

MSC SUSTAINABLE FISHERIES CERTIFICATION

SSMO Shetland inshore brown & velvet crab and scallop fishery



Public Comment Draft Report

November 2017

Prepared For: **The Shetland Shellfish Management Organisation**

Prepared By: Acoura Marine Ltd

Authors: Rod Cappell, Bert Keus and Julian Addison

Contents

1	Executive Summary	6
2	Authorship and Peer Reviewers	8
2.1	Assessment Team.....	8
2.1.1	Peer Reviewers	9
2.1.2	RBF Training.....	10
3	Description of the Fishery.....	11
3.1	Unit(s) of Assessment (UoA) and Scope of Certification Sought	11
3.2	UoA and Proposed Unit of Certification (UoC)	11
3.3	Final UoC(s)	12
3.3.1	Total Allowable Catch (TAC) and Catch Data	12
3.3.2	Scope of Assessment in Relation to Enhanced Fisheries & ISBF	14
3.4	Overview of the fishery	14
3.4.1	Management of the fishery	14
3.4.2	Gears used	15
3.5	Principle One: Target Species Background	17
3.6	Principle Two: Ecosystem Background.....	50
3.7	Retained species.....	50
3.7.1	Creels.....	50
3.7.2	Scallop dredging.....	53
3.8	Bycatch (including discarding).....	55
3.8.1	Creels.....	55
3.8.2	Scallop dredging.....	56
3.9	Endangered, threatened or protected species (ETP).....	58
3.9.1	Interaction of creels with ETP species	58
3.9.2	Interaction of scallop dredging with ETP species	60
3.10	Habitat.....	60
3.10.1	Habitat distribution.....	60
3.10.2	Creel habitat interactions	65
3.10.3	Scallop dredging habitat interactions	67
3.11	Ecosystem impacts	69
3.12	Principle Three: Management System Background.....	70
3.12.1	Shetland Shellfish Management Organisation (SSMO)	71
3.12.2	Roles and responsibilities	72

4	Evaluation Procedure	74
4.1	Harmonised Fishery Assessment	74
4.2	Previous assessments.....	74
4.3	Assessment Methodologies	76
4.4	Evaluation Processes and Techniques	76
4.4.1	Site Visits	76
4.4.2	Consultations	76
4.4.3	Evaluation Techniques	78
5	Traceability	79
5.1	Eligibility Date.....	79
5.2	Traceability within the Fishery	79
5.3	Eligibility to Enter Further Chains of Custody	80
	Evaluation Results.....	81
5.4	Principle Level Scores	81
5.5	Summary of PI Level Scores	81
5.6	Recommendations	82
5.7	Determination, Formal Conclusion and Agreement	82
	References	84
	Appendices.....	91
	Appendix 1a – MSC Principles & Criteria	91
	Appendix 1.1 Performance Indicator Scores and Rationale	96
	Evaluation Table for PI 1.1.1 UoC 1 Brown Crab	96
	Evaluation Table for PI 1.1.2 UoC 1 Brown Crab	98
	Evaluation Table for PI 1.1.3 UoC 1 Brown Crab	103
	Evaluation Table for PI 1.2.1 UoC 1 Brown Crab	105
	Evaluation Table for PI 1.2.2 UoC 1 Brown Crab	109
	Evaluation Table for PI 1.2.3 UoC 1 Brown Crab	113
	Evaluation Table for PI 1.2.4 UoC 1 Brown Crab	116
	Evaluation Table for PI 1.1.1 UoC 2 Velvet Crab	119
	Evaluation Table for PI 1.1.2 UoC 2 Velvet Crab.....	123
	Evaluation Table for PI 1.1.3 UoC 2 Velvet Crab.....	129
	Evaluation Table for PI 1.2.1 UoC 2 Velvet Crab.....	134
	Evaluation Table for PI 1.2.2 UoC 2 Velvet Crab.....	139
	Evaluation Table for PI 1.2.3 UoC 2 Velvet Crab.....	143
	Evaluation Table for PI 1.2.4 UoC 2 Velvet Crab.....	147

Evaluation Table for PI 1.1.1 UoC 3 Scallop.....	150
Evaluation Table for PI 1.1.2 UoC 3 Scallop.....	152
Evaluation Table for PI 1.1.3 UoC 3 Scallop.....	156
Evaluation Table for PI 1.2.1 UoC 3 Scallop.....	158
Evaluation Table for PI 1.2.2 UoC 3 Scallop.....	162
Evaluation Table for PI 1.2.3 UoC 3 Scallop.....	166
Evaluation Table for PI 1.2.4 UoC 3 Scallop.....	171
Evaluation Table for PI 2.1.1 (UoC 1 Brown crab and UoC2 Velvet crab	174
Evaluation Table for PI 2.1.2 UoC 1 Brown crab and UoC2 Velvet crab.....	180
Evaluation Table for PI 2.1.3 UoC 1 Brown crab and UoC2 Velvet crab.....	183
Evaluation Table for PI 2.2.1 UoC 1 Brown crab and UoC2 Velvet crab.....	186
Evaluation Table for PI 2.2.2 UoC 1 Brown crab and UoC2 Velvet crab.....	189
Evaluation Table for PI 2.2.3 UoC 1 Brown crab and UoC2 Velvet crab.....	192
Evaluation Table for PI 2.3.1 UoC 1 Brown crab and UoC2 Velvet crab.....	195
Evaluation Table for PI 2.3.2 UoC 1 Brown crab and UoC2 Velvet crab.....	202
Evaluation Table for PI 2.3.3 UoC 1 Brown crab and UoC2 Velvet crab.....	205
Evaluation Table for PI 2.4.1 UoC 1 Brown crab and UoC2 Velvet crab.....	207
Evaluation Table for PI 2.4.2 UoC 1 Brown crab and UoC2 Velvet crab.....	210
Evaluation Table for PI 2.4.3 UoC 1 Brown crab and UoC2 Velvet crab.....	214
Evaluation Table for PI 2.5.1 UoC 1 Brown crab and UoC2 Velvet crab.....	217
Evaluation Table for PI 2.5.2 UoC 1 Brown crab and UoC2 Velvet crab.....	220
Evaluation Table for PI 2.5.3 UoC 1 Brown crab and UoC2 Velvet crab.....	223
Evaluation Table for PI 2.1.1 Scallop dredge fishery (UoC3)	227
Evaluation Table for PI 2.1.2 Scallop dredge fishery	231
Evaluation Table for PI 2.1.3 Scallop dredge fishery	234
Evaluation Table for PI 2.2.1 Scallop dredge fishery	237
Evaluation Table for PI 2.2.2 Scallop dredge fishery	242
Evaluation Table for PI 2.2.3 Scallop dredge fishery	246
Evaluation Table for PI 2.3.1 Scallop dredge fishery	248
Evaluation Table for PI 2.3.2 Scallop dredge fishery	252
Evaluation Table for PI 2.3.3 Scallop dredge fishery	257
Evaluation Table for PI 2.4.1 Scallop dredge fishery	260
Evaluation Table for PI 2.4.2 Scallop dredge fishery	266
Evaluation Table for PI 2.4.3 Scallop dredge fishery	271
Evaluation Table for PI 2.5.1 Scallop dredge fishery	274

Evaluation Table for PI 2.5.2 Scallop dredge fishery	277
Evaluation Table for PI 2.5.3 Scallop dredge fishery	280
Evaluation Table for PI 3.1.1	284
Evaluation Table for PI 3.1.2	290
Evaluation Table for PI 3.1.3	293
Evaluation Table for PI 3.1.4	296
Evaluation Table for PI 3.2.1	297
Evaluation Table for PI 3.2.2	299
Evaluation Table for PI 3.2.3	303
Evaluation Table for PI 3.2.4	307
Evaluation Table for PI 3.2.5	309
Appendix 1.3 Conditions	310
Table A1.3.1: Condition 1 UoC2 (velvet crab) (Non-Binding).....	310
Table A1.3.2: Condition 2 All UoCs (brown crab, velvet crab, scallop)	311
Appendix 2 Peer Review Reports.....	314
Peer Reviewer A.....	314
Peer Reviewer B.....	341
Appendix 3 Stakeholder submissions	358
Appendix 4 Surveillance Frequency	359
Appendix 5 Objections Process.....	360

1 Executive Summary

- » This report provides details of the MSC assessment process for the SSMO Shetland inshore brown & velvet crab and scallop fishery for The Shetland Shellfish Management Organisation. The assessment process began on 18th August 2016 and was concluded (to be determined at a later date).
- » A comprehensive programme of stakeholder consultations were carried out as part of this assessment, complemented by a full and thorough review of relevant literature and data sources.
- » A rigorous assessment of the wide ranging MSC Principles and Criteria was undertaken by the assessment team and a detailed and fully referenced scoring rationale is provided in the assessment tree provided in **Appendix 1.1** of this report.
- » The **Target Eligibility Date** for this assessment is Eligibility Date.

The assessment team for this fishery assessment comprised of Rod Cappell who acted as team leader and primary Principle 3 specialist; Bert Keus who was primarily responsible for evaluation of Principle 2 and Julian Addison who was primarily responsible for evaluation of Principle 1. Paul MacIntyre was the traceability expert advisor.

Client strengths

- » The limited by-catch and very limited interaction with ETP species.
- » The good information on fishing activities in relation to habitats, enabling management of impacts.
- » The ongoing close control of effort in the fishery in line with stock indicators.
- » The inclusive nature of management decision-making in the fisheries and the resulting good levels of compliance with regulations.

Client weaknesses

- » Three out of the four stock indicators for the velvet crab fishery are currently below the target reference point necessitating a re-building strategy for the fishery.
- » There is no formal peer review of the stock assessment for all three species.

Determination

- » On completion of the assessment and scoring process, the assessment team concluded that the SSMO inshore brown crab and scallop fisheries should be re-certified under the MSC standard, but that the velvet crab fishery should not be re-certified under the MSC standard.

Conditions & Recommendations

- » PI 1.1.3 (Stock rebuilding of the velvet crab fishery) and PI 1.2.4 (Assessment of Stock Status – all UoCs) scored less than the unconditional pass mark, and therefore triggered a non-binding condition to be placed on the fishery. [PI 1.1.1 (Stock Status)

also scored less than the unconditional pass mark for the velvet crab fishery, resulting in the triggering of PI 1.1.3 (Stock Rebuilding) but the scoring of PI 1.1.3 for the velvet crab fishery fulfils the requirement of a condition against PI 1.1.1 as set out in recent new Guidance for the MSC Certification Requirements.] Full explanation of the condition is provided in **Appendix 1.3** of the report, but in brief, the area covered by this condition is:

- › Condition 1 (Velvet crab fishery only) 1.1.3. There should be evidence that the rebuilding strategy is rebuilding stocks.
 - › Condition 2 (All UoCs) 1.2.4: The stock assessment should be subject to peer review.
- » In addition, the assessment team made three recommendations. As these are not the result of a failure to meet the unconditional pass mark, they are non-binding; however in the opinion of the assessment team, they would make a positive contribution to ongoing efforts to ensure the long term sustainability of the fishery. Details of these recommendations are provided in **Section 6.4** of this report.

For interested readers, the report also provides background to the target species and fishery covered by the assessment, the wider impacts of the fishery and the management regime, supported by full details of the assessment team, a full list of references used and details of the stakeholder consultation process.

Acoura Marine Ltd. confirm that this fishery is within scope.

Authorship and Peer Reviewers

2.1 Assessment Team

All team members listed below have completed all requisite training and signed all relevant forms for assessment team membership on this fishery.

Assessment team leader: Rod Cappell

Primarily responsible for assessment under Principle 3

Rod Cappell is Director with Poseidon based in Northern Ireland and has 20 years of experience in the maritime sector. Rod holds degrees in marine biology, marine resource development and a post-graduate qualification in environmental economics. Recent work includes exploring the economic impact of the CFP reform's discard ban. Rod has also worked on a range of European fisheries projects including a review of effort management regimes, Regulatory Impact Assessments and evaluations of EC policy, including CFP reform, cessation measures and EFF funding.

Rod's MSC experience has included a variety of UK and European fisheries at pre-assessment and main assessment level. His completed main assessments include Greenland lumpfish fishery, Dutch flatfish fisheries, hand-raked cockles, Scandinavian *Nephrops* fisheries, whitefish in the Barents Sea and various mussel fisheries. His surveillance experience continues with these fisheries and extends to Greenland shrimp & North Sea Haddock. Rod is also providing support and benchmarking for Fishery Improvement Plans in the UK and in China.

Expert team member: Bert Keus

Primarily responsible for assessment under Principle 2

Bert Keus is an independent consultant based in Leiden, the Netherlands. He holds degrees in biology and law, and has previously held the position of Head of the Environmental Division of the Dutch Fisheries Board, and research fellow with the fisheries division of the Agricultural Economics Research Institute of Holland (LEI-DLO).

Over the years 2003 and 2004 he managed fishing and processing companies in the Gambia handling fish from industrial and artisanal fisheries, and he maintains his contacts with the Gambian seafood industry.

In addition, however, he has long association with the shellfish fisheries of the Wadden Sea and neighbouring areas of northwest Europe, and he has been involved in efforts to achieve MSC certification of the North Sea brown shrimp fishery – acting as technical advisor to this multi-stakeholder initiative, and sitting on the project's management board.

Through this work and several other MSC certifications he has become particularly familiar with the MSC certification process (and indirectly with the GASS/DD assessment methodology). His research work on fish biology and population dynamics is widely published, and between the years 1998 and 2003 he was a Member of the European Sustainable Use Specialist Group, Fisheries Working Group of IUCN.

Expert team member: Julian Addison

Primarily responsible for assessment under Principle 1

Dr 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 experienced shellfish management approaches in North America as a visiting scientist at DFO in Halifax, Nova Scotia and at NMFS in Woods Hole, Massachusetts. 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 has recently completed or is currently undertaking 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, the Nephrops fishery in the Skagerrak and Kattegat, the Swedish shrimp fishery in the Skagerrak and Norwegian Deep and the Eastern Canada offshore lobster fishery. He has also undertaken various MSC pre-assessments and surveillance audits and has carried out peer reviews of MSC assessments in both Europe and North America 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.

Expert advisor: Paul Macintyre

Paul started working in the Aquaculture sector in 1975, managing salmon farms and processing factories for a large multi-national before transferring in 1990 to aquaculture audit and inspection.

During the last 25 years Paul has carried out over 3,000 audits and inspections of aquaculture and fish processing operations across the UK salmon and trout industry and internationally in the cod, tilapia and shrimp aquaculture sectors. Paul's primary interest is salmonids however his role as Aquaculture Director with Acoura Marine has involved him in the development and trial audit of a number of new aquaculture and agricultural standards. Paul is a qualified Lead Assessor and approved to audit BRC, MSC / ASC Chain of Custody, GlobalGAP, Organic Aquaculture, Freedom Food, Label Rouge, Best Aquaculture Practices, ASC Salmon and Friend of the Sea. Paul also audits to UK and French retailer standards.

2.1.1 Peer Reviewers

Peer reviewers used for this report were Ian Scott and Ian Knuckey. A summary CV for each is available in the **Assessment downloads** section of the fishery's entry on the MSC website.

Ian Scott.

In a career spanning 40 years, the main activity of Ian has been in fisheries management. In 1979, he was co-author (with Dr D.I. A. Steele) of one of the first fisheries management

plans drafted for a fishery in the EU (the Highland Region of Scotland). In 1991, he was the co-author of one of the first drafts for a fishery management plan in Latin America; the small pelagics fishery in Ecuador (with Dr K. Patterson). He has worked on fishery management issues in a significant number of countries; as Government adviser on fisheries policy and management in Ecuador, Turkey, Montenegro, Serbia, the Dominican Republic, Yemen and Chile. He has covered fisheries management, fleet development, the need for scientific research and fishery related environmental issues. Ian has work as coordinator and P3 specialist on a large number of MSC assessments as lead assessor and P3 specialist including a number that are on-going. In addition, he has completed a large number of pre-assessments. He is a certified auditor for the MSC chain of custody. Ian is trained in the use of the Risk Based Framework (RBF).

Ian Knuckey

Dr Ian Knuckey has a PhD in fishery population dynamics and 30 years involvement as a fisheries scientist in Australia and overseas working across coastal and offshore fisheries for teleosts, sharks and invertebrates in both temperate and tropical waters. Ian is the Chair and Scientific member of many Australian Resource Assessment Groups and Management Advisory Committees involving fish, sharks, lobster, scallops and squid. Ian has been instrumental in establishing fisheries monitoring and observer programs around Australia. He has also been the driving force behind the design and implementation of fishery independent surveys in a range of fisheries and understands the scientific rigour required to provide sound advice on population structure and stock abundance. Ian is particularly experienced in working on the design of monitoring programs, assessments and harvest strategies for data-poor fisheries. Ian has run a number of projects on the development and review of harvest strategies and their application to commercial fisheries. He is experienced in the range of data collection and analysis techniques used for conducting surveys and as input into stock assessments. He is often contracted to run training courses on the concepts of stock assessment and harvest strategies for fishery managers and industry and has produced a range of videos on these subjects. Ian also has had extensive experience in bycatch monitoring and analysis techniques, and fisheries bycatch mitigation. Ian is across the many issues associated with harvest strategies that include economic as well as biological targets and reference points to manage fisheries. Ian has worked as an MSC assessor and reviewer on both offshore and coastal fisheries.

2.1.2 RBF Training

RBF was not used for this fishery assessment.

2 Description of the Fishery

2.1 Unit(s) of Assessment (UoA) and Scope of Certification Sought

2.2 UoA and Proposed Unit of Certification (UoC)

(ALL REPORTS EXCEPT PCR)

Acoura Marine Ltd confirm that the fishery is within scope of the MSC certification sought following the assessment as defined below.

UoA 1:

Species:	Brown crab (<i>Cancer pagurus</i>)
Stock:	Shetland Inshore Brown crab
Geographical area:	FAO Statistical Area 27, in EU waters - ICES Area IVa which is within 6nm of Shetland.
Harvest method:	Creel/pots (static gear)
Client Group:	The Shetland Shellfish Management Organisation (SSMO)
Other Eligible Fishers:	None

UoA 2:

Species:	Velvet crab (<i>Necora puber</i>)
Stock:	Shetland Inshore Velvet crab
Geographical area:	FAO Statistical Area 27, in EU waters - ICES Area IVa which is within 6nm of Shetland.
Harvest method:	Creel/pots (static gear)
Client Group:	The Shetland Shellfish Management Organisation (SSMO)
Other Eligible Fishers:	None

UoA 3:

Species:	King scallop (<i>Pecten maximus</i>)
Stock:	Shetland Inshore King scallop
Geographical area:	FAO Statistical Area 27, in EU waters - ICES Area IVa which is within 6nm of Shetland
Harvest method:	Scallop dredge (mobile gear)
Client Group:	The Shetland Shellfish Management Organisation (SSMO)
Other Eligible Fishers:	None

The proposed Unit Of Certification for this fishery is as below:

UoC 1:

Species:	Brown crab (<i>Cancer pagurus</i>)
Stock:	Shetland Inshore Brown crab
Geographical area:	FAO Statistical Area 27, in EU waters - ICES Area IVa which is within 6nm of Shetland.

Harvest method:	Creel/pots (static gear)
Client Group:	The Shetland Shellfish Management Organisation (SSMO)

UoC 2:

Species:	Velvet crab (<i>Necora puber</i>)
Stock:	Shetland Inshore Velvet crab
Geographical area:	FAO Statistical Area 27, in EU waters - ICES Area IVa which is within 6nm of Shetland.
Harvest method:	Creel/pots (static gear)
Client Group:	The Shetland Shellfish Management Organisation (SSMO)

UoC 3:

Species:	King scallop (<i>Pecten maximus</i>)
Stock:	Shetland Inshore King scallop
Geographical area:	FAO Statistical Area 27, in EU waters - ICES Area IVa which is within 6nm of Shetland
Harvest method:	Scallop dredge (mobile gear)
Client Group:	The Shetland Shellfish Management Organisation (SSMO)

This Unit of Assessment was used as it is compliant with client wishes for assessment coverage and in full conformity with MSC criteria.

2.3 Final UoC(s)

(PCR ONLY)

The final Unit Of Certification for this fishery is as defined below. This has not changed throughout the process. Alternatively provide rationale for why this has changed.

Species:	
Stock:	
Geographical area:	
Harvest method:	
Client Group:	
Other Eligible Fishers:	

2.3.1 Total Allowable Catch (TAC) and Catch Data

Table 1. TAC and Catch Data

Total TAC for most recent fishing year (2016):		No TAC set for all UoCs
Unit of Certification share of the total TAC established for the fishery in most recent fishing year*		
Brown Crab	UoC 1	N/A

Velvet crab	UoC 2	N/A
Scallops	UoC 3	N/A
Client share of the total TAC established for the fishery in most recent fishing year:		100% of Shetland inshore catch (no TAC set)
Total greenweight catch taken by the client group in the two most recent calendar years:		Brown Crab (tonnes) 2015 473.4 2016 263.6 Velvet Crab (tonnes) 2015 127.2 2016 102.0
		Scallops (no. of shells) 2015 3,691,033 2016 3,636,756

2.3.2 Scope of Assessment in Relation to Enhanced Fisheries & ISBF

The fisheries under assessment are not enhanced and all target species are native to the area.

2.4 Overview of the fishery

2.4.1 Management of the fishery

The Shetland Islands Regulated Fishery (Scotland) Order (also known as a Regulating Order) came into force in 1999. The Shetland Shellfish Management Organisation (SSMO) was set up in 2000 and was granted the legal right to manage inshore commercial shellfish fisheries under the Regulating Order. There have since been another two Regulating Orders with the current one being conferred on SSMO until 2028.

All of the fishing covered in this assessment takes place within 6nm of the Shetland Islands – the area covered by the Regulating Order. The inshore shellfish fishery in Shetland is of great historical, cultural and above all, current economic and social importance. For example, landings in 2014 into Shetland was worth (at the point of first sale) £1.885m for scallops, and around £1.252m for velvet and brown crabs.

SSMO manages the commercial shellfish fisheries between tide line and the 6 mile limit around the coast of Shetland. These fisheries are for lobsters, crabs, scallops, queens, whelks, clams, razorshells, cockles, mussels and oysters. Amongst other things, the Regulating Order gives the SSMO the power to impose restrictions and regulations, to issue licences and the right to set tolls.

Vessels

There are currently a total of 101 vessels holding fishing licenses for one or more of the species under assessment. SSMO publishes a current list of vessels operating under licence in the fishery. These are all small scale (below 12m) vessels that operate with either creel (pots) or dredge gear or occasionally both at different times of the year. All vessels require a licence from the SSMO in addition to the standard fishing licence provided by the Scottish Government.

Small inshore vessels, which make short daily fishing trips, are typically less technologically equipped than larger fishing vessels. Fish finding sonar is of little value for shellfish species targeted with static gear. Echo sounders and GPS have been common for many years but more recent advances allows data from the echo sounder to be used to build up a more comprehensive map of the seabed, which can be presented on the GPS chart plotter, thus providing the fishermen with a more detailed self-surveyed seabed chart. The position of fleets can readily be plotted on the electronic chart, meaning that fishermen can increasingly target particular seabed features, such as crevices, with static gear. It should be noted that the technological advances described above occurred before the SSMO started to collect detailed fisheries data from fishermen's log books.

2.4.2 Gears used

Creels/Pots

Brown and velvet crab and lobster are caught using static gear – pots or ‘creels’ (Figure 2-1). Fleets of baited pots are placed on the seabed. Fishermen typically haul pots every 24hrs (weather permitting) to harvest any catch and replace bait. Gear will often be re-set in the same place for several days – although there is typically sufficient deck space to allow one or two fleets to be moved to new locations.

Figure 2-1 typical creel used in velvet and brown crab fishery



source: Chapman et al, 1977

The target crustaceans crawl into the pots voluntarily, but the pot is designed in such a manner that the entrance serves as a non-return device. Traditionally pots have been wood, but in recent years pots are metal, or increasingly plastic, with nylon netting. There have been no significant changes in the design of pots since the SSMO started to collect detailed fisheries data from fishermen’s log books.

Traditionally fleets of pots would have been hauled by hand but today even the smallest commercially operating boats are equipped with hydraulic haulers. This method of fishing has a very low level of negative interaction with the seabed habitat. Mesh size allows juveniles to escape and undersized species can typically be released alive when the catch is sorted. Occasionally gear may be lost, particularly after prolonged periods of poor weather, or if gear becomes entangled with passing shipping or mobile fishing gears. There is therefore a small risk of lost pots continuing to fish and thus "ghost fish".

Dredges

Scallops are caught using mobile gear-toothed spring-loaded (Figure 2-2). The dredge consists of a triangular frame leading to a mouth opening 0.83 m wide, a tooth bar with a distance of 65 mm between teeth, length of teeth of approximately 8-10 cm long, and a bag of steel rings (75 mm internal diameter) and netting back (75 mm stretched mesh). The tooth bar rakes through the sediment lifting out scallops and the spring-loaded tooth bar swings back, allowing the dredge to clear obstacles on the seabed. The compression in the springs changes and is set up in order to work in stony grounds and to reduce incidence of stones in the dredge. The dredges are held in series on two beams, which are fished on each side of the vessel.

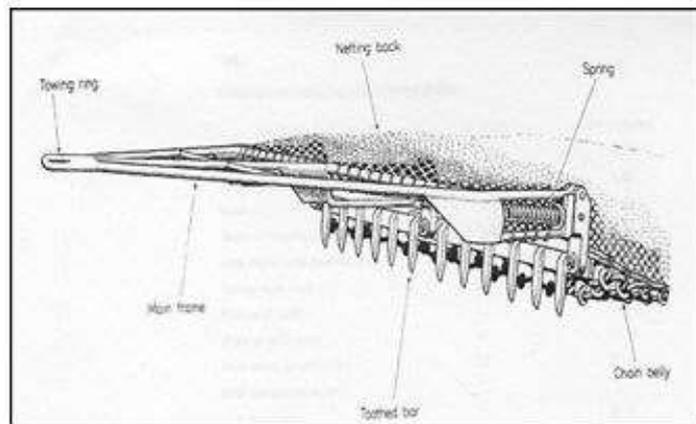
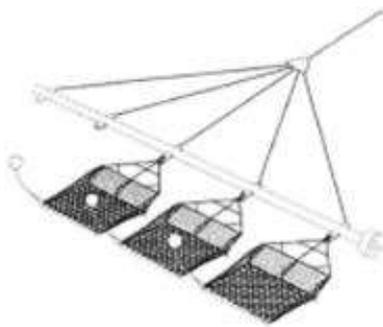
There are a number of potential impacts of dredging activity on the wider marine ecosystem and seabed habitats. These impacts may include:

- » bringing stones to the surface
- » sediment compaction and chemical changes
- » damage to reef and similar structures
- » non-catch mortalities
- » increased vulnerability to predation

The physical effects diminish with time, depending on the level of natural disturbance, influenced by exposure to prevailing weather conditions and tidal strength, depth and sediment type. The degree of dredge effect will be influenced by a number of factors, including: the dredge type, the width and weight, sediment type, number of dredges operated, methods of fishing and whether any form of deflector or rakes are used.

The dredge trawlers used in the Shetland inshore fishery are relatively smaller, with fewer dredges and lighter gear compared with vessels more typically associated with scallop dredging on the mainland of Scotland. That said there remains the potential for significant habitat impact (see **Section 3.10.3** on habitat impact of dredging and management strategies).

Figure 2-2 Dredges on a beam trawl (left) and spring loaded scallop dredge design (right)



source: Chapman et al, 1977

2.5 Principle One: Target Species Background

3.5.1 Biology and life history of the species

3.5.1.1 Brown crab

The brown crab (*Cancer pagurus*) is a large decapod crustacean distributed from Norway throughout the North Sea and English Channel to the coast of Portugal, and is found all around the Scottish coast from the shallow sub-littoral into offshore waters to depths exceeding 100 metres. Brown crabs inhabit rocky reefs, mixed coarse grounds and soft sediments (muddy sand) particularly on the offshore grounds (Marine Science Scotland, 2017). Brown crab may live for 15 years or more and recruit to the fishery at 140 mm carapace width (CW) probably between ages 4-6 years. Moulting may occur each year in smaller crabs but less often as size increases. Mating takes place when the female crab is soft after moulting (Brown and Bennett, 1980) and the male guards the female for a period of time prior to the female moult. Female brown crabs in Scottish waters typically mature between 130 and 150 mm CW (Marine Science Scotland, 2017). Eggs are spawned onto the pleopods where they are carried over winter (Thompson *et al.*, 1995). The hatching season is prolonged and larvae may be found during spring, summer and autumn depending on latitude and water temperatures. Each female brown crab may hatch between 1-4 million eggs (Bennett, 1995). Post-larvae are known to settle inshore and juvenile crabs are more common in shallow than in deep water. Mature female adult crabs undertake extensive migrations of hundreds of kilometres, which may be associated with the reproductive cycle, with larvae drifting back in oceanographic currents to the adult's original location (Eaton *et al.*, 2003). Male adult crabs tend not to undertake migrations. Adults feed primarily on benthic invertebrates such as bivalves, small crustaceans and barnacles.

Detailed reviews of the biology and life history of *Cancer pagurus* can be found in Edwards (1979) and Neal and Wilson (2008).

3.5.1.2 Velvet crab

The velvet crab (*Necora puber*) is a decapod crab species found in north-west Europe from Norway to the Shetlands and south to Spain and the Canary Isles and in the Mediterranean off the coast of Malta. It is a fast moving and aggressive species, most commonly found on rocky substrates down to depths of about 25m (Marine Science Scotland, 2017). Velvet crabs feed on both animal and algal material, with brown algae being the dominant item found in gut content analysis. Females grow more slowly and to a smaller maximum size than males, differences which are likely to be due to reduced growth during the female's egg bearing phase. Growth is highly seasonal and moulting generally occurs from June to August for males and females. Velvet crabs typically live for four to six years and recruit to the fishery at around age three (65 mm CW). They reach maturity at a carapace width of approximately 50 mm, although size at maturity varies according to location. This may reflect differences in water temperature or other factors such as population density, genetic make-up and fishing pressure. Mating occurs after females have moulted, when their shell is still soft. Fecundity studies carried out in Shetland have shown estimated fecundities

(numbers of eggs produced) ranging from 5,000 to 278,000 per female. In contrast to brown crabs, velvet crabs are not thought to undertake extensive migrations and rarely move further than a few hundred metres.

A review of the biology and life history of *Necora puber* can be found in Tallack (2002).

3.5.1.3 Scallop

The scallop (*Pecten maximus*) occurs along the European Atlantic coast from northern Norway, south to the Iberian Peninsula, and is found from the low tide mark to over 100 m, but is most common in waters of 20-70 m. Scallops are found on clean firm sand and fine gravel and in currents which provide good feeding conditions. Scallop can be present in densities of 5-6 m⁻² although a more normal density is 0.2 m⁻². In Scottish waters the life span of *Pecten maximus* is 20 years or more (Marine Science Scotland, 2014), but the oldest specimens normally reach 10-11 years of age in exploited populations. The most abundant year classes in exploited populations are generally 4-6 years old. The life cycle can be divided into the free swimming larval phase and the largely sedentary juvenile and adult phase. The scallop is a filter feeder, drawing in seawater, which is filtered through the gills. It is hermaphroditic, with the gonad divided into a proximal white testis and a distal deep orange-red ovary. In general the potential spawning season is long, from April to September or October, but its timing and duration vary geographically. During spawning gametes are released to the water column and fertilisation occurs externally. Fertilisation success is related to the density of scallop on the seabed as is the case with most species with external fertilisation. The larval development period is 2-3 weeks. Larvae survival is promoted by good concentration and quality of food in the water column. This condition is dependent on physical conditions such as temperature, nutrient supply and light penetration.

Recruitment is usually unpredictable as it depends not only on successful spawning and larval production but also on retention of larvae or transport of larvae into the area suitable for settlement. Settlement in a particular area may be unpredictable leading to unstable age structure. As a consequence of this, scallop beds frequently show a regional separation of year classes and spatial variability in age structure. On settlement scallops secrete a byssus thread after metamorphosis for attachment to the substrate on the seabed. Recently settled scallops have been found on stones, empty shells, bryozoans, hydroids and the algae *Laminaria saccharina* and *Desmarestia*. Scallops generally lose the byssus soon after metamorphosis and few scallops larger than 15 mm shell length are found attached. Scallops are usually recessed into the sediment so that the upper (left flat shell, the right shell is cupped) valve is level with or just below the surface of the sediment. The juvenile and adults are sedentary and they swim in response to stimulation by light, water currents, vibration, fishing gears or predators.

Detailed reviews of the biology and life history of *Pecten maximus* can be found in Mason (1983), Brand (1991), Shumway and Parsons (2005) and Marshall and Wilson (2008).

Brown crab, velvet crab and scallop are not considered as key low trophic level (LTL) species as defined by the MSC Certification Requirements v1.3.

3.5.2 Stock delineation

The geographic area of all units of certification is confined to the Shetland 6nm inshore waters. Velvet crabs and scallops in Shetland have a coastal distribution within the 6nm and therefore the area covered by the Unit of Certification can reasonably be considered to be a stock which is not connected to other velvet crab and scallop stocks in Scotland. In contrast, brown crab is considered a 'shelf' species that is distributed across quite large geographical areas and multiple habitats. These factors compound to make determination of geographic stock boundaries difficult for brown crab. Leslie *et al.* (2008) carried out a tagging experiment in Shetland whereby 2000 brown crabs were tagged to investigate migration patterns of brown crab. Recapture results showed migration of individuals into Orkney waters, but individuals were mostly recaptured in Shetland waters. A more intensive tag and release program involving more than 15,000 specimens conducted by Marine Scotland Science in Orkney waters in 2009-2010 did not result in any reported recaptures within Shetland waters, with movements tending to be within Orkney or to the west. The directional movement of some female brown crab toward Orkney in the Shetland tagging study may suggest a seasonal migration against the prevailing current to ensure that larvae are returned to near-shore nursery areas. Females spawning in Shetland are likely to only supply Shetland, and therefore the level of fishing activity within that area may have an influence on subsequent recruitment in Shetland. However, gravid female brown crabs display a drastically reduced catchability and are not marketable. Gravid females that are captured are returned live to the water in all fisheries and as discard mortality for this species is negligible, presumably continue to contribute to reproductive output that year. Movement of tagged individuals to the west from Orkney, against the prevailing shelf current may indicate a similar larval supply in that area.

In this assessment the Shetland brown crab stock has been defined as the stock distributed in Shetland inshore waters (6 nm). Whilst adult female brown crab make extensive migrations of the order of hundreds of kilometres, there is evidence of lack of significant connectivity between brown crab populations of Shetland and other geographic areas and negligible levels of fishing activity outside the Shetland Shellfish Management Area (Robinson and Leslie, 2010), and therefore the inshore Shetland stock can be defined as a 'stock unit'.

3.5.3 Harvest strategy

3.5.3.1 EU and National Management

As the UK is a Member State of the European Union (EU), the UK Government must ensure that the management of all UK fisheries are consistent with the objectives of the European Union's Common Fisheries Policy (CFP) (*Regulation (EU) No 1380/2013*). Implementation of the CFP at a national level is carried out through the individual Member States, and responsibility for inshore fisheries management in Scottish waters is devolved from the UK to the Scottish Government. The Scottish Government has powers to take non-

discriminatory fishery conservation measures within 12 miles, and has set out its vision for inshore fisheries in the Scottish Inshore Fisheries Strategy (Marine Scotland, 2015), which includes implementing effective assessment methodologies for fishing at Maximum Sustainable Yield (MSY). The main tools available to Scottish Ministers to regulate fisheries in these areas are through restrictive licensing or other measures set out in the Inshore Fishing (Scotland) Act 1984. In addition, Scottish Ministers have the power to introduce Regulating Orders to manage inshore fisheries out to 6 nautical miles under the terms of the Sea Fisheries (Shellfish) Act 1967. A Regulating Order is in place for shellfish fisheries in Shetland waters, further devolving local management.

3.5.3.2 Local management

It is under the Sea Fisheries (Shellfish) Act 1967 that the Shetland Islands Regulating Order 2012 is granted to the Shetland Shellfish Management Organisation (SSMO). Regulating Orders permit the grantee to remove public right of fishing commercially for specified species within specified areas and instead issue a limited number of licences, and therefore gives responsibility for managing a sustainable fishery to local stakeholders.

The Shetlands Regulating Order extends until 2028 and the SSMO has responsibility for managing the commercial shellfish fisheries in line with the conditions of the Regulating Order. (The Regulating Order includes the brown crab, velvet crab and scallop fisheries, but also covers oysters, mussels, cockles, clams, lobsters, queens, whelks and razorshells) The SSMO has developed a Management Plan, the aim of which is “to continue to maintain sustainable and well managed shellfish fisheries operating within a healthy marine environment.” Two key objectives of the Management Plan that underpin the harvest strategy are that stocks will be maintained at biologically sustainable levels, and that fishing activity will be managed in an environmentally responsible manner. To achieve these two objectives, the Management Plan seeks to:

- Establish biologically relevant reference points for commercially-exploited stocks
- Develop a coherent and effective harvest control strategy which utilise the best available information
- Implement effective management measures that are enforceable
- Put in place an effective code of conduct for all fishermen
- Maintain an effective spatial management plan
- Carry out appropriate monitoring

The Regulating Order grants the SSMO the legal right to manage commercial fisheries for lobsters, crabs, scallops, queens, whelks, razorshells, cockles, mussels and oysters within the area between the low water mark and the six mile limit around Shetland. The order enables the SSMO to impose restrictions and regulations, to issue licences and to impose tolls. For the purposes of this MSC certification report, only the regulations which apply to brown crab, velvet crab and scallop are relevant.

3.5.3.3 Regulations under the SSMO's harvest strategy

The key regulation is a control on the overall fishing effort underpinned by the SSMO Licencing Policy which details procedures to ensure that the allocation of licences is fair and transparent and guidance on how licences can be renewed, how licences can be transferred to replacement vessels, and how new entrants can obtain licences if the harvest control rules permit the issue of additional licences. The fisheries are therefore essentially limited entry fisheries and all measures are geared towards limiting the overall fishing effort.

All licence holders must make the vessel and its fishing gear available for inspection at any time. There is a Memorandum of Understanding (MOU) between the SSMO and Marine Scotland Compliance which governs the monitoring, control and surveillance of the Shetland inshore shellfish fleet. Log books recording catches and fishing effort must be completed and submitted in a timely fashion.

In addition to the limited entry licensing policy which controls the level of fishing effort, there are a number of other management regulations. These include:

- a maximum size of vessel of 17m overall length unless fishing exclusively for scallops
- a maximum length of tow bar and maximum number of dredges for scallop fishing, and the prohibition of the use of 'French dredges'
- scallop dredging is prohibited outside the hours of 0600 to 2100
- scallop fishing is not permitted in closed areas as set out in the SSMO Spatial Management Plan
- an overall limit of 600 creels of which only 240 creels may target velvets
- escape gaps of dimensions that will allow the escape of velvet crabs must be incorporated in to all but 240 creels used in the creel fisheries (essentially setting a maximum creel limit of 240 for the velvet crab fishery)
- a velvet crab closed season for a minimum period of 8 consecutive weeks between June and October (timing varies between fishing areas based on moult period)
- compliance with minimum landing sizes (MLS) for brown crab of 140 mm carapace width (CW), 70mm CW for velvet crabs, and 100 mm for scallops.

In addition to the formal regulations summarised above, all vessels must conform with the SSMO Code of Conduct which provides principles and standards relating to the sustainable exploitation of resources, protection of endangered, threatened and protected (ETP) species and habitats, good governance, and the fishing operations and care of the catch. Examples of actions required by licence holders within the Code of Conduct that relate to the harvest strategy are that fishermen are requested to take part in ongoing data collection programmes and research projects which contribute valuable information to the stock assessment process, the loss of any fishing gear should be reported on the log sheets, and that care must be taken to return all undersized target and bycatch species to the water quickly and carefully to reduce damage to individuals and maximise survival rates.

A key element of the harvest strategy for the brown crab, velvet crab and scallop fisheries is the assessment of stock status against pre-determined reference points, and the

implementation of harvest control rules (HCRs) if the reference points are exceeded. A full description of the reference points, their underlying rationale and the HCRs is given below in section 3.5.5.

3.5.3.4 Review of Harvest Strategy

The SSMO Management Plan and the harvest strategy for the brown crab, velvet crab and scallop fisheries are regularly reviewed by the SSMO board which meets 10 times each year. In addition to the SSMO board, there is also an Advisory Group, chaired by a marine scientist from the NAFC Marine Centre in Shetland, which meets on a regular basis and which advises the SSMO Board. A key role of the Advisory Group is to undertake regular reviews of all elements of the harvest strategy, and advise the SSMO board if any changes are necessary. The minutes of SSMO board meetings provide examples of revisions of the harvest strategy, including revisions to the maximum number of creels, the requirement to incorporate escape gaps in all but 240 creels to limit effort on the velvet crab fishery, and recent changes to the reference points and the consequent harvest control rules if those reference points are exceeded. Following agreement at the SSMO board, the SSMO Management Plan is updated regularly.

3.5.4 Information and Data Collection

A key element of the monitoring programme for these fisheries is that all licence holders must complete log books providing information on landings, discards and fishing effort. The log sheets must be filled in daily. Failure to submit log sheets within the prescribed period may result in the SSMO suspending the licence.

For the creel fishery, fishing area (5x5 nm SSMO square), soak time, the type of gear used, the species targeted, the number of creels hauled and the numbers or weight of landed catch must be recorded (Figure 2-3). In addition, the numbers discarded and the reasons for discarding (e.g. undersized, soft-shelled etc.) and interactions with ETP species must also be recorded. The requirement to record the target species allows the calculation of landings per unit effort (LPUE) to be based only for those creels targeted at each individual species, i.e. to ensure that bycatch of the species from creels targeted at other species are not included in the calculation of LPUE.

Figure 2-3 Log book sheet for the creel fishery. (source: NAFC Marine Centre)



Shetland Shellfish Management Organisation Logsheet

Vessel Name

SSMO Licence No.

LS No. **68851**

Date		Velvet Crab		Brown Crab		Lobster		Buckles		Green Crab		Interactions? <input type="checkbox"/> General Comments, Observations and interactions with ETP Species (eg Skuas, Ravens, Murre, Gullweird) or sensitive habitats (See Code of Practice)	
Fishing Area	Soak Time	Gear	No. Used	Main Target Sp.	Weight	Weight	No.	Unit	Weight	Weight	Weight		
					kg <input type="checkbox"/>	kg <input type="checkbox"/>			kg <input type="checkbox"/>	kg <input type="checkbox"/>	kg <input type="checkbox"/>		
					st <input type="checkbox"/>	st <input type="checkbox"/>			st <input type="checkbox"/>	st <input type="checkbox"/>	st <input type="checkbox"/>		
Returns		No.	Unit	Reason	No.	Unit	Reason	No.	Unit	Reason	No.	Unit	Reason

Date		Velvet Crab		Brown Crab		Lobster		Buckles		Green Crab		Interactions? <input type="checkbox"/> General Comments, Observations and interactions with ETP Species (eg Skuas, Ravens, Murre, Gullweird) or sensitive habitats (See Code of Practice)	
Fishing Area	Soak Time	Gear	No. Used	Main Target Sp.	Weight	Weight	No.	Unit	Weight	Weight	Weight		
					kg <input type="checkbox"/>	kg <input type="checkbox"/>			kg <input type="checkbox"/>	kg <input type="checkbox"/>	kg <input type="checkbox"/>		
					st <input type="checkbox"/>	st <input type="checkbox"/>			st <input type="checkbox"/>	st <input type="checkbox"/>	st <input type="checkbox"/>		
Returns		No.	Unit	Reason	No.	Unit	Reason	No.	Unit	Reason	No.	Unit	Reason

Date		Velvet Crab		Brown Crab		Lobster		Buckles		Green Crab		Interactions? <input type="checkbox"/> General Comments, Observations and interactions with ETP Species (eg Skuas, Ravens, Murre, Gullweird) or sensitive habitats (See Code of Practice)	
Fishing Area	Soak Time	Gear	No. Used	Main Target Sp.	Weight	Weight	No.	Unit	Weight	Weight	Weight		
					kg <input type="checkbox"/>	kg <input type="checkbox"/>			kg <input type="checkbox"/>	kg <input type="checkbox"/>	kg <input type="checkbox"/>		
					st <input type="checkbox"/>	st <input type="checkbox"/>			st <input type="checkbox"/>	st <input type="checkbox"/>	st <input type="checkbox"/>		
Returns		No.	Unit	Reason	No.	Unit	Reason	No.	Unit	Reason	No.	Unit	Reason

Date		Velvet Crab		Brown Crab		Lobster		Buckles		Green Crab		Interactions? <input type="checkbox"/> General Comments, Observations and interactions with ETP Species (eg Skuas, Ravens, Murre, Gullweird) or sensitive habitats (See Code of Practice)	
Fishing Area	Soak Time	Gear	No. Used	Main Target Sp.	Weight	Weight	No.	Unit	Weight	Weight	Weight		
					kg <input type="checkbox"/>	kg <input type="checkbox"/>			kg <input type="checkbox"/>	kg <input type="checkbox"/>	kg <input type="checkbox"/>		
					st <input type="checkbox"/>	st <input type="checkbox"/>			st <input type="checkbox"/>	st <input type="checkbox"/>	st <input type="checkbox"/>		
Returns		No.	Unit	Reason	No.	Unit	Reason	No.	Unit	Reason	No.	Unit	Reason

Not fishing from date:

To date:

Returns Reasons:	U= Unfit	S= Soft	Lobster Catch Units:	I= Individuals	Returns Units:	P= Individuals
	O= Overripe	E= Barred		W= Weight		W= Weight
	H= Hatch	D= Dropped or damaged				%= Percent of Catch
		NM= No Market				

EAT:	C= Crabs
	P= Pabs

Figure 2-4 Log book sheet for the scallop dredge fishery (source: NAFC Marine Centre)



Shetland Shellfish Management Organisation Logsheet

Vessel Name:

SSMO Licence No.

LS No. **52051**

Date				King Scallop			Queen Scallop			Interactions? <input type="checkbox"/> General Comments, Observations and interactions with ETP Species (eg Skates, Rays, Maerl, Cirratulans) or sensitive habitats (See Code of Practice)
Fishing Area	Hours Towed	No. Dredges	Main Target Sp.	No.	Unit	Weight	No.	Unit	Weight	
				Catch		kg <input type="checkbox"/>			kg <input type="checkbox"/>	
						st <input type="checkbox"/>			st <input type="checkbox"/>	
Returns				No.	Unit	Reason	No.	Unit	Reason	

Date				King Scallop			Queen Scallop			Interactions? <input type="checkbox"/> General Comments, Observations and interactions with ETP Species (eg Skates, Rays, Maerl, Cirratulans) or sensitive habitats (See Code of Practice)
Fishing Area	Hours Towed	No. Dredges	Main Target Sp.	No.	Unit	Weight	No.	Unit	Weight	
				Catch		kg <input type="checkbox"/>			kg <input type="checkbox"/>	
						st <input type="checkbox"/>			st <input type="checkbox"/>	
Returns				No.	Unit	Reason	No.	Unit	Reason	

Date				King Scallop			Queen Scallop			Interactions? <input type="checkbox"/> General Comments, Observations and interactions with ETP Species (eg Skates, Rays, Maerl, Cirratulans) or sensitive habitats (See Code of Practice)
Fishing Area	Hours Towed	No. Dredges	Main Target Sp.	No.	Unit	Weight	No.	Unit	Weight	
				Catch		kg <input type="checkbox"/>			kg <input type="checkbox"/>	
						st <input type="checkbox"/>			st <input type="checkbox"/>	
Returns				No.	Unit	Reason	No.	Unit	Reason	

Date				King Scallop			Queen Scallop			Interactions? <input type="checkbox"/> General Comments, Observations and interactions with ETP Species (eg Skates, Rays, Maerl, Cirratulans) or sensitive habitats (See Code of Practice)
Fishing Area	Hours Towed	No. Dredges	Main Target Sp.	No.	Unit	Weight	No.	Unit	Weight	
				Catch		kg <input type="checkbox"/>			kg <input type="checkbox"/>	
						st <input type="checkbox"/>			st <input type="checkbox"/>	
Returns				No.	Unit	Reason	No.	Unit	Reason	

Not fishing from date: To date:

Return Reasons: U= Undersize
 O= Oversize
 D= Discard or damaged

Catch Units: BG= Bags
 BX= Boxes
 BA= Baskets
 IN= Individuals
 WT= Weight

Return Units: BG= Bags
 BX= Boxes
 BA= Baskets
 IN= Individuals
 WT= Weight
 %= Percent of Catch

For the scallop dredge fishery, the fishing area (5x5 nm SSMO square), hours towed, number of dredges, the species targeted (both king scallops, *Pecten maximus*, and queen scallops, *Aequipecten opercularis* are targeted in this fishery), and the numbers or weight of landed catch must be recorded (Figure 3-4). In addition, the numbers discarded and the reasons for discarding (e.g. undersized, diseased or damaged etc.) and interactions with ETP species must also be recorded. A separate line on the log sheet must be completed for each fishing area (SSMO square).

Any interaction with ETP species must also be recorded on log sheets. To support this requirement, all vessels are provided with a wheelhouse guide on the identification of species that are protected under national and international legislation (and could be considered as ETP species under the MSC Certification Requirements) including mammals, birds, fish, turtles, molluscs and species which constitute sensitive habitats such as maerl and horse mussels. In addition to being an aid to identification, the guides also define an 'interaction' between fishing gear and marine protected species, and set out the requirements for reporting such interactions.

In addition to SSMO log sheets, vessels over 10m length are required under Scottish legislation to complete EU log books and vessels under 10m are required to complete F1 forms. All commercially-registered vessels are covered by the Registration of Buyers and Sellers (RBS) legislation, and so buyers must submit sales notes for all catches. Marine Scotland Compliance undertakes cross-checks of log book submissions, landings declarations and sales notes from buyers. To date no systematic non-compliance has been identified through this cross-checking process. VMS is mandatory on larger vessels but as yet there is no requirement for the smaller vessels in the shellfish fleet to have VMS on board. However inshore VMS (iVMS) units were voluntarily fitted to several scallop vessels in 2013, representing the majority of the active fleet. Each unit reported the vessel's position and speed every ten minutes with the information stored in a secure online database (see Shelmerdine and Leslie, 2015).

The LPUE data that are collected through the log books are complemented by the collection of biological data and fisheries-independent surveys.

Brown crabs. A wide range of biological information on brown crabs around Shetland including moult and reproductive cycles and estimates of natural mortality and size-at-maturity is available from the study of Tallack (2002). Sampling on-board commercial vessels provides information on the size structure of the stock, including undersized crabs, and on sex ratio and the percentage berried within each size class.

Velvet crabs. As for brown crabs, detailed biological information on velvet crabs around Shetland including moult and reproductive cycles and estimates of natural mortality and size-at-maturity is available from the study of Tallack (2002). Information on the size structure of the stock, including undersized velvet crabs, sex ratio and the percentage berried within each size class is collected through sampling on-board commercial vessels. In addition to the sampling on commercial vessels, stock surveys are regularly undertaken by the NAFC Marine Centre with the principle aim of investigating spatial variability in size

structure, patterns of moulting, sex ratio, and biological parameters (i.e. length-weight relationships) and discard mortality.

The most recent survey was carried out in 2016, and investigated spatial variability in density, width-frequency distribution and the proportion of crabs at different moulting stages.

Scallops. Information on stock structure is obtained through the collection of fishery-dependent data. Scallop size-at-age is obtained by measuring and ageing scallop landings at the local processing factories. Random samples of scallop bags from different vessels are sampled every month to give landings-at-age which are then raised to the vessel and fleet level using total landings from logbook data. Stock structure information including discards is also collected on board vessels.

In addition to the fisheries data, six scallop stock surveys have been carried out by NAFC Marine Centre during 2007, 2010, 2011, 2012, 2013 and 2015. The initial survey in 2007 assessed the use of incorporating two queen scallop bellies with standard king scallop gear and their effectiveness in sampling the smaller portion of the king scallop population. Scallop bycatch was investigated in 2010 and although scallops were aged and measured, the focus of the survey was to identify and quantify all other species caught. Surveys in 2011, 2012, and 2013 quantified number of scallops caught in different areas, based on the design of the 2007 survey, but did not follow a randomised stratified design and did not estimate abundance or biomass. In addition, bycatch species were recorded from the 2011 survey. The main aim of the 2015 survey was to establish a standardised survey procedure for estimating scallop biomass around Shetland with a secondary aim of assessing the effects of tidal strength and water depth on the scallop catch (Shelmerdine and Mouat, in press). The survey followed a single phase stratified random sampling design (as described by Williams, *et al.*, 2013) focussing on historical survey tracks, new areas representing the current fishery, and tidal strength information. The 2015 survey is the first survey which was aimed specifically at providing an estimate of stock biomass within the inshore fishery area. Six regions were identified based on previous surveys and each region was broken down into specific sampling areas, based on locations of previous surveys, iVMS data, and tidal strength. At each sampling station four spring-loaded dredges were towed on a single bar from the research vessel. Number, size and age of scallops were recorded from each dredge along with tidal strength, depth and sediment type. Biomass was estimated from the survey by taking scallop number at length from each tow, converted to observed density at length based on area swept, then corrected for dredge efficiency based on previous literature studies, and finally numbers were converted to weight based on observed length-weight relationships. Expected density, abundance and biomass were calculated for each stratum and the whole population using VMS data of individual vessel's dredge footprint.

3.5.5 Stock assessment methodology

The main element of the stock assessment of the creel fisheries is the assessment of stock status against biological reference points. Direct estimates of stock biomass are not

available for brown crab or velvet crab and therefore the assessment uses reference points based on stock indicators which are a proxy for biomass and exploitation rate. The main stock indicator used for the reference points for all three fisheries is landings per unit effort (LPUE) which is considered as an index of stock abundance. The approach is to examine time series of stock indicators, and then set the limit reference point (LRP) at the lowest observed value. The LRP is therefore considered to be above the point at which recruitment would be impaired because the history of the fishery shows that the stock has demonstrably recovered from that lowest point. In order to set the upper or target reference point (TRP), the data were examined for periods of high LPUE which would be consistent with relatively higher

abundance. These periods of high and stable LPUE were taken to represent a biomass consistent with maximum sustainable yield (MSY). By taking a precautionary approach, the upper or target reference point was set at 80% of the mean LPUE from these periods of high stable values. The setting of upper (target) and lower (limit) reference points was based on an approach taken in the Canadian Northern Shrimp (*Pandalus borealis*) fishery in the Estuary and Gulf of St Lawrence (DFO, 2011) and observed in other MSC-certified fisheries in Canada. This approach is considered to be an improvement to the previous method of determining reference points which arbitrarily set the LRP and set the TRP based on the average of recent years including the current year. This previous approach was considered to be unduly biased by the addition of new data.

It should be noted that the stock indicators are based on unstandardised data. In previous stock assessment reports, standardisation of LPUE data has been undertaken using General Additive Modelling (GAM) methods using month, area fished and vessel as explanatory variables. Whilst these standardised data have been used to inform the stock assessment process, they have not been used formally either in the development of reference points or the assessment of current stock status with respect to those reference points.

For each stock indicator for all three species, the values that were used for the TRP were not a straight 80% of the mean within the specified time range. Instead, the TRP is calculated as 80% of the mean within each time frame but constrained by the minimum value within that time frame, using the following formula:

$$TRP = (1/100) * (PM + 100m - Pm)$$

where P is the percentage value (80%), M is the mean value, and m is the minimum value.

In other words, the TRP is fixed at 80% of the distance between the minimum value and the mean value within the time frame.

3.5.5.1 Reference points for brown crab

There are two reference points for brown crabs based on LPUE and the mean size of the catch (including sub-legal crabs). The time series of the two stock indicators upon which the reference points are based are shown in Figure 3-5 and the values of the reference points are given in Table 2. This information was based on vessels which landed 100% brown crabs and no velvets for a particular day. It was not restricted to vessels which only target brown crabs as this would eliminate a large portion of the available data. SSMO and NAFC Marine Centre considered two additional reference points based on fishing effort and the abundance of pre-recruits. For fishing effort, there was a large variation in the data and SSMO agreed with NAFC Marine Centre that they should not use a reference point based on fishing effort but that the information would be discussed as part of the stock assessment. Similarly the data on pre-recruit abundance was very variable over time and SSMO decided that it was not possible to set an appropriate reference point based on this indicator.

Due to the relatively short-term data set, these reference points should be examined annually and fully reviewed, along with the consequent harvest control rules (HCRs), on a 5 year basis.

3.5.5.2 Harvest Control Rules for the brown crab fishery

The SSMO has implemented new Harvest Control Rules (HCRs) in January 2017 for the brown crab fishery based on the new reference points described above. These HCRs replace those described in the original certification report. The HCRs are dependent upon whether the indicators are in the green zone (at or above the TRP), in the amber zone (between the TRP and the LRP) or in the red zone (below the LRP).

The HCRs for the brown crab fishery are as follows:

Where the fishery is fluctuating at or around the target reference point no management actions are required.

Where any reference points are amber the following management measures shall be considered using a process of expert judgement based on a prior knowledge of the fishery, and using relevant context from additional data sources that are available, but not necessarily included as reference points:

- No new licences issued
- No additional effort permitted via succession or through replacement vessels
- Increased minimum landing size

- Spatial closures
- Temporal closures

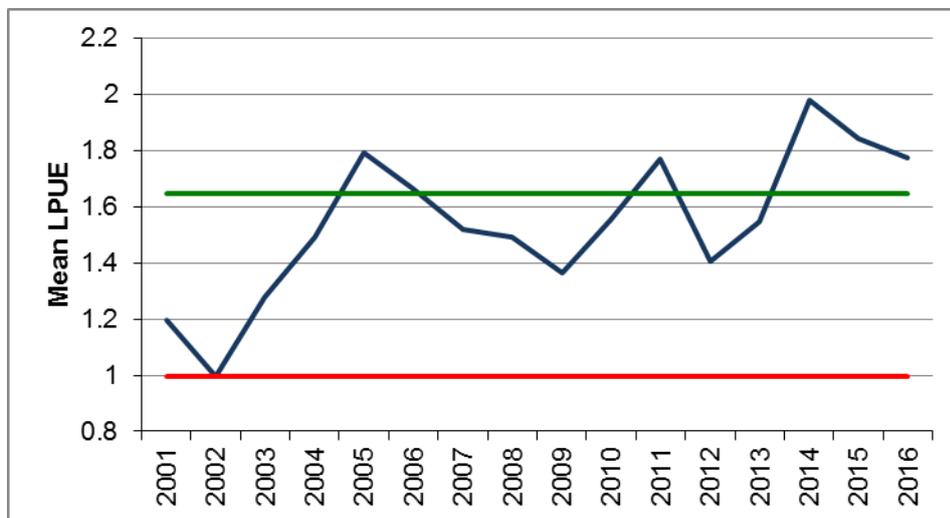
The listed management measures will be applied individually, or in combination depending on the values associated with the amber status, the duration of the amber status, and the rate of change within the reference points.

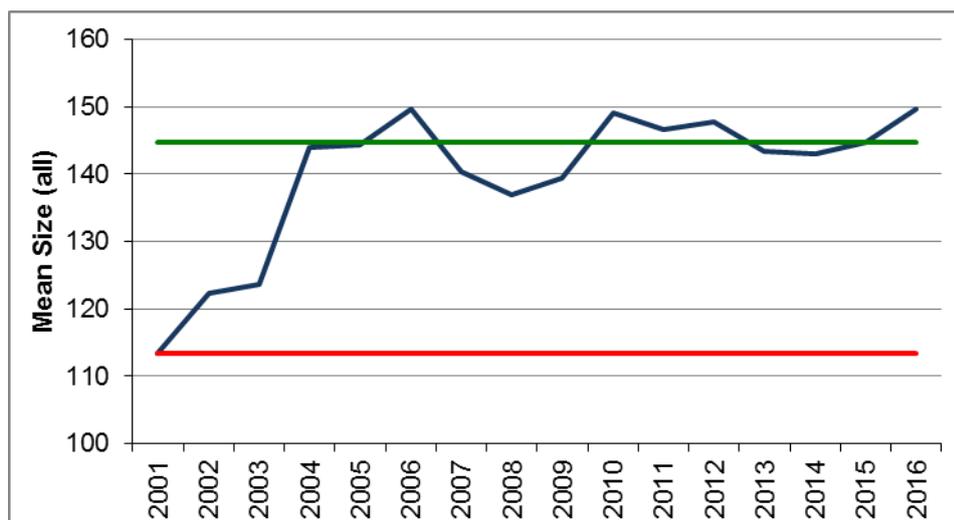
Where one of the reference points are red the following management measures shall be implemented:

- Extending fishery closures
- Implementation of a research programme and monitoring.

Where the limit reference point has been reached the fishery will be closed.

Figure 2-5. Time trend of LPUE in kg/creel (top) and mean size in mm carapace width (bottom) for the brown crab fishery in Shetland from 2001 to 2016. The green lines denote the upper or target reference point (TRP) and the red lines represent the LRP. (source: NAFC Marine Centre)





Variable	TRP	LRP	Rationale
LPUE (kg/creel)	1.65	1.00	80% of the mean from the years 2011 to 2015 inclusive for the target reference point and the minimum value in 2002 was used for the limit reference point
Mean size (mm CW)	144.63	113.36	80% of the mean from the years 2011 to 2015 inclusive for the target reference point and the minimum value in 2001 was used for the limit reference point

Table 2 Reference points for the brown crab fishery in Shetland. (Source: NAFC Marine Centre).

3.5.5.3 Reference points for velvet crab

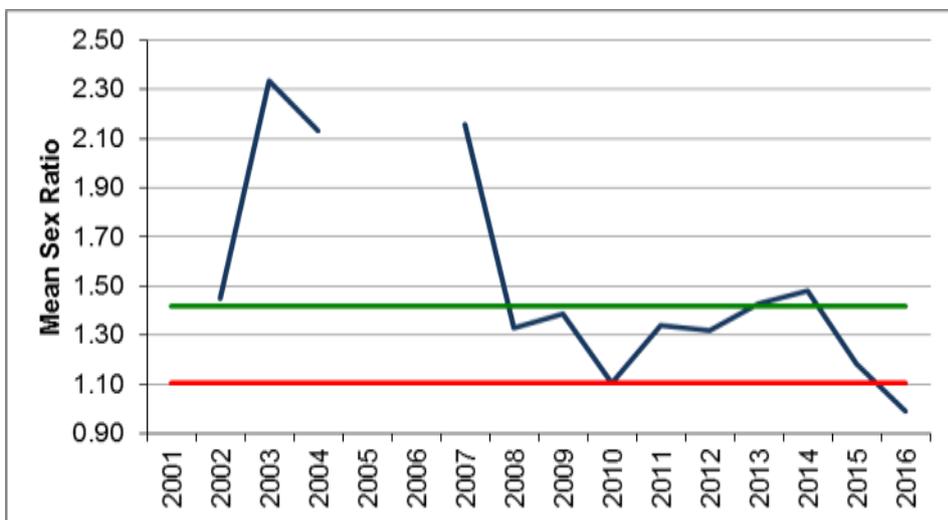
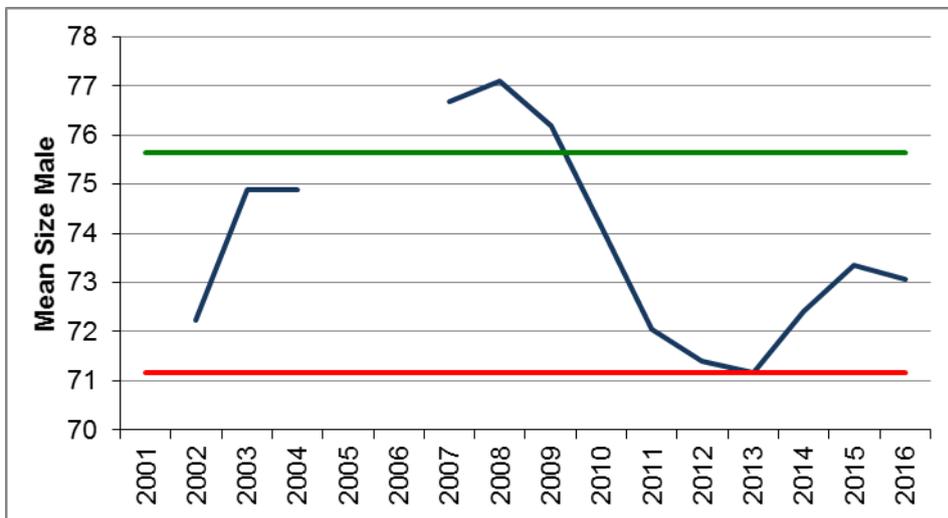
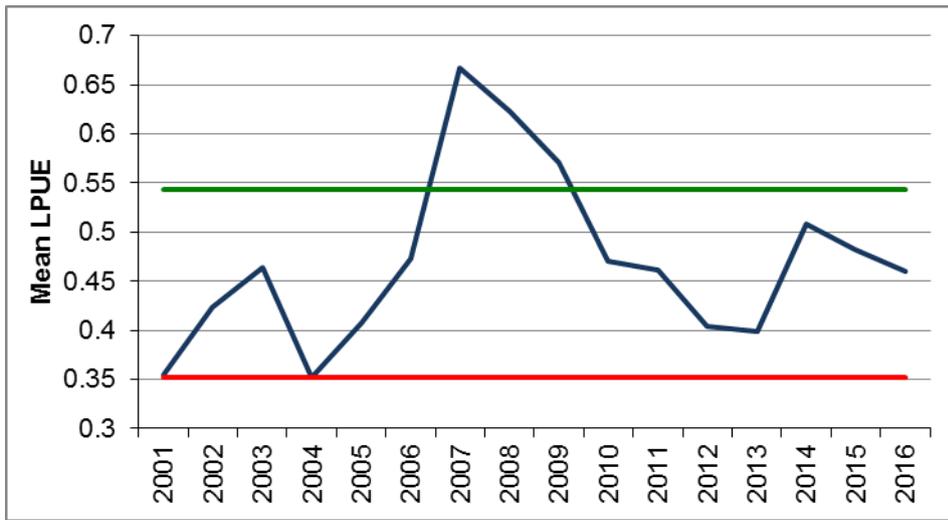
There are four reference points for velvet crabs based on LPUE, the mean size of males in the catch (including sub-legal crabs), the sex ratio and the level of fishing effort. The time series of the four stock indicators upon which the reference points are based are shown in

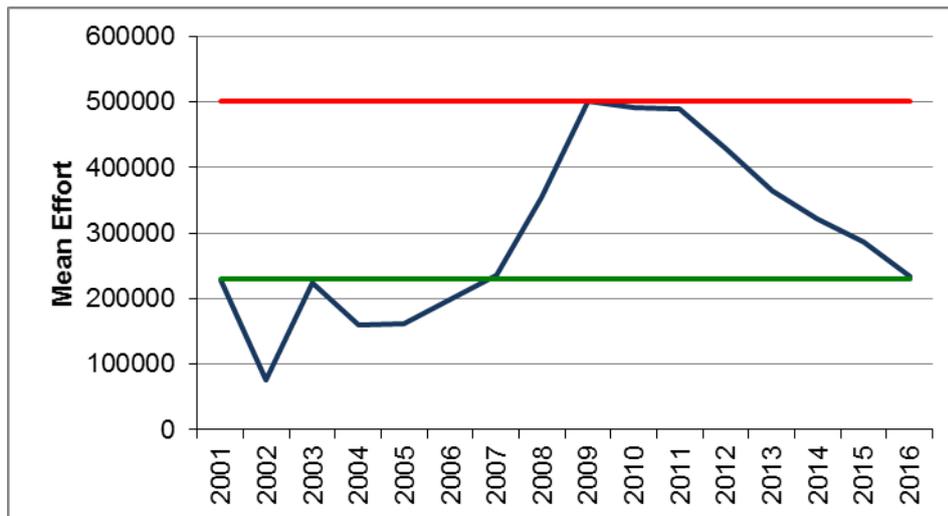
Figure 2-6 and the values of the reference points are given in Table 3. A reference point for a fifth stock indicator, male pre-recruit abundance was considered but not implemented.

Due to the relatively short-term data set, these reference points should be examined annually and fully reviewed, along with the consequent harvest control rules (HCRs), on a 5 year basis.

Figure 2-6. Time trend of LPUE in kg/creel (top), mean size of males in mm carapace width, sex ratio and level of fishing effort in creel numbers (bottom) for the velvet crab fishery in Shetland from 2001 to 2016.

The green lines denote the upper or target reference point (TRP) and the red lines represent the limit reference point (LRP). (Source: NAFC Marine Centre).





Variable	TRP	LRP	Rationale
LPUE (kg/creel)	0.54	0.35	80% of the mean from the years 2006 to 2010 inclusive for the TRP and the minimum value in 2004 was used for the LRP
Mean male size (mm CW)	75.65	71.15	80% of the mean from the years 2006 to 2010 inclusive for the TRP and the minimum value in 2013 was used for the LRP
Sex ratio (Male:female)	1.42	1.11	80% of the mean from the years 2006 to 2010 inclusive for the TRP and the minimum value in 2010 was used for the LRP
Effort (creels)	230 519.04	501 662.00	20% of the mean from the years 2006 to 2010 inclusive for the TRP and the maximum value in 2009 was used for the LRP

Table 3 Reference points for the velvet crab fishery in Shetland. (Source: NAFC Marine Centre).

3.5.5.4 Harvest control rules for velvet crabs

The SSMO has implemented new Harvest Control Rules (HCRs) in January 2017 for the velvet crab fishery based on the new reference points described above. These HCRs replace those described in the original certification report. The HCRs are dependent upon whether the indicators are in the green zone (at or above the TRP), in the amber zone (between the TRP and the LRP) or in the red zone (below the LRP).

The HCRs for the velvet crab fishery are as follows:

Where the stock is fluctuating at or around the target reference point no management actions are required.

Where any reference points are amber the following management measures shall be considered using a process of expert judgement based on a prior knowledge of the fishery, and using relevant context from additional data sources that are available, but not necessarily included as reference points:

- No new licences issued
- No additional effort permitted via succession or through replacement vessels
- Increased minimum landing size
- Spatial closures
- Temporal closures e.g. increasing the period of real time closure, implementing a complete closure for a period of time, implementation of East/West seasonal closures.

The listed management measures will be applied individually, or in combination, depending on the values associated with the amber status, the duration of the amber status, and the rate of change within the reference points.

Where one or more (but not all) of the reference points are red the following management measures shall be implemented:

- Extending fishery closures, or complete closure of the fishery
- Implementation of a research programme and monitoring.

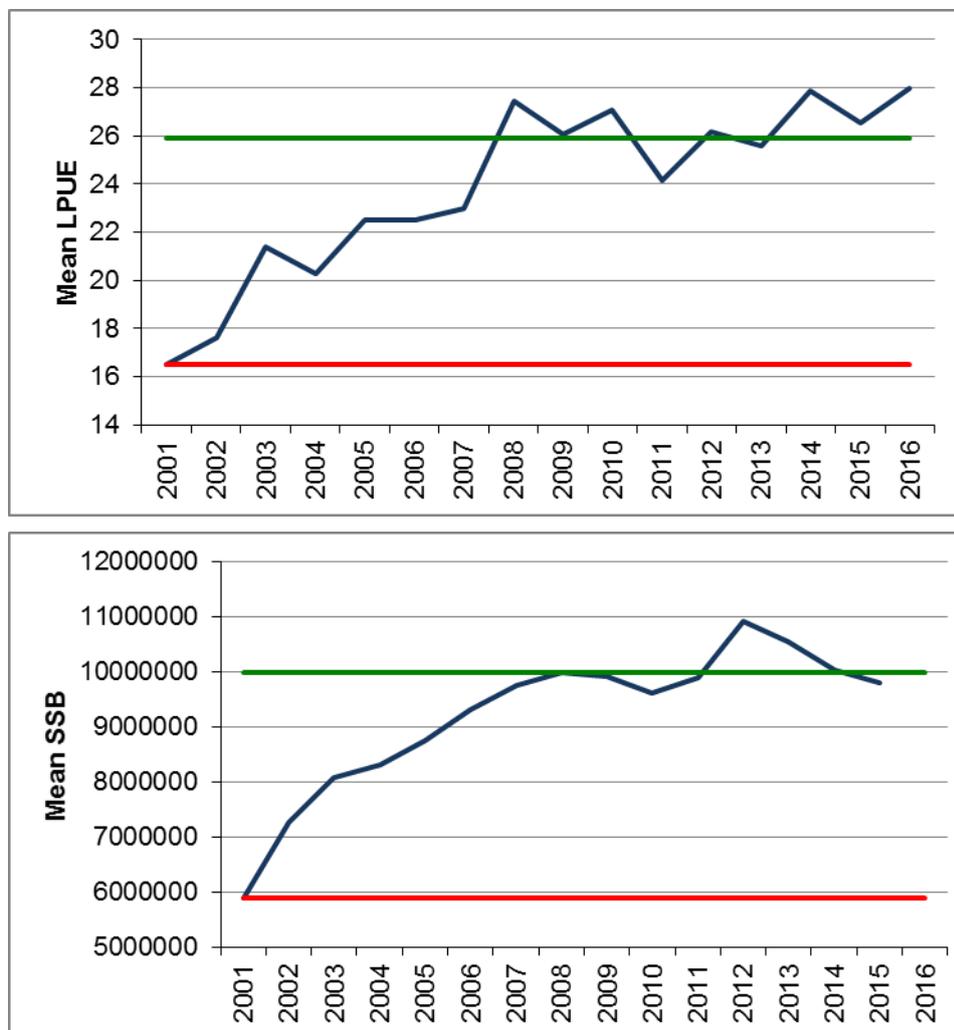
Where all of the limit reference points have been reached the fishery will be closed.

3.5.5.5 *Reference points for scallops*

There are two reference points for scallops based on LPUE from the fishery and spawning stock biomass (SSB) calculated from the Virtual Population Analysis (VPA). The time series of the two stock indicators upon which the reference points are based are shown in Figure 2-7 and the values of the reference points are given in Table 4. SSMO and NAFC Marine Centre also considered additional reference points based on the LPUE in different regions of the fishery. No fixed values were agreed upon, but it was considered essential that any harvest control rules would take into consideration variations between areas. Fishing effort and population-at-age estimates from VPA will also be used within the harvest control rules to inform the management process. No values relating to scallop size were included as the size relative to age varies considerably around Shetland. As results from the new scallop biomass survey build up over future years, these will also be incorporated as a reference point.

Due to the relatively short-term data set, these reference points should be examined annually and fully reviewed, along with the consequent harvest control rules (HCRs), on a 5 year basis.

Figure 2-7. Time trend of LPUE (top) and mean spawning stock biomass (SSB) in tonnes (bottom) for the scallop fishery in Shetland from 2001 to 2016. Note that the mean SSB has not been calculated yet for 2016. The green lines denote the upper or target reference point (TRP) and the red lines represent the limit reference point (LRP). (Source: NAFC Marine Centre).



Variable	TRP	LRP	Rationale
LPUE (no. of scallops per dredge hour)	25.91	16.48	80% of the mean from the years 2008 to 2015 inclusive for the TRP and the minimum value in 2001 was used for the LRP
SSB (spawning stock biomass)	9 990 429.08	5 907 618.09	80% of the mean from the years 2008 to 2015 inclusive for the TRP and the minimum value in 2001 was used for the LRP. This is calculated using VPA population-at-age estimates and whole animal weights from the sampling programme. It will require review in light of the large recruitment in

			2005 moving out of the population.
--	--	--	------------------------------------

Table 4. Reference points for the scallop fishery in Shetland. (Source: NAFC Marine Centre).

3.5.5.6 Harvest Control rules for scallops

The SSMO has implemented new Harvest Control Rules (HCRs) in January 2017 for the scallop fishery based on the new reference points described above. These HCRs replace those described in the original certification report. The HCRs are dependent upon whether the indicators are in the green zone (at or above the TRP), in the amber zone (between the TRP and the LRP) or in the red zone (below the LRP).

The HCRs for the scallop fishery are as follows:

Where the stock is fluctuating at or around the target reference point no management actions are required, **unless**, LPUE values for two or more of the SSMO areas are red. In which case no new licences would be issued.

Where any reference points are amber the following management measures shall be considered using a process of expert judgement based on a prior knowledge of the fishery, and using relevant context from additional data sources that are available, but not necessarily included as reference points:

- No new licences issued
- No additional effort permitted via succession or through replacement vessels
- Increased minimum landing size
- Spatial closures
- Temporal restrictions e.g. days at sea.

The listed management measures will be applied individually, or in combination, depending on the values associated with the amber status, the duration of the amber status, and the rate of change within the reference points.

Where one of the reference points is red the following management measures shall be implemented:

- Extending fishery closures, or a complete closure of the fishery
- Implementation of a research programme and monitoring.

Should all limit reference points be reached the fishery will be closed.

3.5.5.7 Additional stock assessment indicators

In addition to the reference points based on stock indicators described in the previous sections, other methods of stock assessment have been used for the brown crab, velvet crab and scallop fisheries in Shetland. The stock assessments were published annually up

until 2010 (Leslie et al., 2010) but are no longer published formally, and the assessment approach has now moved towards a more interactive feedback of results to the SSMO and stakeholders incorporating the new spatially-referenced fisheries database and also the reference points graphics and data (B. Mouat, NAFC Marine Centre, pers. comm.).

Creel fisheries

For the creel fisheries for both brown crab and velvet crab, stock assessment has been undertaken using length cohort analysis (LCA) (Jones, 1974). As crustaceans grow by moulting and cannot be aged routinely, LCA uses length frequency data collected as part of the market sampling programme to estimate fishing mortality and provide a framework for evaluation of management measures. LCA results are presented in terms of yield per-recruit and biomass-per-recruit, and permit an estimation of F_{max} , the fishing mortality rate that maximizes yield per-recruit. As LCA is a 'per-recruit' model, it is not possible to directly estimate maximum sustainable yield (MSY) for these stocks and hence F_{max} is used as a proxy for F_{msy} . LCA can be used to predict changes in yield-per-recruit and biomass-per-recruit following changes in fishing effort or changes in the minimum landing size, but the predictions are long-term and the method does not provide any indication of short-term stock dynamics or recruitment over-fishing.

There are some significant limitations on the LCA methodology. As noted above, the model is an equilibrium model requiring several years of length data as an input to the model, and provides no indication of short-term stock dynamics, in creel fisheries size distribution of catches are not necessarily representative of population, and the predictions of the model are highly sensitive to assumptions about the natural mortality rate (M). It should be noted therefore that reference points generated from LCA are not used for management purposes, although they may be used to inform managers about stock status and possible management action. Most importantly is the assumption of the LCA model that the fishery and the level of fishing effort are stable and for both brown crab and velvet crab populations there is evidence that this is not the case. Therefore the assumptions of the model are not met and the outputs from the LCA should therefore be treated with caution.

Scallop dredge fisheries

Marine Scotland Science undertakes stock assessment of scallops in Scotland using an aged-structured method entitled Time Series Analysis. The method uses three sources of data: reported landings data, catch at age data from annual scallop dredge surveys, and age and size frequency data collected as part of the market sampling programme conducted at landing sites around the Scottish coast. The TSA assessment model provides annual estimates (with confidence intervals) of yield, fishing mortality, spawning stock biomass and recruitment.

NAFC Marine Centre undertake annual assessments of scallop stocks using a quarterly Virtual Population Analysis (VPA), but the formal stock assessment reports which include scallop stock assessment have not been published in recent years.

3.5.6 Stock status

Brown crab fishery

Total landings of brown crab from all vessels have more than halved in the last two years falling from a high of over 600 tonnes in 2014, but fishing effort has also declined significantly over the last two years (Figure 3-8a). This decline in effort and landings is likely to have been driven by market forces (B. Mouat, NAFC Marine Centre, pers. comm.), and for the whole fleet there has been a concurrent increase in LPUE to its highest ever level in the time series (Figure 3.8a).

As noted in section 3.5.5.1, the LPUE and mean size reference points are derived using only those vessels which have landed 100% brown crabs (i.e. they have targeted brown crabs only). Figure 3.8a relates to the whole fishery, but the equivalent figure using only data from vessels which have landed 100% brown crabs (Figure 3.8b) shows some small differences in the trend in LPUE. Both the LPUE and mean size of brown crabs were above the TRP for 2016 (Figure 3-5).

Assessment of brown crabs in Shetland using LCA showed that for 2013-2015 fishing mortality for males was estimated to be above F_{msy} while assessments for females were deemed inconclusive due to inconsistent results obtained when using the biological parameters estimated for Shetland and those estimated for elsewhere in Scotland (Marine Science Scotland, 2017). The estimates of fishing mortality from LCA are not used for management purposes due to the limitations of this methodology described in section 3.5.5.7.

Velvet crab fishery

Landings of velvet crabs have declined since a peak observed in 2009, but fishing effort has also declined significantly since 2012 following the introduction of new management measures. Nevertheless, LPUE has also declined since 2014 (Figure 3-9). Many stakeholders noted that there has been a significant recent increase in the abundance of lobsters in Shetland. The presence of lobsters in the creel inhibits the entry of velvet crabs, and so the increased catch rate of lobsters may have caused a decline in the catch rate of velvet crabs, such that the decline in catch rate is not necessarily a reflection of a decline in stock numbers.

Two of the stock indicators (LPUE, mean male size) for velvet crabs were below the TRP but above the LRP in 2016 (Figure 2-6). The sex ratio stock indicator was below the LRP in 2016. The fourth stock indicator (fishing effort) was at the TRP.

When the LPUE for the velvet crab fishery initially fell below the TRP in 2012, a number of rebuilding management measures were implemented based on the HCRs in place at that time. These included:

1. Effort Control: A full consultation with industry took place during 2012 and a gear limit of 240 pots targeted at velvet crabs was agreed and implemented in 2013. In addition, no new licences have been issued since certification was awarded.

2. The velvet crab closed period in the summer (when they are moulting) was increased from six to eight weeks.
3. The NAFC Marine Centre was commissioned to carry out a velvet crab survey in 2014.
4. Areal closures by SSMO grid were discussed by the SSMO board but rejected as there was no evidence of the benefit of such closures.

These measures along with a minimum landing size significantly above the size at maturity constitute a rebuilding strategy for the velvet crab stock. In addition, a number of legislative and enforcement activities were implemented which underpin the rebuilding strategy. Creel tags must be attached to all gear to aid enforcement of creel limits, and Marine Scotland Compliance has committed to enforcement of these limits both onshore and at sea. The limit of 240 creels that may be targeted at velvet crabs is underpinned by a new regulation that all additional creels over the 240 limit must be fitted with escape gaps which permit the escape of all velvet crabs (but which retain other species above the minimum landing size).

As two of the four stock indicators for the velvet crab fishery are currently in the amber zone between the TRP and LRP, and one indicator (sex ratio) has dropped just below the LRP, stock managers have continued with the rebuilding plan which includes a continuation of reducing fishing effort (Figure 3-6 shows that fishing effort has now been reduced so that it is at the TRP), a further stock survey was undertaken in 2016, further discussions are underway investigating options for increasing the summer closure of the fishery, and after many initial production problems, escape gaps are finally being introduced.

Whilst these measures are expected to rebuild the velvet crab stock, the sex ratio indicator had dropped below the LRP in 2016 and the assessment team requested further information from NAFC scientists on whether this reduction in sex ratio could have an impact on recruitment. Analysis of sex ratios from observers on commercial vessels showed significant spatial and temporal variation in sex ratios of commercial catches. Whilst the overall sex ratio had fallen below the LRP of 1.11 (males:females) in 2016, low sex ratios were observed only in the western area of the fishery in the winter months (Table 5), and in 2017 samples taken in the western area in the spring showed predominantly male catches. Clearly additional research is required to better understand spatial and temporal variations in sex ratios of catches and a single annual sex ratio indicator for all areas may not be appropriate.

NAFC scientists provided additional information that suggests that there is currently no risk of recruitment impairment in the velvet crab fishery. When berried females are observed in the catch they are found in relatively high proportions (up to ~75%) and gravid females are found throughout the size distribution. There has been no obvious trend in berried female size over the period 2003-2017, and there has been no reduction in berried females within the population, indicating that it is very unlikely there is any sperm limitation taking place within the fishery and that females are not subject to reduced mating opportunities. Around 50% of the berried females observed in the catch are below the minimum landing size and therefore are able to breed, potentially several times, before they become available to the fishery. Examination of the length frequency distributions of males and females does not show skewed distributions towards sizes below the MLS of 70mm carapace length, which would be expected if high fishing pressure was resulting in high levels of removals of individuals above the MLS. Whilst there has been a small decrease in the size of males over

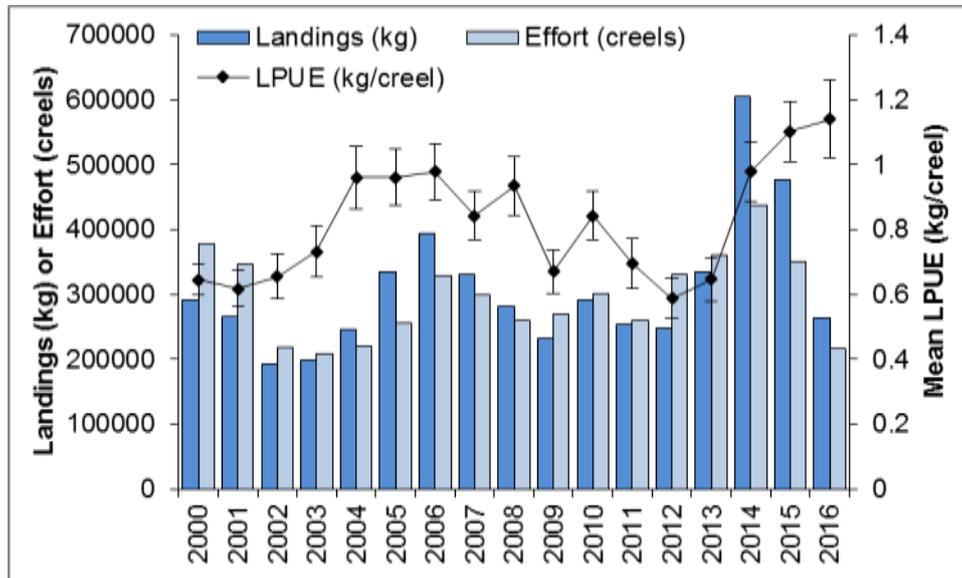
the last ten years, data from the 2016 survey show higher numbers of larger males than observed in the 2014 survey. All of this information from the velvet crab observer programme and the stock surveys provides strong evidence that there is highly unlikely to be an impairment of recruitment at the current time.

Assessments of velvet crabs in Shetland using LCA showed that for 2013-2015 there was no conclusive estimate of fishing mortality because of inconsistent results obtained when using the biological parameters estimated for Shetland and those estimated for elsewhere in Scotland. The estimates of fishing mortality from LCA are not used for management purposes due to the limitations of this methodology described in section 3.5.5.7.

In addition to the fisheries data on LPUE, the velvet crab stock survey undertaken in 2016 showed that there was a considerable reduction in the total number of velvet crabs caught in 2016 compared to previous years. There was a slight increase of 0.3mm in the mean size of both male and female velvet crabs compared with the 2014 survey. Despite this, the mean size of male and female velvet crabs is respectively 2.7mm and 0.4mm smaller than in 2007. Both a reduced CPUE and overall decrease in crab size may have a negative impact on landings.

Figure 2-8. Landings, fishing effort and LPUE (kg/creel) for the Shetland brown crab fishery from 2000 to 2016. (Source: NAFC Marine Centre)

(a) All vessels in the fleet



(b) Only vessels which have landed 100% brown crabs.

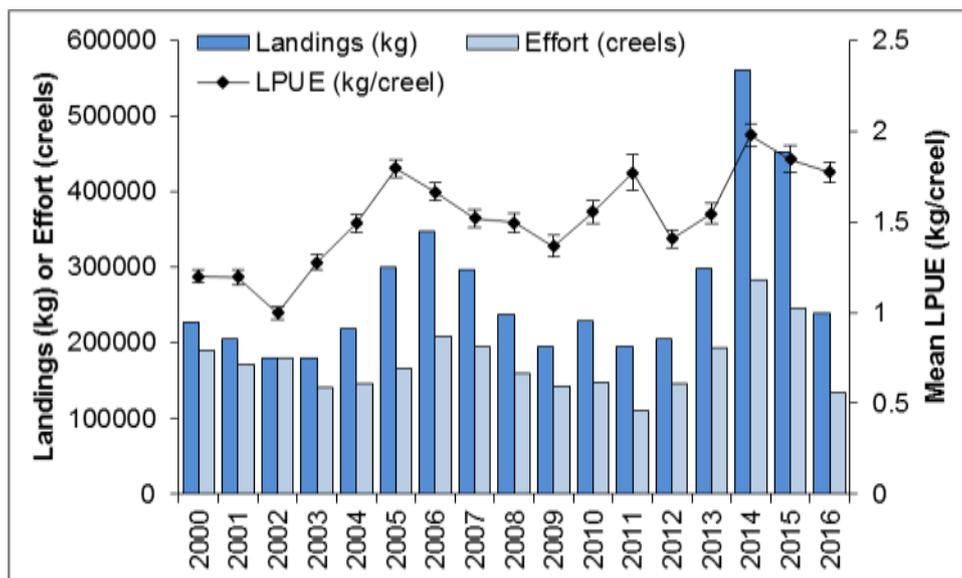
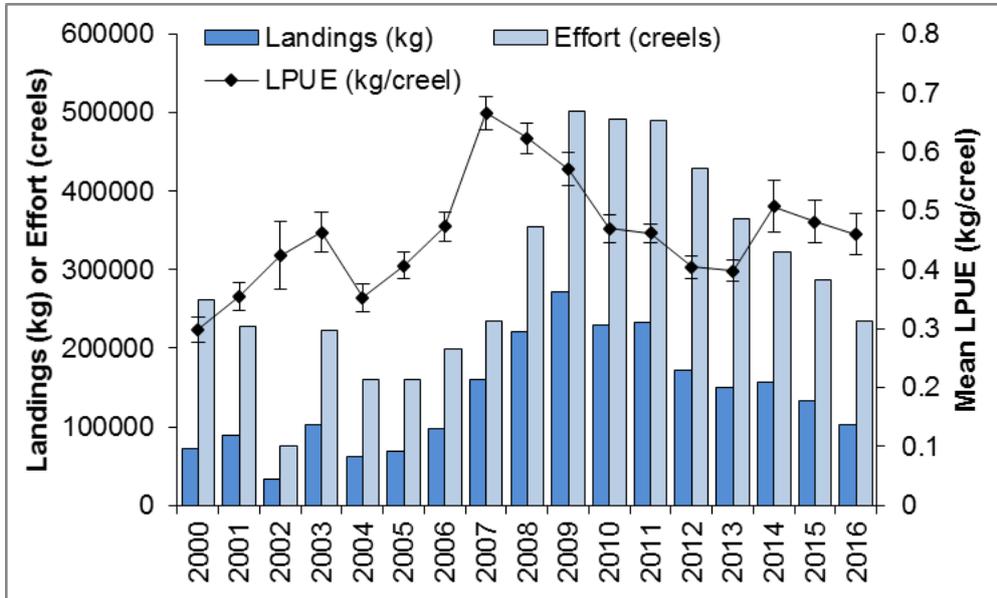


Figure 2-9. Landings, fishing effort and LPUE (kg/creel) for the Shetland velvet crab fishery from 2000 to 2016. (Source: NAFC Marine Centre)

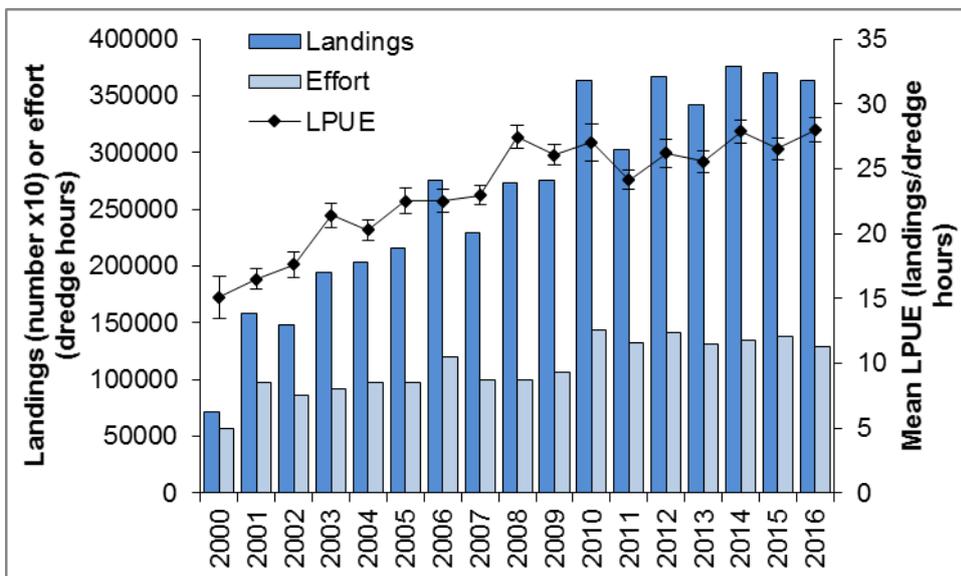


Scallop fishery

Landings, effort and LPUE for scallops remain at a high and stable level in 2016. The figure for LPUE is the highest recorded since data collection began, and is at a similar level to that seen in 2008, 2010 and 2014 (Figure 2-10).

Both the LPUE and spawning stock biomass of scallops were at the TRP for 2015 (Figure 3-7). In 2016, LPUE was found to be above the TRP but no data are available for 2016 SSB.

Figure 2-10. Landings, fishing effort and LPUE (landings/dredge hour) for the Shetland scallop fishery from 2000 to 2016. (Source: NAFC Marine Centre)



The most recently published assessment of Scottish scallop stock assessment was in 2014 (Marine Scotland Science, 2014). (N.B. The 2015, 2016 and 2107 editions of the report do not contain assessments of the scallop stocks in Shetland or elsewhere in Scotland.) The assessment for the Shetland region showed that spawning stock biomass (SSB) had been relatively stable from 2000 to 2010 despite increased catches, but that fishing mortality had increased in recent years (Figure 2-11). Recruitment of scallops aged 3 years was relatively stable over the period 2000 to 2010.

The most recent output from the Shetland VPA analysis showed that the estimate of stock abundance had fluctuated around 65 million scallops from 2005 to 2015, and that the forecast of stock abundance varies little irrespective of the likely level of fishing effort in future years (Figure 2-12, B. Mouat, NAFC, pers. comm.). Population estimates of each cohort from the VPA model are shown in Figure 2-13.

Figure 2-11 Shetland scallop stock summary showing catch and spawning stock biomass (SSB) of scallop muscle (thousands of tonnes), recruitment at age 3 (millions) and annual fishing mortality averaged over ages 4 to 6. (Source: Marine Scotland Science, 2014)

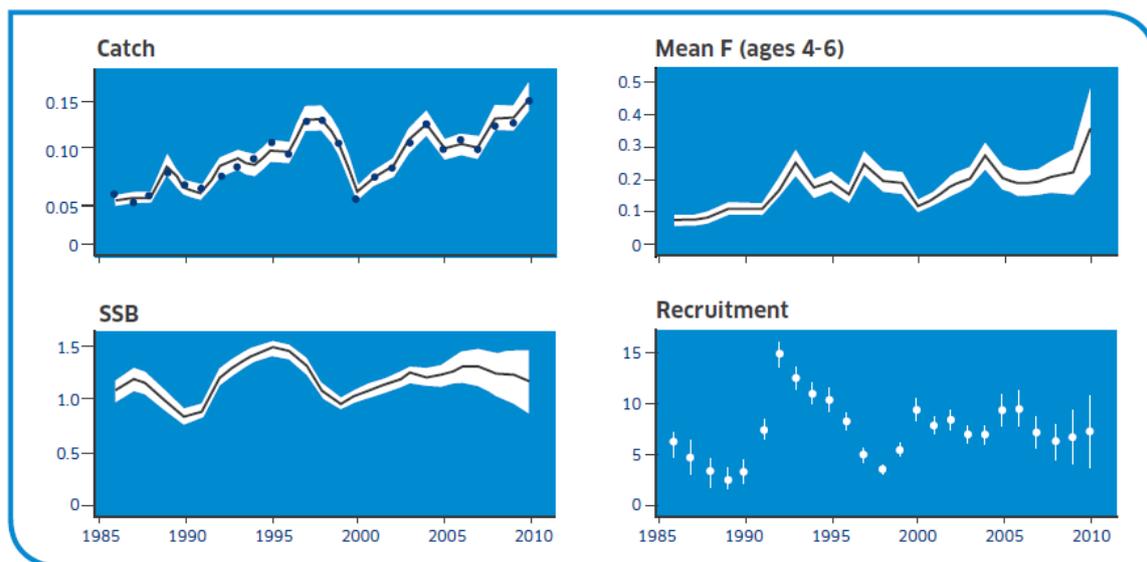


Figure 2-12 VPA model prediction of Population abundance of scallops in Shetland for various catch options for 2017. (Source: NAFC Marine Centre)

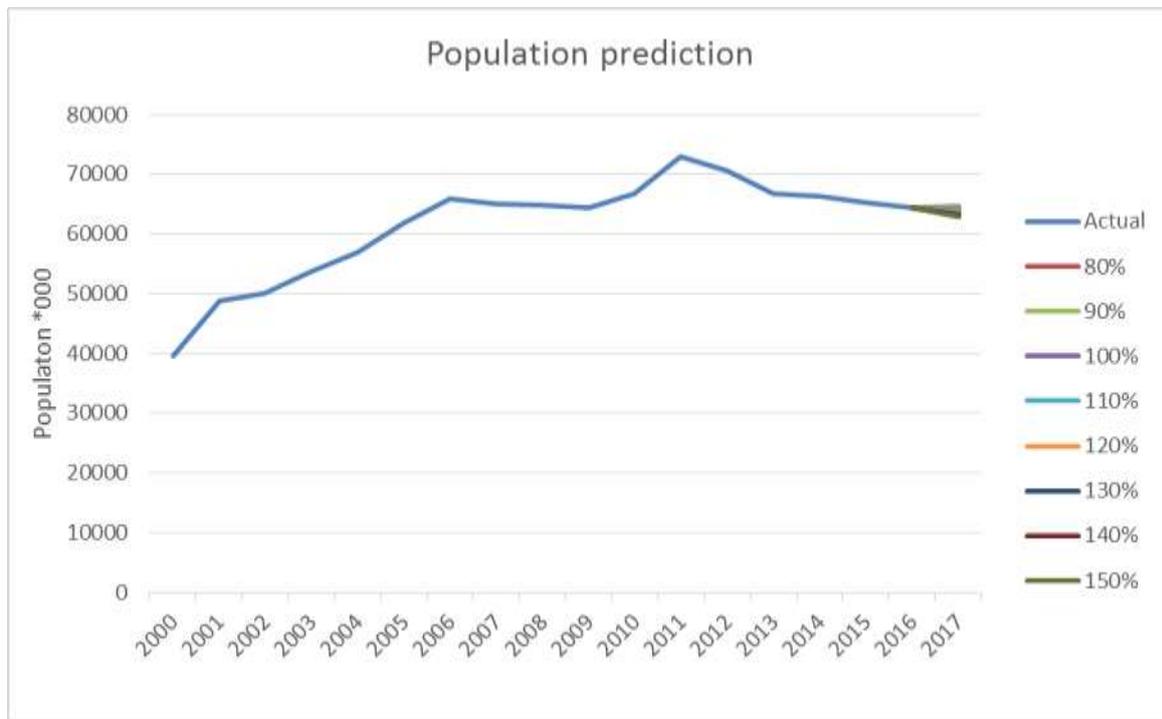
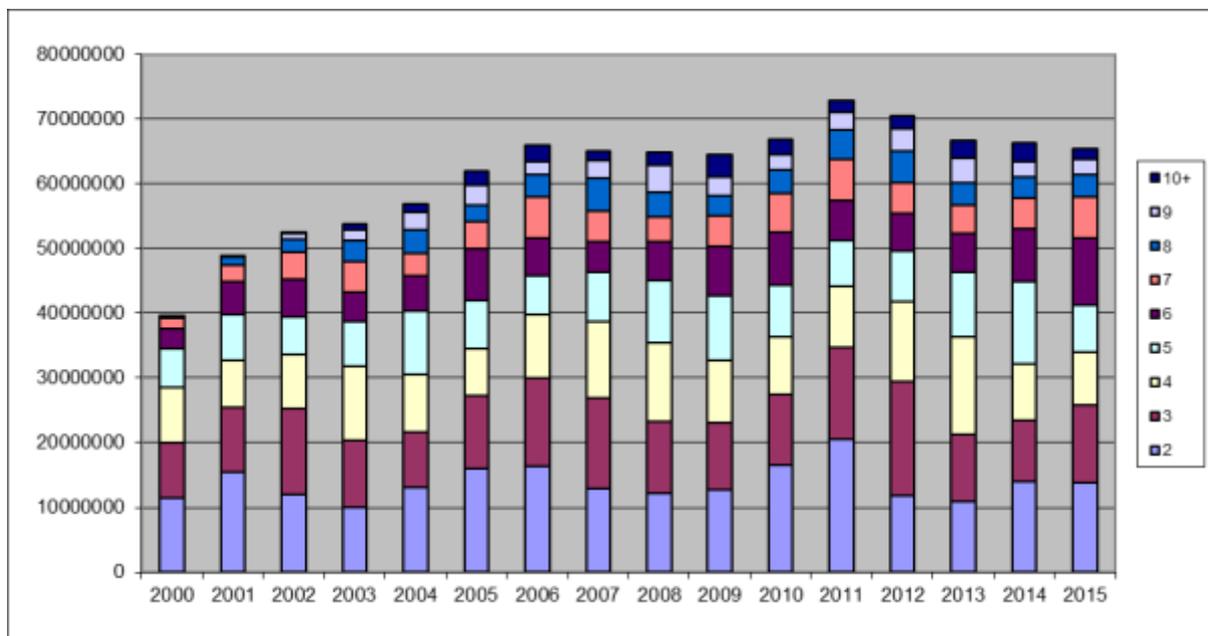


Figure 2-13 Population estimates for each cohort of scallops from VPA model. (Source: NAFC Marine Centre)



Preliminary analysis of the results of the 2015 scallop stock survey are now available in Shelmerdine and Moutat (in press), but it should be noted that these are only preliminary results and full analysis and reporting of the results are not yet complete.

The survey showed that significant regional differences in scallop size were observed and age frequency distributions varied across regions (Figure 2-14). Tide did not have any effect on size or age of scallop, but the interaction between depth and tide showed that larger and older scallops are found in deeper water or areas of stronger tide. Scallops from deeper water are older than those from shallower water, but there was no effect of depth on scallop size. Sediment had an effect on scallop population structure with larger, older and higher density scallops found on gravel in comparison with other sediment types. Observed densities of scallops above the MLS of 100m varies across region (Figure 2-15), and total abundance and biomass of legal-sized scallops were estimated (preliminarily) at 82 million scallops and 13.5 million kg, respectively. The biomass estimate of scallops based on the VPA assessment was just under 10 million tonnes, so that the estimate from the fishery-independent stock survey is higher than that from the estimate based on standard fisheries data. The differences in biomass estimates are likely due to uncertainties in dredge efficiency across sediment types and overestimating total fishing area in the stock survey estimate.

Figure 2-14 Age frequency distributions of scallops from all regions from the 2015 scallop survey. (Source: Shelmerdine and Mouat, in press)

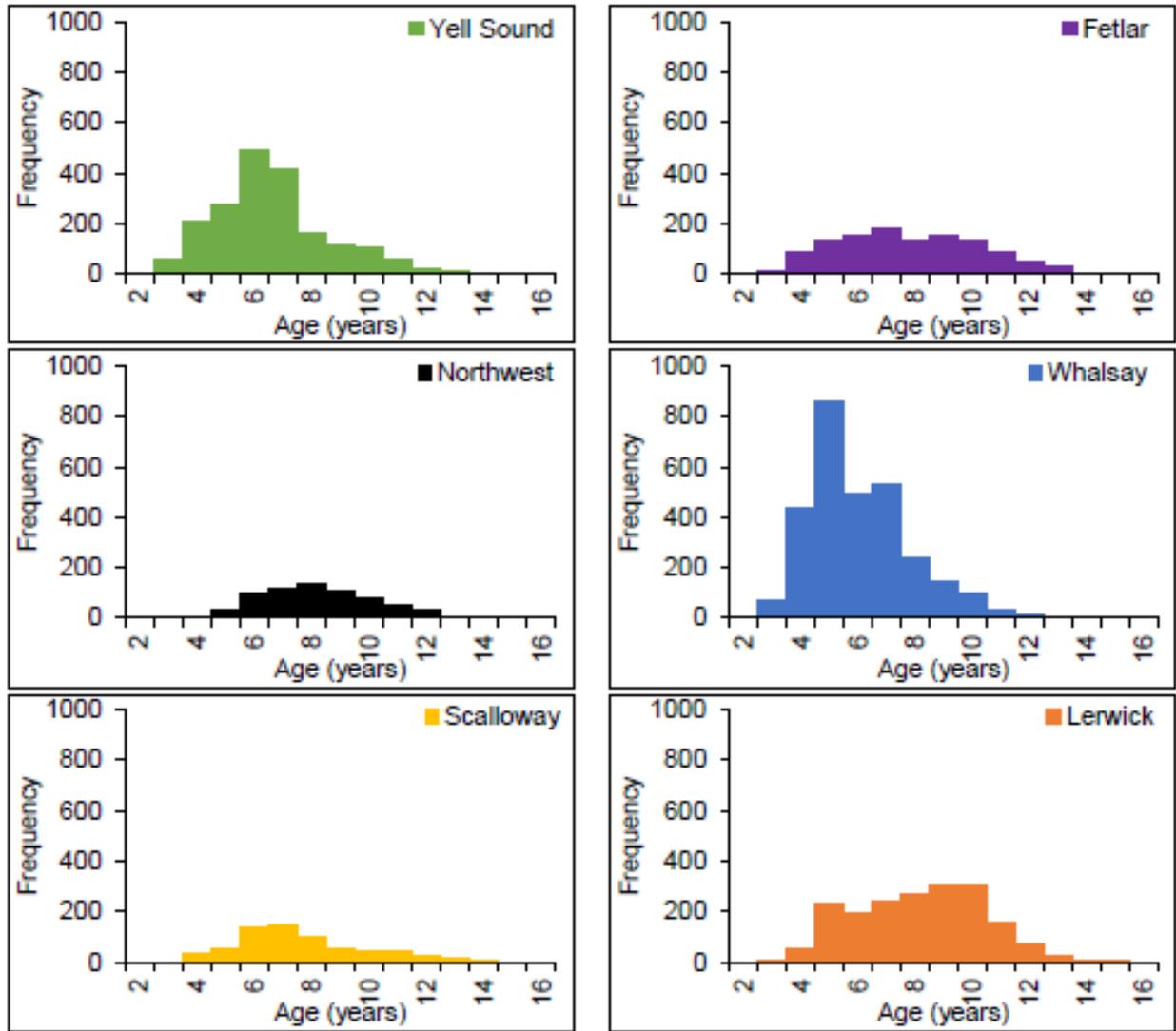
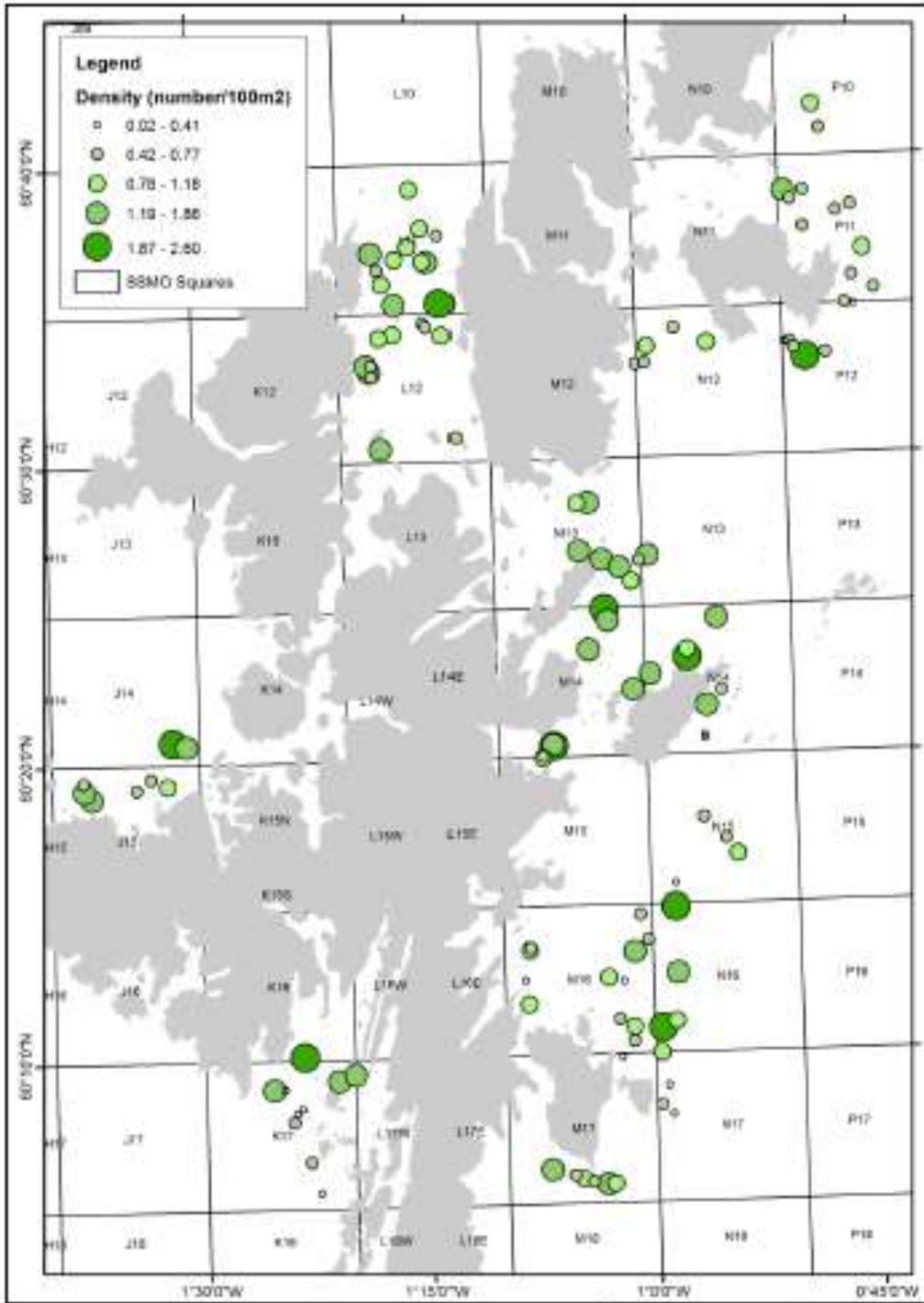


Figure 2-15 Uncorrected density (no. of scallops per 100m²) of scallops above the MLS of 100 mm. (Source: Shelmerdine and Mouat, in press)



2.6 Principle Two: Ecosystem Background

Principle 2 of the Marine Stewardship Council standard states that:

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

The following section of the report highlights some of the key characteristics of the fisheries under assessment with regard to its wider impact on the environment.

2.7 Retained species

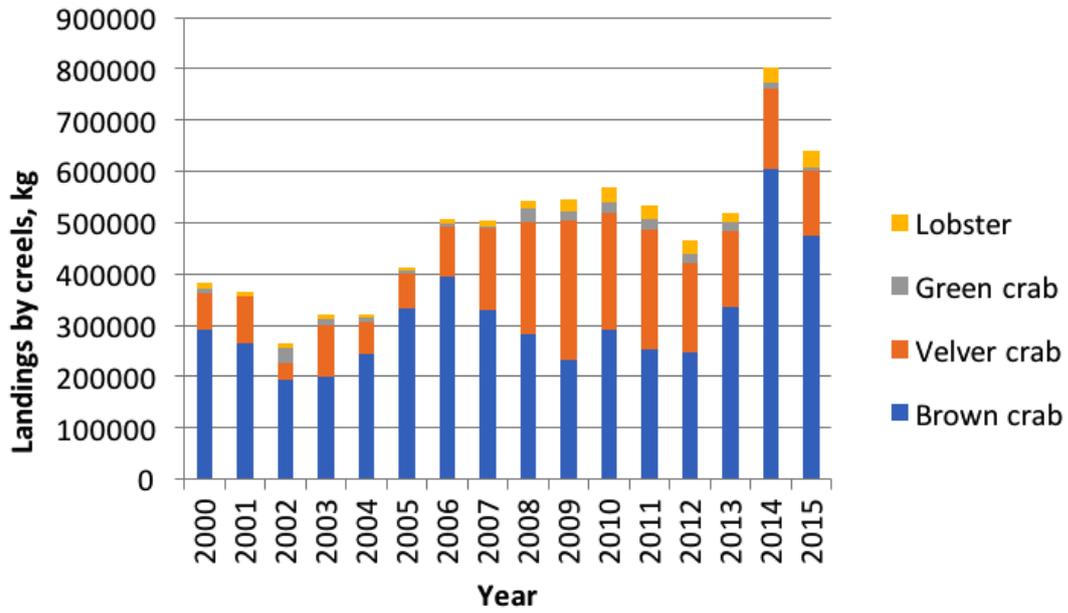
2.7.1 Creels

Shetland SSMO creelers predominately land velvet and brown crab, with smaller quantities of lobster and green crab (Figure 2-16). The two Units of Certification in the creel fishery each have a combination of retained species as presented in Table 6.

Landing data for the four retained species are presented in Figure 3-16. Based on the proportion of the catch by weight velvet crab (29,8% by weight averaged across 2011-2015 and 19,9% in 2015) and brown crab (62,9% by weight averaged across 2011-2015 and 73,9% in 2015) are considered main retained species. Lobster volumes are landed in lower proportions (4,5% by weight averaged across 2011-2015 and 5,2% in 2015. Since this average percentage is only just below 5% and this species is particularly valuable compared to brown crab lobster, it is considered a main retained species in this assessment. Green crab is landed in lower weight proportions as lobster (2,7% by weight averaged across 2011-2015 and 1,1% in 2015) and is of low value and therefore considered to be a minor retained species.

Figure 2-16 Total landings by Shetland SSMO creel vessels from 2010-2015, presented by species.

(note lobster landings based on average of 0.8kg per lobster)



Brown crab and velvet crab

Brown crab and velvet crab are highly likely to be within biologically based limits, as these stocks are considered to be above the point of serious or irreversible harm as described in Principle 1 under PI 1.1.1. Furthermore brown crab is at or fluctuating around target reference points. The stock status for these species has been described in detail in PI 1 1.1 and the text will not be repeated in this section.

Lobster

Stock status for lobster is not re-assessed in this report under P1. In the original assessment report lobster stock status was assessed as a target species and was concluded that at the time of assessment (in 2012) it was likely that the stock was above the point that recruitment would be impaired. It was also concluded that the lobster stock was at or fluctuating around its target reference point. From the catch data in recent years it can be derived that lobster landings in this fishery are a stable proportion of total catches and that this proportion has increased from 2% in 2005-2009 to 4,5% in 2010-2015. Since effort has not increased it can be concluded that there are no signs of overfishing and that the lobster population is stable. Based on this information it is concluded that lobster stock is highly likely between biologically based limits.

Green crab

Green crabs are frequently caught in creels, but whether they are landed or discarded is driven by market conditions and availability of other species (Leslie *et al*, 2010). Green crabs are abundant, robust and have high survivability, for example a study by Darbyson *et al* (2009) found a high survivability of green crab out of water in severe summer conditions – this has led to the green crab becoming a successful invasive species in many countries around the world. They reach maturity within 2 years (Crothers, 1967; Moksnes *et al.*, 1998) and a population of newly settled individuals are likely to grow rapidly and become self-perpetuating within a few years. However, at a Shetland level biologically based limits are not known and target reference points have not been defined. Furthermore routine sampling undertaken in the region of Sullom Voe has found a decline in records of green crab at stations surveyed in 2008 and a further decline in 2009 surveys, but no explanation for the decline is known (Moore, 2009). In the context of the fishery there are no concerns over the interaction of the SSMO creel fishery on green crabs.

Both Units of Certification in the creel fishery will have a combination of the following retained species: brown crab, velvet crab, green crab and lobster. A summary table is presented in Table 6 to clearly show which species are considered as main and minor retained species for each UoC.

Target Species	Retained species (2.1.1 score)
Velvet crab UoC	Main: brown crab and lobster; minor: green crab.
Brown crab UoC	Main: velvet crab and lobster; minor: green crab .

Table 6. Main and minor retained species associated with each creel Unit of Certification. (Source: NAFC Marine Centre, 2016).

The Shetland Shellfish Management Organisation Management Plan sets out the regulations and controls in place under the Regulating Order. The Strategy covers a number of cohesive and strategic management measures including:

- Minimum landings sizes
- Real time closed seasons for velvet crabs during moulting periods
- Ban on landing claws
- Ban on use of crab as bait
- Harvest control rules for brown crab, velvet crab and lobster
- Limit reference points for brown crab, velvet crab and lobster
- Stock assessments for green crab, brown crab, velvet crab and lobster
- Control over number of licences issued
- Restrictions on vessel size that can operate within the Regulating Order

Information is sufficient to quantitatively estimate outcome status of brown crab, lobster and velvet crab with a high degree of certainty. The NAFC Marine Centre produces annual stock assessments which detail catch curves and length cohort analysis for each species. The level of data is presented at a detailed spatial scale.

2.7.2 Scallop dredging

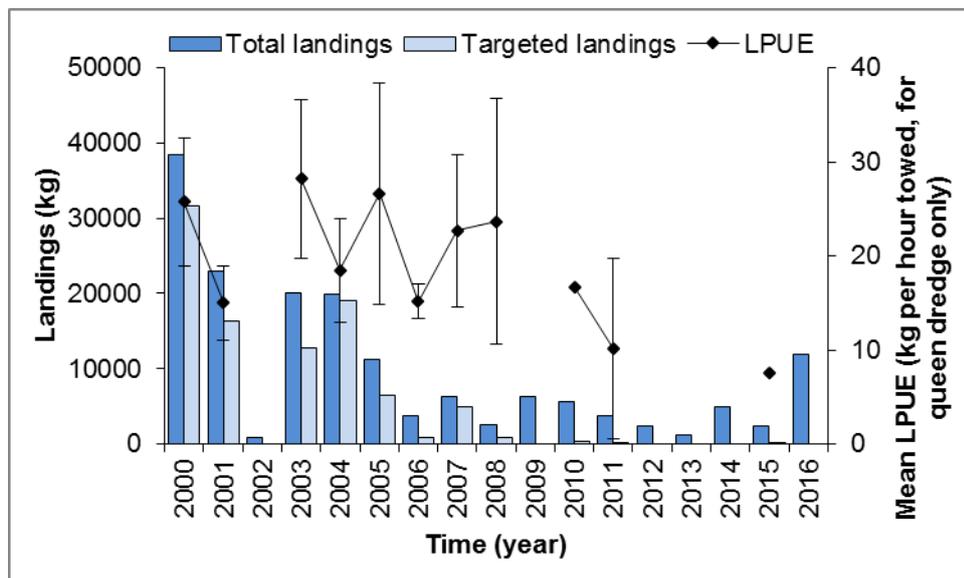
The only retained species associated with the king scallop fishery is the queen scallop, which is landed in very small proportions and is therefore a minor retained species. On average from 2005- 2015 landings of queen scallop (taken by the king scallop targeted fishery) accounted for 1,14 % of the total landings of scallops by weight.

The total landings of queen scallops, by SSMO dredge vessels targeting king scallops within Shetland inshore waters (out to 6 nautical miles) are presented in Figure 3-17. These data also highlight the sporadic nature of the Shetland queen scallop fishery, which is very much influenced by market conditions. There was a very limited targeted queen fishery since 2008. Observations on LPUE from the targeted fishery in previous years have shown a high degree of variability, related to the quantity of data available. The data at present are not sufficient in order to carry out any analytical assessment on the queen scallop stock.

Distributions of the stocks occur across slightly different grounds and therefore low quantities of queen scallops are taken when targeting king scallops. King scallops have a more patchy distribution and are usually found in shallow depressions in the seabed, preferring areas of clean firm sand, fine or sandy gravel and occasionally muddy sand (Marshall and Wilson, 2009); while the queen scallop is found on sand or gravel, often in high densities (Carter, 2009).

Queen scallop are targeted as a separate fishery when market conditions are favourable for this species. Furthermore, the king scallop dredges are not efficient for catching queen scallops since they have a ring size of 65 mm. Different dredges are used when targeting queen scallops with teeth much closer together and a ring size of 50mm.

Figure 2-17 Landings (kg) and mean LPUE (catch per hour per dredge) with 95% confidence intervals)
(source: SSMO logbook data)



As with the creel fishery management is in place as per the Regulating Order and includes the following that are of relevance to queen scallops:

- Minimum landings sizes (queen scallop: 40mm)
- Limit of two tow-bars with a combined maximum overall length, or a single tow bar with a maximum overall length, of 8.80 m and maximum limit of 10 scallop dredges (with an exception for vessels that used more than 10, but not more than 14 dredges during 2001 which can continue using existing tow-bar and dredges)
- Ban on use of French dredges (incorporating paravanes, diving plates, pressure plates, water deflecting plates and rigid fixed teeth)
- Curfew with no scallop or queen scallop fishing before 0600 hours or after 2100 hours.
- Control over number of licences issued

2.8 Bycatch (including discarding)

2.8.1 Creels

The creel bycatch component considers by-caught species which are not assessed under retained but are discarded with no value to the fishery, together with the species used for bait and the effect and likelihood of ghost fishing.

Creel fisheries are known for being highly selective with limited discards. Furthermore due to the benign nature of the fish capture process, it is expected that the mortality of fish discarded from traps may be low as the catch is usually alive, with low injury rates (Nøstvik and Pedersen, 1999) and low capture-related stress (Pilling *et al.* 2001 as cited in Thomsen *et al.*, 2010).

Under Component 2.2 only bycatch species which are not assessed under retained species Component 2.1 but are discarded with no value to the fishery are considered.

Data on bycatches in the creel fishery have been collected during sampling trips undertaken by NAFC staff in 2012 and 2013 (NAFC, 2013). From the collected data it can be derived that in the velvet crab sampling trips only the great spider crab (*Hyas araneus*) with a percentage of 8,7% contributed to over 5 % of the catch in weight and is to be considered a main bycatch species in the velvet crab UoC. This species is highly likely to be within biologically based limits since it is very unlikely that the population of this crab is affected by the creel fishery. These crabs are caught alive in the creels and will usually also be released alive and survive.

From the data collected during the brown crab sampling trips it can be derived that in the brown crab UoC there were 2 species that were caught in a higher proportion than 5 % and have to be considered main bycatch species. These are common starfish (*Asterias rubens*, 14.5%) and Atlantic cod (*Gadus morhua*, 13.3%). Common starfish is a species that is very widespread and occurs in high numbers. After being caught they will be returned to the sea alive. Therefore it is certain that this species is within biologically based limits. Cod caught in the creels will generally be undersized and will probably survive the catch alive (Nøstvik and Pedersen, 1999). Cod is a species that is targeted in several well managed fisheries around Shetland and can therefore be considered a species to be within biologically based limits.

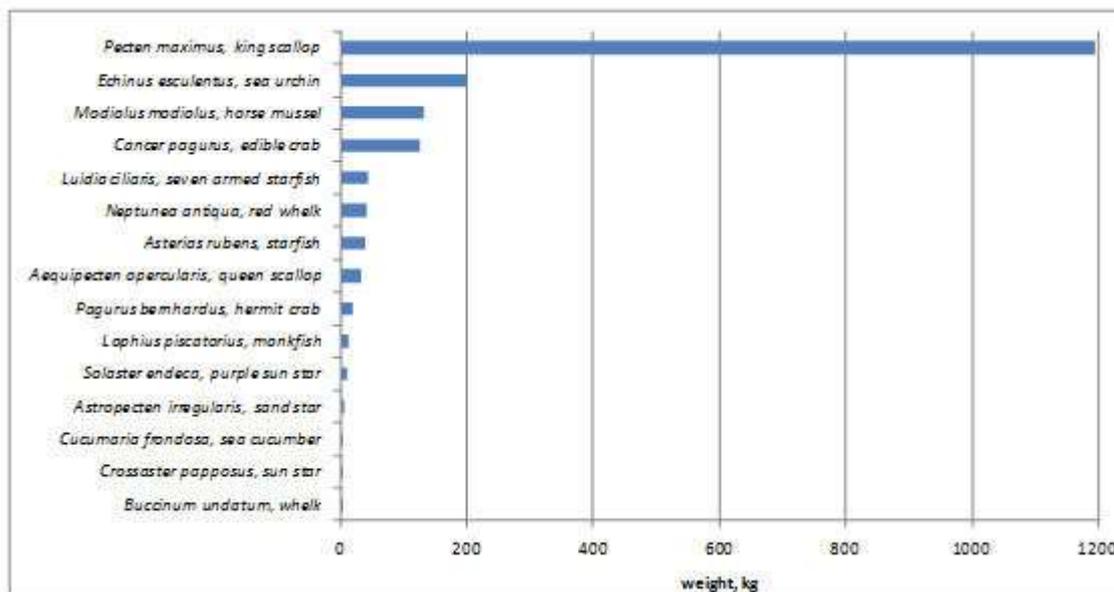
Waste from fish processors including spine, head and offcuts are used as bait in the creel fisheries and therefore no pressure is placed on any other fish or shellfish resources. As such there is no concern in relation to use of bait.

2.8.2 Scallop dredging

A study into the occurrence of bycatch in the scallop dredge fishery around Shetland was undertaken by the NAFC in 2010 (Shelmerdine, 2010). This was based on 57 tows within six sampling areas. In total 63 animals were identified as bycatch, of which 15 made up 98.35% of the total catch weight (Figure 2-18). King scallop dominated the catch contributing 62.6% by weight, followed by sea urchin (10.6%), horse mussel (6.9%) and brown crab (6.6%). All other bycaught species individually made up less than 2.4% of the catch weight and are therefore not considered main retained species.

Horse mussel, *Modiolus modiolus* is an important reef forming benthic organism and is considered under Component 2.4 Habitat.

Figure 2-18 Weight of top 15 species caught during scallop bycatch study (source: Shelmerdine, 2010)



As already presented within Principle 1 and Principle 2 retained species for creel fisheries, brown crab and velvet crab are considered highly likely to be within biologically based limits.

Jenkins *et al.* (2001) researched the impact of scallop dredging on benthic megafauna including crabs, starfish, urchins, whelks and bivalves in the north Irish Sea, off the Isle of Man. Capture efficiency for the megafauna was found to be low, ranging from 2 to 25% among species, thus the majority of megafauna which encounter scallop dredges remain on the seafloor. The report investigated fishing-induced damage to species taken as bycatch and left on the seafloor. In total 53% of the sea urchins encountering scallop dredging were found to be left in good condition and 46% with spine loss, minor cracks or crushed/dead. Based on the area targeted by scallop dredgers together with the fact that urchins prefer rocky boulder substrata (where dredges cannot access); have a high fecundity, early maturation and; a 53% survival rate when encountering scallop dredges, it is considered highly likely that sea urchins are within biologically based limits.

The management measures described for scallop dredge retained species are also applicable for bycatch species. The quantitative evidence provided by the Shelmerdine report has allowed the information performance indicator to pass unconditionally. However a strong management system that ensures sufficient information is collated should state routine survey frequencies for scallop bycatch, for example, once every five years. Commitment to routinely record bycatch of scallop dredging has therefore been recommended for this component.

2.9 Endangered, threatened or protected species (ETP)

According to MSC methodology, ETP species are defined as those that are recognised as such by national legislation and/or binding international agreement (e.g. CITES) to which the jurisdictions controlling the fishery under assessment are party. Species that appear exclusively on non-binding lists such as IUCN Red List, OSPAR or that are only the subject of intergovernmental recognition (such as FAO International Plans of Action) and that are not included under national legislation or binding international agreement are not considered as ETP under MSC protocols.

Most capture fisheries have at least some potential to interact with Endangered, Threatened or Protected species. The ETP interaction profile for each gear type varies and is greatly influenced by the manner in which it is utilised. Factors such as frequency of use, duration of deployment, season, and location all play a role in defining a gear type's ETP interaction profile.

The ETP species assessed in relation to the creel and scallop dredge fisheries have been determined based on three factors: temporal range of the species; spatial range of the species and; evidence of interaction with the fishing gear.

2.9.1 Interaction of creels with ETP species

ETP species interaction with pots can occur on land and in the water. On land it has been reported anecdotally that birds and otters can become trapped within pots stored on land when all the panels of the pot are locked closed. This is however very rare and highly unlikely to create unacceptable impacts to these species.

When pots are set at sea ETP interactions can occur with the buoy lines from the surface to the pot on the seabed. Reviewed literature mentions potential entanglement on buoy lines recorded for right and humpback whales and leatherback turtles (Thomsen *et al.*, 2010). There is also potential for otters to get trapped and drown within a creel while pursuing fish or bait within the creel.

A recent study by the Sea Mammal Research Unit (SMRU) (Northridge *et al.*, 2010) investigated entanglement of minke whales *Balaenoptera acutorostrata* in creel lines in Scotland. The report reviewed available evidence from around the world highlighting that Northern right whales *Eubalaena glacialis* are subject to critical levels of entanglement mortality in lobster pot and gillnet fisheries in the north-eastern US and Atlantic Canadian waters (Kraus 1990, Caswell *et al.* 1999). It is noted however that the Shetland gear configuration differs from that deployed in US and Canada. In Shetland pots are rigged in strings of multiple pots, so there are only two ropes for each grouping of pots. In the inshore waters of the US and Canada, lobster pots are fished in singles or strings of 3 therefore consisting of considerably more buoyed ropes and a higher risk of entanglement.

By cross referencing creel fishing effort data by ICES rectangle and aggregated minke whale sighting to the same ICES rectangle scale, Northridge *et al.* (2010) mapped the Relative Risk

of Entanglement around Scotland. Shetland is markedly lower risk than elsewhere, with highest risk found in the Sea of the Hebrides region, the Little Minch and east coast of Scotland off Angus.

The Shetland creel fisheries are managed by the overarching Shetland Regulating Order and SSMO Management Plan. This restricts the number of vessels within the fishery through the annual issue of licences.

The following legislation pertains to marine turtles, cetaceans and otters:

- Wildlife and Countryside Act (1981, as amended)
- Conservation (Natural Habitats, &c.) Regulations (1994) which transposes EC Habitats Directive 1992 to domestic legislation
- Control of Trade in Endangered Species (Enforcement) Regulations (1997)
- Council Regulation (EC) No. 338/97
- Council Regulation (EC) No. 812/2004 (cetaceans only)
- Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) (cetaceans only)
- UK Biodiversity Action Plans

Under the above legislation instruments it is illegal to deliberately kill or catch a marine turtle, cetacean or otter.

The UK Turtle Code which has been disseminated to all SSMO creel fishermen provides clear instructions on what to do when a turtle is encountered entangled at sea and how to report all encounters including what details to record and who to contact.

SSMO has produced a 'SSMO Cetacean Entanglement Prevention Guide'. This provides a six-point list of measures to reduce the risk of cetacean entanglement, and provides advice in the actual event of cetacean entanglement. This material has been distributed to all SSMO licensees. In order to minimize mortality. SSMO has also distributed wheelhouse cards and obliges all licensees to report ETP interactions. All interactions are recorded in the SSMO database.

SSMO Code of Conduct further obliges all licensees to return ETP species quickly to the water to maximise chances of survival. The Code of Conduct also states that all fishermen should consult and adhere to the actions set out in the wheelhouse cards.

From the information collected in SSMO database on interactions of the creel fishery with ETP species it can be concluded that interactions with otters and turtles are virtually absent. Interaction with whales are a possibility, in the last 5 years one incident with an entangled Minke whale occurred.

2.9.2 Interaction of scallop dredging with ETP species

ETP species that have the potential to be incidentally captured by scallop dredgers are most likely to be demersal elasmobranch species such as the common skate (*Dipturus batis*), angel shark (*Squatina squatina*) and porbeagle (*Lamna nasu*). Other species of ray and skate may also be taken, although these are not considered ETP species in the area under assessment.

The Shelmerdine (2010) report indicates some interaction of scallop dredging with common skate.

Common skate within the EU zone are protected under EU regulations 104/2015. Under these regulations it is prohibited for EU vessels to fish for, to retain on board, to tranship and to land the basking shark, angel shark, common skate and porbeagle. The undulate ray is also protected under these regulations, but not in ICES division IV.

As well as prohibiting landings of common skate, the regulations require any individuals captured to be returned alive to the extent practicable. It is not, however, illegal to incidentally capture a common skate.

As well as the EC regulations, other strategies in place include the European Community's Plan of Action for sharks, skates, rays and chimaeras, released on the 6 February 2009, and at a UK level DEFRA recently published a Shark, Skate and Ray Conservation Plan (DEFRA, 2011) which sets out policy objectives to manage elasmobranch stocks sustainably so that depleted stocks recover and that those faring better are fished sustainably.

Seafish published (with the assistance of the Shark Trust and the Skates and Rays Producers Association) identification guides for fishermen to help distinguish 13 species of skates and rays. Accompanying these is a website that features a database to collect landing data allowing their quantity and geographic availability can be monitored and studied at a species level. The SSMO Code of Conduct and the SSMO log sheets require that fishermen record and report all ETP and habitat interactions to the SSMO. Since 2013 all logsheet data are based on daily data and all fishermen send their logsheets to SSMO on a regular basis. The data from the logsheets on landings, ETP and habitat interactions are fed into the updated SSMO database. No interactions with ETP species have been reported by fishermen over the last 3 years.

2.10 Habitat

2.10.1 Habitat distribution

Habitat seabed types, biotopes and sensitive habitats have been mapped as part of the Shetland Islands' Marine Spatial Plan (NAFC Marine Centre, 2016b).

Figure 2-19 presents an example of a map in the SIMSP. The horse mussel bed and maerl bed are closed to scallop dredging.

Figure 2-20 indicates that the seabed habitat of Shetland's inshore waters is predominately mixed sand, coarse sand, sandy kelp, muddy sand and gravel. The area is exposed to

medium-strong tidal currents. The maps presented allow a clear understanding of the location and distribution of habitats including location of sensitive species.

Figure 2-21 presents the location of Conservation Designations. There are six marine Special Areas of Conservation, designated under the EC Habitats Directive and UK Conservation (Natural Heritage etc.) Regulations 1994. These are: Papa Stour and Mousa designated for Annex I habitats of reefs and submerged or partially submerged sea caves; the Vadills designated for Annex I habitat of coastal lagoons; Sullom Voe designated for Annex I habitats of large shallow inlet and bays, coastal lagoons and reefs; and two at Yell Sound Cost designated for Annex II species of otter and common seal.

The two main SACs with which there is interaction between the qualifying habitats and Shellfish fishing are Papa Stour and Mousa SACs. At Papa Stour, there are important fisheries for crabs and scallops; and at Mousa where crabs and lobsters are fished. Neither of these SACs are currently thought to be damaged by fisheries within the scope of the Shetland Regulating Order. Appropriate Assessments have not been undertaken in relation to scallop dredging and are considered unnecessary, the impacts of this gear on these SACs is not of concern (SNH, pers. comm. during site visit).

Figure 2-19 Important Seabed Habitats (maerl beds) (source: SIMSP, 2016)

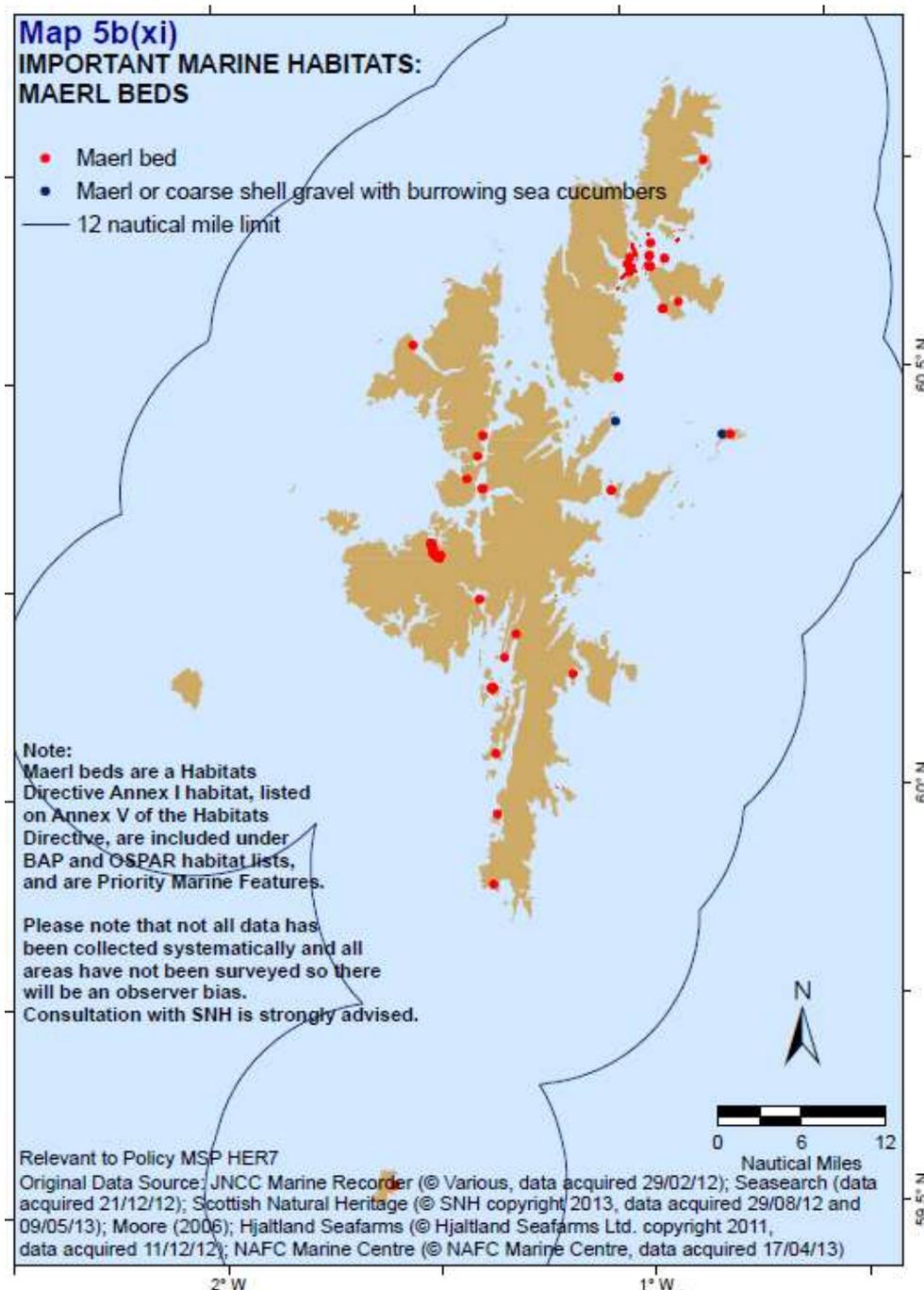


Figure 2-20 Map indicating predicted seabed type. (source: SIMSP, 2016)

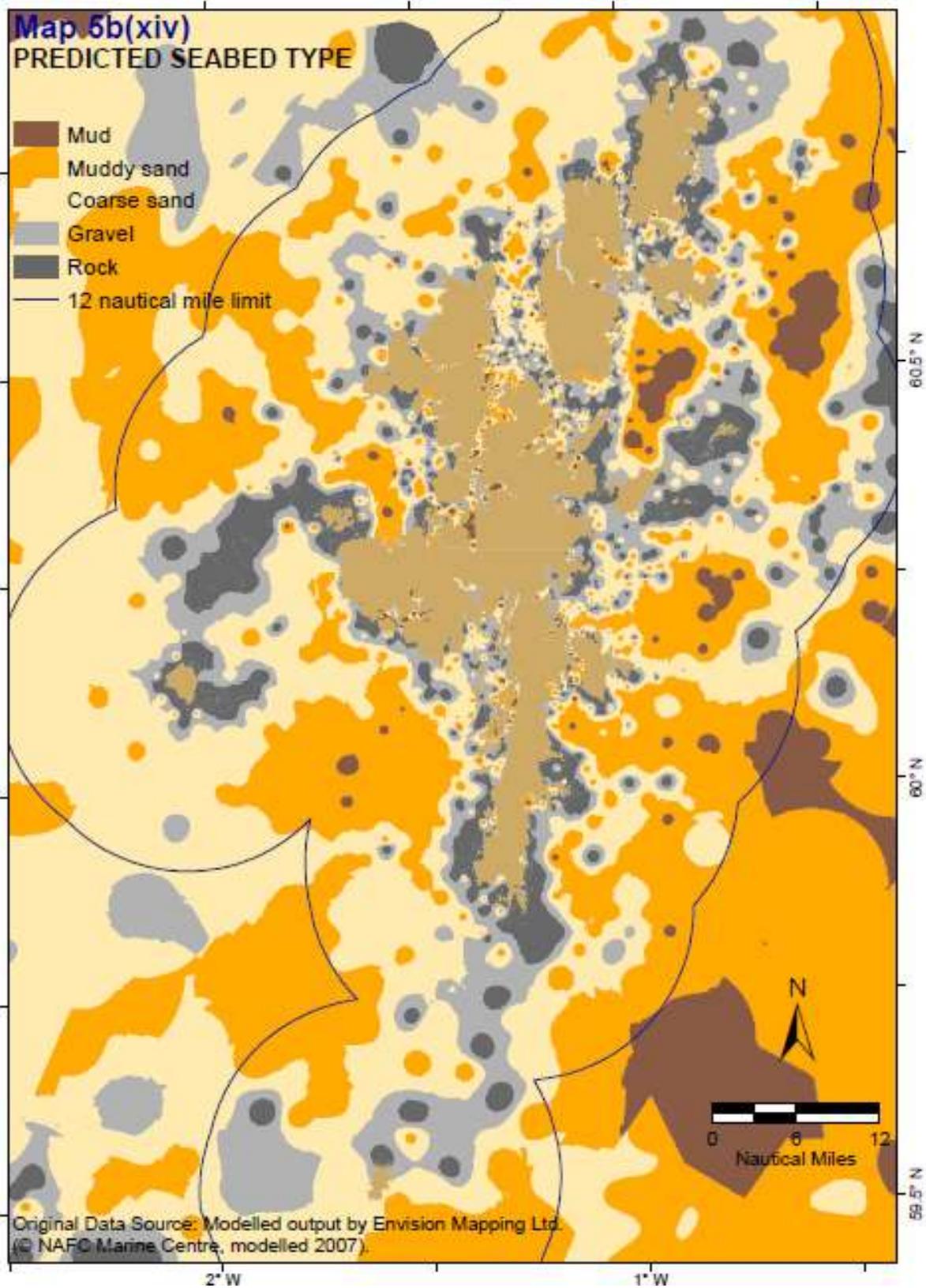
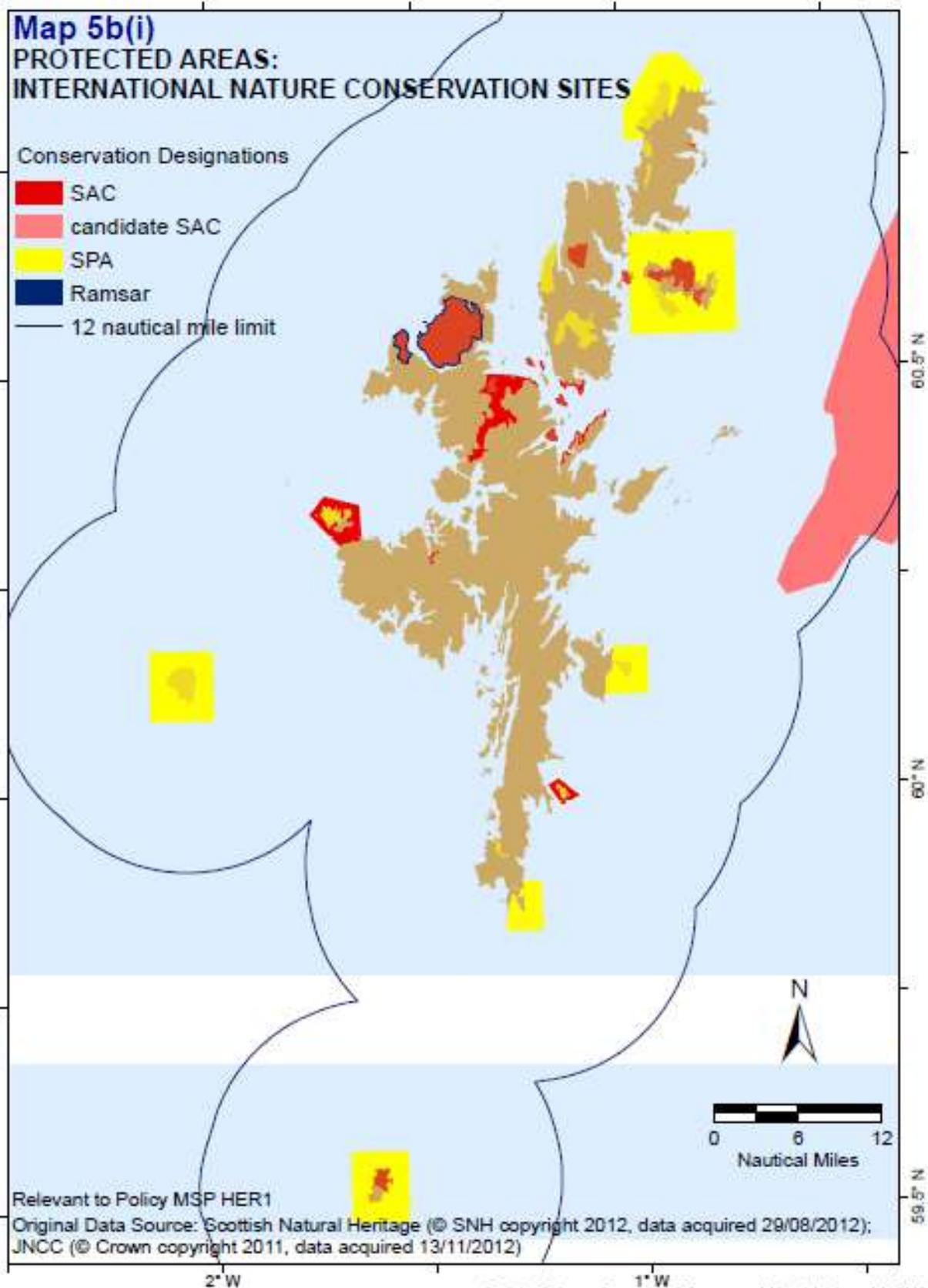


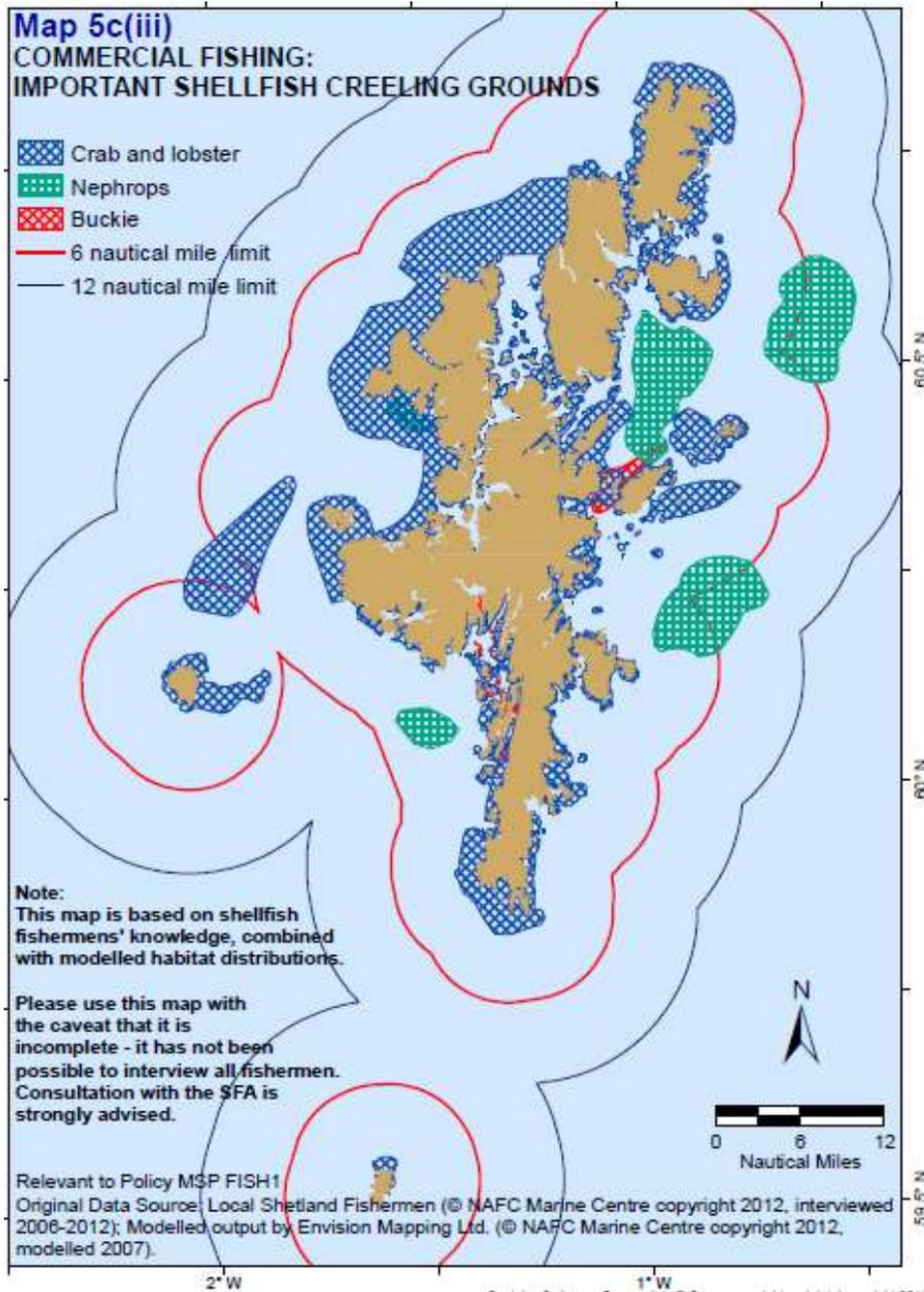
Figure 2-21 : Location of protected areas including Natura 2000 sites. (Source: SIMSP, 2016).



2.10.2 Creel habitat interactions

In general, pots are often advocated on an environmental basis for having a lesser impact on habitat than mobile fishing gear such as trawls and dredges (Rogers *et al.*, 1998; Hamilton, 2000; Barnette, 2001). Static gears in general have smaller and more localised impacts. The distribution of lobster, brown crab and velvet crab potting is well understood based on fishing effort data collected and mapped by the NAFC (Figure 2-22); consultation undertaken with Shetland fishermen to map important fishing grounds and correlation with habitat data as part of the Shetland Islands' Marine Spatial Plan Atlas (NAFC Marine Centre, 2016b).

Figure 2-22 Important shellfish creeling grounds. (Source: SIMSP 2016).



Eno *et al.* (2001) examined the effects of fishing with crustacean pots and creels on benthic species in Great Britain through qualitative and quantitative experiments. This study examined the effects of lobster and crab pots being hauled from rocky substrates in southern England, and found that the habitats and their communities appeared relatively unaffected by potting. The slow-growing, long-lived, pink sea fan, *Eunicella verrucosa*, were frequently observed to flex under the weight of pots as they passed and then returned back to an upright position. While this provides important evidence in relation to the impact of creels on sensitive habitats, it should be noted that the pink sea fan is not present in Shetland waters.

The NAFC have a detailed research plan which includes a programme for surveying the sensitive habitats identified in for example Figure 2-19 (maerl beds).

2.10.3 Scallop dredging habitat interactions

The impact of scallop dredging on habitats and benthic communities is well studied (Auster *et al.*, 1996; Bradshaw *et al.* 2000; Currie and Parry, 1996; Currie and Parry, 1999; Eleftheriou and Robertson, 1992; Jennings *et al.*, 2001; Kaiser *et al.* 1996; Kaiser *et al.* 2006; Løkkeborg, 2004; Thrush *et al.*, 2005). It is understood that bottom fishing activities, in particular scallop dredging, are capable of greatly reducing habitat complexity by either direct modification of the substratum or removal of the fauna that contribute to surface topography (Auster and Langton, 1998; Jennings and Kaiser, 1998).

The recovery time of habitats and biota impacted by scallop dredging varies depending on the type of habitat and geophysical conditions. The recovery time (to -10% recover) after scallop dredging varies from a few days in high tidal and wave swept areas to months in less exposed sand and muddy sand areas and; 2-3 years across sensitive biogenic reef habitats. The level of impact also varies depending on how extensively these areas have been fished with areas of high fishing effort are likely to be maintained in a permanently altered state, inhabited by fauna adapted to frequent physical disturbance.

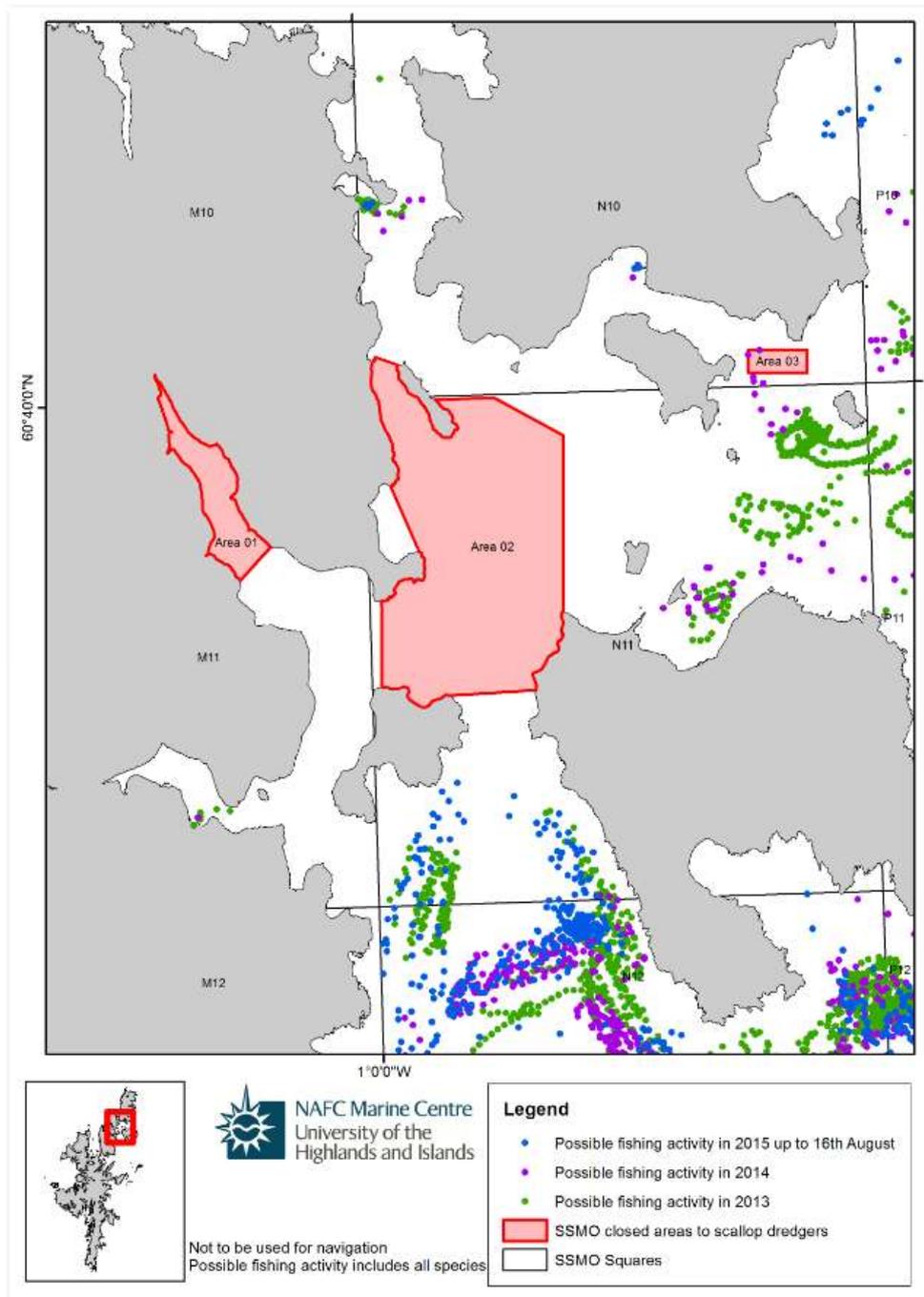
Kaiser *et al.* (2006) undertook a meta-analysis of 101 experimental fishing impact studies in order to identify the types of fishing gear that have the greatest impact on the seabed and on the groups of organisms that are most vulnerable to fishing activities. Scallop dredging was found to have the most severe ecological effects. Scallop dredging in biogenic habitats gave the greatest initial response of all fishing gear/habitat combinations, and the negative effects were predicted to last from 972 to 1175 days post-fishing.

Gravel habitats, which are relatively stable and tend to support communities with high levels of diversity and biomass, were negatively affected by scallop dredging both in the short and long-term although the initial impact was less pronounced than for other less stable habitats (i.e. biogenic). The mean times to -10% recovery for muddy sand and sand habitats were 88 days and 39 days respectively.

The Shetland Islands Marine Spatial Plan (SIMSP, 2016) establishes an overarching policy framework to guide marine activities and brings together authoritative spatial data on the marine and coastal environment.

The SIMSP includes policy framework for commercial fisheries and important species and habitats. Policy MSP F2: Local Management of Sustainable Fisheries states that “Local fisheries management will develop appropriate measures so that fishing is not carried out in ways that damage important habitats and species”. Under this policy framework the SSMO have implemented a series of areas closed to scallop dredging. The areas (as presented in for example Figure 2-19 for mearl beds) that indicate locations of mearl beds and horse mussel beds are closed to scallop dredging. The area closures are monitored by VMS data from the scallop vessels (Figure 2-23).

Figure 2-23 Scallop dredging fishing activity and closed areas. (source: NAFC, 2015)



2.11 Ecosystem impacts

Predator-prey relationships for the target, retained and bycatch species associated with the scallop, lobster, brown crab and velvet crab fisheries are well understood.

None of the target species are considered to be key-stone species which may form crucial linkages in the wider ecosystem food web. It is considered highly unlikely that a trophic cascade would occur due to current levels of biomass removal within these shellfish fisheries. Severely truncated size compositions and gross changes in the species diversity are considered highly unlikely to occur, as are any changes in the genetic diversity of the species as a result of current fishing patterns.

The potential impact of the SSMO creel and scallop dredge fisheries on the ecosystem structure and function is managed at an international scale under the EU framework, a national scale under UK and Scottish fisheries regulations and at a local scale by the SSMO.

The Shetland Regulating Order and the Shetland Islands Marine Spatial Plan (SIMSP, 2015) are applicable for management of the overall ecosystem structure and function. In particular the licensing system of the Regulating Order controls the number of vessels in operation, ensuring no latent capacity and a clear understanding of the level and location of effort.

The SSMO members operate to a Code of Conduct which includes details of operational best practice including marine litter and minimising carbon footprint where possible.

No concerns are raised for the impact of the creel and scallop dredge fisheries on the wider ecosystem structure and function.

2.12 Principle Three: Management System Background

The Shetland inshore fisheries operate under a single jurisdiction within the inshore waters (within 6 nmiles of the coast) of Shetland. Shetland is the most northerly group of islands in Scotland and therefore falls under Scottish jurisdiction for fisheries regulation which is devolved from the UK government. As a member state of the European Union, all regulations must be compliant with the EU's Common Fisheries Policy. Local fisheries regulations can be stricter than the regulations established under the CFP.

Scottish inshore fisheries are managed by Marine Scotland under the powers laid out by the Scottish Government in the Marine (Scotland) Act 2010. The latest iteration of the Scottish Inshore Fisheries Strategy (Marine Scotland, 2015) states its vision as:

Our vision is to support the development of a more sustainable, profitable and well-managed inshore fisheries sector in Scotland. We aim to do this by modernising the management of our inshore fisheries in Scotland and reaping long-term sustainable rewards for the inshore sector, the marine environment and our coastal communities.

It aims to do this through a number of 'outcomes' including:

OUTCOME 2: Marine Scotland will implement an appropriate form of vessel monitoring to provide good quality information on the footprint of inshore fishing by 2020, in line with the goal of prosecuting fishing at Maximum Sustainable Yields.

And

OUTCOME 4 (linked to outcome 2): Our inshore waters will be managed in a way which is environmentally sustainable and their potential will be maximised to the benefit of coastal communities. The management of our fisheries will be congruent with the Marine Strategy Framework Directive. By 2020 effective assessment methodologies will be in place for fishing at Maximum Sustainable Yield, achieving Good Environmental Status and maintaining compliance with other marine conservation initiatives such as the Natura Directive and the development of Marine Protected Areas.

The Shetland inshore fisheries being assessed are managed through a Regulating Order, which is a local fisheries management tool that was introduced in the UK Government's 1967 Fisheries (Shellfish) Act. The purpose of a regulating order is to enable the grantee of the Order (in this case the SSMO) to remove public right of fishing commercially for specified species within specified areas and instead issue a limited number of licences. The grantee may lay down regulations for management and enforcement of the fishery which can take a number of forms, including the imposition of a licensing regime, the requirement to pay tolls or to set quotas and minimum landing size. In effect, a Regulating Order places the responsibility for managing a sustainable fishery on local stakeholders, including fishermen, conservationists, scientists and local authority representatives.

2.12.1 Shetland Shellfish Management Organisation (SSMO)

The Shetland Regulating Order is now in place until 2028 through legislation by the Scottish Government (Scot Gov, 2012). This legislation continues to confer the SSMO with the responsibility for managing the commercial shellfish fisheries in line with the conditions of the Regulating Order.

The SSMO is a partnership of organisations with an interest in the future of Shetland's shellfish fisheries. The organisation is legally constituted as a company limited by guarantee and is run by a board of directors half of whom are active fishermen.

The SSMO Board membership has been restructured over the years and currently comprises 8 directors as follows (www.ssmo.co.uk):

- 1 member from the Association of Shetland Community Councils (nominated by the association)
- 1 shellfish processor (nominated by Seafood Shetland)
- 2 Shetland Island Council (SIC) elected members (nominated by the SIC)
- 2 Shetland Fishermen's Association (SFA) members (nominated by the SFA Small Boat Committee)
- 2 SSMO licencees (nominated and voted for by SSMO members)

The SSMO Board meet 10 times a year and there is also a SSMO Advisory Group who meet on a regular basis and which advises the SSMO Board.

The vision, aim and goals of the SSMO are listed on its website (www.ssmo.co.uk) and repeated in the SSMO Management Plan, which was revised in 2013 for the period 2013-2018.

Vision

A buoyant shellfish sector based on a sound management system, resulting in fisheries that are managed to ensure long term biological, environmental and economic sustainability.

Aim

To continue to maintain sustainable and well managed shellfish fisheries operating within a healthy marine environment.

The SSMO management strategy is built around the following objectives:

- 1. Stocks –Stocks will be maintained at biologically sustainable levels.
- 2. Environment –Fishing activity will be managed in an environmentally responsible manner
- 3. Governance – The SSMO will operate in an efficient and transparent manner and be accountable.
- 4. Socio-Economic – The continued prosperity of the shellfish fleet and the communities which it supports will be given due consideration in management decisions.

5. Research & Development – We will put in place research and development plans to inform and sustain the work of the SSMO into the future

These objectives reflect the high level objectives set out in the Strategic Framework for Inshore Fisheries in Scotland (2005) produced by the Scottish Government (Scottish Executive).

Objective 1: Stocks

In order to meet this objective we will:

- Establish biologically relevant reference points for commercially exploited stocks
- Develop a coherent and effective harvest control strategy which utilises the best available information
- Implement effective management measures that are enforceable

Objective 2: Environment

In order to meet this objective we will:

- Put in place an effective code of conduct for all fishermen
- Maintain an effective spatial management plan

Objective 3: Governance

In order to meet this objective we will:

- Ensure effective communication with all licenced members and wider stakeholders
- Operate in a transparent and accountable manner
- Operate an effective management system

Objective 4: Socio-Economic

In order to meet this objective we will:

- Ensure that socio-economic factors are effectively considered in the management decision making process
- Encourage young people to enter the industry
- Engage with Accreditation Schemes to ensure access to markets and optimum returns for Shetland shellfish

Objective 5: Research & Development

In order to meet this objective we will:

- Develop a research strategy which meets the needs of local industry and feeds into the development of the management plan
- Explore and exploit potential areas of development for the local shellfish industry
- Identify external funding streams to facilitate research and development work

2.12.2 Roles and responsibilities

In the United Kingdom fisheries is a matter that is devolved to the home nations. Management of fisheries in Scotland is the responsibility of **Marine Scotland**. A division of this government body, **Marine Scotland Compliance**, is responsible for enforcing all fisheries regulations. For these inshore fisheries, management is further devolved to the **SSMO** under the Regulating Order, but control still rests with Marine Scotland Compliance.

Scientific advice on the shellfish fisheries is provided to SSMO by **NAFC Marine Centre** based in Scalloway, Shetland. A fisheries research program was initiated in 2000 to provide scientific advice. The fisheries research program enables the production of annual stock assessment for the management of the SSMO fisheries. The SSMO receives advice from NAFC Marine Centre via its Advisory Group, and applies its harvest strategy accordingly (see section 2.5 for further details on the harvest strategy developed).

The regulatory system for the management of shellfish stocks is detailed in the SSMO regulations, which are published on the SSMO website. The regulations limit certain vessel characteristics such as length (LOA) (not greater than 17m unless vessel is wholly used to dredge scallops); size and type of scallop dredge gear and minimum gear marking requirements. The regulations also detail certain biologically based restrictions such as minimum landings sizes, closed seasons for velvet crabs, and restricted dredging times.

SSMO has also developed detailed licensing procedures to ensure the allocation of licences is fair and transparent. The SSMO has implemented a number of measures aimed to controlling fishing effort and exploitation rates on local shellfish stocks. These mainly take the form of license conditions and regulations.

The licensing measures state the terms by which a licence may be obtained, its length of validity, and limit of scope (for example at the point of a vessel being sold). This is supported by guidance for renewal of licences, replacement vessels and new entrants to the fishery. All of these measures are geared toward capping and where possible reducing overall fishing pressure – for example, replacement vessels must be of ‘similar (or smaller) size, capacity and fishing power’.

The main requirement that is placed upon fishers with an SSMO license is the monthly submission of daily log sheets. This forms the crucial feedback mechanism for routine monitoring, scientific research and management action.

Under Scottish Government rules, vessels over 10m are required to submit logbooks, while under 10m vessels submit a FISH1 form each week. The Registration of Buyers and Sellers requires that all purchases of fish is accompanied by a sales note, which provides an additional source of information to corroborate landings. Inshore VMS is also being trialed to enable closer spatial management of inshore vessels in relation to closed areas as well as ‘smart tags’ for creels to manage total numbers and provide additional management/scientific information such as soak time and water temperature.

Marine Scotland Compliance has a Shetland office with five enforcement officers that undertake regular port inspections and at sea patrol using a risk-based approach. These control officers work closely with SSMO under a Memorandum of Understanding (MoU) on information sharing and reporting. This ensures good compliance by licenced fishermen and that unlicensed fishing is a rare occurrence which is quickly stopped. While some regulations differ to mainland Scotland, namely the scallop minimum landing size, the geographically isolated nature of Shetland means that these differences can be effectively enforced.

3 Evaluation Procedure

3.1 Harmonised Fishery Assessment

There is a requirement to identify fisheries that may need to be considered for harmonisation, in accordance with FCR 7.4.16.

There are several Scottish fisheries that are MSC certified, but these operate on a larger scale targeting shared stocks compared to these inshore shellfish fisheries. There is also MSC certified Scottish and Shetland mussels, but these are enhanced fisheries. The management of these inshore stocks is further devolved from national authority through a Regulating Order. Therefore while other Scottish assessments have been reviewed in relation to P3 there are no overlapping fisheries requiring formal harmonisation.

3.2 Previous assessments

This fishery was previously assessed and certified in 2012. At that time the Scallop, Velvet crab and brown crab UoCs passed, while a lobster UoC did not pass. A number of conditions were set and have been closed during the course of the first certification.

Table 7. Summary of Previous Assessment Conditions

Descriptions	PI	Year closed	Justification
<p>Condition 1 (velvet crab, brown crab and scallops) During the fourth year of certification NAFC Marine Centre has proposed to the SSMO board revised limit and target reference points which are set at levels consistent with avoiding recruitment overfishing and maintaining the stock at BMSY.</p>	1.1.2	Closed year 5 (after year 4 surveillance audit)	<p>At its board meeting in January 2017, the SSMO approved the proposed reference points developed by NAFC Marine Centre and therefore achieved the Year 5 milestone: Year 5: Adoption of limit and target reference points using information on the biology of the species to avoid recruitment overfishing and to maintain the stocks at BMSY.</p> <p>The condition has therefore been met. Further details are provided below.</p>
<p>Condition 2 (creels) Evidence of observer coverage that records discarding of all species in the creel fisheries on a routinely basis and is used to shape future strategy where appropriate</p>	2.2.3	Closed year 1	<p>Evidence of observer coverage provided.</p> <p>See yr1 surveillance report for details</p>
<p>Condition 3 (creels) Evidence of an implemented Code of Conduct outlining action to be taken should incidental entanglement occur with ETP species</p>	2.3.2	Closed year 3	<p>Code of Conduct provided.</p> <p>See yr3 surveillance report for details</p>
<p>Condition 4 (scallops) Evidence of an implemented Code of Conduct outlining action to be taken should interactions occur with ETP species</p>	2.3.2	Closed year 3	<p>Code of Conduct provided.</p> <p>See yr3 surveillance report for details</p>
<p>Condition 5 (scallops) Evidence that a vessel log for recording encounters with vulnerable seabed habitats</p>	2.4.2	Closed year 3	<p>Vessel logbook implemented</p> <p>See yr3 surveillance report for details</p>
<p>Condition 6 (crab, velvets, scallops)</p>	3.2.1	Closed year 3	Objectives explicit in SSMO management plan

Short & long term objectives explicit within the management plan			See yr3 surveillance report for details
Condition 7 (crab, velvets, scallops) Decision-making processes well-defined with clear communication of outcomes.	3.2.2	Closed year 3	Decision-making processes defined in SSMO management plan See yr3 surveillance report for details
Condition 8 (crab, velvets, scallops) Monitoring and evaluation of management performance (HCR)	3.2.5	Closed year 2	Monitoring and evaluation processes defined in SSMO Management Plan. See yr2 surveillance report for details
Condition 9 (velvet crab) Continue to implement rebuilding strategies to ensure that the velvet crab stock rebuilds toward the target reference point within the shortest practicable rebuilding timeframe.	1.1.1	Closed year 4	Rebuilding strategies continue to be implemented to the velvet crab fishery. The yr 4 audit team noted under recent MSC Guidance, a score of less than 80 for PI 1.1.1, scoring issue b, does not necessarily require the raising of a condition. The new Guidance states: <i>"In the case that the stock is depleted, and PI 1.1.1 scoring issue (b) scores less than 80, the CAB may present a rationale that PI 1.1.3 fulfils the requirements of that condition."</i> This condition is therefore not required.

Condition 1 – justification for closing the condition

At the fourth surveillance audit in September 2016, the Client advised that the NAFC Marine Centre had been requested to develop new reference points for brown crab, velvet crab and scallops.

The NAFC Marine Centre subsequently proposed a series of reference points for each species. The approach taken was to examine time series of stock indicators, and then set the limit reference point (LRP) at the lowest observed value. The LRP is therefore considered to be above the point at which recruitment would be impaired because the history of the fishery shows that the stock has demonstrably recovered from that lowest point. In order to set the upper or target reference point (TRP), the data were examined for periods of high LPUE which would be consistent with relatively higher abundance. These periods of high and stable LPUE were taken to represent a biomass consistent with maximum sustainable yield (MSY). By taking a precautionary approach, the upper or target reference point was set at 80% of the mean LPUE from these periods of high stable values. The setting of upper (target) and lower (limit) reference points was based on an approach taken in the Canadian Northern Shrimp (*Pandalus borealis*) fishery in the Estuary and Gulf of St Lawrence (DFO, 2011) and observed in other MSC-certified fisheries in Canada.

For each stock indicator for all three species, the values that were used for the TRP were not a straight 80% of the mean within the specified time range. Instead, the TRP is calculated as 80% of the mean within each time frame but constrained by the minimum value within that time frame, using the following formula:

$$TRP=(1/100)*(PM+100m-Pm)$$

where P is the percentage value (80%), M is the mean value, and m is the minimum value.

In other words, the TRP is fixed at 80% of the distance between the minimum value and the mean value within the time frame.

The full set of reference points and the rationale underlying their choice can be found in section 3.5.5 of the report. The NAFC Marine Centre proposed these new reference points at the Advisory Group meeting on 26 January 2017.

The Advisory Group agreed these new reference points (and revised harvest control rules) and they were recommended to the SSMO Board at its meeting on 26 January 2017. The SSMO directors unanimously approved both the new Reference Points and the Harvest Control Rules. It was agreed that the Reference Points would be reviewed every 5 years.

The assessment team reviewed the new reference points and concluded that the LRPs were set at levels consistent with avoiding recruitment impairment and the TRPs were set at levels consistent with maintaining the stock at Bmsy. The assessment team therefore closed the condition in March 2017.

3.3 Assessment Methodologies

This re-assessment has been conducted under the version 2.0 process based on version 1.3 of the standard using the default assessment tree.

3.4 Evaluation Processes and Techniques

3.4.1 Site Visits

A site visit was conducted by the full assessment team from 28th to 30th October 2016 in Shetland. Meetings with the client and stakeholders were held at SSMO offices in Lerwick and NAFC Marine Centre in Scalloway.

3.4.2 Consultations

The assessment team met with:

- SSMO officers who provided management documentation, minutes of meetings and other background information.
- NAFC Marine Centre head of marine science (and SSMO Advisory Board chair) and stock assessment scientists who presented survey data, monitoring information and other scientific background information (relevant research reports etc.)
- Scottish Natural Heritage marine conservation officer who provided views on the impact of inshore fisheries and the status of the inshore marine environment & ETP species.
- Shetland Islands Council Executive Officers (and SSMO board members) detailing decision-making processes and governance arrangements in the SSMO.

- Shetland Fishermen's Association chair and skippers of inshore creel boats who described fishing practices and management/reporting arrangements.
- Marine Scotland Compliance Senior Officer who described MCS system and inshore fishery compliance.

3.4.3 Evaluation Techniques

Stakeholders were invited to submit comments and to consult the assessment team from the onset of the assessment process. Public notification of the assessment, its scope, methodology and assessment team, was issued with an invitation to comment and consult the team, and the same was sent out by e-mail to a list of stakeholders. Meetings were arranged with representatives of the client and key stakeholders, as summarized above.

The assessment team undertook scoring of the fishery achieving the results presented in this report through group consensus. This identified that aggregate scores for each of the three principles was above 80 for all three UoCs.

A Preliminary Draft Report, including conditions and their milestones, was completed and presented to the Client in July 2017. A Peer Review Draft Report was then submitted for peer review in September 2017 and completed in XXXX. Comments made by peer reviewers and the team's responses are in Appendix 2. The Public Comment Draft Report was released in XXXX.

The table below presents the scoring elements considered in the assessment

Table 8. Scoring elements

Component	Scoring elements	Main/Not main	Data-deficient or not
UoC 1& 2 Retained	lobster	main	No
UoC 1 & 2 Retained	Green crab	Main	No
UoC 1& 2 Bycatch	Common starfish	Main	No
UoC 1& 2 Bycatch	Cod	Main	No
UoC3 Retained	Queen scallop	Not main	No
UoC3 Bycatch	Sea urchin	Main	No
UoC3 Bycatch	Brown crab	Not main	No

4 Traceability

4.1 Eligibility Date

The fishery is eligible for certification from the date of expiry of the current certificate, 31st August, 2017.

4.2 Traceability within the Fishery

Table 9. Traceability Factors within the Fishery

Traceability Factor	Description of risk factor if present. Where applicable, a description of relevant mitigation measures or traceability systems (this can include the role of existing regulatory or fishery management controls)
Potential for non-certified gear/s to be used within the fishery	Only licensed vessels are permitted to operate within the fisheries, which are all subject to the same gear regulations for the gears specified under the UoCs. MS Compliance said there were no reports of any non-permitted gears or non-licensed vessels operating in the fishery.
Potential for vessels from the UoC to fish outside the UoC or in different geographical areas (on the same trips or different trips)	The whole of the Shetland coast is included in the UoCs within 6 nautical miles, which contains the certified resources. Shetland is geographically isolated and these small inshore vessels cannot operate further afield.
Potential for vessels outside of the UoC or client group fishing the same stock	MS Compliance said there were no reports of any non-licensed vessels operating in the fishery. These could only be either larger vessels or other small vessel local operators and would be reported very quickly by licensed operators.
Risks of mixing between certified and non-certified catch during storage, transport, or handling activities (including transport at sea and on land, points of landing, and sales at auction)	All catches of the species listed are certified and there is no trans-shipment at sea. Therefore all scallop, velvets and crab landed into Shetland by these vessels is certified. Landings of these species from elsewhere, eg further offshore by larger vessels landing into Shetland are rare but are labelled and documented as such in logbooks.
Risks of mixing between certified and non-certified catch during processing activities (at-sea and/or before subsequent Chain of Custody)	There is no processing at sea. Few other landings are received. Crab and velvets are mainly sold live to export markets with full documentation from point of sale/landing. All processing factories are registered buyers that must supply sales notes to

	authorities.
Risks of mixing between certified and non-certified catch during transshipment	No transshipment occurs with these inshore boats landing daily.
Any other risks of substitution between fish from the UoC (certified catch) and fish from outside this unit (non-certified catch) before subsequent Chain of Custody is required	None identified.

4.3 Eligibility to Enter Further Chains of Custody

Parties eligible to use the certificate will be operators of SSMO licensed vessels fishing for brown crab, velvet crab via creel and scallop via dredge in Shetland inshore waters.

Chain of custody will commence as of the first point of sale, change of ownership and/or processing after landing.

Evaluation Results

4.4 Principle Level Scores

Table 10. Final Principle Scores

Principle level scores	UoC1 crab	UoC2 velvets	UoC3 scallop
Principle 1 - Target species	85.0	77.9	83.8
Principle 2 - Ecosystem	90.0	90.0	87.2
Principle 3 - Management	90.1	90.1	90.1

4.5 Summary of PI Level Scores

Table11. PI Level Scores

Component	PI No.	Performance Indicator (PI)	UoC		
			UoC1	UoC2	UoC3
Outcome	1.1.1	Stock status	90	70	90
	1.1.2	Reference points	80	80	80
	1.1.3	Stock rebuilding		70	
Management	1.2.1	Harvest strategy	95	95	95
	1.2.2	Harvest control rules & tools	90	80	80
	1.2.3	Information & monitoring	80	80	80
	1.2.4	Assessment of stock status	75	75	75
Retained species	2.1.1	Outcome	80	80	80
	2.1.2	Management	80	80	80
	2.1.3	Information	85	85	80
Bycatch species	2.2.1	Outcome	80	80	80
	2.2.2	Management	80	80	80
	2.2.3	Information	80	80	80
ETP species	2.3.1	Outcome	100	100	85
	2.3.2	Management	95	95	90
	2.3.3	Information	80	80	80
Habitats	2.4.1	Outcome	90	90	80
	2.4.2	Management	80	80	95
	2.4.3	Information	95	95	95
Ecosystem	2.5.1	Outcome	90	90	80
	2.5.2	Management	90	90	95
	2.5.3	Information	90	90	90
Governance and policy	3.1.1	Legal & customary framework	95	95	95
	3.1.2	Consultation, roles & responsibilities	100	100	100
	3.1.3	Long term objectives	90	90	90
	3.1.4	Incentives for sustainable fishing	80	80	80
Fishery specific management system	3.2.1	Fishery specific objectives	90	90	90
	3.2.2	Decision making processes	85	85	85
	3.2.3	Compliance & enforcement	100	100	100
	3.2.4	Research plan	80	80	80
	3.2.5	Management performance evaluation	90	90	90

Summary of Conditions

Table12. Summary of Conditions

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/NA)
1	The rebuilding strategy for the velvet crab fishery should be demonstrated to be rebuilding the stock within a specified timeframe.	1.1.3	N
2	A peer review of the stock assessments of the brown crab, velvet crab and scallop fishery should be undertaken	1.2.4	N

4.6 Recommendations

Three recommendations are made by the assessment team:

Recommendation 1. PI 1.1.2

The reference points should be standardised for season, fishing area and vessel effects to allow more consistent comparison with standardised stock indicators.

Recommendation 2. PI 1.1.2.

The fishing effort reference points for the velvet crab fishery should be reviewed as soon as possible.

Recommendation 3. PI 1.2.4.

Uncertainty around annual stock indicator values should be evaluated using either standard statistical methods or through computer-intensive methods such as boot-strapping

4.7 Determination, Formal Conclusion and Agreement

(REQUIRED FOR FR AND PCR)

1. The report shall include a formal statement as to the certification determination recommendation reached by the Assessment Team about whether or not the fishery should be certified.

(Reference: FCR 7.16)

(REQUIRED FOR PCR)

2. The report shall include a formal statement as to the certification action taken by the CAB's official decision-makers in response to the Determination recommendation.

References

- Auster PJ, Malatesta RJ, Langton RW, Watling L Valentine, P.C., Donaldson, C.L.S., Langton, E.W., Shepard, A.N. & Babb, I.G. 1996. The impact of mobile fishing gear on seafloor habitats in the Gulf of Maine (northwest Atlantic): implications for conservation of fish populations. *Rev Fish Sci* 4:185–202
- Auster, P.J., & Langton, R.W. 1999. The effects of fishing on fish habitat. p.150-187, in: L. Benaka. *Fish habitat: essential fish habitat and restoration*. Bethesda, Maryland, American Fisheries Society. Symposium 22.
- Barnette, M.C. 2001. A review of fishing gear utilized within the Southeast Region and their potential impacts on essential fish habitat. NOAA Technical Memorandum NMFSSSEFSC-449.
- Bennett, D.B. 1995. Factors in the life history of the edible crab (*Cancer pagurus* L.) that influence modelling and management. *ICES Marine Science Symposia*, **199**, 89-98.
- Bradshaw C, Veale LO, Hill AS, Brand AR. 2000. The effects of scallop-dredging on gravelly seabed communities. In: Kaiser MJ, De Groot SJ (eds) *Effects of fishing on non-target species and habitats: biological, conservation and socio-economic issues*. Blackwell Science, Oxford, p 83–104
- Brand, A.R. 1991. Scallop ecology: Distributions and behaviour. In *Scallops: biology, ecology and aquaculture* (ed. S.E. Shumway), pp. 517-584. Amsterdam: Elsevier. [Developments in Aquaculture and Fisheries Science, no.21.]
- Brown, C.G. & Bennett, D.B. 1980. Population and catch structure of the edible crab (*Cancer pagurus*) in the English Channel. *Journal du Conseil*, ICES. **39**, 88-100.
- Carter, M. 2009. *Aequipecten opercularis*. Queen scallop. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom.
- Currie DR, Parry GD. 1996. Effects of scallop-dredging on a soft sediment community: a large-scale experimental study. *Mar Ecol Prog Ser* 134:131–150
- Currie DR, Parry GD. 1999. Impacts and efficiency of scallop-dredging on different soft substrates. *Can J Fish Aquat Sci* 56:539–550
- Dayton, P.K., Thrush, S.F., Agardy, M.T. and Hofman R.J. 1995. Environmental effects of marine fishing. *Aquatic conservation: Mar. Freshw. Ecosys.* 5: 205-232.
- DFO 2011. Reference points consistent with the precautionary approach for northern shrimp in the Estuary and Gulf of St. Lawrence. DFO Can. Sci. Advis. Sec., Sci. Advis. Rep. 2011/062.
- Eaton, D.R., Brown, J., Addison, J. T., Milligan, S. P. and Fernand, L. 2003. Larvae surveys of edible crab (*Cancer pagurus*) off the east coast of England: implications for stock structure. *Fisheries Research*, 65: 191-199.
- Ebert, T.A. 1975. Growth and mortality of post-larval echinoids. *Amer. Zool.* 15: 755-775

Ebert, T.A. and Russel, M.P. 1992. Growth and mortality estimates for res sea urchin *Strongylocentrotus franciscanus* from San Nicolas Island, California. *Mar. Ecol. Prog. Ser.* 81: 31-41. EC (2009) Council Regulation 1224/2009 (“the Control Regulation”)

Eleftheriou, A. & Robertson, M.R. 1992. The effects of experimental scallop dredging on the fauna and physical environment of a shallow sandy community. *Netherlands Journal of Sea Research*, 30: 289-299

Edwards, E. 1979. *The Edible Crab and its fishery in British Waters*. Surrey, England: Fishing News Books Ltd.

Eno N.C., MacDonald D.S. & Amos S.C. 1996. A study on the effects of fish (crustacea/mollusc) traps on benthic habitats and species. Report to the European Commission.

Eno, N. C., MacDonald, D. S., Kinnear, J. A. M., Amos, C. S., Chapman, C. J., Clark, R. A., Bunker, F. St P. D., and Munro, C. 2001. Effects of crustacean traps on benthic fauna. – *ICES Journal of Marine Science*, 58: 11–20.

EMFF 2014. The European Maritime and Fisheries Fund (EC Reg. 508/2014)

European Commission 2013. Common Fisheries Policy EC reg.1380/2013

FAO, 2008. FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas, which is Annex F to the Report of the FAO Technical Consultation on International Guidelines for the Management of Deep-sea Fisheries in the High Seas, Rome, 4-8 February and 25-29 August 2008

Food Certification International Limited 2014. Report of the 2nd Surveillance Audit for SSMO Shetland Inshore Brown and Velvet Crab and Scallop Fishery.

FRS: Fisheries Research Services. 2006. Impacts of Climate and Fishing on the North Sea Food Web

Guillory, V. 2001. A review of incidental fishing mortalities of blue crabs. In V. Guillory, H.M. Perry & S. Vanderkooy, eds. *Proceedings of the Blue Crab Mortality Symposium*, pp. 28–41. Gulf States Marine Fisheries Commission.

Hall-Spencer JM, Froggia C, Atkinson RJA, Moore PG. 1999. The impact of Rapido trawling for scallops *Pecten jacobaeus* (L.), on the benthos of the Gulf of Venice. *ICES J Mar Sci* 56:111–124

Hall-Spencer JM, Moore PG 2000. Impact of scallop dredging on maerl grounds. In: Kaiser MJ, De Groot SJ (eds) *Effects of fishing on non-target species and habitats: biological, conservation and socio-economic issues*. Blackwell Science, Oxford, p 105–118

Hamilton, A.N., Jr. 2000. Gear impacts on essential fish habitat in the Southeastern region. United States Department of Commerce, Southeast Fisheries Science Center, Pascagoula Facility.

ICES, 2015. Interim report of the Working Group on the Biology and Life History of Crabs (WGCRAB). ICES CM 2015/SSGEPD:11

Jenkins, S. R., Beukers-Stewart, B. D. And Brand A. R. 2001. Impact of scallop dredging on benthic megafauna: a comparison of damage levels in captured and non-captured organisms. *Mar Ecol Prog Ser* 215: 297–301.

Jennings, S., & Kaiser, M. 1998. The effects of fishing on marine ecosystems. *Advances in Marine Biology*, 34: 201-352.

Jennings, S., Kaiser, M.J and Reynolds, J.D. 2001. *Marine Fisheries Ecology*. Blackwell Science, Oxford

Jones, R. 1984. Assessing the effects in changes in exploitation pattern using length composition data. *FAO Fish. Tech. Pap.* 256: 118 pp.

Kaiser, M.J., Spencer, B.E. & Hart, P.J.B. 2000. Fishing-gear restrictions and conservation of benthic habitat complexity. *Conservation Biology*, 14: 1512–1525.

Kaiser, M. J., Hill, A.S., Ramsay, K., Spencer, B.E., Brand, A.R., Veale, L.O., Prudden, K., Rees, E.I.S., Munday, B.W., Ball, B. & Hawkins, S.J. 1996. Benthic disturbance by fishing gear in the Irish Sea: a comparison of beam trawling and scallop dredging. *Aquatic Conservation Marine and Freshwater Ecosystem*, 6: 269-295.

Kaiser, M. J., Clarke, K. R., Hinz, H., Austen, M. C. V., Somerfield, P. J., Karakassis, I. 2006. Global analysis of response and recovery of benthic biota to fishing. *Marine Ecology Progress Series* 311:1–14

Leslie, B., Laurenson, C., Shelmerdine, R., Riley, D. and Simmons, S. (2008). *Shetland Shellfish Stock Assessments 2008*. NAFC Marine Centre Report 94p. Marine Scotland Science. (2014). *Fish and Shellfish Stocks*. 2014 edition.

Leslie, B., Laurenson, C.H., Shelmerdine, R.H., Gear, D.J.R. and Winter, K.A. (2010). *Shetland Shellfish Stock Assessments 2010*. Prepared by the NAFC for the Shetland Shellfish Management Organisation.

Løkkeborg, S. 2004. Impacts of trawling and scallop dredging on benthic habitats and communities. *FAO Fisheries Technical Paper* 472.

Mackinson, S. 2001. Representing trophic interactions in the North Sea in the 1880s, using the Ecopath mass-balance approach. *Fisheries Centre Research Report* 9:44: 35-98.

Mackinson and Daskalov, 2007. An ecosystem model of the North Sea to support an ecosystem approach to fisheries management: description and parameterisation. For CEFAS Science Series Technical Report no.142

Marine (Scotland) Act (2010)
<http://www.gov.scot/Topics/marine/seamanagement/marineact>

Marine Scotland (2013) Guidance note on the EU points system for serious infringements.
<http://www.gov.scot/Resource/0042/00421676.pdf>

Marine Scotland 2015. Scottish Inshore Fisheries Strategy.
<http://www.gov.scot/Resource/0049/00494784.pdf>

Marine Scotland. 2017. The Shellfish (Restrictions on Taking by Unlicensed Fishing Boats) (Scotland) Order 2017.

Marine Scotland Science. 2017. Fish and Shellfish Stocks. 2017 edition.

Marshall, C.E. & Wilson, E. 2008. *Pecten maximus* Great scallop. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available from: <http://www.marlin.ac.uk/species/detail/1398>

Marshall, C. and Wilson, E. 2009. *Pecten maximus*. Great scallop. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom

Mason, J. 1983. *Scallop and queen fisheries in the British Isles*. Farnham: Fishing News Books

Moore, H.B. 1935. A comparison of the biology of *Echinuc esculentus* in difference habitats. Part II. J. Mar. Biol. Ass. UK. 20: 109-128

Morgan, L.E., Botsford L.W. , Wing, S.R. and Smith B.D. 2000. Spatial variability in growth and mortality of the red sea urchin, *Strongylocentrotus franciscanus*, in northern California. Can. J. Fish. Aquat. Sci. 57: 980–992 (2000)

NAFC Marine Centre, 2013. The occurrence of bycatch in the *Pecten maximus*, *Cancer pagurus* and *Necora puber* fishery around Shetland. April 2013.

NAFC Marine Centre 2014. Shetland Islands' Marine Spatial Plan fourth edition. NAFC Marine Centre, 202pp.

NAFC Marine Centre, 2016a. Landing statistics 2000-2015

NAFC Marine Centre 2016b. A Marine Spatial Plan for the Shetland Islands (SIMSP, 2016).
https://www.nafc.uhi.ac.uk/research/msp/simsp/SIMSP_2015.pdf

Neal, K.J. & Wilson, E. 2008. *Cancer pagurus* Edible crab. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-

line]. Plymouth: Marine Biological Association of the United Kingdom. Available from: <http://www.marlin.ac.uk/species/detail/1179>

Northridge, S., Cargill, A., Coram, A., Mandleberg, L., Calderan, S. and Reid, B. 2010. Entanglement of minke whales in Scottish waters; an investigation into occurrence, causes and mitigation. By Sea Mammal Research Unit for Scottish Government.

Nøstvik, F. and Pedersen, T., 1999. Catching cod for tagging experiments. Fisheries Research, Volume 42, Number 1, August 1999 , pp. 57-66(10).

Penrose R.S.& Gander L.R. 2007. UK & Republic of Ireland Marine Turtle Strandings & Sightings Annual Report 2006

Rees, H.L. and Dare, P.J. 1993. Sources of mortality and associated life-cycle traits of selected benthic species: a review. Fisheries Research Data Report Number 33. Ministry of Agriculture, Fisheries and Food Directorate of Fisheries Research

Reid, J.B., Evans, P.G.H. and Northridge, S.P. 2003. Atlas of Cetacean Distribution in North-West European Waters. Joint Nature Conservation Committee.

Reuther, C. 2002. Otters and fyke nets -some aspects which need further attention. IUCN Otter Spec. Group Bull. 19(1).

Robinson M & Leslie B. (2010). Defining the brown crab (*Cancer pagurus*) 'stock' around Shetland. NAFC Marine Centre Communication.

Rogers, S.I., Kaiser, M.J. & Jennings, S. 1998. Ecosystem effects of demersal gear: a European perspective, In E.M. Dorsey & J. Pederson, eds. Effect of Fishing Gear on the Sea Floor of New England, pp. 68–78. Conservation Law Foundation, Boston, MA, USA.

Scottish Executive 2005. Strategic Framework for Inshore Fisheries in Scotland.

Scottish Government 2010. Marine (Scotland) Act, 2010

Scottish Government 2012. The Shetland Islands Regulated Fishery (Scotland) Order 2012 (no.348)

Scottish Statutory Instruments. 2009 No. 443. Sea Fisheries. The Shetland Islands Regulated Fishery (Scotland) Order 2009

Sewell, J. and Hiscock, K. 2005. Effects of fishing within UK European Marine Sites: guidance for nature conservation agencies> Report to Countryside Council for Wales, English Nature and Scottish Natural Heritage from the marine Biological Association, Plymouth: CCW contract FC 73-03-214A.

Shelmerdine, R.L. 2010. The occurrence of bycatch from scallop grounds around Shetland. Study undertaken by NAFC.

[Shelmerdine, R. L.](#), Stone, D., [Leslie, B.](#) & Robinson, M. (2014) Implications of defining fisheries closed areas based on predicted habitats in Shetland: a proactive and precautionary approach Marine Policy. 43, p. 184-199.

Shelmerdine, R. L. and Leslie, B. 2015. A multidisciplinary approach to collection and use of VMS data from an inshore scallop fishery. NAFC Marine Centre. Report of Fishing Industry Science Alliance (FISA) project 04/12. **6**(13). pp. 27.

Shelmerdine, R. L. and Mouat, B. (in press). Biomass survey for the Shetland inshore scallop fishery, 2015. *NAFC Marine Centre report for the Shetland Shellfish Management Organisation Pp. 21.*

Shumway, S.E. & Parsons, J. (ed.) 2005. *Scallops: biology, ecology and aquaculture.* Amsterdam: Elsevier.

SSMO 2013. Management Plan 2013-2018

SSMO 2014. SSMO Licensing policy. July, 2014.

SSMO 2016a. Regulations, Shetland Shellfish Management Organisation

[<http://www.mrsite.co.uk/usersitesv18/65412.mrsite.com/wwwroot/USERIMAGES/SSMO%20Regulat.pdf>]

SSMO 2016b. Reference Points and Harvest Control Strategy.

Tallack, S. 2002. The biology and exploitation of three species in the Shetland Islands, Scotland: *Cancer pagurus*, *Necora puber* and *Carcinus maenas*. PhD Thesis. NAFC/UHI.

Thompson, B.M., Lawler, A.R. & Bennett, D.B. 1995. Estimation of the spatial distribution of spawning crabs (*Cancer pagurus* L.) using larval surveys of the English Channel. *ICES Marine Science Symposia*, **199**, 139-150.

Thomsen, B., Humborstad, O. B. and Furevik, D. M. 2010. Fish Traps: Fish Behavior, Capture Processes, and Conservation Issues. In *Behaviour of marine fishes: capture, process and conservation challenges*. Published by Wiley-Blackwell.

Thrush SF, Hewitt JE, Cummings VJ, Dayton PK. 1995. The impact of habitat disturbance by scallop-dredging on marine benthic communities: what can be predicted from the results of experiments? *Mar Ecol Prog Ser* 129: 141–150

Twelves, J., 1983. Otter *Lutra lutra* mortality in lobster creels. *Journal of Zoology*, London, 201, 585- 588.

Tyler-Walters, H. 2008. *Echinus esculentus*. Edible sea urchin. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom

UK Sea Fisheries (Shellfish) Act 1967 <https://www.gov.uk/government/publications/fishing-regulations-the-blue-book/section-a-principal-acts-relating-to-sea-fishing>

Walday M. and Kroglund T. 2002. Europe's biodiversity, biogeographical regions and seas around Europe: The North Sea. For the European Environment Agency. Available at:

http://www.eea.europa.eu/publications/report_2002_0524_154909/regional-seas-around-europe/page131.html/#1.1.2.....

Watling L, Findlay RH, Mayer LM, Schick DF. 2001. Impact of a scallop drag on the sediment chemistry, microbiota, and faunal assemblages of a shallow subtidal marine benthic community. *Int Sea Res* 46:309–324.

Williams, J. R., Parkinson, D. M. and Bian, R. 2013. Biomass survey and yield calculation for the Coromandel commercial scallop fishery, 2012. Ministry for Primary Industries. New Zealand Fisheries Assessment Report 2013/18. pp. 61.

Appendices

Appendix 1a – MSC Principles & Criteria

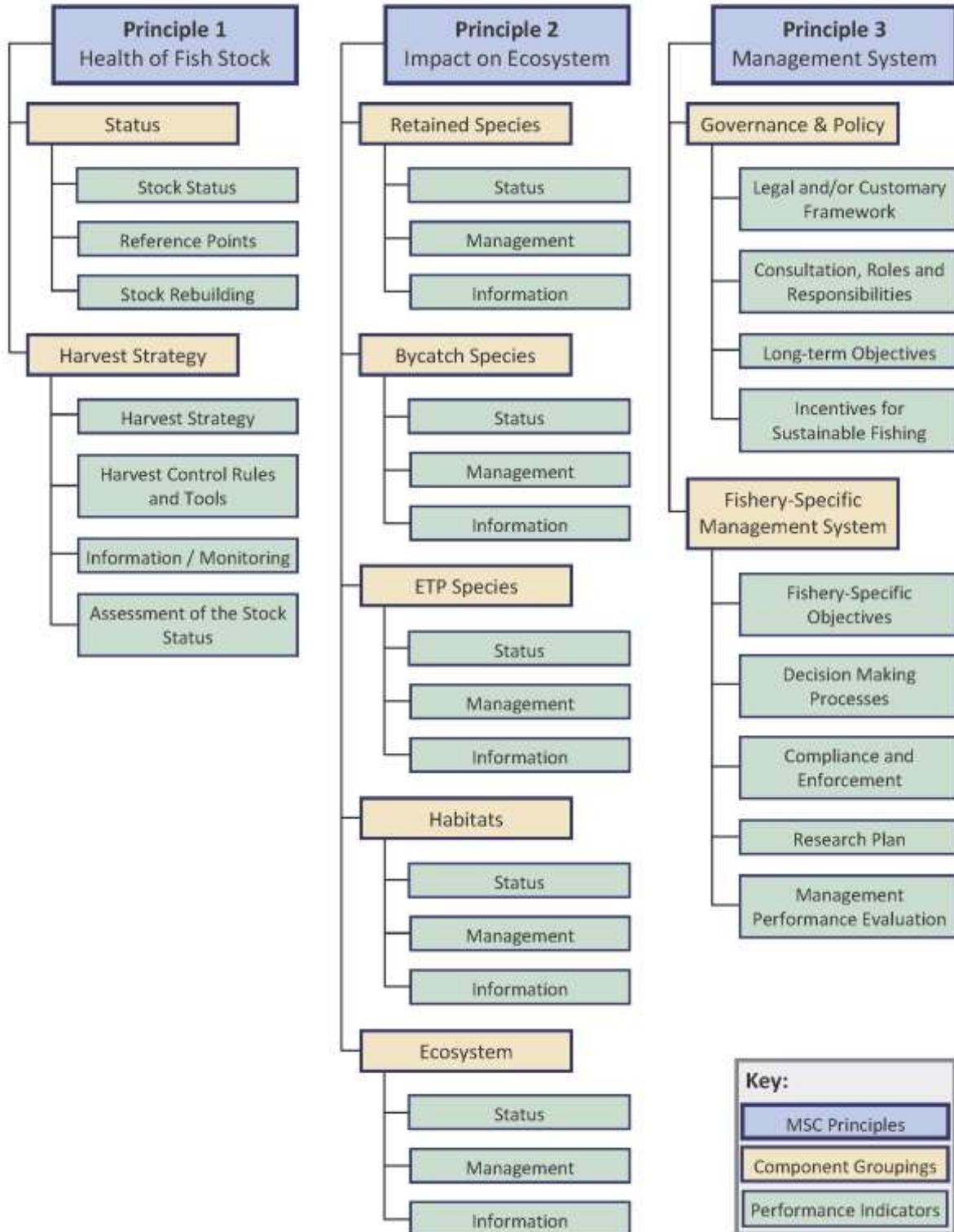


Figure A1 – Graphic of MSC Principles and Criteria

Below is a much-simplified summary of the MSC Principles and Criteria, to be used for overview purposes only. For a fuller description, including scoring guideposts under each Performance Indicator, reference should be made to the full assessment tree, complete with scores and justification, contained in **Appendix 1.1** of this report. Alternately a fuller description of the MSC Principles and Criteria can be obtained from the MSC website (www.msc.org).

Principle 1

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

Intent:

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

Status

- » The stock is at a level that maintains high productivity and has a low probability of recruitment overfishing.
- » Limit and target reference points are appropriate for the stock (or some measure or surrogate with similar intent or outcome).
- » Where the stock is depleted, there is evidence of stock rebuilding and rebuilding strategies are in place with reasonable expectation that they will succeed.

Harvest strategy / management

- » There is a robust and precautionary harvest strategy in place, which is responsive to the state of the stock and is designed to achieve stock management objectives.
- » There are well defined and effective harvest control rules in place that endeavour to maintain stocks at target levels.
- » Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.
- » The stock assessment is appropriate for the stock and for the harvest control rule, takes into account uncertainty, and is evaluating stock status relative to reference points.

Principle 2

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

Intent:

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

Retained species / Bycatch / ETP species

- » Main species are highly likely to be within biologically based limits or if outside the limits there is a full strategy of demonstrably effective management measures.
- » There is a strategy in place for managing these species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species.
- » Information is sufficient to quantitatively estimate outcome status and support a full strategy to manage main retained / bycatch and ETP species.

Habitat & Ecosystem

- » The fishery does not cause serious or irreversible harm to habitat or ecosystem structure and function, considered on a regional or bioregional basis.
- » There is a strategy and measures in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types.
- » The nature, distribution and vulnerability of all main habitat types and ecosystem functions in the fishery area are known at a level of detail relevant to the scale and intensity of the fishery and there is reliable information on the spatial extent, timing and location of use of the fishing gear.

Principle 3

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

Intent:

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

Governance and policy

- » The management system exists within an appropriate and effective legal and/or customary framework that is capable of delivering sustainable fisheries and observes the legal & customary rights of people and incorporates an appropriate dispute resolution framework.
- » Functions, roles and responsibilities of organisations and individuals involved in the management process are explicitly defined and well understood. The management system includes consultation processes.
- » The management policy has clear long-term objectives, incorporates the precautionary approach and does not operate with subsidies that contribute to unsustainable fishing.

Fishery specific management system

- » Short and long term objectives are explicit within the fishery's management system.
- » Decision-making processes respond to relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner.
- » A monitoring, control and surveillance system has been implemented. Sanctions to deal with non-compliance exist and there is no evidence of systematic non-compliance.
- » A research plan provides the management system with reliable and timely information and results are disseminated to all interested parties in a timely fashion.

Appendix 1.1 Performance Indicator Scores and Rationale

Evaluation Table for PI 1.1.1 UoC 1 Brown Crab

PI 1.1.1		UoC 1 Brown Crab: 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>Analysis of catch rates for brown crab recorded on SSMO log books over the last 15 years shows that the annual LPUE index has been at or above the TRP and been well above the LRP in recent years. The LRP for LPUE has been set above the point where recruitment would be impaired. The mean size of brown crab caught in the fishery has increased significantly since 2002 suggesting a reduction in fishing mortality, and in recent years has been fluctuating around the target reference point and has therefore been well above the limit reference point.</p> <p>In addition, the mean size at maturity for brown crab was estimated at 133 mm and 125 mm for females and males respectively, and therefore a minimum landing size of 140 mm carapace width should ensure that a proportion of the mature population is not subject to fishing mortality. The level of fishing effort has declined significantly since 2014, most likely due to market forces, and this reduction in fishing effort will have provided an additional buffer against recruitment impairment.</p> <p>All the evidence – stock indicators at or above TRPs, a minimum landing size above size-at-maturity and reduced fishing effort - provides a high degree of certainty that the stock is above the point where recruitment would be impaired. The SG100 is met.</p>		
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?		Y	N

PI 1.1.1		UoC 1 Brown Crab: The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing	
	Justification	<p>The LPUE stock indicator has been above the target reference point (TRP) for the last three years, and the mean size stock indicator has been fluctuating around the target reference point for the last few years. The SG80 is met therefore.</p> <p>The reference points have been revised by SSMO in 2017, and in 2011 and 2012, the LPUE stock indicator dropped below the previous TRP, following which management measures were introduced to ensure that the stock returned to the TRP. This recent temporary decline in the LPUE stock indicator and the use of “raw” rather than standardised data for the stock indicators means that there is not a high degree of certainty that the stock has been fluctuating around or above the TRP in recent years. The SG100 is not met.</p>	
	References	<p>Food Certification International Limited 2014. Report of the 2nd Surveillance Audit for SSMO Shetland Inshore Brown and Velvet Crab and Scallop Fishery</p> <p>NAFC Marine Centre stock assessments</p> <p>SSMO Revised Reference Points</p> <p>Tallack, S. 2002. The biology and exploitation of three species in the Shetland Islands, Scotland: <i>Cancer pagurus</i>, <i>Necora puber</i> and <i>Carcinus maenas</i>. PhD Thesis. NAFC/UHI.</p>	
Stock Status relative to Reference Points			
	Type of reference point	Value of reference point	Current stock status relative to reference point
Target reference point	Landings per unit effort (LPUE) Mean size of crab in catch	LPUE = 1.65 kg/creel Mean size = 144.63 mm CW	Current LPUE / TRP = 1.77/1.65 = 1.07 x TRP Current mean size / TRP = 149.7/144.63 = 1.04 x TRP
Limit reference point	Landings per unit effort (LPUE) Mean size of crab in catch	LPUE = 1.00 kg/creel Mean size = 113.36 mm CW	Current LPUE / LRP = 1.77/1.00 = 1.77 x LRP Current mean size / LRP = 149.7/113.36 = 1.32 x LRP
OVERALL PERFORMANCE INDICATOR SCORE:			90
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 1.1.2 UoC 1 Brown Crab

PI 1.1.2		UoC 1 Brown Crab: 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	

PI 1.1.2		UoC 1 Brown Crab: Limit and target reference points are appropriate for the stock		
	Justification	<p>Brown crabs cannot be aged routinely and therefore conventional age-based analytical assessments producing estimates of biomass (Bmsy) and fishing mortality (Fmsy) at maximum sustainable yield (MSY) are not possible. Length cohort analysis (LCA) has been used to produce a proxy for Fmsy (Fmax), but the equilibrium nature of the LCA model precludes the use of Fmax as a reference point for management purposes. Reference points have therefore been formulated in terms of an index of abundance based on catch rates in the commercial fishery and an index of exploitation rate based on the mean size of brown crab in the catch.</p> <p>The Guidance to MSC Certification Requirements v1.3 GCB2.3.9 states that <i>“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. Examples of quantitative interpretation include the use of measured data from the relevant fishery”</i> and that surrogate measures for reference points are acceptable and that <i>“ in some crustacean species, fishery management strategies might seek to protect from harvest the complete female reproductive capacity in the population (i.e. single sex harvest). The trigger or reference points involved could relate to metrics such as per cent fertilised eggs and or other female population indicators that are evaluating the management system’s effectiveness at achieving its goal.”</i></p> <p>As with most crustacean species, direct estimates of stock biomass are not available for brown crab and so it is conventional to use proxies for stock abundance and exploitation rate. The use of stock indicators, such as LPUE, which is an index of stock biomass, and mean size which is an indicator of exploitation rate, as reference points is considered appropriate for the brown crab stock. These reference points are used to assess the status of the stock, and management action triggered by the harvest control rules for the fishery is formulated in relation to these reference points. LPUE can be estimated from log book returns and mean size can be estimated from at-sea and shore-based measurements of the catch. The SG80 is met therefore.</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	N

PI 1.1.2		UoC 1 Brown Crab: Limit and target reference points are appropriate for the stock		
	Justification	<p>The limit reference points (LRP) for the two stock indicators, LPUE and mean size, have been defined as the lowest value observed in the time series of the two indicators from 2001 to 2015. The LRP for LPUE was set at the 2002 value of 1.00 kg/creel and the LRP for mean size was set at the 2001 value of 113.36 mm CW. Since those lowest observed values, the stock has demonstrably recovered to much higher levels and could be expected to do so again in the future if the stock declined to that level. It can be concluded that the LRPs are set above the level at which there is an appreciable risk of impairing reproductive capacity. The SG80 is met.</p> <p>The values of the stock indicators used as the LRPs have not been standardised to take into account explanatory variables such as month, fishing area or vessel, and therefore the setting of the LRPs has not fully taken into account precautionary issues. SG100 is not met.</p> <p>The assessment team recommends therefore that the reference points should be standardised for season, fishing area and vessel effects to allow more consistent comparison with standardised stock indicators.</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.
	Met?		Y	N

<p>PI 1.1.2</p>	<p>UoC 1 Brown Crab: Limit and target reference points are appropriate for the stock</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The target reference points (TRPs) have been set for the two stock indicators for the brown crab fishery at a LPUE value of 1.65 kg/creel and a mean size of 144.63 mm CW. If either of the two indicators drop below the TRP, additional harvest or effort control measures are implemented.</p> <p>MSC Certification Requirements v1.3 paragraph CB2.3.1.1 state that the target reference point should be “consistent with Bmsy” or “some other measure or surrogate with similar intent or outcome, which maintains a high productivity of the stock and is a level well above the point at which recruitment might be impaired”.</p> <p>The intent of these target reference points is to maintain the stock at high productivity and well above the point at which recruitment might be impaired. The TRPs were based on a period in the historical time trends in the two stock indicators during which the stock indicators have been at high levels and stable, in this case from 2011 to 2015. Such a period of high indicator values could be considered consistent with being at Bmsy, which is a similar approach to that set out in Canada in the Department of Fisheries and Ocean’s (DFO) Precautionary Approach, an example of which is the approach to reference points taken in the Canadian Northern Shrimp (<i>Pandalus borealis</i>) fishery in the Estuary and Gulf of St Lawrence and observed in other MSC-certified fisheries in Canada.</p> <p>These periods of high and stable LPUE were therefore taken to represent a biomass consistent with maximum sustainable yield (MSY). By taking a precautionary approach, all the upper or target reference points were set at 80% of the mean value from these periods of high stable values. The TRP is calculated as 80% of the mean within each time frame but constrained by the minimum value within that time frame, using the following formula:</p> $TRP=(1/100)*(PM+100m-Pm)$ <p>where P is the percentage value (80%), M is the mean value, and m is the minimum value.</p> <p>In other words, the TRP is fixed at 80% of the distance between the minimum value and the mean value within the time frame.</p> <p>The assessment team concluded that values of stock indicators above the target reference point would be consistent with the stock being at Bmsy. The SG80 is met therefore.</p> <p>The values of the stock indicators used as the TRP have not been standardised to take into account explanatory variables such as month, fishing area or vessel, and therefore the setting of the TRPs have not fully taken into account precautionary issues, and cannot be said to have taken into account the ecological role of the stock. SG100 is not met.</p>

PI 1.1.2		UoC 1 Brown Crab: Limit and target reference points are appropriate for the stock	
d	Guidepost		For key low trophic level stocks, the target reference point takes into account the ecological role of the stock.
	Met?		Not relevant
	Justification	Brown crab (<i>Cancer pagurus</i>) does not meet the criteria for key low trophic level species as set out in paragraph CB2.3.13 of the MSC Certification Requirements v1.3 (MSC 2013). As such, this SI is not scored.	
References		<p>MSC Certification Requirements v1.3. MSC Guidance for the Fisheries Certification Requirements v1.3. SSMO Revised Reference Points. DFO 2009. Fishery decision-making framework incorporating the precautionary approach. Fisheries and Oceans Canada, available online: http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/precaution-eng.htm DFO 2011. Reference points consistent with the precautionary approach for northern shrimp in the Estuary and Gulf of St. Lawrence. DFO Can. Sci. Advis. Sec., Sci. Advis. Rep. 2011/062.</p>	
OVERALL PERFORMANCE INDICATOR SCORE:			80
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 1.1.3 UoC 1 Brown Crab

PI 1.1.3		UoC 1 Brown Crab: 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 two stock indicators for the brown crab stock are currently at or above the target reference point. The stock is not therefore considered to be depleted and there is no requirement to score PI 1.1.3.		
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?	N/A	N/A	N/A
	Justification	N/A		

PI 1.1.3		UoC 1 Brown Crab: Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe		
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	N/A		
References				
OVERALL PERFORMANCE INDICATOR SCORE:				N/A
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.1 UoC 1 Brown Crab

PI 1.2.1		UoC 1 Brown Crab: 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

<p>PI 1.2.1</p>	<p>UoC 1 Brown Crab: There is a robust and precautionary harvest strategy in place</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The overall harvest strategy is underpinned by the Scottish Government’s vision for inshore fisheries set out in the Scottish Inshore Fisheries Strategy, which includes implementing effective assessment methodologies for fishing at Maximum Sustainable Yield (MSY), and the Shetland Islands Regulating Order 2012 granted to the Shetland Shellfish Management Organisation (SSMO).</p> <p>The SSMO has developed a Management Plan, the aim of which is “to continue to maintain sustainable and well managed shellfish fisheries operating within a healthy marine environment.” Two key objectives of the Management Plan that underpin the harvest strategy are that stocks will be maintained at biologically sustainable levels, and that fishing activity will be managed in an environmentally responsible manner. To achieve these two objectives, the Management Plan seeks to:</p> <ul style="list-style-type: none"> - Establish biologically relevant reference points for commercially-exploited stocks - Develop a coherent and effective harvest control strategy which utilises the best available information - Implement effective management measures that are enforceable - Put in place an effective code of conduct for all fishermen - Maintain an effective spatial management plan - Carry out appropriate monitoring <p>Regulations within the Management Plan for the brown crab fishery include limited entry licensing, maximum size of vessel, limits on creel numbers, incorporation of escape gaps in all creels not targeting velvet crabs, and a minimum landing size of 140mm carapace width, all of which are designed to maintain the exploitation rate at levels such that the stock does not fall below the reference points. In addition, license holders must comply with all monitoring requirements including submission of SSMO log books, and making the vessel and its fishing gear available for inspection at any time. All vessels must also conform with the SSMO Code of Conduct which includes reporting the loss of any fishing gear on the log sheets, and taking care to return all undersized target and bycatch species to the water quickly and carefully to reduce damage to individuals and maximise survival rates.</p> <p>A key element of the harvest strategy for the brown crab fishery is the assessment of stock status against pre-determined reference points, and the implementation of harvest control rules (HCRs) if the reference points are exceeded. The harvest strategy is therefore responsive to the state of the stock and has been specifically designed over many years by the SSMO in line with the Scottish Government’s guidelines to ensure that it maintains the stocks at or above the target reference point. The SG100 is met therefore.</p>

PI 1.2.1		UoC 1 Brown Crab: 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>The two stock indicators (LPUE and mean size) have been at or above the target reference point (TRP) in recent years, and there is no indication of recruitment impairment. In 2011 and 2012, the LPUE stock indicator dropped below the (then) TRP, following which management measures were introduced under the harvest control rules to ensure that the stock returned to the TRP.</p> <p>All evidence suggests that the harvest strategy is meeting its objectives and the SG80 is met therefore. The performance of the harvest strategy has not been fully evaluated through, for example, a Management Strategy Evaluation (MSE), so 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>A requirement of the SSMO licence is that catch, fishing effort and LPUE from the commercial fishery are recorded on log books permitting the evaluation of stock status against reference points. At-sea and shore-based monitoring provides information on stock structure such as size distribution and sex ratio. In addition, Marine Scotland Compliance enforcement activity at both sea and on the quayside, ensures that all fisheries regulations including creel limits and minimum landing size (MLS) are observed. Sufficient monitoring is carried out to determine whether the harvest strategy is working. The SG60 is met.</p>		
d	Guidepost			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			Y

PI 1.2.1		UoC 1 Brown Crab: There is a robust and precautionary harvest strategy in place		
	Justification	<p>The SSMO Management Plan and the harvest strategy for the brown crab fishery are regularly reviewed by the SSMO board which meets 10 times each year. There is also an SSMO Advisory Group, chaired by a marine scientist from the NAFC Marine Centre in Shetland, which meets on a regular basis and which advises the SSMO Board. A key role of the Advisory Group is to undertake regular reviews of all elements of the harvest strategy, and advise the SSMO board if any changes are necessary. The minutes of SSMO board meetings provide examples of revisions of the harvest strategy including revisions to the maximum number of creels, the requirement to incorporate escape gaps in all but 240 creels to limit effort on the velvet crab fishery, and recent changes to the reference points and the consequent harvest control rules if those reference points are exceeded. Following agreement at the SSMO board, the SSMO Management Plan is updated regularly. The SSMO Licensing Policy is also regularly updated.</p> <p>The assessment team concluded that the harvest strategy is periodically reviewed and improved as necessary. The SG100 is met.</p>		
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		<p>Marine Scotland 2015. Scottish Inshore Fisheries Strategy. SSMO Management Plan SSMO Licensing Policy SSMO Reference Points and Harvest Control Rules Minutes of the SSMO Board and SSMO Advisory Group meetings</p>		
OVERALL PERFORMANCE INDICATOR SCORE:				95
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.2 UoC 1 Brown Crab

PI 1.2.2		UoC 1 Brown Crab: 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	

PI 1.2.2	UoC 1 Brown Crab: There are well defined and effective harvest control rules in place
Justification	<p>Harvest control rules for the brown crab fishery based on the reference points have been agreed and implemented by the SSMO Board following advice from the NAFC Marine Centre and the SSMO Advisory Board. (These HCRs replace those described in the original certification report.) The HCRs are dependent upon whether the indicators are in the green zone (at or above the TRP), in the amber zone (between the TRP and the LRP) or in the red zone (below the LRP).</p> <p>The HCRs for the brown crab fishery are as follows:</p> <p>Where the fishery is fluctuating at or around the target reference point no management actions are required.</p> <p>Where any reference points are amber the following management measures shall be considered using a process of expert judgement based on a prior knowledge of the fishery, and using relevant context from additional data sources that are available, but not necessarily included as reference points:</p> <ul style="list-style-type: none"> No new licences issued No additional effort permitted via succession or through replacement vessels Increased minimum landing size Spatial closures Temporal closures <p>The listed management measures will be applied individually, or in combination depending on the values associated with the amber status, the duration of the amber status, and the rate of change within the reference points.</p> <p>Where one of the reference points are red the following management measures shall be implemented:</p> <ul style="list-style-type: none"> Extending fishery closures Implementation of a research programme and monitoring. <p>Where the limit reference point has been reached the fishery will be closed.</p> <p>The assessment team considered that the HCRs are well-defined and will ensure that the exploitation rate is reduced as limit reference points are approached. The SG80 is met.</p>

PI 1.2.2		UoC 1 Brown Crab: 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 harvest control rules are based upon two indicators – LPUE which is an index of stock abundance, and mean size which is an index of exploitation rate, so the use of a multiple indicator approach inherently takes uncertainty into account. In addition, whilst the pre-defined harvest control rules are triggered primarily by changes in the two stock indicators, the HCRs state explicitly that “the management measures shall be considered using a process of expert judgement based on a prior knowledge of the fishery, and using relevant context from additional data sources that are available, but not necessarily included as reference points”, which clearly takes into account that there may be uncertainty surrounding the stock indicators and about the precise management action that is required. The SG80 is met.</p> <p>The harvest control rules do not take into account a wide range of uncertainties. For example, the reference points and harvest control rules are based on unstandardised data and have not therefore taken into account explanatory variables such as month, fishing area or vessel. Similarly, interactions between brown crabs and other species in and around the creels may affect catch rates and the HCRs take only the stock indicators for brown crabs into account. 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	Y

PI 1.2.2		UoC 1 Brown Crab: There are well defined and effective harvest control rules in place	
	Justification	<p>Empirical observations and assessment modelling for this fishery (and also from a wide range of other crustacean fisheries) provide evidence that the tools used to implement the HCRs – reduction in fishing effort, changes in technical conservation measures designed to safeguard the reproductive potential of the stock, spatial and temporal closures of the fishery – are appropriate and effective tools for reducing exploitation rate and increasing stock productivity. The high level of enforcement and good compliance with the creel limits and the minimum landing size provide evidence that the tightening of these regulations would be effective in achieving a reduction in exploitation levels.</p> <p>Harvest control rules have been triggered in recent years for the brown crab fishery, following which the stock recovered to be above the TRP, providing clear evidence that the tools in use are effective in achieving the exploitation levels required under the harvest control rules. The SG100 is met.</p>	
References		<p>SSMO Management Plan SSMO Licensing Policy SSMO Reference Points and Harvest Control Rules Minutes of the SSMO Board and SSMO Advisory Group meetings</p>	
OVERALL PERFORMANCE INDICATOR SCORE:			90
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 1.2.3 UoC 1 Brown Crab

PI 1.2.3		UoC 1 Brown Crab: 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	All licence holders must complete log books providing information on landings, discards and fishing effort. For the creel fishery, fishing area (5x5 nm SSMO square), soak time, the type of gear used, the species targeted, the number of creels hauled and the numbers or weight of landed catch must be recorded. In addition, the numbers discarded and the reasons for discarding (e.g. undersized, soft-shelled etc.) and any potential interactions with ETP species must also be recorded. The requirement to record the target species allows the calculation of landings per unit effort (LPUE) to be based only for those creels targeted at each individual species, i.e. to ensure that bycatch of the species from creels targeted at other species are not included in the calculation of LPUE. A wide range of biological information on brown crabs around Shetland including moult and reproductive cycles and estimates of natural mortality and size-at-maturity is available, and stock structure information is available from measurement of catches at sea and landings on shore. SSMO operates a limited entry licensing fishery and full information is available on the fleet composition. The information available is sufficient to support the harvest strategy, so the SG80 is met. A comprehensive range of information is not available. For example, there is no obligation for the smaller vessels to have a Vessel Monitoring System (VMS) or an Automatic Identification System (AIS) on board, and no additional environmental information is collected from the fishery. The SG100 is not met therefore.		

PI 1.2.3		UoC 1 Brown Crab: Relevant information is collected to support the harvest strategy		
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>Mandatory daily log book returns for all vessels provide good information on stock abundance in the form of the LPUE index and stock structure information is available from regular measurements of catches at sea and landings on shore. These indicators are therefore monitored with sufficient frequency to assess stock status in relation to agreed reference points which form the basis of the harvest control rules. Fishery removals are closely monitored through log books, landings declarations and sales notes generated through the Registration of Buyers and Sellers (RBS) system. Cross-checking of these three records of fishery removals by Marine Scotland Compliance revealed no anomalies. The SG80 is met.</p> <p>There is not a good understanding of the inherent uncertainties in the data used in the assessments and there is no information on the robustness of the assessment and management to this uncertainty. The SG100 is not met therefore.</p>		
c	Guidepost		There is good information on all other fishery removals from the stock.	
	Met?		Y	

PI 1.2.3		UoC 1 Brown Crab: Relevant information is collected to support the harvest strategy	
	Justification	<p>Unlicensed fishing vessels are not permitted to catch brown crabs and sell them for profit, but hobby fishermen do not require a licence to catch fish for personal consumption. The Shellfish (Restrictions on Taking by Unlicensed Fishing Boats) (Scotland) Order 2017 permits hobby fishermen to land a maximum of 5 brown crabs per day. Whilst neither Marine Scotland nor SSMO require landing returns from these hobby fishermen, and there is no accurate information on the exact number of hobby fishermen, the very low permitted daily catch quota is such that these hobby catches are considered to be very small in relation to the commercial catch.</p> <p>Shetland is geographically discrete from the rest of Scotland and therefore there are no brown crabs caught in Shetland waters but then landed elsewhere. Brown crabs are very rarely caught in trawls because offshore from the coast the seabed is silt/sand so there is virtually no trawl bycatch. However any such catches would be covered by the Registration of Buyers and Sellers (RBS) scheme, so the fishery removals would be recorded.</p> <p>In summary, all commercial catches of brown crab should be recorded through the RBS, and catches by unlicensed hobby fishermen are minimal in relation to commercial catches, and so there is good information on all fishery removals from the stock. SG80 is met.</p>	
	References	<p>NAFC Marine Centre stock assessments SSMO Management Plan SSMO Licensing Policy SSMO Reference Points and Harvest Control Rules Minutes of the SSMO Board and SSMO Advisory Group meetings The Shellfish (Restrictions on Taking by Unlicensed Fishing Boats) (Scotland) Order 2017</p>	
OVERALL PERFORMANCE INDICATOR SCORE:			80
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 1.2.4 UoC 1 Brown Crab

PI 1.2.4		UoC 1 Brown Crab: 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	As with all fisheries for brown crab, there are no direct estimates of biomass of brown crabs in Shetland, and therefore a multiple stock indicator approach to stock assessment is highly appropriate given the nature of the fishery and the biology of the target species. Length cohort analysis (LCA) has been used to assess fishing mortality in the brown crab fishery, but the output of the model has not been directly used for management purposes due to the limitations of this method. An indicator approach to stock assessment is the standard approach used in other creel/pot fisheries when no analytical assessment is available. Assessing absolute stock abundance of brown crab directly from fisheries data is very difficult as catch per unit effort from creel fisheries may not necessarily be directly related to stock abundance because of gear selectivity and behavioural interactions between animals around pots. It is highly appropriate therefore that the assessment uses a second indicator (mean size of crabs in catch) to provide a fuller description of stock status, and additional stock information (such as output from LCA) may be used with the two stock indicators when considering management actions within the harvest control rules. The SG100 is met therefore.		
b	Guidepost	The assessment estimates stock status relative to reference points.		
	Met?	Y		
	Justification	The stock assessment evaluates stock status of brown crab through the annual update of the two stock indicators of LPUE and mean size of the catch in relation to pre-defined limit and target reference points. The SG60 is met therefore.		

PI 1.2.4		UoC 1 Brown Crab: There is an adequate assessment of the stock status		
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	<p>The assessment uses two stock indicators which provide both an index of stock abundance and of exploitation rate to assess the status of the stock. The assessment team concluded that the use of a multiple indicator approach to the assessment of stock status implicitly takes uncertainty into account. The harvest control rules are based primarily on these two stock indicators of LPUE and mean size of crab, but also recognise that other data may provide valuable additional information on stock status and may therefore influence the type of management action that is implemented if the stock falls below either the limit or target reference points. The SG80 is met.</p> <p>As recommended under PI 1.1.2, the LPUE stock indicator should be standardised for season, fishing area and vessel effects. In addition the assessment team recommends that uncertainty around annual stock indicator values should be evaluated using either standard statistical methods or through computer-intensive methods such as boot-strapping.</p> <p>The assessment does not evaluate stock status relative to reference points in a probabilistic way so the SG100 is not met.</p>		
d	Guidepost			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			N
	Justification	<p>The assessment approach using stock indicators of LPUE and mean size of the catch has not been fully tested and shown to be robust through a Management Strategy Evaluation (MSE) or similar approach. Whilst alternative assessment methods such as Length Cohort Analysis (LCA) have been trialled, it cannot be concluded that alternative hypotheses and assessment approaches have been rigorously explored. The SG100 is not met therefore.</p>		

PI 1.2.4		UoC 1 Brown Crab: There is an adequate assessment of the stock status		
e	Guidepost		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		N	N
	Justification	<p>Whilst elements of the assessment approach, such as the definition of reference points and HCRs may be discussed at the Advisory Group prior to submission to the SSMO Board, it is not clear that the annual assessment of stock status of brown crab is subject to peer review. Previously an annual stock assessment report was produced and one such annual report underwent an external peer review. However the annual stock assessment report has not been produced in recent years. The output of the stock assessment has been presented at the ICES Crab Working Group, but no formal peer review of the assessments take place at the Working Group. In conclusion the assessment team considered that the assessment of stock status is not subject to sufficient internal or external peer review. The SG80 is not met.</p>		
References	<p>NAFC Marine Centre stock assessments SSMO Reference Points and Harvest Control Rules Marine Scotland Science. (2017). Fish and Shellfish Stocks. 2017 edition. Jones, R. 1984. Assessing the effects in changes in exploitation pattern using length composition data. FAO Fish. Tech. Pap. 256: 118 pp.</p>			
OVERALL PERFORMANCE INDICATOR SCORE:				75
CONDITION NUMBER (if relevant):				2

Evaluation Table for PI 1.1.1 UoC 2 Velvet Crab

PI 1.1.1		UoC 2 Velvet Crab: 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	N

	Justification	<p>Analysis of catch rates for velvet crab recorded on SSMO log books over the last 15 years shows that the annual LPUE index is currently below the TRP but well above the LRP, which has been set at a precautionary level above the point where recruitment would be impaired. Other stock indicators are only indirectly related to stock size. Mean size of male velvet crabs caught in the fishery has increased significantly recently towards the TRP. From 2011 to 2014, the sex ratio was fluctuating around the TRP, but has since declined to just below the LRP, and a major programme of effort reduction has seen fishing effort decline such that it is just above the TRP in 2016.</p> <p>Whilst the key stock indicator of LPUE clearly shows that the stock is highly likely to be above the point where recruitment would be impaired, the sex ratio has declined in recent years. Data from observer trips on commercial vessels showed significant spatial and temporal variation in sex ratios of commercial catches. Whilst the overall sex ratio had fallen below the LRP of 1.11 (males:females) in 2016, low sex ratios were observed only in the western area of the fishery in the winter months, and in 2017 samples taken in the western area in the spring showed predominantly male catches. Clearly additional research is required to better understand spatial and temporal variations in sex ratios of catches and a single annual sex ratio indicator for all areas may not be appropriate. NAFC scientists provided the following additional information that suggests that there is currently no risk of recruitment impairment in the velvet crab fishery. (1) When berried females are observed in the catch they are found in relatively high proportions (up to 75%) and gravid females are found throughout the size distribution. There has been no obvious trend in berried female size over the period 2003-2017, and there has been no reduction in berried females within the population, indicating that it is very unlikely there is any sperm limitation taking place within the fishery and that females are not subject to reduced mating opportunities. (2) The mean size at maturity for velvet crab was estimated at 56 mm and 45 mm for females and males respectively, well below the minimum landing size of 70 mm CW. Around 50% of the berried females observed in the catch are below the minimum landing size and therefore are able to breed, potentially several times, before they become available to the fishery. (3) Examination of the length frequency distributions of males and females does not show skewed distributions towards sizes below the MLS, which would be expected if high fishing pressure was resulting in high levels of removals of individuals above the MLS. Whilst there has been a small decrease in the size of males over the last ten years, data from the 2016 survey show higher numbers of larger males than observed in the 2014 survey.</p> <p>All the evidence – the LPUE stock indicator well above the LRP, a minimum landing size well above size-at-maturity, and data from the observer programme and the stock surveys trips showing evidence of high proportions of berried females - provides sufficient justification to conclude that the stock is highly likely to be above the point where recruitment would be impaired. The SG80 is met.</p> <p>None of the four stock indicators is at or above the TRP, and therefore the SG100 is not met.</p>
--	----------------------	--

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?		N	N
	Justification	<p>The current values of all stock indicators for the velvet crab fishery are below the target reference point (above the TRP for fishing effort). It cannot be concluded therefore that the stock is at or fluctuating around its target reference point and the SG80 is not met, triggering the scoring of PI 1.1.3.</p> <p>The assessment team noted that under recent MSC Guidance, a score of less than 80 for PI 1.1.1, scoring issue b, does not necessarily require the raising of a condition. The new Guidance states: <i>“In the case that the stock is depleted, and PI 1.1.1 scoring issue (b) scores less than 80, the CAB may present a rationale that PI 1.1.3 fulfils the requirements of that condition.”</i></p> <p>The assessment considered therefore that the scoring of PI 1.1.3 for the velvet crab fishery fulfils the requirement of a condition against PI 1.1.1.</p>		
References	<p>NAFC Marine Centre stock assessments SSMO Revised Reference Points Tallack, S. 2002. The biology and exploitation of three species in the Shetland Islands, Scotland: <i>Cancer pagurus</i>, <i>Necora puber</i> and <i>Carcinus maenas</i>. PhD Thesis. NAFC/UHI.</p>			
Stock Status relative to Reference Points				
	Type of reference point	Value of reference point	Current stock status relative to reference point	
Target reference point	Landings per unit effort (LPUE) Mean size of male velvet crab in catch Sex ratio Fishing effort	LPUE = 0.54 kg/creel Mean size = 75.65 mm CW Sex ratio = 1.42 Effort = 230,519 creel hauls	Current LPUE / TRP = 0.46/0.54 = 0.85 x TRP Current mean size / TRP = 73.06/75.65 = 0.97 x TRP Current sex ratio / TRP = 0.99/1.42 = 0.70 x TRP Current effort / TRP = 234,043/230,519 = 1.02 x TRP	
Limit reference point	Landings per unit effort (LPUE) Mean size of male velvet crab in catch	LPUE = 0.35 kg/creel Mean size = 71.15 mm CW	Current LPUE / LRP = 0.46/0.35 = 1.31 x LRP Current mean size / LRP = 73.06/71.15 = 1.03 x LRP	

	Sex ratio Fishing effort	Sex ratio = 1.11 Effort = 501,662 creel hauls	Current sex ratio / LRP = $0.99/1.11 = 0.89 \times \text{LRP}$ Current effort / LRP = $234,043/501,662 = 0.47 \times \text{LRP}$
OVERALL PERFORMANCE INDICATOR SCORE:			70
CONDITION NUMBER (if relevant):		PI 1.1.3 is evoked and no condition is required	

Evaluation Table for PI 1.1.2 UoC 2 Velvet Crab

PI 1.1.2		UoC 2 Velvet Crab: 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	

PI 1.1.2	UoC 2 Velvet Crab: Limit and target reference points are appropriate for the stock
<p style="text-align: center; vertical-align: middle;">Justification</p>	<p>Velvet crabs cannot be aged routinely and therefore conventional age-based analytical assessments producing estimates of biomass (Bmsy) and fishing mortality (Fmsy) at maximum sustainable yield (MSY) are not possible. Length cohort analysis (LCA) has been used to produce a proxy for Fmsy (Fmax), but the equilibrium nature of the LCA model precludes the use of Fmax as a reference point for management purposes. Reference points have therefore been formulated in terms of an index of abundance based on catch rates in the commercial fishery, an index of exploitation rate based on the mean size of male velvet crabs in the catch, the sex ratio (the velvet crab fishery is predominantly a male fishery) and a proxy for fishing mortality in the form of fishing effort.</p> <p>The Guidance to MSC Certification Requirements v1.3 GCB2.3.9 states that <i>“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. Examples of quantitative interpretation include the use of measured data from the relevant fishery”</i> and that surrogate measures for reference points are acceptable and that <i>“ in some crustacean species, fishery management strategies might seek to protect from harvest the complete female reproductive capacity in the population (i.e. single sex harvest). The trigger or reference points involved could relate to metrics such as per cent fertilised eggs and or other female population indicators that are evaluating the management system’s effectiveness at achieving its goal.”</i></p> <p>As with most crustacean species, direct estimates of stock biomass are not available for velvet crab and so it is conventional to use proxies for stock abundance and exploitation rate. The use of stock indicators, such as LPUE, which is an index of stock biomass, and mean size which is an indicator of exploitation rate, as reference points is considered appropriate for the velvet crab stock. As the velvet crab fishery is predominantly a male fishery, it is also appropriate to set a reference point in terms of sex ratio. These reference points are used to assess the status of the stock, and management action triggered by the harvest control rules for the fishery is formulated in relation to these reference points. LPUE and the level of fishing effort can be estimated from log book returns, and mean male size and sex ratio can be estimated from at-sea and shore-based measurements of the catch. The SG80 is met therefore.</p>

PI 1.1.2		UoC 2 Velvet Crab: Limit and target reference points are appropriate for the stock	
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	N
	Justification	<p>The limit reference points (LRP) for the four stock indicators, LPUE, mean male size, sex ratio and fishing effort have been defined as the lowest value (or highest value for fishing effort) observed in the time series of the four indicators from 2001 to 2015. The LRP for LPUE was set at the 2004 value of 0.35 kg/creel, the LRP for mean male size was set at the 2013 value of 71.15 mm CW, the sex ratio LRP was set at the 2010 value of 1.11 and the fishing effort LRP was set at the 2009 value of 501,662 creel hauls. Since those lowest (or highest for fishing effort) observed values, the stock has demonstrably recovered to much higher levels and could be expected to do so again in the future if the stock indicators declined to that level. It can be concluded that the LRPs are set above the level at which there is an appreciable risk of impairing reproductive capacity. The SG80 is met. However the assessment team considered that the fishing effort LRP may potentially be too high as this level of fishing for 2-3 years appeared to have a negative impact on the LPUE indicator as well as the size and sex ratio indicators.</p> <p>The assessment team recommends therefore that the fishing effort reference points for the velvet crab fishery are reviewed as soon as possible.</p> <p>The values of the stock indicators used as the LRPs have not been standardised to take into account explanatory variables such as month, fishing area or vessel, and therefore the setting of the LRPs has not fully taken into account precautionary issues. SG100 is not met.</p> <p>The assessment team recommends therefore that the reference points should be standardised for season, fishing area and vessel effects to allow more consistent comparison with standardised stock indicators.</p>	

PI 1.1.2		UoC 2 Velvet Crab: Limit and target reference points are appropriate for the stock		
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?		Y	N

PI 1.1.2	UoC 2 Velvet Crab: Limit and target reference points are appropriate for the stock
Justification	<p>The target reference points (TRPs) have been set for the four stock indicators for the velvet crab fishery at a LPUE value of 0.54 kg/creel, a mean male size of 75.65 mm CW, a sex ratio of 1.42 and a fishing effort level of 230,519 creel hauls. If either of the four indicators drop below the TRP, additional harvest or effort control measures are implemented.</p> <p>MSC Certification Requirements v1.3 paragraph CB2.3.1.1 state that the target reference point should be “consistent with Bmsy” or “some other measure or surrogate with similar intent or outcome, which maintains a high productivity of the stock and is a level well above the point at which recruitment might be impaired”.</p> <p>The intent of these target reference points is to maintain the stock at high productivity and well above the point at which recruitment might be impaired. The TRPs were based on a period in the historical time trends in the four stock indicators during which the stock indicators have been at high levels (or low levels for fishing effort) and stable, in this case from 2006 to 2010. Such a period of high (or low) indicator values could be considered consistent with being at Bmsy, which is a similar approach to that set out in Canada in the Department of Fisheries and Ocean’s (DFO) Precautionary Approach, an example of which is the approach to reference points taken in the Canadian Northern Shrimp (<i>Pandalus borealis</i>) fishery in the Estuary and Gulf of St Lawrence and observed in other MSC-certified fisheries in Canada.</p> <p>These periods of high and stable LPUE were therefore taken to represent a biomass consistent with maximum sustainable yield (MSY). By taking a precautionary approach, all the upper or target reference points were set at 80% of the mean value from these periods of high stable values. The TRP is calculated as 80% of the mean within each time frame but constrained by the minimum value within that time frame, using the following formula:</p> $TRP = (1/100) * (PM + 100m - Pm)$ <p>where P is the percentage value (80%), M is the mean value, and m is the minimum value.</p> <p>In other words, the TRP is fixed at 80% of the distance between the minimum value and the mean value within the time frame.</p> <p>The assessment team concluded that values of stock indicators above (or below for fishing effort) the target reference point would be consistent with the stock being at Bmsy. The SG80 is met therefore.</p> <p>The values of the stock indicators used as the TRP have not been standardised to take into account explanatory variables such as month, fishing area or vessel, and therefore the setting of the TRPs have not fully taken into account precautionary issues, and cannot be said to have taken into account the ecological role of the stock. SG100 is not met.</p>

PI 1.1.2		UoC 2 Velvet Crab: Limit and target reference points are appropriate for the stock	
d	Guidepost		For key low trophic level stocks, the target reference point takes into account the ecological role of the stock.
	Met?		Not relevant
	Justification	Velvet crab (<i>Necora puber</i>) does not meet the criteria for key low trophic level species as set out in paragraph CB2.3.13 of the MSC Certification Requirements v1.3 (MSC 2013). As such, this SI is not scored.	
References		<p>MSC Certification Requirements v1.3. MSC Guidance for the Fisheries Certification Requirements v1.3. SSMO Revised Reference Points. DFO 2009. Fishery decision-making framework incorporating the precautionary approach. Fisheries and Oceans Canada, available online: http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/precaution-eng.htm DFO 2011. Reference points consistent with the precautionary approach for northern shrimp in the Estuary and Gulf of St. Lawrence. DFO Can. Sci. Advis. Sec., Sci. Advis. Rep. 2011/062.</p>	
OVERALL PERFORMANCE INDICATOR SCORE:			80
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 1.1.3 UoC 2 Velvet Crab

PI 1.1.3		UoC 2 Velvet Crab: 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?	Y		N

<p>PI 1.1.3</p>	<p>UoC 2 Velvet Crab: Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>Formally agreed Harvest Control Rules (HCRs) which are incorporated within the SSMO Management Plan and are triggered when the stock falls below limit or target reference points can be interpreted as a rebuilding strategy. As a result of the velvet crab LPUE declining below the (then) target LPUE in 2012, a number of rebuilding management measures were implemented based on the HCRs in place at that time. These included:</p> <ol style="list-style-type: none"> 1. Effort Control: A full consultation with industry took place during 2012 and a gear limit of 240 pots targeted at velvet crabs was agreed and implemented in 2013. In addition, no new licences have been issued since certification was awarded. 2. The velvet crab closed period in the summer (when they are moulting) was increased from six to eight weeks. 3. The NAFC Marine Centre was commissioned to carry out a velvet crab survey in 2014. 4. Areal closures by SSMO grid were discussed by the SSMO board but rejected as there was no evidence of the benefit of such closures. <p>These measures along with a minimum landing size significantly above the size at maturity constitute a rebuilding strategy for the velvet crab stock, which could be considered to have a reasonable expectation of success.</p> <p>In addition, a number of legislative and enforcement activities were implemented which will underpin the rebuilding strategy. Creel tags must be attached to all gear to aid enforcement of creel limits, and Marine Scotland Compliance has committed to enforcement of these limits both onshore and at sea. The limit of 240 creels that may be targeted at velvet crabs is underpinned by a new regulation that all additional creels over the 240 limit must be fitted with escape gaps which permit the escape of all velvet crabs (but which retain other species above the minimum landing size). The SG 60 is met therefore.</p> <p>Although velvet crab LPUE showed a significant increase in 2014, this was the first year since 2007 that LPUE had increased, and this increase was not sustained in 2015 and 2016. In addition the audit team noted that velvet crab populations may be influenced by factors other than the level of fishing. For example observations from fishermen and the most recent stock assessments show that both lobster and brown crab populations are increasing, and such increases may be to the detriment of the recovery of the velvet crab stock. Lobster and crabs may be predators of small and soft velvet crabs and so natural mortality rates may have increased recently at the time when fishing mortality has declined, such that stock re-building has been compromised. In addition, fishermen report that velvet crabs will not enter creels in which a lobster has already entered, and so the increase in abundance of lobsters may be negatively impacting on catch rates of velvet crabs. It cannot be concluded therefore that the rebuilding strategies have been demonstrated to be rebuilding stocks continuously or that there is strong evidence that rebuilding will be complete within the specified timeframe, and so SG100 is not met.</p>

PI 1.1.3		UoC 2 Velvet Crab: Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe		
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?	Y	Y	N
	Justification	The generation time for velvet crabs is equal to the time needed to reach 45mm for males and 56mm for females (size at maturity) which is approximately 2 years. The current rebuilding strategy in place, based primarily on significant reductions in fishing effort, does not have an explicitly-stated timeframe, but was implemented by the Client with the aim of rebuilding the stock towards the target reference point in the shortest possible timeframe. The rebuilding strategy includes the mandatory use of escape gaps in all creels above the 240 limit permitted for targeting velvet crabs. (Escape gaps are designed to permit the escape of velvet crabs whilst retaining the other target species, thus permitting a creel limit of 600 for other target species, but underpinning the limit of 240 creels targeted at velvet crabs.) However, as noted, in section 3.5.6, there were significant problems with the production and operation of the escape gaps, and reliable escape gaps have only just been introduced in the fishery. The assessment team concluded therefore that the implicit rebuilding timeframe since the stock became depleted has been revised to five years. The SG80 is met therefore, and the delay in implementing all elements of the rebuilding strategy means that the SG100 is not met		

PI 1.1.3		UoC 2 Velvet Crab: Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe		
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?	Y	N	

PI 1.1.3	UoC 2 Velvet Crab: Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe	
	Justification	<p>There are monitoring programmes in place. Catches, fishing effort and LPUE data are available from SSMO log books which provide an assessment of stock status against the LPUE and fishing effort reference points. Mean male size and sex ratio in relation to reference points can be estimated from at-sea and shore-based measurements of the catch. In addition there are regular fishery-independent stock surveys which provide information on stock abundance and stock structure including size distribution and sex ratio data. The SG60 is met therefore.</p> <p>At the 4th surveillance audit in September 2016, the assessment team reviewed progress with the re-building plan. The cap on the number of licences and the increase in the moulting period closure from 6 to 8 weeks were introduced in 2012, but the limit of 240 creels targeted at velvet crabs did not come into force until 1 July 2013 and the requirement to have any additional creels fitted with escape gaps had not been planned for introduction until July 2014. However the Client reported that in 2016 escape gaps had still not been fitted to creels because the initial production of escape panels was faulty, with most breaking up either during rigging or shortly afterwards. Marine Scotland compliance officers have carried out observations of vessels, lifting their gear to ensure they are complying with creel limits and tagging of creels, and a specified number of days of surveillance are agreed annually.</p> <p>The most recent stock assessment showed that fishing effort targeted at velvet crabs has decreased significantly year-on-year since 2012 (Figure 3.9), providing evidence that the implementation of the harvest control rules has resulted in a reduction in exploitation rates. However after a significant increase in 2014, LPUE has declined further (Figure 3.9). The NAFC Marine Centre velvet crab survey in 2016 showed that there had been an increase in mean size of both males and females in 2016 compared with the results of the 2014 survey. LPUE may be influenced by factors other than stock abundance. The Client and fishers report a large increase in abundance of both lobsters and brown crabs, and the presence of lobsters and brown crabs in the creels may inhibit further entry of velvet crabs thereby reducing the observed LPUE of velvet crabs. The assessment team concluded that despite the significant reduction in fishing effort observed in the velvet crab fishery, the observed increase in mean size of velvet crabs, and the potential for factors other than stock abundance to influence catch rates, there was not sufficient evidence to conclude that the rebuilding strategies were rebuilding the stocks. The SG80 is not met therefore.</p>
References	<p>SSMO Management Plan SSMO Licensing Policy SSMO Harvest Control Rules</p>	
OVERALL PERFORMANCE INDICATOR SCORE:		70
CONDITION NUMBER (if relevant):		1

Evaluation Table for PI 1.2.1 UoC 2 Velvet Crab

PI 1.2.1		UoC 2 Velvet Crab: 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

<p>PI 1.2.1</p>	<p>UoC 2 Velvet Crab: There is a robust and precautionary harvest strategy in place</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The overall harvest strategy is underpinned by the Scottish Government’s vision for inshore fisheries set out in the Scottish Inshore Fisheries Strategy, which includes implementing effective assessment methodologies for fishing at Maximum Sustainable Yield (MSY), and the Shetland Islands Regulating Order 2012 granted to the Shetland Shellfish Management Organisation (SSMO).</p> <p>The SSMO has developed a Management Plan, the aim of which is “to continue to maintain sustainable and well managed shellfish fisheries operating within a healthy marine environment.” Two key objectives of the Management Plan that underpin the harvest strategy are that stocks will be maintained at biologically sustainable levels, and that fishing activity will be managed in an environmentally responsible manner. To achieve these two objectives, the Management Plan seeks to:</p> <ul style="list-style-type: none"> - Establish biologically relevant reference points for commercially-exploited stocks - Develop a coherent and effective harvest control strategy which utilises the best available information - Implement effective management measures that are enforceable - Put in place an effective code of conduct for all fishermen - Maintain an effective spatial management plan - Carry out appropriate monitoring <p>Regulations within the Management Plan for the velvet crab fishery include limited entry licensing, maximum size of vessel, limits on creel numbers, incorporation of escape gaps in all creels not targeting velvet crabs, a velvet crab closed season for a minimum period of 8 consecutive weeks between June and October (timing varies between fishing areas based on moult period) and a minimum landing size of 70 mm carapace width, all of which are designed to maintain the exploitation rate at levels such that the stock does not fall below the reference points. In addition, license holders must comply with all monitoring requirements including submission of SSMO log books, and making the vessel and its fishing gear available for inspection at any time. All vessels must also conform with the SSMO Code of Conduct which includes reporting the loss of any fishing gear on the log sheets, and taking care to return all undersized target and bycatch species to the water quickly and carefully to reduce damage to individuals and maximise survival rates.</p> <p>A key element of the harvest strategy for the velvet crab fishery is the assessment of stock status against pre-determined reference points, and the implementation of harvest control rules (HCRs) if the reference points are exceeded. The harvest strategy is therefore responsive to the state of the stock and has been specifically designed over many years by the SSMO in line with the Scottish Government’s guidelines to ensure that it maintains the stocks at or above the target reference point. The SG100 is met therefore.</p>

PI 1.2.1		UoC 2 Velvet Crab: 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	All stock indicators are well above the LRP, there is a minimum landing size above the size-at-maturity and fishing effort has been significantly reduced in recent years, all of which provides evidence that the harvest strategy is achieving its objective of maintaining the stock above the point where recruitment would be impaired. The stock indicators are not currently at the target reference point (TRP), but when the LPUE stock indicator recently dropped below the (then) TRP, management measures were introduced under the harvest control rules to rebuild the stock. The rebuilding plan is still in operation and one element of the rebuilding plan has only just been implemented. However the most recent stock assessment showed that fishing effort had been reduced significantly and that the harvest control rules were therefore successful in reducing exploitation rate. The SG80 is met and although there is evidence currently available that the harvest strategy is achieving its objective of maintaining the stock above the point where recruitment would be impaired, it may be a few more years before the rebuilding plan has provided stronger evidence that the harvest strategy is maintaining the stock fluctuating around the TRP. The performance of the harvest strategy has not been fully evaluated through, for example, a Management Strategy Evaluation (MSE), so SG100 is not met.		
c	Guidepost	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Y		

PI 1.2.1		UoC 2 Velvet Crab: There is a robust and precautionary harvest strategy in place		
	Justification	A requirement of the SSMO licence is that catch, fishing effort and LPUE from the commercial fishery are recorded on log books permitting the evaluation of stock status against reference points. At-sea and shore-based monitoring provides information on stock structure such as size distribution and sex ratio. In addition, the NAFC Marine Centre carries out regular fishery-independent surveys of the velvet crab stock. Marine Scotland Compliance enforcement activity at both sea and on the quayside, ensures that all fisheries regulations including creel limits and minimum landing size (MLS) are observed. Sufficient monitoring is carried out to determine whether the harvest strategy is working. The SG60 is met.		
d	Guidepost			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			Y
	Justification	The SSMO Management Plan and the harvest strategy for the velvet crab fishery are regularly reviewed by the SSMO board which meets 10 times each year. There is also an SSMO Advisory Group, chaired by a marine scientist from the NAFC Marine Centre in Shetland, which meets on a regular basis and which advises the SSMO Board. A key role of the Advisory Group is to undertake regular reviews of all elements of the harvest strategy, and advise the SSMO board if any changes are necessary. The minutes of SSMO board meetings provide examples of revisions of the harvest strategy including revisions to the maximum number of creels, the requirement to incorporate escape gaps in all but 240 creels to limit effort on the velvet crab fishery, and recent changes to the reference points and the consequent harvest control rules if those reference points are exceeded. Following agreement at the SSMO board, the SSMO Management Plan is updated regularly. The SSMO Licensing Policy is also regularly updated. The assessment team concluded that the harvest strategy is periodically reviewed and improved as necessary. The SG100 is met.		
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.

PI 1.2.1		UoC 2 Velvet Crab: There is a robust and precautionary harvest strategy in 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		Marine Scotland 2015. Scottish Inshore Fisheries Strategy. SSMO Management Plan SSMO Licensing Policy SSMO Reference Points and Harvest Control Rules Minutes of the SSMO Board and SSMO Advisory Group meetings		
OVERALL PERFORMANCE INDICATOR SCORE:				95
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.2 UoC 2 Velvet Crab

PI 1.2.2		UoC 2 Velvet Crab: 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	

PI 1.2.2	UoC 2 Velvet Crab: There are well defined and effective harvest control rules in place
Justification	<p>Harvest control rules for the velvet crab fishery based on the reference points have been agreed and implemented by the SSMO Board following advice from the NAFC Marine Centre and the SSMO Advisory Board. (These HCRs replace those described in the original certification report.) The HCRs are dependent upon whether the indicators are in the green zone (at or above the TRP), in the amber zone (between the TRP and the LRP) or in the red zone (below the LRP).</p> <p>The HCRs for the velvet crab fishery are as follows:</p> <p>Where the stock is fluctuating at or around the target reference point no management actions are required.</p> <p>Where any reference points are amber the following management measures shall be considered using a process of expert judgement based on a prior knowledge of the fishery, and using relevant context from additional data sources that are available, but not necessarily included as reference points:</p> <ul style="list-style-type: none"> No new licences issued No additional effort permitted via succession or through replacement vessels Increased minimum landing size Spatial closures Temporal closures e.g. increasing the period of real time closure, implementing a complete closure for a period of time, implementation of East/West seasonal closures. <p>The listed management measures will be applied individually, or in combination, depending on the values associated with the amber status, the duration of the amber status, and the rate of change within the reference points.</p> <p>Where one or more (but not all) of the reference points are red the following management measures shall be implemented:</p> <ul style="list-style-type: none"> Extending fishery closures, or complete closure of the fishery Implementation of a research programme and monitoring. <p>Where all of the limit reference points have been reached the fishery will be closed.</p> <p>The assessment team considered that the HCRs are well-defined and will ensure that the exploitation rate is reduced as limit reference points are approached. The SG80 is met.</p>

PI 1.2.2		UoC 2 Velvet Crab: 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 harvest control rules are based upon four indicators – LPUE which is an index of stock abundance, mean size and sex ratio which are indices of exploitation rate, and fishing effort which is an index of fishing mortality. The use of a multiple indicator approach inherently takes uncertainty into account. In addition, whilst the pre-defined harvest control rules are triggered primarily by changes in the four stock indicators, the HCRs state explicitly that “the management measures shall be considered using a process of expert judgement based on a prior knowledge of the fishery, and using relevant context from additional data sources that are available, but not necessarily included as reference points”, which clearly takes into account that there may be uncertainty surrounding the stock indicators and about the precise management action that is required. The SG80 is met.</p> <p>The harvest control rules do not take into account a wide range of uncertainties. For example, the reference points and harvest control rules are based on unstandardised data and have not therefore taken into account explanatory variables such as month, fishing area or vessel. Similarly, interactions between velvet crabs and other species (e.g. lobsters) in and around the creels may affect catch rates and the HCRs take only the stock indicators for velvet crabs into account. 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

PI 1.2.2		UoC 2 Velvet Crab: There are well defined and effective harvest control rules in place
	Justification	<p>Empirical observations and assessment modelling for this fishery (and also from a wide range of other crustacean fisheries) provide evidence that the tools used to implement the HCRs – reduction in fishing effort, changes in technical conservation measures designed to safeguard the reproductive potential of the stock, spatial and temporal closures of the fishery – are appropriate and effective tools for reducing exploitation rate and increasing stock productivity. The high level of enforcement and good compliance with the creel limits and the minimum landing size provide evidence that the tightening of these regulations would be effective in achieving a reduction in exploitation levels. Harvest control rules have been triggered in recent years for the velvet crab fishery, and the most recent stock assessment for velvet crabs shows that fishing effort has been reduced significantly since 2012, providing an indication of the achievement of exploitation rates required under the harvest control rules. The SG80 is met.</p> <p>As yet there is not clear evidence from the velvet crab fishery that the observed reduction in fishing effort has resulted in the rebuilding of the stocks towards the target reference point. The SG100 is not met.</p>
	References	<p>SSMO Management Plan SSMO Licensing Policy SSMO Reference Points and Harvest Control Rules Minutes of the SSMO Board and SSMO Advisory Group meetings</p>
OVERALL PERFORMANCE INDICATOR SCORE:		80
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 1.2.3 UoC 2 Velvet Crab

PI 1.2.3		UoC 2 Velvet Crab: 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

PI 1.2.3		UoC 2 Velvet Crab: Relevant information is collected to support the harvest strategy		
	Justification	<p>All licence holders must complete log books providing information on landings, discards and fishing effort. For the creel fishery, fishing area (5x5 nm SSMO square), soak time, the type of gear used, the species targeted, the number of creels hauled and the numbers or weight of landed catch must be recorded. In addition, the numbers discarded and the reasons for discarding (e.g. undersized, soft-shelled etc.) and any potential interactions with ETP species must also be recorded. The requirement to record the target species allows the calculation of landings per unit effort (LPUE) to be based only for those creels targeted at each individual species, i.e. to ensure that bycatch of the species from creels targeted at other species are not included in the calculation of LPUE. A wide range of biological information on velvet crabs around Shetland including moult and reproductive cycles and estimates of natural mortality and size-at-maturity is available, and stock structure information is available from measurement of catches at sea and landings on shore. In addition to the sampling on commercial vessels, stock surveys are regularly undertaken by the NAFC Marine Centre with the principle aim of investigating spatial variability in size structure, patterns of moulting, sex ratio, and biological parameters (i.e. length-weight relationships) and discard mortality. SSMO operates a limited entry licensing fishery and full information is available on the fleet composition. The information available is sufficient to support the harvest strategy, so the SG80 is met.</p> <p>A comprehensive range of information is not available. For example, there is no obligation for the smaller vessels to have a Vessel Monitoring System (VMS) or an Automatic Identification System (AIS) on board, and no additional environmental information is collected from the fishery. The SG100 is not met therefore.</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

PI 1.2.3		UoC 2 Velvet Crab: Relevant information is collected to support the harvest strategy		
	Justification	<p>Mandatory daily log book returns for all vessels provide good information on stock abundance in the form of the LPUE index and on levels of fishing effort and stock structure information (including mean male size and sex ratio) is available from regular measurements of catches at sea and landings on shore. These indicators are therefore monitored with sufficient frequency to assess stock status in relation to agreed reference points which form the basis of the harvest control rules. Regular fishery-independent stock surveys provide additional information on stock abundance. Fishery removals are closely monitored through log books, landings declarations and sales notes generated through the Registration of Buyers and Sellers (RBS) system. Cross-checking of these three records of fishery removals by Marine Scotland Compliance revealed no anomalies. The SG80 is met.</p> <p>There is not a good understanding of the inherent uncertainties in the data used in the assessments and there is no information on the robustness of the assessment and management to this uncertainty. The SG100 is not met therefore.</p>		
c	Guidepost		There is good information on all other fishery removals from the stock.	
	Met?		Y	

PI 1.2.3		UoC 2 Velvet Crab: Relevant information is collected to support the harvest strategy	
	Justification	<p>Unlicensed fishing vessels are not permitted to catch velvet crabs and sell them for profit, but hobby fishermen do not require a licence to catch fish for personal consumption. The Shellfish (Restrictions on Taking by Unlicensed Fishing Boats) (Scotland) Order 2017 permits hobby fishermen to land a maximum of 5 velvet crabs per day. Whilst neither Marine Scotland nor SSMO require landing returns from these hobby fishermen, and there is no accurate information on the exact number of hobby fishermen, the very low permitted daily catch quota is such that these hobby catches are considered to be very small in relation to the commercial catch.</p> <p>Shetland is geographically discrete from the rest of Scotland and therefore there are no velvet crabs caught in Shetland waters but then landed elsewhere. Velvet crabs are highly unlikely to be caught in trawls, but any such catches would be covered by the Registration of Buyers and sellers (RBS) scheme, so the fishery removals would be recorded.</p> <p>In summary, all commercial catches of velvet crab should be recorded through the RBS, and catches by unlicensed hobby fishermen are minimal in relation to commercial catches, and so there is good information on all fishery removals from the stock. SG80 is met.</p>	
	References	<p>NAFC Marine Centre stock assessments SSMO Management Plan SSMO Licensing Policy SSMO Reference Points and Harvest Control Rules Minutes of the SSMO Board and SSMO Advisory Group meetings The Shellfish (Restrictions on Taking by Unlicensed Fishing Boats) (Scotland) Order 2017</p>	
OVERALL PERFORMANCE INDICATOR SCORE:			80
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 1.2.4 UoC 2 Velvet Crab

PI 1.2.4		UoC 2 Velvet Crab: 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	As with all fisheries for velvet crab, there are no direct estimates of biomass of velvet crabs in Shetland, and therefore a multiple stock indicator approach to stock assessment is highly appropriate given the nature of the fishery and the biology of the target species. Length cohort analysis (LCA) has been used to assess fishing mortality in the velvet crab fishery, but the output of the model has not been directly used for management purposes due to the limitations of this method. An indicator approach to stock assessment is the standard approach used in other creel/pot fisheries when no analytical assessment is available. Assessing absolute stock abundance of velvet crab directly from fisheries data is very difficult as catch per unit effort from creel fisheries may not necessarily be directly related to stock abundance because of gear selectivity and behavioural interactions between animals around pots. It is highly appropriate therefore that the assessment uses four indicators (LPUE, mean size of male crabs, sex ratio and fishing effort) to provide a fuller description of stock status, and additional stock information (such as output from LCA) may be used with the four stock indicators when considering management actions within the harvest control rules. The SG100 is met therefore.		
b	Guidepost	The assessment estimates stock status relative to reference points.		
	Met?	Y		
	Justification	The stock assessment evaluates stock status of velvet crab through the annual update of the four stock indicators of LPUE, mean male size and sex ratio of the catch and fishing effort in relation to pre-defined limit and target reference points. The SG60 is met therefore.		

PI 1.2.4		UoC 2 Velvet Crab: There is an adequate assessment of the stock status		
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	<p>The assessment uses four stock indicators which provide indices of stock abundance, exploitation rate and fishing mortality to assess the status of the stock. The assessment team concluded that the use of a multiple indicator approach to the assessment of stock status implicitly takes uncertainty into account. The harvest control rules are based primarily on these four stock indicators of LPUE, mean size of male velvet crab, sex ratio and fishing effort but also recognise that other data may provide valuable additional information on stock status and may therefore influence the type of management action that is implemented if the stock falls below either the limit or target reference points. The SG80 is met.</p> <p>As recommended under PI 1.1.2, the LPUE stock indicator should be standardised for season, fishing area and vessel effects. In addition the assessment team recommends that uncertainty around annual stock indicator values should be evaluated using either standard statistical methods or through computer-intensive methods such as bootstrapping.</p> <p>The assessment does not evaluate stock status relative to reference points in a probabilistic way so the SG100 is not met.</p>		
d	Guidepost			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			N
	Justification	<p>The assessment approach using stock indicators of LPUE, mean size and sex ratio of the catch and fishing effort has not been fully tested and shown to be robust through a Management Strategy Evaluation (MSE) or similar approach. Whilst alternative assessment methods such as Length Cohort analysis (LCA) have been trialled, it cannot be concluded that alternative hypotheses and assessment approaches have been rigorously explored. The SG100 is not met therefore.</p>		

PI 1.2.4		UoC 2 Velvet Crab: There is an adequate assessment of the stock status		
e	Guidepost		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		N	N
	Justification	<p>Whilst elements of the assessment approach, such as the definition of reference points and HCRs may be discussed at the Advisory Group prior to submission to the SSMO Board, it is not clear that the annual assessment of stock status of velvet crab is subject to peer review. Previously an annual stock assessment report was produced and one such annual report underwent an external peer review. However the annual stock assessment report has not been produced in recent years. The output of the stock assessment has been presented at the ICES Crab Working Group, but no formal peer review of the assessments take place at the Working Group. In conclusion the assessment team considered that the assessment of stock status is not subject to sufficient internal or external peer review. The SG80 is not met.</p>		
References	<p>NAFC Marine Centre stock assessments SSMO Reference Points and Harvest Control Rules Marine Scotland Science. 2017. Fish and Shellfish Stocks. 2017 edition. Jones, R. 1984. Assessing the effects in changes in exploitation pattern using length composition data. FAO Fish. Tech. Pap. 256: 118 pp.</p>			
OVERALL PERFORMANCE INDICATOR SCORE:				75
CONDITION NUMBER (if relevant):				2

Evaluation Table for PI 1.1.1 UoC 3 Scallop

PI 1.1.1		UoC 3 Scallop: 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>Analysis of catch rates for scallops recorded on SSMO log books over the last 15 years shows that the annual LPUE index has been at or above the TRP and been well above the LRP in recent years. The LRP for LPUE has been set above the point where recruitment would be impaired. The mean spawning stock biomass (SSB) estimated from the quarterly VPA has been fluctuating around the TRP since 2008, and has therefore been well above the LRP for many years.</p> <p>In addition, the estimates of pre-recruits to the fishery (scallops age 2) from the VPA show that the abundance of scallops of this age class have been stable since 2000 providing further evidence that recruitment is not impaired.</p> <p>The two stock biomass indicators do not take spatial variations in the scallop stock into account, but all the evidence – both stock biomass indicators at or above TRPs and stable levels of recruitment to this fishery since 2000 - provides a high degree of certainty that the stock is above the point where recruitment would be impaired. The SG100 is met.</p>		
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?		Y	N

PI 1.1.1		UoC 3 Scallop: The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing	
	Justification	<p>The LPUE stock indicator increased continuously from 2001 to 2008 and since then has been fluctuating around the target reference point and in 2016 was at its highest level since current statistics were initially compiled in 2001. The time trend in LPUE is mirrored by the time trend in spawning stock biomass (SSB) estimated from the quarterly VPA. The two stock biomass indicators provide evidence that the stock has been fluctuating around the target reference point for the last few years. The SG80 is met therefore.</p> <p>The stock biomass reference points are for the whole stock, and recent stock assessments by the NAFC Marine Centre have identified significant differences in stock dynamics between the different geographical areas of the fishery. Ideally the stock assessment should consider LPUE indicators on a regional basis rather than for the whole fishery. In addition, the LPUE indicator uses “raw” rather than standardised data and the assessment team concluded therefore that there is not a high degree of certainty that the stock has been fluctuating around or above the TRP in recent years. The SG100 is not met.</p>	
References		<p>NAFC Marine Centre stock assessments SSMO Revised Reference Points</p>	
Stock Status relative to Reference Points			
	Type of reference point	Value of reference point	Current stock status relative to reference point
Target reference point	Landings per unit effort (LPUE) Spawning stock biomass (SSB)	LPUE = 25.92 kg/dredge/hour SSB = 9.99 million tonnes	Current LPUE / TRP = 27.98/25.92 = 1.08 x TRP Current SSB / TRP = 9.80/9.99 = 0.98 x TRP (2015 figure as 2016 data not yet available)
Limit reference point	Landings per unit effort (LPUE) Spawning stock biomass (SSB)	LPUE = 16.48 kg/dredge/hour SSB = 5.91 million tonnes	Current LPUE / LRP = 27.98/16.48 = 1.70 x LRP Current SSB / LRP = 9.80/5.91 = 1.66 x LRP (2015 figure as 2016 data not yet available)
OVERALL PERFORMANCE INDICATOR SCORE:			90
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 1.1.2 UoC 3 Scallop

PI 1.1.2		UoC 3 Scallop: 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>For the scallop fishery, there are no estimates of biomass (Bmsy) and fishing mortality (Fmsy) at maximum sustainable yield (MSY). Reference points have therefore been formulated in terms of two indicators of stock biomass - an index of abundance based on catch rates in the commercial fishery (LPUE) and an estimate of spawning stock biomass (SSB) from the quarterly VPA model output. There are therefore two biomass reference points, one based on a model estimate of spawning stock biomass and the other based on a proxy for stock biomass. NAFC Marine Centre have now implemented regular fishery-independent scallop stock surveys. The 2015 survey was the first to provide a full estimate of scallop stock biomass and in the future when a substantial times series of stock biomass estimates has been built up, a reference point based on this stock indicator can be defined. The reference points do not include an indicator of scallop size (relating to exploitation rate) because the size relative to age varies considerably around Shetland.</p> <p>The use of these stock biomass indicators as reference points is considered appropriate for the scallop stock. These reference points are used to assess the status of the stock, and management action triggered by the harvest control rules for the fishery is formulated in relation to these reference points. LPUE can be estimated from log book returns and spawning stock biomass can be estimated from landings data and at-sea and shore-based measurements of the catch. The SG80 is met therefore.</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	N

PI 1.1.2		UoC 3 Scallop: Limit and target reference points are appropriate for the stock	
Justification	<p>The limit reference points (LRP) for the two stock indicators, LPUE from the commercial fishery and spawning stock biomass (SSB) estimated from VPA, have been defined as the lowest value observed in the time series of the two indicators from 2001 to 2015. The LRP for LPUE was set at the 2001 value of 16.48 kg/dredge/hour and the LRP for SSB was set at the 2001 value of 5.91 million tonnes. Since those lowest observed values, the stock has demonstrably recovered to much higher levels and could be expected to do so again in the future if the stock declined to that level. It can be concluded that the LRPs are set above the level at which there is an appreciable risk of impairing reproductive capacity. The SG80 is met.</p> <p>The values of the stock indicators used as the LRPs have not been standardised to take into account explanatory variables such as month, fishing area or vessel, and therefore the setting of the LRPs has not fully taken into account precautionary issues. SG100 is not met.</p> <p>The assessment team recommends therefore that the reference points should be standardised for season, fishing area and vessel effects to allow more consistent comparison with standardised stock indicators.</p>		
Guidepost	c	<p>The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome.</p>	<p>The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome, or a higher level, and takes into account relevant precautionary issues such as the ecological role of the stock with a high degree of certainty.</p>
Met?		Y	N

<p>PI 1.1.2</p>	<p>UoC 3 Scallop: Limit and target reference points are appropriate for the stock</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The target reference points (TRPs) have been set for the two stock indicators for the scallop fishery at a LPUE value of 25.92 kg/dredge/hour and a SSB of 9.99 million tonnes. If either of the two indicators drop below the TRP, additional harvest or effort control measures are implemented.</p> <p>MSC Certification Requirements v1.3 paragraph CB2.3.1.1 state that the target reference point should be “consistent with Bmsy” or “some other measure or surrogate with similar intent or outcome, which maintains a high productivity of the stock and is a level well above the point at which recruitment might be impaired”.</p> <p>The intent of these target reference points is to maintain the stock at high productivity and well above the point at which recruitment might be impaired. The TRPs were based on a period in the historical time trends in the two stock indicators during which the stock indicators have been at high levels and stable, in this case from 2008 to 2015. Such a period of high indicator values could be considered consistent with being at Bmsy, which is a similar approach to that set out in Canada in the Department of Fisheries and Ocean’s (DFO) Precautionary Approach, an example of which is the approach to reference points taken in the Canadian Northern Shrimp (<i>Pandalus borealis</i>) fishery in the Estuary and Gulf of St Lawrence and observed in other MSC-certified fisheries in Canada.</p> <p>These periods of high and stable LPUE were therefore taken to represent a biomass consistent with maximum sustainable yield (MSY). By taking a precautionary approach, the two upper or target reference points were set at 80% of the mean value from these periods of high stable values. The TRP is calculated as 80% of the mean within each time frame but constrained by the minimum value within that time frame, using the following formula:</p> $TRP=(1/100)*(PM+100m-Pm)$ <p>where P is the percentage value (80%), M is the mean value, and m is the minimum value.</p> <p>In other words, the TRP is fixed at 80% of the distance between the minimum value and the mean value within the time frame.</p> <p>The assessment team concluded that values of stock indicators above the target reference point would be consistent with the stock being at Bmsy. The SG80 is met therefore.</p> <p>The values of the stock indicators used as the TRP have not been standardised to take into account explanatory variables such as month, fishing area or vessel, and therefore the setting of the TRPs have not fully taken into account precautionary issues, and cannot be said to have taken into account the ecological role of the stock. SG100 is not met.</p>

PI 1.1.2		UoC 3 Scallop: Limit and target reference points are appropriate for the stock	
d	Guidepost		For key low trophic level stocks, the target reference point takes into account the ecological role of the stock.
	Met?		(Not relevant)
	Justification	Scallop (<i>Pecten maximus</i>) does not meet the criteria for key low trophic level species as set out in paragraph CB2.3.13 of the MSC Certification Requirements v1.3 (MSC 2013). As such, this SI is not scored.	
References		<p>MSC Certification Requirements v1.3. MSC Guidance for the Fisheries Certification Requirements v1.3. SSMO Revised Reference Points. DFO 2009. Fishery decision-making framework incorporating the precautionary approach. Fisheries and Oceans Canada, available online: http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/precaution-eng.htm DFO 2011. Reference points consistent with the precautionary approach for northern shrimp in the Estuary and Gulf of St. Lawrence. DFO Can. Sci. Advis. Sec., Sci. Advis. Rep. 2011/062.</p>	
OVERALL PERFORMANCE INDICATOR SCORE:			80
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 1.1.3 UoC 3 Scallop

PI 1.1.3		UoC 3 Scallop: 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 two stock biomass indicators for the scallop stock are fluctuating around the target reference point. The stock is not therefore considered to be depleted and there is no requirement to score PI 1.1.3.		
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?	N/A	N/A	N/A
	Justification	N/A		

PI 1.1.3		UoC 3 Scallop: Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe		
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	N/A		
References				
OVERALL PERFORMANCE INDICATOR SCORE:				N/A
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.1 UoC 3 Scallop

PI 1.2.1		UoC 3 Scallop: 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

<p>PI 1.2.1</p>	<p>UoC 3 Scallop: There is a robust and precautionary harvest strategy in place</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The overall harvest strategy is underpinned by the Scottish Government’s vision for inshore fisheries set out in the Scottish Inshore Fisheries Strategy, which includes implementing effective assessment methodologies for fishing at Maximum Sustainable Yield (MSY), and the Shetland Islands Regulating Order 2012 granted to the Shetland Shellfish Management Organisation (SSMO).</p> <p>The SSMO has developed a Management Plan, the aim of which is “to continue to maintain sustainable and well managed shellfish fisheries operating within a healthy marine environment.” Two key objectives of the Management Plan that underpin the harvest strategy are that stocks will be maintained at biologically sustainable levels, and that fishing activity will be managed in an environmentally responsible manner. To achieve these two objectives, the Management Plan seeks to:</p> <ul style="list-style-type: none"> - Establish biologically relevant reference points for commercially-exploited stocks - Develop a coherent and effective harvest control strategy which utilises the best available information - Implement effective management measures that are enforceable - Put in place an effective code of conduct for all fishermen - Maintain an effective spatial management plan - Carry out appropriate monitoring <p>Regulations within the Management Plan for the scallop fishery include limited entry licensing, maximum size of vessel unless fishing exclusively for scallops, a maximum length of tow bar, maximum number of dredges and the prohibition of the use of ‘French dredges’, prohibition of fishing outside the hours of 0600 to 2100, prohibition of fishing in closed areas as set out in the SSMO Spatial Management Plan, and a minimum landing size of 100mm carapace width, all of which are designed to maintain the exploitation rate at levels such that the stock does not fall below the reference points. In addition, license holders must comply with all monitoring requirements including submission of SSMO log books, and making the vessel and its fishing gear available for inspection at any time. All vessels must also conform with the SSMO Code of Conduct which includes reporting the loss of any fishing gear on the log sheets, and taking care to return all undersized target and bycatch species to the water quickly and carefully to reduce damage to individuals and maximise survival rates.</p> <p>A key element of the harvest strategy for the scallop fishery is the assessment of stock status against pre-determined reference points, and the implementation of harvest control rules (HCRs) if the reference points are exceeded. The harvest strategy is therefore responsive to the state of the stock and has been specifically designed over many years by the SSMO in line with the Scottish Government’s guidelines to ensure that it maintains the stocks at or above the target reference point. The SG100 is met therefore.</p>

PI 1.2.1		UoC 3 Scallop: 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	The two stock indicators (LPUE and spawning stock biomass) have been at or above the target reference point (TRP) in recent years, and there is no indication of recruitment impairment. All evidence suggests that the harvest strategy is meeting its objectives and the SG80 is met therefore. The performance of the harvest strategy has not been fully evaluated through, for example, a Management Strategy Evaluation (MSE), so SG100 is not met.		
c	Guidepost	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Y		
	Justification	A requirement of the SSMO licence is that catch, fishing effort and LPUE from the commercial fishery are recorded on log books permitting the evaluation of stock status against reference points. At-sea and shore-based monitoring provides information on stock structure such as size distribution and sex ratio. In addition, the NAFC Marine Centre undertake regular fishery-independent scallop stock surveys which provide a direct estimate of stock abundance. Marine Scotland Compliance enforcement activity at both sea and on the quayside, ensures that all fisheries regulations including creel limits and minimum landing size (MLS) are observed. Sufficient monitoring is carried out to determine whether the harvest strategy is working. The SG60 is met.		
d	Guidepost			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			Y

PI 1.2.1		UoC 3 Scallop: There is a robust and precautionary harvest strategy in place		
	Justification	<p>The SSMO Management Plan and the harvest strategy for the scallop fishery are regularly reviewed by the SSMO board which meets 10 times each year. There is also an SSMO Advisory Group, chaired by a marine scientist from the NAFC Marine Centre in Shetland, which meets on a regular basis and which advises the SSMO Board. A key role of the Advisory Group is to undertake regular reviews of all elements of the harvest strategy, and advise the SSMO board if any changes are necessary. The minutes of SSMO board meetings provide examples of revisions of the harvest strategy including recent changes to the reference points and the consequent harvest control rules if those reference points are exceeded, revisions to the maximum number of creels and the requirement to incorporate escape gaps in all but 240 creels to limit effort on the velvet crab fishery. Following agreement at the SSMO board, the SSMO Management Plan is updated regularly. The SSMO Licensing Policy is also regularly updated.</p> <p>The assessment team concluded that the harvest strategy is periodically reviewed and improved as necessary. The SG100 is met.</p>		
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	<p>Marine Scotland 2015. Scottish Inshore Fisheries Strategy. SSMO Management Plan SSMO Licensing Policy SSMO Reference Points and Harvest Control Rules Minutes of the SSMO Board and SSMO Advisory Group meetings</p>			
OVERALL PERFORMANCE INDICATOR SCORE:				95
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.2 UoC 3 Scallop

PI 1.2.2		UoC 3 Scallop: 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	

PI 1.2.2	UoC 3 Scallop: There are well defined and effective harvest control rules in place
Justification	<p>Harvest control rules for the scallop fishery based on the reference points have been agreed and implemented by the SSMO Board following advice from the NAFC Marine Centre and the SSMO Advisory Board. (These HCRs replace those described in the original certification report.) The HCRs are dependent upon whether the indicators are in the green zone (at or above the TRP), in the amber zone (between the TRP and the LRP) or in the red zone (below the LRP).</p> <p>The HCRs for the scallop fishery are as follows:</p> <p>Where the stock is fluctuating at or around the target reference point no management actions are required, unless, LPUE values for two or more of the SSMO areas are red. In which case no new licences would be issued.</p> <p>Where any reference points are amber the following management measures shall be considered using a process of expert judgement based on a prior knowledge of the fishery, and using relevant context from additional data sources that are available, but not necessarily included as reference points:</p> <ul style="list-style-type: none"> No new licences issued No additional effort permitted via succession or through replacement vessels Increased minimum landing size Spatial closures Temporal restrictions e.g. days at sea. <p>The listed management measures will be applied individually, or in combination, depending on the values associated with the amber status, the duration of the amber status, and the rate of change within the reference points.</p> <p>Where one of the reference points is red the following management measures shall be implemented:</p> <ul style="list-style-type: none"> Extending fishery closures, or a complete closure of the fishery Implementation of a research programme and monitoring. <p>Should all limit reference points be reached the fishery will be closed.</p> <p>The assessment team considered that the HCRs are well-defined and will ensure that the exploitation rate is reduced as limit reference points are approached. The SG80 is met.</p>

PI 1.2.2		UoC 3 Scallop: 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 harvest control rules are based upon two stock biomass indicators – LPUE and spawning stock biomass (SSB), so the use of a multiple indicator approach inherently takes uncertainty into account. Local depletion is a concern for sedentary molluscs such as scallops, and management action is triggered if the overall stock indicators are above the TRP, but there are low stock indicators in some regions of the fishery. Spatial variation in scallop abundance and catch rates is therefore taken into account in the HCRs, and spatial closures can be triggered if either of the stock indicators falls below the TRP. In addition, whilst the pre-defined harvest control rules are triggered primarily by changes in the two stock indicators, the HCRs state explicitly that “the management measures shall be considered using a process of expert judgement based on a prior knowledge of the fishery, and using relevant context from additional data sources that are available, but not necessarily included as reference points”, which clearly takes into account that there may be uncertainty surrounding the stock indicators and about the precise management action that is required. The regular scallop surveys may identify significant changes in the stock, e.g. evidence of local depletion, and such information can be taken into account in the HCRs. The SG80 is met.</p> <p>The harvest control rules do not take into account a wide range of uncertainties. For example, the reference points and harvest control rules are based on unstandardised data and have not therefore taken into account explanatory variables such as month, fishing area or vessel. 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

PI 1.2.2		UoC 3 Scallop: There are well defined and effective harvest control rules in place
	Justification	<p>Empirical observations and assessment modelling for this fishery (and also from a wide range of other molluscan fisheries) provide evidence that the tools used to implement the HCRs – reduction in fishing effort, changes in technical conservation measures designed to safeguard the reproductive potential of the stock, spatial and temporal closures of the fishery – are appropriate and effective tools for reducing exploitation rate and increasing stock productivity. The high level of enforcement and good compliance with the spatial and temporal closures and the minimum landing size provide evidence that the tightening of these regulations would be effective in achieving a reduction in exploitation levels.</p> <p>Harvest control rules have not been triggered in recent years for the scallop fishery, so as yet there is no clear evidence that the tools in use are effective in achieving the exploitation levels required under the harvest control rules. The SG100 is met.</p>
	References	<p>SSMO Management Plan SSMO Licensing Policy SSMO Reference Points and Harvest Control Rules Minutes of the SSMO Board and SSMO Advisory Group meetings</p>
OVERALL PERFORMANCE INDICATOR SCORE:		80
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 1.2.3 UoC 3 Scallop

PI 1.2.3		UoC 3 Scallop: 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

<p>PI 1.2.3</p>	<p>UoC 3 Scallop: Relevant information is collected to support the harvest strategy</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>All licence holders must complete log books providing information on landings, discards and fishing effort. For the scallop fishery, the fishing area (5x5 nm SSMO square), hours towed, number of dredges, the species targeted (both king scallops, <i>Pecten maximus</i>, and queen scallops, <i>Aequipecten opercularis</i> are targeted in this fishery), and the numbers or weight of landed catch must be recorded. In addition, the numbers discarded and the reasons for discarding (e.g. undersized, diseased or damaged etc.) and interactions with ETP species must also be recorded. A separate line on the log sheet must be completed for each fishing area (SSMO square).</p> <p>Information on stock structure is obtained through the collection of fishery-dependent data. Scallop size-at-age is obtained by measuring and ageing scallop landings at the local processing factories. Stock structure information including discards is also collected on board vessels. In addition to the sampling on commercial vessels, scallop stock surveys are regularly undertaken by the NAFC Marine Centre which has now established a standardised survey procedure for estimating scallop biomass around Shetland, and the surveys also investigate all factors that may influence the catch rates of scallops. SSMO operates a limited entry licensing fishery and full information is available on the fleet composition. The information available is sufficient to support the harvest strategy, so the SG80 is met.</p> <p>At present VMS is mandatory on larger scallop vessels but as yet there is no requirement for the smaller scallop vessels to have VMS on board. However inshore VMS (iVMS) units were voluntarily fitted to several scallop vessels in 2013, representing the majority of the active fleet, but as yet these VMS systems are not mandatory. A comprehensive range of information is not available. For example, there is no obligation for the smaller vessels to have a VMS or an Automatic Identification System (AIS) on board, and no additional environmental information is collected from the fishery. The SG100 is not met.</p>

PI 1.2.3		UoC 3 Scallop: Relevant information is collected to support the harvest strategy		
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>Mandatory daily log book returns for all vessels provide good information on stock abundance in the form of the LPUE index and the output from the quarterly VPA model provides estimates of spawning stock biomass. These indicators are therefore monitored with sufficient frequency to assess stock status in relation to agreed reference points which form the basis of the harvest control rules. The regular scallop stock surveys provide an additional direct estimate of stock abundance. Stock structure information is available from regular measurements of catches at sea and landings on shore, and from the stock surveys. Fishery removals are closely monitored through log books, landings declarations and sales notes generated through the Registration of Buyers and Sellers (RBS) system. Cross-checking of these three records of fishery removals by Marine Scotland Compliance revealed no anomalies. The SG80 is met.</p> <p>There is not a good understanding of the inherent uncertainties in the data used in the assessments and there is no information on the robustness of the assessment and management to this uncertainty. The SG100 is not met therefore.</p>		
c	Guidepost		There is good information on all other fishery removals from the stock.	
	Met?		Y	

PI 1.2.3	UoC 3 Scallop: Relevant information is collected to support the harvest strategy
<p style="text-align: center;">Justification</p>	<p>Unlicensed fishing vessels are not permitted to catch scallops and sell them for profit, but hobby fishermen do not require a licence to catch fish for personal consumption. The Shellfish (Restrictions on Taking by Unlicensed Fishing Boats) (Scotland) Order 2017 permits hobby fishermen to land a maximum of 6 scallops per day. Whilst neither Marine Scotland nor SSMO require landings returns from these hobby fishermen, and there is no accurate information on the exact number of hobby fishermen, the very low permitted daily catch quota is such that these hobby catches are considered to be very small in relation to the commercial catch.</p> <p>Shetland is geographically discrete from the rest of Scotland and therefore there are no scallops caught in Shetland waters but then landed elsewhere. Scallops could be caught in trawls but any such catches would be covered by the Registration of Buyers and Sellers (RBS) scheme, so the fishery removals would be recorded. There may be some scallops caught outside the 6nm (i.e. outside the UoC), and while these are separated for appropriate chain of custody, it is not possible to discriminate in landings data between scallops caught inside and outside the UoC because log book records may give only SSMO square as capture position and vessels may fish both inside and outside the 6nm on any one fishing trip. However only a very small proportion of the total landings of scallops are caught outside the 6nm, and therefore the total landings data may be a slight overestimate of the landings from within the UoC.</p> <p>In summary, all commercial catches of scallop both inside and outside the UoC should be recorded through the RBS, so there is good information on all fishery removals from the stock. SG80 is met.</p>
<p style="text-align: center;">References</p>	<p>NAFC Marine Centre stock assessments SSMO Management Plan SSMO Licensing Policy SSMO Reference Points and Harvest Control Rules Minutes of the SSMO Board and SSMO Advisory Group meetings The Shellfish (Restrictions on Taking by Unlicensed Fishing Boats) (Scotland) Order 2017 Shelmerdine, R. L. and Leslie, B. 2015. A multidisciplinary approach to collection and use of VMS data from an inshore scallop fishery. NAFC Marine Centre. Report of Fishing Industry Science Alliance (FISA) project 04/12. 6(13). pp. 27. Shelmerdine, R. L. and Mouat, B. (in press). Biomass survey for the Shetland inshore scallop fishery, 2015. <i>NAFC Marine Centre report for the Shetland Shellfish Management Organisation</i> Pp. 21.</p>

PI 1.2.3	UoC 3 Scallop: Relevant information is collected to support the harvest strategy
OVERALL PERFORMANCE INDICATOR SCORE:	80
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 1.2.4 UoC 3 Scallop

PI 1.2.4		UoC 3 Scallop: 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	N
	Justification	<p>There are currently no direct estimates of biomass of scallops in Shetland, and therefore a multiple stock indicator approach to stock assessment is highly appropriate given the nature of the fishery and the biology of the target species. An indicator approach to stock assessment is the standard approach used in other fisheries when no analytical assessment of Bmsy is available. It is highly appropriate therefore that the assessment uses two indicators of stock biomass (LPUE and spawning stock biomass from VPA) to provide a fuller description of stock status, and is currently developing a direct estimate of stock biomass from the stock surveys. Additional stock information (such as geographical variation in the LPUE indicators) may be used with the two stock indicators when considering management actions within the harvest control rules. The SG80 is met therefore.</p> <p>The development of a direct estimate of stock biomass from the stock survey has not been fully developed, and the assessment does not directly take into account the known geographical variation in stock dynamics of scallops. In addition, VPA may not be fully appropriate to a sedentary species such as scallop, so spatial modelling approaches would be more appropriate. SG100 is not met therefore.</p>		
b	Guidepost	The assessment estimates stock status relative to reference points.		
	Met?	Y		
	Justification	The stock assessment evaluates stock status of scallop through the annual update of the two stock indicators of LPUE and spawning stock biomass (SSB) in relation to pre-defined limit and target reference points. The SG60 is met therefore.		

PI 1.2.4		UoC 3 Scallop: There is an adequate assessment of the stock status		
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	<p>The assessment uses two stock biomass indicators to assess the status of the stock, and is developing a third index from the stock surveys. The assessment team concluded that the use of a multiple indicator approach to the assessment of stock status implicitly takes uncertainty into account. Local depletion is a concern for sedentary molluscs such as scallops. Spatial variation in scallop abundance and catch rates is taken into account in the HCRs through the triggering of management action if the stock indicators drop below the LRP even though the overall LPUE remains above the TRP, and by the potential to implement spatial closures if either of the stock indicators falls below the TRP. The harvest control rules are based primarily on the two stock indicators of LPUE and spawning stock biomass (SSB), but also recognise that other data may provide valuable additional information on stock status and may therefore influence the type of management action that is implemented if the stock falls below either the limit or target reference points. For example, the regular scallop surveys may identify significant changes in the stock such as evidence of local depletion, and such information can be taken into account in the HCRs. The SG80 is met.</p> <p>As recommended under PI 1.1.2, the LPUE stock indicator should be standardised for season, fishing area and vessel effects. In addition the assessment team recommends that uncertainty around annual stock indicator values should be evaluated using either standard statistical methods or through computer-intensive methods such as boot-strapping.</p> <p>The assessment does not evaluate stock status relative to reference points in a probabilistic way so the SG100 is not met.</p>		
d	Guidepost			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			N

PI 1.2.4		UoC 3 Scallop: There is an adequate assessment of the stock status		
	Justification	The assessment uses stock biomass indicators of LPUE from commercial data and spawning stock biomass (SSB) from the quarterly VPA, and in future will have a third biomass estimate from the stock survey. However the assessment approach has not been fully tested and shown to be robust through a Management Strategy Evaluation (MSE) or similar approach. Whilst alternative assessment methods have been trialled, there is no evidence that, for example, a spatial modelling approach has been tested, and it cannot be concluded that alternative hypotheses and assessment approaches have been rigorously explored. The SG100 is not met therefore.		
e	Guidepost		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		N	N
	Justification	Whilst elements of the assessment approach, such as the definition of reference points and HCRs may be discussed at the Advisory Group prior to submission to the SSMO Board, it is not clear that the annual assessment of stock status of scallops is subject to peer review. Previously an annual stock assessment report was produced and one such annual report underwent an external peer review. However the annual stock assessment report has not been produced in recent years. In conclusion the assessment team considered that the assessment of stock status is not subject to sufficient internal or external peer review. The SG80 is not met.		
References		NAFC Marine Centre stock assessments SSMO Reference Points and Harvest Control Rules Marine Scotland Science. 2014. Fish and Shellfish Stocks. 2014 edition. Shelmerdine, R. L. and Mouat, B. (in press). Biomass survey for the Shetland inshore scallop fishery, 2015. <i>NAFC Marine Centre report for the Shetland Shellfish Management Organisation Pp. 21.</i>		
OVERALL PERFORMANCE INDICATOR SCORE:				75
CONDITION NUMBER (if relevant):				2

Evaluation Table for PI 2.1.1 (UoC 1 Brown crab and UoC2 Velvet crab)

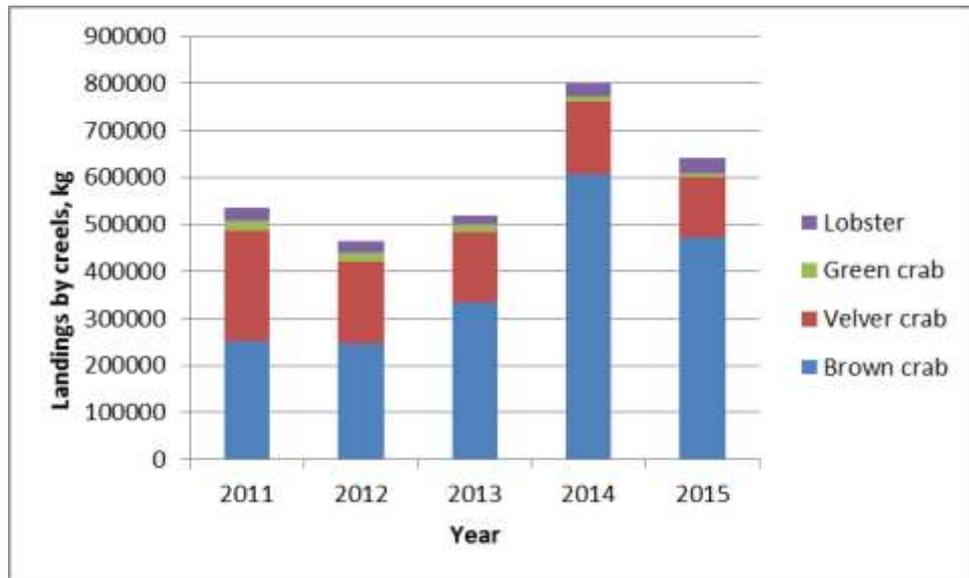
PI 2.1.1		The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Main retained species are likely to be within biologically based limits (if not, go to scoring issue 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

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

Shetland SSMO creelers predominately land velvet and brown crab, with smaller quantities of lobster and green crab (Figure below).

Total landings by Shetland SSMO creel vessels from 2011-2015, presented by species.



Source: NAFC, 2017

Based on the proportion of the catch by weight velvet crab (29,8% by weight averaged across 2011-2015 and 19,9% in 2015) and brown crab (62,9% by weight averaged across 2011-2015 and 73,9% in 2015) are considered main retained species. Lobster volumes are landed in lower proportions (4,5% by weight averaged across 2011-2015 and 5,2% in 2015). Since this average percentage is only just below 5% and this species is particularly valuable compared to brown crab lobster is considered a main retained species in the fishery.

Green crab is landed in lower weight proportions as lobster (2,7% by weight averaged across 2011-2015 and 1,1% in 2015) and is of low value and therefore considered to be a minor retained species.

Both Units of Certification in the creel fishery will have a combination of the following retained species: brown crab, velvet crab, green crab and lobster. Each of these species is treated as an 'element' of the retained species assessment and are analysed below. In each UoC the target species will be analysed under P1 and removed from P2 consideration. A summary table is presented at the end of this justification to clearly show which species are considered as retained for each UoC.

Justification

<p>PI 2.1.1</p>	<p>The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species</p>
	<p>Green crabs are frequently caught in creels, but whether they are landed or discarded is driven by market conditions and availability of other species (Leslie <i>et al</i>, 2010).</p> <p>At a UK level green crabs are sometimes landed for sale at fish markets in France and Portugal and soft crabs (known as 'peelers') are used as fishing bait but although there is some mortality, neither are at a sufficient magnitude to significantly affect green crab populations (Neal & Pizzolla, 2008). Green crabs are abundant, robust and have high survivability, for example a study by Darbyson <i>et al</i> (2009) found a high survivability of green crab out of water in sever summer conditions – this has led to the green crab becoming a successful invasive species in many countries around the world. They reach maturity within 2 years (Crothers, 1967; Moksnes et al., 1998) and a population of newly settled individuals are likely to grow rapidly and become self-perpetuating within a few years. If a population of green crab was completely wiped out by a catastrophic event, for example an oil spill, recovery is likely to be rapid as fecundity is high (up to 185,000 eggs) and reproduction is frequent (Crothers, 1968). There are no concerns over the interaction of the SSMO creel fishery on green crabs. However, at a Shetland level biologically based limits are not known and target reference points have not been defined.</p> <p>Green crab is a minor retained species and therefore the SG80 level is met. The SG100 level is not met since target reference points have not been defined for this species.</p> <p>Brown crab and velvet crab are highly likely to be within biologically based limits, as these stocks are considered to be above the point of serious or irreversible harm as described in Principle 1 under PI 1.1.1. Therefore for these two main retained species SG80 is met. SG100a is not met for both Brown crab and velvet crab since as the rational under PI 1.1.1 shows they are currently not fluctuating around their target reference points. Lobster</p> <p>Stock status for lobster is not re-assessed in this report under P1. In the original assessment report lobster stock status was assessed as a target species and was concluded that at the time of assessment (in 2012) it was likely that the stock was above the point that recruitment would be impaired.</p>

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							
		<p>From the catch data in recent years it can be derived that lobster landings in this fishery are a stable proportion of total catches and that this proportion has increased from 2% in 2005-2009 to 4,5% in 2010-2015. LPUE has increased since 2013. Therefore it can be concluded that there are no signs of overfishing and that the lobster population is stable. Based on this information it is concluded that the lobster stock is highly likely within biologically based limits and lobster meets the SG80 level. Since there is not a high degree of certainty the SG100 level is not met.</p> <p>Bait used</p> <p>Waste from fish processors including spine, head and offcuts are used as bait in this creel fishery and therefore no pressure is placed on any other fish or shellfish resources. As such there is no further need to consider species used as bait in this fishery under the Retained Species component in P2 as per CR 1.3 CB3.5.5.</p> <p>Scoring justification per creel UoC.</p> <p>Each Unit of Certification in the creel fishery will have the following combinations of retained species:</p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="background-color: #4f81bd; color: white;">Target Species</th> <th style="background-color: #4f81bd; color: white;">Retained species (2.1.1 score)</th> </tr> </thead> <tbody> <tr> <td>Velvet crab</td> <td>Main: brown crab (SG80) and lobster (SG80); minor: green crab (SG80)</td> </tr> <tr> <td>Brown crab</td> <td>Main: velvet crab (SG80) and lobster(SG80); minor: green crab (SG80)</td> </tr> </tbody> </table> <p>The table above shows that in both the Brown crab as the Velvet crab UoC the main species reach the SG80 level. Therefore SG80a is met for both UoCs. SG100a is not met for both UoCs since no species reach the SG100 level.</p>		Target Species	Retained species (2.1.1 score)	Velvet crab	Main: brown crab (SG80) and lobster (SG80); minor: green crab (SG80)	Brown crab	Main: velvet crab (SG80) and lobster(SG80); minor: green crab (SG80)
Target Species	Retained species (2.1.1 score)								
Velvet crab	Main: brown crab (SG80) and lobster (SG80); minor: green crab (SG80)								
Brown crab	Main: velvet crab (SG80) and lobster(SG80); minor: green crab (SG80)								
b	Guidepost		Target reference points are defined for retained species.						
	Met?		N						
	Justification	Target reference points have been defined for Brown crab and Velvet crab. They have not been defined for lobster and green crab. Therefore SG100b is not met.							

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		
c	Guidepost	If main retained 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.	If main retained 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?	N/A	N/A	
	Justification	N/A		
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?	N/A		
References		<ul style="list-style-type: none"> » Crothers, J.H., 1968. The biology of the shore crab <i>Carcinus maenas</i> (L.) 2. The life of the adult crab. Field Studies, 2, 579-614. » Crothers, J.H., 1967. The biology of the shore crab <i>Carcinus maenas</i> (L.) 1. The background-anatomy, growth and life history. » Darbyson, E.A., Hanson, J.M., Locke, A. and Willison, J.H.M. 2009. Surv Green Crab (<i>Carcinus maenus</i> L.) Exposed to Simulated Overland and Transport Conditions. Journal of Shellfish Research 28(2):377-382. » Neal, K. and Pizzo Neal, K. and Pizzolla, P. 2008. <i>Carcinus maenas</i>. Common shore crab. Marine Life Information Network: Biology and 		

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	
	Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available from: http://www.marlin.ac.uk/specieshabitats.php?speciesID=2885	
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):		80
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):		80
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.1.2 UoC 1 Brown crab and UoC2 Velvet crab

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>The Shetland Islands Regulated Fishery (Scotland) Order 2009 (Regulating Order) includes green crab, velvet crab, brown crab and lobster. The Strategy is appropriate for the species and the fishery under assessment. The Shetland Shellfish Management Organisation Management Plan 2009-2013 sets out the regulations and controls in place as per the Regulating Order. The Strategy covers a number of cohesive and strategic management measures including:</p> <ul style="list-style-type: none"> • Minimum landings sizes • Real time closed seasons for velvet crabs during moulting periods • Ban on landing claws • Ban on use of crab as bait • Harvest control rules for brown crab, velvet crab and lobster • Limit reference points for brown crab, velvet crab and lobster • Stock assessments for green crab, brown crab, velvet crab and lobster • Control over number of licences issued • Restrictions on vessel size that can operate within the Regulating Order <p>It is concluded that there is a strategy in place for managing all of the main retained species within the creel fishery and thus that SG80a is met. SG100a is not met since the harvest control rules do not include minor retained species like Green crabs.</p>		

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		
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	For the main retained species brown crab, velvet crab and lobster a partial strategy is in place as described under SG100a. Fishing will be reduced when limit reference points are reached. There is an objective basis for confidence that this partial strategy will work and thus SG80b is met. Since the strategy is a partial strategy and not a full strategy SG100b is not met.		
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	There is clear evidence that the measures comprising the partial strategy have been implemented successfully. The SSMO have a Memorandum of Understanding with Marine Scotland: Compliance in relation to monitoring and enforcement of Regulatory Order management measures. Therefore SG80c is met. SG 100c is not met since the strategy is considered a partial strategy and not a full strategy.		
d	Guidepost			There is some evidence that the strategy is achieving its overall objective.
	Met?			N
	Justification	SG 100d is not met since the strategy is considered a partial strategy and not a full strategy.		

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		
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	No sharks are caught in the creels.		
References		<p>Shetland Shellfish Management Organisation (SSMO) 2016. Regulations, Shetland Shellfish Management Organisation [http://www.mrsite.co.uk/usersitesv18/65412.mrsite.com/wwwroot/USERIMAGES/SSMO%20Regulat.pdf]</p> <p>Shetland Shellfish Management Organisation 2016. Reference Points and Harvest Control Strategy.</p>		
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):				80
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):				80
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.1.3 UoC 1 Brown crab and UoC2 Velvet crab

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	Y
	Justification	Accurate and verifiable information is available on the catch of all retained species and the consequences for the status of their stocks. The members of the SSMO complete a detailed logbook which records activity on a daily basis. Logbooks are submitted on a monthly basis to the SSMO and data is entered into a database at the NAFC. Logbooks provide information on the weight of catch and effort including number of creels deployed and location of deployment to a scale of 5 x 5 nautical mile grids. Maps are produced on an annual basis to indicate landings, effort and landings per unit effort for brown crab, velvet crab, green crab and lobster. Therefore it is concluded that SG100a is met.		
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	Information is sufficient to quantitatively estimate outcome status of brown crab, lobster and velvet crab with a high degree of certainty. The NAFC produce annual stock assessments which detail catch curves and length cohort analysis for each species (NAFC Marine Centre, 2016a). Catches of other species retained are recorded. Therefore Information is sufficient to estimate outcome status with respect to biologically based limits and SG80b is met. SG100b is not met since the information on minor retained species is insufficient to quantitatively estimate outcome status with a high degree of certainty.		

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>While green crab is included within the NAFC stock assessments, there is a lack of biological information to assess this species against i.e. catch curves or length cohort analysis. This is mainly due to the lower commercial interest in this species with landings very much dominated by market conditions.</p> <p>Brown crab, velvet crab and lobster are main retained species and for these species information is adequate to support a partial strategy to manage these species. Therefore SG80 is met.</p> <p>Green crab, a minor retained species does not meet the requirements for SG100c. Therefore SG100c is not met.</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	Y

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	
	Justification	<p>NAFC undertakes independent observer trips on board fishing vessels to record the total catch of retained species including velvet crab, brown crab, green crab and lobster. The length, sex and number of individuals of the total catch is recorded for these species. Observer trips are undertaken on board vessels targeting brown crab and velvet crab with lobster and green crab monitored as bycatch within these fisheries. Six trips per quarter are undertaken – three on each of brown crab and velvet crab vessels. This equates to 24 observer trips per year. This monitoring of retained species is conducted in sufficient detail to assess ongoing mortalities to all retained species in the creel fishery. Therefore SG100d is met.</p>
References	» NAFC Marine Centre, 2016a. Landings and LPUE information provided by NAFC to the assessment team during the site visit.	
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):		85
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):		85
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.2.1 UoC 1 Brown crab and UoC2 Velvet crab

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>Under Component 2.2 only bycaught species which are not assessed under retained species Component 2.1 but are discarded with no value to the fishery are considered.</p> <p>Data on bycatches in the creel fishery have been collected during sampling trips undertaken by NAFC staff in 2012 and 2013 (NAFC, 2013). From the collected data it can be derived that in the velvet crab sampling trips only the great spider crab (<i>Hyas araneus</i>) with a percentage of 8,7% contributed to over 5 % of the catch in weight and is to be considered a main bycatch species in the velvet crab UoC. This species is highly likely within biologically based limits since it is very unlikely that the population of this crab is affected by the creel fishery. These crabs are caught alive in the creels and will usually also be released alive and survive. Therefore it is concluded that SG80a is met for the velvet crab UoC.</p> <p>From the data collected during the brown crab sampling trips it can be derived that in the brown crab UoC there were 2 species that were caught in a higher proportion than 5 % and have to be considered main bycatch species. These are common starfish (<i>Asterias rubens</i>, 14.5%) and Atlantic cod (<i>Gadus morhua</i>, 13.3%). Common starfish is a species that is very widespread and occurs in high numbers. After being caught they will be put back to the sea alive. Therefore it is certain that this species is within biologically based limits. Cod caught in the creels will generally be undersized and will probably survive the catch alive (Nøstvik and Pedersen, 1999). Cod is a species that is targeted in several well managed fisheries around Shetland (Scottish North Sea Cod has recently gained MSC certification) and can therefore be considered a species to be within biologically based limits. Considering both starfish and cod it is concluded that SG80a is met for main retained species in the brown crab & velvet crab creel UoCs.</p>		

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		
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.	
	Met?	NA	NA	
	Justification			
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?	NA		
	Justification			
References		<ul style="list-style-type: none"> » NAFC Marine Centre, 2013. The occurrence of bycatch in the Pecten maximus, Cancer pagurus and Necora puber fishery around Shetland. April 2013. » Nøstvik, F. and Pedersen, T., 1999. Catching cod for tagging experiments. Fisheries Research, Volume 42, Number 1, August 1999 , 		

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
	pp. 57-66(10)
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):	80
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):	80
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.2.2 UoC 1 Brown crab and UoC2 Velvet crab

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>The creel fisheries are known for being highly selective with limited discards. Furthermore due to the benign nature of the fish capture process, it is expected that the mortality of fish discarded from traps may be low as the catch is usually alive, with low injury rates (Nøstvik and Pedersen, 1999) and low capture-related stress (Pilling <i>et al.</i> 2001 as cited in Thomsen <i>et al.</i>, 2010). The SSMO Code of Conduct contains obligations to return all undersized target and bycatch species to the water quickly and carefully to reduce damage to individuals and maximise survival rates. All live returns should be placed back in areas of suitable habitat. The catch should not be retained on-board and sorted away from the fishing area.</p> <p>Considering the information presented under PI 2.2.1 about the main retained species great spider crab, common starfish and cod it can be concluded that these species can be considered to be within biologically based limits. The impact of the fishery on these main bycatch species will be negligible or at least very limited. It is therefore concluded that the way the fishery is carried out in itself can be considered a partial strategy to limit bycatch. A further strategy to reduce bycatch is not considered necessary. Therefore SG80b is met. Since there is considered to be a partial strategy and no (full) strategy SG100a is not met.</p>		

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	From the information collected during the bycatch sampling conducted in 2012 and 2013 it can be concluded that there is information directly from the fishery that discard levels are generally low. Besides that there is an objective basis for confidence (from scientific literature) that the catch is usually alive with low injury rates and high survival. Therefore 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 and thus SG80b is met. SG100b is not met since there is a partial strategy and not a full strategy.		
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	The information on bycatch (NAFC, 2013) forms some evidence that the partial strategy is implemented successfully. SG100 is not met since there is a partial strategy and not a full strategy.		
d	Guidepost			There is some evidence that the strategy is achieving its overall objective.
	Met?			N
	Justification	Since there is a partial strategy and not a strategy SG100d is not met.		

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	
References	<ul style="list-style-type: none"> » Nøstvik, F. and Pedersen, T., 1999. Catching cod for tagging experiments. Fisheries Research, Volume 42, Number 1, August 1999 , pp. 57-66(10). » Thomsen, B., Humborstad, O. B. and Furevik, D. M. 2010 Fish Traps: Fish Behavior, Capture Processes, and Conservation Issues. In Behaviour of marine fishes: capture, process and conservation challenges. Published by Wiley-Blackwell. 	
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):		80
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):		80
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.2.3 UoC 1 Brown crab and UoC2 Velvet crab

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 is available on the injury rates and (high) survival of bycatch species in the creel fishery (Pilling <i>et al.</i> 2001 as cited in Thomsen <i>et al.</i> , 2010; Nøstvik and Pedersen, 1999). There is some quantitative information on the amounts of main bycatch species from the bycatch sampling conducted in 2012 and 2013 (NAFC, 2013). Therefore it can be concluded that SG80a is met. SG100a is not met since there is no accurate and verifiable information on the consequences for the status of affected populations.		
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	From information from bycatch sampling trips and general information on survival of bycatch in creel fisheries it can be concluded that the impact of the fishery on bycatch species is negligible or very limited for the species that are caught as bycatch. Therefore it is concluded that this information is sufficient to estimate outcome status with respect to biologically based limits and SG80b is met. SG100b is not met since the information available does not allow for quantitative estimation of outcome status for all bycatch species.		

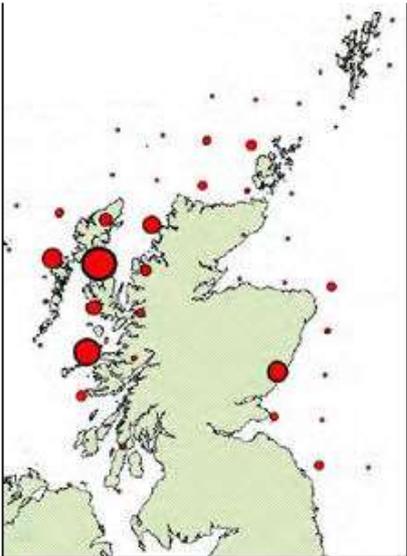
PI 2.2.3		Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch		
c	Guidepost	Information is adequate to support measures to manage bycatch.	Information is adequate to support a partial strategy to manage main bycatch species.	Information is adequate to support a strategy to manage bycatch species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	Y	Y	N
	Justification	From information from bycatch sampling trips and general information on survival of bycatch in creel fisheries it can be concluded that the impact of the fishery on bycatch species is negligible or very limited for the species that are caught as bycatch. The practice of creel fishing itself is therefore considered as a partial strategy to manage impact on main bycatch species. It is therefore concluded that information is adequate to support a partial strategy to manage main bycatch species and thus SG80 is met. SG100 is not met since there is a partial strategy and not a full strategy in place.		
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	The number of creels that are set is continuously monitored and controlled. It is therefore possible to monitor any increase in effort that would increase the impact on the outcome status of main bycatch species. Observer trips are carried out regularly by staff of NAFC to monitor catches and discards of target species. These observers would detect any increase of bycatches of retained species. It is therefore concluded that sufficient data continue to be collected to detect any increase in risk to main bycatch species and SG80d is met. SG100d is not met since detailed bycatch data are not monitored on a regular basis.		
References		» NAFC Marine Centre, 2013. The occurrence of bycatch in the Pecten maximus, Cancer pagurus and Necora puber fishery around Shetland.		

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>April 2013.</p> <ul style="list-style-type: none"> » Nøstvik, F. and Pedersen, T., 1999. Catching cod for tagging experiments. Fisheries Research, Volume 42, Number 1, August 1999 , pp. 57-66(10). » Thomsen, B., Humborstad, O. B. and Furevik, D. M. 2010 Fish Traps: Fish Behavior, Capture Processes, and Conservation Issues. In Behaviour of marine fishes: capture, process and conservation challenges. Published by Wiley-Blackwell. 	
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):		80
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):		80
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.3.1 UoC 1 Brown crab and UoC2 Velvet crab

PI 2.3.1		The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species		
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

<p>PI 2.3.1</p>	<p>The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>ETP species are defined as those that are recognised as such by national legislation and/or binding international agreement (e.g. CITES) to which the jurisdictions controlling the fishery under assessment are party. Species that appear exclusively on non-binding lists such as IUCN Red List, OSPAR or that are only the subject of intergovernmental recognition (such as FAO International Plans of Action) and that are not included under national legislation or binding international agreement are not considered as ETP under MSC protocols.</p> <p>ETP species interaction with pots can occur on land and in the water. On land it has been reported anecdotally that birds (that are protected under the EU Birds Directive and otters (protected under the EU Habitat directive) can become trapped within pots stored on land when all the panels of the pot are closed. This is however very rare and therefore highly unlikely to create unacceptable impacts to these species.</p> <p>When pots are set at sea ETP interactions can occur with the buoy lines from the surface to the pot on the seabed. Reviewed literature mentions potential entanglement on buoy lines recorded for right and humpback whales and leatherback turtles (Thomsen <i>et al.</i>, 2010).</p> <p>Cetacean entanglement</p> <p>Baleen whales are included in group species action plan under the UK Biodiversity Action Plan (Anon, 1999v). All baleen whales are protected under schedule 5 in the Wildlife and Countryside Act 1981, the Wildlife (Northern Ireland) Order 1985. All whales are listed on Annex A of EU Council Regulation 338/97 and therefore treated by the EU as if they are on CITES, Appendix I, thus prohibiting their commercial trade (Anon, 1999v). Whales are listed in Appendix I of CITES, Appendix II of the Bern Convention and Annex IV of the EC Habitats Directive (Anon, 1999). Under these legal arrangements cetaceans are fully protected and it is illegal to catch or kill them.</p> <p>Entanglement of baleen whales in ropes, notably from static fishing gears such as lobster creels and gillnets, is a well-known phenomenon in many parts of the world. Member states of the International Whaling Commission (IWC) regularly report in excess of 200 such entanglements worldwide annually (IWC, 2009).</p>

<p>PI 2.3.1</p>	<p>The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species</p>
	<p>A study by the Sea Mammal Research Unit (SMRU) (Northridge <i>et al.</i>, 2010) investigated entanglement of minke whales <i>Balaenoptera acutorostrata</i> in creel lines in Scotland. The report reviewed available evidence from around the world highlighting that Northern right whales <i>Eubalaena glacialis</i> are subject to critical levels of entanglement mortality in lobster pot and gillnet fisheries in the north-eastern US and Atlantic Canadian waters (Kraus 1990, Caswell <i>et al.</i> 1999). Humpback whales are also known to become entangled not infrequently in both Canadian and US Atlantic waters (Lien 1994, Robbins and Mattila 2001), with between 48 and 65% of whales photographed every year bearing some evidence of previous entanglement.</p> <p>To investigate the entanglement of minke whale in Scotland, the SMRU study undertook full scale necropsies on stranded minke whales, investigated evidence of previous entanglement in live whales based on existing sightings networks and investigated extent of the implicated fisheries around Scotland to identify areas of high risk. It was found that up to 22% of all sighted minke whales had signs of previous rope entanglement. These rates are low compared to the rates reported for humpback whales elsewhere in the world.</p> <p>By cross referencing creel fishing effort data by ICES rectangle and aggregated minke whale sighting to the same ICES rectangle scale, Northridge <i>et al.</i> (2010) mapped the Relative Risk of Entanglement around Scotland (Figure below). Shetland is markedly lower risk than elsewhere, with highest risk found in the Sea of the Hebrides region, the Little Minch and east coast of Scotland off Angus.</p> 

<p>PI 2.3.1</p>	<p>The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species</p>
	<p>No evidence collated or comments from stakeholders during the assessment team’s Shetland site visit pointed to any concern with entanglement of minke whales. The SMRU report found fewer than expected strandings of minke whale to occur in Shetland which itself constitutes 12.7% of the Scottish coastline.</p> <p>The SSMO Code of Conduct and the SSMO log sheets require that fishermen record and report all ETP interactions to the SSMO. Since 2013 all logsheet data are based on daily data and all fishermen sent their logsheets to SSMO on a regular basis. Since 2012 one interaction of the creel fishery with an ETP species was recorded and reported. This concerned an entanglement of a Minke whale in a creel line.</p> <p>Turtle entanglement</p> <p>In 2000, a 7ft leatherback turtle became entangled in creel ropes off Shetland, with the rope found tangled round its flippers and neck (BBC News, 2000). The turtle died despite being rescued.</p> <p>Sewell and Hiscock (2005) undertook a review of marine turtle bycatch in the UK and Ireland and found that the leather back is the only turtle species that could be significantly affected. Dayton <i>et al.</i> (1995) speculate that leather back turtles may mistake marker buoys for jellyfish and become entangled in buoy lines.</p> <p>Penrose and Gander (2007) report on turtle sightings, strandings and bycatch incidents around the UK and Ireland in 2006. In total five leatherback turtles were reported as by caught during 2006. Four out of five were tangled in creel ropes and one in a salmon drift net fishery. Four out of five were released alive and well, with one individual found dead entangled in a lobster pot buoy rope.</p> <p>The leatherback sightings indicate a higher occurrence along the west coast of the UK and south coast of Ireland.</p>

<p>PI 2.3.1</p>	<p>The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species</p>
	<p>Otter interactions</p> <p>Eurasian otters (<i>Lutra lutra</i>) can be attracted by fishes caught in creels or the bait within creels, and they are sometimes drowned by trying to get access to these fish (Reuther, 2002).</p> <p>The Scottish Natural Heritage national survey of otter distribution in 2003-04 (Strachan, 2007) reported that incidents with otters occurred within the Yell Sound SAC. This was based on anecdotal evidence that otters had been drowned in a number of the pots as accidental by-catch. The extent of this problem is unknown but one inshore pot was reported as killing four otters in as many months, until the pot was relocated to deeper water (Strachan, 2007).</p> <p>Twelves (1983) investigated mortality of otters in creels around South Uist. This study found most otters were drowned foraging in depth of 2-5m of water. Furthermore crab creels were considered less of a threat as they are usually set on sandy bottom in deeper water further offshore rather than the favoured otter foraging areas. Consultation with fishermen and nature conservation bodies during the site visit did not raise any concern for incidental capture of otters, other than occasional entrapment in pots stored on land.</p> <p>From the information on interactions of the creel fishery with ETP species from both ETP logbook recordings and independent verifications through surveys carried out by NAFC it can be concluded that interactions with otters and turtles are virtually absent. Interaction with whales are very rare as well and in the last 5 years 1 incident occurred. Based on the rarity of interactions with ETP species it is concluded that there is a high degree of certainty that the effects of the fishery are negligible and therefore within limits of national and international requirements for protection of ETP species and thus SG100a is met.</p>

PI 2.3.1		The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species		
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	Considering the fact that the interactions with ETP species have been monitored and recorded in the SSMO database in the last 5 years and that only 1 interaction has occurred there is a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species. SG100b is therefore met.		
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.
	Met?		Y	Y
	Justification	The creel fishery does not interact with the food sources of ETP species in any way. Other possible indirect effects have been considered but not been identified. It is concluded that there is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species and thus SG100c is met.		
References		<ul style="list-style-type: none"> » Dayton, P.K., Thrush, S.F., Agardy, M.T. and Hofman R.J. 1995. Environmental effects of marine fishing. Aquatic conservation: Mar. Freshw. Ecosys. 5: 205-232. » Northridge, S., Cargill, A., Coram, A., Mandleberg, L., Calderan, S. and Reid, B. 2010. Entanglement of minke whales in Scottish waters; an investigation into occurrence, causes and mitigation. By Sea Mammal Research Unit for Scottish Government. » Penrose R.S.& Gander L.R. 2007. UK & Republic of Ireland Marine Turtle Strandings & Sightings Annual Report 2006 » Reid, J.B., Evans, P.G.H. and Northridge, S.P. 2003. Atlas of Cetacean Distribution in North-West European Waters. Joint Nature Conservation Committee. » Reuther, C. 2002. Otters and fyke nets -some aspects which need further attention. IUCN Otter Spec. Group Bull. 19(1). » Sewell, J. and Hiscock, K. 2005. Effects of fishing within UK European 		

<p>PI 2.3.1</p>	<p>The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species</p>	
	<p>Marine Sites: guidance for nature conservation agencies> Report to Countryside Council for Wales, English Nature and Scottish Natural Heritage from the marine Biological Association, Plymouth: CCW contract FC 73-03-214A.</p> <p>» Thomsen, B., Humborstad, O. B. and Furevik, D. M. 2010 Fish Traps: Fish Behavior, Capture Processes, and Conservation Issues. In Behaviour of marine fishes: capture, process and conservation challenges. Published by Wiley-Blackwell.</p> <p>» Twelves, J., 1983. Otter Lutra lutra mortality in lobster creels. Journal of Zoology, London, 201, 585- 588.</p>	
<p>OVERALL PERFORMANCE INDICATOR SCORE (UoC1):</p>		<p>100</p>
<p>OVERALL PERFORMANCE INDICATOR SCORE (UoC2):</p>		<p>100</p>
<p>CONDITION NUMBER (if relevant):</p>		

Evaluation Table for PI 2.3.2 UoC 1 Brown crab and UoC2 Velvet crab

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	Y
	Justification	SSMO has produced an ‘SSMO Cetacean Entanglement Prevention Guide’. This provides a six-point list of measures to reduce the risk of cetacean entanglement, and provides advice in the actual event of cetacean entanglement. This material has been distributed to all SSMO licensees. In order to minimize mortality. SSMO has also distributed wheelhouse cards and obliges all licensees to report ETP interactions. SSMO code of conduct further obliges all licensees to return ETP species quickly to the water to maximise chances of survival. The Code of Conduct also states that all fishermen should consult and adhere to the actions set out in the wheelhouse cards. It is concluded that the actions taken by SSMO form a strategy for managing the fishery’s impact on ETP species, including measures to minimise mortality, which is designed to achieve national and international requirements for the protection of ETP species and thus SG100a is met.		

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. 		
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	Given the fact that interactions with ETP species have to be reported to SSMO and that one 1 interactions has been reported in the last 5 years it is concluded that the information in the SSMO database is an objective basis for confidence that the strategy will work, based on information directly about the fishery and/or the species involved. Therefore SG80b is met. SG100b is also met since quantitative analysis of the data shows that there has been only one interaction.		
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	N
	Justification	The fact that only one incident has been reported in the last 5 years forms evidence that the strategy is being implemented successfully. Thus SG80c is met. SG100c is not met since it can not be concluded with certainty that all interactions have been reported.		
d	Guidepost			There is evidence that the strategy is achieving its objective.
	Met?			Y

<p>PI 2.3.2</p>	<p>The fishery has in place precautionary management strategies designed to:</p> <ul style="list-style-type: none"> • Meet national and international requirements; • Ensure the fishery does not pose a risk of serious harm to ETP species; • Ensure the fishery does not hinder recovery of ETP species; and • Minimise mortality of ETP species. 	
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The fact that only one incident has been reported in the last 5 years forms evidence that the strategy is achieving its objective. Therefore SG100d is met.</p>	
<p>References</p>	<p>SSMO, 2013. Cetacean Entanglement Prevention Guide'</p>	
<p>OVERALL PERFORMANCE INDICATOR SCORE (UoC1):</p>		<p>95</p>
<p>OVERALL PERFORMANCE INDICATOR SCORE (UoC2):</p>		<p>95</p>
<p>CONDITION NUMBER (if relevant):</p>		<p></p>

Evaluation Table for PI 2.3.3 UoC 1 Brown crab and UoC2 Velvet crab

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	N
	Justification	<p>The SSMO Code of Conduct and the SSMO log sheets require that fishermen record and report all ETP and habitat interactions to the SSMO. Since 2013 all logsheet data are based on daily data and all fishermen sent their logsheets to SSMO on a regular basis. The data from the logsheets on landings, ETP and habitat interactions are fed into the updated SSMO database. Although this database is still being further developed so that it also includes biological data from observer trips and surveys it is already fully functional concerning landing data and ETP and habitat interaction data. The SSMO has implemented policies and procedures for dealing with reports and also for reviewing these data on ETP species and habitats on a regular basis via the Inshore Co-ordinator and SSMO Advisory Group. The data collection through logsheets and the collation of these data through the database proves that relevant information is collected to support the management of fishery impacts on ETP species. It is therefore concluded that sufficient information is available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species and thus SG80a is met. SG100a is not met since the available information is dependent on the willingness of fishermen to report all interactions and can not be independently confirmed. Therefore there is not a high degree of certainty that the information is complete.</p>		

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. 		
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	As described under SG80a the information in SSMO database is sufficient to determine that interactions of the the creel fishery with ETP species are very rare and thus that it can not be a threat to protection and recovery of the ETP species. Therefore SG80b is met. SG100b is not met since the information on interactions is provided by fishermen and can not be verified independently.		
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 that is collected in the SSMO database is considered sufficient to measure trends and support a full strategy to manage impacts on ETP species and thus SG80c is met. SG100c is not met since the information on interactions is so limited that it can not be used to minimize mortality and injury of ETP species.		
References		» SSMO, 2015. Code of Conduct, updated 21 August 2015		
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):				80
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):				80
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.4.1 UoC 1 Brown crab and UoC2 Velvet crab

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	P
	Justification	<p>In general, pots are often advocated on an environmental basis for having a lesser impact on habitat than mobile fishing gear such as trawls and dredges (Rogers <i>et al.</i>, 1998; Hamilton, 2000; Barnette, 2001). Static gears in general have smaller and more localised impacts.</p> <p>The distribution of lobster, brown crab and velvet crab potting is well understood based on fishing effort data collected and mapped by the NAFC ; consultation undertaken with Shetland fishermen to map important fishing grounds; and correlation with habitat data as part of the Shetland Islands’ Marine Spatial Plan Atlas (NAFC Marine Centre, 2016). Habitat seabed types, biotopes and sensitive habitats have also been mapped as part of the Shetland Islands’ Marine Spatial Plan. The maps in the Spatial Plan allow a clear understanding of the location of fishing effort and the distribution of habitats including location of sensitive species.</p> <p>Eno <i>et al.</i> (2001) examined the effects of fishing with crustacean pots and creels on benthic species in Great Britain through qualitative and quantitative experiments. This study examined the effects of lobster and crab pots being hauled from rocky substrates in southern England, and found that the habitats and their communities appeared relatively unaffected by potting. The slow-growing, long-lived, pink sea fan <i>Eunicella verrucosa</i> were frequently observed to flex under the weight of pots as they passed and then returned back to an upright position. Quantitative studies, undertaken in south England and west Wales, were based on surveys carried out along transect lines before and after a month of pot fishing for crabs and lobsters. The results suggest that four weeks of fairly intense fishing did not have immediate detrimental effects on the abundance of the species selected for study, although some individual rosette coral colonies <i>Pentapora foliacea</i> were damaged.</p>		

<p>PI 2.4.1</p>	<p>The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function</p>
	<p>The observations of pots and creels being dropped and hauled show clearly that these fisheries have little or no immediate effect on several species that had previously been thought to be sensitive. Other than damage sustained by large individual ross corals <i>P. foliacea</i>, which are not known to be present in Shetland waters, Eno <i>et al.</i> (2001) found the short-term effects of crab and lobster potting on sensitive benthic species in west Wales and Lyme Bay not to be detrimental. Indeed, apparent increases in the abundance of some species were reported in experimental plots compared to control plots. As many of these species are unable to settle and grow quickly enough to explain these short-term changes, the apparent increases more likely reflect an artefact of the potting activities.</p> <p>The potential physical impact of lost potting gear on habitat structure is also considered within the PI. The level of this impact depends upon the type of habitat and the occurrence of these habitats relative to the distribution of pots (Guillory, 2001).</p> <p>The Eno <i>et al.</i> (2001) report provides qualitative and quantitative evidence that the creel fisheries are highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm. While these data collected in the UK are undoubtedly of relevance to the fishery under assessment, it is noted that direct research of the Shetland creel fishery's impact on habitats has not been undertaken. It is therefore felt that a score somewhere between SG80 and SG100 is appropriate, to reflect the low risk known to be posed by the fishery. A score of 90 is therefore awarded.</p>
<p>References</p>	<ul style="list-style-type: none"> » Barnette, M.C. 2001. A review of fishing gear utilized within the Southeast Region and their potential impacts on essential fish habitat. NOAA Technical Memorandum NMFSSSEFSC-449. » Eno N.C., MacDonald D.S. & Amos S.C. (1996). A study on the effects of fish (crustacea/mollusc) traps on benthic habitats and species. Report to the European Commission. » Eno, N. C., MacDonald, D. S., Kinnear, J. A. M., Amos, C. S., Chapman, C. J., Clark, R. A., Bunker, F. St P. D., and Munro, C. 2001. Effects of crustacean traps on benthic fauna. – ICES Journal of Marine Science, 58: 11–20. » Guillory, V. 2001. A review of incidental fishing mortalities of blue crabs. In V. Guillory, H.M. Perry & S. Vanderkooy, eds. Proceedings of the Blue Crab Mortality Symposium, pp. 28–41. Gulf States Marine Fisheries Commission. » Hamilton, A.N., Jr. 2000. Gear impacts on essential fish habitat in the Southeastern region. United States Department of Commerce, Southeast Fisheries Science Center, Pascagoula Facility.

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	
	» Rogers, S.I., Kaiser, M.J. & Jennings, S. 1998. Ecosystem effects of demersal gear: a European perspective, In E.M. Dorsey & J. Pederson, eds. Effect of Fishing Gear on the Sea Floor of New England, pp. 68–78. Conservation Law Foundation, Boston, MA, USA. » NAFC Marine Centre, 2016b. A Marine Spatial Plan for the Shetland Islands. Fourth edition.	
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):		90
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):		90
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.4.2 UoC 1 Brown crab and UoC2 Velvet crab

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	N

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		
	Justification	<p>There are two overarching strategies in place with the framework to manage habitat interactions of the creel fisheries: the Regulating Order and the Marine Spatial Plan for the Shetland Islands.</p> <p>The Shetland Islands Regulated Fishery (Scotland) Order 1999 (Scottish Statutory Instrument 1999 No. 194) grants the SSMO the legal right to manage the commercial fisheries for shellfish including lobster and crab. The Regulating Order gives the SSMO powers to impose restrictions and regulations, to issue licences and to impose tolls for vessels operating within Shetland’s six mile limit. Licences are valid for one year and each vessel must reapply annually to renew their licence. The application includes declaration of the number of pots fished per vessel, although the vessel is not held to operating with this number of pots. The SSMO have the ability to control the number of vessels operating within the six mile limit and therefore have jurisdiction over the overall effort of creel vessels.</p> <p>The Shetland Islands’ Marine Spatial Plan (MSP) (NAFC Marine Centre, 2010) establishes an overarching policy framework to guide marine activities and brings together authoritative spatial data on the marine and coastal environment. The MSP includes policy framework for commercial fisheries and important species and habitats. Policy MSP F2: Local Management of Sustainable Fisheries states that “Local fisheries management will develop appropriate measures so that fishing is not carried out in ways that damage important habitats and species”. Under this policy framework a series of closed areas have been established which are closed to scallop dredging. While this is not applicable to the creel fishery, it provides evidence that the framework to deliver management for habitat interactions exists, is working and is being implemented successfully.</p> <p>No specific management strategy has been established due to the low risk posed by the fishery. A strategy to achieve the Habitat Outcome 80 level is not considered necessary. The use of creels as a fishing method in itself could also be considered a partial strategy to avoid habitat impacts. Therefore SG80 is met.</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

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		
	Justification	The use of creels as a fishing method in itself can be considered an effective partial strategy to avoid habitat impacts (for instance compared with the use of trawls to catch the same species). Therefore SG80b is met. SG100b is not met since the use of creels is considered a partial strategy and not a full strategy.		
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	Information from scientific research forms evidence that the impacts on bottom habitats are very limited and thus that the partial strategy is implemented successfully. Thus SG80c is met. SG100b is not met since the use of creels is considered a partial strategy and not a full strategy.		
d	Guidepost			There is some evidence that the strategy is achieving its objective.
	Met?			N
	Justification	SG100b is not met since the use of creels is considered a partial strategy and not a full strategy.		
References		<ul style="list-style-type: none"> » Eno N.C., MacDonald D.S. & Amos S.C. (1996). A study on the effects of fish (crustacea/mollusc) traps on benthic habitats and species. Report to the European Commission. » Eno, N. C., MacDonald, D. S., Kinnear, J. A. M., Amos, C. S., Chapman, C. J., Clark, R. A., Bunker, F. St P. D., and Munro, C. 2001. Effects of crustacean traps on benthic fauna. – ICES Journal of Marine Science, 58: 11–20. » The Shetland Islands Regulated Fishery (Scotland) Order 1999: Scottish Statutory Instrument 1999 No. 194 » NAFC Marine Centre, 2016b. A Marine Spatial Plan for the Shetland Islands. Fourth edition..... 		
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):				80

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
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):	80
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.4.3 UoC 1 Brown crab and UoC2 Velvet crab

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	The distribution of habitat is mapped and presented within the Marine Spatial Plan Marine Atlas (NAFC Marine Centre, 2016b) which is used to guide planning and activities. Changes in habitat distributions over time are measured. The NAFC have a detailed research plan which includes a programme for surveying sensitive habitats. It is concluded that distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types. Therefore SG100a is met.		
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

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		
	Justification	<p>The nature of the impact of the creel fishery on bottom habitats can be inferred from scientific literature (Eno <i>et al.</i>, 1996 & 2005). The distribution of the creel fishery around Shetland is well known from logbook data and these data provide reliable information on the spatial extent of interaction, and the timing and location of use of the fishing gear, and thus SG80b is met.</p> <p>The physical impacts of the gear on the habitat types within Shetland waters have not been quantified fully for the fishery under assessment and therefore SG100b is not met.</p>		
c	Guidepost		Sufficient data continue to be collected to detect any increase in risk to habitat (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	Changes in habitat distributions over time are measured.
	Met?		Y	Y
	Justification	<p>SSMO logbooks require the number of pots deployed to be logged and location of deployment to a 5x5 nautical mile scale. The NAFC map these effort data annually per species. These maps are used by the SSMO when considering new applications for licences. It is concluded that sufficient data continue to be collected to detect any increase in risk to habitat and thus SG80c is met. Changes in habitat distribution are monitored by NAFC and the Marine Spatial Plan and the map it contains are updated regularly. It is therefore concluded that SG100c is met as well.</p>		
References		<p>» Eno N.C., MacDonald D.S. & Amos S.C. (1996). A study on the effects of fish (crustacea/mollusc) traps on benthic habitats and species. Report to the European Commission.</p> <p>» Eno, N. C., MacDonald, D. S., Kinneer, J. A. M., Amos, C. S., Chapman, C. J., Clark, R. A., Bunker, F. St P. D., and Munro, C. 2001. Effects of crustacean traps on benthic fauna. – ICES Journal of Marine Science, 58: 11–20.</p>		
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):				95

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
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):	95
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.5.1 UoC 1 Brown crab and UoC2 Velvet crab

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

<p>PI 2.5.1</p>	<p>The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>Fishing with pots or creels is generally regarded as a very environmentally friendly technique, with few undesirable side effects when catching target species. Potting is often encouraged as an alternative fishing method to mitigate ecosystem impacts of other fishing gear, particularly for habitats interactions (replacing demersal trawl for example) and ETP species (replacing set nets for example).</p> <p>Predator-prey relationships for the target and retained species associated with this fishery (lobster, brown crab, velvet crab and green crab) are well understood. Mackinson and Daskalov (2007) provide a detailed characterisation of the North Sea ecosystem and use the Ecopath model to explore ecosystem structure and biomass flows, food web interactions, and sensitivities. Lobsters and crabs provide important food sources when in their planktonic and benthic life stages. Mackinson and Daskalov (2007) document large crabs as providing approximately 10-20% of the diets of small sharks, rays, saithe and Norway pout.</p> <p>The Marine Life Information Network (MarLin) assesses brown crab to have intermediate intolerance, high recoverability and low sensitivity in relation to extraction of this species. This is predominately due to the MLS regulation together with the understanding that berried females are less likely to feed and therefore less likely to be caught by baited pots (Howard, 1982, as cited in Neal and Wilson, 2008). The same sensitivity assessment is provided for green crabs, but lobster and velvet crabs have not been assessed to this detail.</p> <p>It is considered highly unlikely that a trophic cascade would occur due to current levels of removal within the creel fishery. Severely truncated size compositions and gross changes in the species diversity are considered highly unlikely to occur, as are any changes in the genetic diversity of the species as a result of current fishing patterns.</p> <p>Therefore based on both qualitative and some quantitative (Mackinson and Daskalov, 2007) understanding of the role and function of lobster and crabs within the ecosystem, it is highly unlikely that key elements of the ecosystem would be disrupted to a point of serious or irreversible harm and thus SG80a is met. Part of the evidence stems from a rather generalistic ecosystem model of the North Sea ecosystem and not from specific ecosystem studies conducted in Shetland waters. Therefore it is concluded that there is some evidence and not full evidence that it is highly unlikely that key elements of the ecosystem would be disrupted to a point of serious or irreversible harm. Therefore SG100a is partially met and a score of 90 is awarded.</p>
<p>References</p>	

PI 2.5.1	The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function	
	<ul style="list-style-type: none"> » ICES, 2015. Interim report of the Working Group on the Biology and Life History of Crabs (WGCRAB). ICES CM 2015/SSGEPD:11 » Mackinson and Daskalov, 2007. An ecosystem model of the North Sea to support an ecosystem approach to fisheries management: description and parameterisation. For CEFAS Science Series Technical Report no.142 » Neal and Wilson 2008. <i>Cancer pagurus</i>. Edible crab. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. 	
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):		90
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):		90
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.5.2 UoC 1 Brown crab and UoC2 Velvet crab

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	Y
	Justification	<p>The potential impact of the SSMO creel fishery on the ecosystem structure and function is managed at an international scale under the EU framework, a national scale under UK and Scottish fisheries regulations and at a local scale by the SSMO.</p> <p>The Shetland Regulating Order and the Marine Spatial Plan for the Shetland Islands have been discussed throughout the justifications tables and are applicable for management of the overall ecosystem structure and function. In particular the licensing system of the Regulating Order controls the number of vessels in operation, ensuring no latent capacity and a clear understanding of the level and location of effort. Minimum Landing Sizes are set at an EU basis for brown crab: 140mm and lobster: 87mm. A higher MLS is in force within the Shetland Regulating Order for lobster set at 90mm and a MLS for velvet crabs is set at 70mm. Real time seasonal closures are also instigated for velvet crab to protect moulting season.</p> <p>The SSMO members operate to a Code of Conduct which includes details of operational best practice including marine litter and minimising carbon footprint where possible. The measures that are implemented to safeguard the stocks of target species and to manage ecosystem impacts together can be considered as a strategy. This strategy is laid down in plans like the SSMO management plan and the Marine Spatial plan. Thus it can be concluded that a strategy that consists of a plan is in place and thus SG100a is met.</p>		

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		
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.	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. 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.
	Met?	Y	Y	N
	Justification	<p>The strategy that is laid down in the SSMO management plan, SSMO Code of Conduct and in the Marine Spatial plan is based on scientific information which is amongst others collected by NAFC. The SSMO Code of Conduct states that <i>“conservation and management decisions should be taken based on the best available scientific evidence, also taking into account traditional and local knowledge of the resources and their habitat, as well as relevant environmental, economic, and social factors”</i>. It can therefore be concluded that the strategy takes into account available information.</p> <p>The use of creels in it self can be considered as a strategy to minimize ecosystem impacts since compared to other fishing techniques like trawling or dredging creel fishing has very limited ecosystem impacts like disturbance of bottom habitats or large removals of retained or bycatch species. Besides this the impact of the creel fishery is also limited by effort limitations, minimum landing sizes (MLS) and high survival of discarded species. It can therefore be concluded that the strategy is expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance and thus SG80b is met. SG100b is not met since it can not be concluded that the plan is based on well-understood functional relationships between the fishery and the Components and elements of the ecosystem.</p>		

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		
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	The MLS together with the high survival rate of returned/ discarded catch ensures that the strategy is likely to work. This conclusion is mainly based on general experience and scientific literature concerning similar fisheries and therefore SG80 is met.		
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	N
	Justification	The main measures that have been implemented are the limitation of the total number of licenses, the maximum number of creel and the minimum landing sizes for the different target species. From discussions with SSMO personel and Marine Scotland inspector the team learned that measures are generally well respected by the fishermen and there is no indication of significant non-compliance. This information forms some evidence that the measures comprising the partial strategy are being implemented successfully and therefore SG80d is met.		
References	» NAFC Marine Centre, 2016b. A Marine Spatial Plan for the Shetland Islands Part Two Marine atlas 4th Edition.			
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):				90
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):				90
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.5.3 UoC 1 Brown crab and UoC2 Velvet crab

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	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. Sections 2.1.3, 2.2.3, 2.3.3 and 2.4.3 outline the array of data that are collected in relation to the fishery. The range of data is sufficient to allow some of the main impacts on these components to be inferred directly. Information is adequate to <u>broadly understand</u> the functions of the key elements of the ecosystem. Key elements include the trophic structure of the North Sea and Shetland inshore waters such as key prey, predators and competitors; community composition, productivity patterns and characteristics of biodiversity.		
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

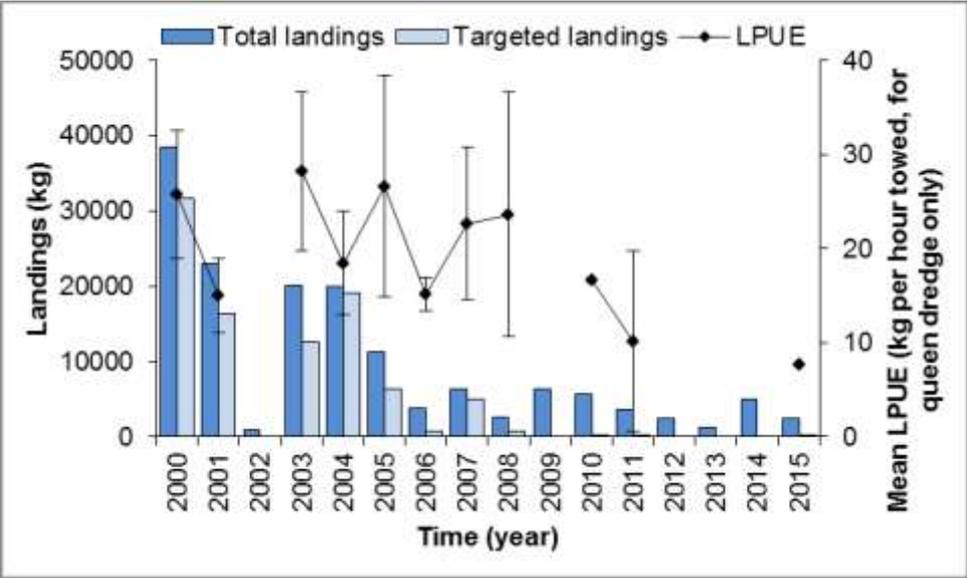
PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem	
	Justification	Mackinson (2001) describes the construction and calibration of an ecosystem model of the North Sea using the Ecopath with Ecosim approach. Models of this type readily lend themselves to answering simple, ecosystem wide questions about the dynamics and the response of the ecosystem to anthropogenic changes. Thus, they can help design policies aimed at implementing ecosystem management principles, and can provide testable insights into changes that have occurred in the ecosystem over time. Main impacts of the fishery on these key ecosystem elements can be inferred from existing information like landing and and bycats data and impacts on target species have been investigated in detail. Therefore it is concluded that SG80b is met. It can however not be concluded that all main interactions between the fishery and ecosystem elements have been investigated in detail and thus SG100b is not met.	
c	Guidepost		The main functions of the Components (i.e., target, Bycatch, Retained and ETP species and Habitats) in the ecosystem are known.
	Met?		Y
	Justification	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.	
d	Guidepost		The main functions of the Components (i.e. target, Bycatch, Retained and ETP species and Habitats) in the ecosystem are <u>known</u> . It is known that brown crab, velvet crab and lobster mainly act as epibenthic predators feeding on a variety of live molluscs and crustaceans, as well as carrion and that green crab are omnivores consuming plants, algae, molluscs, arthropods (including their own species), annelids and carrion. Direct and indirect impacts of the fishery on retained species, bycatch species, ETP species and seabed habitats are identified and the main functions of the Components in the ecosystem are understood. Therefore SG110c is met. .
	Met?		Y
	Justification		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.
	Met?		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
	Met?		N

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem	
	Justification	Information is available on the impacts of the fishery on Components (i.e. Retained species, Bycatch specie, ETP species and Habitats) from scientific reseach conducted by NAFC to allow the main consequences for the ecosystem to be inferred. Therefore SG80c is met. SG100c is not met since there is no information on the impact on all the different elements of the ecosystem.	
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
	Justification	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). Data is routinely collected on an ongoing basis to allow for the detection of any change or increase in risk level to the main ecosystem components. Key data collected include landings data for all species, spatial data in relation to fishing effort (via SSMO logbooks and NAFC maps) and data in relation to fishing effort (LPUE). Information is sufficient to support the development of strategies to manage ecosystem impacts and therefore SG100d is met.	
References		<ul style="list-style-type: none"> » FRS: Fisheries Research Services. 2006. Impacts of Climate and Fishing on the North Sea Food Web » Mackinson, S. 2001. Representing trophic interactions in the North Sea in the 1880s, using the Ecopath mass-balance approach. Fisheries Centre Research Report 9:44: 35-98. » Mackinson, S. & G. Daskalov. 2007. An ecosystem model of the North Sea for use in fisheries management and ecological research: description and parameterisation. 195 pp. » Walday M. and Kroglund T. 2002. Europe's biodiversity, biogeographical regions and seas around Europe: The North Sea. For the European Environment Agency. Available at: » http://www.eea.europa.eu/publications/report_2002_0524_154909/regional-seas-around-europe/page131.html/#1.1.2..... 	

PI 2.5.3	There is adequate knowledge of the impacts of the fishery on the ecosystem
OVERALL PERFORMANCE INDICATOR SCORE (UoC1):	90
OVERALL PERFORMANCE INDICATOR SCORE (UoC2):	90
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.1.1 Scallop dredge fishery (UoC3)

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

<p>PI 2.1.1</p>	<p>The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species</p>																																																																				
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The only retained species associated with the king scallop fishery is the queen scallop, which is landed in very small proportions and is therefore a minor retained species. On average from 2005- 2015 landings of queen scallop (taken by the king scallop targeted fishery) accounted for 1,14 % of the total landings of scallops in weight. This indicates that queen scallop is a minor retained species and thus there are no main retained species and SG60 and SG80 are met for all scoring issues.</p> <p>The total landings of queens scallops, by SSMO dredge vessels targeting king scallops within Shetland inshore waters (out to 6 nautical miles) are presented in the figure below. This figure also represents the landings in the targeted queen fishery and the LPUE.</p> <p>These data also highlight the sporadic nature of the Shetland queen scallop fishery which is very much influenced by market conditions. There was a very limited targeted queen fishery since 2008. Observations on LPUE from the targeted fishery in previous years have shown a high degree of variability, related to the quantity of data available. The data at present are not sufficient in order to carry out any analytical assessment on the queen scallop stock (Leslie <i>et al.</i>, 2010). Since target reference points have not been defined for the queen scallop stock it can not be concluded that this retained species is fluctuating around its target reference points and therefore SG100 is not met.</p> <p>Queen scallop landings (kg) and mean LPUE (catch per hour per dredge) from SSMO logbook data with 95% confidence intervals.</p>  <table border="1"> <caption>Queen scallop landings (kg) and mean LPUE (kg per hour per dredge) from SSMO logbook data with 95% confidence intervals.</caption> <thead> <tr> <th>Year</th> <th>Total landings (kg)</th> <th>Targeted landings (kg)</th> <th>Mean LPUE (kg per hour per dredge)</th> </tr> </thead> <tbody> <tr><td>2000</td><td>38000</td><td>32000</td><td>32</td></tr> <tr><td>2001</td><td>23000</td><td>16000</td><td>18</td></tr> <tr><td>2002</td><td>1000</td><td>0</td><td>0</td></tr> <tr><td>2003</td><td>20000</td><td>12000</td><td>35</td></tr> <tr><td>2004</td><td>20000</td><td>18000</td><td>23</td></tr> <tr><td>2005</td><td>11000</td><td>6000</td><td>33</td></tr> <tr><td>2006</td><td>4000</td><td>1000</td><td>18</td></tr> <tr><td>2007</td><td>6000</td><td>4000</td><td>28</td></tr> <tr><td>2008</td><td>2000</td><td>1000</td><td>29</td></tr> <tr><td>2009</td><td>6000</td><td>0</td><td>0</td></tr> <tr><td>2010</td><td>5000</td><td>0</td><td>21</td></tr> <tr><td>2011</td><td>3000</td><td>0</td><td>12</td></tr> <tr><td>2012</td><td>2000</td><td>0</td><td>0</td></tr> <tr><td>2013</td><td>1000</td><td>0</td><td>0</td></tr> <tr><td>2014</td><td>4000</td><td>0</td><td>0</td></tr> <tr><td>2015</td><td>2000</td><td>0</td><td>8</td></tr> </tbody> </table>	Year	Total landings (kg)	Targeted landings (kg)	Mean LPUE (kg per hour per dredge)	2000	38000	32000	32	2001	23000	16000	18	2002	1000	0	0	2003	20000	12000	35	2004	20000	18000	23	2005	11000	6000	33	2006	4000	1000	18	2007	6000	4000	28	2008	2000	1000	29	2009	6000	0	0	2010	5000	0	21	2011	3000	0	12	2012	2000	0	0	2013	1000	0	0	2014	4000	0	0	2015	2000	0	8
Year	Total landings (kg)	Targeted landings (kg)	Mean LPUE (kg per hour per dredge)																																																																		
2000	38000	32000	32																																																																		
2001	23000	16000	18																																																																		
2002	1000	0	0																																																																		
2003	20000	12000	35																																																																		
2004	20000	18000	23																																																																		
2005	11000	6000	33																																																																		
2006	4000	1000	18																																																																		
2007	6000	4000	28																																																																		
2008	2000	1000	29																																																																		
2009	6000	0	0																																																																		
2010	5000	0	21																																																																		
2011	3000	0	12																																																																		
2012	2000	0	0																																																																		
2013	1000	0	0																																																																		
2014	4000	0	0																																																																		
2015	2000	0	8																																																																		

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		
b	Guidepost			Target reference points are defined for retained species.
	Met?			N
	Justification	Target reference points have not been defined for the queen scallop stock and therefore it can not be concluded that SG100 is met.		
c	Guidepost	If main retained 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.	If main retained 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	There are no main retained species and therefore SG80 is met.		
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		

<p>PI 2.1.1</p>	<p>The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species</p>	
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>It is understood that the areas targeted for king scallops and queen scallops are distinct due to the slight habitat preference of these species. King scallops have a more patchy distribution and are usually found in shallow depressions in the seabed, preferring areas of clean firm sand, fine or sandy gravel and occasionally muddy sand (Marshall and Wilson, 2009); while the queen scallop is found on sand or gravel, often in high densities (Carter, 2009). Distributions of the stocks occur across slightly different grounds and therefore low quantities of queen scallops are taken when targeting king scallops. Queen scallop are only targeted as a separate fishery when market conditions are favourable for this species.</p> <p>Furthermore, the king scallop dredges are not efficient for catching queen scallops since they have a ring size of 65 mm. Different dredges are used when targeting queen scallops with teeth much closer together and a ring size of 50mm.</p> <p>The low overlap of the king scallop fishery with the distribution of queen scallops, together with the very small proportion of retained landings in this fishery can be considered as a practice that is expected to result in the fishery not causing the retained species to be outside biologically based limits or hindering recovery and therefore S60 is met.</p>	
<p>References</p>	<ul style="list-style-type: none"> » Carter, M. 2009. Aequipecten opercularis. Queen scallop. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. » Leslie, B., Laurenson, C.H., Shelmerdine, R.H., Gear, D.J.R. and Winter, K.A.2010. Shetland Shellfish Stock Assessments 2010. Prepared by the NAFC for the Shetland Shellfish Management Organisation. » Marshall, C. and Wilson, E. 2009. Pecten maximus. Great scallop. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom » NAFC Marine Centre, 2016a. Landing statistics 2000-2015 	
<p>OVERALL PERFORMANCE INDICATOR SCORE (UoC3):</p>		<p>80</p>
<p>CONDITION NUMBER (if relevant):</p>		

Evaluation Table for PI 2.1.2 Scallop dredge fishery

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

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		
	Justification	<p>There are no main retained species and therefore a partial strategy for managing these is not necessary to meet SG 80a. Therefore SG80a is met.</p> <p>There is measures in place for managing the retained species within the scallop dredge fishery. The Shetland Islands Regulated Fishery (Scotland) Order 2009 (Regulating Order) includes queen scallops. The Strategy is appropriate for the species and the fishery under assessment. The Shetland Shellfish Management Organisation Management Plan 2009-2013 sets out the regulations and controls in place as per the Regulating Order. The measures cover a number of cohesive and strategic management measures including:</p> <ul style="list-style-type: none"> • Minimum landings sizes (queen scallop: 40mm) • Limit of two tow-bars with a combined maximum overall length, or a single tow bar with a maximum overall length, of 8.80 m and maximum limit of 10 scallop dredges (with an exception for vessels that used more than 10, but not more than 14 dredges during 2001 which can continue using existing tow-bar and dredges) • Ban on use of French dredges (incorporating paravanes, diving plates, pressure plates, water deflecting plates and rigid fixed teeth) • Curfew with no scallop or queen scallop fishing before 0600 hours or after 2100 hours. • Control over number of licences issued <p>Since the measures do not include harvest control rules for minor retained species SG100a is not met.</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 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 no main retained species and therefore a partial strategy for managing these is not necessary to meet SG 80b. Therefore SG80b is met. There is not a full strategy that includes minor retained species. and therefore SG100b is not met.</p>		

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		
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	There are no main retained species and therefore a partial strategy for managing these is not necessary . Therefore SG80c is met. The There is not a full strategy that includes minor retained species. and therefore SG100c is not met.		
d	Guidepost			There is some evidence that the strategy is achieving its overall objective.
	Met?			N
	Justification	Since the measures together do not form a full strategy SG100d is not met.		
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 caught in the creels.		
References		» Leslie, B., Laurenson, C.H., Shelmerdine, R.H., Gear, D.J.R. and Winter, K.A.2010. Shetland Shellfish Stock Assessments 2010.		
OVERALL PERFORMANCE INDICATOR SCORE(UoC3):				80
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.1.3 Scallop dredge fishery

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	The members of the SSMO complete a detailed logbook which records activity on a daily basis. Logbooks are submitted on a monthly basis to the SSMO and data is entered into a database at the NAFC. Logbooks provide information on the weight of catch and effort including number of dredges deployed and location of deployment to a scale of 5 x 5 nautical mile grids (see Figure 11, overleaf). Maps are produced on an annual basis to indicate landings, effort and landings per unit effort for both the targeted queen scallop fishery and for queen scallops taken by the king scallop fishery. There are no main retained species and therefore SG80a is met. SG100 a is not met since the consequences for the status of the minor retained species queen scallop are not fully known.		
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	The NAFC produce annual stock assessments which detail LPUE for queen scallops and assess both the targeted fishery and the bycatch from king scallop fishery (Leslie <i>et al</i> , 2010). However, the data available are not sufficient in order to carry out any analytical assessment on the queen scallop stock. Outcome status of queen scallop can therefore not be estimated with a high degree of certainty. Due to the clear understanding of the location of fisheries information is sufficient to estimate outcome status of queen scallops. SG80b is met but SG100b is not met. .		

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	There are no main retained species. Therefore SG80c is met. The level of detail reported within logbooks and the ongoing monitoring and analysis undertaken by the NAFC is adequate to support a partial strategy to manage to a high degree of certainty whether the Regulating Order and SSMO Management Plan are achieving their objectives. SG100c is not met since only a partial strategy is in place. .		
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	The annual maps produced as presented in Figure xx allow the effort, landings and LPUE to be assessed and monitored geographically. SG80d is therefore met. Monitoring is not, however, considered sufficient to allow to assess ongoing mortality on the queen scallop stock. Therefore SG100c is not met. For this to be met more detailed collection of biological data to properly assess <u>all</u> queen scallop mortality would be expected.		
References		<ul style="list-style-type: none"> » Leslie, B., Laurenson, C.H., Shelmerdine, R.H. and Winter, K.A.2010. Shetland Shellfish Stock Assessments Maps September 2010. Prepared by the NAFC for the Shetland Shellfish Management Organisation. » Leslie, B., Laurenson, C.H., Shelmerdine, R.H., Gear, D.J.R. and Winter, K.A.2010. Shetland Shellfish Stock Assessments 2010. Prepared by the NAFC for the Shetland Shellfish Management Organisation. 		

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
	» NAFC, 2011. Observer trip database of total catch profile for crab and lobster onboard brown crab and velvet crab targeted creel fisheries
OVERALL PERFORMANCE INDICATOR SCORE (UoC3):	80
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.2.1 Scallop dredge fishery

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

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**

A study into the occurrence of bycatch in the scallop dredge fishery around Shetland was undertaken by the NAFC in 2010 (Shelmerdine, 2010). This was based on 57 tows within six sampling areas. In total 63 animals were identified as bycatch, of which 15 made up 98.35% of the total catch weight (figure 12). King scallop dominated the catch contributing 62.6% by weight, followed by sea urchin (10.6%), horse mussel (6.9%) and brown crab (6.6%). All other bycaught species individually made up less than 2.4% of the catch weight and are therefore not considered main retained species.

The main bycatch species are sea urchin, horse mussel and brown crab.

Horse mussel, *Modiolus modiolus* is an important reef forming benthic organism. The horse mussel bed areas presented in Figure 4.5 (in paragraph 2.4.2) are closed to scallop dredging. Main parts of the horse mussel stock are therefore protected from fishing impact and it is therefore considered highly likely that horse mussels are within biologically based limits. Horse mussels are further considered under the habitats component.

As already presented within Principle 1 and Principle 2 retained species for creel fisheries, brown crab is considered highly likely to be within biologically based limits..

Sea urchins are found on rocky substrata of rocks and boulders, and sometimes gravel, from the sub littoral fringe to circa 40 m, although may be found at depths of 100 m or more.

Sea urchins have a high fecundity (>1,000,000), fertilisation is external and larvae are planktonic for first 1-2 months with a dispersal potential of >10km. Age at maturity is 1-3 years with a generation time of 1-2 years (Tyler-Walters, 2008).

An instantaneous mortality rate of 0.52 (=c.40% mortality per year) is quoted for sea urchin by Ebert (1975) for an Irish Sea population sampled by Moore (1935). However Rees and Dare (1993) consider it reasonable to assume that mortality rate would generally be relatively low beyond a critical size. Ebert and Russel (1992) found a mortality rate of about 10% for US intertidal populations of the red sea urchin *Strongylocentrotus franciscanus* which compares well to findings of Morgan *et al.* (2000) for the same species that reported a natural mortality of 9%.

Jenkins *et al.* (2001) researched the impact of scallop dredging on benthic megafauna including crabs, starfish, urchins, whelks and bivalves in the north Irish Sea, off the Isle of Man. Capture efficiency for the megafauna was found to be low, ranging from 2 to 25% among species, thus the majority of megafauna which encounter scallop dredges remain on the seafloor. The report investigated fishing-induced damage to species taken as bycatch and left on the seafloor. In total 53% of the sea urchins encountering scallop dredging were found to be left in good condition and 46% with spine loss, minor cracks or crushed/dead.

Based on the area targeted by scallop dredgers together with the fact that urchins prefer rocky boulder substrata (where dredges cannot access), have a high fecundity, early maturation and; a 53% survival rate when encountering scallop dredges, it is considered highly likely that sea urchins are within biologically based limits. However no quantitative data is

ation

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		
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.	
	Met?	Y	Y	
	Justification	<p>As already presented within Principle 1 and Principle 2 retained species for creel fisheries, brown crab is considered highly likely to be within biologically based limits. Standardised Landing per Unit Effort (LPUE) is used by management as agreed management response points. Management aims to maintain the stock at a target LPUE level and in the event of failing bellow it there are a number of limits or trigger LPUE points at which management actions take place which are aimed to maintain the stock at high productivity levels. It is therefore concluded that for Brown crab there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding and SG80b is met.</p> <p>As described under SG80a sea urchins are considered to be within biologically based limits. Sea urchins have high fecundity and early maturation so it is considered that the sea urchins within closed areas and rocky areas that can not be trawled and the sea urchins that survive trawling will always be able to produce sufficient offspring to rebuild the stock if necessary. The closure of areas and the fishing strategy together form a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding and thus SG80b is met.</p>		

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	
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	<p>As already presented within Principle 1 and Principle 2 retained species for creel fisheries, brown crab is considered highly likely to be within biologically based limits. Standardised Landing per Unit Effort (LPUE) is used by management as agreed management response points. Management aims to maintain the stock at a target LPUE level and in the event of failing bellow it there are a number of limits or trigger LPUE points at which management actions take place which are aimed to maintain the stock at high productivity levels. It is therefore concluded that for Brown crab 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 and thus SG60c is met.</p> <p>As described under SG80a and SG80b sea urchins are considered to be within biologically based limits. Sea urchins have high fecundity and early maturation so it is considered that the sea urchins within closed areas and rocky areas that can not be trawled and the sea urchins that survive trawling will always be able to produce sufficient offspring to rebuild the stock if necessary. The closure of areas and the fishing strategy are expected to result in the fishery not causing the bycatch species to be outside biologically based limits or hindering recovery and thus for sea urchings SG60c is met.</p>	
References		<ul style="list-style-type: none"> » Ebert, T.A. 1975. Growth and mortality of post-larval echinoids. Amer. Zool. 15: 755-775 » Ebert, T.A. and Russel, M.P. 1992. Growth and mortality estimates for res sea urchin <i>Strongylocentrotus franciscanus</i> from San Nicolas Island, California. Mar. Ecol. Prog. Ser. 81: 31-41 » Jenkins, S. R., Beukers-Stewart, B. D. And Brand A. R. 2001. Impact of scallop dredging on benthic megafauna: a comparison of damage levels in captured and non-captured organisms. Mar Ecol Prog Ser 	

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	
	<p>215: 297–301.</p> <ul style="list-style-type: none"> » Moore, H.B. 1935. A comparison of the biology of <i>Echinuc esculentus</i> in difference habitats. Part II. J. Mar. Biol. Ass. UK. 20: 109-128 » Morgan, L.E., Botsford L.W. , Wing, S.R. and Smith B.D. 2000. Spatial variability in growth and mortality of the red sea urchin, <i>Strongylocentrotus franciscanus</i>, in northern California. Can. J. Fish. Aquat. Sci. 57: 980–992 (2000) » Rees, H.L. and Dare, P.J. 1993. Sources of mortality and associated life-cycle traits of selected benthic species: a review. Fisheries Research Data Report Number 33. Ministry of Agriculture, Fisheries and Food Directorate of Fisheries Research » Shelmerdine, R.L. 2010. The occurrence of bycatch from scallop grounds around Shetland. Study undertaken by NAFC. » Tyler-Walters, H. 2008. <i>Echinus esculentus</i>. Edible sea urchin. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom 	
	OVERALL PERFORMANCE INDICATOR SCORE (UoC3):	80
	CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.2.2 Scallop dredge fishery

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

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		
	Justification	<p>There is a strategy in place for managing the SSMO scallop dredge fishery; namely the Shetland Islands Regulated Fishery (Scotland) Order 2009 (Regulating Order) and the Shetland Shellfish Management Organisation Management Plan which sets out the regulations and controls in place.</p> <p>The management measures of relevance which work to limit effort of the dredge fishery and therefore overall impact on bycatch species include:</p> <ul style="list-style-type: none"> • Limit of two tow-bars with a combined maximum overall length, or a single tow bar with a maximum overall length, of 8.80 m and maximum limit of 10 scallop dredges (with an exception for vessels that used more than 10, but not more than 14 dredges during 2001 which can continue using existing tow-bar and dredges) • Ban on use of French dredges (incorporating paravanes, diving plates, pressure plates, water deflecting plates and rigid fixed teeth) • Curfew with no scallop or queen scallop fishing before 0600 hours or after 2100 hours.¹ • Control over number of licences issued • Closed areas <p>The management measures in place constitute a partial strategy for managing bycatch species and since they effectively limit overall impact on bycatch species they 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. Therefore SG80a is met. The measures are not specifically designed for managing the impact on the bycatch component and therefore they do not constitute a full strategy and thus SG100a is not met.</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 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

¹ Scallop fishing is under a night time curfew in order to reduce overall effort on the stocks.

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	
	Justification	The SSMO have a Memorandum of Understanding with Marine Scotland: Compliance in relation to monitoring and enforcement of Regulatory Order management measures. Marine Scotland Compliance personel has confirmed to the team that fisherman generally comply with management measures and VMS data show that there is no fishing in closed areas. This information forms some objective basis for confidence that the partial strategies will work and thus SG80b is met. However there is not testing to a degree that would support high confidence that the strategy will work for these bycatch species and therefore SG100b is not met.	
c	Guidepost		There is some evidence that the partial strategy is being implemented successfully.
	Met?	Y	N
	Justification	The SSMO have a Memorandum of Understanding with Marine Scotland: Compliance in relation to monitoring and enforcement of Regulatory Order management measures. Marine Scotland Compliance personel has confirmed to the team that fishermen generally comply with management measures and VMS data show that there is no fishing in closed areas. This information forms some evidence that the partial strategy is being implemented successfully.that objective basis for confidence that the partial strategies will work and thus SG80b is met. However clear evidence relating to other measures was not available and therefore SG100 is not met.	
d	Guidepost		There is some evidence that the strategy is achieving its overall objective.
	Met?		N
	Justification	Since the measures form a partial strategy that are not specifically designed for the protection of bycatch species is can not be concluded that SG100d is met.	
References		<ul style="list-style-type: none"> » Leslie, B., Laurenson, C.H., Shelmerdine, R.H., Gear, D.J.R. and Winter, K.A.2010. Shetland Shellfish Stock Assessments 2010. Prepared by the NAFC for the Shetland Shellfish Management Organisation. » Scottish Statutory Instruments. 2009 No. 443. Sea Fisheries. The Shetland Islands Regulated Fishery (Scotland) Order 2009 	

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
OVERALL PERFORMANCE INDICATOR SCORE (UoC3):	80
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.2.3 Scallop dredge fishery

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	The Shelmerdine (2010) report has provided sufficient information on the species and quantities of bycatch associated with the scallop fishery and thus the amount of main bycatch species by the fishery is quantitatively known and SG80a is met. SG100a is not met since there is no accurate and verifiable information about the consequences for the status of affected populations.		
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	The Shelmerdine report, together with background biological data on bycatch species provides sufficient information to estimate outcome status with respect to biologically based limits and thus SG80b is met. Information is not sufficient to quantitatively estimate outcome status with respect to biologically based limits with a high degree of certainty and thus SG100 is not met.		
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

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		
	Justification	<p>Effort of the fishery is well understood in terms of both LPUE and location of effort. This provides sufficient information to ensure the SSMO framework is delivered effectively i.e. control of effort including number of licences etc.</p> <p>The available Information is considered adequate to support a partial strategy to manage main bycatch species and thus SG80c is met. SG100c is not met since there is only a partial strategy in place and information is insufficient to evaluate with a high degree of certainty whether the strategy is achieving its objective.</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	Sufficient data continue to be collected to detect any increase in risk to main bycatch species. Again this is in the form of annual mapping of effort, landings and LPUE of the scallop fishery which provides a clear picture of any increase in risk for main bycatch species over time. Therefore SG80d is met. SG100d is not met since there is no ongoing monitoring of all bycatch species.		
References		» Shelmerdine, R.L. 2010. The occurrence of bycatch from scallop grounds around Shetland. Study undertaken by NAFC.		
OVERALL PERFORMANCE INDICATOR SCORE (UoC3):				80
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.3.1 Scallop dredge fishery

PI 2.3.1		The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species		
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	N

<p>PI 2.3.1</p>	<p>The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species</p>
<p>Justification</p>	<p>The ETP species that have the potential to be incidentally caught by scallop dredgers can be determined based on three factors: temporal range of the species; spatial range of the species and; evidence of interaction with the fishing gear. Concerning marine mammals and birds it is considered highly unlikely that any interactions with the fishing gear could occur.</p> <p>ETP species that have the potential to be incidentally captured by scallop dredgers are demersal elasmobranch species such as the common skate <i>Dipturus batis</i>, starry ray <i>Amblyraja radiata</i> and angel shark <i>Squatina squatina</i>.</p> <p>The bycatch report by Shelmerdine, 2010 has been studied to identify any ETP species interactions. 1.15kg of common skate is recorded within the bycatch which was taken at two separate sampling stations. This is most likely to be parts of a common skate i.e. not small juveniles, with the remainder left on the seafloor. Survival of common skate that have interacted with scallop dredging is likely to be rare with interactions considered to be lethal. Skate egg capsules were also recorded within the bycatch at two separate sampling stations. There is no evidence of any other ETP species being taken by scallop dredgers in Shetland.</p> <p>The skate lives on sandy and muddy bottoms. The adults live in depths of 10 to 600 m while younger specimens prefer shallower waters. Seafish report that common skate has disappeared from the shallow waters of the North Sea, English Channel and Irish Sea. Catch-per-unit-effort in the northern North Sea, NW Scotland and Celtic Sea is low and the stock status is considered depleted (Seafish, 2013).</p> <p>Common skate within the EU zone are protected under EU regulations 104/2015. Under this regulation it is prohibited for EU vessels to fish for, to retain on board, to tranship and to land the basking shark, angel shark, common skate and porbeagle. White skate and undulate ray are also protected under these regulations, but not in ICES division IV.</p> <p>As well as prohibiting landings of common skate, the regulations require any individuals captured to be returned alive to the extent practicable. It is not, however, illegal to incidentally capture a common skate.</p> <p>Based on the landing statistics for SSMO vessels, there is no indication that common skate have ever been intentionally captured and landed. Any interaction is incidental and assumed to be fatal. The effects of the fishery are therefore known and it is considered highly likely that they are within limits of national and international requirements for protection of ETP species. Therefore SG80 a is met. SG100a is not met since there is not sufficient quantitative information on the exact level of interactions.</p>

PI 2.3.1		The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species		
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	N
	Justification	The depth range of common skate extends from shallow waters to 600 m, and the spatial distribution extends throughout much of the north North Sea and Europe. So while the species distribution does overlap with the fishery under assessment, it is expected to have a low susceptibility in terms of availability and encounterability when comparing the global distribution of common skate with the area targeted by the Shetland SSMO scallop dredgers. The direct effects of the fishery are therefore highly unlikely to create unacceptable impacts to ETP species and SG80b is met. SG100b is not met since there is not sufficient quantitative information on the exact level of interactions.		
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.
	Met?		Y	Y
	Justification	Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts. Common skate typically feed on bristle worms, sand eels, crabs and flatfish (Neal <i>et al</i> , 2008). They are not known to prey on scallops. The effect of scallop dredging and discards or injured megafauna such as sea urchins and crab may provide feed opportunities for common skate. There is therefore a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species and thus SG100c is met.		
References		<ul style="list-style-type: none"> » COUNCIL REGULATION (EU) 2015/104 of 19 January 2015 fixing for 2015 the fishing opportunities for certain fish stocks and groups of fish stocks, applicable in Union waters and, for Union vessels, in certain non-Union waters, amending Regulation (EU) No 43/2014 and repealing Regulation (EU) No 779/2014. » IUCN Red list, 2016-3 » Neal, K., Pizzolla, P. and Wilding, C. 2008. <i>Dipturus batis</i>. Common Skate. Marine Life Information Network: Biology and Sensitivity Key 		

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>	
	<p>Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom</p> <p>» Seafish, 20013 Responsible Sourcing Guide: Skates and Rays. Version 5 September 2013.</p> <p>» Shelmerdine, R.L. 2010. The occurrence of bycatch from scallop grounds around Shetland. Study undertaken by NAFC.</p>	
OVERALL PERFORMANCE INDICATOR SCORE (UoC3):		85
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.3.2 Scallop dredge fishery

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	Y

<p>PI 2.3.2</p>	<p>The fishery has in place precautionary management strategies designed to:</p> <ul style="list-style-type: none"> • Meet national and international requirements; • Ensure the fishery does not pose a risk of serious harm to ETP species; • Ensure the fishery does not hinder recovery of ETP species; and • Minimise mortality of ETP species.
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>A number of strategies exist to manage fisheries interactions with elasmobranchs at EU and UK levels. As discussed under PI 2.3.1 EC regulations 104/2015 prohibits EU vessels to fish for, to retain on board, to tranship and to land the basking shark, angel shark, common skate, starry ray and porbeagle. The regulation requires prompt release of these species unharmed to the extent practicable and encourages fisheries to develop and use techniques and equipment to facilitate the rapid and safe release of the species. The regulations also require the following five species of ray to be recorded separately when landed: Cuckoo ray (<i>Leucoraja naevus</i>), Thornback ray (<i>Raja clavata</i>), Blonde ray (<i>Raja brachyura</i>), Spotted ray (<i>Raja montagui</i>) and Starry ray (<i>Amblyraja radiata</i>) in order to allow a better understanding of stock status at a species level.</p> <p>The European Community's Plan of Action for sharks, skates, rays and chimaeras was released on the 6 February 2009. The Plan is not a Regulation; it is a framework document that sets out a range of potential measures (both mandatory and voluntary) to be implemented at Member State or European Community level and within Regional Fisheries Management Organisations. The European Commission has committed to introducing a number of the measures through new legislative proposals, or by amending existing legislation.</p> <p>At a UK level DEFRA published a Shark, Skate and Ray Conservation Plan (DEFRA, 2011) which sets out policy objectives to manage elasmobranch stocks sustainably so that depleted stocks recover and that those faring better are fished sustainably. The document identifies the following four key outcomes:</p> <ol style="list-style-type: none"> 1. Catches (targeted and bycatch) of elasmobranchs are sustainable and that action is taken to protect and restore those species most at risk as a matter of priority. 2. Knowledge on elasmobranch fisheries and species is improved through better data collection and scientific research. Information is used to more effectively manage elasmobranchs. 3. International conservation bodies adopt and promote effective conservation measures for elasmobranchs. 4. Increased understanding, education and awareness of elasmobranch issues.

<p>PI 2.3.2</p>	<p>The fishery has in place precautionary management strategies designed to:</p> <ul style="list-style-type: none"> • Meet national and international requirements; • Ensure the fishery does not pose a risk of serious harm to ETP species; • Ensure the fishery does not hinder recovery of ETP species; and • Minimise mortality of ETP species. 		
	<p>Seafish published (with the assistance of the Shark Trust and the Skates and Rays Producers Association) identification guides for fishermen to help distinguish 13 species of skates and rays.. Accompanying these is a website that features a database to collect landing data allowing their quantity and geographic availability can be monitored and studied at a species level.</p> <p>The SSMO Code of Conduct and the SSMO log sheets require that fishermen record and report all ETP and habitat interactions to the SSMO. Since 2013 all logsheet data are based on daily data and all fishermen sent their logsheets to SSMO on a regular basis. The data from the logsheets on landings, ETP and habitat interactions are fed into the updated SSMO database. Although this database is still being further developed so that it also includes biological data from observer trips and surveys it is already fully functional concerning landing data and ETP and habitat interaction data. The SSMO has implemented policies and procedures for dealing with reports and also for reviewing these data on ETP species and habitats on a regular basis via the Inshore Co-ordinator and SSMO Advisory Group. Client has reported tot he surveillance team that logsheet data on ETP interactions have been reviewed. However in the period from the start of the monitoring program until now no interactions of the scallop I fishery with any ETP species was recorded and reported.</p> <p>The measures outlined above are considered to form a strategic and cohesive strategy for managing the fisheries interactions with ETP species. It is concluded that 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 be highly likely to achieve national and international requirements for the protection of ETP species and therefore SG100a is met</p>		
<p>b</p>	<p>Guidepost</p>	<p>The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).</p>	<p>There is an objective basis for confidence that the strategy will work, based on information directly about the fishery and/or the species involved.</p> <p>The strategy is mainly based on information directly about the fishery and/or species involved, and a quantitative analysis supports high confidence that the strategy will work.</p>

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. 			
	Met?	Y	Y	N
	Justification	<p>The location of fishing effort and risk of the fishery to common skate is well understood. Recordings are undertaken through the recording of interactions with ETP species on logsheets. No interactions with ETP species have been reported in the last 5 years for the scallop fishery. There is therefore an objective basis for confidence that the management measures outlined above work, based on some information directly about the fishery and thus SG80b is met.</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	N
	Justification	<p>No interactions with ETP species have been recorded in the last three years. All SSMO scallop dredge fishermen have been sent the Seafish Skates and Rays I.D. guide. There is therefore evidence that the strategy is being implemented successfully and thus SG80c is met. Since the evidence is only based on reporting by fishermen it can not be concluded that the evidence is clear and thus SG100c is not met.</p>		
d	Guidepost			There is evidence that the strategy is achieving its objective.
	Met?			Y
	Justification	<p>The measures and strategies applied are designed to monitor and minimise the impact on ETP species. Since no interactions with ETP species have been recorded there is evidence that the strategy is achieving its objective and thus SG100d is met.</p>		
References	<p>» COUNCIL REGULATION (EU) 2015/104 of 19 January 2015 fixing for 2015 the fishing opportunities for certain fish stocks and groups of fish stocks, applicable in Union waters and, for Union vessels, in certain non-Union waters, amending Regulation (EU) No 43/2014 and repealing Regulation (EU) No 779/2014.</p>			

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>» DEFRA, 2011. Shark, Skate and Ray Conservation Plan. Published January 2011.</p> <p>» Seafish, 2017. Skates and Rays I.D. Guide (updated February, 2017).</p>	
OVERALL PERFORMANCE INDICATOR SCORE (UoC3):		90
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.3.3 Scallop dredge fishery

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	N
	Justification	<p>The spatial distribution of the scallop dredge fishery is well understood. The SSMO Code of Conduct and the SSMO log sheets require that fishermen record and report all ETP and habitat interactions to the SSMO. Since 2013 all logsheet data are based on daily data and all fishermen sent their logsheets to SSMO on a regular basis. The data from the logsheets on landings, ETP and habitat interactions are fed into the updated SSMO database. Although this database is still being further developed so that it also includes biological data from observer trips and surveys it is already fully functional concerning landing data and ETP and habitat interaction data. Details of species identification have been provided and it is expected that fishermen will be able to identify ETP interactions when they occur. The Shelmerdine (2010) report provides quantitative evidence of interaction, with common skate accounting for 0.06% of the overall catch. No interactions with ETP species have been reported by fishermen over the last 3 years. Therefore it is concluded that sufficient information is available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species and thus SG80 is met. The information is not sufficient to quantitatively estimate outcome status of ETP species with a high degree of certainty and thus SG100a is not met.</p>		

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. 		
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	The Shelmerdine (2010) report was undertaken in 2010 with no known intent to continue studying monitoring dredge bycatch. The SSMO have implemented a management framework to deliver a fishery dependent recording protocol to ensure fishermen record the location, species, quantity and outcome of any ETP species interaction. This monitoring program did not record any interactions with ETP species in the last 3 years. The available Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species and thus SG80b is met. SG100b is not met since not all information is verifiable.		
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 fishery dependent recording of interactions with ETP species is considered to be sufficient to measure trends and support a full strategy to manage impacts on ETP species. Therefore SG80c is met. SG100c is not met since the information is fishery dependent and thus it can not be concluded that the 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.		
References		» Shelmerdine, R.L. 2010. The occurrence of bycatch from scallop		

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. 	
	<p>grounds around Shetland. Study undertaken by NAFC.</p> <p>» Shelmerdine, R. L., Stone, D., Leslie, B. & Robinson, M. (2014) Implications of defining fisheries closed areas based on predicted habitats in Shetland: a proactive and precautionary approach Marine Policy. 43, p. 184-199.</p>	
OVERALL PERFORMANCE INDICATOR SCORE (UoC3):		80
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.4.1 Scallop dredge fishery

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

<p>PI 2.4.1</p>	<p>The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The impact of scallop dredging is well studied (Auster <i>et al.</i>, 1996; Bradshaw <i>et al</i> 2000; Currie and Parry, 1996; Currie and Parry, 1999; Eleftheriou and Robertson, 1992; Jennings <i>et al</i>, 2001; Kaiser <i>et al.</i> 1996; Kaiser <i>et al.</i> 2006; Løkkeborg, 2004; Thrush <i>et al.</i>, 2005).</p> <p>Bottom fishing activities are capable of greatly reducing habitat complexity by either direct modification of the substratum or removal of the fauna that contribute to surface topography (Auster and Langton, 1998; Jennings and Kaiser, 1998).</p> <p>Scallop dredging studied in an exposed sandy bay of a Scottish loch was found to cause significant physical disturbance, indicated by furrows, elimination of natural bottom features (ripples and irregular topography) and dislodgement of shell fragments and small stones. The furrows were, however, eliminated by wave and tidal actions shortly after the dredging operations (Eleftheriou and Robertson, 1992). Similar observations were made on a sandy sea bed subject to scallop dredging in New Zealand (Thrush <i>et al.</i>, 1995). Studies in less tidally exposed areas of sand silt habitats (e.g. Port Phillip Bay, Australia; Currie and Parry, 1996) have found recovery after scallop dredging to take up to six months with topography returning to control site appearance in 11 months.</p> <p>In terms of biological impact to habitat communities it has been demonstrated for coarse sand habitats that the macrobenthic community structure in dredged areas differs from un-dredged areas for at least three months (Thrush <i>et al.</i>, 1995). Furthermore the impact to the number of infaunal species present post dredge has been found to remain significantly less than un-dredged areas in sand silt habitats for up to eight months, with recovery after 14 months (Currie and Parry, 1996).</p> <p>Kaiser <i>et al.</i> (2000) studied the impact of scallop dredging across areas of low, medium and high fishing effort in south England. They found that the habitat differences (depth, grain size, mass of stones and broken shells) had a more apparent effect on community structures (total number of individuals, number of species, diversity) than the level of fishing effort. As fishing disturbance increased there was a general decrease in less mobile, larger-bodied and fragile fauna and an increase in the more resilient, mobile fauna. It was also found that higher levels of impact to more sensitive species occurred in the areas with low fishing intensity since these areas had a higher level of such species. It is logical that areas of high fishing effort are likely to be maintained in a permanently altered state, inhabited by fauna adapted to frequent physical disturbance. These effects will be most apparent for stable types of habitats that contain structural biogenic components.</p> <p>Hall-Spencer and Moore (2000) examined the effects of fishing disturbance on maerl beds (which are composed of highly dichotomous calcareous algae that forms a complex substratum with a high degree of 3-dimensional complexity). The associated assemblages of such habitats have high diversity and many of the associated species are large-bodied and slow-growing.</p>

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>Hall-Spencer and Moore (2000) showed that four years after the occurrence of an initial scallop-dredging disturbance had occurred, certain fauna, such as the nest building bivalve <i>Limaria hians</i>, had still not re-colonized trawl tracks.</p> <p>Kaiser et al. (2006) undertook a meta-analysis of 101 experimental fishing impact studies in order to identify the types of fishing gear that have the greatest impact on the seabed and on the groups of organisms that are most vulnerable to fishing activities. Scallop dredging was found to have the most severe ecological effects. Scallop dredging in biogenic habitats gave the greatest initial response of all fishing gear/habitat combinations, and the negative effects were predicted to last from 972 to 1175 d post-fishing.</p> <p>Gravel habitats, which are relatively stable and tend to support communities with high levels of diversity and biomass, were negatively affected by scallop dredging both in the short and long-term although the initial impact was less pronounced than for other less stable habitats (i.e. biogenic). The mean times to -10% recovery for muddy sand and sand habitats were 88 d and 39 d respectively. Although sand habitats were found to return to -10% recovery the fastest, they showed very high extrapolation times for maximum recovery (extrapolated to > 8 yr) due to a lack of evidence of strong recovery during the time period of the study, reflecting the tendency of many studies to examine initial impacts only.</p> <p>In summary the literature reviewed to inform the scoring of this PI indicate that scallop dredging can have a significant impact on habitats and biota. The recovery time after scallop dredging varies from a few days in high tidal and wave swept areas to months in less exposed sand and muddy sand areas and; 2-3 years across sensitive biogenic reef habitats. The level of impact varies depending on the habitats fished and how extensively these areas have been fished previously with the highest initial impact recorded for biogenic habitats.</p> <p>Habitat seabed types, biotopes and sensitive habitats in the waters around the Shetland Islands have been mapped as part of the Shetland Islands' Marine Spatial Plan (NAFC Marine Centre, 2016b).</p>

<p>PI 2.4.1</p>	<p>The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function</p>
	<p>The SSMO Code of Conduct states that SSMO operates a proactive approach to the protection of vulnerable seabed habitats. Where sensitive seabed habitats are identified the SSMO will put in place appropriate measures to protect these areas prior to the confirmation of the presence of a feature of interest. SSMO’s management strategy towards the protection of marine habitats is described in SSMO’s Spatial management Plan. The spatial management plan states that spatial management of fisheries shall be carried out in conjunction with the SSMO Code of Conduct and the Harvest Control Strategy and will be based on the most recent stock assessment data and scientific advice.</p> <p>In the framework of the spatial management plan the SSMO has implemented scallop closed areas for the protection of horse mussel and mearl beds. This was done after close consultation with fishermen and these have all agreed with the implemented measures. The management strategy as laid down in the spatial management plan includes procedures for the additional closure of horse mussel and mearl beds in case these are discovered either through biological surveys or through data habitat interactions reported by fishermen.</p> <p>SSMO also provided VMS maps that show scallop fishing activities have not taken place within the scallop closed areas as agreed in the framework spatial management strategy. The VMS data provide evidence that the spatial management strategy is implemented and enforced successfully. Therefore the surveillance team concludes that sensitive habitats are effectively protected by the measures and procedures laid down in the Spatial Management Plan and the Code of Conduct and that the fishery is therefore highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm. It is therefore concluded that SG80a is met. SG100a is not met since the previous conclusion is based on the fact that habitats are protected as soon as they are discovered and there is no full evidence that all areas with sensitive habitats have been discovered and closed yet.</p>
<p>References</p>	<ul style="list-style-type: none"> » Auster PJ, Malatesta RJ, Langton RW, Watling L Valentine, P.C., Donaldson, C.L.S., Langton, E.W., Shepard, A.N. & Babb, I.G. 1996. The impact of mobile fishing gear on seafloor habitats in the Gulf of Maine (northwest Atlantic): implications for conservation of fish populations. Rev Fish Sci 4:185–202 » Auster, P.J., & Langton, R.W. 1999. The effects of fishing on fish habitat. p.150-187, in: L. Benaka. Fish habitat: essential fish habitat and restoration. Bethesda, Maryland, American Fisheries Society. » Society. Symposium 22. Bradshaw C, Veale LO, Hill AS, Brand AR. 2000. The effects of scallop-dredging on gravelly seabed communities. In:

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>Kaiser MJ, De Groot SJ (eds) Effects of fishing on non-target species and habitats: biological, conservation and socio-economic issues. Blackwell Science, Oxford, p 83–104</p> <p>» Currie DR, Parry GD. 1996. Effects of scallop-dredging on a soft sediment community: a large-scale experimental study. Mar Ecol Prog Ser 134:131–150</p> <p>» Currie DR, Parry GD. 1999. Impacts and efficiency of scallop-dredging on different soft substrates. Can J Fish Aquat Sci 56:539–550</p> <p>» Eleftheriou, A. & Robertson, M.R. 1992. The effects of experimental scallop dredging on the fauna and physical environment of a shallow sandy community. Netherlands Journal of Sea Research, 30: 289-299</p> <p>» FAO, 2008. FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas, which is Annex F to the Report of the FAO Technical Consultation on International Guidelines for the Management of Deep-sea Fisheries in the High Seas, Rome, 4-8 February and 25-29 August 2008</p> <p>» Hall-Spencer JM, Froggia C, Atkinson RJA, Moore PG. 1999. The impact of Rapido trawling for scallops <i>Pecten jacobaeus</i> (L.), on the benthos of the Gulf of Venice. ICES J Mar Sci 56:111–124</p> <p>» Hall-Spencer JM, Moore PG (2000) Impact of scallop dredging on maerl grounds. In: Kaiser MJ, De Groot SJ (eds) Effects of fishing on non-target species and habitats: biological, conservation and socio-economic issues. Blackwell Science, Oxford, p 105–118</p> <p>» Jennings, S., & Kaiser, M. 1998. The effects of fishing on marine ecosystems. Advances in Marine Biology, 34: 201-352.</p> <p>» Jennings, S., Kaiser, M.J and Reynolds, J.D. 2001. Marine Fisheries Ecology. Blackwell Science, Oxford</p> <p>» Kaiser, M.J., Spencer, B.E. & Hart, P.J.B. 2000. Fishing-gear restrictions and conservation of benthic habitat complexity. Conservation Biology, 14: 1512–1525.</p> <p>» Kaiser, M. J., Hill, A.S., Ramsay, K., Spencer, B.E., Brand, A.R., Veale, L.O., Prudden, K., Rees, E.I.S., Munday, B.W., Ball, B. & Hawkins, S.J. 1996. Benthic disturbance by fishing gear in the Irish Sea: a comparison of beam trawling and scallop dredging. Aquatic Conservation Marine and Freshwater Ecosystem, 6: 269-295.</p> <p>» Kaiser, M. J., Clarke, K. R., Hinz, H., Austen, M. C. V., Somerfield, P. J., Karakassis, I. 2006. Global analysis of response and recovery of benthic biota to fishing. Marine Ecology Progress Series 311:1–14</p> <p>» Løkkeborg, S. 2004. Impacts of trawling and scallop dredging on</p>

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>benthic habitats and communities. FAO Fisheries Technical Paper 472.</p> <ul style="list-style-type: none"> » Sewell, J. & Hiscock, K., 2005. Effects of fishing within UK European Marine Sites: guidance for nature conservation agencies. Report to the Countryside Council for Wales, English Nature and Scottish Natural Heritage from the Marine Biological Association. Plymouth: Marine Biological Association. CCW Contract FC 73-03-214A. 195 pp. » NAFC Marine Centre, 2016b. A Marine Spatial Plan for the Shetland Islands (SIMSP, 2016). https://www.nafc.uhi.ac.uk/research/msp/simsp/SIMSP_2015.pdf » Thrush SF, Hewitt JE, Cummings VJ, Dayton PK. 1995. The impact of habitat disturbance by scallop-dredging on marine benthic communities: what can be predicted from the results of experiments? Mar Ecol Prog Ser 129: 141–150 » Watling L, Findlay RH, Mayer LM, Schick DF. 2001. Impact of a scallop drag on the sediment chemistry, microbiota, and faunal assemblages of a shallow subtidal marine benthic community. Int Sea Res 46:309–324.
OVERALL PERFORMANCE INDICATOR SCORE (UoC3):	
80	
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.4.2 Scallop dredge fishery

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

<p>PI 2.4.2</p>	<p>There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The Marine Spatial Plan for the Shetland Islands (NAFC Marine Centre, 2016b) sets out policy guidance in relation to marine activities and sensitive habitats and species. Commercial fishing activities are considered in the Spatial Plan, both in terms of ‘Safeguarding Fishing Opportunities’ and also in relation to sensitive habitats. The Policy MSP F2 states that:</p> <p><i>‘Local Management of Sustainable Fisheries – Local fisheries management will develop appropriate measures so that fishing is not carried out in ways that damage important habitats and species (as detailed in the matrix of sensitivity).’</i></p> <p>The corresponding matrix of sensitivity considers the impact of commercial fishing as relatively high in ‘benthic habitats/ecosystems’; in the context of the SSMO this evaluation is relevant to dredge fishing only. The impact of commercial fishing on ‘coastal habitats/ecosystems’ has been considered to be negligible in the Spatial Plan, as the fishing methodologies currently used within Shetland do not encroach into such zones (including BAP and OSPAR habitats and species).</p> <p>The SSMO published a Spatial management framework for dredge fisheries in August 2010 which was updated in August 2016 (SSMO Marine Spatial Plan, 2016). The overall Management Statement in the Code of Conduct is as follows:</p> <p><i>“The SSMO will operate a proactive approach to the protection of vulnerable seabed habitats. Where sensitive seabed habitats² are identified the SSMO will put in place appropriate measures to protect these areas prior to the confirmation of the presence of a feature of interest (i.e. maerl or horse mussels present at a level which constitutes a bed).”</i></p> <p>The framework also sets out three priority management areas as follows:</p> <p>Priority 1. Based on available published data reduce as much as possible (allowing for as yet unknown distributions/locations) the probability of dredge fishing impacting on sensitive species and/or habitats.</p> <p>Priority 2. Reduce the probability of dredge gears impacting potential sensitive habitats that have not been classified as such (only indicative).</p> <p>Priority 3. Integrate fisher’s knowledge of as yet unidentified sensitive habitats into Shetland Marine Spatial Plan to promote the involvement of industry in spatial management.</p> <p>To for fill Priority 1 and to meet Policy MSP F2 of the Marine Spatial Plan the SSMO have implemented a series of areas closed to scallop dredging.</p>

² For horse mussels, which are common around Shetland, these must be present in sufficient quantities to constitute a bed as defined in the NAFC Marine Centre report on closed areas (see also SSMO Spatial Management Plan and SSMOC1 Wheelhouse cards).

<p>PI 2.4.2</p>	<p>There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types</p>
	<p>The Shetland Shellfish Management Organisation Management Plan 2009-2013 sets out the regulations and controls in place as per the Shetland Islands Regulated Fishery (Scotland) Order 2009 (Regulating Order). This includes a number of management measures that restrict the level of effort by scallop dredgers within 6 nautical mile limit, including:</p> <ul style="list-style-type: none"> • Limit of two tow-bars with a combined maximum overall length, or a single tow bar with a maximum overall length, of 8.80 m and maximum limit of 10 scallop dredges (with an exception for vessels that used more than 10, but not more than 14 dredges during 2001 which can continue using existing tow-bar and dredges) • Ban on use of French dredges (incorporating paravanes, diving plates, pressure plates, water deflecting plates and rigid fixed teeth) • Curfew with no scallop fishing before 0600 hours or after 2100 hours. • Control over number of licences issued <p>The SSMO Code of Conduct states that SSMO operates a proactive approach to the protection of vulnerable seabed habitats. Where sensitive seabed habitats are identified the SSMO will put in place appropriate measures to protect these areas prior to the confirmation of the presence of a feature of interest. SSMO’s management strategy towards the protection of marine habitats is described in SSMO’s Spatial management Plan. The spatial management plan states that spatial management of fisheries shall be carried out in conjunction with the SSMO Code of Conduct and the Harvest Control Strategy and will be based on the most recent stock assessment data and scientific advice.</p> <p>In the framework of the spatial management plan the SSMO has implemented scallop closed areas for the protection of horse mussel and mearl beds. This was done after close consultation with fishermen and these have all agreed with the implemented measures. The management strategy as laid down in the spatial management plan includes procedures for the additional closure of horse mussel and mearl beds in case these are discovered either through biological surveys or through data habitat interactions reported by fishermen.</p> <p>SSMO has provided evidence to the team that these procedures are in place by providing the minutes of SSMO board meeting where the closure of an additional site with horse mussels and mearl was discussed and it was decided to ask fishermen to avoid this site pending further survey and the expected closure of this area. This demonstrates that a reactive management strategy has been implemented that is able to mitigate adverse impacts to sensitive habitats.</p>

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		
		Therefore it can be concluded that sensitive habitats are effectively protected by the measures and procedures laid down in the SIMSP and the Code of Conduct, and thus that there is a strategy in place for managing the impact of the fishery on habitat types and thus SG100a is met.		
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	SSMO has provided VMS maps that show that fishing activities have not taken place within the scallop closed areas as agreed in the framework of the spatial management strategy. These areas are statutory closed and fishing in these areas constitutes an offence. The VMS data objective basis for confidence that the partial strategy will work, based on information directly about the fishery and/or habitats involved and therefore SG80b is met. SG100b is not met since testing does not support high confidence that all areas were sensitive areas occur have been closed.		
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	Y
	Justification	SSMO has provided VMS maps that show that fishing activities have not taken place within the scallop closed areas as agreed in the framework of the spatial management strategy. These areas are statutory closed and fishing in these areas constitutes an offence. The VMS data provide clear evidence dat the spatial management strategy is implemented and enforced successfully and therefore SG100c is met.		
d	Guidepost			There is some evidence that the strategy is achieving its objective.
	Met?			Y

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	
	Justification	SSMO has provided VMS maps that show that fishing activities have not taken place within the scallop closed areas as agreed in the framework of the spatial management strategy. These areas are statutory closed and fishing in these areas constitutes an offence. The VMS data provide some evidence that the strategy is achieving its objective and therefore SG100c is met.	
References			
OVERALL PERFORMANCE INDICATOR SCORE (UoC3):			95
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 2.4.3 Scallop dredge fishery

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	The distribution of habitat is mapped and presented within the Marine Spatial Plan Marine Atlas (NAFC Marine Centre, 2016b) which is used to guide planning and activities. Changes in habitat distributions over time are measured. The NAFC have a detailed research plan which includes a programme for surveying sensitive habitats. It is concluded that distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types. Therefore SG100a is met.		
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

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	
	Justification	<p>The nature of the impact of the scallop fishery on bottom habitats can be inferred from scientific literature (Bradshaw <i>et al.</i>, 2000; Currie & Parry, 1996 & 1999; Hall-Spencer & Moore, 2000; Jennings & Kaiser, 1998). The distribution of the scallop fishery around Shetland is well known from IVMS and logbook data and these data provide reliable information on the spatial extent of interaction, and the timing and location of use of the fishing gear, and thus SG80b is met.</p> <p>The physical impacts of the gear on the habitat types within Shetland waters have not been quantified fully for the fishery under assessment and therefore SG100b is not met.</p>	
c	Guidepost	Sufficient data continue to be collected to detect any increase in risk to habitat (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	Changes in habitat distributions over time are measured.
	Met?	Y	Y
	Justification	<p>The spatial distribution of scallop dredging is well known from VMS and logbook data. The NAFC map these effort data annually per species. It is concluded that sufficient data continue to be collected to detect any increase in risk to habitat and thus SG80c is met. Changes in habitat distribution are monitored by NAFC and the Marine Spatial Plan and the map it contains are updated regularly. It is therefore concluded that SG100c is met as well.</p>	
References		<ul style="list-style-type: none"> » Bradshaw C, Veale LO, Hill AS, Brand AR. 2000. The effects of scallop-dredging on gravelly seabed communities. In: Kaiser MJ, De Groot SJ (eds) Effects of fishing on non-target species and habitats: biological, conservation and socio-economic issues. Blackwell Science, Oxford, p 83–104. » Currie DR, Parry GD. 1996. Effects of scallop-dredging on a soft sediment community: a large-scale experimental study. <i>Mar Ecol Prog Ser</i> 134:131–150 » Currie DR, Parry GD. 1999. Impacts and efficiency of scallop-dredging 	

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	
	<p>on different soft substrates. Can J Fish Aquat Sci 56:539–550</p> <p>» Hall-Spencer JM, Moore PG 2000. Impact of scallop dredging on maerl grounds. In: Kaiser MJ, De Groot SJ (eds) Effects of fishing on non-target species and habitats: biological, conservation and socio-economic issues. Blackwell Science, Oxford, p 105–118</p> <p>» Jennings, S., & Kaiser, M. 1998. The effects of fishing on marine ecosystems. Advances in Marine Biology, 34: 201-352.</p>	
OVERALL PERFORMANCE INDICATOR SCORE (UoC3):		95
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.5.1 Scallop dredge fishery

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	N

<p>PI 2.5.1</p>	<p>The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>Predator-prey relationships for the target, retained and bycatch species associated with this fishery (scallop, queen scallop, urchin, and brown crab) are well understood. Mackinson and Daskalov (2007) provide a detailed characterisation of the North Sea ecosystem and use the Ecopath model to explore ecosystem structure and biomass flows, food web interactions, and sensitivities. Scallops are included with the epifaunal macrobenthos category of assessment. Large crabs and small mobile epifauna are also included within the assessment. Trophic levels for each of these categories are classified as follows: epifaunal macrobenthos: 3.31, large crabs: 3.71 and small mobile epifauna: 2.91. Scallops provide an important food source to starfish and brown crab, and many organisms prey on scallop spat.</p> <p>The Marine Life Information Network (MarLin) assesses scallops to have intermediate intolerance, moderate recoverability and moderate sensitivity in relation to extraction of this species. This is predominately due to scallop dredging removing a proportion of the population for any area fished, although it is noted that estimates for the efficiency of the dredge are usually below 20% (Marshall and Wilson, 2009).</p> <p>It is considered highly unlikely that a trophic cascade would occur due to current levels of removal within the scallop dredge fishery. Severely truncated size compositions and gross changes in the species diversity are considered highly unlikely to occur, as are any changes in the genetic diversity of the species as a result of current fishing patterns.</p> <p>Therefore based on both qualitative and some quantitative (Mackinson and Daskalov, 2007) understanding of the role and function of scallops and associated retained and discarded species within the ecosystem, it is assessed as highly unlikely that key elements of the ecosystem would be disrupted to a point of serious or irreversible harm.</p> <p>Issues remain including ecological impact escape and discard mortality, incidental megafaunal interactions and habitat interactions particularly with sensitive biogenic habitats.</p> <p>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. Therefore SG80a is met. SG100a is not met since there is no full evidence that sensitive biogenic habitats are all protected effectively in their range.</p>
<p>References</p>	<ul style="list-style-type: none"> » ICES, 2008. Report of the Working Group for the Regional Ecosystem Description (WGRED). » Mackinson and Daskalov, 2007. An ecosystem model of the North Sea to support an ecosystem approach to fisheries management: description and parameterisation. For CEFAS Science Series Technical Report no.142

PI 2.5.1	The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function	
	<ul style="list-style-type: none"> » Marshall, C. and Wilson, E. 2009. <i>Pecten maximus</i>. Great scallop. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom » ICES, 2008. Report of the Working Group for the Regional Ecosystem Description (WGRED). » Mackinson and Daskalov, 2007. An ecosystem model of the North Sea to support an ecosystem approach to fisheries management: description and parameterisation. For CEFAS Science Series Technical Report no.142 » Marshall, C. and Wilson, E. 2009. <i>Pecten maximus</i>. Great scallop. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom 	
OVERALL PERFORMANCE INDICATOR SCORE(UoC3):		80
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.5.2 Scallop dredge fishery

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	Y
	Justification	<p>The potential impact of the SSMO scallop fishery on the ecosystem structure and function is managed at an international scale under the EU framework, a national scale under UK and Scottish fisheries regulations and at a local scale by the SSMO.</p> <p>The Shetland Regulating Order and the Marine Spatial Plan for the Shetland Islands have been discussed throughout the justifications tables and are applicable for management of the overall ecosystem structure and function.</p> <p>As sensitive areas for scallop dredging have been closed and these measures are incorporated in the Marine Spatial Plan it can be concluded that a strategy that consists of a plan is in place and thus SG100a is met.</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>
	Met?	Y	Y	Y

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			
Justification	<p>The licensing system of the Regulating Order controls the number of vessels in operation, ensuring a clear understanding of the level and location of effort. The Regulating Order also prohibits the use of French dredge and limits overall tow bar length and/or total number of scallop dredgers per vessel. Minimum Landing Sizes are set at an EU basis for scallop at 100mm. The SSMO members operate to a Code of Conduct which includes details of operational best practice including marine litter and minimising carbon footprint where possible.</p> <p>It can be concluded that the strategy, which consists of a plan, contains measures to address impacts of the fishery on the ecosystem, and that these measures are in place. The 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. Therefore SG80b is met. The plan and measures are based on known effects of scallop dredging on bottom habitats but it can not be concluded that the functional relationships between the fishery and the Components and elements of the ecosystem are well understood. Therefore it can be concluded that SG100b is 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).
	Met?	Y	Y	Y
Justification	The measures that have been implemented to address the impacts of the scallop fishery are based on the known effects op scallop dredging on sensitive habitats. The closure of areas with sensitive habitats for fishing is expected to work based on prior experience and therefore SG100c is met.			

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		
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	N
	Justification	The SSMO have a Memorandum of Understanding with Marine Scotland: Compliance in relation to monitoring and enforcement of Regulatory Order management measures. Scallop dredging around Shetland Islands is carried out in accordance with existing regulations including closed areas. Therefore it can be concluded that there is some evidence that the measures are implemented successfully and SG80 is met. SG100d is not met since the previous conclusion is based on the fact that enforcement measures have been taken but the level of enforcement is not exactly known to the team. Therefore there is no full evidence that the measures are being implemented successfully.		
References		» NAFC Marine Centre 2016b. A Marine Spatial Plan for the Shetland Islands Part Two Marine atlas 4rd Edition.		
OVERALL PERFORMANCE INDICATOR SCORE (UoC3):				95
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.5.3 Scallop dredge fishery

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>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. Sections 2.1.3, 2.2.3, 2.3.3 and 2.4.3 outline the array of data that are collected in relation to the fishery. The range of data is sufficient to allow some of the main impacts on these components to be inferred directly.</p> <p>Information is adequate to <u>broadly understand</u> the functions of the key elements of the ecosystem. Key elements include the trophic structure of the North Sea and Shetland inshore waters such as key prey, predators and competitors; community composition, productivity patterns and characteristics of biodiversity.</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

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem	
	Justification	Mackinson (2001) describes the construction and calibration of an ecosystem model of the North Sea using the Ecopath with Ecosim approach. Models of this type readily lend themselves to answering simple, ecosystem wide questions about the dynamics and the response of the ecosystem to anthropogenic changes. Thus, they can help design policies aimed at implementing ecosystem management principles, and can provide testable insights into changes that have occurred in the ecosystem over time. Main impacts of the fishery on these key ecosystem elements can be inferred from existing information like landing and and bycats data and impacts on target species have been investigated in detail. Therefore it is concluded that SG80b is met. It can however not be concluded that all main interactions between the fishery and ecosystem (like for instance impacts from bycatch on all bycatch species)elements have been investigated in detail and thus SG100b is not met.	
c	Guidepost		The main functions of the Components (i.e., target, Bycatch, Retained and ETP species and Habitats) in the ecosystem are known.
	Met?		Y
	Justification	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.	
d	Met?		Y
	Justification	The main functions of the Components (i.e. target, Bycatch, Retained and ETP species and Habitats) in the ecosystem are <u>known</u> . It is known that brown crab, velvet crab and lobster mainly act as epibenthic predators feeding on a variety of live molluscs and crustaceans, as well as carrion and that green crab are omnivores consuming plants, algae, molluscs, arthropods (including their own species), annelids and carrion. Direct and indirect impacts of the fishery on retained species, bycatch species, ETP species and seabed habitats are identified and the main functions of the Components in the ecosystem are understood. Therefor SG100c is met. .	
	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.
	Met?		N

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem	
	Justification	Information is available on the impacts of the fishery on Components (i.e. Retained species, Bycatch specie, ETP species and Habitats) from scientific reseach conducted by NAFC to alow the main consequences for the ecosystem to be inferred. Therefore SG80c is met. SG100c is not met since there is no information on the impact on all the different elements of the ecosystem.	
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
	Justification	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). Data is routinely collected on an ongoing basis to allow for the detection of any change or increase in risk level to the main ecosystem components. Key data collected include landings data for all species, spatial data in relation to fishing effort (via SSMO logbooks and NAFC maps) and data in relation to fishing effort (LPUE). Information is sufficient to support the development of strategies to manage ecosystem impacts and therefore SG100d is met.	
References		<ul style="list-style-type: none"> » FRS: Fisheries Research Services. 2006. Impacts of Climate and Fishing on the North Sea Food Web » Mackinson, S. 2001. Representing trophic interactions in the North Sea in the 1880s, using the Ecopath mass-balance approach. Fisheries Centre Research Report 9:44: 35-98. » Mackinson, S. & G. Daskalov. 2007. An ecosystem model of the North Sea for use in fisheries management and ecological research: description and parameterisation. 195 pp. » Walday M. and Kroglund T. 2002. Europe's biodiversity, biogeographical regions and seas around Europe: The North Sea. For the European Environment Agency. Available at: http://www.eea.europa.eu/publications/report_2002_0524_154909/ 	

PI 2.5.3	There is adequate knowledge of the impacts of the fishery on the ecosystem
	regional-seas-around-europe/page131.html/#1.1.2.....
OVERALL PERFORMANCE INDICATOR SCORE (UoC3):	90
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 3.1.1

PI 3.1.1		<p>The management system exists within an appropriate legal and/or customary framework which ensures that it:</p> <ul style="list-style-type: none"> Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and Incorporates an appropriate dispute resolution framework. 		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There is an effective national legal system and <u>a framework for 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

<p>PI 3.1.1</p>	<p>The management system exists within an appropriate legal and/or customary framework which ensures that it:</p> <ul style="list-style-type: none"> • Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and • Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and • Incorporates an appropriate dispute resolution framework.
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The fisheries concerned are single jurisdiction stocks associated with the inshore waters (out to 6 nautical miles) around the Shetland coast. There are several tiers of legislation which apply to these Shetland shellfisheries; international, EU, UK, Scotland (devolved government) and local (Regulating Order). At the level of international law, the UK ratified the United Nations Convention on the Law of the Sea (UNCLOS) convention in 2004. As a member of the European Union, the principle legislative instrument for fisheries management in the EU is the Common Fisheries Policy (CFP). The UK and its devolved administrations (Marine Scotland in this case) must ensure that management of fisheries complies with CFP requirements. Stricter management conditions can be introduced at a more local level, but all must ultimately be compliant with the CFP, which aims at achieving sustainable fisheries management across the EU. This clearly aims to achieve both P1 (stock management) and P2 (wider ecosystem impacts). The Marine (Scotland) Act, 2010 states that: “In exercising any function that affects the Scottish marine area under this Act— (a) the Scottish Ministers, and (b) public authorities must act in the way best calculated to further the achievement of sustainable development, including the protection and, where appropriate, enhancement of the health of that area, so far as is consistent with the proper exercise of that function. The Act recognizes the Sea Fisheries Act 1967 and the Wildlife and Countryside Act 1981, illustrating an effective national legal system to deliver P1 and P2 outcomes and SG80 is met. The Marine (Scotland) Act also represents binding procedures (in the development of regional marine plans, in the enforcement of regulations and in seeking advice from Scottish Natural Heritage) through which parties must co-operate to deliver sustainable outcomes for Scotland’s sea area. SG100 is therefore met.</p>

PI 3.1.1		<p>The management system exists within an appropriate legal and/or customary framework which ensures that it:</p> <ul style="list-style-type: none"> • Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and • Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and • Incorporates an appropriate dispute resolution framework. 		
b	Guidepost	<p>The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system.</p>	<p>The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the fishery.</p>	<p>The management system incorporates or 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>
	Met?	Y	Y	Y

<p>PI 3.1.1</p>	<p>The management system exists within an appropriate legal and/or customary framework which ensures that it:</p> <ul style="list-style-type: none"> • Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and • Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and • Incorporates an appropriate dispute resolution framework.
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The Marine (Scotland) Act modifies the UK’s Sea Fisheries (Shellfish) Act 1967 to this devolved arrangement and enables Scottish ministers to develop Regulating Orders that further devolve management responsibilities to appropriate organisations. The Shetland Islands Regulated Fishery (Scotland) Order 2012 (no.348) gives rights of management to the Shetland Shellfish Management Organisation (SSMO is a fully constituted company limited by guarantee) for prescribed species (oysters, mussels, cockles, clams, lobsters, scallops, queens, crabs, whelks and razorshells), under the 1967 act. Most disputes have arisen as a result of license allocations. In 2014 the SSMO established a licensing policy that details the process by which licensing decisions are made (SSMO, 2014). This includes an appeals process:</p> <p><u>Appeals Process</u></p> <p>L3.10 Unsuccessful applicants have the right to appeal within one month of the date of notice. An appeals form (SSMOG1) and guidance can be obtained from the SSMO office where the intention to appeal will be logged.</p> <p>L3.11 Appeals will be considered at the next board meeting and a decision will be communicated in writing within 30 days of that meeting. The board will consider the appeal relative to the application criteria, stock assessment advice and evidence presented in the appeal. The board will not disclose the ranking of the application relative to others, but will provide feedback as to the decision made both in terms of the original licence application and with regards to the appeal.</p> <p>The Regulating Order itself does not explicitly contain a mechanism to resolve legal disputes. However, outside of the main fisheries legislation, there is full and transparent right of appeal via the normal national judicial route, and at EU level. Although in the context of the Shetland fishery this has not been tested, the legal apparatus has been tested and proven effective in many other fisheries (including non-shellfish fisheries in Shetland). Together the available procedures amount to a mechanism that is appropriate to the context of the fishery that has been tested and is proven to be effective. SG100 is met.</p>

<p>PI 3.1.1</p>	<p>The management system exists within an appropriate legal and/or customary framework which ensures that it:</p> <ul style="list-style-type: none"> • Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and • Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and • Incorporates an appropriate dispute resolution framework. 			
<p>d</p>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Guidepost</p>	<p>The management system has a mechanism to generally respect the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</p>	<p>The management system has a mechanism to observe__the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</p>	<p>The management system has a mechanism to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</p>
	<p>Met?</p>	<p>Y</p>	<p>Y</p>	<p>N</p>
	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The Sea Fisheries (Shellfish) Act 1967 states that: No order shall take away or abridge any right of immemorial usage, except with the consent of that person. This is taken to be a safeguard for customary rights. Furthermore, in granting the Regulating Order, the Scottish Government gives careful consideration (with appropriate legal advice) to ensure that the Order is non-discriminatory or open to challenge. In particular this gives clear recognition of the need to not exclude those with historical rights or proven track record. This can be considered to be observing the legal rights of dependent communities and SG80 is met.</p> <p>The SSMO licensing policy process for awarding new licences within the Shetland Regulating Order, does not formally commit to customary rights as licensing is on an annual basis (ensuring capacity is in line with management objectives, rather than access for dependent people) and the Regulating Order can be revoked or not renewed. As annual licenses are allocated based on the stock status of relevant shellfish stocks and the associated HCRs, allocation is consistent with P1 objectives, but there is no formal commitment toward dependent peoples. SG100 is not met.</p>		
<p>References</p>	<p>European Commission (2013) Common Fisheries Policy EC reg.1380/2013Sea Fisheries (Shellfish) Act 1967</p>			

PI 3.1.1	<p>The management system exists within an appropriate legal and/or customary framework which ensures that it:</p> <ul style="list-style-type: none"> • Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and • Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and • Incorporates an appropriate dispute resolution framework.
	<p>Scottish Government (2010) Marine (Scotland) Act, 2010</p> <p>Scottish Government (2012) The Shetland Islands Regulated Fishery (Scotland) Order 2012 (no.348)</p> <p>SSMO (2014) SSMO Licensing policy. July, 2014.</p>
OVERALL PERFORMANCE INDICATOR SCORE (UOA 1):	95
OVERALL PERFORMANCE INDICATOR SCORE (UOA2):	95
OVERALL PERFORMANCE INDICATOR SCORE (UOA3):	95
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 3.1.2

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties		
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	Section 3.5 of this report details the main organisations involved in the fishery, including the SSMO, Marine Scotland (both Policy and Compliance), and NAFC Marine Centre in providing scientific advice to managers. The management arrangements are well established and the roles and responsibilities of all organisations are explicitly defined in the Regulating Order and under the Marine (Scotland) Act. SG100 is met.		
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 used.
	Met?	Y	Y	Y

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties.	
		The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties	
	Justification	<p>The structure of the Shetland Shellfish Management Organisation is designed to enable proactive communication with Shetland Island Council and fishermen’s representatives being members of the board. Annual meetings, or extraordinary general meetings are open to all licensees. Fishermen who do not hold licences or who have not agreed with the actions of the SSMO have been able to speak directly to the Scottish Government, and problems have been resolved in an inclusive manner. A Shetland Inshore Fishermen’s Association has also been established, and is now represented on the SSMO board, and this has helped further with consultation in both directions.</p> <p>NAFC Marine Centre presents scientific advice to local fishing interests giving an opportunity for both sides to learn from the other. There is further feedback possible when the advice is presented to the SSMO board.</p> <p>The SSMO licensing policy is clear in its approach to allocation and states that “The board will not disclose the ranking of the application relative to others, but will provide feedback as to the decision made both in terms of the original licence application and with regards to the appeal.” This is another example of explaining how information is used or not used. SG100 is met.</p>	
c	Guidepost		<p>The consultation process provides opportunity for all interested and affected parties to be involved.</p> <p>The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.</p>
	Met?		Y
	Justification	<p>The SSMO manager is contactable by fishermen and other affected parties to discuss any matters arising.</p> <p>The SSMO holds monthly board meetings with additional meetings where necessary giving additional opportunities fishermen to consult with managers. The timing of meetings is set to enable active fishermen to attend and this facilitates their effective engagement. The Scottish Government consults on wider policy developments with all affected parties with any substantial developments the subject of open public consultation exercises. SG100 is met.</p>	
References		<p>Scottish Government (2010) Marine (Scotland) Act, 2010</p> <p>Scottish Government (2012) The Shetland Islands Regulated Fishery (Scotland) Order 2012 (no.348)</p>	

PI 3.1.2	The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties	
	SSMO (2014) SSMO Licensing policy. July, 2014.	
OVERALL PERFORMANCE INDICATOR SCORE (UOA 1):		100
OVERALL PERFORMANCE INDICATOR SCORE (UOA2):		100
OVERALL PERFORMANCE INDICATOR SCORE (UOA3):		100
CONDITION NUMBER (if relevant):		

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

<p>PI 3.1.3</p>	<p>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</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Justification</p>	<p>The SSMO Management Plan (SSMO,2013) states the following:</p> <p>The SSMO management strategy is built around the following objectives:</p> <ol style="list-style-type: none"> 1. Stocks –Stocks will be maintained at biologically sustainable levels. 2. Environment –Fishing activity will be managed in an environmentally responsible manner 3. Governance – The SSMO will operate in an efficient and transparent manner and be accountable. 4. Socio-Economic – The continued prosperity of the shellfish fleet and the communities which it supports will be given due consideration in management decisions. 5. Research & Development – We will put in place research and development plans to inform and sustain the work of the SSMO into the future <p>The plan states that the above are consistent with the Strategic Framework for Inshore Fisheries in Scotland (2005) produced by the Scottish Government (then called the Scottish Executive). These are explicit within management policy and SG80 is met.</p> <p>Since this 2005 strategy, a 2012 and now a 2015 Inshore Fisheries Strategy have been published by the Scottish Government to better reflect the need to integrate fisheries management with wider marine environmental management. The 2015 strategy states that:</p> <p>Marine Scotland will make provision for complying with international fisheries obligations under the Marine Strategy Framework Directive (MSFD), moving towards Maximum Sustainable Yield (MSY) for key shellfish stocks by 2020 and managing our fisheries in line with MSFD and other marine conservation initiatives.</p> <p>This strategy makes an explicit commitment to the ecosystem approach as set out in the MSFD, which is consistent with MSC principles and criteria as well as the precautionary approach. However it does not state that all management policy is required to comply with these objectives and it sets a 2020 target for achieving MSY in inshore stocks. Therefore it is determined that SG80 is currently met, but SG100 is not fully met and a partial score of 90 is given.</p> <p>Note this differs to the original assessment of 2012, which scored the fishery at 100. It is the contention of this assessment team that these strategy developments are not required by management policy. The 2015 strategy itself recognises a legislative update is needed to reflect these developments. As such as partial score at SG100 is appropriate.</p>
<p>References</p>	<p>SSMO 2013. Management Plan 2013-2018</p>

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	
	Scottish Executive (2005) Strategic Framework for Inshore Fisheries in Scotland. Marine Scotland (2015) Scottish Inshore Fisheries Strategy. http://www.gov.scot/Resource/0049/00494784.pdf	
OVERALL PERFORMANCE INDICATOR SCORE (UOA 1):		90
OVERALL PERFORMANCE INDICATOR SCORE (UOA2):		90
OVERALL PERFORMANCE INDICATOR SCORE (UOA3):		90
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 3.1.4

PI 3.1.4		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	N
	Justification	<p>Incentives in the form of subsidies for innovations in the fishery are available through the European Maritime Fisheries Fund (EMFF). In response to criticisms of the previous funding programme, the EMFF takes greater account of avoidance of unintended environmental impacts, e.g. through requiring only highly targeted fleet decommissioning schemes to avoid over-capitalisation in the sector. A range of environmental measures including gear innovations and fuel efficiency are supported in the EMFF. This should better ensure incentives provided in the form of subsidies are consistent with P1 and P2 outcomes and ensures that perverse incentives do not arise.</p> <p>The SSMO licensing system provides incentives for operators supporting P1 and P2 in the annual allocation of licenses only to those that are compliant with regulations (SG80 is met).</p> <p>There is not evidence that incentives are explicitly considered in a regular review of management policy and therefore SG100 is not met.</p>		
References		EMFF (2014) The European Maritime and Fisheries Fund (EC Reg. 508/2014) SSMO (2014) SSMO Licensing policy. July, 2014.		
OVERALL PERFORMANCE INDICATOR SCORE (UOA 1):				80
OVERALL PERFORMANCE INDICATOR SCORE (UOA2):				80
OVERALL PERFORMANCE INDICATOR SCORE (UOA3):				80
CONDITION NUMBER (if relevant):				

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>NOTE: The 3 UoAs (Brown crab, Velvet crab and scallop) are managed by SSMO & Marine Scotland Surveillance under exactly the same arrangements with joint documents outlining fishery-specific management (HCRs, licensing etc.). Therefore the scoring rationales and scores are the same across the UoAs for 3.2.1 to 3.2.5.</p> <p>The recent Scottish Inshore Fisheries Strategy sets objectives relating to both P1 outcomes (inshore stocks at MSY) and P2 outcomes (MSFD Good Environmental Status) both by 2020. However these are yet to be explicit within the fishery-specific management system.</p> <p>In terms of the fishery-specific management the SSMO management plan (2013) is the most significant document and this contains short and long-term objectives that are consistent with MSC P1 and P2 outcomes (SG80 is met).</p> <p>There are well defined and time-bound actions associated with each objective (listed under 3.1.3). While it can be determined whether actions have been undertaken, the outcomes are not always readily measurable and in relation to the environment are described as 'tactics':</p> <p>2.1 To further develop the code of conduct and circulate to all licensees 2.2 To maintain an effective spatial management plan"</p> <p>Objectives address both P1 aspects (e.g. HCR for all 3 target shellfish species) and P2 aspects (e.g. managing interactions with ETP and habitats). These objectives are well-defined and certainly measurable for P1, but less so for P2 and therefore a partial score at SG100 is given and a score of 90 awarded.</p>		
References		Marine Scotland (2015) Scottish Inshore Fisheries Strategy. SSMO 2013. Management Plan 2013-2018		
OVERALL PERFORMANCE INDICATOR SCORE (UOA 1:				90

PI 3.2.1	The fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2	
OVERALL PERFORMANCE INDICATOR SCORE (UOA2):		90
OVERALL PERFORMANCE INDICATOR SCORE (UOA3):		90
CONDITION NUMBER (if relevant):		

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	<p>The SSMO management plan (2013-2018) contains a clear description of decision-making processes under the SSMO: For all decisions there should be a consensus of opinion. Where agreement cannot be reached there should be a process of voting either by a show of hands or where appropriate via a secret ballot to be facilitated by the Inshore Officer. The chair will have the casting vote where there is a tie. (SSMOP1 7.2)</p> <p>Roles and responsibilities for board members with regards to decision making are detailed in individual policy documents and outlined in the management plan where appropriate. (SSMOP1 7.3)</p> <p>A key element in the decision-making process is associated with licensing. The SSMO has reviewed and revised the licencing policy and procedures, resulting in a new licensing policy (SSMO P3 – Licencing Policy). SG80 is met</p>		
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.

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.		
	Met?	Y	Y	N
	Justification	The operation of the Advisory Group and its deliberations to date show that important issues are considered in a timely and adaptive manner that takes into account wider implications. As evidenced by the board meeting minutes, serious and other important issues identified by the Advisory Group or other parties are raised at the monthly SSMO board meetings. The process by which annual licensing levels are determined is timely and adaptive in response to HCR requirements, but do take into account the wider implications, such as socio-economic impacts, of those decisions. SG80 is met. However it is not evident and there is no explicit commitment for decision-making processes to respond to all issues indentified through research or consultation and so SG100 is not met.		
c	Guidepost		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		Y	
	Justification	Through engaging NAFC Marine Centre, a locally-based centre for fisheries expertise that is part of the University of Highlands and Islands, the SSMO has ensured that it has access to the best available information. The NAFC Marine Centre procedures of survey, assessment and advice are all well developed and the preacutionaty approach is central to the advice given. A peer review process is in place to review NAFC scientific advice before submission to the SSMO board. SG80 is met.		

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.		
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	N
	Justification	<p>The Management Plan includes an improved communication strategy. All licencing rounds will be communicated on the website and in the local press. Applications are scored against clear criteria and all applicants are then informed of decisions. An appeals process is also described.</p> <p>The SSMO Management Plan states that “Summary notes of all board meetings should be circulated to all interested licence holders on a monthly basis as soon as possible after the full minute of the board has been approved. These should contain information on the decisions made in the board meeting (including the scoring of votes if relevant, see 7.2 below) but should not contain any sensitive information or personal details relating to licence holders or board members. (SSMOP1 7.1)</p> <p>With the revised management plan and the updated licencing policy, it is evident that decision-making processes have been improved and decisions are clearly communicated to affected parties. The minutes of the Advisory Group are communicated to SSMO stakeholders where the actions or inaction proposed is explained (SG80 is met, but this stops short of a formal reporting commitment required for SG100).</p>		

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.		
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 repeatedly violating the same law or regulation necessary for the sustainability for the fishery.	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.
	Met?	Y	Y	Y
	Justification	Scottish law requires that public sector management bodies comply with judicial decisions in a timely fashion (SG80 is met). The management system acts proactively to avoid disputes reaching judicial proceedings through an open decision-making process involving the SSMO board that includes active fishers to ensure equitable and workable solutions are developed. SG100 is met.		
References		SSMO board meetings http://www.ssmo.co.uk/news/ssmo-2016-board-meeting-dates		
OVERALL PERFORMANCE INDICATOR SCORE (UOA 1):				85
OVERALL PERFORMANCE INDICATOR SCORE (UOA2):				85
OVERALL PERFORMANCE INDICATOR SCORE (UOA3):				85
CONDITION NUMBER (if relevant):				

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	The original Shetland Regulating Order placed the powers of enforcement of any additional management measures (over and above national or EU regulations) in the hands of the grantee; the SSMO. However, the SSMO had neither the expertise nor resources to adequately enforce measures, other than through the right to withhold licences in event of non-compliance. In August 2006 a memorandum of understanding was signed between the Marine Scotland Compliance (the SFPA as was) and the SSMO over the level of enforcement that would be applied in the regulating order fishery. Since that time it has been clear that responsibility for enforcement (including the SSMO licence requirements) lies with Marine Scotland (Compliance). In line with elsewhere in Scotland, a comprehensive MCS system is implemented by MS Compliance, which has demonstrated its ability to enforce management rules across all 3 UoA fisheries. SG100 is met.		
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	

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with		
	Justification	<p>A series of escalating actions are implemented for more non-compliance. For minor offences a verbal warning is issued, which is followed by an advisory letter and then fixed penalty notices may be applied. For more serious infringements, MS Compliance applies the penalty points system in line with the EU's Control Regulation (Marine Scotland, 2013).</p> <p>In Scotland, non-compliance is dealt with through the Scottish criminal justice systems, and using agreed and tested procedures. In event of an infringement being detected by Marine Scotland (Compliance), details of the infringement are passed to the procurator fiscal, who determines the appropriate fine / sanction. This process also enables the fisher to prepare a defence against the charge and provides full right of appeal. Marine Scotland (Compliance) do not themselves have unilateral power to impose sanctions – thereby ensuring the system of deterrent remains transparent, independent and consistently applied. SG80 is met.</p>		
c	Guidepost	Fishers are generally thought to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	Some evidence exists to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	Y	Y	Y

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with	
	Justification	<p>It is estimated that around 6 advisory letters are issued per year to operators in the Shetland inshore fishery (across all 3 UoAs). No quotas are applied and there is no incentive to mis-report landings to managers (MS Compliance pers. comm). It is a condition of license that fishers submit accurate weekly catch returns to the SSMO (SSMO management team pers comm.) and therefore any non-compliance with this would be quickly identified and addressed. Sales notes can be used to cross-check with landings declarations and these show good consistency. The SSMO also provided evidence of the Code of Conduct relating to ETP interactions, including the reporting of all incidents. All interactions are recorded in the SSMO database, but no interactions have occurred in recent years.</p> <p>The level of returns supplied and the use of inshore VMS in some vessels give a high degree of confidence that fishers comply with the management system. SG100 is met.</p>	
d	Guidedpost		There is no evidence of systematic non-compliance.
	Met?		Y
	Justification	<p>The Marine Scotland (Compliance) inspection strategy is influenced by intelligence and risk. It is acknowledged that the Shetland inshore shellfish fishery is a relatively low risk fishery. However regular monitoring is in place with weekly liaison with SSMO management (MS Compliance pers. comm). There have been no reports from any stakeholders of systematic non-compliance SG80 is met.</p>	
References	<p>Council Regulation 1224/2009 ("the Control Regulation")</p> <p>Marine Scotland (2013) Guidance note on the EU points system for serious infringements.</p> <p>http://www.gov.scot/Resource/0042/00421676.pdf</p> <p>SSMO Cetacean Entanglement Prevention Guide.</p>		
OVERALL PERFORMANCE INDICATOR SCORE (UOA 1):		100	
OVERALL PERFORMANCE INDICATOR SCORE (UOA2):		100	
OVERALL PERFORMANCE INDICATOR SCORE (UOA3):		100	
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 3.2.4

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>The SSMO Management Plan relating to all 3 UoAs contains objectives specifying research and development actions and this refers to the SSMO Research and Development Plan.</p> <p>The SSMO has an advisory group, which is chaired by the NAFC head of Marine Science and ensures the ongoing implementation of the research plan. This has extended to habitat survey to inform closed areas (particularly in relation to the scallop fishery) as well as the developing stock assessment needs (with the development of reference points and HCRs). This certainly meets the objectives for a research plan in relation to P1 and P2 (SG80 is met), but is not of such a comprehensive nature as to extend to P3 aspects and SG100 is not met.</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	<p>NAFC publishes certain research outputs relating to all 3 UoAs and ensures results are disseminated to interested parties (SG80 is met).</p> <p>NAFC publishes some outputs, but does not publish all the research findings stating: "Copies of the most recent stock assessment can be made available on request, with the agreement of the SSMO, who retain joint ownership of the data. Requests can be made to the Senior Shellfish Scientist at the Marine Centre or the SSMO." SG100 is not met.</p>		
References		<p>NAFC Marine Centre website: https://www.nafc.uhi.ac.uk/research/fisheries/shellfish</p>		

PI 3.2.4	The fishery has a research plan that addresses the information needs of management
OVERALL PERFORMANCE INDICATOR SCORE (UOA 1):	80
OVERALL PERFORMANCE INDICATOR SCORE (UOA2):	80
OVERALL PERFORMANCE INDICATOR SCORE (UOA3):	80
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 3.2.5

PI 3.2.5		There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives There is effective and timely review of the fishery-specific management system		
Scoring Issue		SG 60	SG 80	SG 100
a	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/N)	Y	Y
	Justification	The SSMO management plan (relating to all 3 UoAs) includes a section on monitoring and review: In relation to Governance, the plan states: The SSMO management plan will be reviewed on an annual basis (SSMO 7.5 in the Code of Conduct). The full extent of the management plan is subject to review and evaluation and SG100 is met.		
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	The Scottish inshore fisheries strategy has been reviewed and updated in 2005, 2012 and 2015 following extensive stakeholder consultation exercises. The process considers the management in place for inshore fisheries throughout Scotland, including the Shetland Regulating Order. This, along with the more occasional review of the Regulating Order itself by Marine Scotland can be considered 'occasional external review' and SG80 is met, but SG100 is not met.		
References		Marine Scotland (2015) Scottish Inshore Fisheries Strategy. Scottish Government (2012) The Shetland Islands Regulated Fishery (Scotland) Order 2012 (no.348) SSMO 2013. Management Plan 2013-2018		
OVERALL PERFORMANCE INDICATOR SCORE (UOA 1):				90
OVERALL PERFORMANCE INDICATOR SCORE (UOA2):				90

PI 3.2.5	There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives There is effective and timely review of the fishery-specific management system
OVERALL PERFORMANCE INDICATOR SCORE (UOA3):	90
CONDITION NUMBER (if relevant):	

Appendix 1.3 Conditions

Table A1.3.1: Condition 1 UoC2 (velvet crab) (Non-Binding)

Performance Indicator	PI 1.1.3 UoC 2 Velvet Crab: Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe. Scoring issue c. 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.
Score	70
Rationale	The most recent stock assessment showed that fishing effort targeted at velvet crabs has decreased significantly year-on-year since 2012 (Figure 3.9), providing evidence that the implementation of the harvest control rules has resulted in a reduction in exploitation rates. However after a significant increase in 2014, LPUE has declined further (Figure 3.9). The NAFC Marine Centre velvet crab survey in 2016 showed that there had been an increase in mean size of both males and females in 2016 compared with the results of the 2014 survey. LPUE may be influenced by factors other than stock abundance. The Client and fishers report a large increase in abundance of both lobsters and brown crabs, and the presence of lobsters and brown crabs in the creels may inhibit further entry of velvet crabs thereby reducing the observed LPUE of velvet crabs. The assessment team concluded that despite the significant reduction in fishing effort observed in the velvet crab fishery, the observed increase in mean size of velvet crabs, and the potential for factors other than stock abundance to influence catch rates, there was not sufficient evidence to conclude that the rebuilding strategies were rebuilding the stocks. The SG80 is not met therefore.
Condition	The rebuilding strategy for the velvet crab fishery should be demonstrated to be rebuilding the stock by the third surveillance audit
Milestones	Annual surveillance 1: Provide evidence that the rebuilding strategy for the velvet crab fishery has started to rebuild the stock, or if the stock has not started to move towards the TRP, provide written evidence of proposals for additional management measures. This milestone is an incremental step toward fulfilling the condition. Its

	<p>successful completion will not result in a change of score to this PI. Expected interim score: 70</p> <p>Annual surveillance 2: Provide evidence that the rebuilding strategy for the velvet crab fishery has continued to rebuild the stock, or if the stock has not started to move towards the TRP, provide written evidence of implementation of additional management measures. This milestone is an incremental step toward fulfilling the condition. Its successful completion will not result in a change of score to this PI. Expected interim score: 70</p> <p>Annual surveillance 3: Provide evidence that the rebuilding strategy for the velvet crab fishery has rebuilt the stock. Expected score: 80</p>
Client action plan	<p>Annual Surveillance 1. <u>The Client will provide the results of the most recent stock assessment of the velvet crab fishery. If the stock has not started to move towards the TRP, the Client will present proposals for additional management measures.</u></p> <p>Annual Surveillance 2: <u>The Client will provide the results of the most recent stock assessment of the velvet crab fishery. If the stock has not started to move towards the TRP, the Client will provide evidence of the implementation of additional management measures.</u></p> <p>Annual Surveillance 3: <u>The Client will provide the results of the most recent stock assessment of the velvet crab fishery demonstrating that the stock has recovered to the TRP.</u></p>
Consultation on condition	SSMO and NAFC Marine Centre will work jointly on meeting the condition.

Table A1.3.2: Condition 2 All UoCs (brown crab, velvet crab, scallop)

Performance Indicator	<p>PI 1.2.4 There is an adequate assessment of the stock status</p> <p>Scoring issue e. The assessment of stock status is subject to peer review.</p>
Score	75
Rationale	Whilst elements of the assessment approach, such as the definition of reference points and HCRs may be discussed at the Advisory Group prior to submission to the SSMO Board, it is not clear that the annual assessments of stock status of brown crabs, velvet crabs and scallops are subject to peer review. Previously an annual stock assessment report

	<p>was produced and one such annual report underwent an external peer review. However the annual stock assessment report has not been produced in recent years. The output of the brown crab and velvet crab stock assessments have been presented at the ICES Crab Working Group, but no formal peer review of the assessments takes place at the Working Group. In conclusion the assessment team considered that the assessments of stock status are not subject to sufficient internal or external peer review. The SG80 is not met.</p>
Condition	<p>A peer review of the stock assessments of the brown crab, velvet crab and scallop fishery should be undertaken by the 2nd annual surveillance audit, and a process whereby the stock assessments are regularly peer-reviewed should be put in place by the 3rd annual surveillance audit.</p>
Milestones	<p>Annual surveillance 1: Show written evidence of an agreement to carry out a peer review (preferably external) of the stock assessments for the brown crab, velvet crab and scallop fisheries. This milestone is an incremental step toward fulfilling the condition. Its successful completion will not result in a change of score to this PI. Expected interim score: 75</p> <p>Annual surveillance 2: Completion and publication of a peer review of the stock assessments for the brown crab, velvet crab and scallop fisheries. This milestone is an incremental step toward fulfilling the condition. Its successful completion will not result in a change of score to this PI. Expected interim score: 75</p> <p>Annual surveillance 3: Show written evidence of a commitment to carry out regular peer reviews of the stock assessments for the brown crab, velvet crab and scallop fisheries. Expected score: 80</p>
Client action plan	<p>Annual Surveillance 1. The identification of two suitably qualified individuals will be carried out and they will be contacted to determine if they are willing to undertake a peer review of the stock assessments. This will be carried out by the NAFC Marine Centre. Budget will be identified for reimbursing peer reviewers – SSMO and NAFC Marine Centre. The stock assessments will be collated in such a way as to provide a document which can be circulated for peer review (this is not currently the case due to the move to a more interactive reporting and management approach).</p> <p>Annual Surveillance 2: A first peer review will have been completed</p>

	Annual Surveillance 3: The peer review process including incorporation of recommendations will be fully integrated into the management plan and its implementation and included in the annual budgeting processes.
Consultation on condition	SSMO and NAFC Marine Centre will work jointly on meeting the condition.

Recommendations

Recommendation 1. PI 1.1.2

The reference points should be standardised for season, fishing area and vessel effects to allow more consistent comparison with standardised stock indicators.

Recommendation 2. PI 1.2.4.

Uncertainty around annual stock indicator values should be evaluated using either standard statistical methods or through computer-intensive methods such as boot-strapping

Appendix 2 Peer Review Reports

Peer Reviewer A

Summary of Peer Reviewer Opinion

<i>Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?</i>	Yes/No Partial	CAB Response
<p><u>Justification:</u></p> <p>Generally, yes but there were a couple of areas where I think the assessment team could have provided better justifications for their scoring. In these areas, it appears the scoring has been higher than possibly warranted, although more information may justify the higher scores currently given. In this respect I point particularly to P1 for Velvet Crab and Brown Crab and P2 for lobster as a retained species.</p> <p>With respect to P2, there has been a number of surveys and research cruises over the years where observers have been on board vessels that are fishing in otherwise commercial manner (both creel and dredge). In the justifications, I do not think enough emphasis has been put on this information (I know it is not incorporated into the main database yet) as a way of verifying the information that is recorded in the fisher's logbooks. Where independent information supports the logbook data this should be stated to strengthen the arguments.</p> <p>One of the major issues with scallop dredging is potential impact on the benthic habitat, particularly sensitive or vulnerable habitat types. It would appear that there is considerable spatial information available on seafloor habitat type and the footprint of fishing which would allow this issue to be better (more quantitatively) addressed than it currently is. It appears that this work has yet to be done and therefore was not available to the assessors. I believe the fishery would benefit if these analyses were performed.</p> <p>In addressing the specific issues outlined below, it may be that some of the scoring and hence conditions might change.</p>		

<i>Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe? [Reference: FCR 7.11.1 and sub-clauses]</i>	Yes	CAB Response
<p><u>Justification:</u> Yes – as they currently stand the conditions are appropriate</p>		

If included:

<i>Do you think the client action plan is sufficient to close the conditions raised? [Reference FCR 7.11.2-7.11.3 and sub-clauses]</i>	Yes/No	CAB Response
<p><u>Justification:</u></p>		

Yes – as the conditions currently stand.

Performance Indicator Review

Table 5 P1 Review for UoC1 Brown Crab:

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.1.1	Yes	No	N/A	<p>I am concerned with the scoring of 1.1.1a at SG100, given that the stock status LRP is based on unstandardised LPUE from a single point in the fishery 15 years ago.</p> <p>Since this time, there has been significant changes in the fishery including sounder seabed mapping to enable improved targeting and recent changes to the fishing gear from predominantly wooden pots to "metal, or increasingly plastic, with nylon netting". Both of these noted changes in the fishery has potentially changed (increased?) fishing efficiency. The LRP is set at the lowest historically recorded LPUE on the assumption that "the stock has demonstrably recovered from that lowest point". If there has been efficiency increases in the fishery, similar current LPUE levels could be achieved at lower stock sizes.</p> <p>This situation could be addressed by using</p>	<p>The peer reviewer comments that increases in efficiency in the fishery through technological advances and changes in gear design may result in the achievement of current LPUE levels at lower stock levels, thereby casting some doubt on the utility of the current limit reference point. It should be noted however that the technological advances and changes in gear design described by the peer reviewer occurred long before the start of collection of detailed LPUE data for this fishery and so would not be expected to have any impact on the recent trends in LPUE. The client and fishers confirm that the brown crab fishery is very habitat specific and that in recent years there have not been any new fishing areas which were previously unexploited. Additional text has been added to section 3.4 to clarify that there have been no recent changes in fishing practices.</p> <p>The assessment team agrees with the peer</p>

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				<p>standardised LPUE in the reference points or by building some level of precaution into the LRP. It is understood that stanadrised LPUE analyses have previously been conducted but not used in the development of reference points.</p> <p>With reference to 1.1.1a therefore, given current LPUE is well above the LRP, it could be accepted that it is "highly likely" that the stock is above the point where recruitment would be impaired (SG80) but I question whether "there is a high degree of certainty" about this (SG100).</p>	<p>reviewer that evaluation of changes in LPUE would be improved by the use of standardised LPUE in the reference points and made a recommendation to that effect.</p> <p>Given that there have been no significant changes in fishing practices during the time series of LPUE data used in the assessment of brown crab, and that both stock indicators are above the TRP thereby meeting SG80 for 1.1.1b, the assessment team considers that there is a high degree of certainty that the stock is above the LRP and that recruitment is not impaired. The score for 1.1.1a is unchanged.</p>

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.1.2	Yes	NO	N/A	<p>Similar to detail provided in 1.1.1a above, I am concerned with the scoring of 1.1.2a regarding the appropriateness of the LRP.</p> <p>The argument that the stock status LRP is related to a level where recruitment is not impaired is not clear. The stock status LRP is based on unstandardised LPUE from a single point in the fishery 15 years ago, where it is noted that there has been efficiency increases in the fishery that would make this LRP less precautionary over time.</p> <p>It has also been suggested (Hamilton et al 2016) that "seasonal cycles in LPUE are linked not only to absolute temperatures, but to biological processes that also follow seasonal cycles, such as moulting and reproduction". Thus, long-term changes/cycles in environmental conditions may also impact fixed unstandardised LPUE as a LRP?</p>	<p>As noted above in relation to PI 1.1.1, any technological advances and changes in gear design occurred long before the start of collection of detailed LPUE data for this fishery and so there have been no observed changes in fishing practices that would have made the LRP less precautionary over time.</p> <p>The assessment team believe therefore that the current LRP is set above the level at which there is an appreciable risk of impairing reproductive capacity thereby meeting SG80, but the lack of standardisation of the reference points means that precautionary issues have not been considered and SG100 is not met. The score for 1.1.2b is unchanged, but the assessment team recommended that reference points should be based upon standardised data.</p> <p>There may be seasonal cycles in LPUE of crustacean species linked to moulting and reproductive cycles, and changes in environmental conditions might impact unstandardised LPUE reference points. The assessment team agrees that in the future it might be worthwhile developing seasonal as well as annual LPUE reference points.</p>

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.1.3	N/A	N/A	N/A		
1.2.1	Yes	Yes	N/A		
1.2.2	Yes	Yes	N/A		
1.2.3	Yes	Yes	N/A	The justification would be improved if there was a statement or estimate about how many hobby fishermen were likely involved in the fishery – not just about the maximum number they can take.	There is no accurate information available on the number of hobby fishermen, but the maximum daily limit will ensure that even with a large number of hobby fishermen, the overall catch by hobby fishermen would still be small in comparison with the catch of commercial fishermen.
1.2.4	Yes	No	N/A	1.2.4d is rated as Y (met) but the text says it is not met. It should be changed to N (not met).	The error in the scoring table has been corrected.

Table 6 P1 Review for UoC2 Velvet Crab:

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.1.1	Yes	No	N/A	<p>1.1.1a is about stock levels that may impair recruitment. The major indicator of stock size for this fishery is mean LPUE. Most of the other indicators only have weak (if any) relationship to stock size.</p> <p>For example, just because mean effort during 2016 has reduced to the TRP (a reference point which does not appear to be appropriate – see below) does not provide any indication of stock size in relation to recruitment.</p> <p>To use this and other indicators to support the statement “All of the evidence.....provides sufficient justification to conclude that the stock is highly likely to be above the point where recruitment would be impaired” is not appropriate rationale.</p>	<p>The assessment team agrees that indicators other than mean LPUE have only a weak relationship to stock size. However sex ratio can be an important indicator of stock size as this is essentially a male-only fishery, and so any decline in the ratio of males to females may be an indicator of decline in stock size. In addition, 1.1.1a considers whether recruitment has been impaired, so any information on, for example, the numbers of berried females or changes in size distribution because of low numbers of the smallest crabs will be an indirect indicator of whether recruitment has been impaired.</p> <p>The peer reviewer comments that increases in efficiency in the fishery through technological advances and changes in gear design may result in the achievement of current LPUE levels at lower stock levels, thereby casting some doubt on the utility of the current limit reference point. It should be noted however that the technological advances and changes in gear design</p>

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				<p>The argument that the stock status LRP is related to a level where recruitment is not impaired is not clear. It is based on unstandardised LPUE from a single point in the fishery 13 years ago.</p> <p>Since this time, there has been significant changes in the fishery including sounder seabed mapping to enable improved targeting and recent changes to the fishing gear from predominantly wooden pots to "metal, or increasingly plastic, with nylon netting". Both of these noted changes in the fishery has potentially changed (increased?) fishing efficiency. The LRP is set at the lowest historically recorded LPUE on the assumption that "the stock has demonstrably recovered from that lowest point". If there has been efficiency increases in the fishery, similar current LPUE levels could be achieved at lower stock sizes.</p> <p>This situation could be addressed by using standardised LPUE in the reference points or by building some level of precaution into the</p>	<p>described by the peer reviewer occurred long before the start of collection of detailed LPUE data for this fishery and so would not be expected to have any impact on the recent trends in LPUE. The client and fishers confirm that velvet crabs have a very limited distribution close to the shore in shallow water, and the areas targeted by fishermen will not have changed substantially in the period covered by SSMO log books. Additional text has been added to Section 3.4 to clarify that there have been no recent changes in fishing practices.</p> <p>The assessment team agrees with the peer reviewer that evaluation of changes in LPUE would be improved by the use of standardised LPUE in the reference points and made a recommendation to that effect.</p> <p>The additional information provided by NAFC scientists has been itemised within the rationale, and clarification has been provided on why any information might support the justification that recruitment has not been impaired.</p>

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				<p>LRP. It is understood that stanadrised LPUE analyses have previously been conducted but not used in the development of reference points.</p> <p>In the justification it asys that "NAFC scientists provided additional information that suggests that there is currently no risk of recruitment impairment in the velvet crab fishery". Please clearly state what information this is and how it relates to justification that the stock is above a level where recruitment may be impaired. Discussion about, size frequency, proportion berried, fleet effort etc do not really support this statement</p>	

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.1.2	Yes	No	N/A	<p>The argument that the stock status LRP is related to a level where recruitment is not impaired is not clear. The stock status LRP is based on unstandardised LPUE from a single point in the fishery 13 years ago, where it is noted that there has been efficiency increases (Sounders , potin the fishery that would make this LRP less precautionary over time.</p> <p>Aside from the stock LPUE limit, I am also concerned that the fleet effort indicators for velvet crab may not be appropriate. The limit referenece point is set at the maximum value in 2009 yet this level of fishing for a couple of years had an obvious negative impact on the LPUE indicator as well as the size and sex ration indicator. I would suggest that this LRP is too high. I also had difficulty understanding the rationale and calculation of the effort TRP as 20% of the mean from 2006-2010 inclusive. 1) Why would you include in your average two years that so obviously impacted the stocks? 2) I can not understand how the effort TRP is calculated but it does not appear to be 20% of the mean effort levels from 2006-10 (~ 200K, 230K, 350K, 500K and 490K respectively = 1,770K with a mean of 295K</p>	<p>As noted above in relation to PI 1.1.1, any technological advances and changes in gear design occurred long before the start of collection of detailed LPUE data for this fishery and so there have been no observed changes in fishing practices that would have made the LRP less precautionary over time.</p> <p>The assessment team believe therefore that the current LRP for LPUE is set above the level at which there is an appreciable risk of impairing reproductive capacity thereby meeting SG80 for 1.1.2b, but the lack of standardisation of the LPUE reference points means that precautionary issues have not been considered and SG100 is not met. The score is unchanged but a recommendation has been made that reference points should be based upon standardised data.</p> <p>SSMO determined reference periods for the fishing effort indicator based upon the same time period as the other stock indicators. The LPUE and size and sex ratio indicator had already started to decline before 2009, so it is not clear that the decline in stock was wholly due to the high fishing effort in 2009-2011. However the assessment team agrees that the fishing effort LRP and TRP are potentially too high and has made a recommendation that the effort reference points should be reviewed as soon as possible. As described in section 3.5.5, the TRP is not calculated as a simple 20% of the mean value, but the TRP is fixed at 20% of the distance between the minimum value and the mean value within the time frame, which produces a more precautionary TRP.</p>



Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.1.3	Yes	No		<p>Where is the evidence of rebuilding? LPUE has been declining since 2014.</p> <p>What is the rebuilding timeframe? I can not see this stated anywhere.</p> <p>Without the above it is difficult to understand how this PI has been scored at all under 1.1.3b.</p> <p>Based on what is presented I can not see any information which supports that the rebuilding will be achieved in the shortest possible timeframe (SG100). There is just a statement of age at maturity and an assumption about significant reduction in fishing effort.</p> <p>With respect to 1.1.3c, the information provided supports SG60. I do not see evidence of prior performance or simulation to support scoring of SG80.</p>	<p>The assessment team agrees that the most recent stock assessment of velvet crabs does not provide any evidence that the rebuilding strategy is rebuilding stocks despite the observed significant reduction in fishing effort targeted at velvet crabs. SIc has therefore been rescored at 60.</p> <p>The Client's original implicit aim was to rebuild the stock within the shortest possible timeframe. However there have been significant problems with one element of the rebuilding strategy, the mandatory use of escape gaps in all creels not targeted at velvet crabs, and so the assessment team has now concluded that an implicit time frame of 5 years for the rebuilding strategy is more appropriate. The score for SIb has been reduced from 100 to 80.</p> <p>The overall score for PI 1.1.3 has now been revised to 70 and a condition is raised.</p>

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.2.1	Yes	No	N/A	<p>I agree with the scoring and rationale of 1.2.1 c, d & e. I question the support for scoring SG100 for 1.2.1a and SG80 for 1.2.1b. Apart from the increase in LPUE (the key stock indicator) in 2014 it has declined every year since 2007 and has continued to decline in 2015 and 2016 despite being under a rebuilding strategy implemented in 2013.</p> <p>All indicators have been amber or red for the last six years (exception of mean sex ratio in 2014) in a species that recruits to the fishery at 3yo and lives to 6yo.</p> <p>There was effort reduction introduced in 2013 through the 240 limit on creels together with increased summer closure period. They would have been expected to achieve stock management objectives (meeting SG60 of 1.2.1a) but do not appear to have achieved the objective of rebuilding to the TRP. It is not clear that there has been subsequent "responsive" (SG80) management measures introduced (landing size, spatial closures or</p>	<p>Scoring issue 1.2.1a evaluates whether the harvest strategy is responsive to the state of the stock (there are HCRs in place) and whether it is designed to achieve stock management objectives (there are a series of elements of the harvest strategy in place designed to control exploitation rates), not whether the harvest strategy is achieving its objectives (which is covered by SIb). The score for SIa is unchanged.</p> <p>For 1.2.1b, there is clear evidence that the harvest strategy is achieving its objective of maintaining the stock above the point where recruitment would be impaired. The stock indicators are not currently at the target reference point (TRP), but when the LPUE stock indicator recently dropped below the (then) TRP, management measures were introduced under the harvest control rules to rebuild the stock. The re-building plan is still in operation and one element of the rebuilding plan has only just been implemented. However the most recent stock assessment showed that fishing effort had</p>

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				temporal closures) although there has however been implementation of more monitoring (surveys). Prior experience would have suggested that the harvest strategy would likely work (meeting 1.2.1b SG60) but with a number of the indicators still declining, there is not clear evidence provided that the harvest strategy is achieving its objective.	been reduced significantly and that the harvest control rules were therefore successful in reducing exploitation rate. The SG80 is met and although there is evidence currently available that the harvest strategy is achieving its objective of maintaining the stock above the point where recruitment would be impaired, it may be a few more years before the rebuilding plan has provided stronger evidence that the harvest strategy is maintaining the stock fluctuating around the TRP.
1.2.2	Yes	Yes	N/A		
1.2.3	Yes	Yes	N/A		
1.2.4	Yes	Yes	N/A	Can some recruitment index be developed based on the proportion of undersized crabs be developed?	The Client confirms that a recruitment index could be developed based on the proportion of undersized crabs, but to be fully effective this would require additional fisheries-independent sampling.

Table 7 P1 Review for UoC3 Scallop:

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.1.1	Yes	Yes	N/A		
1.1.2	Yes	Yes	N/A		
1.1.3	N/A	N/A	N/A		
1.2.1	Yes	Yes	N/A		

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.2.2	Yes	No	N/A	<p>One of the major uncertainties in scallop stocks and assessments is the patchiness and spatial variability of population structure between beds. There is obvious potential for hyperstability in LPUE if the spatial dynamics of the fleet is not considered (ie serial depletion of beds by the fleet moving from bed to bed and fishing them down).</p> <p>It is not clear in the justification of SG80 for 1.2.2b how this issue is addressed.</p>	<p>The spatial distribution of scallops is taken into account by the HCRs. LPUE information is available by area for the fishery, and even if the overall LPUE is above the TRP, management action will be triggered if the LPUE drops below the LRP in two or more sub-areas. If either of the reference points falls below the TRP, then spatial closures can be implemented, and the HCRs specify clearly that other information, such as that from the regular scallop stock surveys, which provide estimates of stock biomass by area, can be used in determining appropriate management action. So whilst serial depletion is not explicitly considered within the HCRs, the assessment team concluded that uncertainty due to spatial variations in catch rates and stock biomass is taken into account in the HCRs and that SG80 for 1.2.2b is met therefore. Additional text has been added to the rationale.</p>
1.2.3	Yes		N/A		

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.2.4	Yes	No	N/A	<p>I would suggest that more than for the crab fisheries, a patchy sedentary species such as scallops does require a spatial component in the assessment in order to take uncertainty into account (SG80 1.2.4.c).</p> <p>1.2.4d has been scored Y (SG100) yet the text says SG100 has not been met.</p>	<p>We agree with the peer reviewer that management of scallops requires a spatial component. Whilst we note under 1.2.4a that there is as yet no spatially-explicit stock assessment model, spatial variation is taken into account in the HCRs through the triggering of management action when there is a decline in LPUE in two or more areas of the fishery even if the overall LPUE is above the TRP. In addition, regular scallop stock surveys may identify local depletion and this can also be taken into account in the HCRs through, for example, spatial closures of the fishery. The score for Slc is unchanged.</p> <p>The error in the scoring table has been corrected.</p>

Table 8 P2 Review for Creel Fishery (UoCs 1 Brown Crab and 2 Velvet Crab):

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.1.1	Yes	No	N/A	I understand that lobster stock status is not reassessed as under P1 in this report, but I am not sure that just referring back to the 2012 assessment is sufficient justification for lobster achieving SG80 for 2.1.1a, particularly when lobster P1 assessment in 2012 failed to achieve SG80. Has there been any recent assessment of the lobster stocks?	Additional rationale is added to explain that since 2012 the LPUE of lobsters has increased and landings of lobster have been a larger proportion of catches which supports the conclusion that the lobster stock has not decreased and that the stock is still within biologically based limits.

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.1.2	Yes	No	N/A	<p>I do not see the evidence of the particular strategy for managing lobster, identified as a high-value main retained species. I think this needs to be outlined in this section.</p> <p>Also, it is scored at SG100 for 2.1.2a but the remaining 2.1.2 scoring issues refer to the strategy as a "partial strategy".</p>	<p>In the scoring rationale several measures aimed at controlling the lobster catches are mentioned. It is correct to comment that these measures do not form a strategy. The scoring rationales have been amended to express that there is only a partial strategy in place. Consequently the score of 2.1.2. has been reduced from 95 to 80.</p> <p>The comment is correct. The strategy can only be considered a partial strategy since the harvest control rules only consider main retained species. As a consequence SG100 scoring issues can not be met and now a score of 80 is awarded.</p>
2.1.3	Yes	Yes	N/A		
2.2.1	Yes	Yes	N/A		
2.2.2	Yes	Yes	N/A		

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.2.3	Yes	Yes	N/A		
2.3.1	Yes	No	N/A	<p>The justification states that otters can get caught and whales and turtles can become entangled in the ropes. Incidences of this occurring are well detailed and appear to be rare based on fishermen's logbook reports.</p> <p>Independent verification about the low level of capture is presumably available from the surveys but is not mentioned.</p> <p>Regardless of the above, there is no mention of what the national / international requirements or limits for these ETP species are, so it is very difficult for the reader to determine whether the catches are within these limits. This needs to be addressed to score 2.3.1a as SG100.</p>	<p>Indeed it is true that no incidents with the catch of otters or the entanglement of whales is recorded in the independent surveys. This has now been added to the rationale of 2.3.1.</p> <p>In the rationale it is concluded now that the effects of the fishery on ETP species are negligible. The national and international requirements for these species are that they are fully protected from intentional catch or harm. There are no quantitative limits set therefore.</p>
2.3.2	Yes	Yes	N/A		

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.3.3	Yes	Yes	N/A		
2.4.1	Yes	Yes	N/A		
2.4.2	Yes	Yes	N/A		
2.4.3	Yes	Yes	N/A		
2.5.1	Yes	Yes	N/A		
2.5.2	Yes	Yes	N/A		
2.5.3	Yes	Yes	N/A		

Table 9 P2 Review for Scallop Dredge Fishery (UoC 3 Scallop):

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.1.1	Yes	Yes	N/A		
2.1.2	Yes	Yes	N/A		
2.1.3	Yes	Yes	N/A		
2.2.1	Yes	Yes	N/A		
2.2.2	Yes	Yes	N/A	I can see no reference as to why scallop fishing is under a night time curfew.	Reference inserted: "Scallop fishing is under a night time curfew in order to reduce overall effort on the stocks."
2.2.3	Yes	Yes	N/A		
2.3.1	Yes	Yes	N/A		
2.3.2	Yes	Yes	N/A		

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.3.3	Yes	No	N/A	I think there is opportunity to mention the fishery independent surveys and observer data to verify and support the logbook data	
2.4.1	No	No	N/A	<p>The justification for 2.4.1a provides a lot of detail on the impacts of scallop dredging both in the Shetland fishery and in scallop fisheries around the world. It concludes that "scallop dredging can have significant impact on habitats and biota.</p> <p>It further states that Habitat seabed types, biotopes and sensitive habitats in the waters around the Shetland Islands have been mapped as part of the Shetland Islands' Marine Spatial Plan.</p> <p>There is also good information on the spatial extent of the dredge fishery.</p> <p>Despite this good spatial information on both fishery and habitats, the justification for the</p>	<p>Reference to "Shelmerdine et al., 2014" has been added.</p> <p>Further rationale is added to explain that all areas of sensitive seabed which have been identified under the marine spatial plan, and which are classified as beds following survey, have been closed to scallop dredging. The quote included by the peer reviewer is out of date</p>

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				<p>scoring (SG80) is poor apart from the statement that horse mussel and maerl beds are closed to dredging.</p> <p>Given the available data, it would appear to be a fairly simple process to overlay the fishing footprint on the sensitive habitat spatial maps to provide quantified information on potential impact of dredge fishing.</p> <p>I could not find reference to :</p> <p>Shelmerdine and Robinson (2013) Assessment of the appropriateness of areas closed to protect priority marine features from scallop dredging around Shetland.</p> <p>This document has important information that would assist in the rationale, including the following:</p> <p>"As a result the corresponding closed areas originally established by the SSMO were either not fully encompassing the UK BAP</p>	

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				habitats located at the sites or were not protecting any UK BAP habitats (none present). Of the 20 sites surveyed, 12 were found to have either M. modiolus, maerl, or both; nine of these contained a priority feature but only two had a closed area which completely encapsulated the full extent of the feature. Alteration or removal of the boundaries of the existing closed areas is therefore appropriate and recommendations for this process are included. Further refinement of boundary areas may be warranted after consultation and additional focussed surveys".	
2.4.2	Yes	Yes	N/A		
2.4.3	Yes	Yes	N/A		
2.5.1	Yes	Yes	N/A		

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.5.2	Yes	Yes	N/A		
2.5.3	Yes	Yes	N/A		

Table 10 P3 Review for SSMO Brown Crab, Velvet Crab and Scallop Fishery:

3.1.1	Yes	Yes	N/A		
3.1.2	Yes	Yes	N/A		
3.1.3	Yes	Yes	N/A		
3.2.1	Yes	Yes	N/A		
3.2.2	Yes	Yes	N/A		
3.2.3	Yes	No	N/A	3.2.3c relates to fishers compliance with regulations including reporting of catches. There is evidence that fishers comply with reporting of landings, but to meet SG100 further evidence is required to demonstrate the compliance with reporting of bycatch and interactions with ETP species.	Added text re. reporting on ETP interactions: The SSMO also provided evidence of the Code of Conduct relating to ETP interactions, including the reporting of all incidents. All interactions are recorded in the SSMO database, but no interactions have occurred in recent years.
3.2.4	Yes	Yes	N/A		

Optional: General Comments on the Peer Review Draft Report (including comments on the adequacy of the background information if necessary) can be added below and on additional pages

Peer Reviewer B

Summary of Peer Reviewer Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	Yes	CAB Response
I FULLY AGREE WITH THE RECOMMENDATION TO RECERTIFY THE FISHERY; HOWEVER, CARE SHOULD BE TAKEN TO FULLY RESPOND TO MSC FCR 1.3 AND CR 2.0 REQUIREMENTS WHILE PROVIDING A GOOD PRESENTATION OF THE EVIDENCE WHICH IS UNDERSTANDABLE BY ALL STAKEHOLDERS.		

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe? [Reference: FCR 7.11.1 and sub-clauses]	Yes	CAB Response
WITH THE CAVEAT THAT THE MILESTONES ARE OVERLY PRESCRIPTIVE.		<u>We disagree – the incremental steps need to be clear enough to gauge progress.</u>

If included:

Do you think the client action plan is sufficient to close the conditions raised? [Reference FCR 7.11.2-7.11.3 and sub-clauses]	Yes	CAB Response
THE PLAN IS SOUND.		

Performance Indicator Review

Please complete the appropriate table(s) in relation to the CAB's Peer Review Draft Report:

- For reports using one of the default assessment trees (general, salmon or enhanced bivalves), please enter the details on the assessment outcome using Table 5.
- For reports using the Risk-Based Framework please enter the details on the assessment outcome at

- .
- For reports assessing enhanced fisheries please enter the further details required at Table 13.

Table 11 For reports using one of the default assessment trees:

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
VARIOUS	Rather than repeat the justification for all the PIs where it may be relevant, please note "MSC CR 1.3 27.10.6 To contribute to the scoring of any PI, the team shall verify that each scoring issue is fully and unambiguously met. 27.10.6.1 Rationale shall be presented to support the team's conclusion. 27.10.6.2 The rationale shall make direct reference to every scoring issue and whether or not it is fully met".				
1.1.1					
BROWN	YES	YES	NA	NOT RELEVANT	
VELVET	YES	YES	CONDITION ARTICULATED THRU PI 1.1.3 AS ALLOWED BY MSC	NOT RELEVANT	
SCALLOP	YES	YES	NA	NOT RELEVANT	
1.1.2					

BROWN	YES	YES	NA	NOT RELEVANT		
VELVET	YES	YES	NA	NOT RELEVANT		
SCALLOP	YES	YES	NA	NOT RELEVANT		
1.1.3						
BROWN	PI 1.1.3 WAS NOT SCORED AS P1.1.1 = 90					
VELVET	NO	NO		<p>IS THERE EVIDENCE THAT the current rebuilding strategy in place (S/C) HAS BEEN implemented with the aim of rebuilding the stock toward the target reference point in the shortest possible timeframe?</p> <p>DO the reduction in fishing effort and the observed compliance of the vessels with the new regulations PROVIDE EVIDENCE THAT THE REBUILDING STRATEGIES ARE REBUILDING STOCKS, AS OPPOSED TO SHOW RESPECT FOR THE MEASURES THAT COMPRISE THE STRATEGY?</p>	<p>The Client's original implicit aim was to rebuild the stock within the shortest possible timeframe. However there have been significant problems with one element of the rebuilding strategy, the mandatory use of escape gaps in all creels not targeted at velvet crabs, and so the assessment team has now concluded that an implicit time frame of 5 years for the rebuilding strategy is more appropriate. The score for SIb has been reduced from 100 to 80.</p> <p>The assessment team agrees that the most recent stock assessment of velvet crabs does not provide any evidence that the rebuilding strategy is rebuilding stocks despite the observed significant reduction in fishing effort targeted at velvet crabs. SIc has therefore been rescored at 60.</p> <p>The overall score for PI 1.1.3 has now been revised to 70 and a condition is raised.</p>	

SCALLOP	PI 1.1.3 WAS NOT SCORED AS P1.1.1 = 90				
1.2.1					
BROWN	YES	NO	NA	IS IT NOT THE CASE THAT A LARGE PART OF THE RATIONALE FOR Sia BELONGS TO P3 AND DOES NOT PROVIDE EVIDENCE THAT THE HARVEST STRATEGY IS LIKELY TO WORK AND IS ACHIEVING ITS OBJECTIVES?	The assessment team does not agree with the peer reviewer. National strategies and the SSMO Management Plan which include “implementing effective assessment methodologies for fishing at MSY”, “maintaining stocks at biologically sustainable levels”, “developing a coherent and effective harvest control strategy” and “carrying out appropriate monitoring” all appear to be directly relevant to the harvest strategy for each fishery.
VELVET	YES	NO	NA		
SCALLOP	YES	NO	NA		
1.2.2					

BROWN	YES	NO	NA	<p>COULD THE EXPERT CLARIFY THE APPROACH WHEN THE INDICATORS ARE IN RED.</p> <p>IF ONE OF THE TWO INDICATORS ARE BELOW LRP THERE MAY BE ADDITIONAL MEASURES I.E.</p> <p>Extending fishery closures Implementation of a research programme and monitoring. AND THE FISHERY WILL BE CLOSED Where the limit reference point (SIC) has been reached.</p> <p>IF IT IS THE CASE THAT BOTH LRP NEED TO BE IN RED BEFORE THE FISHERY IS CLOSED, IS IT JUSTIFIABLE TO CONCLUDE</p> <p>that the HCRs are well-defined and will and ensure that the exploitation rate is reduced as limit reference points are approached.</p> <p>I WOULD HAVE THOUGHT THAT THE MEASURES TAKEN UNDER AMBER CONDITIONS WOULD HAVE TO BE STRENGTHENED IF ONE LRP WAS IN RED. I AM NOT SURE HOW A RESEARCH PROGRAMME WOULD ENSURE THAT THE EXPLOITATION RATE IS REDUCED.</p>	<p>The following response relates to the implementation of the harvest control rules for all three fisheries:</p> <p>The harvest control rules prescribe action that must be taken when the stock indicators are in the amber zone (when one or more indicators are below the TRP), when one stock indicator is in the red zone, and when all stock indicators are in the red zone. In this way, the HCRs can be considered to be well-defined and will ensure that exploitation rate is reduced as limit reference points are approached, i.e. when the stock is in the amber zone. These measures are strengthened if one of the stock indicators is in the red zone, and the fishery is closed when all indicators are in the red zone.</p> <p>The peer reviewer correctly points out that there is some confusion for the brown crab HCRs in that the final line of the HCR states:</p> <p><i>“Where the limit reference point has been reached the fishery will be closed.”</i></p> <p>The assessment team believes that this is a typographical error and, in line with the HCRs for velvet crab and scallop, it should read:</p> <p><i>“Where all of the limit reference points have been reached the fishery will be closed.”</i></p> <p>The Client has been advised of this error.</p> <p>The Client accepts that a research programme does not ensure that the exploitation rate is reduced, but emphasises that additional data may be required to monitor the efficacy of additional management measures, and therefore it will be necessary to implement additional research and monitoring programmes as part of the measures triggered by the harvest control rules.</p>
-------	-----	----	----	---	---

VELVET	YES	NO	NA	NOTE THE COMMENTS FOR BROWN CRAB. GIVEN The current values of all stock indicators for the velvet crab fishery are below the target reference point (above the TRP for fishing effort). It cannot be concluded therefore that the stock is at or fluctuating around its target reference point and the SG80 is not met, triggering the scoring of PI 1.1.3 IT IS DIFFICULT TO ACCEPT THE JUSTIFICATION THAT TOOLS IN USE ARE APPROPRIATE AND EFFECTIVE IN ACHIEVING THE EXPLOITATION LEVELS REQUIRED UNDER THE HARVEST CONTROL RULES	See response to comments on brown crab. SI 1.2.2c. Harvest control rules have been triggered in recent years for the velvet crab fishery, and the most recent stock assessment for velvet crabs shows that fishing effort has been reduced significantly since 2012, providing an indication of the achievement of exploitation rates required under the harvest control rules. The assessment team concludes that the SG80 is met. The scoring rationale has been revised accordingly.
SCALLOP	YES	NO	NA	NOTE THE COMMENTS FOR BROWN CRAB.	See response to comments on brown crab.
1.2.3					
BROWN	YES	NO	NA	COULD THE EXPERT INDICATE THE COVERAGE OF Cross-checking of these three records of fishery removals by Marine Scotland Compliance. IS IT 100 % OR A SAMPLE? (THIS HAS IMPLICATIONS FOR CONSIDERATION OF THE VERACITY OF INFORMATION AS REQUIRED BY MSC CR 1.3 CB 2.7.3.)	Marine Scotland Compliance undertake cross-checking of log books, landings declarations and sales notes generated through the Registration of Buyers and Sellers (RBS) system from all vessels.
VELVET	YES	NO	NA		
SCALLOP	YES	NO	NA		
1.2.4					
BROWN	YES	YES	YES	NOT RELEVANT	

VELVET	YES	YES	YES	NOT RELEVANT	
SCALLOP	YES	YES	YES	NOT RELEVANT	
2.1.1	FOR ALL P2 PIs COVERING THE CREEL FISHERY, TO ENSURE COMPLIANCE WITH MSC FCR I THINK THAT A SEPARATE SCORE SHOULD BE SHOWN FOR THE TWO SPECIES AT THE END OF EACH SCORING TABLE. THE WAY THE SCORING TABLES ARE LABELLED IT IS DIFFICULT TO SEE THAT EACH REFERS TO THE TWO SPECIES. ALSO FOR CLARITY, WITHIN THE SCORING JUSTIFICATIONS, YOU MAY CONSIDER DEALING SPECIFICALLY WITH EACH UOA AND WHERE POSSIBLE SIMPLY REFER TO THE PREVIOUS RATIONALE (E.G. BROWN CRAB – SEE VELVET CRAB)				A separate score for both UoC1 Brown crab and UoC2 Velvet crab is now shown for both of these UoCs at the end of each scoring table. At the top of each table concerning the creel fishery it is now also shown that these tables concern both UoC1 and UoC2.
BROWN	NO	YES	NA	NOTE MSC CR 1.3 CB3.5.5 The team shall consider species used as bait in a fishery, if they are caught by the fishery under assessment or elsewhere under the Retained Species component in P2.	It has now been added to the scoring rationale that in this fishery waste from fish processors including spine, head and offcuts are used as bait and therefore no pressure is placed on any other fish or shellfish resources. As such there is no further need to consider species used as bait in this fishery under the Retained Species component in P2 as per CR 1.3 CB3.5.5.
VELVET	NO	YES	NA		It has now been added to the scoring rationale that in this fishery waste from fish processors including spine, head and offcuts are used as bait and therefore no pressure is placed on any other fish or shellfish resources. As such there is no further need to consider species used as bait in this fishery under the Retained Species component in P2 as per CR 1.3 CB3.5.5.
SCALLOP	YES	YES	NA	NOT RELEVANT	

2.1.2					
BROWN	NO	NO	NA	<p>Sla, Slc, Sld. CAN THE EXPERTS CLARIFY THE HARVEST STRATEGY IN PLACE TO MANAGE GREEN CRABS THAT ALLOWS THE FISHERY TO MEET SG100.</p> <p>MY READING OF THE TEXT INDICATES THAT GREEN CRAB IS NOT INCLUDED IN ALL ELEMENTS OF THE DEFINED STRATEGY. I.E. NO EVIDENCE IS PRESENTED TO SHOW THERE IS A MINIMUM LANDING SIZE FOR THE SPECIES, BRP, HCR, STOCK ASSESSMENT, COMPREHENSIVE INFORMATION. .</p>	<p>The comment is correct. The strategy can therefore only be considered a partial strategy since the harvest control rules only consider main retained species. As a consequence SG100 scoring issues can not be met and now a score of 80 is awarded.</p>
VELVET	NO	NO	NA		<p>The comment is correct. The strategy can therefore only be considered a partial strategy since the harvest control rules only consider main retained species. As a consequence SG100 scoring issues can not be met and now a score of 80 is awarded.</p>
SCALLOP	NO	YES	NA	<p>AS THERE ARE NO MAIN SPECIES A PARTIAL STRATEGY IS NOT NECESSARY,</p>	<p>The comment is correct. The rationales now reflect that there are no main retained species and that a partial strategy is not necessary and SG80 scoring issues are therefore met.</p>
2.1.3					
BROWN	NO	NO	NA	<p>Sib. THE JUSTIFICATION DOES NOT PROVIDE EVIDENCE THAT THE FISHERY MEETS SG100 (I.E. THERE IS NO MENTION OF GREEN CRAB).</p>	<p>The comment is correct. SG100b is not met since there is insufficient information to quantitatively estimate outcome status with a high degree of certainty for minor retained species. The score of 2.1.3 is reduced from 95 to 85.</p>

VELVET	NO	NO	NA		The comment is correct. SG100b is not met since there is insufficient information to quantitatively estimate outcome status with a high degree of certainty for minor retained species. The score of 2.1.3 is reduced from 95 to 85.
SCALLOP	NO	YES	NA	THERE ARE NO MAIN SPECIES.	The scoring rationales of SG80a and SG80c already state that there are no main retained species and that SG80a and SG80c are therefore met.
2.2.1					
BROWN	YES	YES	NA	NOT RELEVANT	
VELVET	YES	YES	NA		
SCALLOP	NO	YES	NA	<p>WHILE IT IS CLEAR THAT FISHERIES SHOULD NOT FACE DOUBLE JEOPARDY IN SCORING. COULD THE EXPERTS PROVIDE A STRONGER RATIONALE FOR NOT CONSIDERING HORSE MUSSEL UNDER 2.2.2.</p> <p>THIS IS EXPECIALLY THE CASE AS IT APPEARS THAT IN C2.4 CONSIDERATION OF HORSE MUSSEL IS LIMITED TO 2.4.2.</p>	The rationale is amended and it is now explained that horse mussel beds are closed for fishery and that main parts of the horse mussel stock are therefore protected from fishing impact and it is therefore considered highly likely that horse mussels are within biologically based limits.
2.2.2					
BROWN	YES	YES	NA	NOT RELEVANT	
VELVET	YES	YES	NA		

SCALLOP	NO	NO	NA	SEE COMMENT UNDER 2.2.1. A LARGE PART OF THE SCORING RATIONALE IS A CUT AND PASTE OF THE SCORING GUIDELINE WHICH IS GENERALLY FROWNED UPON BY MSC. WHY IS THE PARTIAL STRATEGY EXPECTED TO MAINTAIN THE MAIN BY-CATCH SPECIES etc?	See response at 2.2.1 The scoring rationale contains parts of the scoring guidelines to reflect which parts of the scoring guidelines are met. The rationale of SG80a is amended to express more clearly why SG80 is met.
2.2.3					
BROWN	YES	YES	NA	NOT RELEVANT	
VELVET	YES	YES	NA		
SCALLOP	NO	YES	NA	SEE COMMENT UNDER 2.2.1	See response at 2.2.1
2.3.1					
BROWN	NO	YES	NA	ON-LAND "birds & otters" – WHICH ETP SPECIES?	All birds are protected under the EU bird

VELVET	NO	YES	NA	WHAT IS THE NATIONAL REQUIREMENT FOR MINKE WHALES?	<p>Directive. Otters are protected under the EU Habitat Directive. This has now been added to the rationale.</p> <p>Minke whales are fully protected under the Wildlife and Countryside Act 1981, CITES and the Habitat Directive. This information has now been included in the rationale for 2.3.1.</p> <p>In the rationale it is concluded now that the effects of the fishery on ETP species are negligible. The national and international requirements for these species are that they are fully protected from intentional catch or harm. There are no quantitative limits set therefore.</p>
SCALLOP					
2.3.2					
BROWN	NO	YES	NA	WHY DO THE EXPERTS CONSIDER THAT THE STRATEGY IS NOT COMPREHENSIVE?	<p>The conclusion that the strategy is not comprehensive has been reconsidered by the team. Since it can be concluded that the strategy in place is designed to achieve national and international requirements for the protection of ETP species it is now concluded that SG100a is met and the score has been increased from 90 to 95.</p>
VELVET	NO	YES	NA		
SCALLOP	YES	YES	NA	NOT RELEVANT	
2.3.3					

BROWN	YES	YES	NA	NOT RELEVANT	
VELVET	YES	YES	NA		
SCALLOP	YES	YES	NA		
2.4.1					
BROWN	YES	YES	NA	NOT RELEVANT	
VELVET	YES	YES	NA		
SCALLOP	YES	NO	NA		A SPECIFIC RATIONALE PER SG IS NOT PRESENTED AND IT IS NOT CLEAR WHY THE FISHERY DOES NOT MEET SG100.
2.4.2					
BROWN	YES	YES	NA	NOT RELEVANT	
VELVET	YES	YES	NA		
SCALLOP	YES	YES	NA		
2.4.3					
BROWN	YES	YES	NA	NOT RELEVANT	
VELVET	YES	YES	NA		

SCALLOP	YES	YES	NA		
2.5.1					
BROWN	YES	NO	NA	THE SCORING GUIDEPOST FOR 2.5.1 DOES NOT DIFFERENTIATE BETWEEN "SOME EVIDENCE" AND "EVIDENCE". ACCORDINGLY, IS EVIDENCE NOT AVAILABLE TO SCORE THE FISHERY AT 100?	Since there is only one scoring issue at 2.5.1 the possibility exists to award a partial score. The rationale has been amended however to better explain why there is only limited evidence and that therefore a partial score has been given.
VELVET	YES	NO	NA		
SCALLOP	YES	YES	NA	NOT RELEVANT	
2.5.2					
BROWN	YES	YES	NA	NOT RELEVANT	
VELVET	YES	YES	NA		
SCALLOP	NO	NO	NA	THE EXPERTS DO NOT CONSIDER IF THE FISHERY MEETS Sid SG100.	Rationale is added to explain that SG100d is not met.
2.5.3					
BROWN	YES	YES	NA	NOT RELEVANT	
VELVET	YES	YES	NA		

SCALLOP	NO	YES	NA	TO JUSTIFY THE FISHERY NOT MEETING SG100 S1b WHICH INTERACTIONS MAIN INTERACTIONS HAVE NOT BEEN STUDIED?	An example has now been included in the rationale.
3.1.1	FOR ALL P3 PIs COVERING THE THREE SPECIES, TO ENSURE COMPLIANCE WITH MSC FCR I THINK THAT A SEPARATE SCORE SHOULD BE SHOWN FOR EACH SPECIES AT THE END OF EACH SCORING TABLE. ALSO FOR CLARITY, WITHIN THE SCORING JUSTIFICATIONS, YOU MAY CONSIDER DEALING SPECIFICALLY WITH EACH UOA AND WHERE POSSIBLE SIMPLY REFER TO THE PREVIOUS RATIONALE (E.G. BROWN CRAB – SEE VELVET CRAB)				Score now presented for each UoA specifically
BROWN	YES	NO	NA	COULD THE EXPERT REVIEW THE SCORE OF Sid. WOULD IT NOT BE THE CASE THAT THE EXISTING LICENSING SYSTEM PRESENTS A FORMAL COMMITMENT, BUT THE OVERALL APPROACH TO MANAGEMENT EMPHASISES THE PRIORITY OF SUSTAINABILITY OVER SOCIAL PARAMETERS (AS REQUIRED BY MSC),	Disagree and further text added: licensing is on an annual basis (ensuring capacity is in line with management objectives, rather than access for dependent people) and the Regulating Order can be revoked or not renewed.
VELVET	YES	NO	NA		
SCALLOP	YES	NO	NA		
3.1.2					
BROWN	YES	YES	NA	NOT RELEVANT	
VELVET	YES	YES	NA		
SCALLOP	YES	YES	NA		
3.1.3					
BROWN	YES	YES	NA	NOT RELEVANT	

VELVET	YES	YES	NA		
SCALLOP	YES	YES	NA		
3.1.4					
BROWN	YES	YES	NA	NOT RELEVANT	
VELVET	YES	YES	NA		
SCALLOP	YES	YES	NA		
3.2.1	COMPONENT 3.2 IS FISHERY SPECIFIC; THIS EMPHASISES THE NEED FOR SPECIFIC REFERENCE TO THE INDIVIDUAL SPECIES IN THE RATIONALES AND ALLOCATED SCORING				<p>The 3 fisheries are managed by SSMO & Marine Scotland Surveillance under exactly the same arrangements with joint documents outlining fishery-specific management (HCRs, licensing etc.). Therefore the scoring rationales and scores are the same across the UoAs for 3.2.1 to 3.2.5.</p> <p>This text has been inserted at the start of 3.2.1</p>
BROWN	NO	NO	NA	THE SCORING JUSTIFICATION MUST BE FISHERY SPECIFIC AND RECOGNISE THE POTENTIAL DIFFERENCE FOR APPROACH BETWEEN THE 3 DIFFERENT UOA. ON THAT BASIS IT IS NOT POSSIBLE TO REVIEW THE ALLOCATED SCORE.	See above
VELVET	NO	NO	NA		See above
SCALLOP	NO	NO	NA		See above
3.2.2					

BROWN	NO	NO	NA	THE SCORING JUSTIFICATION MUST BE FISHERY SPECIFIC AND RECOGNISE THE POTENTIAL DIFFERENCE FOR APPROACH BETWEEN THE 3 DIFFERENT UOA. ON THAT BASIS IT IS NOT POSSIBLE TO REVIEW THE ALLOCATED SCORE.	See above
VELVET	NO	NO	NA		See above
SCALLOP	NO	NO	NA		See above
3.2.3					
BROWN	NO	NO	NA	THE SCORING JUSTIFICATION MUST BE FISHERY SPECIFIC AND RECOGNISE THE POTENTIAL DIFFERENCE FOR APPROACH BETWEEN THE 3 DIFFERENT UOA. ON THAT BASIS IT IS NOT POSSIBLE TO REVIEW THE ALLOCATED SCORE.	See above
VELVET	NO	NO	NA		See above
SCALLOP	NO	NO	NA		See above
3.2.4					
BROWN	NO	NO	NA	THE SCORING JUSTIFICATION MUST BE FISHERY SPECIFIC AND RECOGNISE THE POTENTIAL DIFFERENCE FOR APPROACH BETWEEN THE 3 DIFFERENT UOA. ON THAT BASIS IT IS NOT POSSIBLE TO REVIEW THE ALLOCATED SCORE.	See above
VELVET	NO	NO	NA		See above
SCALLOP	NO	NO	NA		See above

Table 12 For reports using the Risk-Based Framework:

NOT RELEVANT

Table 13 For reports assessing enhanced fisheries:

NOT RELEVANT

Optional: General Comments on the Peer Review Draft Report (including comments on the adequacy of the background information if necessary) can be added below and on additional pages

THE BACKGROUND INFORMATION IS ADEQUATE BUT THE PRESENTATION COULD BE IMPROVED (E.G. SPECIES-SPECIFIC HEADINGS) TO MAKE IT MORE READABLE AND UNDERSTANDABLE. IT IS ALL A BIT CONFUSED.

Appendix 3 Stakeholder submissions

1. The report shall include:
 - a. All written submissions made by stakeholders during consultation opportunities listed in FCR 7.15.4.1.
 - b. All written and a detailed summary of verbal submissions received during site visits regarding issues of concern material to the outcome of the assessment (*Reference FCR 7.15.4.2*)
 - c. Explicit responses from the team to stakeholder submissions included in line with above requirements (*Reference: FCR 7.15.4.3*)

(REQUIRED FOR FR AND PCR)

2. The report shall include all written submissions made by stakeholders about the public comment draft report in full, together with the explicit responses of the team to points raised in comments on the public comment draft report that identify:
 - a. Specifically what (if any) changes to scoring, rationales, or conditions have been made.
 - b. A substantiated justification for not making changes where stakeholders suggest changes but the team makes no change.

(*Reference: FCR 7.15.5-7.15.6*)

Appendix 4 Surveillance Frequency

1. The report shall include a rationale for any reduction from the default surveillance level following FCR 7.23.4 in Table 4.1.
2. The report shall include a rationale for any deviations from carrying out the surveillance audit before or after the anniversary date of certification in Table 4.2
3. The report shall include a completed fishery surveillance program in Table 4.3.

Table 4.1 : Surveillance level rationale

Year	Surveillance activity	Number of auditors	Rationale
<i>e.g.3</i>	<i>e.g.On-site audit</i>	<i>e.g. 1 auditor on-site with remote support from 1 auditor</i>	<i>e.g. From client action plan it can be deduced that information needed to verify progress towards conditions 1.2.1, 2.2.3 and 3.2.3 can be provided remotely in year 3. Considering that milestones indicate that most conditions will be closed out in year 3, the CAB proposes to have an on-site audit with 1 auditor on-site with remote support – this is to ensure that all information is collected and because the information can be provided remotely.</i>

Table 4.2: Timing of surveillance audit

Year	Anniversary date of certificate	Proposed date of surveillance audit	Rationale
<i>e.g. 1</i>	<i>e.g. May 2014</i>	<i>e.g. July 2014</i>	<i>e.g. Scientific advice to be released in June 2014, proposal to postpone audit to include findings of scientific advice</i>

Table 4.3: Fishery Surveillance Program

Surveillance Level	Year 1	Year 2	Year 3	Year 4
<i>e.g. Level 5</i>	<i>e.g. On-site surveillance audit</i>	<i>e.g. On-site surveillance audit</i>	<i>e.g. On-site surveillance audit</i>	<i>e.g. On-site surveillance audit & re-certification site visit</i>

Appendix 5 Objections Process

(REQUIRED FOR THE PCR IN ASSESSMENTS WHERE AN OBJECTION WAS RAISED AND ACCEPTED BY AN INDEPENDENT ADJUDICATOR)

The report shall include all written decisions arising from an objection.

(Reference: FCR 7.19.1)