Jensen	Vice-chairman of Centralforeningen, CF

a. Status

Fishers representing Limfjord mussel and cockle dredge fishery and the principal stakeholder organisation engaged in the management process, including the Advisory Committee for Mussel Production.

b. Stakeholder key issues

The fishers provided a summary of their fishing activities and their views on the status of the stocks and the effectiveness of the various management measures –

- All fishers were members of the principal stakeholder organisation, CF, which is a key contributor to the Advisory Committee for Mussel Production.
- The association, CF, proposes an overall fishing plan annually which is submitted to the Advisory Committee.
- The association, CF, determines management measures in addition to the statutory measures, e.g. CF limits landings to 30 tonnes per licence per day, which is more restrictive than the statutory daily TAC of 45 tonnes, and determines which vessels are allowed to fish in the Natura 2000 sites at any one time.
- The communal vessel, Limfjord, will undertake pre-surveys of the fishing grounds to identify the highest densities of mussels. The areas of highest density will vary from year to year.
- Two of the three fishers present landed their catch to the new local plant in Jegindø, Johs. Jensen Fiske-og Muslingeeksport and the other fisher landed his catch to Vilsund.
- The fishers demonstrated the dredge currently in use and how it is adapted to catch cockles. The fishers also described when cockles are most frequently caught, with probably less than 20 days per year when cockles are caught.

FINAL REPORT AND DETERMINATION

- Sorting of mussels on board is not permitted, but after sorting of the catch at the processors, the Limfjord will relay mussels for the benefit of all members in areas of high production where hypoxia events are rare.
- Vessels must 'hail in' their estimate of landings one hour prior to landing, and also complete log book records of their catches. The processing factories will then provide a record of the sorted catch which is the official statistic of landings.
- The fishers confirmed that the results of the SICA workshop on cockle stock status conducted in 2014 were still valid.
- Attempts are being made to develop a fishery for starfish, but fishers confirmed that the price is not necessarily high enough to make the fishery viable.
- All fishers believed that they had a good relationship with the management authorities, and that the limited entry nature of the fishery produced a sense of ownership of the fishery.
- Fishers reported a very strong enforcement presence at the point of landing. The high level of enforcement and the introduction of the black box system on board all vessels were welcomed by the fishers.

FINAL REPORT AND DETERMINATION

Interview with Anja Gadegaard Boye (policy) and Søren Palle Jensen (control), NaturErhvervstyrelsen (AgriFish Agency)

<i>MSC Fishery Assessment Stakeholder Interview Record</i>	
Assessment Team	Name
Lead Assessor	Robert Wakeford
P1 Team Member	Julian Addison
P2 Team Member	Robert Wakeford
P3 Team Member	Chris Grieve
Meeting Location	NaturErhvervstyrelsen, Nyropsgade 30, Copenhagen Denmark
Date	12 th March, 2015
Stakeholders name	Affiliation
Anja Gadegaard Boye (policy)	NaturErhvervstyrelsen
Søren Palle Jensen (control)	NaturErhvervstyrelsen

a. Status

Representing the policy-making and compliance/enforcement functions of NaturErhvervstyrelsen, the Danish government agency within the overarching Ministry for Food, Agriculture and Fisheries responsible for regulating Denmark's fisheries.

b. Stakeholder key issues (summary)

Both government representatives gave a brief overview of their respective responsibilities within the AgriFish Agency.

Ms Anja Gadegaard Boye explained the Mussel Policy – how it was developed with stakeholders including the Ministry's representatives, the CF and DFPO and eNGO representatives; how it now serves as a transparent framework for discussing annual fishery management arrangements; and how it effectively resolved the complaint lodged by DN to the EU by creating a comprehensive, sustainable approach to managing the fishery and its impacts in ecologically sensitive areas.

Ms Gadegaard Boye explained the detailed process undertaken each year to develop the annual mussel regulation under the Mussel Policy framework:

- DFPO makes an annual fishing plan proposal to the Ministry
- DFPO, the Ministry and DTU-Aqua meet to discuss the DFPO fishing plan proposal, with scientific stock assessment and Environmental Impact Assessment information informing the discussions
- The multi-stakeholder Advisory Committee on Mussel Production meets to discuss DTU-Aqua reports and develop the following year's fishery licence condition recommendations.
- Recommendations are forwarded, along with Ministry advice, to the AgriFish Agency Director in a document which takes account of both the Mussel Policy and the opinions of stakeholders.

FINAL REPORT AND DETERMINATION

- The Director decides and a note goes back to the Advisory Committee and DFPO/CF representatives about the decision, including reasons why / why not certain decisions were made. The decision is publicised on the website too.

Mr Søren Palle Jensen presented detailed information about the monitoring, control and surveillance (MCS) measures implemented in the fishery. He explained how the technology, specifically the “black boxes”, is used to support MCS in the fishery and how the technology has:

- Enabled a ‘micro-management’ tool to give accurate information about where, when and how vessels are deployed in the fishery.
- Enabled the effective and efficient targeting of enforcement resources.
- Provided proof to the Ministry, other stakeholders and even the public that fishers are in fact fishing where they said they fished. Thus giving everyone confidence in the fishers and the conduct of the fishery: “*everyone’s happy*”.
- Created effective deterrents to fishers, so that there are no violations of fishing regulations.
- Resulted in the ability to shift focus from the initial MCS driver for the technology to how to innovate its use for environmental impact assessments or other scientific purposes.
- Opened possibilities for innovation in other technology for the future, for example, using cameras on dredges or vessels to monitor compliance with the EU’s discard ban.

Mr Palle Jensen explained what happens if a black box or the sensors fail: the immediate reporting requirements via SMS text message and cessation of fishing and return to port. In the event of a transmitter breakdown, the systems in place ensure that the boxes continue recording for three months.

FINAL REPORT AND DETERMINATION

Interview with Jens Kjerfulf Petersen, Danish Shellfish Centre / DTU-Aqua

<i>MSC Fishery Assessment Stakeholder Interview Record</i>		
Assessment Team	Name	
Lead Assessor	Robert Wakeford	
P1 Team Member	Julian Addison	
P2 Team Member	Robert Wakeford	
P3 Team Member	Chris Grieve	
Meeting Location	DFPO, H.C. Andersens Boulevard 38, Copenhagen, Denmark.	
Date	12 th March, 2015	
Stakeholders name		Affiliation
Jens Kjaerulf Petersen		Danish Shellfish Centre / DTU-Aqua

a. Status

What is the nature of the organisations interest in the fishery (e.g. client / science / management / industry / eNGO, etc)?

DTU-Aqua is responsible for fisheries research in Denmark and providing scientific advice to the Danish Government on fisheries and marine environmental issues.

b. Stakeholder key issues

Jens Kjaerulf Petersen leads the Danish Shellfish team within DTU-Aqua that undertakes mussel surveys in the Limfjord and environmental impact assessments within the Natura 2000 sites. The key issues discussed included –

- The Limfjord mussel fishery is considered to be one of the best surveyed, managed and environmentally-impact assessed fisheries in the world.
- The mussel survey is conducted only in areas that are open to the fishery, and so could be improved. Much more detailed survey work is undertaken within the Natura 2000 sites.
- Environmental impact assessments have four key elements – benthic infauna, eelgrass, macroalgae and mussels.
- Mortality of mussels due to predation and hypoxia events are significantly greater than removals due to fishing.
- Only a few per cent of the overall distribution of mussels within the Limfjord are subject to fishing.
- DTU Aqua plays a key role in the decision-making framework as described above from the meeting with NaturErhvervstyrelsen – DTU Aqua assesses the annual fishing plan proposed by the industry organisation, CF, determines whether the plan is compatible with the conservation requirements of the Natura 2000 sites, and reports on their findings to the Advisory Committee.

FINAL REPORT AND DETERMINATION

- Detailed mapping of Natura 2000 sites permits the exclusion of mussel fishing from the most sensitive areas. Black box data provide the ability to enforce highly localised closed areas.
- There is no stock survey for cockles as the fishery is based on the capture in the dredge of cockles that have emerged onto the surface of the seabed. A stock survey using the standard fishing dredge would therefore provide information only on emergence patterns rather than stock size.
- Emergence patterns are probably driven by parasite-induced behaviour, density-dependent processes or spawning behaviour.
- DTU confirmed that the results of the SICA workshop on cockle stock status conducted in 2014 were still valid.

FINAL REPORT AND DETERMINATION

Written submissions received during site visit / assessment

No written submissions were received during the site visit.

FINAL REPORT AND DETERMINATION

Written submissions received during consultation on report

Technical Oversight Comments from Marine Stewardship Council

www.msc.org



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Date 01/12/2015

SUBJECT: MSC Review and Report on Compliance with the scheme requirements

Dear Amanda Stern-Pirlot

Please find below the results of our partial review of compliance with scheme requirements.

CAB	MRAG Americas, Inc (MRAG)
Lead Auditor	Amanda Stern-Pirlot
Fishery Name	DFPO Limfjord mussel and cockle fishery
Document Reviewed	Public Comment Draft Report

Ref	Type	Page	Requirement	Reference	Details	PI
18402	Minor	183	CR-27.10.6.1 v.1.3	Rationale shall be presented to support the team's conclusion	PI 3.1.2 Scoring issue b: The rationale presented does not provide evidence of the regularity that management seeks relevant information. This is required at both the SG80 and SG100 level for this PI.	3.1.2

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Page 1 of 3

FINAL REPORT AND DETERMINATION

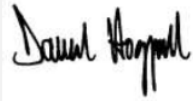
www.msc.org						
18418	Minor	71, 72	CR-27.12.1.3 v.1.3	27.12.1 The CAB shall determine if the systems of tracking and tracing in the fishery are sufficient to make sure all fish and fish products identified and sold as certified by the fishery originate from the certified fishery. The CAB shall consider the following points and their associated risk for the integrity of certified products: 27.12.1.3 The opportunity of substitution of certified with non-certified fish prior to or at landing fraudulent claims from within and outside their certified fishery.	The report states on page 71 that some of the mussel and cockle vessels in the UoC are also licenced to fish for oysters (also MSC certified) and that a mussel bycatch of up to 10% is permitted. The report must clarify whether the mussel bycatch is eligible to be sold as MSC certified. If the mussel bycatch is not MSC eligible, further detail is required on what systems are in place to ensure traceability and segregation of certified and non-certified mussels (e.g. where the mussel bycatch is offloaded, how mixing with certified mussels is prevented, whether vessels target oysters on the same trip as they target the mussels from this UoC, etc). Further, the report should clarify whether all harvest from the fishery is certified (e.g. Are all vessels part of the UoC? Is any non-certified catch landed at the eligible points of landing listed in Table 15?)	
18419	Minor	73	CR-27.12.2.1a v.1.3	27.12.2 If the CAB determines the systems are sufficient, fish and fish products from the fishery may enter into further certified chains of custody and be eligible to carry the MSC ecolabel. The CAB shall determine: 27.12.2.1 The scope of the fishery certificate, including the parties and categories of parties eligible to use the certificate and the point(s) at which chain of custody is needed. a. Chain of custody certification shall always be required following a change of ownership of the product to any party not covered by the fishery certificate.	The report suggests that CoC starts at the point of first purchase, although this could be stated more clearly. It is not indicated which activities take place at point of landing up until change of ownership (for example, transport). This makes it difficult to assess whether CoC certification may be required at an earlier stage, especially if non-certified catch is also landed at the same points of landing.	

This report is provided for action by the CAB and ASI in order to improve consistency with the MSC scheme requirements; MSC does not review all work products submitted by Conformity Assessment Bodies and this review should not be considered a checking service. If any clarification is required, please contact Sergio Cansado for more information.

FINAL REPORT AND DETERMINATION

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Best regards,
Fisheries Oversight Director
Dan Hoggarth
Marine Stewardship Council



cc: Accreditation Services International

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Page 3 of 3

FINAL REPORT AND DETERMINATION

MRAG Americas response to MSC Comments

Reference	MRAG Americas response
18402	<p>The minutes of the mussel Advisory Committee meetings, that also includes the cockle fishery (incl. oysters and clam fisheries) provides evidence of the regularity that management seeks relevant information.</p> <p>Information has been added to scoring issue 3.1.2b to support the scoring rationale sufficient to meet both SG80 and SG100. No changes to the original scoring have been made.</p>
18418	<p>Clarification has been provided in section 6.2c of this report to explain that all vessels within the oyster fishery are included within the mussels UoC and therefore all mussel bycatch is eligible to be sold as MSC certified.</p> <p>To date, all vessels within the oyster fishery also form part of the mussel and cockle UoC. A list of vessels within the mussel and cockle UoC is maintained online and regularly updated so buyers can check they have bought MSC certified product.</p>
18419	<p>Further information has been added within section 6.3d to clarify that transport by truck may occur between the point of landing and the factory. However, this is arranged by the factory, which retains full control over movement of MSC certified product prior to processing. Further to this, no non-certified catch is landed at the same point of landing, thus eliminating any risk of mixing.</p>

Appendix 4. Surveillance Frequency

The MSC Certification Requirements specify that after each certification, surveillance and re-certification the Conformity Assessment Body (CAB) shall determine the level at which subsequent surveillance of the fishery shall be undertaken.

The surveillance level required for this fishery has been calculated using the methodology set out in the MSC Certification Requirements. The fishery has a “surveillance score” of 0 for the mussel fishery UoC and 5 for the cockle fishery UoC (see Table 20).

Table 20: Surveillance Score for the Fishery

Criteria	Surveillance score	UoC1: Mussel Fishery	UoC2: Cockle Fishery
1. Default assessment tree			
Yes	0	0	-
No	2	-	2
2. Number of conditions			
Zero conditions	0	0	-
1-5 Conditions	1	-	1
>5 Conditions	2	-	-
3. Principle level scores			
≥ 85	0	0	-
< 85	2	-	2
4. Conditions on outcome PIs?			
Yes	2	-	-
No	0	0	0
Total score		0	5

The response to this score is set out in Table C4 of the MSC Certification Requirements (reproduced as Table 21). Fisheries that score 2 or more have a “Normal” surveillance level, requiring annual assessments throughout the period of certification. Fisheries that score 1 or 0 have the option of “remote” or “reduced” surveillance.

The mussel fishery UoC returns a score of 0

The cockle fishery UoC returns a score of 5

The MSC CRv1.3 specifies that under such circumstances the highest score should be adopted for all UoCs (CR at §27.22.1.3. Overall, a Normal surveillance schedule is therefore appropriate for this fishery. The surveillance activities required under this schedule are listed in the fishery surveillance plan for this fishery (Table 22).

FINAL REPORT AND DETERMINATION

Table 21: MSC Fishery Surveillance levels (from MSC Certification Requirements v1.3, Table C4).

			Years after certification or recertification			
Surveillance score	Surveillance level		Year 1	Year 2	Year 3	Year 4
2 or more	Normal surveillance		On-site surveillance audit	On-site surveillance audit	On-site surveillance audit	On-site surveillance audit & recertification visit
1	Remote surveillance	Option 1	Off-site surveillance audit	On-site surveillance audit	Off-site surveillance audit	On-site surveillance audit & recertification visit
		Option 2	On-site surveillance audit	Off-site surveillance audit	On-site surveillance audit	
0	Reduced surveillance		Review new information	On-site surveillance audit	Review new information	On-site surveillance audit & recertification visit

Table 22: Fishery Surveillance Plan for the Limfjord Mussel and Cockle Fishery Units of Certification

Score from CR Table C3	Surveillance Category	Year 1	Year 2	Year 3	Year 4
5	Normal	On-site	On-site	On-site	On-site

Appendix 5. Client Agreement

The client for this assessment, the Danish Fishermen's Producer Organisation (DFPO), has provided a formal commitment to MRAG Americas Inc. to implement the client action plan, meet the intent of the condition of certification, and comply with the surveillance schedule set out in this report.

Appendix 6. Objections Process

To be completed following the objections period for this fishery.