Marine Stewardship Council Full Assessment

Client Draft Report/Preliminary Draft Report (PDR)

For The

OSF Orkney brown crab creel fishery

Facilitated By the

Orkney Sustainable Fisheries (OSF)

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Foreword

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Glossary

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1. Executive Summary

This report sets out the details of the MSC assessment for the OSF Orkney brown crab creel fishery against the MSC Principles and Criteria for Sustainable Fisheries. The report details the background, results and justification of the fishery, performed by SAI Global.

The full assessment process began on May 30th , 2017.

The OSF Orkney brown crab creel fishery under assessment is defined by the UoA and UoC as follows.

UoA	
Target species	Brown crab, *Cancer pagurus*
Geographic area	FAO Major Fishing Area 27 Atlantic Northeast, Subarea 27.4.a Northern North Sea, ICES Division Iva. Orkney Islands (North of Scotland) waters within 12 nm UK Territorial Limit, with few larger fishing vessels fishing also outside the 12 nm Limit.
Stock	Orkney Islands brown crab stock
Fishing gear	Baited creel (pot)
Management system	European Commission through the Common Fisheries Policy Marine Scotland Orkney Sustainable Fisheries is the regional Inshore Fisheries Group for Orkney
Client group and other eligible fishers	Orkney Sustainable Fisheries (OSF) All the registered and licenced fishing vessels fishing brown crab with creel around Orkney Islands are OSF members. There are currently no other eligible fishers. Potential other eligible fishers would be any registered and licenced fishing vessels that is eligible to fish brown crab with creel around Orkney Islands waters that are not members of OSF.

UoC	
Target species	Brown crab, *Cancer pagurus*
Geographic area	FAO Major Fishing Area 27 Atlantic Northeast, Subarea 27.4.a Northern North Sea, ICES Division Iva. Orkney Islands (North of Scotland) waters within 12 nm UK Territorial Limit, with few larger fishing vessels fishing also outside the 12 nm Limit.
Stock	Orkney Islands brown crab stock
Fishing gear	Baited creel (pot)
Management system	European Commission through the Common Fisheries Policy Marine Scotland Orkney Sustainable Fisheries is the regional Inshore Fisheries Group for Orkney
Client group	Orkney Sustainable Fisheries (OSF)

SAI Global's assessment team includes Géraldine Criquet (Lead Assessor, Principle 2 and RBF expert), Julian Addison (Assessor, Principle 1 and RBF expert) and Tim Huntington (Assessor, Principle 3 expert). Short biographies are provided in section 2.

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Full assessment process and stakeholder consultation

Date	Purpose	Media
30/05/2017	Fishery Enters assessment	Notification on MSC website Direct email/letter
18/07/2017	Use of RBF	Notification on MSC website Direct email/letter
07/12/2017	Proposed peer reviewers	Notification on MSC website Direct email/letter
02/03/2018	Revised timeline and Notification of additional stakeholder consultation period	Notification on MSC website Direct email/letter

Strenghts and weaknesses

Strenghts	Weaknesses
● There is no evidence of recruitment overfishing in the Orkney brown crab stock ● Brown crab creels are highly selective with a low bycatch level ● Interactions with whales seem to be low enought not to represent serious threat for their conservation and recovery ● The UoA is highly unlikely to reduce structure and function of the commonly encountered habitats and VMEs to a point where there would be serious or irreversible harm ● OSF Observer, logbook, market sampling and succorfish programmes ● Robust governance and policy ● High level of compliance	● The harvest strategy is not responsive to the state of the stock ● Alternative measures to minimise UoA-related mortality of unwanted catch of the brown crab and the secondary species are not implemented ● Well defined harvest control rules are not in place ● Short and long-term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are not explicit within the fishery-specific management system.

Assessment results

Final Principle Scores

Principle	Score
Principle 1 – Target Species	**79 - FAIL**
Principle 2 – Ecosystem	87 - PASS
Principle 3 – Management System	89.6 - PASS

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Non-binding conditons

As per 7.21.2, where the CAB makes a decision not to award certification and fail the fishery, the report:

- 7.21.2.1 Shall not specify any mandatory conditions or defined actions that would need to be undertaken before the fishery could be reconsidered for certification in the future;
- 7.21.2.2 Shall outline draft and non-binding conditions for any PIs that score more than 60 and less than 80;
- Shall clearly specify that the conditions outlined are non-binding and serve to provide and indication of the actions that may be required should the fishery should have been certified.

Table below presents the non-binding and non-mandatory conditions for PIs with score more than 60 and less than 80 and drafted by the assessment team to provide an indication of the actions that the fishery may implement to address the issues identified.

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/NA)
1	Evidence should be provided that the harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving stock management objectives reflected in PI 1.1.1 SG80. Evidence should also be provided that alternative measures to minimise UoA-related mortality of unwanted catch of the target stock are implemented as appropriate.	**1.2.1**	**NA**
2	Evidence should be provided that well defined HCRs are in place that ensure that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock fluctuating around a target level consistent with (or above) MSY.	**1.2.2**	**NA**
3	Evidence should be provided that alternative measures to minimise UoA-related mortality of unwanted catch of main secondary species are implemented as appropriate.	**2.2.2**	**NA**
4	Evidence should be provided that 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-specific management system.	**3.2.1**	**NA**

Assessment team conclusion and determination

SAIG's assessment team determined that the OSF Orkney brown crab fishery does not conform with the MSC Fisheries Standard and therefore does not recommend certification to be awarded.

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2. Authorship and Peer Reviewers

2.1. Assessment Team

Dr. Géraldine Criquet (Lead assessor, Principle 2 and RBF expert.
Géraldine is an MSC approved Fisheries Team Leader for SAI Global - experienced fishery scientist in both Finfish and Shellfish fisheries, and ecosystems considerations. Géraldine holds a PhD in Marine Ecology (École Pratique des Hautes Études, France) which focused on coral reef fisheries management, Marine Protected Areas, fish ecology and ecosystem impacts. She worked 2 years for the Institut de Recherche pour le Développement (IRD) at Reunion Island for studying fish target species growth and connectivity between fish populations in the Indian Ocean using otolith analysis. She served as Consultant for FAO on a Mediterranean Fisheries Program (COPEMED) and developed and implemented during 2 years a monitoring program of catches and fishing effort in the Marine Natural Reserve of Cerbère-Banyuls (France). Géraldine is an experienced full time MSC Lead Assessor with SAI Global, successfully leading MSC certifications and assessment teams and acting as Principle 2 expert for multiple MSC Pre, Full and Surveillance audits including full assessments and surveillance audits of Canada American lobster trap fisheries.

Dr. Julian Addison (Principle 1 and RBF expert)
Julian 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 undertaken various MSC full assessment, 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.

Tim Huntington (Principle 3 expert)
Tim is a fisheries biologist with over 30 years' industry and consulting experience. His qualifications include a BSc (Hons) in Biological Sciences and MSc in Applied Fish Biology. He has worked in capture fisheries and aquaculture in over 60 countries worldwide, with a particular focus on Europe, the Middle East, Africa and Asia (including the Indian and Pacific Ocean countries). Following a number of industry and consulting posts, Tim has specialised in promoting sustainability in fisheries and aquaculture. This initially included working on a number of fisheries development projects for the Global Environment Facility, FAO and other agencies before focusing on the roles that eco-labelling can play in driving improved fishing practises and management. He has worked extensively with the MSC responsible fisheries programme, including leading pre-assessments, full assessments as well as chain of custody audits for a number of certification bodies including Acoura, Intertek, Tún, MacAlister Elliott and SCS. He also works with fisheries on fisheries improvement planning, using the MSC standard as a benchmark for baseline and incremental assessments.

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2.2. Peer Reviewers

The MSC's Peer Review College has compiled a shortlist of potential peer reviewers to undertake the peer review for OSF Orkney brown crab creel fishery which is in assessment process with the Conformity Assessment Body SAI Global.
Two peer reviewers will be selected from the following list:

Colin Bannister
Colin is a former fishery biologist, assessment scientist, and stock management advisor. Graduating in Zoology in 1964 he was appointed to the government Fisheries Laboratory, Lowestoft, UK, retiring in 2004 from what is now Cefas with 40 years experience of the dynamics and management of a wide range of finfish and shellfish stocks and fisheries. From 1964-1974 he studied the biology and assessment of flatfish stocks at Iceland and in the North Sea, obtaining a PhD in 1971. In 1975-76 he was seconded to Brussels to give specialist fisheries advice during the development of the EU Common Fisheries Policy. From 1981-2000 he was responsible for research, assessment, and advice on the management of coastal crustacean and molluscan fisheries in England and Wales, including the evaluation of pioneering lobster enhancement experiments around the UK. In 1999 he received the Walne Medal of the UK Shellfish Association for his contribution to shellfisheries management. In the 1990s, Colin was active in the International Council for the Exploration of the Sea as chair of the Shellfish Committee, Living Resources Committee, and the Consultative Committee, and in restructuring the ICES scientific and advisory processes. From 2001-2004, Colin managed the finfish team at Cefas Lowestoft, responsible for monitoring, assessment and advice for the fish resources of the NE Atlantic, assisting the Deputy Director with advice to senior officials and industry on EU stock recovery programmes. Colin remains professionally active in retirement, with MSC assessments and peer reviews, lecturing, higher degree examinations, plus the provision of reports and advice to the Shellfish Association of Great Britain, which he chairs. He received the Le Cren Medal of the Fisheries Society of the British Isles in 2014, and an Honorary D.Sc. from the University of Hull in 2015. He is the Buckland Foundation Professor for 2015, and an Emeritus Fellow at Cefas Lowestoft.

Andrew Hough
Marine Environmental Consultant. Andrew has a PhD in marine ecology from the University of Wales, Bangor (1987-90). He has been involved in marine, coastal and freshwater environmental management since 1991, including management of fishery impacts on ecosystems and marine conservation biology, principally in European inshore waters. He was manager of Moody Marine operations within Moody International Certification from 1999 to 2011 with particular responsibility for the implementation of MSC Certification procedures and development of MSC methodologies. He has acted as lead assessor on a large proportion of MSC pre assessments and main assessments during this time, and subsequently as team member and/or lead auditor for various assessments. This has involved stock assessment analysis, evaluation of ecosystem effects and management effectiveness of groundfish, pelagic and shellfish fisheries in various administrations around the world. He now works as a freelance environmental/fishery management consultant and auditor, consultancy projects include certification-related policy advice to the Association of Sustainable Fisheries.

Jim Andrews
Jim Andrews has over 20 years' experience working in marine fisheries and environmental management. His previous experience includes running the North Western and North Wales Sea Fisheries Committee as its Chief Executive from 2001 to 2005, and previously working as the SFC's Marine Environment Liaison Officer. During this time he was responsible for the regulation, management and assessment of inshore finfish and shellfish stocks along a 1,500km coastline. He has an extensive practical knowledge of both fisheries and environmental management and enforcement under UK and EC legislation. He has formal legal training & qualifications, with a special interest in the policy, governance and management of fisheries impacts on marine ecosystems. He

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has worked as an assessor and lead assessor on more than 20 MSC certifications within the UK, Europe, Asia, Australia and the Southern Ocean since 2007. He has assessed a wide range of fisheries including finned fish, shellfish, enhanced shellfisheries and also for several data-deficient fisheries requiring the use of the risk based framework (RBF). Jim has also carried out numerous MSC Chain of Custody assessments within the UK, and also several peer reviews of MSC assessments. In December 2015 he was appointed to serve on the North Western Inshore Fisheries and Conservation Authority by the UK Government.

Earl Geoffrey Dawe

Retired in 2015 following a 35-year research career with Fisheries and Oceans Canada which focused on the fisheries, biology, population dynamics, and ecology of cephalopods and crustaceans. Published 170 scientific/technical reports and journal articles (58 in the primary, peer reviewed literature) on various aspects of population biology and ecology as well as fishery resource assessment and management of both short-finned squid and snow crab. Research effort has most recently focused on ecosystem structure and functioning, particularly the relative effects of ocean climate versus predation on finfish and crustacean resources. Career included heavy involvement in the review and formulation of scientific advice for management of shellfish resources in Atlantic Canada as well as the advisory/consultative part of managing the Newfoundland and Labrador (NL) fisheries for short-finned squid and snow crab. Recently participated, as scientific advisor, in MSC certification of the NL snow crab fishery. Also recently served as peer reviewer in MSC certification of the Western Asturias octopus trap fishery.

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3. Description of the Fishery

3.1. Unit(s) of Assessment (UoA) and Scope of Certification Sought

3.1.1. UoA and Proposed Unit of Certification (UoC)

(ALL REPORTS EXCEPT PCR)

SAI Global confirms that the fishery entering assessment is within the scope requirements (FCR 7.4) for MSC fishery assessments [FCR 7.8.3.1].

- The target species is not an amphibian, a reptile, a bird or a mammal;
- Fishing operations are not conducting using destructive fishing practices such as fishing with poisons or explosives
- The fishery does not operate under a controversial unilateral exemption to an international agreement and is not overwhelmed by dispute;
- A pre-assessment has been carried out in 2012.
- The proposed UoA and UoC have been confirmed;
- The fishery has not failed an assessment within the last two years;
- The client is willing to share the certificate with fishers not initially part of the client group;
- There are no catches of non-target stocks (Principle 2) that are inseparable or practicably inseparable (IPI) from the target stock (Principle 1);
- The brown crab fishery is not an enhanced fishery;
- Although the assessment of the OSF Orkney brown crab fishery overlaps with the SSMO Shetland inshore brown & velvet crab and scallop fishery certified in March 2012 and currently under re-assessment (started in August 2016), harmonisation is not required as the fisheries are under different version of the MSC Standard.
- The fishery is not based on an introduced species, brown crab being a native species of the North Sea; and
- The fishery does not include an entity that has been successfully prosecuted for violations against forced labour laws.

The MSC guidance for FCR specifies that the Unit of Certification (UoC) is “The target stock or stocks (biologically distinct unit) combined with the fishing method/gear and practice (vessel(s) pursuing the that stock and any fleets, groups of vessels, or individuals of other fishing operators”.
The Unit of Assessment (UoA) defines the full scope of what is being assessed and includes other eligible fishers.

Consequently, the OSF Orkney brown crab creel fishery under assessment is defined by the UoA and UoC as follows.

UoA	
Target species	Brown crab, *Cancer pagurus*
Geographic area	FAO Major Fishing Area 27 Atlantic Northeast, Subarea 27.4.a Northern North Sea, ICES Division IVa. Orkney Islands (North of Scotland) waters within 12 nm UK Territorial Limit, with few larger fishing vessels fishing also outside the 12 nm Limit.
Stock	Orkney Islands brown crab stock

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Fishing gear	Baited creel (pot)
Management system	European Commission through the Common Fisheries Policy Marine Scotland Orkney Sustainable Fisheries is the regional Inshore Fisheries Group for Orkney
Client group and other eligible fishers	Orkney Sustainable Fisheries (OSF) All the registered and licenced fishing vessels fishing brown crab with creel around Orkney Islands are OSF members. There are currently no other eligible fishers. Potential other eligible fishers would be any registered and licenced fishing vessels that is eligible to fish brown crab with creel around Orkney Islands waters that are not members of OSF.

UoC	
Target species	Brown crab, *Cancer pagurus*
Geographic area	FAO Major Fishing Area 27 Atlantic Northeast, Subarea 27.4.a Northern North Sea, ICES Division Iva. Orkney Islands (North of Scotland) waters within 12 nm UK Territorial Limit, with few larger fishing vessels fishing also outside the 12 nm Limit.
Stock	Orkney Islands brown crab stock
Fishing gear	Baited creel (pot)
Management system	European Commission through the Common Fisheries Policy Marine Scotland Orkney Sustainable Fisheries is the regional Inshore Fisheries Group for Orkney
Client group	Orkney Sustainable Fisheries (OSF)

3.1.2. Final UoC(s)

(PCR ONLY)

The PCR shall describe:

a. The UoC(s) at the time of certification.
b. A rationale for any changes to the proposed UoC(s) in section 3.1(c).
c. Description of final other eligible fishers at the time of certification.

(References: FCR 7.4.8-7.4.10)

3.1.3. Total Allowable Catch (TAC) and Catch Data

The Orkney brown crab creel fishery is not TAC managed.

Table 1. TAC and Catch Data

TAC	**Year**	**[YYYY]**	**Amount**	**[n, unit]**
UoA share of TAC	**Year**	**[YYYY]**	**Amount**	**[n, unit]**
UoC share of total TAC	**Year**	**[YYYY]**	**Amount**	**[n, unit]**
Total green weight catch by UoC	**Year (most recent)**	**2016/2017**	**Amount**	**1,800 t**
	Year (second most recent)	**2015/2016**	**Amount**	**1,428 t**

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3.1.4. Scope of Assessment in Relation to Enhanced Fisheries

Not applicable.

3.1.5 Scope of Assessment in Relation to Introduced Species Based Fisheries (ISBF)

Not applicable.

3.2. Overview of the fishery

Brown crab has been fished in Orkney for 1000's of years with crab and lobster being an important part of the diet of local people before selling and exporting shellfish changed the emphasis towards fishing for a market. Fishermen have sold their fish and shellfish locally since 1880's but were limited by vessel size and weather to access to other markets. Brown crab was also originally caught as a secondary species, the fishermen's effort was mainly targeted at European lobster. The fishery nowadays is considered a "mixed" creel fishery with often with more than one target species, mainly brown crab but also lobster and velvet crabs. It is also a seasonal fishery with different species being targeted at particular parts of the year.

In 1953 Orkney Fishermen's Society, a fishermen co-operative, was set up primarily for exporting live European lobster. The co-op expanded into crab processing in the 60's and is now one of the most recognised processors of brown crab both within the UK and Europe.

Traditionally brown crab was caught from traditional sailing yoles and the fishing gear was wooden creels. In the post-war years there was a shift into engine powered boats and in the 1970's changes in gear with a move towards more durable metal creels. The advances of both wheel house electronics and fishing gear has increased the efficiency of the local fleet. The previous part-time crofter model for inshore fishing has been in decline since the 60's with most fishermen now full-time. The size of the fishing fleet has stayed relatively the same over the past 20-30 years with the average number of vessels registered in Orkney fluctuating around 145. The number of fishermen employed by the industry has also been pretty constant with Orkney Islands Council considering around 350 fishermen employed. This includes part time and full time fishermen.

In 2006 Orkney Sustainable Fisheries Ltd (OSF) was established to operate the local lobster hatchery and carry out locally driven research initiatives to help support inshore fishing into the future. In 2010 OSF was awarded EMFF funding to run brown crab tagging trials and collect data on the commercially creel-fished species. Since then OSF has employed full-time fisheries scientists to run a number of research initiatives relating to the sustainability of the local shellfisheries. A Fisheries Improvement Project has been implemented in 2013 for the brown crab, lobster and velvet crab fishery.

Historically regulation of the fishery would have been dictated by local weather patterns which would have restricted the number of days fishermen could go to sea. The management of the fishery is now governed by the European Commission and by Marine Scotland at the national level. Through devolved responsibility for fisheries management, Scottish Ministers are responsible for the regulation of sea fishing around Scotland and within 12nm of Scotland's coast. The primary regulatory instrument for the Orkney creel fishery is the Inshore Fishing (Scotland) Act 1984 which introduced both local and national measures for fishery management purposes.

As part of the Strategic Framework for Inshore Fisheries in Scotland, Marine Scotland set out to develop a network of Regional Inshore Fisheries Groups (RIFGs) to plan and manage inshore fisheries at a local level. Since 2013 Orkney Sustainable Fisheries has been recognised as the RIFG for Orkney. The board is made up of fishermen covering all gear types. The Orkney brown crab fishery is managed under the OSF Fisheries Management Plan.

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The Orkney brown crab fishery is currently comprised of a fleet of 103 vessels: 46 less than 10 m, 50 between 10-12 vessels, 7 over 12, 3 vessels with tanks that fish 2-3 days during the summer .The majority of the inshore fleet operates as part of a mixed fishery, targeting a combination of brown crab, European lobster and velvet crab. The offshore fleet is comprised of three vessels ≥ 16m in length that operate outside of the 12 nm territorial water and target solely brown crab. They consists of larger vivier tank vessels undertaking single week long fishing trips. Creel is the only fishing gear allowed to be used to target brown crab.

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3.3. Principle One: Target Species Background

This section focuses on brown crab stock assessment and status, the harvest strategy in place and the relevant information collected to support the harvest strategy.

MSC FCR v.2.0 states that:

Principle 1
A fishery must be conducted in a manner that does not lead to overfishing 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.

3.3.1. Brown crab biology and life history

Taxonomy and distribution

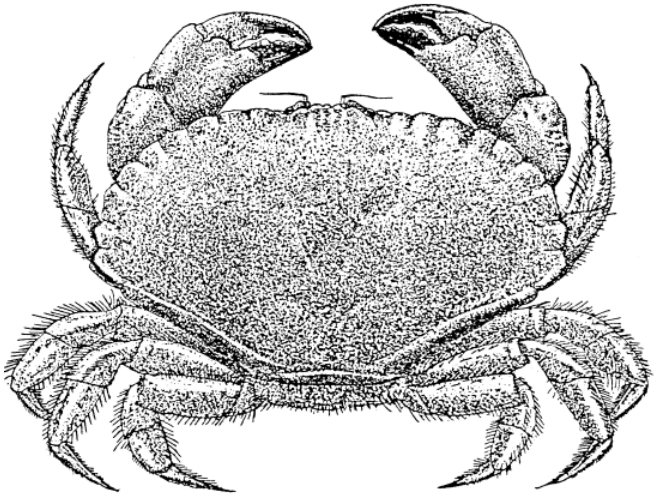

Figure 1. Brown crab or edible crab. Source: http://www.fao.org/fishery/species/2627/en.

The brown crab (*Cancer pagurus*) (Figure 1) 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).

Stock structure/stock delineation

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 in the absence of studies on genetic structure of brown crab in the region. OSF have undertaken a major tagging programme since 2016 with approximately 8,000 crabs tagged. Tagging returns showed that there was little movement of male and female crabs inshore (Figure 2), but there was some offshore migration of mature females in a westward direction (Figure 3) (Coleman and Rodrigues, 2017a). The results complement those from a major T-bar tagging programme undertaken by Jones *et al*. (2010) (Figures 4 & 5). The primary current is in an easterly direction which might facilitate the return of larvae back to the original grounds of the mature females (Hunter *et al*., 2013) but many of the large migratory movements observed are too great a distance to allow the return of larvae back to the Orkney fishing grounds (Client, pers. comm.). The Client advised that

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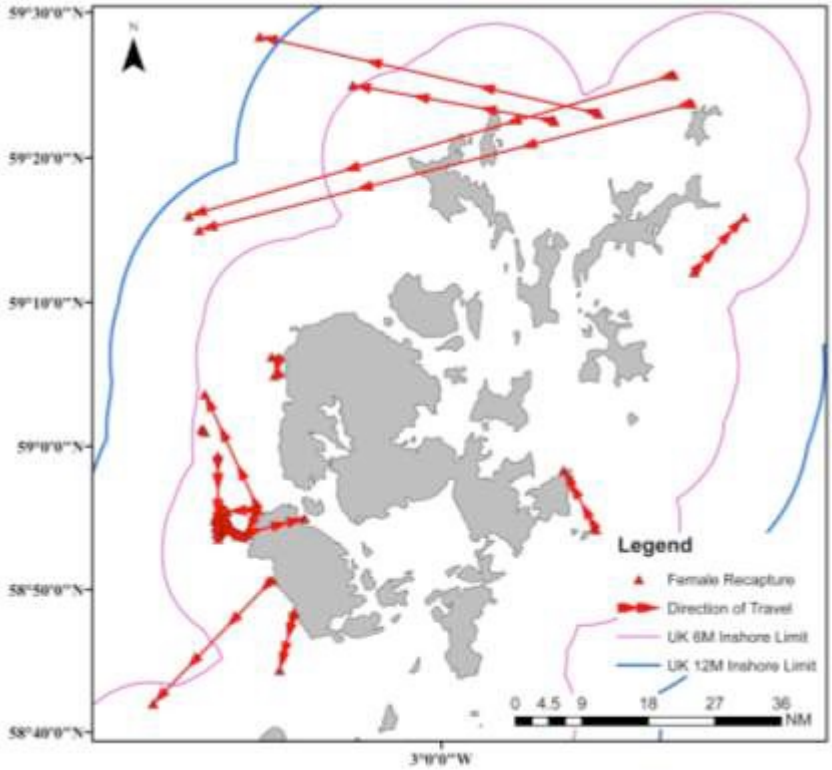
there is some larvae modelling work in progress, but as yet the connectivity between the various crab grounds offshore is unclear. Assuming a stock structure which considers Orkney as a single stock with localised recruitment seems pragmatic and reasonable given the available information.



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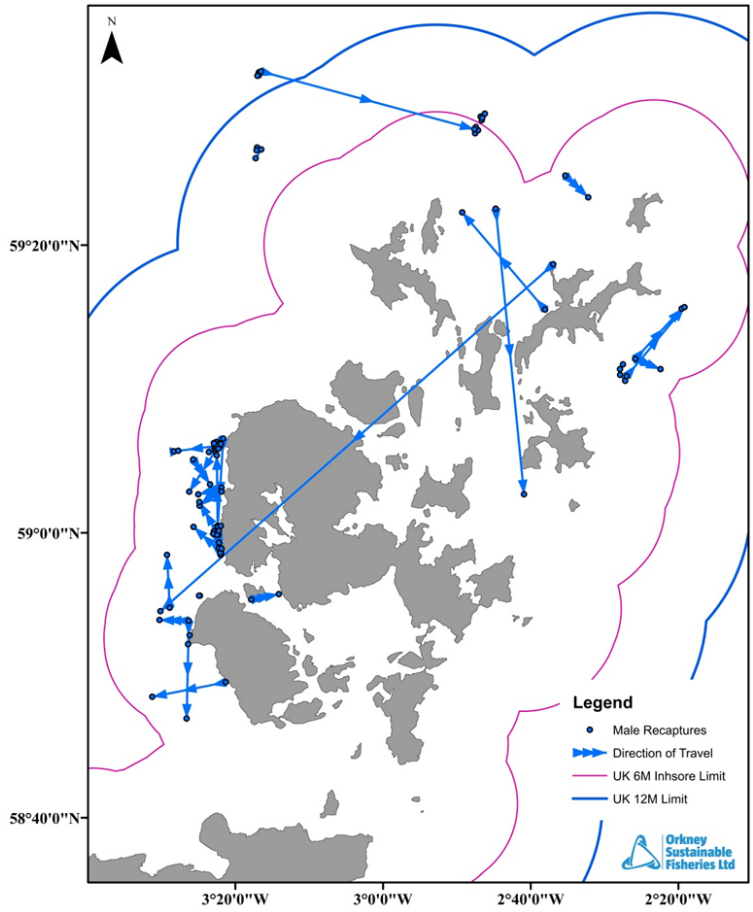

Figure 2. Female (upper figure) and male (lower figure) recaptures from tagging studies undertaken by OSF from 2010 to 2016. Source: Coleman and Rodrigues, 2017a.

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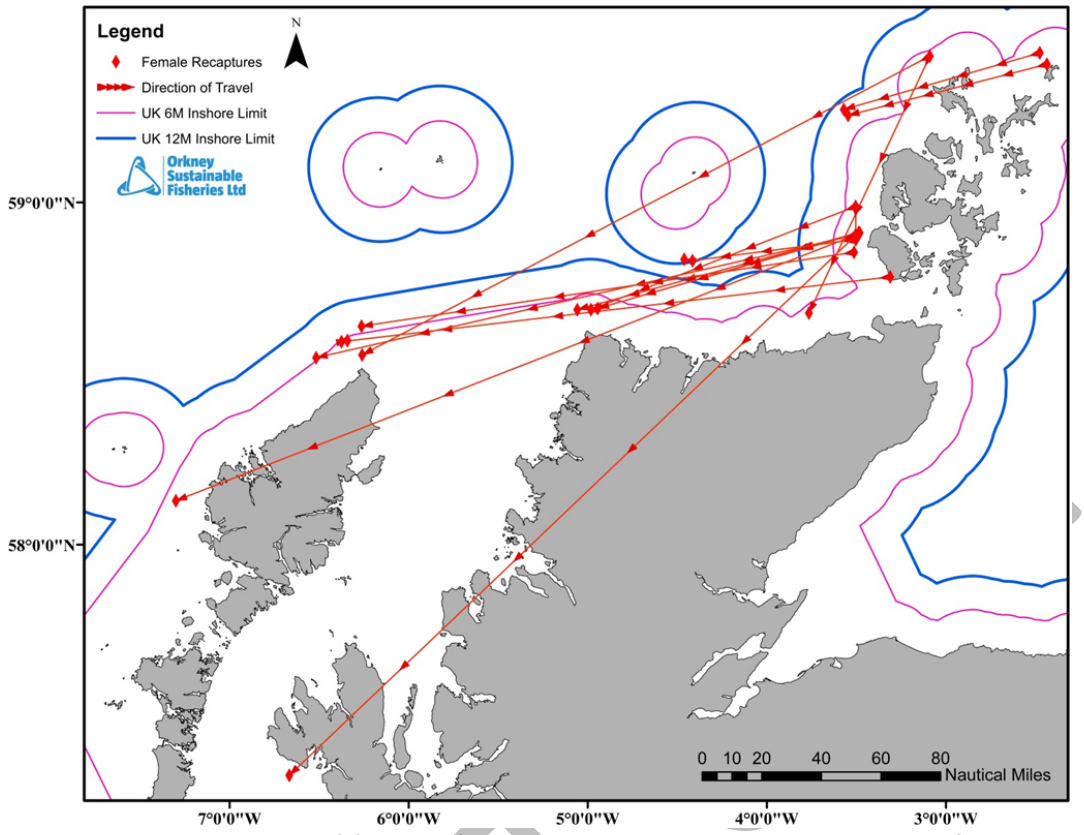

Figure 3. Long distance recaptures of females from tagging studies undertaken by OSF from 2010 to 2016. Source: Coleman and Rodrigues, 2017a.

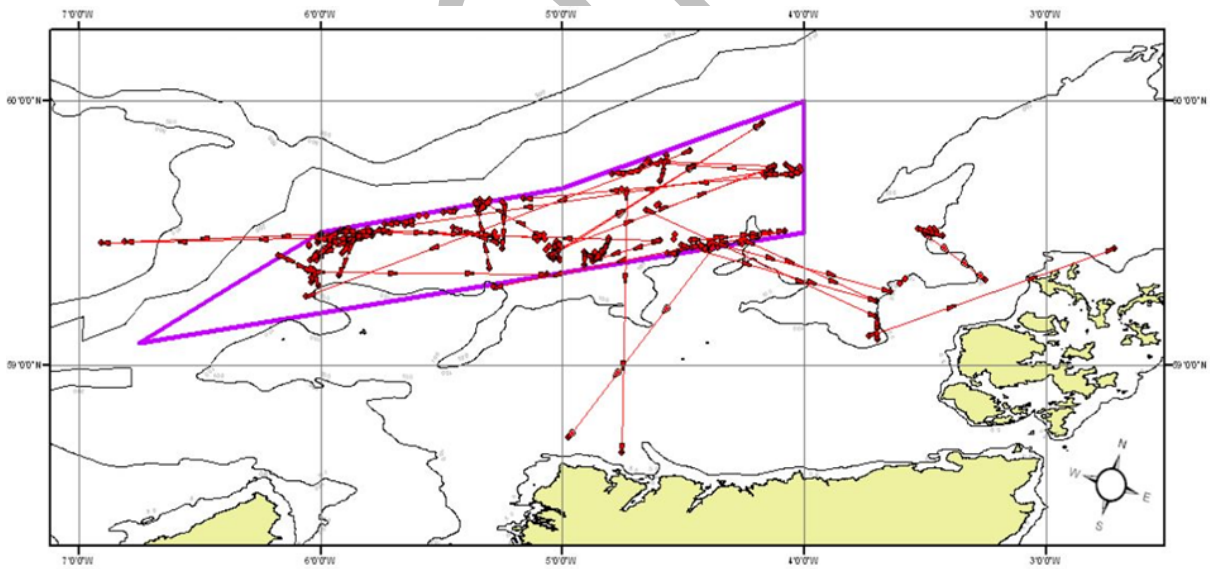

Figure 4. Tagging returns from female brown crabs tagged on large vivier vessels in the Orkney and Sule areas off the north coast of Scotland. Source: Jones *et al*., 2010.

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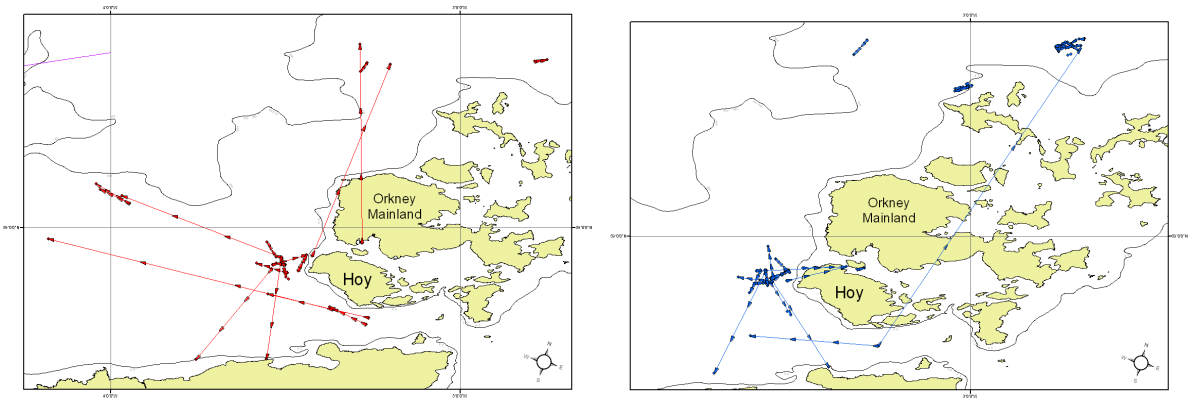

Figure 5. Release and recapture positions for female (left) and male (right) brown crabs tagged in inshore Orkney waters by MSS. Source: Jones *et al*., 2010.

Life history

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. The most recent MSS stock assessment of brown crabs noted that female brown crabs in Scottish waters typically mature between 130 and 150 mm CW (Marine Science Scotland, 2017), but new studies of maturity across a wide geographical area using identical methodology demonstrated that size at maturity is much lower than previously thought (Haig *et al*., 2016). In Orkney the size at which 50% of crabs are mature was estimated at 91.2 mm CW in males and 97.4 mm CW in females. This size at 50% maturity is well below the current MLS of 140mm CW (to be increased to 150mm CW in February 2018, and OFS apply a 153mm CW limit for females), which means that all crabs will have an opportunity to spawn at least once before becoming available to the fishery. 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; Tallack, 2007). Post-larvae are known to settle inshore and juvenile crabs are more common in shallow than in deep water. Recent work at Heriot-Watt University showed that intertidal areas are an important habitat for juvenile edible crabs during early stages of its life cycle (Bakonya, 2016). 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, but will also scavenge for food as demonstrated by their capture in creels baited with various fish species. In the adult stage of their life cycle, brown crabs have few predators.

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

Cancer pagurus is not considered as a key low trophic level (LTL) species as defined by the MSC FCR v2.0 in that it does not meet the criteria for key LTL species set out in SA2.2.9.

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3.3.2. Harvest strategy

EU and National management

As the UK is currently 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. Management of fisheries within Scotland is the responsibility of Marine Scotland. 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). Under the European Marine Strategy Framework Directive (MSFD) Member States are required to prepare national strategies to achieve Good Environmental Status (GES) by 2020. Included under Descriptor 3 of GES is the requirement that stocks should be exploited sustainably consistent with high long-term yields, have full reproductive capacity in order to maintain stock biomass, and the proportion of older and larger fish/shellfish should be maintained (or increased) being an indicator of a healthy stock. GES is achieved for a particular stock only if all of the three attributes are fulfilled, implying that all commercially exploited stocks should be in a healthy state and that exploitation should be sustainable, yielding the 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. Whilst a Regulating Order is in place for shellfish fisheries in Shetland waters, such an approach has not been taken for the management of shellfish fisheries in Orkney waters.

Local management in Orkney

OSF has been the recognised regional Inshore Fisheries Group (IFG) in Orkney since 2013. IFGs are non-statutory groups. They are essentially advisory groups, and although they may develop Fisheries Management Plans (FMPs), they have no legislative powers. OSF meetings are attended by fishermen, scientists from Heriot-Watt University and other stakeholders and may be attended by policy staff, scientists and compliance officers from Marine Scotland. In addition to the IFGs, there is an Inshore Fisheries Management and Conservation group (IFMAC) which consists of industry, government and environmental NGO representatives and is responsible for resolving issues and developing policies that are of national importance to the inshore sector of Scotland's fishing industry.

OSF has developed an Inshore Fisheries Management Plan (IFMP) under which the brown crab fishery operates (OSF, 2017). The IFMP was developed to "formulate local objectives that will contribute to the delivery of Marine Scotland's high level objectives and help to ensure that local inshore fisheries are well managed, sustainable and profitable". The key aim of the IFMP is to "secure the future of inshore fisheries in Orkney and maximise benefits to the local community – through protecting stocks by developing local management measures, and enhancing our scientific knowledge on which management decisions can be made. This will help to ensure that local governance is both transparent and accountable". The IFMP describes the characteristics of the area, the local environment, the inshore fisheries and other marine activities, an overview of local shellfish research and information on newly introduced management measures. Whilst the brown crab fishery operates under the IFMP, it is noticeable that the IFMP does not refer specifically to the brown crab fishery, indeed the IFMP does not even include any reference to the current MLS for brown crab of 140mm CW, or the decision to increase this MLS to 150mm CW from February 2018.

OFS also has had a Code of Practice for crab suppliers in place for ten years now which covers hygiene practices on vessels, ensuring only good condition crabs (i.e. hard-shelled, non-berried, legal-sized crabs without black

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spot disease) are landed, good handling and storage processes and good environmental practices. In line with the Code of Practice, a number of Orkney vessels are also piloting the SEAFISH Responsible Fishing Scheme.

There are two possible methods for introducing legislation in Orkney – either national legislation through Marine Scotland, although it can be geographically delineated or through applying for a Regulating Order under the Sea Fisheries (Shellfish) Act 1967. As Orkney has not applied for a Regulating Order, the only method of introducing new legislation is therefore to work through Marine Scotland. If, for example, Orkney wished to introduce a closed season or creel limits, it would have to do so through the standard Marine Scotland process.

Regulations

Within Scotland a fishing vessel licence is required in order to fish commercially and to land the catch for profit. The basis for sea fisheries licensing is provided in The Sea Fish Licensing Order 1992, which is made under the Sea Fish (Conservation) Act 1967. The Scottish Government licenses Scottish fishing vessels registered under Section 8 of the Merchant Shipping Act 1995. Licences are spilt into two length categories – over 10m length and 10 metres and under. There is an overall cap on the larger vessels (>15m length) through EU restrictions on kilowatt days in ICES Subarea VI. Since 2004 vessels require both a license and a shellfish entitlement to fish commercially for brown crabs in Orkney waters. Across Scotland there are around 2000 licensed fishing vessels of which approximately 60% hold shellfish entitlements. There is a degree of restriction on overall fishing effort in Scottish waters for shellfish in that there is a limit on the number of vessels that hold a shellfish entitlement. However there are some trawlers and scallop dredgers that hold a shellfish entitlement and these vessels could transfer to creel fishing. In principle any Scottish-registered vessel with a shellfish entitlement can legally target brown crabs in Orkney, but in practice there are currently no non-Orkney vessels actively fishing in Orkney waters.

Marine Scotland require licensed crab vessels to make catch returns. All vessels over 12m in length must have on board a Vessel Monitoring System (VMS) to record fishing position and must complete an electronic log book (ERS). As yet there is no requirement for the smaller vessels in the shellfish fleet to have VMS on board. Vessels of 10-12m length must complete EU paper log books. All vessels under 10m length must complete the Marine Scotland FISH1 landing returns. Of the current 105 registered creel vessels in Orkney, 81 are under 10m in length.

Licensed crab vessels with a shellfish entitlement are not limited by days at sea, creel numbers or by TACs. Licensed vessels which do not hold a shellfish entitlement may land a daily maximum of 25 crabs in total from the following four species - brown crab, velvet crab, spider crab and green crab. Under the Shellfish (Restrictions on Taking by Unlicensed Fishing Boats (Scotland) Order 2017, unlicensed hobby fishermen are allowed to land a daily total of 5 crabs of any species; for example they may land 3 brown crabs and 2 velvet crabs. There is no requirement for hobby fishermen to record their catches, but they are not permitted to sell anything they catch for profit. In some areas of Scotland, there is anecdotal evidence that there are significant landings of shellfish made by hobby fishermen, but the fishing industry in Orkney does not see such catches by hobby fishermen to be a significant problem (Client, pers. comm.). Trawlers fishing in Orkney waters are permitted a shellfish bycatch of 10% by weight of the total catch. In practice brown crabs are rarely caught on trawling grounds.

The smaller inshore vessels use 300-400 creels, larger vessels will use around 1000 creels, and the vivier vessels will use more than 1200 creels. For all vessels, there is no limit on the number of creels that can be fished. In the absence of creel limits and TACs, a key regulation in the brown crab fishery is the minimum landing size (MLS). Under EU 850/98 the MLS was set at 140 mm carapace width (CW). However following a consultation with the fishing industry and other stakeholders in 2016, the MLS will be increased in February 2018 to 150 mm CW across Scotland (except Shetland), although Orkney Fishermen's Society (OFS) have been applying a

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limit of 153mm CW for females. Under the Sea Fisheries (Shellfish) Act 1967 there is a prohibition on the landing of egg-bearing (berried) females and soft-shelled crabs, although berried crabs are relatively inactive and therefore rarely enter creels (Howard, 1982) and soft-shelled crabs have no market value. There are no spatial or temporal controls on fishing effort, and no restrictions on creel design through limitations on size of creel or mesh size or any legislation requiring mandatory use of escape gaps or vents in creels, although recent research in Orkney has demonstrated the effectiveness of escape gaps in reducing the catch of undersized crabs (Rodrigues, 2015).

Review of harvest strategy

The key element of any review of the harvest strategy is through national or regional consultations by Marine Scotland on changes to the current management measures. For example, minimum landing size has recently been increased for brown crab following consultation. Fishery stakeholders were also recently consulted on the introduction of limits on creel numbers in order to restrict fishing effort, but following the consultation, Marine Scotland has not proposed any limit on creel numbers at this time. In 2017, Marine Scotland also ran a consultation exercise on the future of managing the inshore fisheries within 12miles, in particular the opportunity to devolve the control of entry and effort to local groups.

The Orkney Inshore FMP was reviewed and amended in January 2017. The harvest strategy including collection of information and data from the fishery has been reviewed annually though the Fishery Improvement Project (FIP) which commenced in 2013. A FIP Action plan was drawn up which highlighted the key weaknesses in relation to Principle 1 as (1) a lack of data on fishing effort, LPUE, fishing positions and data to inform the identification of stock structure, (2) an absence of biological reference points and (3) an absence of an explicit harvest control rule. These weaknesses were identified following a MSC pre-assessment undertaken in 2012 (Bell and Gascoigne, 2012). The FIP used the MSC Bench Marking Tool (BMT) to evaluate progress against the action plan (MSC, 2014), and the final output from the FIP concluded that whilst there had been major progress in filling data gaps on an ongoing basis, there was still a deficiency in relation to the harvest strategy and harvest control rules.

3.3.3. Information and data collection

A key element of data collection in the Orkney crab fishery is the mandatory recording of catch, fishing effort and fishing position for all vessels. At present there are 105 registered vessels of which approximately 80% make annual returns. For vessels over 12m in length, VMS is mandatory and therefore vessel position is recorded regularly whilst at sea. The larger vessels must also complete electronic logbooks. Vessels between 10m and 12m must complete paper EU logbooks which record a general fishing position (ICES rectangle), landings by day and fishing effort in terms of the number of creels hauled each day. Vessels under 10m must record their fishing activity on a daily basis on the FISH1 form under Marine Scotland regulations and the forms must be returned on a weekly basis. Until recently, the recording of fishing effort was not mandatory on the FISH1 forms and therefore there was no accurate estimate of the overall level of fishing effort in the brown crab fishery. The new FISH1 forms require the recording of the fishing position (latitude/longitude) at the start of the first haul and the ICES rectangle in which fishing took place, the total number of creels in the water, the number of creels hauled on each day and the weight of each species in kilograms (Appendix 2). The crustacean creel fishery in Orkney is a multi-species fishery, but the FISH1 form does not require recording of target species. There is scope for recording whether some crabs are discarded, but this is essentially a record of whether any undersized crabs below the minimum landing size were discarded. There is no requirement for the recording of quantitative information on discarded crabs. The data from the FISH1 forms is entered into the COMPASS database.

In addition to national requirements, OSF have conducted a logbook scheme since 2012. It is not mandatory, but 8 vessels regularly complete logbooks on a voluntary basis, which represents around 10% of crab vessels

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which make annual returns. These logbooks are more informative than the records required under national legislation in that in addition to landings and the number of creels hauled, the target species, the soak time, percentage discarded and bycatch must be recorded (Appendix 2) (Coleman and Rodrigues, 2017b).

Around 20 of the smaller inshore vessels have been fitted with Succorfish VMS units which permits a sampling of the distribution of fishing activity within the inshore waters (Coleman and Rodrigues, 2017c). An example of the data returned from the Succourfish units is given in Figure 6. A more general analysis of fishing activity was produced in 2011 through the completion of a "Scotmap" following participation of 100% of Orkney inshore fishermen.

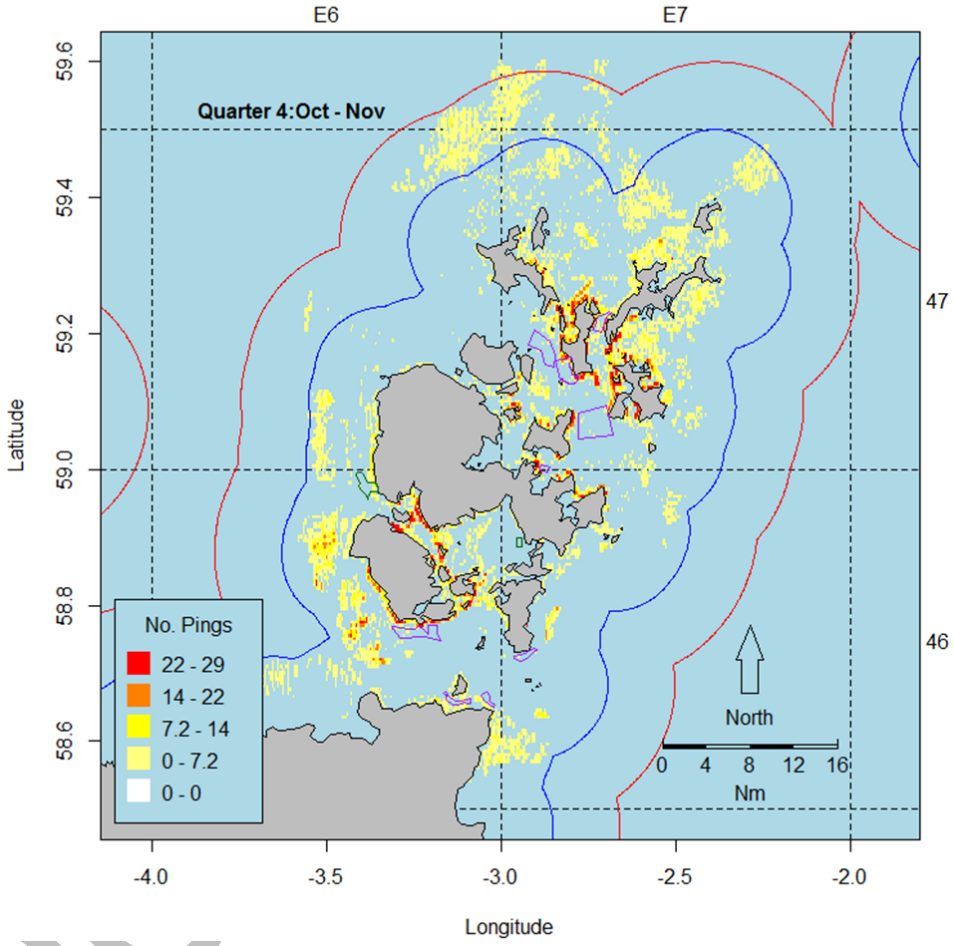

Figure 6. Indicatio of fishing activity patterns from a sample of vessels (22) fitted with the Succorfish device. Source: Coleman and Rodrigues, 2017c.

Marine Science Scotland (MSS) undertake regular market sampling of catches of brown crab. The size distribution of landings of brown crabs measured on the quayside by MSS has been supplemented since 2010 by data collected by OSF in coordination with MSS to ensure no overlap of sampling, and these data are an important input to the length-based assessment model used by MSS to determine whether the brown crab stock is over-exploited. A summary of the extensive market sampling programme carried out by OSF can be found in Rodrigues and Coleman (2017). MSS does not have a formal observer programme on shellfish vessels in Orkney, but regular observer trips by OSF and Heriot-Watt University staff on brown crab vessels monitor total catches on a creel-by-creel basis (Coleman and Rodrigues, 2017b). The OSF market sampling and observer programme, along with regional stock assessments, crab tagging studies and other research projects are key elements of the OSF Research Strategy for 2017-2020 (OSF, no date).

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All commercially-registered crab vessels are covered by the Registration of Buyers and Sellers (RBS) legislation. Buyers must submit sales notes for all catches, which provides another source of information to corroborate landings.

There are no formal fisheries-independent stock surveys of the brown crab stock, but the LPUE data that are collected through the logbooks are complemented by the collection of a wide range of biological data from the observer programme. The observer programme carried out by OSF in Orkney covers 15% of the brown crab vessels. The programme has a target of 4 trips per month, and from 2014 to September 2017, a total of 131 trips had been undertaken in the fishery. Regular reports on the results of the observer programme are produced by OSF (e.g. Coleman and Rodrigues, 2016). Sampling on-board these commercial vessels provides information on the size structure of the crab stock, including undersized crabs, the sex ratio and the percentage berried within each size class, and on non-target species. The data are collected on a creel-by-creel basis, and during the course of the programme, catch information from over 30,000 creels has been recorded. The observer programme provides extensive coverage of all areas of the fishery (Figure 7) and provides detailed information on the total catch of brown crabs including those under the MLS (140mm CW now, but due to increase to 150mm CW in February 2018) that are not sampled through the market sampling programme (Figure 8). The observer programme also provides detailed information on bycatch and discards.

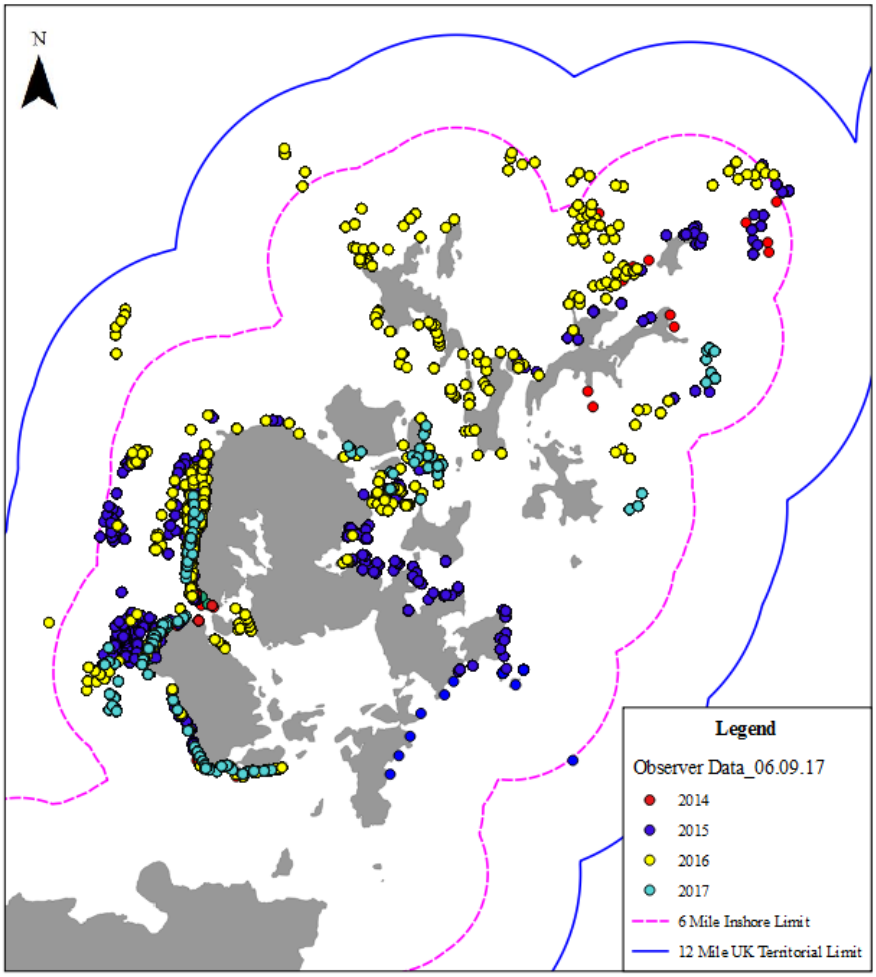

Figure 7. Spatial distribution of observer coverage from 2014 up to September 2017.

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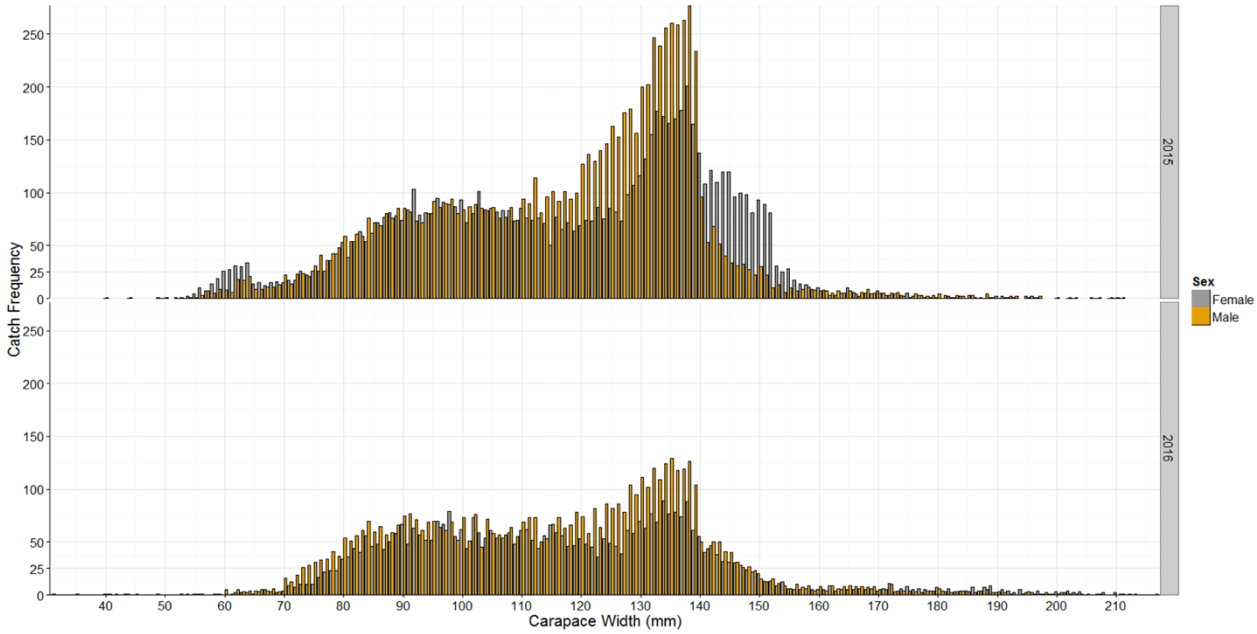

Figure 8. Size distribution of brown crab recorded during the observer sampling program. Source: OSF.

One of the key biological studies carried out recently in Orkney is a determination of the size-at-maturity as part of a major project within the UK and Ireland (Haig *et al.*, 2016). The study produced estimates of 91.2 mm and 97.4 mm CW for the size at 50% maturity for males and females respectively. These figures for size-at-maturity demonstrate that the current MLS of 140mm CW in Orkney (due to increase to 150mm CW in February 2018, and OFS apply a limit of 153mm CW for females) is significantly above the size at maturity and therefore female crabs may be able to spawn on multiple occasions before they become available to the fishery.

3.3.4. Stock assessment methodology

Marine Scotland Science undertake regular stock assessment for brown crab in Scottish waters, including Orkney (Marine Scotland Science, 2017). Whilst the stock division used by MSS includes the large vessels targeting offshore fishing areas in addition to the Orkney fishing grounds, this does not tie in perfectly with the UoC which is essentially a small vessel fishery inside the 12 mile limit, but including three larger vivier vessels which also fish outside the 12 mile limit. It is possible for vessels to fish within the Orkney stock area and land elsewhere, but all vessels must record the ICES rectangle in which the catch was made, so all relevant landings information should be allocated to the Orkney stock. Although brown crabs can be aged using neurolipofuscin-based techniques (Sheehy and Prior, 2008), crabs are not routinely aged and so conventional age-structured assessment models are not applicable. For the creel fisheries for brown crab, stock assessment by Marine Scotland Science has therefore been undertaken using length cohort analysis (LCA) (Jones, 1974), which 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. Input parameters to the model in the form of growth parameters, natural mortality rates and length-weight relationships are generic values rather than specific values estimated in the Orkney fishery. LCA results are presented in terms of yield per-recruit and biomass-per-recruit, and permit an estimation of Fmax, 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 Fmax is used as a proxy for Fmsy. 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

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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 the 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 (e.g. Fmax) are not used for management purposes, although they may be used to inform Marine Scotland 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 brown crab populations there is evidence that this is not the case. Therefore some of the assumptions of the model are not met and the outputs from the LCA should therefore be treated with caution.

The MSS stock assessments are peer reviewed internally before publication, but there is no formal external peer review process. OSF research is peer-reviewed by Heriot-Watt University, but as there are such close links between OSF and the University, these peer reviews should be considered as internal. The MSS assessments and OSF research are presented annually at the ICES Working Group on the Biology and Life History of Crabs (WGCRAB). Whilst presentation of work at WGCRAB provides some form of peer review from other crustacean scientists, this working group is not an assessment working group and no formal advice emanates from WGCRAB.

Until recently Marine Scotland had not collected reliable fishing effort statistics from the brown crab fishery, because the majority of vessels in the fleet are under 10m in length, and data collection from this sector of the fleet through FISH1 forms did not require the recording of fishing effort. The new FISH1 forms have mandatory recording of fishing effort. OSF have a voluntary log book scheme in place which covers approximately 10% of crab vessels which make annual returns, but this programme began only in 2012, so at present there is only a very short time series of data.

There are no formally-defined biologically-based reference points for the brown crab fishery, and therefore there are no conventional harvest control rules (HCRs) in place which specify what management action would be triggered when stock levels exceed reference points. Currently, there are no biomass reference points for the brown crab stock derived from analytical stock assessments, so there is no information on the stock levels at which recruitment would be likely to be impaired, and there is no assessment of the status of the stock in relation to Bmsy. Many other similar MSC-certified fisheries have developed reference points based on long term trends in landings per unit effort (LPUE) which is considered as an index of stock abundance. As noted above, no LPUE-based reference points are available for this fishery because of the short time series of LPUE data. Length compositions have been used in length cohort analysis (LCA) to provide an estimate of fishing mortality (F), which can be compared with an estimate of Fmax (a proxy for Fmsy), but there are significant doubts about using LCA to examine recent trends in F as a means of evaluating stock status, because LCA is an equilibrium model requiring the input of multiple years of data, and there are doubts about the reliability of using changes in length composition as an indicator of changes in exploitation rate in trap fisheries. The Client is in the process of developing new indicators of stock status, so in the meantime, the assessment team determined that it was more precautionary to use the RBF to score Performance Indicator 1.1.1.

The FIP Action Plan highlighted the lack of biological reference points and harvest control rules as two key weaknesses of the fishery in relation to the assessment of the fishery against Principle 1. At the site visit in September 2017, the assessment team were not provided with any evidence that any reference points or HCRs had been agreed for the brown crab fishery.

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There are likely to be high discard rates in brown crab fisheries due to the regular capture of individuals under the MLS, soft recently-moulted crabs and any crabs that may have been broken during the capture process. There may also be some "high-grading" of smaller crabs in the larger offshore vessels. High-grading is the discarding of small, low value individuals and replacing them with larger, high-value individuals. This occurs primarily in fisheries where quotas are restrictive and fishers wish to ensure that small, low value individuals do not take up a significant proportion of the TAC. However as the brown crab fishery is not limited by quotas, it seems unlikely that high-grading will be occurring at a significant level in the fishery.

A study by OSF has estimated that overall mortality of discarded brown crab was 7.3% (E. Rodrigues & M. Bell, unpublished), but this was considered to be an overestimate of mortality as the samples contained an unrepresentative proportion of damaged crabs (E. Rodrigues, pers. comm. at site visit). Although sub-legal individuals are a frequent component of the total catch in creels (Figure 8), the results of this study suggest that even at periods of high discarding in the fishery, the discarding process has little impact on stock abundance.

3.3.5. Orkney brown crab stock status

LPUE has remained relatively stable since data collection by OSF commenced in 2012 (Figure 9). OSF have not therefore developed limit and target reference points based on LPUE as has been the case for other MSC certified crustacean fisheries, because there is only a short time trend of LPUE data with little obvious trend, so that selecting an appropriate LRP or TRP from these data is not possible (Figure 9).

The most recent Marine Scotland Science assessment for brown crab within Orkney waters concluded that the current level of fishing mortality (for the period 2013-2015) was 0.77 and 0.45 for males and females respectively, and these estimates are significantly above the Fmax (a proxy for Fmsy) values of 0.33 and 0.36 for males and females respectively (Mesquita *et al*., 2017). The assessment concluded that both the male and female components of the stock were growth-overfished (Figure 10), but there is no evidence of recruitment overfishing in the Orkney stock (Marine Scotland Science, 2017). The yield-per-recruit-curves generated from the LCA for males and females are both relatively flat-topped (Figure 11), and therefore the values of Fmax are likely to be sensitive to parameter input. The detailed assessment document (Mesquita *et al*., 2017) discusses uncertainties underlying the assessment of brown crab stocks, and the Marine Scotland Science assessment document warns therefore that all Fmsy proxy values remain preliminary and may be modified following further data exploration and analysis (Marine Scotland Science, 2017).

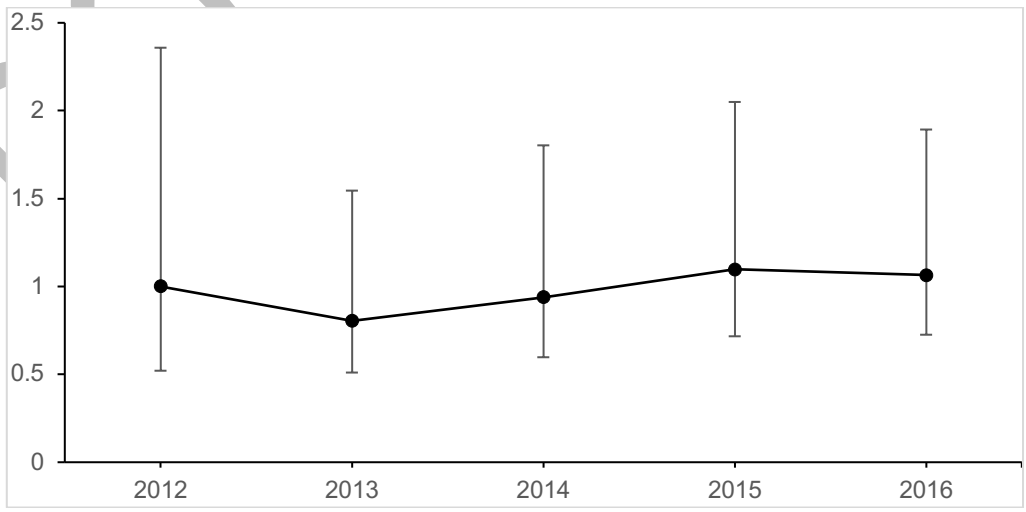

Figure 9. LPUE trend in the Orkney brown crab fishery from 2012 to 2016. Source: OSF

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		F (Fishing Mortality)					F (Fishing Mortality)		
		2006-2008	2009 - 2012	2013- 2015			2006-2008	2009 - 2012	2013- 2015
Clyde	Males	✗	?	✗ Unknown	East Coast	Males	✗	✗	✗ Above F_{MSY}
	Females	✗	?	✗ Unknown		Females	✗	✗	✗ Above F_{MSY}
Hebrides	Males	✗	✓	0 At F_{MSY}	Mallaig	Males	?	?	? Unknown
	Females	✗	✗	✗ Above F_{MSY}		Females	?	?	? Unknown
North Coast	Males	✗	✓	✗ Above F_{MSY}	Orkney	Males	✗	✗	✗ Above F_{MSY}
	Females	✗	✓	✗ Above F_{MSY}		Females	✗	✗	✗ Above F_{MSY}
Papa	Males	?	✓	✓ Below F_{MSY}	South East	Males	✗	✗	✗ Above F_{MSY}
	Females	?	✓	0 At F_{MSY}		Females	✗	✗	✗ Above F_{MSY}
Shetland	Males	?	?	✗ Above F_{MSY}	South Minch	Males	✗	✗	✗ Above F_{MSY}
	Females	?	?	? Unknown		Females	✗	✗	✗ Above F_{MSY}
Sule	Males	✗	0	✗ Above F_{MSY}	Ullapool	Males	?	?	? Unknown
	Females	0	✗	✗ Above F_{MSY}		Females	?	?	? Unknown

Figure 10. Brown crab stock status (blue rectangle for Orkney Islands): relationship between F and Fmsy for 2006-2008, 2009-2012 and 2013-2015. Source: Marine Scotland Science 2017.

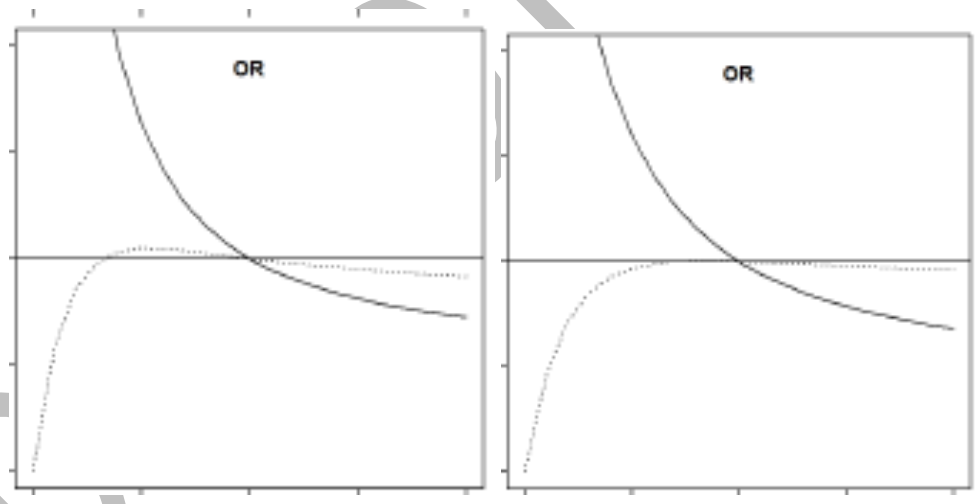

Figure 11. Yield and biomasse-per-recruit curves for Orkney brown crab (males on left panel and females on right panel). X-axis is percentage change in effort and y-axis is percentage change in biomass or yield per recruit. The horizontal line represents no change in biomass or yield-per-recruit and the curves cross the horizontal line when there is no change in effort. Source: Mesquita *et al*., 2017.

OSF question the conclusions drawn from the MSS assessment of stock status of brown crabs in Orkney. Firstly OSF believe that the stock structure is more complex than a single large stock, but currently the links between offshore and inshore areas are not fully understood. Secondly, as noted above, the MSS assessment produces a very flat-topped yield-per-recruit curve, such that the position of Fmax is highly sensitive to input parameters. The MSS assessment uses a natural mortality rate (M) of 0.1 as a default value for all areas,

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whereas more recent work by OSF in Orkney suggests a value for M of about 0.25. The MSS assessment methodology produces an estimate of fishing mortality (F) based upon an analysis of size distribution data. Estimates based on size distribution from the period 2013-2015 were 0.77 and 0.45 for males and females respectively. Independent estimates of fishing mortality in Orkney presented during the site visit (M. Bell, Heriot-Watt University, pers. comm.) suggest a value of F of around 0.25 to 0.5. With these new estimated levels of F and M for Orkney, yield-per-recruit curves are very different from those presented in the MSS report and conclude that stock status is "green" as opposed to "red" (ref. Figure 10), i.e. F is below Fmsy.

During and after the site visit, the assessment team was presented with some new approaches to assessing stock status of brown crab by Dr. Mike Bell of Heriot-Watt University, Stromness. The study aimed to evaluate whether the current (140mm CW), new (150mm CW) and operational (153mm CW applied by OFS) MLS, combined with high survival rates of discarded undersized crabs, provide significant protection of spawning potential in the brown crab stock in Orkney.

The study explored the relationship between relative spawning potential and fishing pressure and exploitation pattern using standard egg-per-recruit analyses based on the three values of MLS described above. The egg-per-recruit model was run as a stochastic simulation, addressing risk and uncertainty in the outcomes, and considered uncertainty in growth, natural mortality, fecundity, size at maturity and discard mortality. A Monte Carlo approach was used, with 1,000 simulations sampling values of the parameters from their probability distributions (M.C. Bell, unpublished). The method of McCoy and Gillooly (2008) using constraints of body size and temperature on individual metabolism to provide quantitative predictions of the natural mortality rate (M) was used to provide an estimate of natural mortality rate for *Cancer pagurus* of 0.25, which appeared to be consistent with temperature-adjusted estimates for Shetland brown crab stocks (Tallack, 2002) using catch curve analysis, but significantly higher than the value of 0.1 used in MSS stock assessments. Values estimated for other exploited decapod crustacean species (e.g. snow crabs, blue crabs) are consistent with M=0.25 for brown crab being at the lower end of the expected range of variation, and therefore this estimate is considered to be precautionarily low. Based on this new estimate of M, both males and females will take 2 to 3 years to grow from the size at first maturity to becoming vulnerable to the fishery at the new MLS of 150mm CW.

Egg per recruit curves based on this model are shown in Figure 12. The current value of fishing mortality can be calculated from an estimate of total mortality (Z) of 0.6 estimated from length-converted catch curve analysis of observer samples. With an estimated value of M of 0.25, F can be calculated as Z – M = 0.35, which based on uncertainty in M, gives a 95% confidence interval of F = 0.32 to 0.38. Figure 12 shows that for all values of MLS, current values of F would estimate an egg-per-recruit (EPR) of between 40% and 60% of virgin EPR. Although there are no existing reference points for the Orkney brown crab fishery, Cefas (2014) used $F_{35\%}$ and $F_{15\%}$ (respectively F at 35% and 15% of unexploited spawning potential) as indicative target and limit reference points in assessments of brown crab stocks in England & Wales. Figure 13 estimates that current values of F are significantly below those reference values, and Figure 13 shows the risk of these thresholds being breached at different levels of fishing effort. There is effectively zero probability of EPR falling below 15% of the unexploited (virgin) level at current levels of fishing effort, and that the risk of EPR falling below 35% is also very low (Table 1), and at the higher level (2 x current fishing mortality) there is appreciable probability that EPR would be below the notional target of 35%, but it is worth noting that at the new MLS of 150 mm CW, there is increased protection of spawning potential.

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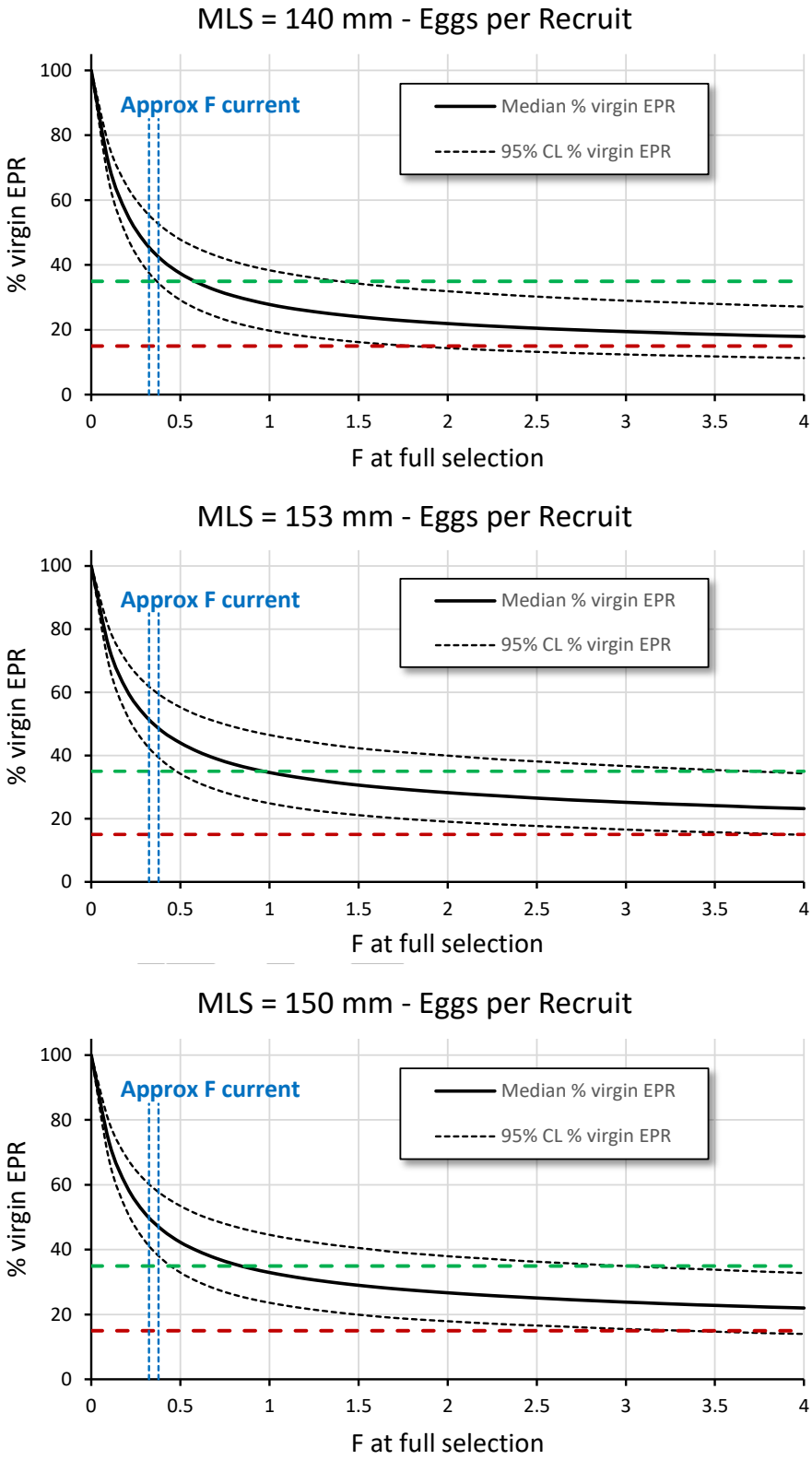

Figure 12. Egg per recruit curves for Orkney brown crab at various values of MLS. Curves are median and percentiles from distribution of simulated values. Dashed horizontal lines indicate potential thresholds at 15% virgin EPR (red) and 35% virgin EPR (green). Vertical lines indicate approximate fishing mortality at current fishing effort. Source: M. Bell, unpublished

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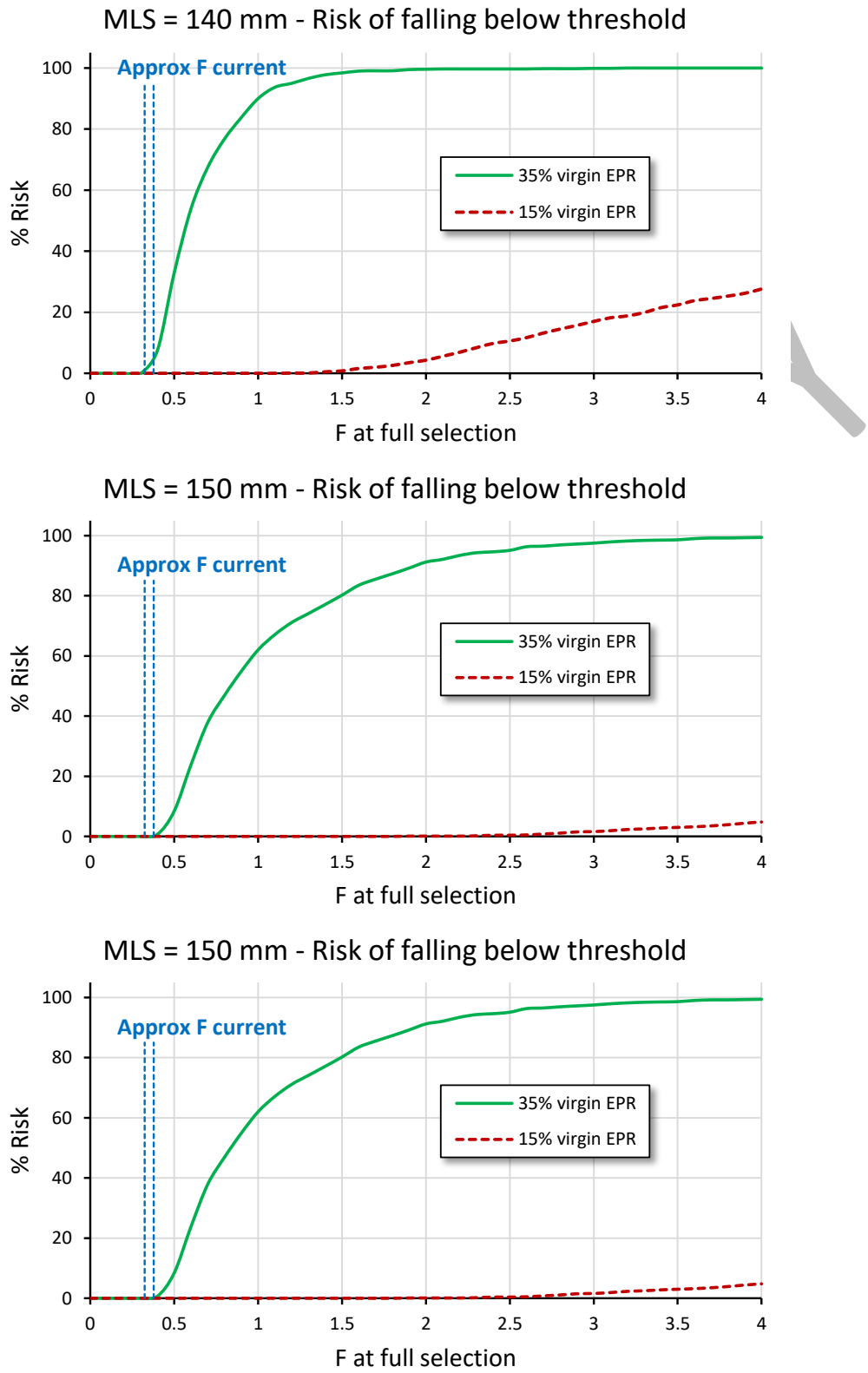

Figure 13. Risk of eggs per recruit falling below thresholds of 15% or 35%, for Orkney brown crab at various values of MLS. Risk is evaluated as the percentage of 1,000 simulations that yielded an EPR value lower than the threshold. Vertical lines indicate approximate fishing mortality at current fishing effort. Source: M. Bell, unpublished.

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Table 2. Orkney brown crab. Risk of eggs per recruit being below threshold values at current and twice current levels of fishing effort. This is evaluated as the percentage of simulations giving EPR values less than the threshold. Source: M. Bell, unpublished.

Threshold	MLS (mm CW)	Fishing effort	Risk (%)
15% virgin EPR	140	Current	0
		2 x Current	0
	150	Current	0
		2 x Current	0
	153	Current	0
		2 x Current	0
35% virgin EPR	140	Current	2.3
		2 x Current	67.8
	150	Current	0.3
		2 x Current	38.6
	153	Current	0.1
		2 x Current	31.0

This new study concludes that both the current and future MLS should provide significant protection to spawning potential even at increased levels of fishing mortality (fishing effort), and therefore along with the high survival of discarded undersized crabs which has been demonstrated for the Orkney creel fishery, the MLS can be considered to be an effective harvest control rule (Bell, unpublished). It should be emphasised that this new study is not yet published and has not undergone any formal peer-review process.

3.3.6. Management of the fishery in relation to the brown crab stock status

The most recent stock assessment in Orkney carried out by MSS indicated that current F was above Fmax, and that a higher yield and biomass per recruit in the long term could potentially be obtained by reducing the level of fishing mortality (effort), although as discussed above, OSF do not believe that this represents an accurate assessment of current stock status. Whilst MSS undertake regular assessments of the status of the brown crab stock in Orkney, there is no formal annual process by which the stock assessments are translated into management advice to Marine Scotland in Edinburgh and hence potential management action. Additional stock assessment and research work undertaken by OSF and Heriot-Watt University will feed back to OSF as the IFG in Orkney. Whilst such scientific advice may trigger OSF to consider additional management measures, as discussed previously, OSF has no formal legislative power, and therefore any new management measures proposed by OSF must be taken up and progressed by Marine Scotland. There have been various consultation exercises on changes to the management measures in the shellfish fisheries instigated by Marine Scotland. Whilst a recent increase in the MLS for brown crab is due to take effect across Scotland (except Shetland) in February 2018 following a nationwide consultation, other consultation exercises, such as that on a limit on creel numbers, did not result in any change in regulations. It is not clear therefore whether there is an appropriate mechanism in place to allow Marine Scotland to act quickly to introduce management measures if brown crab stock status in Orkney declined rapidly.

3.3.7. Other fishery removals

In addition to the creel fishery for brown crabs caught and landed in Orkney, there is relatively good information on all other fishery removals from the brown crab stock. Marine Scotland Compliance confirmed that there were no crabs caught in Orkney waters and landed elsewhere within Scotland. There may be some by-catch in trawls, which will be recorded on sales notes, but there are no inshore beam trawlers and so any

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bycatch is from the offshore waters, and therefore this bycatch is believed to be very small (Marine Scotland Compliance, and Client, pers. comm.) although it may not be recorded if it is less than the minimum catch requirement for recording on logbooks. There is also a small bycatch by two scallop dredgers, but again this catch is recorded through the sales notes. As discussed previously, there is a daily limit of 5 crabs for hobby fishermen, but it is not mandatory for hobby fishermen to record their catches. There are no formal estimates of the number of hobby fishermen or their landings, but OSF considered that there was very little hobby fishing taking place in Orkney waters.

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3.4. Principle Two: Ecosystem Background

This section focuses on the ecosystem the brown crab fishery depends on and the environmental impacts of brown crab creel fishing. The team assesses the impact of the fishery on the following components: primary species, secondary species, endangered, threatened and protected (ETP) species, habitats and ecosystem.

MSC FCR v.2.0 states that:

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

3.4.1. Primary and secondary species

According to MSC FCR v.2.0, primary and secondary species are non-target species that are not ETP species. Table 3 gives the definition of these two components bearing in mind that primary and secondary species can be either retained or discarded or species used as bait.

Table 3. Definition of Primary and Secondary Species according to MCS Guidance for FCR, 2014.

Primary Species	Secondary Species
• In scope species, e.g. fish and shellfish • Managed with tools controlling exploitation • Reference points are in place • Analytical or empirical derived stock assessment in place	• Fish and shellfish, and out of scope species (birds, reptiles, amphibians and mammals) that are not ETP species • Not managed according to reference points • No analytical or empirical derived stock assessment in place

The team team determines which species are considered as main and which are considered as minor according to the MCS FCR SA3.4.2. A species is considered as main if:

- The catch of a species comprises 5% or more by weight of the total catch of all species; or
- The species is classified as less resilient and the catch of the species comprises 2% or more by weight of the total catch of all species.

In addition any secondary species caught at very low level, ≤ 2%, each year of the Orkney Shellfish Research Project (OSRP), is considered as negligible, and as such is not considered further in the assessment.

In the case of very large fisheries with exceptionally large catches, the assessment team shall still classify species that do not meet the threshold of 5% and 2% as main. It is not the case for the Orkney brown crab creel fishery which total catches cannot be considered as exceptionally large.

3.4.1.1 Source of information used to determine the non-target species composition

Logbook programme

The logbook programme is one of the component of the Orkney Shellfish Research Project (OSRP) undertaken from 2013-2016.
A total of 8 creel vessels, representing 8% of registered creel fishing vessels in Orkney, participated within the ORSP voluntary programme, submitting daily effort and landings information (Coleman and Rodrigues 2017b). Landed catches include velvet crab, European lobster and green crab ; and a total of 14 discarded species were recorded among which 10 demersal fish species, 1 congridae and 2 crustaceans (Table 4).

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The logbook programme is scheduled to continue until 2020 and the fishermen participation increases with 15% of creel vessels currently involved in the programme (OSF *pers. comm*.).

Table 4. Non-target species icatch n the Orkney brown crab creel fishery from the logbook programme for the period 2013-2016. Source: Coleman and Rodrigues 2017b.

Species	Out of scope?	Managed?	% UoA Catch (average of 2013-2016)	Less resilient	Main/minor	Category
Velvet crab, *Necora puber*	No	No	19%	No	Main	Main secondary
European lobster, *Homarus gammarus*	No	No	4%	No	Minor	Minor secondary
Green crab, *Carcinus maenas*	No	No	<1%	No	Minor	Negligible secondary
Lesser-spotted dogfish, *Scyliorhinus canicula*	No	No	<1%	No	Minor	Negligible secondary
Atlantic cod, *Gadus morhua*	No	Yes	<1%	Yes	Minor	Minor primary
Wrasse, *Labridae* sp.	No	No	<1%	No	Minor	Negligible secondary
Haddock, *Melanogrammus aeglefinus*	No	Yes	<1%	No	Minor	Minor primary
Conger eel, *Conger conger*	No	No	<1%	No	Minor	Negligible secondary
Three bearded rockling, *Gaidropsarus mediterraneus*	No	No	<1%	No	Minor	Negligible secondary
Wolffish, *Anarhichas lupus*	No	No	<1%	Yes	Minor	Negligible secondary
Curled octopus, *Eledone cirrhosa*	No	No	<1%	No	Minor	Negligible secondary
Sea scorpion, *Taurulus bubalis*	No	No	<1%	No	Minor	Negligible secondary
Comber, *Serranus cabrilla*	No	No	<1%	No	Minor	Negligible secondary
Monkfish, *Lophius piscatorius*	No	No	<1%	No	Minor	Negligible secondary
Ling, *Molva molva*	No	No	<1%	No	Minor	Negligible secondary
Saithe, *Pollachius virens*	No	Yes	<1%	No	Minor	Minor primary

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Observer programme

The observer is one of the component of the OSRP undertaken from 2013-2016, and is still running. This programme was carried out by the OSF marine scientist who went on-board creel fishing vessels to record catch composition. 131 trips were conducted onboard 16 different fishing vessels and 33,000 creels were observed over 2014-September 2017 (Coleman and Rodrigues 2017b and OSF *pers.comm*.). Figure 7 shows the spatial distribution of the observer coverage from 2014 up to September 2017.

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Landed catches include European lobster, velvet crab and green crab; and a total of 42 discarded species were recorded among which 7 crustaceans, 7 invertebrate species, 1 elasmobranch, 25 demersal fish and 1 congridae (Table 5). All species recorded in the logbook programme were also observer by the marine scientists.

Table 5. Bycatch species in the Orkney brown crab creel fishery from the observer programme for the period 2013-2016. Source: Coleman and Rodrigues 2017b.

Species	Out of scope?	Managed?	% UoA Catch (average of 2013-2016)	Less resilient	Main/minor	Category
Velvet crab, *Necora puber*	No	No	22%	No	Main	Main secondary
European lobster, *Homarus gammarus*	No	No	3%	No	Minor	Minor secondary
Green crab, *Carcinus maenas*	No	No	2%	No	Minor	Negligible secondary
Harbour crab, *Liocarcinys depurator*	No	No	<1%	No	Minor	Negligible secondary
Common hermit crab, *Pagurus bernhardus*	No	No	<1%	No	Minor	Negligible secondary
Majidae sp.	No	No	<1%	No	Minor	Negligible secondary
Nephrops, *Nephrops norvegicus*	No	No (Noup stock, ICES 2016)	<1%	No	Minor	Negligible secondary
Squat lobster, *Munida rugosa*	No	No	<1%	No	Minor	Negligible secondary
Common starfis, *Asterias rubens*	No	No	<1%	No	Minor	Negligible secondary
Sun star, *Crossaster papposus*	No	No	<1%	No	Minor	Negligible secondary
Cushion starfish, *Asterina gibbosa*	No	No	<1%	No	Minor	Negligible secondary
Seven armed starfish, *Luidia ciliaris*	No	No	<1%	No	Minor	Negligible secondary
Whelk, *Buccinum undatum*	No	No	<1%	No	Minor	Negligible secondary
Sea urchin, *Echinus esculentis*	No	No	<1%	No	Minor	Negligible secondary
Lesser-spotted dogfish, *Scyliorhinus canicula*	No	No	<5%	No	Minor	Minor secondary
Atlantic cod, *Gadus morhua*	No	Yes	<2%	Yes	Minor	Minor primary
Ballen wrasse, *Crenilabrus melops*	No	No	<1%	No	Minor	Negligible secondary
Goldsinny wrasse, *Ctenolabrus rupestris*	No	No	<1%	No	Minor	Negligible secondary
Cuckoo wrasse, *Labrus mixtus*	No	No	<1%	No	Minor	Negligible secondary

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Species	Out of scope?	Managed?	% UoA Catch (average of 2013-2016)	Less resilient	Main/minor	Category
Haddock, *Melanogrammus aeglefinus*	No	Yes	<1%	No	Minor	Minor primary
Conger eel, *Conger conger*	No	No	<1%	No	Minor	Negligible secondary
Three bearded rockling, *Gaidropsarus mediterraneus*	No	No	<1%	No	Minor	Negligible secondary
Wolffish, *Anarhichas lupus*	No	No	<1%	Yes	Minor	Negligible secondary
Curled octopus, *Eledone cirrhosa*	No	No	<1%	No	Minor	Negligible secondary
Sea scorpion, *Taurulus bubalis*	No	No	<1%	No	Minor	Negligible secondary
Comber, *Serranus cabrilla*	No	No	<1%	No	Minor	Negligible secondary
Monkfish, *Lophius piscatorius*	No	No	<1%	No	Minor	Negligible secondary
Ling, *Molva molva*	No	No	<1%	No	Minor	Negligible secondary
Saithe, *Pollachius virens*	No	Yes	<1%	No	Minor	Minor primary
Tad pole fish, *Raniceps raninus*	No	No	<1%	No	Minor	Negligible secondary
Rock cook,	No	No	<1%	No	Minor	Negligible secondary
Butter fish, *Pholis gunnellus*	No	No	<1%	No	Minor	Negligible secondary
Pouting, *Trisopterus luscus*	No	No	<1%	No	Minor	Negligible secondary
Poor cod, *Trisopteurs minutus*	No	No	<1%	No	Minor	Negligible secondary
Blue whiting, *Merlangius merlangus*	No	Yes	<1%	No	Minor	Minor primary
Red gunnar, *Chelidonichthys cuculus*	No	No	<1%	No	Minor	Negligible secondary
Tusk, *Brosme brosme*	No	No	<1%	Yes	Minor	Negligible secondary
Dab, Limanda limanda	No	No	<1%	No	Minor	Negligible secondary
Flounder, *Platichthys flesus*	No	No	<1%	No	Minor	Negligible secondary
European plaice, *Pleuronectes platessa*	No	No	<1%	No	Minor	Negligible secondary

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Species	Out of scope?	Managed?	% UoA Catch (average of 2013-2016)	Less resilient	Main/minor	Category
Topknot, *Zeugopterus punctatus*	No	No	<1%	No	Minor	Negligible secondary
Lemon sole, *Microstomus kitt*	No	No	<1%	No	Minor	Negligible secondary
Flatfish sp.	No	No	<1%	No	Minor	Negligible secondary

Species used as bait

Bait are supplied by OSF and purchased to Enterfoods in Fraserburgh Scotland, all fish are caught and landed in Scotland by licenced and registered vessels. OSF provided the quantity of bait purchased for 2015-2016 and 2016-2017.

Species used as bait are herring, haddock, saithe, whiting, gurnard (only for 2015-2016), horse mackerel and cod (only for 2016-2017) (Table 6). In addition, ling and wrasses bycaught in creels could be used by some fishermen as complementary bait.

In 2015-2016, a total of 378t of bait was used among which 95t of herring, 24t of haddock, 149t of saithe, 43t of whiting, 12t of gunards and 55t of horse mackerel. In 2016-2017, a total of 405t of bait was used among which 45t of herring, 47t of haddock, 179t of saithe, 37t of whiting, 16t of cod, and 81t of horse mackerel.

Table 6. Species used as bait. An average between 2015-2016 and 2016-2017 was calculated. Source: OSF.

Species	Out of scope?	Managed?	% UoA Catch	Less resilient	Main/minor	Category
Herring *Clupea harengus*	No	Yes	Close to 5%	No	Main	Main primary
Haddock frames *Melanogrammus aeglefinus*	No	Yes	Close to 2%	No	Minor	Minor primary
Saithe frames *Pollachius virens*	No	Yes	>5%	No	Main	Main primary
Whiting frames *Merlangius merlangus*	No	Yes	2%	No	Minor	Minor primary
Gurnards sp.	No	No	<1%	No	Minor	Negligible secondary
Horse mackerel *Trachurus trachurus*	No	No	<5%	No	Minor	Minor secondary
Cod frames *Gadus morhua*	No	Yes	1%	Yes	Minor	Minor primary

3.4.1.2 Main and minor primary and secondary species for the Orkney brown crab fishery

The assessment team determines which species are main and minor primary and secondary species (Table 7) based on the information presented in the previous section.

Please note that negligible secondary species are not considered further in the assessment.

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Table 7. Main and minor primary and secondary species for the OSF Orkney brown crab creel fishery. Stock is specified and stock status is given.

Species	Stock	Category	Stock status	Reference
Herring (bait) *Clupea harengus*	North Sea, Skagerrak, Kattegat and Eastern English channel (IV, IIIa and VIId)	Main primary	SSB>MSY $B_{trigger}$ and F<F_{MSY}	ICES 2017a, Marine Scotland Science 2017
Saithe (bait) *Pollachius virens*	North Sea, Rockall and West of Scotland, Skagerrak and Kattegat (Subareas IV and VI and division IIIa)	Main primary	SSB>MSY $B_{trigger}$ and F<F_{MSY}	ICES 2017 c, Marine Scotland Science 2017
Cod (bait and non-target species) *Gadus morhua*	North Sea, eastern English channel, Skagerrat (IV, VIId, II)	Minor primary	SSB>B_{lim} and F<F_{lim}	ICES 2017b, Marine Scotland Science 2017
Haddock (bait and non-target species) *Melanogrammus aeglefinus*	Rockall (VIb) North Sea, West of Scotland, Skagerrat (IV, VIa, II)	Minor primary	Rockall: SSB>MSY $B_{trigger}$ and F<F_{MSY} North Sea, West of Scotland, Skagerrat: SSB>MSY $B_{trigger}$, F_{lim}>F>F_{MSY}	ICES 2017d, ICES 2017e, Marine Scotland Science 2017
Whiting (bait and non-target species) *Merlangius merlangus*	North Sea and eastern English channel (IV and VIId)	Minor primary	SSB>MSY $B_{trigger}$, F_{lim}>F>F_{MSY}	ICES 2017f, Marine Scotland Science 2017
Velet crab (non-target species) *Necora puber*	Orkney Islands	Main secondary	Assessed using RBF, see Appendix 1.2	Marine Scotland Science 2017
Horse mackerel (bait) *Trachurus trachurus*	Skagerrak and Kattegat, southern and central North Sea, eastern English channel (IIIa, IVb-c, VIId)	Minor secondary	Abundance at low level but some signs of recovery are observed.	ICES 2017g
European lobster (non-target species) *Homarus gammarus*	Orkney Islands	Minor secondary	Assessed using RBF, see Appendix 1.2	Marine Scotland Science 2017
Lesser-spotted dogfish (non-target species), *Scyliorhinus canicula*	Celtic Seas (VII)	Minor secondary	Long-term increase of the stock size indicator.	ICES 2017h

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Herring in North Sea, Skagerrak, Kattegat and Eastern English channel (ICES 2017a, Marine Scotland Science 2017)

SSB is well above both B_{lim} and MSY $B_{trigger}$ (Figure 14). ICES classifies the stock as being at full reproductive capacity and a being harvested sustainable below F_{MSY} snce 1996.

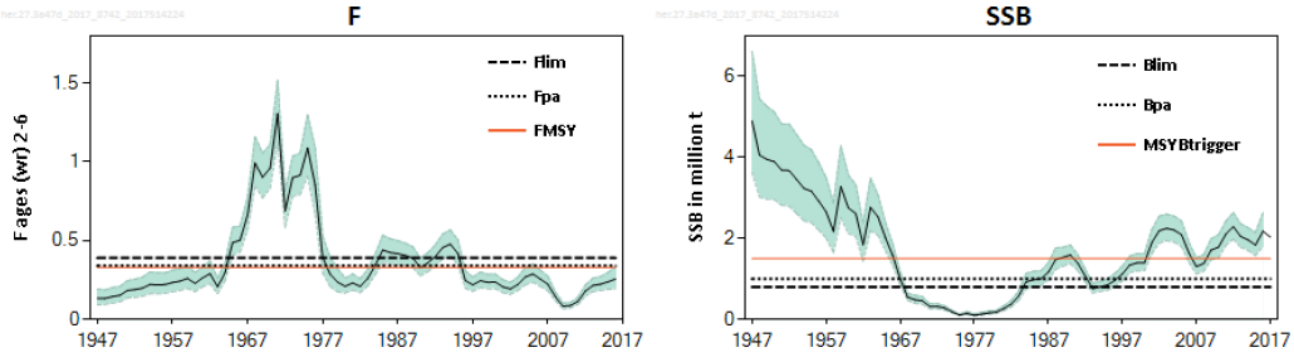

Figure 14. Fishing mortality and Spawning Stock Biomass for herring in North Sea, Skagerrak, Kattegat and Eastern English channel. Shaded areas indicate point-wise 95% confidence intervals. Source: ICES 2017a.

Saithe in North Sea, Rockall and West of Scotland, Skagerrak and Kattegat (ICES 2017c, Marine Scotland Science 2017)

SSB has fluctuated without trend and has been above MSY $B_{trigger}$ in the last 10 years (Figure 15). F has been below F_{lim} since 1996 and below F_{MSY} since 2012. ICES classifies the stock as being at full reproductive capacity.

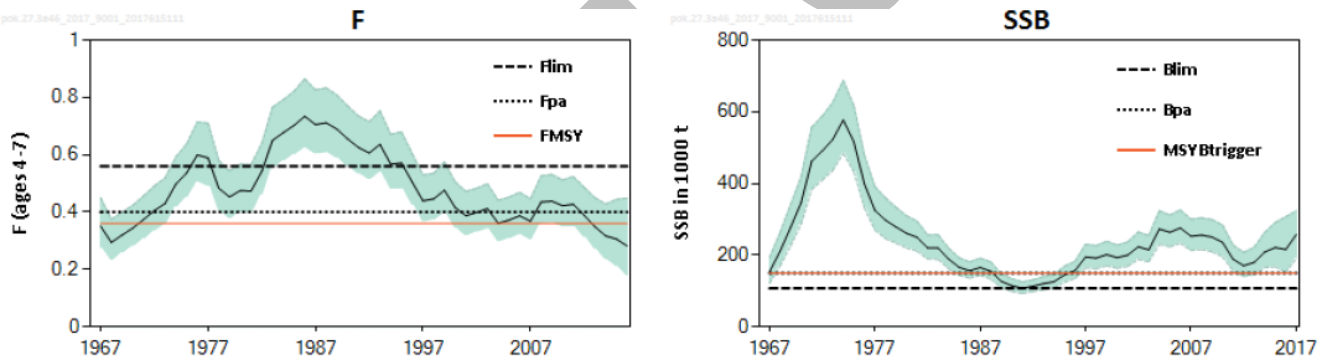

Figure 15. Fishing mortality and Spawning Stock Biomass for saithe in North Sea, Rockall and West of Scotland, Skagerrak and Kattegat. Shaded areas indicate point-wise 95% confidence intervals. Source: ICES 2017c.

Cod in North Sea, eastern English channel, Skagerrat (ICES 2017b, Marine Scotland Science 2017)

Although F has declined since 2000, it is estimated to be currently above F_{MSY} but below F_{lim} (Figure 16). SSB has increased from the historical low level in 2006 to be currently above B_{lim} and slightly below MSY $B_{trigger}$. There are also indications of increased recruitment in 2017. ICES classifies the sotck as being at full reproductive capacity.

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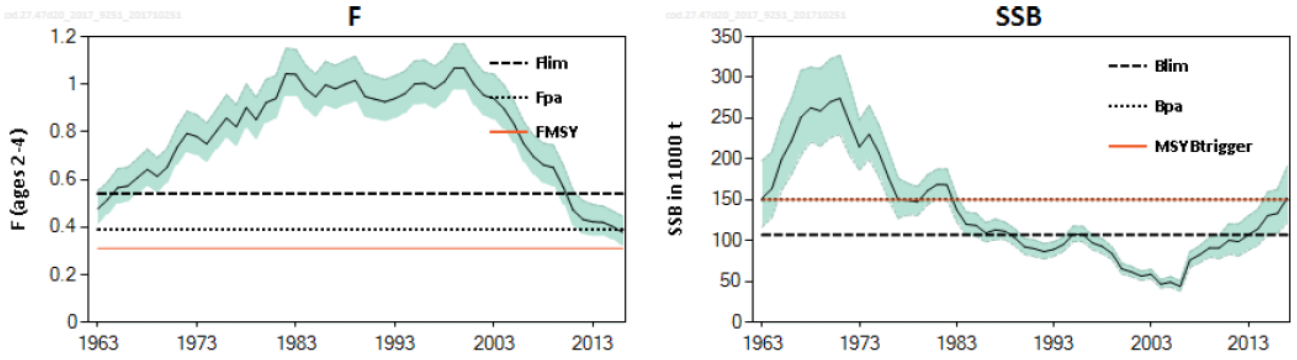

Figure 16. Fishing mortality and Spawning Stock Biomass for cod in North Sea, eastern English channel and Skagerrat. Shaded areas indicate point-wise 95% confidence intervals. Source: ICES 2017b.

Haddock in Rockall, North Sea, West of Scotland, Skagerrat (ICES 2017d, ICES 2017e, Marine Scotland Science 2017)

In Rockall, haddock SSB has increased from the lowest observed in 2014 and is currently estimated to be above MSY $B_{trigger}$ and F is currently below F_{MSY} (Figure 17). Recruitment was weak during the period 2008-2012 but has improved since with a 2017 recruitment estimated to be high.

In North Sea, West Scotland and Skagerrat, haddock SSB has been mostly above MSY $B_{trigger}$ since 2002, and F is currently below F_{lim} but above F_{MSY} (Figure 18).

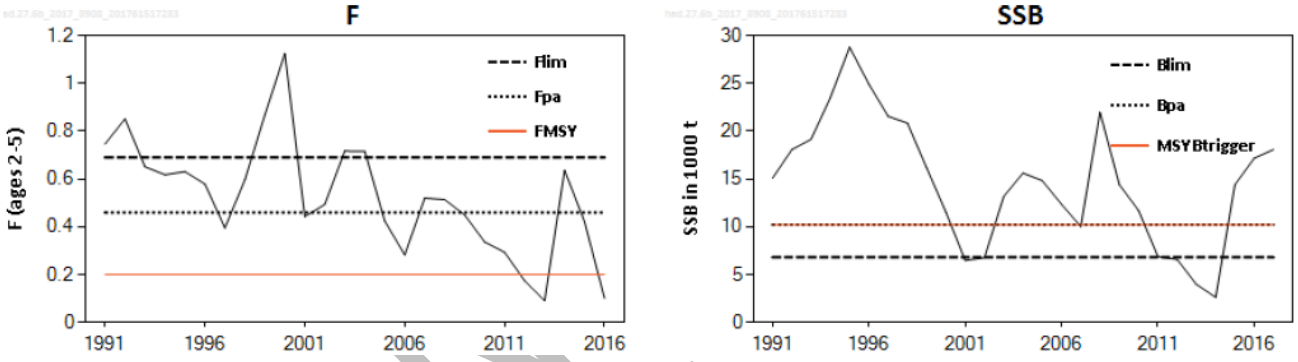

Figure 17. Fishing mortality and Spawning Stock Biomass for haddock in Rockall. Source: ICES 2017d.

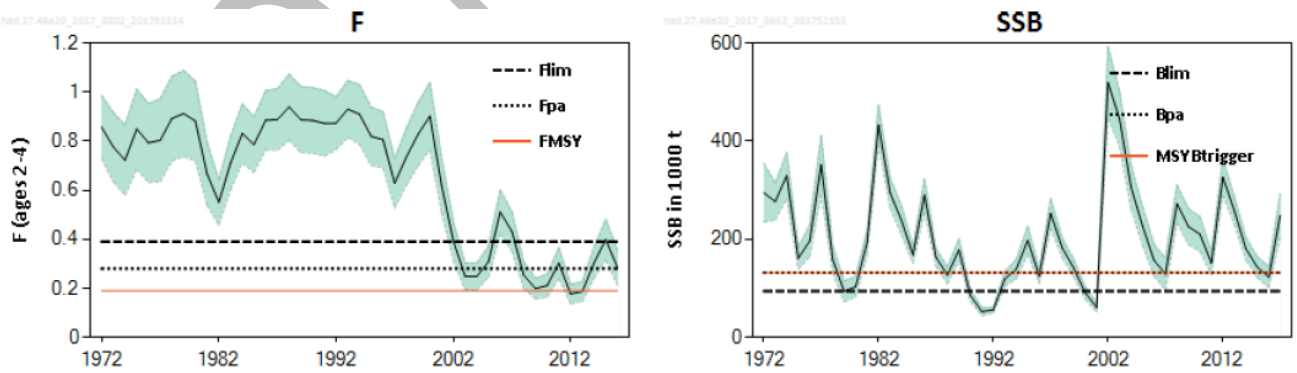

Figure 18. Fishing mortality and Spawning Stock Biomass for haddock in North Sea, West of Scotland, and Skagerrat. Shaded areas indicate point-wise 95% confidence intervals. Source: ICES 2017e.

Whiting in North Sea and eastern English Channel (ICES 2017f, Marine Scotland Science 2017)

SSB has fluctuated around, and is currently above MSY $B_{trigger}$, and and F is currently below F_{lim} but above F_{MSY} (Figure 19). ICES classifies the stock as being at full reproductive capacity.

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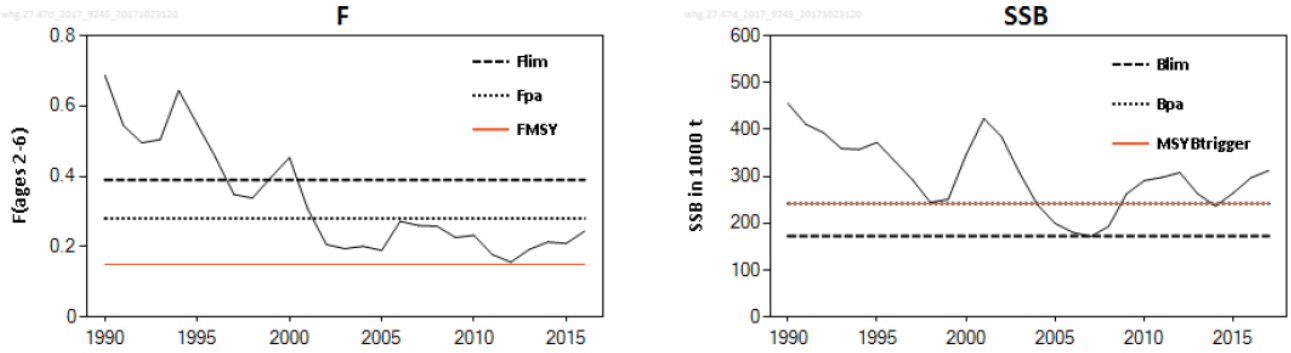

Figure 19. Fishing mortality and Spawning Stock Biomass for whiting in North Sea and eastern English Channel. Source: ICES 2017f.

Horse mackerel in Skagerrak and Kattegat, southern and central North Sea, eastern English channel (ICES 2017g)

The combined Channel Groundfish Survey (CGFS)-North Sea International Bottom Trawl Survey (IBTS) index indicates that the horse mackerel stock continues to be at a low level although some signs of recovery are observed (Figure 20).

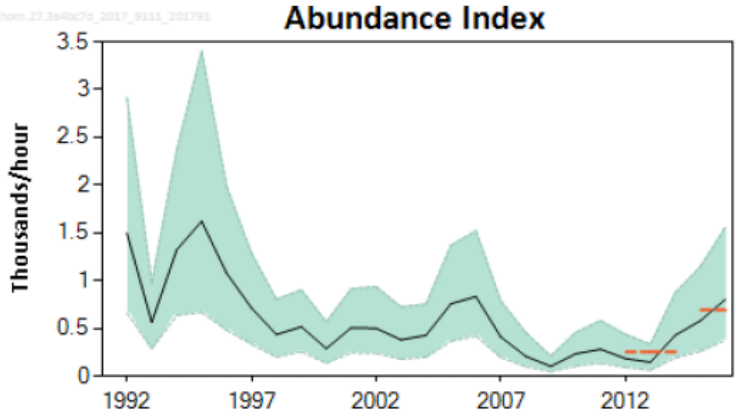

Figure 20. Index of abundance of horse mackerel > 20 cm length in Skagerrak and Kattegat, southern and central North Sea, eastern English channel. Data obtained from a combination of the IBTS and CGFS. Shaded area indicates point-wise 95% confidence intervals. Source: ICES 2017g.

Lesser-spotted dogfish in Celtic Seas (ICES 2017h)

Biomass indices derived from four surveys (EVHOE-WIBTS-Q4, IGFS-WIBTS-Q4, SpPGFS-WIBTS-Q4 and UK(E&W)-BTS-Q3) were used to provide an overall stock size indicator. The stock size indicator has increased over the time series (Figure 21).

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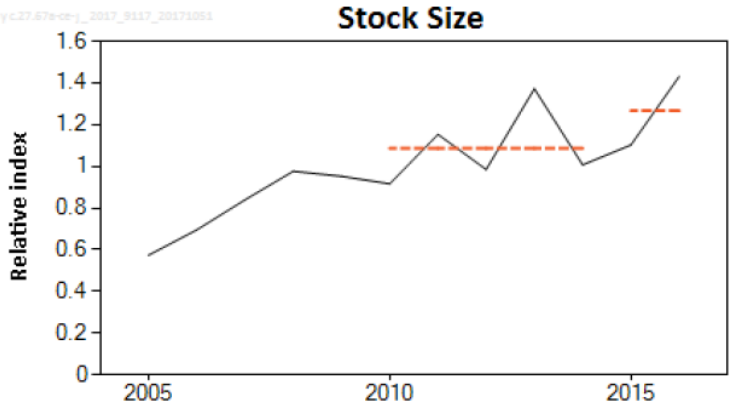

Figure 21. Stock size indicator of lesser-spotted dogfish in Celtic Seas relative to the time-series mean (dotted red lines show the mean stock indocators for 2015-2016 and 2010-2014). Source: ICES 2017h.

3.4.1.3 Conclusion

Orkney Islands creelers predominately catch and land brown crab (approximately 75%-80%) and velvet crab (approximately 15%-20%), with smaller quantities of lobster (less than 5%) and negligible quantities of green crab (≤1%) (Figure 22).

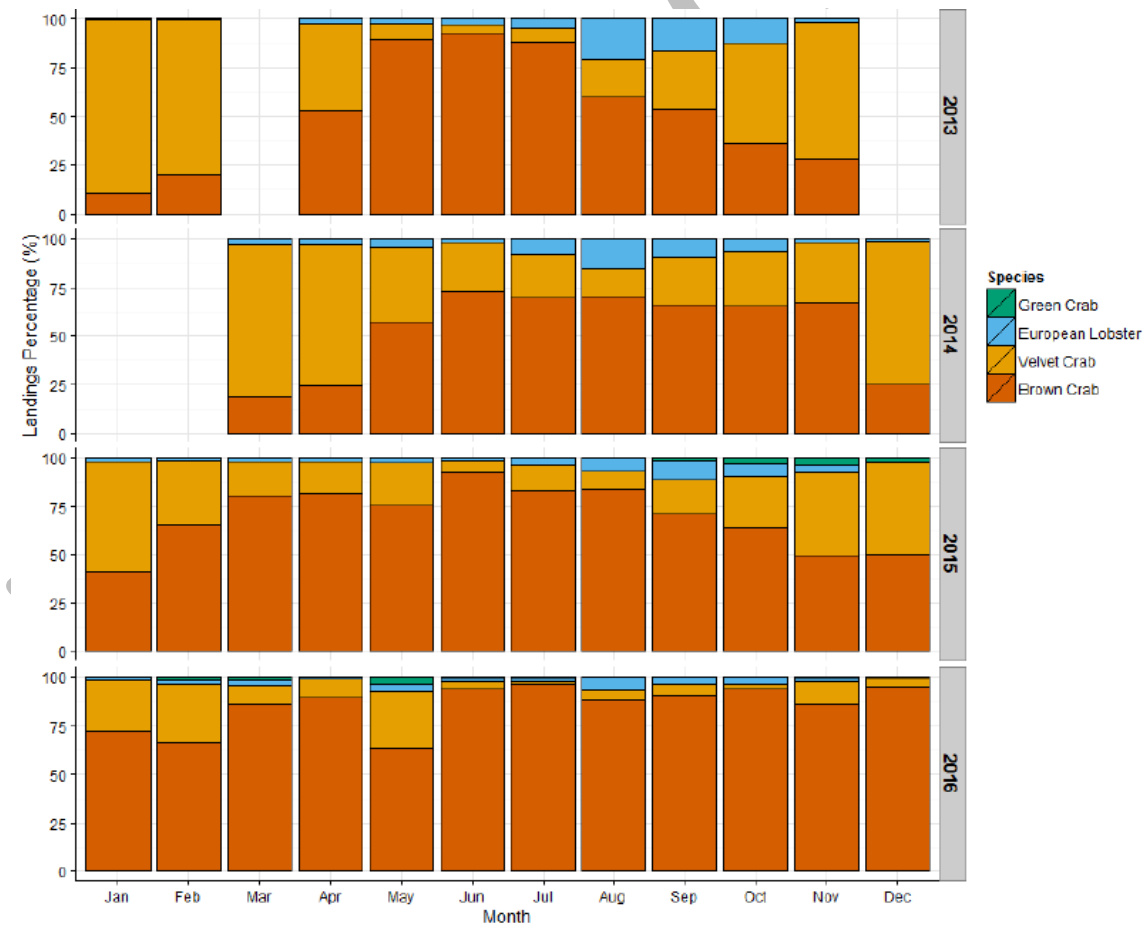

Figure 22. Monthly total catch composition per commercial important crustacean species reported by the logbook fleet for the period 2013-2016. Source: Coleman and Rodrigues 2017b.

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The OSF Inshore Fisheries Management Plan (Orkney Sustainable Fisheries Ltd, 2017) set out the management measures for shellfish species. In 2016, management measures for velvet crab, lobster and green crab were:

- For velvet crab, a minimum landing size (MLS) of 70 mm and the prohibition to land berried females;
- For lobster, a MLS of 88 mm (moving to 90 mm one year thereafter); and
- For green crab, a MLS of 70 mm.

Bait are mostly supplied from healthy stocks with management strategy in place.

Brown crab creels are highly selective with a low bycatch level. Creels are not designed to catch fish and it is expected that post-release mortality of fish and non-fish species may be low as they are catch usually alive, with no injuries and low capture-related stress (Taggart et al 1995, Nøstvik et al 1999).
Although escapement vents are not mandatory, at least 10% of fishermen equip their creels with escapement vents on a voluntary basis to reduce catch of smaller crabs and non-taret species (OSF, *per.comm*.).

3.4.2. Endangered, Threatened and Protected (ETP) species

According to MSC FCR v.2.0, ETP species are species recognized by national ETP legislation and/or listed in binding international agreements listed in SA3.1.5.2. Binding in this context refers to the agreement being binding on the parties to the agreement and does not require the state in whose waters the fishery takes place to be a signatory to the agreement for it to be applicable. Also ETP species are species classified as out-of-scope (amphibians, reptiles, birds and mammals) that are listed in the UICN Red List as vulnerable, endangered or critically endangered.

Table 8 below lists all ETP species that are found in Scotland waters and may potentially overlap with the Orkney Islands brown crab creel fishery.

Table 8. ETP species in Scotland waters that may overlap with the Orkney brown crab creel fishery. Source: Scottish Natural Heritage, CITES, IUCN Red List.

Group	Species	National Legislation	Status
Dolphin	Bottlenose dolphin, *Tursiops truncatus*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), ASCOBANS
	Harbour Porpoise, *Phocoena phocoena*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), ASCOBANS
Whale	Humpback whale, *Megaptera novaeangliae*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), listed in CITES Appendix I
	Minke whale, *Baleanoptera acutorostrata*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), listed in CITES Appendix I
	Fin whale, *Balaenoptera physalus*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), listed in CITES Appendix I, listed in IUCN Red List as endangered

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	North Atlantic right whale, *Eubalaena glacialis*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), listed in CITES Appendix I, listed in IUCN Red List as endangered
Seal	Grey seal, *Halichoerus grypsus*	Conservation Regulation 1994, Marine (Scotland) Act 2010, The Protection of Seals Order 2014	Protected
	Harbour seal, *Phoca vitulina*	Conservation Regulation 1994, Marine (Scotland) Act 2010, The Protection of Seals Order 2014	Protected
Sea turtle	Leatherback turtle, *Dermochelis coriacea*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), listed in CITES Appendix, listed in IUCN Red List as vulnerable
Shark	Basking shark, *Cetorhinus maximus*	Wildlife and Countryside Act 1981	Protected
Otter	Otter, *Lutra lutra*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), listed in CITES Appendix I

It is an offence to intentionally or recklessly kill, injure, take or disturb or harass marine mammals, sea turtles and basking sharks.

Whale species and bottlenose dolphin are under a grouped UK Biodiversity Action Plan (BAP); the harbour porpoise, basking shark have their own UK BAP, and sea turtles are under a grouped UK BAP[1]. However, the work previously carried out by the UK BAP is now focussed at the country-level rather than UK-level, and the UK Post-2010 Biodiversity Framework published in July 2012 has succeeded the UK BAP.

3.4.2.1 Interactions with whales and dolphins

Whales can potentially get entangled in creels buoy lines. The species that are most likely to be encountered in Orkney Islands waters are minke whale and in a lesser extend humpback whale, fin whale and North Atlantic right whale being rare to absent in Orkney waters.

Northridge et al (2010) investigated the occurrence of entanglement of minke whale in Scottish waters. The overlap between the relative creel fishing density and aggregated minke whale sighting in the same ICES rectangles has been analysed to determine a relative risk level of entanglement around Scotland. The area with the higher risk of minke whale entanglement is central Hebrides (West Scotland), and Orkney Islands may have also a relative elevated risk of minke whale entanglement. Overall, Northridge et al (2010) concludes that it cannot be said that entanglements of minke (or orther) whales in Scottish waters represent a serious threat for conservation. However it should receive continued attention because of the protected status of whale species.

[1] http://jncc.defra.gov.uk/page-5167

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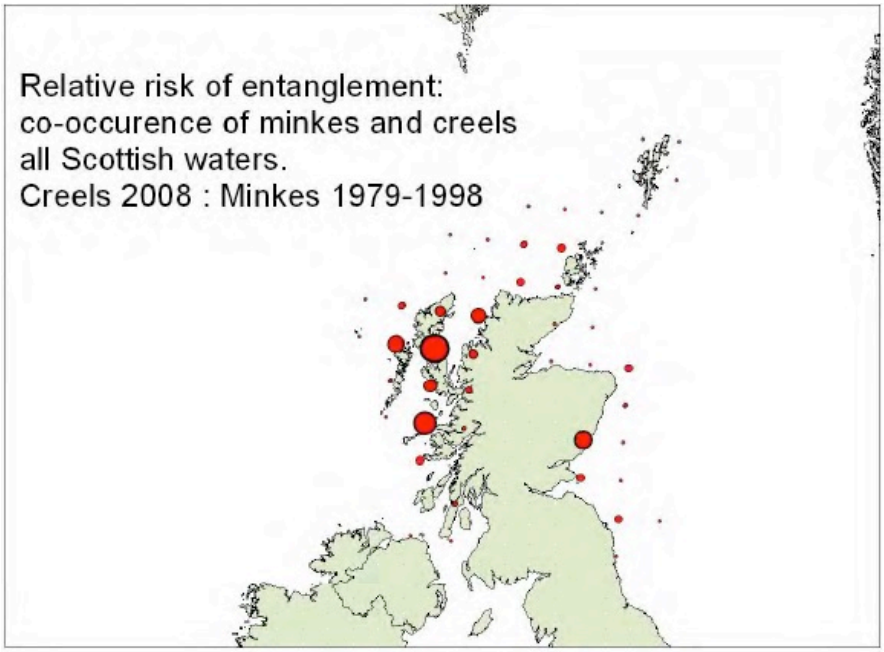

Figure 23. Relative risk entanglement. Source: Northridge et al (2010).

Ryan et al (2016) investigated the entanglement of humpback whale in Scottish waters by analysing the temporal and spatial distribution of humpback whale sightings and entanglements collected from different data base and a marine mammal survey (only in Hebrides). Scottish waters are not currently a key habitats for humpback whale, they occur in very low abundance and there is a small number of observations. From 1992-2016, there were 3 sightings of humpback whale and 2 entanglements observed in creel gear in Orkney Islands. The authors estimated the entanglement risk and considered that the risk of entanglement in creel fisheries is high. The study concludes that there would be a concern for the recovery of humpback whale populations if the species would increasingly inhabit Scottish waters.

Gillnets, driftnets and trammelnets account for the majority of harbour porpoise and bottlenose dolphin bycatch in UK waters (Sewell and Hiscock 2005).There are reports of harbour porpoise being entangled in creel ropes but the number are not though to be significant (Sewell and Hiscock 2005).
No concern has been raised regarding incidental capture of dolphins by brown crab creels in Orkney during meetings with fishermen, management agencies and nature conservation organisations.

The assessment team has been provided with entanglements data by the Whale and Dolphin Conservation which obtained them from the Scottish Marine Animal Stranding Scheme (SMASS). Since 2010, SMASS has had 2 records of entanglement of whale in Orkney: two minke whale (Thurso, Holm). However, it has not been confirmed which fishing gear was involved in these entanglements.

3.4.2.2 Interactions with otters

Otters are known to be attracted by fish and crustaceans which are used as bait or caught in creels, and a survey of drowned otters in lobster creels off the Uists (Hebrides) showed that the majority drowned while foraging in depth of 2-5 m (Sewell and Hiscock 2005). Futhermore, crab creels were considered not to pose such a threat as the gear was usually set on sandy seabed in deeper water.
No concern has been raised regarding incidental capture of otters by brown crab creels in Orkney during meetings with fishermen, management agencies and nature conservation organisations.

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3.4.2.3 Interactions with seals

Seal bycatch is often associated with static gears, and incidental catch of grey seals and harbour seals in gillnets has been widely reported (Sewell and Hiscock 2005).
The assessment team has been provided with interaction data by the Whale and Dolphin Conservation which obtained them from the SMASS. Since 2010, SMASS has had 3 records of incidental catch of seals in Orkney: one grey seal (Billia Croo near Stromness) and two harbour seals (Wideweall Bay, South Ronaldsay). However, it has not been confirmed which fising gear was involved in these entanglements.
No concern has been raised regarding incidental capture of seals by brown crab creels in Orkney during meetings with fishermen, management agencies and nature conservation organisations.

3.4.2.4 Interactions with sea turtles

The leatherback turtke is the only sea turtle considered to have a regular and normal occurrence in UK waters (Pierpoint 2000; Sewell and Hiscock 2005). In the last 20 years, the most significant incidental catch of leatherback turtles in UK waters has been by inshore pot fisheries (whelk and crustaceans) and pelagic drift nets (Pierpoint 2000; Sewell and Hiscock 2005). The leatherback turtle sightings indicate a higher occurrence in west of Eire, northwest of Scotland, the Irish Sea and English Channel.
No concern has been raised regarding incidental capture of leatherback turtle by brown crab creels in Orkney during meetings with fihsermen, management agencies and nature conservation organisations.

3.4.2.5 Interactions with basking sharks

No concern has been raised regarding incidental capture of basking sharks by brown crab creels in Orkney during meetings with fishermen, management agencies and nature conservation organisations. None of the stakeholder met were aware of any entanglement of basking shark in Orkney Islands.

3.4.2.6 Conclusion

Based on the information provided below, the assessment team concludes that there are no interactions with leatherback turtles, basking shark, otter and dolphins. Interactions with seals are not rare and although some whale entanglements may be unreported, interactions with whales seem to be low enought not to represent serious threat for their conservation and recovery.

OSF has developed a Code of Practices for Crab Suppliers (a copy has been provided to the assessment team). This Code of Practices include a section related to the record and report of any accidental capture of ETP species in a ETP species logbook. Also is included the notice of the British Divers Marine Life Rescue (BDMLR) - Large Whale Entanglement Awareness that explains and describes what to do in the event of a entanglement of whale in fishing gear.
In April 2017, the Scottish Creel Fishermen's Federation (SCFF) published a booklet "Reducing the risk of entanglement in creel ropes fro marine animals" produced in collaboration with the BDMLR, Scottish Natural Heritage, Whale and Dolphin Conservation, SMASS and the Hebridean Whale and Dolphin Trust[2]

3.4.3. Habitats

3.4.3.1 Benthic habitats distribution

Benthic habitats around Orkney Islands have been mapped and benthic habitats mapping is available through the European Marine Observation and Data Network (EMODnet) and Joint Nature Conservation Committee

[2] http://www.scottishcreelfishermensfederation.co.uk/entanglement.htm

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(JNCC) (Figure 24). Benthic habitats are dominated by inshore rock and biogenic reef and coarse sediment and offshore sand and coarse sediment.

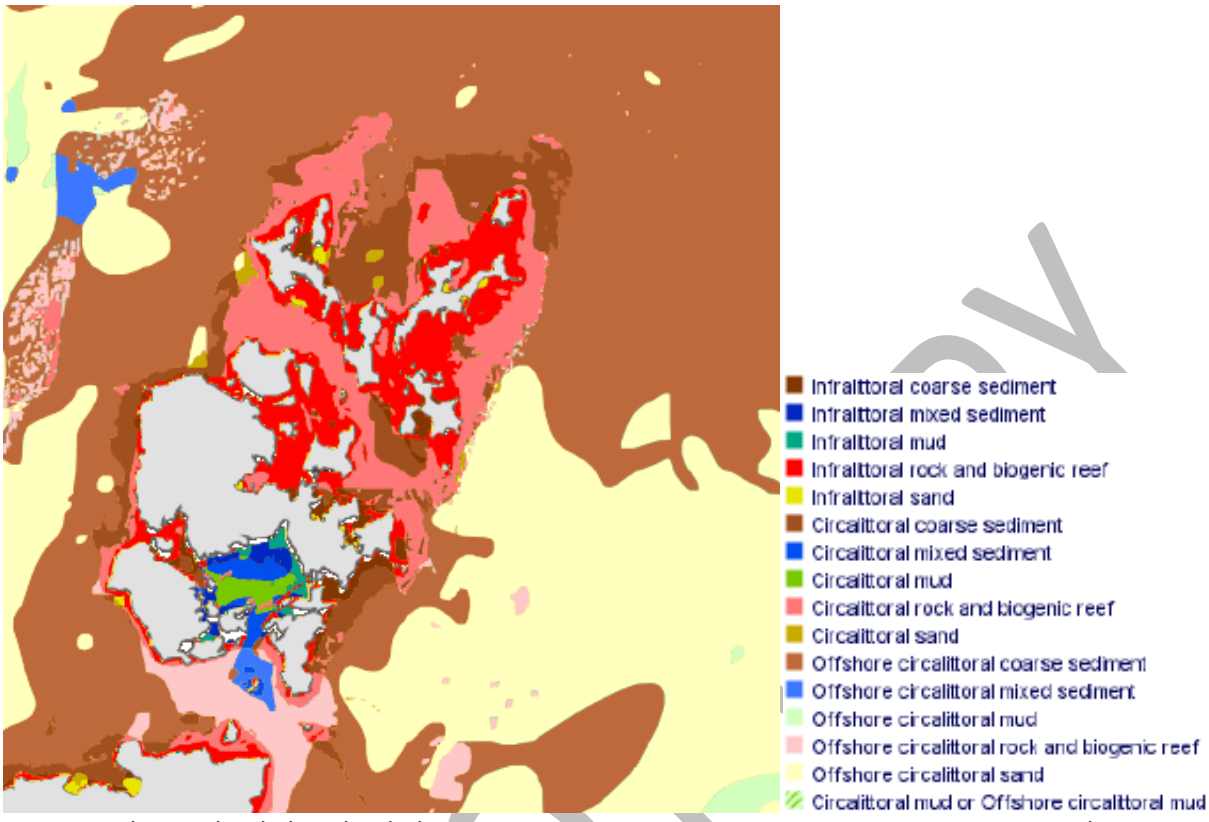

Figure 24. Orkney Islands benthic habitats mapping. Source: EMODnet, European Marine Observation and Data Network – Map copyright JNCC.

Priority Marine Habitats in Scotland waters correspond to the definition of Vulnerable Marine Ecosystems (VMEs) and are: mussel and native oyster beds, seapens and burrowing megafauna in circalittoral fine mud, cold-water coral reefs, deep-sea sponge aggregations, kelp beds, seagrass beds, maerl beds, offshore deep sea muds, offshore subtidal sands and gravels, seamount communities and tide-swept algal communities and coarse sands with burrowing bivalves.
Mussel and native oyster beds, seagrass beds (*Zostera noltii*), Northern sea fan and sponge communities, cold-water coral reefs, flame shell beds, burrowed mud, deep-sea habitats and seamount communities are not present in Orkney Islands (Baxter et al 2011).

Maerl beds are found in Orkney Islands waters (Figure 25). Maerl is extremely slow growing and maerl beds create a complex, open structure that supports diverse associated communities of red seaweeds and animals including juveniles stages of a range of commercially important species.
Subtidal seagrass beds of *Zostera marina* and *Ruppia maritima* are found in Orkney Islands waters (Figure 26). Eelgrass beds are considered to be scarce in Scotland and have an important role in the ecosystem by stabilising sediments, protecting the coast from waves action and being a nursery area fro many commercially important species.

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Figure 25. Mearl beds distribution in Orkney Islands. Source: Baxter et al 2011.

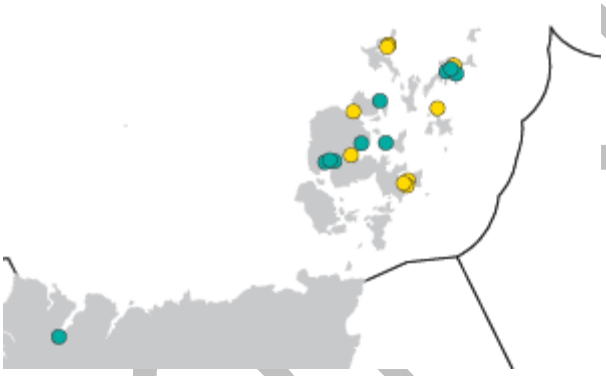

Figure 26. Seagrass beds of *Zostera marina* and distribution in Orkney Islands. Source: Baxter et al 2011.

3.4.3.2 Habitat impacts

A succorfish project was undertaken by OSF as part of the OSRP from 2013-2016 (Coleman and Rodrigues, 2017c). This project studied the spatial and temporal distribution of creel fishing effort.

Brown crab capture density has been mapped in relation to benthic habitats (Figure 27). The most important brown crab grounds and higher density of catches are occurring on the west coast of Orkney mainland both inshore (<30m) and deeper (≥80m), typically on the borderline between two habitat types, rock and biogenic reef and coarse sand /mixed sediment which are thus considered as commonly encountered habitats.

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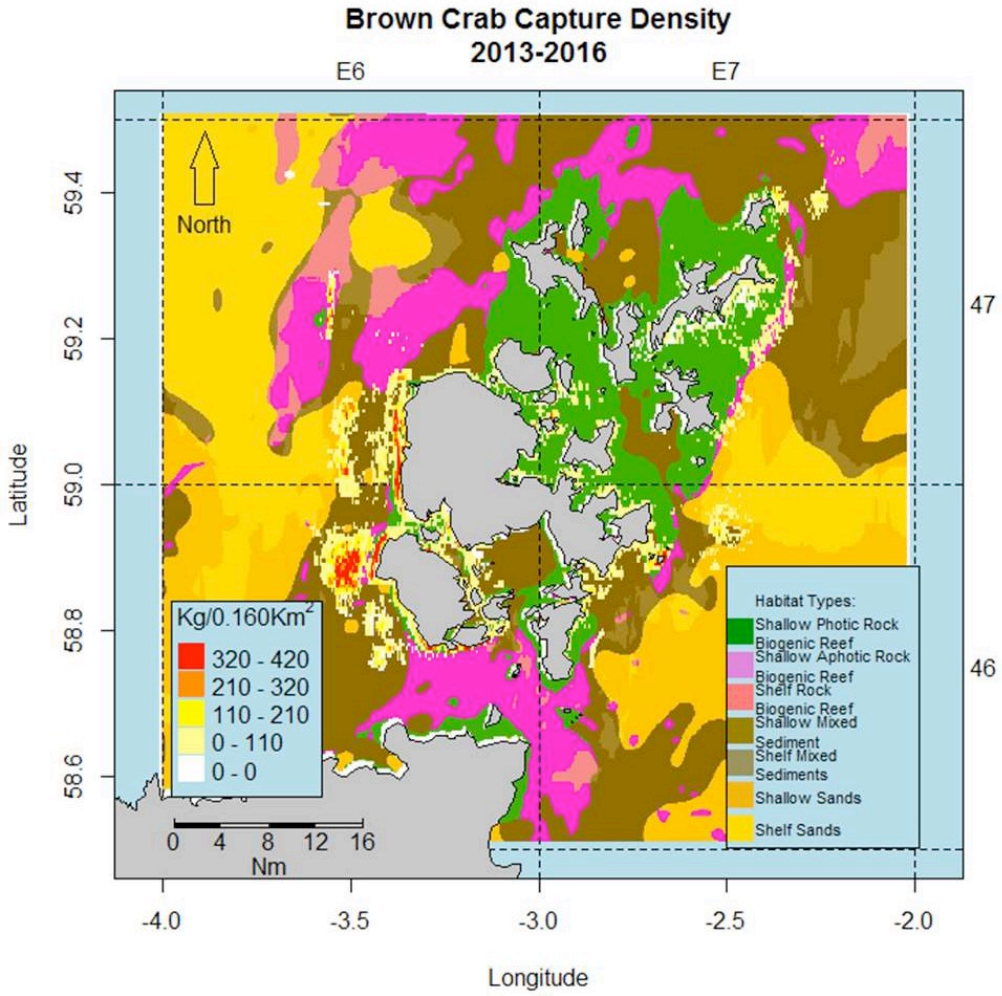

Figure 27. Brown crab capture density for 2013-2016 in relation to benthic habitats around Orkney Islands. Source: Coleman and Rodrigues (2017c).

Traps are passive gear types that rely on bait to attract the target species. Although trap fisheries are generally considered to have slight impacts on the habitat, traps can impact biogenic structures (e.g. sponges, corals) through crushing or entanglement (DFO 2010). Crushing and scouring effects can result if traps are dragged across the bottom during retrieval or during periods of strong currents (e.g. storms, tides).

Eno et al (2001) examined the effects of fishing with crustacean traps on benthic fauna in UK through qualitative and quantitative experiments. This study examined the effects of lobster and crab traps being hauled from rocky substrates in southern England, and found that the habitats and their communities appeared relatively unaffected by potting.

A study carried out by Chuenpagdee et al (2003) ranked fishing gears regarding their collateral impacts on bycath and on habitats in U.S. each Fishery Management Council region. They found that traps have low and medium impacts on biological and physical component of habitat, respectively. Shester and Micheli (2011) quantify and compare the ecosystem impacts of four gears (lobster traps, fish traps, set gillnets, drift gillnets) used in small-scale fisheries of Baja California, Mexico, using at-sea observations and field experiments. Results indicated that traps caused minimal immediate damage to habitats.

The most important brown crab grounds and higher density of catches do not overlap with the maerl beds and seagrass beds distribution (Figures 25-27).

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3.4.4. Ecosystem

3.4.4.1 Description of the ecosystem the Orkney brown crab creel fishery depends on

Orkney Islands lie at latitude 59.09 N and longitude 2.95 W, in the North of Scotland (Figure 28), and are typically rocky but with many bays, channels and sheltered beaches (Baxter et al 2011).

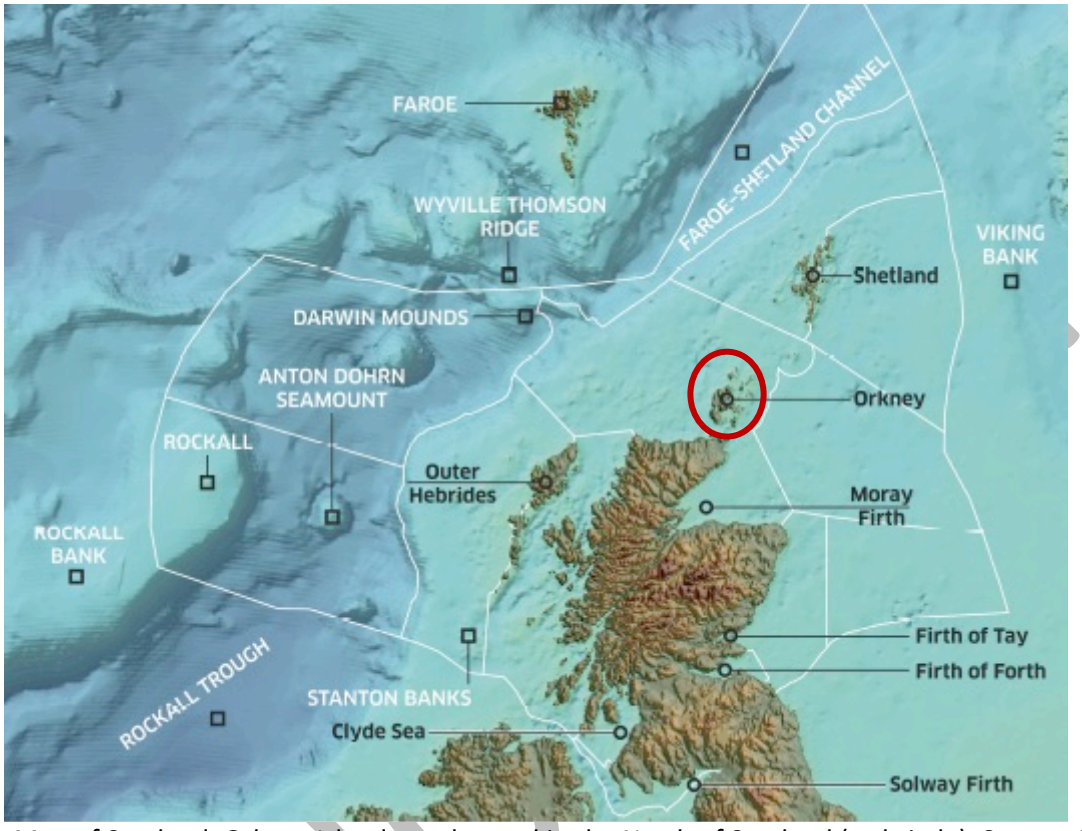

Figure 28. Map of Scotland. Orkney Islands are located in the North of Scotland (red circle). Source: Baxter et al 2011.

Orkney Islands have a maritime climate that is strongly influenced by the oceanic waters of the North Atlantic and prevailing southwesterly winds. Orkney's position on the UK Continental Shelf means that the seas around the Islands are directly affected by oceanic circulation. The steep bathymetry of the continental slope acts as a barrier between oceanic regions and the shelf sea systems, reducing the amount of water that can travel from the deeper waters of the North Atlantic into the shallower waters on the continental shelf. Processes that cause mixing of oceanic waters and shelf sea waters are complex but have a significant impact on conditions in Orkney waters. Most waters from the North Atlantic that enter the North Sea do so between Orkney Islands and Shetland Isalnds.

The strong mixing of different water bodies makes Orkney's Islands marine environment highly productive. Orkney waters support significant populations of invertebrates and fish, as well as marine predators such as seabirds and marine mammals.

There is a substantial programme of environmental monitoring undertaken by a range of organisations in Orkney. The European Marine Energy Centre (EMEC) carries out monitoring of sea surface temperature (SST), OSF monitors bottom temperatures and Orkney Marine Services monitors SST, water quality, the marine intertidal and non-native species. Marine Scotland Science monitor environmental parameters including salinity and sea surface temperature through their Scottish Coastal Observatory Programme including at Scapa Pier in Orkney.

DO NOT

3.4.4.2 Ecosystem impacts

The Orkney Islands brown crab creel fishery does not cause serious or irreversible harm to key elements of the ecosystem structure and function.

Given the generalist role of brown crab and velvet crab in the ecosystem, as well as the range of other benthic and bentho-pelagic predators and scavengers present in the stock areas, it is likely that functional group composition, community distribution and trophic dynamics would be virtually unchanged from natural background levels. Species composition may be impacted by fishing, given that removal of crabs is likely to reduce competition for other benthic predators and scavengers, but it seems unlikely that any changes would be major in comparison with the natural range of variation.

Bycatch level is low, incidental catch of ETP species is low and does not represent serious threat for their conservation and recovery, and effects on habitats are considered to be not significant.

No concerns have been raised about the impacts of the Orkney brown crab creel fishery on the wider ecosystem structure and function.

3.4.4.3 Management

The potential impacts of the Orkney brown crab creel fishery on the ecosystem structure and function is managed at the international level under the EU framework, at the national level under UK and Scottish regulations and the regional/local level.

Marine planning matters in Scotland's inshore waters are governed by the Marine (Scotland) Act 2010 (Act of the Scottish Parliament) and in its offshore waters by the Marine and Coastal Acess Act 2009 (Act of the UK Parliament). A Scotland's National Marine Plan has been published in 2015 (Marine Scotland 2015). The Plan has been developed in accordance with the EU Directive 2014/89/UE which came into force in 2014 and introduces a framework for marine spatial planning and aims to promote the sustainable development of marine areas and the sustainable use of marine resources. The Plan sets objectives specific to the marine environment.

A Pilot Pentland Firth and Orkney Waters Marine Spatial Plan has been published in 2016 (Marine Scotland 2016). The Plan sets out an integrated planning policy framework to guide marine development, activities and management decisions, whilst ensuring the quality of the marine environment is protected. This pilot plan was prepared in parallel with the Scotland's Nationa Marine plan and will establish a useful basis for the preparation of separate regional marine plans.

A network of Marine Protected Areas (MPAs) helps to protect nationally important marine wildlife, habitats, geology and undersea landforms. Developing Scotland's network of MPAs is part of a wider strategy to meet the Scottish Government's commitment to a "clean, healthy, safe, productive and biologically diverse marine and coastal environment that meets the long term needs of people and nature"[3].

Scotland's MPAs includes Nature Conservation MPAs (NCMPA), Special Areas of Conservation (SAC), Special protection Areas (SPA) and Sites of Special Scientific Interest (SSSI) (Table 9).

[3] https://www.snh.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/national-designations/marine-protected-area/scotlands-marine-protected

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Table 9. Summary of the who, what and why each type of MPA. Source: Scottish Natural Heritage.

Type of MPA	What does it protect?	Legislation / Agreement	Lead organisation	SNH and JNCC roles
SAC	Protection of marine species and habitats agreed at a European level to contribute to the conservation of Europe's biodiversity. The habitats and species are listed in Annex I and Annex II of Council Directive 92/43/EEC.	**International** Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (as amended) (commonly known as the Habitats Directive) is transposed into law in Scotland by The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (includes territorial waters) and The Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007 (as amended) (offshore waters).	Marine Scotland	SNH lead in developing and providing scientific advice to Scottish Ministers on the selection of sites within Scottish territorial waters (out to 12nm). SNH work in partnership with JNCC, MS and Historic Scotland. SNH also produce communication materials and directly engage with the public and marine users to support the delivery of the MPA network consultation process for Scottish territorial waters. Once sites are proposed and / or designated, SNH provides advice on the sensitivities of the habitats and species to MS. When providing this advice for MPAs in Scottish territorial waters SNH will take into account the objectives set for each site. Scottish Ministers then decide what management is required to maintain the interest of the MPA. There is a legal requirement to consult SNH and have regard to our advice when considering plans / projects likely to have a significant effect on these types of MPAs. JNCC fulfil the same role as SNH for these types of MPAs in offshore waters.
SPA	Protection for bird species wholly dependent on the marine environment (agreed at a European level) to contribute to ensuring their survival and reproduction in their area of distribution within Europe. The species include those listed in Annex I of Directive 2009/147/EC and all migratory bird species.	**International** Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (commonly known as the Birds Directive) is transposed into law in Scotland largely through the Wildlife and Countryside Act 1981 (as amended by the Nature Conservation (Scotland) Act 2004) and also by elements of the Habitats Regulations.	Marine Scotland	
Nature Conservation MPA	Conserves marine flora or fauna, habitats or geological or geomorphological interests and protection of these features can be used to complement other protection measures including SACs, SPAs and SSSIs.	**National** Marine (Scotland) Act 2010 (territorial waters) UK Marine and Coastal Access Act 2009 (offshore waters) MPAs have been identified primarily using OSPAR principles.	Marine Scotland	
SSSI	Conservation of areas of land and water (to mean low water spring tide level) that represent Scotland's diversity of plants, animals, habitats, rocks and landforms.	**National** Nature Conservation (Scotland) Act 2004	Scottish Natural Heritage	SNH identifies, designates and de-notifies sites. We establish management processes and grant permission for operations requiring consent that are proposed to be carried out within sites. We also respond to consultations from regulatory authorities regarding operation applications within sites.

Figure 29 shows the MPAs in Orkney Islands.
There are 3 NCMPAs (plain blue):

- Wyre and Rousay Sounds established for the protection and conservation of maerl beds.
- Papa Westray established for the conservation and protection for black guillemot.
- North-west Orkney established for the protection and conservation of sandeel.

There are 4 SAC in Orkney: Sanday, Loch of Stenness, Stromness Heaths and Coast, and Hoy.

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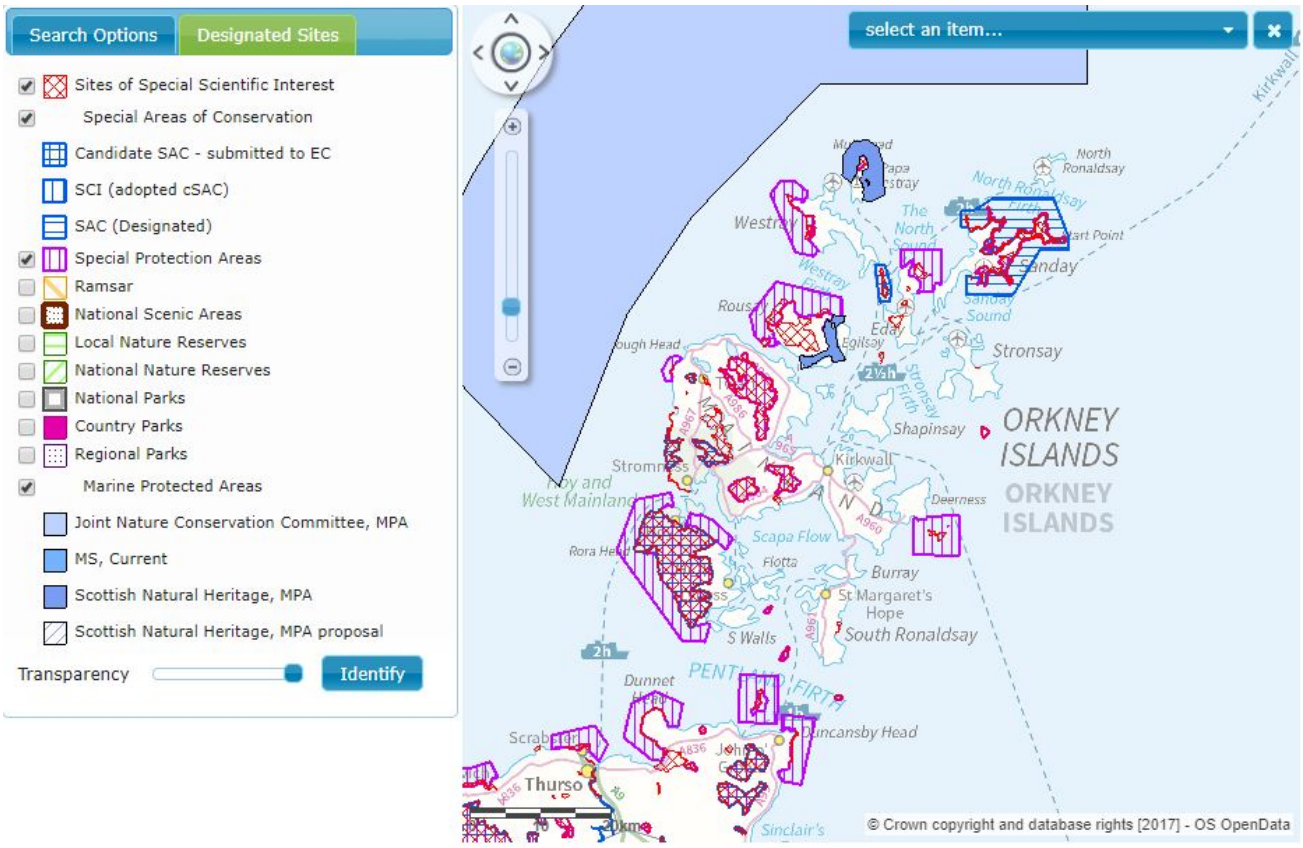

Figure 29. MPAs in Orkney Islands. Source: JNCC.

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3.5. Principle Three: Management System Background

This section focuses on the management system, its objectives, consultation and decision-making processes, the monitoring, control and surveillance mechanisms in place, and mechanisms in place to monitor and evaluate its performance.

MSC FCR v.2.0 states that:

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

3.5.1. The legal basis and scope of the management system

European Union

The United Kingdom has been a Member State of the European Union (EU) since 1973 and its fisheries are therefore subject to the principles and practices of the EU's Common Fisheries Policy (CFP)[4]. The first EU common measures in the fishing sector date from 1970 when it was agreed that, in principle, EU fishermen should have equal access to Member States' waters. It was also decided that the EU was best placed to manage fisheries in the waters under their jurisdiction and to defend their interests in international negotiations. However, in order to ensure that smaller vessels could continue to fish close to their home ports, an inshore fishing area (6 nm) was reserved for local fishermen who have traditionally fished these areas.

The CFP came into being in the form we recognise today in 1983. It was reviewed thoroughly in 2002 and updated fisheries regulation (No.2731/2002) was adopted by the Council of Ministers on 20th December 2002. Following further review over 2011 – 2013, a new CFP was agreed by the European Council and became effective from 1 January 2014 that stipulates, amongst other things, that between 2015 and 2020 catch limits should be set that are sustainable and maintain fish stocks in the long term. This is enshrined in Regulation (EU) No. 1380/2013 on the Common Fisheries Policy[5].

The scope of the CFP extends to conservation, management and exploitation of living aquatic resources and aquaculture, as well as processing and marketing of fishery products, covering related activities, both within EU waters and by any member state vessel or national – with due regard to the UN Convention on the Law of the Sea (UNCLOS) and without prejudice to the primary responsibility of the flag State.

The CFP regulation is a 'chapeau' regulation setting out the strategic aims of the CFP and enabling the Council of Ministers, or in certain cases the Commission, to make more detailed Regulations. In total there are in excess of 1,227 related regulations broadly divided into four categories (Structural measures, State Aid, Conservation of Resources, market organisation). Included within these are regulations dealing with almost all fisheries management related aspects from control requirements, to fleet structure, technical conservation, marketing, annual total allowable catches (TAC) and species management and recovery plans.

[4] In a referendum on 23 June 2016, 51.9% of the participating UK electorate voted to leave the EU. On 29 March 2017, the British government invoked Article 50 of the Treaty on the European Union. The UK is thus on course to leave the EU on Friday, 29 March 2019.

[5] Thus amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC

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A key piece of EU legislation relevant to this fishery is Council Regulation (EC) No 850/98 of 30 March 1998 for the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms. This provides the basis for various technical measures including minimum sizes for edible (brown) crab in different regions (140 mm in Regions 1 and 2 north of 56° N).

National level

Scotland is part of the United Kingdom, but fisheries management has been devolved to the Scottish Parliament, with management centred in Marine Scotland. Marine Scotland has responsibility for marine science, planning, policy development, management and for monitoring compliance through its three divisions, *Marine Scotland Science*, *Marine Scotland Planning and Policy*, and *Marine Scotland Compliance* respectively. Scottish Ministers are responsible for the regulation of sea fishing around Scotland and within 12nm of Scotland's coast, the Scottish Government has the ability to take non-discriminatory conservation measures, provided that the EU has not already legislated in this area. In general, the only areas where the European Commission adopts measures which have effect within 12 miles are in relation to fleet, TAC and gear – principally in relation to the management of pressure stocks.

The main UK enabling legislation is the Sea Fish (Conservation) Act 1992. The Scotland Act 1998 sets out the powers devolved from UK Government in London, to the Scottish Government in Edinburgh. The 2010 Marine (Scotland) Act is an Act of the Scottish Parliament which provides a framework which is intended to balance competing demands on Scotland's seas. The Scottish Government has powers to take non-discriminatory fishery conservation measures within 12 miles. 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 Order, to manage inshore fisheries out to 6 nautical miles, under the terms of the Sea Fisheries (Shellfish) Act 1967.

Local level

Orkney is a small archipelago of islands some 20 km north of the north-eastern tip of mainland Scotland. At local level, the Orkney Sustainable Fisheries Lt is the recognised Inshore Fisheries Group (IFG) for Orkney. In 2016 the 'Orkney Inshore Fisheries Management Plan' (OIFMP) was drafted by the OFG Board to formulate local objectives that are intended to contribute to the delivery of Marine Scotland's high level objectives and help to ensure that local inshore fisheries are well managed, sustainable and profitable. This document was finalised in January 2017.

IFGs have the ability to implement many of the actions that stem from their management plans. However, some measures require implementation by the Scottish Government through legislation. Scottish Ministers will consider IFG legislative proposals which are in keeping with national high level objectives, stem from or complement local objectives, and have been formulated in an open and transparent manner.

Scotland's 2012 Inshore Fisheries Strategy set out high level objectives for the industry: improving science and data required for more effective management; improving engagement with fishermen; and supporting the Inshore Fisheries Group network. While these are still seen as central tenets of a devolved strategy, a 2015 update[6] highlighted a need for greater focus on integration with the marine planning system. The 2015 inshore strategy focusses on:

- Improving the evidence base on which fisheries management decisions are made;
- Streamlining fisheries governance, and promoting stakeholder participation; and
- Embedding inshore fisheries management into wider marine planning.

[6] Marine Scotland (2015). Scottish Inshore Fisheries Strategy 2015. 4 pp.

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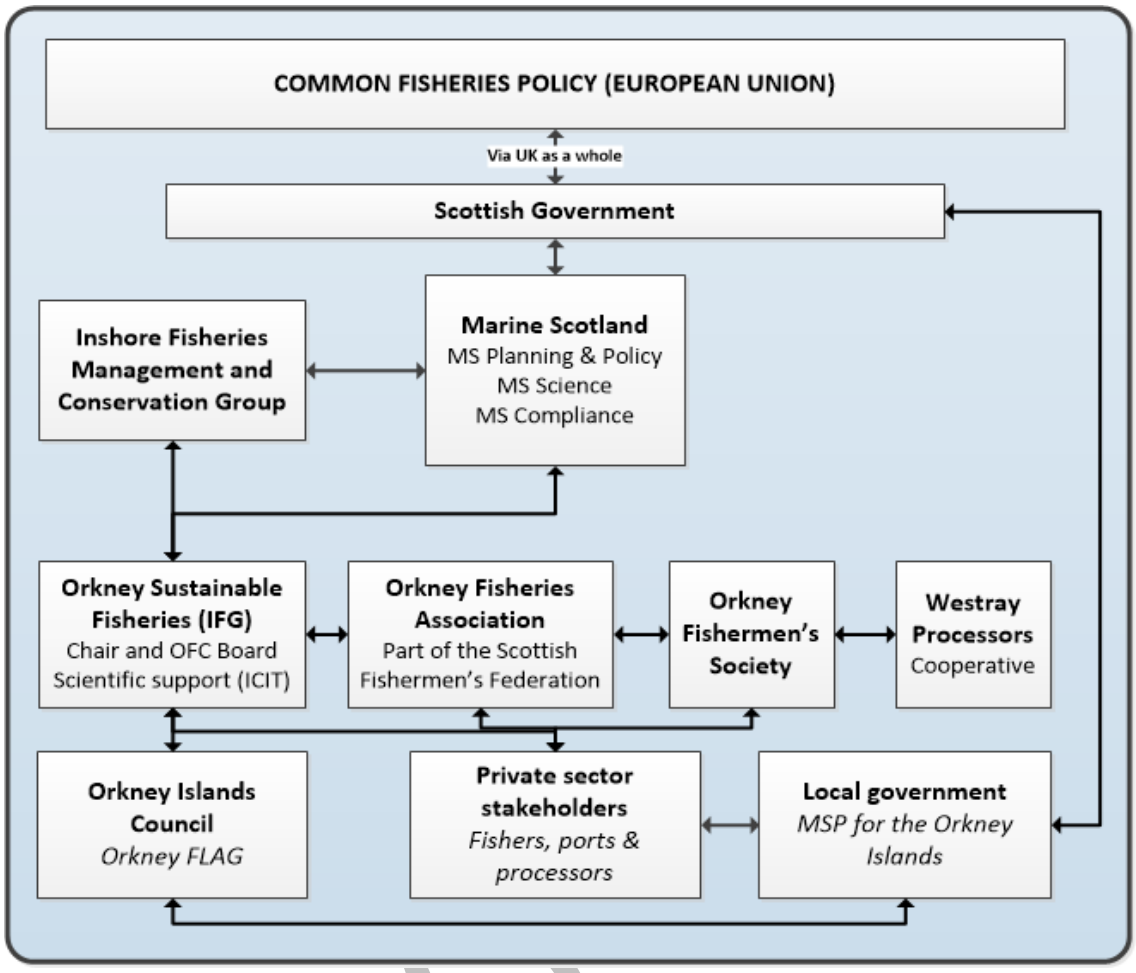

Figure 30. Organisation of fisheries governance in the Orknay brown crab creel fishery.

Overall there is an effective legal and management system across EU, UK, Scottish and local levels. Cooperation is via established lines which are effectively binding (e.g. they cannot be cut short) for both P1 (e.g. through recommendations by, and consultations with, ICIT in Orkney, Marine Scotland Science and then to DG Mare (and the STECF) where necessary (Figure 30 above) . P2 issues are covered by the same pathway. As a rule there is a high degree of consultation, especially between OSF (as the IFG) and Marine Scotland, with the aim of being as proactive as possible in order to ensure that new legislation and other management mechanisms are fit for purpose before being formalised.

3.5.2. Rights and dispute resolution

There are no groups of people who are, by custom, dependent upon food for living or livelihoods in the Orkney Islands. Fishing crews are mostly UK nationals, with a small proportion of other EU nationals. There is a higher ratio of non-UK nationals in the Westray and Stromness processing factories, mostly from Poland (c. 50%). Fishers and other related stakeholders in the Orkney Islands have a number of established rights under both UK and EU law, with no limitations in terms of resource access, and there is a comprehensive level of labour and other human rights.

Any disputes are usually raised at local level through the three fisheries organisations (Orkney Fisheries Association, the Orkney Fishermen's Society or Westray Processors), with all catchers members of one of these organisations. Whilst OFC (which is open to all for a nominal membership fee of £1, and has a broad stakeholder mix across the board membership) and the other three organisations have different roles and

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aims, they tend to work as a community group at Orkney level. Any disputes would likely be raised through the IFG (and most likely in parallel through the SFF) directly to Marine Scotland. Disputes with wider ramifications e.g. over marine spatial planning issues would likely be raised through the Orkney Island Council and then to the Scottish Parliament if necessary. This latter process has been strengthened by the introduction of the Islands (Scotland) Bill in 2017, which gives greater power to local authorities, such as the Orkney Islands Council (see box below). If raised to mainland level, the dispute would enter a formal Scottish Government dispute resolution process, initially within Marine Scotland. There is also a well-established legal system in Scotland, allowing people the opportunity to challenge any legal decisions in a transparent and open fashion.

Box 1: Islands (Scotland) Bill 2017

As Orkney is an archipelago of islands the ability to fish is of great cultural and economic importance. The Scottish Government recognizes the need to safeguard island comminutes and passed the Islands (Scotland) Bill in 2017.
Part 2 of the Islands (Scotland) Bill requires Scottish Ministers to prepare a National Islands Plan, setting out the main objectives and strategy of the Scottish Ministers in relation to improving outcomes for islands communities that result from, or are contributed to by, the carrying out of functions of a public nature.
Part 5 of the Islands Bill outlines articles in relation to development in the Scottish Island Marine Area and defines permitted development activity within the 12 nm zone
This new piece of legislation highlights the importance of island communities to the Scottish Government and aims to provide island communities with new rights in regards to the marine area but also includes a licensing mechanism which will safeguard overexploitation of resources.
See http://www.parliament.scot/parliamentarybusiness/Bills/105168.aspx

The respect of legal rights for people depended on fishing for livelihood is also highlighted in Scotland's National Marine Plan (2014), which includes a policy statement that the "cultural and economic importance of fishing, in particular to vulnerable coastal communities" should be taken into account when deciding on uses of the marine environment and the potential impact on fishing.

3.5.3. Roles and responsibilities

The roles and responsibilities for management are well understood for all areas relevant to this fishery:

- At **local level**, the OSF, as the designated IFG for Orkney, which provides OSF with a formal designated local management role for waters out to 6 nm, which it implements in close consultation with the other three local fishers stakeholder organisations. OSF's IFG organisation and role is common to all Scottish of the non-statutory IFGs[7]. Orkney IFG's particular structure and implementation plan is defined ad agreed in the Orkney Inshore Fisheries Management Plan This plan, last revised in January 2017, written internally and then developed and approved by the OSF Board (which include creel fishermen, other fishers and processors). It is then reviewed by Marine Scotland, who also participate in regular (quarterly) meetings, but they do not sign off on it. Marine Scotland Compliance is also represented locally by two full-time fisheries officers who are based in an office in Kirkwall.
- At a **national level** Marine Scotland is responsible for stock and marine ecosystem management (mainly via MS Science in Aberdeen), monitoring, control and surveillance (MCS, via MS Compliance) and wider fisheries management and governance (via MS Planning and Policy). Marine Scotland is the Scottish Government's directorate responsible for the integrated management of Scotland's seas, as laid out in the Marine (Scotland) Act 2010. Scottish Natural Heritage (SNH) is the Scottish public body

[7] http://ifgs.org.uk/files/2414/7886/1167/RIFG_-_Outline_Structure_and__Functions.pdf

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responsible for the country's natural heritage, especially its natural, genetic and scenic diversity, and is thus responsible for licensing activities rated to ETP species.

3.5.4. Consultation and participation mechanisms

Following a series of devolution steps, fisheries management, especially for a predominantly coastal (e.g. < 6 nm) fishing activity such as brown crab is now largely, but not exclusively, managed at local level. The creation of the non-statutory IFGs in particular has seen the management role passed to local bodies such as OFC who, in close consultation with Marine Scotland, have developed their own inshore fisheries management plan. This plan, and it subsequent updates (it is considered a 'living' document) is developed internally but with regular consultation with other local stakeholder groups and Marine Scotland (all three divisions of Marine Scotland are invited to OSF's quarterly meetings, but only MS Science regularly attend), and is externally reviewed by Marine Scotland to ensure it is compliant with the high level objectives of the 2015 Inshore Fisheries Strategy.

In addition to the IFG network there is the Inshore Fisheries Management and Conservation (IFMAC) who are responsible for inshore fisheries management issues that are out with the remit of the RIFGs (6-12nm). Membership to IFMAC is open to the IFGs, fishing associations (minimum of 10 member required), national fishing federations and NGO's with an interest in inshore fishing. The organisation of the inshore fisheries management bodies in Scotland ensures that consultations are participated by all stakeholders.

In terms of fisheries legislation, any proposals affecting this predominantly inshore fishery are subject to discussions between OSF (and other local fisheries interests if appropriate) and Marine Scotland before moving into the formal legal development process. This process tends to eliminate any obvious issues. Proposals generated by the IFG are then sent to MS Planning and Policy (or generated directly if not specific to Orkney) for internal review. Once the draft legislation is ready it goes out for external review with other government departments (e.g. SNH), as well as the local fisheries offices (inc. on Orkney) and then back to Marine Scotland where a formal recommendation will be drafted and presented to the Minister, together with their recommendations. If passed by the Minister, the draft law goes out for a 12 week public consultation period, and the responses collated and then published (subject to the Freedom of Information (Scotland) 2002 Act). Marine Scotland then arrives at a final policy view, if necessary. consulting with different internal and external government advisers. In some situations, SNH may require that an Appropriate Assessment is undertaken if there are implications for Natura 2000 sites or species. There may also be a need for a Business and Regulatory Impact Assessment. This latter process takes around three months, with lawyers then drafting the final legislation before it is put in front of the Scottish Parliament for finalisation.

3.5.5. Long-term objectives

The EU is legally obliged to maintain or restore fish stocks at sustainable levels (maximum sustainable yield; MSY), and adhere to good environmental management practices that follow the precautionary principle as enshrined in Union law. The precautionary principle is a binding principle of European Union law and must be applied to EU policies during their formulation and when they are implemented. The precautionary principle was also included in the establishment of the CFP and the Council's General Approach for the CFP reform[8].

At Scottish policy level, long-term objectives are embedded into the Scottish Inshore Fisheries Strategy, 2015. Of particular relevance is Outcome 4: that requires that "*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*

[8] Article 2(2), Proposal for a Regulation of the European Parliament and of the Council on the Common Fisheries Policy – General approach. 11322/12, PECHE 227, CODEC 1657

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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". This covers both stocks (P1), habitats and ETP species (P2). It should be noted that the ICES MSY framework – where ICES advises on the preferred level of fishing mortality – incorporate the precautionary approach (ICES adopted the Precautionary Approach in 1998). The Scottish Marine Plan (2015) explicitly states that "*Where evidence is inconclusive and impacts of development or use on marine resources are uncertain, reasonable efforts should be made to fill evidence gaps and decision makers should apply precaution within an overall risk-based approach*" and High Level Marine Objective 21 is that "*The precautionary principle is applied consistently in accordance with the UK Government and Devolved Administrations' sustainable development policy*"[9].

3.5.6. Fisheries-specific management

The Orkney Inshore Fisheries Management Plan is the *de facto* fisheries management plan for brown crab. Whilst it is not limited only for brown crab, it recognises that brown crab represents 74% by volume and 51% by value of Orkney's inshore fisheries landings and this fishery is the main focus of the plan. A specific section of the FMP devoted to the creel fishery is being developed, but is still in draft. The management plan has a number of specific objectives for inshore fisheries in Orkney, but these are not disaggregated into short and long-term timelines, but can be considered as long-term in nature. There are short-term objectives as part of OSF's Research Objectives / Strategy 2017 – 2020.

3.5.7. Decision-making processes

The Orkney Inshore Fisheries Management Plan is a live document, which is periodically updated to reflect new research information and resultant management decisions. Last revised in January 2017, its next revision is likely to be when the proposed Inshore Fisheries Bill is passed, probably sometime in 2018. Decision-making in this fishery is mainly based around the quarterly IFG board meetings, which are usually linked to internal meetings and feedback from research (i.e. from ICIT), as well as other meetings with the Orkney Fisheries Association and the Orkney Fishermen's Society. These meetings allow issues to be raised, and decisions made on all aspects of the fishery relevant to the local level. As stated before, Marine Scotland is invited to participate at these quarterly IFG meetings and one or more of it three operational divisions usually participate. All IFG meetings are minuted and are available upon request

Over the last few years, due to OSF's partnership with Heriot Watt University's International Centre for Island Technology (ICIT) campus in Stromness, decision-making is strongly science-driven. As with all Scottish fish stocks, there is an annual stock assessment updated by Marine Scotland Science, which utilises ICIT / OSF inputs for this fishery. In general, these decisions are precautionary in nature. Examples include the use of 0.25 for natural mortality (M) (most crustacean assessments use 0.5), and the key management tool, minimum landing-size, is 140 mm (is well below size age maturity ogives) and is being voluntarily increased to 150 mm. There is extensive data being collected on the actual size at landing, both in port and in the processing factories.

OSF has a public website that includes a research section[10] that provides the status of various species-specific research projects, including brown crab. As OFS have an open information policy, any research report or other IFG outputs would be made available on request, if not already on the website. OFS does not make its financial records available, although the annual accounts would be freely available through Companies House. Marine

[9] Marine Scotland (2015). Scotland's National Marine Plan - A Single Framework for Managing Our Seas. 144 pp. See http://www.gov.scot/Resource/0047/00475466.pdf

[10] http://www.orkneysustainablefisheries.co.uk/?page_id=137

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Scotland also has a number of online resources and publications relevant to this fishery, including stock[11], catch and other information. As mentioned above, the brown crab fishery in general, including the Orkney creel fishery assessment area (one of 11 such areas assessed by MS Science), undergoes an annual stock assessment, which is published online and includes a description of the assessment, the current state of the stocks and a brief summary of the current management advice. This advice is developed by MS Science and the results sent to MS Planning and Policy, with a high level summary provided to the IFGs, who are able to comment if necessary. In addition, the fishery participates in the ICES 'Working Group on the Biology and Life History of Crabs' (WG Crab), thus providing a scientific linkage (inc. stock models and management refence points) with wider European brown crab stock management.

According to Marine Scotland Planning and Policy, no legal challenges have been made against this fishery's management system to date (Jim Watson, pers. comm., 5 September 2017). The UK Government's Sea Fish (Conservation) Act 1992 forms the basis for the implementation of the EU Common Fisheries Policy (2371/2002). The act establishes licensing, MCS and penalty procedures. The act also includes appeal procedures. The legal framework is clear and unambiguous. Outside of the main fisheries legislation, there is full and transparent right of appeal via the normal national judicial route, and even EU law. Although in the context of the Orkney fishery this has rarely been tested (simply because there has been no requirement), the legal apparatus has been tested and proven effective in many other fisheries (including non-shellfish fisheries in other parts of Scotland).

3.5.8. Monitoring, control and surveillance (MCS)

Marine Scotland Compliance is responsible for enforcing fisheries within fisheries waters. Based in Edinburgh, the Fisheries Monitoring Centre has a number of sea, air and other assets at its disposal. There are two fisheries officers based full-time in the Orkney Islands, with a main office in Kirkwall. Given the inshore, static nature of this fishery, most enforcement is land-based, involving inspections of landings as they come ashore on the pier in Stromness or elsewhere on the Orkney islands. If required, MS Compliance can contract in rigid inflatable boat (RIB) patrols for specific operations, which are carried out about twice a year in Orcadian waters. All inspections are recorded on the MS Compliance MCS database, providing location and results of inspections. If potential infractions are detected, then the details are recorded, with location, samples and photographic and other evidence retained.

There is no annual plan for MCS in Orkney, but instead a two week rolling risk assessment is used. The Orkney fisheries officers assess local compliance risks, and forward their risk assessment to the regional office in Ullapool, and then onto Edinburgh. There is a conference call every Friday to discuss emerging risks, and responses, if any.

3.5.8.1 MCS implementation

Compliance levels in this fishery are considered by MS Compliance to be very high. From the 1,259 sea and land inspections over 2013 – 2016, no cases have been brought and only one formal warning (for a buyer who did not wish to report his purchases). Most advisories (19 over the last 4 years) have been for small quantities being recorded as landed under-size.

Table 10. Inspection rates and results in the Orkney Islands. Source: Marine Scotland Compliance,October 2017.

Inspections and results	Year				
	2013	2014	2015	2016	TOTAL
At-sea inspections	2			18	**20**

[11] See http://www.gov.scot/Topics/marine/Publications/publicationslatest/farmedfish/fishandshellfishstocks/2017

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Quayside inspections	355	256	46	582	**1,239**
Advisory Letters	5	2	10	2	**19**
Verbal warnings			1	2	**3**
Formal warnings	1				**1**

3.5.8.2 Sanctions

Sanctions exist for non-compliance e.g. non- or mis-reporting, or landing under-size catch, but to date have never had to be imposed in this fishery. This, coupled with the high level of inspections, demonstrates that the sanctions are effective. This also supports the premise that this is a highly compliant fishery

3.5.9. Monitoring and evaluation of the fishery management system performance

The stock status and management regime is formally reviewed annually by MS Science and their results published by Marine Scotland. Whilst this is not a detailed audit it is sufficient to assess whether the management regime is broadly fit for purpose. In addition, the IFG's Orkney Inshore Fisheries Management Plan is a live document, which is periodically updated to reflect new research information and resultant management decisions. Whilst not specific to this fishery, it is wide-ranging coving the key fisheries of Orkney (including the brown crab fishery), environmental issues and in line with its marine spatial planning remit, with other maritime activities relent to these waters. It also covered local shellfish research, as well as management measures, and thus is reasonably comprehensive. Last revised in January 2017, its next revision is likely to be when the proposed Inshore Fisheries Bill is passed, probably sometime in 2018.

According to the January 2017 version of the plan, it is the intention to internally review the plan on an annual basis, with any changes requiring approval by the OSF Board. According to the same plan, an external audit is also required, and it is envisaged that a review panel comprising ICIT, Marine Scotland, two OSF Directors and a representative from the Orkney Islands Council would meet annually to review and evaluate the work of OSF for the previous 12 months and endorse plans for the year ahead. An annual report from such a review process will be a public document and available on the OSF website. Given it is less than 12 months since this intention was declared, no such review has been undertaken to date.

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4. Evaluation Procedure

4.1. Harmonised Fishery Assessment

CAB assessing fisheries that have areas of overlap are required to ensure consistency of outcomes so as not to undermine the integrity of MSC fishery assessments. The FCR provides guidance for harmonisation where a fishery in assessment overlaps with an already certified fishery.

The MSC wishes to discourage overlapping assessments to avoid potential financial, consistency and credibility costs, including:

- fisheries managers, scientists and stakeholders receiving duplicate requests for information
- duplication of costs for a fishery's certification, including that expense incurred by fishery management agencies pre- and post-certification; and
- The possibility of different assessments placing different conditions upon the same fisheries managers and upon different fishery clients.

The SSMO Shetland inshore brown crab and scallop fishery operates in Shetland Island using the same creel gear under the same Governance and Policy. However, the fishery hs been acertified under MSC CR v.1.3 and is currently under re-assessement also under v.1.3.

The same version of the tree has not been used for these respective fisheries and per PB 2.1, when different CR versions of the default tree are used, harmonisation is not required.

4.2. Previous assessments

Not applicable. The OSF Orkney brown crab creel fishery has not been previously assessed.

4.3. Assessment Methodologies

The full assessment is carried out using MSC FCR v.2.0. The following MSC Scheme Documents and reporting template were used by SAI Global.

MSC Scheme Document	Issue date	Implementation
General Certification Requirements v2.1	Feb 20th 2015	Process
MSC Fihseries Certification Requirements and Guidance v.2.0.	Oct 1st, 2014	Standard and Process
Full assessment Reporting Template v.2.0	Oct 8th, 2014	Process
RBF Worksheets v.2.03	July 13th, 2017	Process and Standard
Fishery Assessment Scoring Worksheet v.2.0	Oct 8th, 2014	Process and Standard

There are no particular characteristics of the fishery that would necessitate any revisions to the default assessment tree. Therefore, the Default Assessment Tree was used without adjustements.

4.4. Evaluation Processes and Techniques

4.4.1. Site Visits

The site visit was held from 5th to 8th September 2017 in Aberdeen, Edinburgh and Orkney Islands (Kirkwall and Stromness).

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In addition, conference call were held on the 25th September 2017 with Whale and Dolphin Conservation and with Marine Scotland Compliance.

The site visit was informed by a pre-determined agenda. The agenda was set out so as to allow specific stakeholder interests and concerns to be covered through a structured approach.

The Table below summarises the meetings held during the site visit.

Name of Organisation	Present at meeting	Location	Venue	Date/time	Purpose
Marine Scotland Science	SAIG assessment team Carlos Mesquita Anne McLay Helen Dobby Heiko Seilert (ASI)	Aberdeen	Marine Scotland Science, Marine Laboratory	Tuesday 5th September at 9.00 am	Brown crab stock assessment, stock structure, catch report, tagging project, market sampling data, harvest strategy, removals from other fisheries, Marine Scotland Interactive for habitats mapping, MPAs, ETP
Marine Scotland Policy	SAIG assessment team Jim Watson Heiko Seilert (ASI) Sergio Cansado (ASI)	Edinburgh	Marine Scotland Policy offices	Wednesday 6th September at 10.00 am	ETP species management, habitats management, licence regulation, creel fishery management, Inshore Fisheries Strategy, consultation processes, decision-making processes, Impact Assessments, MPAs
OSF	SAIG assessment team Stewart Crichton Mike Bell Matthew Coleman Elisabete Rodrigues Kate Rudzkowsi Heiko Seilert (ASI) Sergio Cansado (ASI)	Kirkwall and Stromness	The Pickaquoy Centre in Kirkwall and the Heriot University in Stromness	Thusay 7th September at 9.00 am	Fleet composition, OSF Inshore Fisheries Management Plan, OSF Research programme , landings, bait, non-target species, OSF Code of Practices, ETP species, escapement vents, HCRs, marketing, traceability, consultation and decision-making processses
Crab harvester	SAIG assessment team Stewart Crichton Matthew Coleman Elisabete Rodrigues Kate Rudzkowsi Heiko Seilert (ASI) Sergio Cansado (ASI)	Stromness	Stromness harbour	Thusay 7th September at 3.00 pm	Fishing operations and practices, bait, non-target species, landings, catch report
RBF workshop	SAIG assessment team Stewart Crichton Mike Bell Matthew Coleman Elisabete Rodrigues Kate Rudzkowsi Heiko Seilert (ASI) Sergio Cansado (ASI)	Stromness	Heriot University in Stromness	Friday 8th September at 8.30 am	RBF for brown crab, velvet crab and lobster
OSF – Client closing meeting	SAIG assessment team Stewart Crichton	Stromness	Heriot University in Stromness	Friday 8th September	Weaknesses identified: harvest strategy and HCRs, timeline and next steps.

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	Matthew Coleman Elisabete Rodrigues Heiko Seilert (ASI) Sergio Cansado (ASI)				
Whale and Dolphin Conservation	SAIG assessment team	Conference call	Conference call	Monday 25th September	Interactions with whales, sighting programmes, basking shark, Best Practices Guideline booklet, mitigation measures
Marine Scotland Complinace	SAIG assessment team	Conference call	Conference call	Monday 25th September at 2.00 am	Fleet composition, description of the monitoring, control and surveillance system, surveillance activities, compliance

4.4.2. Consultations

Date	Purpose	Media
30/05/2017	Fishery Enters assessment	Notification on MSC website Direct email/letter
18/07/2017	Use of RBF	Notification on MSC website Direct email/letter
07/12/2017	Proposed peer reviewers	Notification on MSC website Direct email/letter
02/03/2018	Revised timeline and Notification of additional stakeholder consultation period	Notification on MSC website Direct email/letter

4.4.3. Evaluation Techniques

Public announcements are published on the MSC website and stakeholders are notified by emails about all notifications published.

Each PI under each Principle is weighted so that each of the three Principles is equal to one other.
At the Level of the Performance Indicator, the performance of the fishery is assessed as a "score". In order for the fishery to achieve certification, an overall weighted average score of 80 is necessary for each of the three Principles and no Indicator should score less than 60. Accordingly, 100 represents a theoretically ideal level of performance and 60 a measureable shortfall.

The Scoring Guideposts (SGs) identify the level of performance necessary to achieve 100, 80 (a pass score), and 60 scores for each Performance Indicator.

The scoring methodology is fully explained in the MSC Fisheries Assessment Methodology. It can be summarized as follow:

- Scoring is a qualitative process, involving discussion between team members and arrival at a joint agreed score. Scores should be normally assigned in divisions of 5 points following the 7.10 sections on MSC FCR V2.0
- The only narrative guidance that is available is at 60, 80 and 100 SGs. Intermediate scores must therefore reflect;
    - A failure to meet all the scoring issues specified in a SG.

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- The following system should then be used to determine the overall score for the PI from the scores of the different scoring issues, combining elements scores.
- This system combines a primary approach based on the combination of scores achieved by the individual scoring issues (the a) to i) list below):

    a) Score = 60: all issues meet SG60, and only SG60. Any scoring issues within a PI which fails to reach SG60, represents a failure against the MSC standard and no score shall be assigned.
    b) 65: all issues meet SG60; a few achieve higher performance, at or exceeding SG80, but most do not meet SG80.
    c) 70: all issues meet SG60; some achieve higher performance, at or exceeding SG80, but some do not meet SG80 and require intervention action to ensure they get there.
    d) 75: all issues meet SG60; most achieve higher performance, at or exceeding SG80; only a few fail to achieve SG80 and require intervention action.
    e) 80: all issues meet SG80.
    f) 85: all issues meet SG80; a few achieve higher performance, but most do not meet SG100.
    g) 90: all issues meet SG80; some achieve higher performance at SG100 but some do not.
    h) 95: all issues meet SG80; most achieve higher performance, at SG100; only a few fail to achieve SG100.
    i) 100: all issues meet SG100

Table 11 presents the scoring elements considered in the assessment

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Table 11. Scoring elements [

Component	Scoring elements	Main/Not main	Data-deficient or not
Primary species	herring (*Clupea harengus*) in North Sea, Skarregak, Kattegat and Eastern English Channel	Main	Not
Primary species	saithe (*Pollachius virens*) in North Sea, Rockall and West of Scotland, Skagerrak and Kattegat	Main	Not
Primary species	cod (*Gadus morhua*) in North Sea, eastern English channel and Skagerrat	Not main	Not
Primary species	haddock (*Melanogrammus aeglefinus*) in North Sea, West Scotland and Skagerrat and Rockall	Not main	Not
Primary species	whiting (*Merlangius merlangus*) in North Sea and eastern English Channel	Not main	Not
Secondary species	Orkney Islands velvet crab (*Necora puber*)	Main	Not
Secondary species	Orkney Islands European lobster (Homarus gammarus)	Not main	Not
Secondary species	Horse mackerel in Skagerrak and Kattegat, southern and central North Sea, eastern English channel	Not main	Not
Secondary species	Lesser-spotted dogfish in Celtic Seas	Not main	Not
ETP species	Minke whale	NA	Not
ETP species	Seal	NA	Not
ETP species	Dolphins	NA	Not
ETP species	Otter	NA	Not
ETP species	Leatherback turtle	NA	Not
ETP species	Basking shark	NA	Not
Habitats	Coarse sand/mixed sediments	Main	Not
Habitats	Rock and biogenic reef	Main	Not
Habitats	Mear beds	Not main	Not
Habitats	Seagrass beds	Not main	Not

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RBF was used to score PI 1.1.1 Brown crab stock status and P1 2.2.1 Secondary Species Outcome. The justification of the use of the RBF is available on the MSC website:
https://fisheries.msc.org/en/fisheries/osf-orkney-brown-crab-creel-fishery/@@assessments

All stakeholders have been invited by email to provide comments on the use of the RBF and have been invited to participated to a RBF workshop that was held during the site visit in Stromness.
Participants provided information on the biology of brown crab , velvet crab and lobster, on the fishering effort spatial distribution and the risks pose by the fishery.

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5. Traceability

5.1. Eligibility Date

According to FCR 7.6.1, the CAB shall nominate a date from which product from a certified fishery is eligible to be sold as MSC certifiifed or bear the MSC ecolabel. Although the assessment team determines that the fishery should not be certified , the date of certification of the fishery was initially nominated as the eligibility date.

5.2. Traceability within the Fishery

Although the assessment team determined that the fishery should not be certified, Table 12 provides a description of the traceability factors within the fishery.

Table 12. 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	No risk. Creel is the only fishing gear allowed to be used to target brown crab. Only licensed vessels are permitted to operate within the fisheries, which are all subject to the same gear regulations for the gear specified under the UoC. MS Compliance said there were no reportsof 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)	No risk. Creel vessels from the UoC do not fish outside the geographical area covered by the UoC.
Potential for vessels outside of the UoC or client group fishing the same stock	Low to no risk. The target stock is Orkney Islands brown crab stock. All the registered and licenced fishing vessels fishing brown crab with creel around Orkney Islands are OSF members. There are currently no other eligible fishers. Whilst there is a limit on the number of vessels that hold a shellfish entitlement, any Scottish registered vessel with a shellfish entitlement could fish in Orkney waters, although this is an unlikely scenario.
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)	No risk. All the registered and licenced fishing vessels fishing brown crab with creel around Orkney Islands are OSF members. There are currently no other eligible fishers. Brown crab caught outside the UoC is not imported to Orkney Islands.
Risks of mixing between certified and non-certified catch during processing activities (at-sea and/or before subsequent Chain of Custody)	No risk. There is no processing activities at-sea. All the registered and licenced fishing vessels fishing brown crab with creel around Orkney Islands are OSF members. There are

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	currently no other eligible fishers. Brown crab caught outside the UoC is not imported to Orkney Islands.
Risks of mixing between certified and non-certified catch during transhipment	There is no transhipment.
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.

5.3. Eligibility to Enter Further Chains of Custody

N/A

The assessment team determines that the fishery should not be certified, therefore products from the UoC are not allowed to enter further Chains of Custody.

5.4. Eligibility of IPI stock(s) to Enter Further Chains of Custody

N/A

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6. Evaluation Results

6.1. Principle Level Scores

Table 13 shows the overall score of each Pricnciple. Principle level scores are reported to the nearest one decimal place.

Table 13.Final Principle Scores

Principle	Score
Principle 1 – Target Species	79 - FAIL
Principle 2 – Ecosystem	87 - PASS
Principle 3 – Management System	89.6 - PASS

6.2. Summary of PI Level Scores

Table 14. Summary of score and weighting of each PI.

Principle	Component	Performance Indicator (PI)	Wt	Score
One	Outcome	1.1.1 Stock status	1.0	82
		1.1.2 Stcok rebuilding	0.5	
	Management	1.2.1 Harvest strategy	0.25	65
		1.2.2 Harvest control rules & tools	0.25	75
		1.2.3 Information & monitoring	0.25	90
		1.2.4 Assessment os stock status	0.25	80
Two	Primary species	2.1.1 Outcome	0.333	100
		2.1.2 Management strategy	0.333	90
		2.1.3 Information/Monitoring	0.333	95
	Secondary species	2.2.1 Outcome	0.333	80
		2.2.2 Management strategy	0.333	75
		2.2.3 Information/Monitoring	0.333	95
	ETP species	2.3.1 Outcome	0.333	95
		2.3.2 Management strategy	0.333	80
		2.3.3 Information/Monitoring	0.333	80
	Habitats	2.4.1 Outcome	0.333	80
		2.4.2 Management strategy	0.333	80
		2.4.3 Information/Monitoring	0.333	95
	Ecosystem	2.5.1 Outcome	0.333	90
		2.5.2 Management strategy	0.333	80
		2.5.3 Information/Monitoring	0.333	90
Three	Governance & policy	3.1.1 Legal and/or customary framework	0.333	95
		3.1.2 Consultation, roles & responsibilities	0.333	95
		3.1.3 Long term objectibes	0.333	100
		3.2.1 Fishery specific objectives	0.25	70

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	Fishery specific management system	3.2.2 Decision making processes	0.25	85
		3.2.3 Compliance & enforcement	0.25	95
		3.2.4 Monitoring & management performance evaluation	0.25	80

6.3. Summary of Conditions

As per 7.21.2, where the CAB makes a decision not to award certification and fail the fishery, the report:

- 7.21.2.1 Shall not specify any mandatory conditions or defined actions that would need to be undertaken before the fishery could be reconsidered for certification in the future;
- 7.21.2.2 Shall outline draft and non-binding conditions for any PIs that score more than 60 and less than 80;
- Shall clearly specify that the conditions outlined are non-binding and serve to provide and indication of the actions that may be required should the fishery should have been certified.

Table 15 presents the non-binding and non-mandatory conditions for PIs with score more than 60 and less than 80 and drafted by the assessment team to provide an indication of the actions that the fishery may implement to address the issues identified.

Table 15. Summary of non-binding conditions

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/NA)
1	Evidence should be provided that the harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving stock management objectives reflected in PI 1.1.1 SG80. Evidence should also be provided that alternative measures to minimise UoA-related mortality of unwanted catch of the target stock are implemented as appropriate.	**1.2.1**	**NA**
2	Evidence should be provided that well defined HCRs are in place that ensure that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock fluctuating around a target level consistent with (or above) MSY.	**1.2.2**	**NA**
3	Evidence should be provided that alternative measures to minimise UoA-related mortality of unwanted catch of main secondary species are implemented as appropriate.	**2.2.2**	**NA**
4	Evidence should be provided that 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-specific management system.	**3.2.1**	**NA**

6.4. Recommendations

(OPTIONAL)

[If the CAB wishes to include any recommendations to the client, include these here.]

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6.5. Determination, Formal Conclusion and Agreement

SAIG's assessment team determined that the OSF Orkney brown crab fishery does not conform with the MSC Fisheries Standard and therefore does not recommend certification to be awarded.

(REQUIRED FOR PCR)

1. 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.

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

(OPTIONAL)

Identify any work conducted by the client (or the management agency) specifically targeted at bringing the fishery to the MSC standard, either prior to or since any pre-assessment report that was prepared. This information is particularly valuable for MSC's reporting on the impacts of its programme.

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http://www.orkneysustainablefisheries.co.uk/

Marine Scotland
http://www.gov.scot/Topics/marine

Scottish Natural Heritage
https://www.snh.scot/

Joint Nature Conservation Committee
http://jncc.defra.gov.uk/default.aspx?page=1729

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http://www.ices.dk/community/advisory-process/Pages/Latest-advice.aspx

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IUCN Red List
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8. Appendices

8.1. Appendix 1 Scoring and Rationales

8.1.1. Appendix 1.1 Performance Indicator Scores and Rationale – Evaluation Tables

8.1.1.1 Principle 1 – Sustainable Target Fish Stocks – Evaluation Tables

PI 1.1.1 – Stock Status

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	Stock status relative to recruitment impairment			
	Guidepost	It is **likely** that the stock is above the point where recruitment would be impaired (PRI).	It is **highly likely** that the stock is above the PRI.	There is a **high degree of certainty** that the stock is above the PRI.
	Met?	N/A	N/A	N/A
	Justification	The Risk Based Framework (RBF) has been used to score this PI. Consequence Analysis (CA) and Productivity Susceptibility Analysis (PSA) tables are in Annexe 1.2.1 and 1.2.2, respectively. CA score is 80 and PSA score is 84. FCR v.2.0 Table PF7 shows the rules to beused to produce an overall score. When the CA score is 80 or 100, and the PSA score is ≥80, the overall score awarded shall be at the midway point between the CA and PSA scores. A score of 82 is therefore awarded for this PI.		
b	Stock status in relation to achievement of MSY			
	Guidepost		The stock is at or fluctuating around a level consistent with MSY.	There is a **high degree of certainty** that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
	Met?		(Y/N)	(Y/N)
	Justification	The Risk Based Framework (RBF) has been used to score this PI. Consequence Analysis (CA) and Productivity Susceptibility Analysis (PSA) tables are in Annexe 1.2.1 and 1.2.2, respectively. CA score is 80 and PSA score is 84. FCR v.2.0 Table PF7 shows the rules to beused to produce an overall score. When the CA score is 80 or 100, and the PSA score is ≥80, the overall score awarded shall be at the midway point between the CA and PSA scores. A score of 82 is therefore awarded for this PI.		
References		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. Haig, J. A., Bakke, S., Bell, M. C., Bloor, I. S. M., Cohen, M., Coleman, M., Dignan, S., Kaiser, M. J., Pantin, J. R., Roach, M., Salomonsen, H., and Tully, O. Reproductive traits and factors affecting		

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PI 1.1.1	The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue	SG 60	SG 80	SG 100
	the size at maturity of *Cancer pagurus* across Northern Europe. – ICES Journal of Marine Science, doi:10.1093/icesjms/fsw081. Mesquita, C., Miethe, T., Dobby, H. and McLay, A. 2017. Crab and Lobster Fisheries in Scotland: Results of stock assessments 2013-2015. Scottish Marine and Freshwater Science, Volume 8, No.14. Sheehy, M.R.J and Prior, A. E. 2008. Progress on an old question for stock assessment of the dibble crab *Cancer pagurus*. Marine Ecology Progress Series, 353: 191-202 Tallack, S. M. L. 2007. Size-fecundity relationships for *Cancer pagurus* and *Necora puber* in the Shetland Island, Scotland: how is reproductive capacity facilitated. J. Mar. Biol. Ass. UK, 87: 507-515. 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.		
Stock Status relative to Reference Points			
	Type of reference point	**Value of reference point**	**Current stock status relative to reference point**
Reference point used in scoring stock relative to PRI (SIa)	[e.g. B_{LOSS}]	[Include value specifying units. e.g. 50,000t total stock biomass]	[Include current stock status in the same units as the reference point e.g. 90,000/B_{LOSS}=1.8]
Reference point used in scoring stock relative to MSY (SIb)	[e.g. B_{MSY}]	[Include value specifying units. e.g. 100,000t total stock biomass]	[Include current stock status in the same units as the reference point e.g. 90,000/B_{MSY}=0.9]
OVERALL PERFORMANCE INDICATOR SCORE:			**82**
CONDITION NUMBER (if relevant):			**N/A**

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PI 1.1.2 – Stock rebuilding

PI 1.1.2		Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	Rebuilding timeframes			
	Guidepost	A rebuilding timeframe is specified for the 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 stock.
	Met?	N/A		N/A
	Justification	As the RBF is used to score PI 1.1.1, this PI is not scored (FCR 2.0 Table PF1).		
b	Rebuilding evaluation			
	Guidepost	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is evidence that the rebuilding strategies are rebuilding stocks, **or it is likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.	There is **strong** evidence that the rebuilding strategies are rebuilding stocks, **or it is highly likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.
	Met?	N/A	N/A	N/A
	Justification	As the RBF is used to score PI 1.1.1, this PI is not scored (FCR 2.0 Table PF1).		
References				
OVERALL PERFORMANCE INDICATOR SCORE:				N/A
CONDITION NUMBER (if relevant):				N/A

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PI 1.2.1 – Harvest strategy

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	Harvest strategy design			
	Guidepost	The harvest strategy is **expected** to achieve stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy **work together** towards achieving stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and is **designed** to achieve stock management objectives reflected in PI 1.1.1 SG80.
	Met?	Y	N	Not scored
	Justification	The harvest strategy is expected to achieve stock management objectives reflected in PI 1.1.1 SG80. The overall harvest strategy is underpinned by the European Union's CFP which is implemented at a national level through the individual Member States. Responsibility for inshore fisheries management in Scottish waters is devolved from the UK to the Scottish Government whose vision for inshore fisheries is set out in the Scottish Inshore Fisheries Strategy, which includes implementing effective assessment methodologies for fishing at MSY. Under the European Marine Strategy Framework Directive (MSFD) Member States are required to prepare national strategies to achieve Good Environmental Status (GES) by 2020. Included under Descriptor 3 of GES is the requirement that stocks should be exploited sustainably consistent with high long-term yields, have full reproductive capacity in order to maintain stock biomass, and the proportion of older and larger fish/shellfish should be maintained (or increased) being an indicator of a healthy stock. GES is achieved for a particular stock only if all of the three attributes are fulfilled, implying that all commercially exploited stocks should be in a healthy state and that exploitation should be sustainable, yielding the MSY. The main tools available to Scottish Ministers to regulate fisheries are through restrictive licensing or other measures set out in the Inshore Fishing (Scotland) Act 1984. At a local level, an IFMP has been developed by OSF which is recognised by the Scottish Government as the local Inshore Fisheries Group for Orkney. As the Orkney Inshore Fisheries Group, OSF has no legislative powers. The Orkney IFMP was developed "to formulate local objectives that will contribute to the delivery of Marine Scotland's high level objectives and help to ensure that local inshore fisheries are well managed, sustainable and profitable". The objectives of the management plan are "to secure the future of inshore fisheries in Orkney and maximise benefits to the local community – through protecting stocks by developing local management measures, and enhancing our scientific knowledge on which management decisions can be made". The IFMP describes the characteristics of the area, the local environment, the inshore fisheries and other marine activities, an overview of local shellfish research and information on newly introduced management measures. Whilst the brown crab fishery operates under the IFMP, it is noticeable that the IFMP does not refer specifically to the brown crab fishery, indeed the IFMP does not even include any reference to the current MLS for brown crab of 140mm CW, or the decision to increase this MLS to 150mm CW from February 2018. OSF has a Code of Practice for crab suppliers which ensures only good condition crabs are landed, and covers hygiene practices on vessels, good handling and storage processes and good environmental practices. The key elements of the harvest strategy are a restrictive licensing scheme for shellfish fishing under the governance of Marine Scotland and a MLS) of 140 mm CW as set out in EU Technical Conservation Regulation 850/98. Following a consultation with the fishing industry and other stakeholders in 2016, the MLS will be increased in February 2018 to 150 mm CW across Scotland		

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PI 1.2.1		There is a robust and precautionary harvest strategy in place		
		(except Shetland), although OSF have been applying a limit of 153mm CW for females. All vessels must have a general licence but must also have a shellfish entitlement to fish for brown crabs. Vessels without a shellfish entitlement are restricted to a maximum daily catch of 25 crabs in total of all crab species, hobby fishermen are limited to a catch of 5 crabs of any species per day, and trawlers are entitled to a maximum bycatch of 10% of crabs. Whilst there is a limit on the number of vessels that hold a shellfish entitlement, any Scottish registered vessel with a shellfish entitlement could fish in Orkney waters, although this is an unlikely scenario. There is no limit on creel numbers that can be targeted at brown crabs, no spatial controls on the fishery, and there is no annual quota or TAC for either the fishery as a whole or individual vessels. Under the Sea Fisheries (Shellfish) Act 1967 there is a prohibition on the landing of egg-bearing (berried) females and soft-shelled crabs. A key element of the harvest strategy is the requirement for licensed crab vessels to make catch returns. All vessels over 12m in length must have on board a VMS to record fishing position and must complete an electronic logbook (ERS). As yet there is no requirement for the smaller vessels in the shellfish fleet to have VMS on board, although around 20 have been fitted with a Succourfish position recording system. Vessels of 10-12m length must complete EU paper logbooks. All vessels under 10m length must complete the Marine Scotland FISH1 landing returns. A harvest strategy which includes a restrictive entry licensing scheme and a minimum landing size is expected to achieve the stock management objectives of maintaining catch rates of brown crabs at or above current levels and therefore SG60 is met. Whilst MSS undertake regular assessments of the status of the brown crab stock in Orkney, there is no formal annual process by which the stock assessments are translated into management advice to Marine Scotland in Edinburgh and hence potential management action. Stock assessment and research work undertaken locally by OSF and Heriot-Watt University will feed back to OSF as the IFG in Orkney. Whilst such scientific advice may trigger OSF to consider additional management measures, OSF has no formal legislative power, and therefore any new management measures proposed by OSF must be taken up and progressed by Marine Scotland. There is no clear mechanism in place to allow Marine Scotland to act quickly to introduce management measures if brown crab stock status in Orkney declined rapidly. Whilst there have been recent consultations on increasing the minimum landing size (which was implemented) and introducing limits on the number of creels (which was not implemented), it is not clear that the current harvest strategy is responsive to the state of the stock and therefore the SG80 is not met. SG 100 is not scored as all SG80 have not been met (FCR 7.10.53).		
b	Harvest strategy evaluation			
	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	Not scored
	Justification	The harvest strategy may not have been fully **tested** but evidence exists that it is achieving its objectives.		

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PI 1.2.1		There is a robust and precautionary harvest strategy in place		
		A harvest strategy based on a restrictive entry licensing scheme and a minimum landing size significantly above the observed size-at-maturity is likely to work based on prior experience in other brown crab fisheries, so SG60 is met. Recent landings of brown crab in Orkney have been relatively stable over the last 10 years, but show an increase since 2014/15, and LPUE data from OSF logbooks have been stable since the start of data collection in 2012. Although the harvest strategy has not been fully tested, and there is still a relatively short time series of logbook data, recent unpublished research from Heriot-Watt University concluded that the current fishing mortality ensures that there is a sustainable level of egg production. All the current evidence suggests that the harvest strategy is achieving its objectives of maintaining a sustainable fishery. Therefore, SG80 is met. SG 100 is not scored as all SG80 have not been met (FCR 7.10.53).		
c	Harvest strategy monitoring			
	Guidepost	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Y		
	Justification	Monitoring is in place that is expected to determine whether the harvest strategy is working. There is mandatory collection of landings and effort data through electronic log books for over 12m vessels, EU log books on vessels between 10m and 12m and through the FI forms for under 10m vessels. In addition OSF has its own log book scheme where approximately 8% of the fleet provide data on landings, fishing effort, discards of brown crab, bycatch and soak time. The Registration of Buyers and Sellers Regulation ensures that all landings are recorded. Size distribution of brown crab landings are collected through Marine Scotland's market sampling programme, supplemented by additional size distribution data collected by OSF. OSF undertakes regular observer trips to obtain information on discarding practices for both unwanted brown crabs and other species. In addition, Marine Scotland Compliance enforcement activity at both sea and on the quayside, ensures that all fisheries regulations including minimum landing size (MLS) are observed. Sufficient monitoring is carried out to determine whether the harvest strategy is working. Therefore, SG60 is met. SG 100 is not scored as all SG80 have not been met (FCR 7.10.53).		
d	Harvest strategy review			
	Guidepost			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			Not scored
	Justification	SG 100 is not scored as all SG80 have not been met (FCR 7.10.53).		
e	Shark finning			
	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	Scoring issue is not scored as sharks are not a target species		
f	**Review of alternative measures**			
	Guidepost	There has been a review of the potential effectiveness and practicality of alternative	There is a **regular** review of the potential effectiveness and practicality of alternative	There is a **biennial** review of the potential effectiveness and practicality of alternative

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PI 1.2.1		There is a robust and precautionary harvest strategy in place		
		measures to minimise UoA-related mortality of unwanted catch of the target stock.	measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	Y	N	Not scored
	Justification	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock. There is a significant unwanted catch of the target species, either through being under the minimum legal landing size and at times of the year when the creels may contain large numbers of newly-moulted soft crabs for which there is no market. Survival of discarded small and soft crabs has been estimated to be very high in Orkney, and consideration has been given by OSF as to how catches of unwanted crabs could be minimized through the use of escape gaps. The SG60 is met. Whilst recent research in Orkney has demonstrated the effectiveness of escape gaps in reducing the catch and hence can minimise mortality of undersized crabs, the research has not yet been published and OSF report that escape gaps cannot currently be implemented as a mandatory technical measure, with such an action requiring public consultation and the resulting enforcement by Marine Scotland. Alternative measures to minimise mortality of unwanted catch of brown crab have not been implemented and so SG80 is not met. SG 100 is not scored as all SG80 have not been met (FCR 7.10.53).		
References		EU Common Fisheries Policy (CFP) (Regulation (EU) No 1380/2013) Bell, M.C. and Gascoigne, J. 2012. MSC Pre-Assessment of the Orkney lobster, brown crab and velvet crab fishery. MacAlister Elliott and Partners Ltd. 100pp. Marine Scotland 2015. Scottish Inshore Fisheries Strategy. http://www.gov.scot/Resource/0049/00494784.pdf Mesquita, C., Miethe, T., Dobby, H. and McLay, A. 2017. Crab and Lobster Fisheries in Scotland: Results of stock assessments 2013-2015. Scottish Marine and Freshwater Science, Volume 8, No.14. MSC, 2014. Benchmarking and Tracking Tool (BMT): Guidance for benchmarking fisheries improving towards MSC certification. Marine Stewardship Council. http://www.msc.org/documents/developing-world/benchmarking-and-trackingtool/benchmarking-and-tracking-tool-guidance-document Orkney Sustainable Fisheries (OSF). 2017. Inshore Fisheries Management Plan, January 2017, 14pp. Rodrigues, E. 2015. Effectiveness of escape panels for reducing undersized catch in the Orkney brown *Cancer pagurus*. 3pp. Unpublished.		
OVERALL PERFORMANCE INDICATOR SCORE:				**65**
CONDITION NUMBER (if relevant):				**1**

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PI 1.2.2 – Harvest control rules and tools

PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
Scoring Issue		SG 60	SG 80	SG 100
a	HCRs design and application			
	Guidepost	**Generally understood** HCRs are in place **or available** that are **expected** to reduce the exploitation rate as the point of recruitment impairment (PRI) is approached.	**Well defined** HCRs are **in place** that **ensure** that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock **fluctuating around** a target level consistent with (or above) MSY, or for key LTL species a level consistent with ecosystem needs.	The HCRs are expected to keep the stock **fluctuating at or above** a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, **most** of the time.
	Met?	Y	N	Not scored
	Justification	Generally understood HCRs are in place or available that are expected to reduce the exploitation rate as the point of recruitment impairment (PRI) is approached. In the absence of formal target and limit reference points, it is not possible to determine the status of the brown crab stocks relative to biologically-based limits for sustainability, and the RBF was therefore used to score PI 1.1.1. It is appropriate therefore to consider how the harvest control rules manage the fishery to ensure that the susceptibility scores (for areal overlap, vertical overlap, selectivity and post capture mortality) remain acceptable. When the RBF is used it is not necessary for exploitation rates to be reduced as reference points are approached. The MSC Guidance for the Fisheries Certification Requirements (MSC FCR Guidance v2.0, paragraph GSA2.5.2 – 2) states that - "CABs should assess the extent to which there are management tools and measures in place that are consistent with ensuring that susceptibility of the target species to removal is no higher than that which would cause the risk to the target species to be above an acceptable risk range. Measures could be spatial, temporal, or changes to gear overlap. Assessments should also consider measures in place to respond to changes in the fishery, for example, by reducing susceptibility of target species when the fishery is not heading in the direction of its objectives." The restrictive entry licensing scheme should limit the areal overlap of the fishery with the brown crab stock, capture in creels requires brown crabs to be active and feeding to enter the creels, and the current MLS is significantly above the size-at-maturity, and post-capture mortality is low in brown crabs that are captured and discarded. During and following the site visit, the assessment team was presented with some new approaches to assessing stock status of brown crab by Dr. Mike Bell of Heriot-Watt University, Stromness. This new study concluded that both the current and future MLS should provide significant protection to spawning potential even at increased levels of fishing mortality (fishing effort), and therefore along with the high survival of discarded undersized crabs which has been demonstrated for the Orkney creel fishery, the MLS can be considered to be an effective harvest control rule. Although this new study is not yet published and has not undergone any formal peer-review process, along with other current management tools, it provides an initial evaluation of the likelihood that the current tools in use would seem appropriate to ensuring that the susceptibility of the brown crab stock is not impacted. Being the recognised Orkney Inshore Fisheries Group, OSF has no legislative powers, and so legislation must be made through Marine Scotland. The main tools available to Scottish Ministers to regulate fisheries are through restrictive licensing or other measures set out in the Inshore Fishing (Scotland) Act 1984, and a range of orders have been made under the Act introducing a number of local and national measures for a		

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PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
		range of fishery management purposes. It is generally understood that measures will be introduced if stock indicators decline in the Orkney brown crab fishery, and local measures introduced previously under the 1984 Act demonstrate that appropriate HCRs are available to reduce exploitation rates if required. For example, in 2016 new minimum landing sizes for velvet crabs, lobsters and green crabs in Orkney were implemented along with a prohibition on the landing of berried velvet crabs. The introduction of these management measures followed an initial proposal by OSF, consultations with stakeholders undertaken by Marine Scotland and then implementation of these measures by Marine Scotland. The SG60 is met therefore. As noted above, the MSC CRv2.0 Guidance states that "assessments should also consider measures in place to respond to changes in the fishery, for example, by reducing susceptibility of target species when the fishery is not heading in the direction of its objectives". There are no current limits on creel numbers and no TAC in place, the likelihood is that the MLS (the assumed HCR) will not be either increased or decreased in relation to changes in stock status primarily due to market considerations, and there is no well-defined mechanism in place to allow OSF or Marine Scotland to act quickly to introduce management measures in the Orkney brown crab fishery. It cannot be concluded therefore that there are well-defined HCRs that would ensure that exploitation rates would be reduced or that susceptibility would be reduced quickly in response to significant detrimental trends in stock indicators. Therefore, SG80 is not met. SG 100 is not scored as all SG80 have not been met (FCR 7.10.53).		
b	HCRs robustness to uncertainty			
	Guidepost		The HCRs are likely to be robust to the main uncertainties.	The HCRs take account of a **wide** range of uncertainties including the ecological role of the stock, and there is **evidence** that the HCRs are robust to the main uncertainties.
	Met?		Y	Not scored
	Justification	The HCRs are likely to be robust to the main uncertainties. The assessment team was presented with some new approaches to assessing stock status of brown crab by Dr. Mike Bell of Heriot-Watt University, Stromness during and following the site visit. This new study concluded that the MLS should provide significant protection to spawning potential even at increased levels of fishing mortality (fishing effort), and therefore along with the high survival of discarded undersized crabs which has been demonstrated for the Orkney creel fishery, the MLS can be considered to be an effective harvest control rule. The study considered uncertainties in relation to growth, natural mortality, discard mortality, fecundity, size at maturity and fishing mortality, and assessed how well the MLS (the assumed HCR) is likely to function when the unexpected (e.g. doubling of fishing effort) happens in the future. Whilst the MLS cannot be considered as a well-defined HCR, and it is not clear that there are mechanisms in place to ensure that exploitation rates are reduced when stock indicators decline and that susceptibility of the stock to fishing is not increased, there has been some evaluation of the robustness of the selected HCR to the main uncertainties. SG80 is met. SG 100 is not scored as all SG80 have not been met (FCR 7.10.53).		
c	**HCRs evaluation**			

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PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
	Guidepost	There is **some evidence** that tools used **or available** to implement HCRs 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 HCRs.	**Evidence clearly shows** that the tools in use are effective in achieving the exploitation levels required under the HCRs.
	Met?	Y	Y	Not scored
	Justification	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs. A restrictive entry licensing scheme and a minimum landing size significantly above the size -at-maturity have been shown to be appropriate tools to control exploitation and ensure that the susceptibility of the stock to fishing does not increase. Since data quality was significantly improved in 2012, the evidence from stock indicator trends is that the tools in use are effective in ensuring that exploitation levels do not increase and that susceptibility of the stock is not compromised. SG 80 is met. SG 100 is not scored as all SG80 have not been met (FCR 7.10.53).		
References		MSC Fisheries Certification Requirements Guidance v2.0 Bell, M. 2017. Egg per recruit analysis in support of a Harvest Control Rule for the Orkney brown crab creel fishery. Unpublished report. Haig, J. A., Bakke, S., Bell, M. C., Bloor, I. S. M., Cohen, M., Coleman, M., Dignan, S., Kaiser, M. J., Pantin, J. R., Roach, M., Salomonsen, H., and Tully, O. 2016. Reproductive traits and factors affecting the size at maturity of *Cancer pagurus* across Northern Europe. – ICES Journal of Marine Science, doi:10.1093/icesjms/fsw081.		
OVERALL PERFORMANCE INDICATOR SCORE:				**75**
CONDITION NUMBER (if relevant):				**2**

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PI 1.2.3 – Information and monitoring

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	Range of information			
	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, UoA 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	Y
	Justification	A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available. Recording of landings and fishing effort data is mandatory under Marine Scotland regulations through electronic logbooks, paper EU logbooks or FISH1 forms depending on the size of the vessel, VMS is required on all large vessels to record fishing activity, and Succorfish position monitoring equipment has been installed on approximately 20 of the smaller inshore vessels. Catch and effort data are supplemented by voluntary OSF logbooks, market sampling of stock structure is undertaken by both Marine Scotland and OSF, and observer sampling of discarded catches of both brown crab and bycatch species is undertaken by OSF staff. There is a good understanding of the composition of the creel fleet in Orkney, and the mandatory recording of landings under the Registration of Buyers and Sellers (RBS) scheme provides complementary data to the log books on UoA removals. A wide range of biological data on the Orkney crab stock is available including estimates of natural and fishing mortality, size at maturity, fecundity, estimates of mortality rates of discards, and tagging studies to evaluate stock structure. In addition, there is a major programme of environmental monitoring in Orkney waters, including sea surface temperate (SST) monitoring by the European Marine Energy Centre, sea bottom temperature monitoring by OSF, and SST, water quality, marine intertidal and non-native monitoring by Orkney Marine Services. In summary, there is a comprehensive range of information available to support the harvest strategy. The SG100 is met therefore.		
b	Monitoring			
	Guidepost	Stock abundance and UoA removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA 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

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PI 1.2.3		Relevant information is collected to support the harvest strategy		
				and management to this uncertainty.
	Met?	Y	Y	N
	Justification	Stock abundance and UoA 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. UoA removals are well monitored through mandatory recording of landings and effort from vessels of all size categories, and OSF supplements this information with more detailed log book requirements on around 8% of the brown crab fleet, and by regular observer trips on brown crab vessels. Similarly the Registration of Buyers and Sellers regulations ensures that all landings are recorded. Stock abundance cannot be measured directly, but LPUE data from mandatory log books provide an index of stock abundance. The SG80 is met. The FISH1 forms completed by the under 10m sector of the fleet have only recently required mandatory recording of fishing effort information, and there is currently only a relatively short time series of LPUE data collected from log books by OSF since 2012. In addition, there may be some uncertainty about how LPUE relates to stock abundance in a creel fishery and so there is not a high degree of certainty about long term time trends in stock indicators. Whilst there is some understanding of the inherent uncertainties in the data, the robustness of assessment and management to the uncertainty is not well understood. SG100 is not met.		
c	Comprehensiveness of information			
	Guidepost		There is good information on all other fishery removals from the stock.	
	Met?		Y	
	Justification	There is good information on all other fishery removals from the stock. There may be fishery removals from vessels other than licensed fishing vessels with a shellfish entitlement. Vessels without a shellfish entitlement may only land a daily maximum of 25 crabs in total from the following four species - brown crab, velvet crab, spider crab and green crab, but virtually all vessels have shellfish entitlements. Hobby fishermen are not allowed to sell their catch, but may land up to 5 brown crabs per day, although there is little opportunity for hobby fishermen to find sufficient space on the ground to fish their creels. There is no requirement for hobby fishermen to declare their landings, but hobby landings are considered to be minimal in relation to the commercial fishery. There are no vessels fishing in Orkney waters for crab which then land outside the region, so there are no unrecorded catches of brown crabs, but any such landings would in any case be recorded on log books as originating from ICES rectangles within the Orkney fishery and so would be allocated to the Orkney fishery. There is a small bycatch in scallop dredges, but there is some understanding of the magnitude of these bycatches, and there may be some bycatch by trawlers, but if there is a sufficient number landed they should be covered by the Registration of Buyers and Sellers and recorded as landings from the Orkney fishery. It can be concluded that there is good information on all other fishery removals from the stock and the SG80 is met.		
References		Coleman, M.T. and Rodrigues, E. 2017a. Orkney Shellfish Research Project: Orkney brown crab (*Cancer pagurus*) tagging project. Orkney Sustainable Fisheries Ltd. Report no. 19, 21 pp. Coleman, M.T. and Rodrigues, E. 2017b. Orkney Shellfish Research Project: Logbook and Observer Report, 2013-2016. Orkney Sustainable Fisheries Ltd. Report no. 21, 25 pp. Coleman, M.T. and Rodrigues, E. 2017c. Orkney Shellfish Research Project: Succorfish report. Orkney Sustainable Fisheries Ltd. Report no. 20, 18 pp.		

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PI 1.2.3	Relevant information is collected to support the harvest strategy
	Haig, J. A., Bakke, S., Bell, M. C., Bloor, I. S. M., Cohen, M., Coleman, M., Dignan, S., Kaiser, M. J., Pantin, J. R., Roach, M., Salomonsen, H., and Tully, O. 2016. Reproductive traits and factors affecting the size at maturity of *Cancer pagurus* across Northern Europe. – ICES Journal of Marine Science, doi:10.1093/icesjms/fsw081. Orkney Sustainable Fisheries (OSF). (no date) Research Objectives/Strategy 2017-2020. Rodrigues, E., and Coleman, M.T. 2017. Orkney Shellfish Research Project: Market sampling report. Orkney Sustainable Fisheries Ltd. Report no. 22, 39 pp. Shellfish (Restrictions on Taking by Unlicensed Fishing Boats (Scotland) Order 2017
OVERALL PERFORMANCE INDICATOR SCORE:	**90**
CONDITION NUMBER (if relevant):	**N/A**

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PI 1.2.4 – Assessment of stock status

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	Appropriateness of assessment to stock under consideration			
	Guidepost		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA.
	Met?		N/A	N/A
	Justification	As the RBF is used to score PI 1.1.1, a default score of 80 is awarded to this PI (FCR v.2.0 Table PF1)		
b	Assessment approach			
	Guidepost	The assessment estimates stock status relative to generic reference points appropriate to the species category.	The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated.	
	Met?	N/A	N/A	
	Justification	As the RBF is used to score PI 1.1.1, a default score of 80 is awarded to this PI (FCR v.2.0 Table PF1)		
c	Uncertainty in the assessment			
	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?	N/A	N/A	N/A
	Justification	As the RBF is used to score PI 1.1.1, a default score of 80 is awarded to this PI (FCR v.2.0 Table PF1)		
d	Evaluation of assessment			
	Guidepost			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			N/A
	Justification	As the RBF is used to score PI 1.1.1, a default score of 80 is awarded to this PI (FCR v.2.0 Table PF1)		
e	Peer review of assessment			
	Guidepost		The assessment of stock status is subject to peer review.	The assessment has been **internally and externally** peer reviewed.
	Met?		N/A	N/A
	Justification	As the RBF is used to score PI 1.1.1, a default score of 80 is awarded to this PI (FCR v.2.0 Table PF1)		
References		MSC FCR v.2.0 Table PF1		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**

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PI 1.2.4	There is an adequate assessment of the stock status	
CONDITION NUMBER (if relevant):		N/A

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8.1.1.2 Principle 2 – Environmental Impact of Fishing – Evaluation Tables

PI 2.1.1 – Primary species outcome

PI 2.1.1		The UoA aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.		
Scoring Issue		SG 60	SG 80	SG 100
a	Main primary species stock status			
	Guidepost	Main primary species are **likely** to be above the PRI OR If the species is below the PRI, the UoA has measures in place that are **expected** to ensure that the UoA does not hinder recovery and rebuilding.	Main primary species are **highly likely** to be above the PRI OR If the species is below the PRI, there is either **evidence of recovery** or a demonstrably effective strategy in place **between all MSC UoAs which categorise this species as main**, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main primary species are above the PRI **and are** fluctuating around a level consistent with MSY.
	Met?	Y	Y	Y
	Justification	There is a high degree of certainty that all main primary species are above the PRI and are fluctuating around a level consistent with MSY, the fishery meeting SG100. Main primary species are herring (*Clupea harengus*) in North Sea, Skarregak, Kattegat and Eastern English Channel and saithe (*Pollachius virens*) in North Sea, Rockall and West of Scotland, Skagerrak and Kattegat used as bait. North Sea, Skarregak, Kattegat and Eastern English Channel herring stock has been classified as being at full reproductive capacity. SSB is well above MSY $B_{trigger}$ since the last 10 years. North Sea, Rockall and West of Scotland, Skagerrak and Kattegat saithe SSB has fluctuated without trend and has been well above MSY $B_{trigger}$ in the last 10 years. ICES classifies the stock as being at full reproductive capacity.		
b	Minor primary species stock status			
	Guidepost			Minor primary species are highly likely to be above the PRI OR If below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species
	Met?			Y
	Justification	All minor primary species are highly likely to be above the PRI, the fishery meeting SG100.		

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PI 2.1.1		The UoA aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.
		Minor primary species are cod (*Gadus morhua*) in North Sea, eastern English channel and Skagerrat, haddock (*Melanogrammus aeglefinus*) in North Sea, West Scotland and Skagerrat and Rockall, and whiting (*Merlangius merlangus*) in North Sea and eastern English Channel used as bait and caught in brown crab creels as non-target species. North Sea, eastern English channel and Skagerrat cod stock has been classified as being at full reproductive capacity. SSB has increased from the historical low level in 2006 to be currently above B_{lim} and slightly below MSY $B_{trigger}$. There are also indications of increased recruitment in 2017. In Rockall, haddock SSB has increased from the lowest observed in 2014 and is currently estimated to be above MSY $B_{trigger}$. Recruitment was weak during the period 2008-2012 but has improved since with a 2017 recruitment estimated to be high. In North Sea, West Scotland and Skagerrat, haddock SSB has been mostly above MSY $B_{trigger}$ since 2002. In North Sea and eastern English Channel, whiting SSB has fluctuated around, and is currently above MSY $B_{trigger}$. ICES classifies the stock as being at full reproductive capacity.
References		Coleman M.T. and Rodrigues E., 2017b. Logbook and Observer Report: Orkney Shellfish Research Project. Orkney Sustainable Fisheries Ltd. No 21, pp 25. ICES 2017a. Herring (*Clupea harengus*) in Subarea 4 and divisions 3.a and 7.d, autumn spawners (North Sea, Skagerrak and Kattegat, eastern English channel). ICES advice on fishing opportunities, catch, and effort – Greater North Sea Ecoregion. Published 31 May 2017, DOI: 10.17895/ices.pub.3130. ICES 2017b. Cod (*Gadus morhua*) in Subarea 4, Division 7.d, and Subdivision 20 (North Sea, easter English Channel, Skagerrak). ICES advice on fishing opportunities, catch, and effort – Greater North Sea Ecoregion. Published 14 November 2017, DOI: 10.17895/ices.pub.3526. ICES 2017c. Saithe (*Pollachius virens*) in subareas 4 and 6, and in Division 3a (North Sea, Rockfall and West Scotland, Skagerrak and Kattegat). ICES advice on fishing opportunities, catch, and effort – Celtic Seas, Faroes and Greater Noth Sea Ecoregions. Published 30 June 2017, DOI: 10.17895/ices.pub.3206. ICES 2017d. Haddock (*Melanogrammus aeglefinus*) in Division 6.b (Rockall). ICES advice on fishing opportunities, catch, and effort – Celtic Seas and Oceanic Northeast Atlantic Ecoregions. Published 30 June 2017, DOI: 10.17895/ices.pub.3121. ICES 2017e. Haddock (*Melanogrammus aeglefinus*) in Subareas 4, Division 6.a, and Subdivision 20 (North Sea, West of Scotland, Skagerrak). ICES advice on fishing opportunities, catch, and effort – Celtic Seas and Greater North Sea Ecoregions. Published 14 November 2017, DOI: 10.17895/ices.pub.3525. ICES 2017f. Whiting (*Merlangius merlangus*) in Subarea 4 and Division 7.d (North sea and eastern English Channel). ICES advice on fishing opportunities, catch, and effort – Greater North Sea Ecoregion. Published 14 November 2017, DOI: 10.17895/ices.pub.3530.
OVERALL PERFORMANCE INDICATOR SCORE:		**100**
CONDITION NUMBER (if relevant):		**N/A**

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PI 2.1.2 – Primary species management strategy

PI 2.1.2		There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guidepost	There are **measures** in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to above the point where recruitment would be impaired.	There is a **partial strategy** in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the point where recruitment would be impaired.	There is a **strategy** in place for the UoA for managing main and minor primary species.
	Met?	Y	Y	N
	Justification	There is a partial strategy in place for the UoA for managing main and minor primary species, the fishery meeting SG80. Main primary species are herring and saithe usead as bait. Minor primary species are cod, haddock and whiting used as bait and caught in brown crab creels as non-target species. All main and minor primary species stocks are highly likely to be above the point where recruitment would be impaired. Bait are mostly supplied from healthy stocks with management strategy in place for directed fisheries. The fishing method can be considered as a partial strategy itself as creels are not designed to catch fish and it is expected that post-release mortality of fish may be low as they are catch usually alive, with no injuries and low capture-related stress. According to OSF, 10% of fishermen equip creels with escapement vents on a voluntary basis, escapement vents not being mandatory. Non-target species monitoring is in place and amount of bait used by creelers is available. Fishing practices in place avoid unobserved mortality due to ghost fishing from lost creels. In case of bad weather, creels are set in deeper.OSF Code of Practices include a clause related to recovery of lost fishing gear. According to OSF and fishermen met during the site visit, lost of creels is infrequent. However, it cannot be considered as a full strategy for managing main and minor primary species, escapement vents are not mandatory, number of creels per fishing vessel are not limited and fishing activities operate all year round, preventing the fishery from meeting SG100.		
b	Management strategy evaluation			
	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 measures/partial strategy will work, based on some information directly about the fishery and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Y	Y	Y
	Justification	Testing supports high confidence that the partial strategy will work, the fishery meeting SG100.		

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PI 2.1.2		**There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**		
		Bycatch monitoring is in place to show that bycatch level is low. Also, according to most recent stocks assessments, all main and minor primary species are highly likely to be above the PRI.		
c	Management strategy implementation			
	Guidepost		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its overall objective as set out in scoring issue (a).
	Met?		Y	Y
	Justification	There is clear evidence that the partial strategy is being implemented successfully and is achieving its overall objective. Bycatch monitoring is in place to show that bycatch level is low. Bait are mostly supplied from healthy stocks with management strategy in place for directed fisheries. The fishing method can be considered as a partial strategy itself as creels are not designed to catch fish and it is expected that post-release mortality of fish may be low as they are catch usually alive, with no injuries and low capture-related stress. All main and minor primary species are highly likely to be above the PRI.		
d	Shark finning			
	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	Not relevant as no Primary species are sharks.		
e	Review of alternative measures			
	Guidepost	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate.
	Met?	Not scored	Not scored	N
	Justification	SG60 and SG80 are not scored as there is no unwanted catch of main primary species, main primary species being only species used as bait. SG100 is not met as there is no biennial review of potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of minor primary species and escapement vents are not mandatory.		
References		Coleman M.T. and Rodrigues E., 2017b. Logbook and Observer Report: Orkney Shellfish Research Project. Orkney Sustainable Fisheries Ltd. No 21, pp 25.		

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PI 2.1.2	**There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**
	ICES 2017a. Herring (*Clupea harengus*) in Subarea 4 and divisions 3.a and 7.d, autumn spawners (North Sea, Skagerrak and Kattegat, eastern English channel). ICES advice on fishing opportunities, catch, and effort – Greater North Sea Ecoregion. Published 31 May 2017, DOI: 10.17895/ices.pub.3130. ICES 2017b. Cod (*Gadus morhua*) in Subarea 4, Division 7.d, and Subdivision 20 (North Sea, easter English Channel, Skagerrak). ICES advice on fishing opportunities, catch, and effort – Greater North Sea Ecoregion. Published 14 November 2017, DOI: 10.17895/ices.pub.3526. ICES 2017c. Saithe (*Pollachius virens*) in subareas 4 and 6, and in Division 3a (North Sea, Rockfall and West Scotland, Skagerrak and Kattegat). ICES advice on fishing opportunities, catch, and effort – Celtic Seas, Faroes and Greater Noth Sea Ecoregions. Published 30 June 2017, DOI: 10.17895/ices.pub.3206. ICES 2017d. Haddock (*Melanogrammus aeglefinus*) in Division 6.b (Rockall). ICES advice on fishing opportunities, catch, and effort – Celtic Seas and Oceanic Northeast Atlantic Ecoregions. Published 30 June 2017, DOI: 10.17895/ices.pub.3121. ICES 2017e. Haddock (*Melanogrammus aeglefinus*) in Subareas 4, Division 6.a, and Subdivision 20 (North Sea, West of Scotland, Skagerrak). ICES advice on fishing opportunities, catch, and effort – Celtic Seas and Greater North Sea Ecoregions. Published 14 November 2017, DOI: 10.17895/ices.pub.3525. ICES 2017f. Whiting (*Merlangius merlangus*) in Subarea 4 and Division 7.d (North sea and eastern English Channel). ICES advice on fishing opportunities, catch, and effort – Greater North Sea Ecoregion. Published 14 November 2017, DOI: 10.17895/ices.pub.3530. Nøstvik, F. and Pedersen, T., 1999. Catching cod for tagging experiments. Fisheries Research 42 (1): 57-66. Taggart, C.T., P. Penney, N. Barrowman and C. George 1995. The 1954-1993 Newfoundland codtagging database: statistical summaries and spatial-temporal distributions. Can. Tech. Rep. Fis. and Aquat. Sci. 2042. OSF Code of Practice
OVERALL PERFORMANCE INDICATOR SCORE:	**90**
CONDITION NUMBER (if relevant):	**NA**

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PI 2.1.3 – Primary species information

PI 2.1.3		Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impact on main primary species			
	Guidepost	Qualitative information is **adequate to estimate** the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Qualitative information is adeqaute to estimate productivity and susceptibility attributes for main primary species.	Some quantitative information is available and is **adequate to assess** the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptiblity attributes for main primary species.	Quantitative information is available and is **adequate to assess with a high degree of certainty** the impact of the UoA on main primary species with respect to status.
	Met?	Y	Y	Y
	Justification	Quantitative information is available and is adequate to assess with a high degree of certainty the impact of the UoA on main primary species with respect to status, the fishery meeting SG100. Main primary species are herring (*Clupea harengus*) in North Sea, Skarregak, Kattegat and Eastern English Channel and saithe (*Pollachius virens*) in North Sea, Rockall and West of Scotland, Skagerrak and Kattegat used as bait. Bait are supplied by OSF and purchased to Enterfoods in Fraserburgh Scotland, all fish caught and landed in Scotland by licenced and registered vessels. OSF provided the quantity of bait purchased for 2015-2016 and 2016-2017. A total of 95t of herring and 149t of saithe has been used by creelers in 2015-2016. A total of 45t of herring and 179t of saithe has been used by creelers in 2016-2017. Herring and saithe stock are asseded and their status is known.		
b	Information adequacy for assessment of impact on minor primary species			
	Guidepost			Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status.
	Met?			Y
	Justification	Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status, the fishery meeting SG100. Minor primary species are cod in North Sea, eastern English channel and Skagerrat, haddock in North Sea, West Scotland and Skagerrat and Rockall, and whiting in North Sea and eastern English Channel used as bait and caught in brown crab creels as non-target species.		

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PI 2.1.3		Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
		Logbook programme and observer programme are undertaken since 2013 as part of the OSRP. Quantity of bait used by creelers is known and the information is available by species. Stocks status of minor primary species are asseded and their status is known.		
c	Information adequacy for management strategy			
	Guidepost	Information is adequate to support **measures** to manage **main** primary species.	Information is adequate to support a **partial strategy** to manage **main** Primary species.	Information is adequate to support a **strategy** to manage **all** primary species, and evaluate with a **high degree of certainty** whether the strategy is achieving its objective.
	Met?	Y	Y	N
	Justification	Information is adequate to support a partial strategy to manage all main primary species, the fishery meeting SG80. Logbook programme and observer programme are undertaken since 2013 as part of the OSRP. Quantity of bait used by creelers is known and the information is available by species. The stock status of main and minor primary species is assessed and known. SG100 is not meet has there is no strategy in place to manage all primary species.		
References		Coleman M.T. and Rodrigues E., 2017a. Logbook and Observer Report: Orkney Shellfish Research Project. Orkney Sustainable Fisheries Ltd. No 21, pp 25. ICES 2017a. Herring (*Clupea harengus*) in Subarea 4 and divisions 3.a and 7.d, autumn spawners (North Sea, Skagerrak and Kattegat, eastern English channel). ICES advice on fishing opportunities, catch, and effort – Greater North Sea Ecoregion. Published 31 May 2017, DOI: 10.17895/ices.pub.3130. ICES 2017b. Cod (*Gadus morhua*) in Subarea 4, Division 7.d, and Subdivision 20 (North Sea, easter English Channel, Skagerrak). ICES advice on fishing opportunities, catch, and effort – Greater North Sea Ecoregion. Published 14 November 2017, DOI: 10.17895/ices.pub.3526. ICES 2017c. Saithe (*Pollachius virens*) in subareas 4 and 6, and in Division 3a (North Sea, Rockfall and West Scotland, Skagerrak and Kattegat). ICES advice on fishing opportunities, catch, and effort – Celtic Seas, Faroes and Greater Noth Sea Ecoregions. Published 30 June 2017, DOI: 10.17895/ices.pub.3206. ICES 2017d. Haddock (*Melanogrammus aeglefinus*) in Division 6.b (Rockall). ICES advice on fishing opportunities, catch, and effort – Celtic Seas and Oceanic Northeast Atlantic Ecoregions. Published 30 June 2017, DOI: 10.17895/ices.pub.3121. ICES 2017e. Haddock (*Melanogrammus aeglefinus*) in Subareas 4, Division 6.a, and Subdivision 20 (North Sea, West of Scotland, Skagerrak). ICES advice on fishing opportunities, catch, and effort – Celtic Seas and Greater North Sea Ecoregions. Published 14 November 2017, DOI: 10.17895/ices.pub.3525. ICES 2017f. Whiting (*Merlangius merlangus*) in Subarea 4 and Division 7.d (North sea and eastern English Channel). ICES advice on fishing opportunities, catch, and effort – Greater North Sea Ecoregion. Published 14 November 2017, DOI: 10.17895/ices.pub.3530.		
OVERALL PERFORMANCE INDICATOR SCORE:				**95**
CONDITION NUMBER (if relevant):				**NA**

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PI 2.2.1 – Secondary species outcome

PI 2.2.1		The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit.		
Scoring Issue		SG 60	SG 80	SG 100
a	Main secondary species stock status			
	Guidepost	Main Secondary species are **likely** to be within biologically based limits. OR If below biologically based limits, there are measures in place expected to ensure that the UoA does not hinder recovery and rebuilding.	Main secondary species are **highly likely** to be above biologically based limits OR If below biologically based limits, there is either **evidence of recovery** or a **demonstrably effective partial strategy** in place such that the UoA does not hinder recovery and rebuilding. AND Where catches of a main secondary species outside of biological limits are considerable, there is either evidence of recovery or a, demonstrably effective strategy in place between those MSC UoAs that also have considerable catches of the species, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main secondary species are within biologically based limits.
	Met?	NA	NA	NA
	Justification	Velvet crab (*Necora puber*) is the only main secondary species. The species has been assessed using the RBF. PSA tables are in Appendix 1.2.2. The productivity and susceptibility attribute scores are 1.33 and 1.43, respectively. The PSA score is 1.95 which corresponds to a MSC PSA-derived score of 96.		
b	**Minor secondary species stock status**			
	Guidepost			Minor secondary species are highly likely to be above biologically based limits. OR If below biologically based limits', there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species
	Met?			NA

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PI 2.2.1		The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit.
	Justification	Minor secondary species are lobster, lesser-spotted dogfish and horse mackerel (bait). Lobster has been scored using the RBF. Although lobster has been assessed using the RBF, horse mackerel and lesser-spotted dogfish have not been considered in the PSA analysis so the the outputs of the PSA for lobster is not presented, thus PF5.3.2.1 "*If the team has only considered main species in the PSA analysis, the final PI score shall not be greater than 80.*"
References		Coleman M.T. and Rodrigues E., 2017b. Logbook and Observer Report: Orkney Shellfish Research Project. Orkney Sustainable Fisheries Ltd. No 21, pp 25. Hearn A. R. 2004. Reproductive biology of the velvet swimming crab, *Necora puber* (Brachyura: Portunidae), in Orkney Islands, UK. Sarsia North Atlantic Marine Science (Taylor & Francis) October 2004 – DOI 10.1080/00364820410002578. Lee J. T., R. A. Coleman, M. B. Jones, 2006. Population dynamics and growth of juveniles of the velvet swimming crab *Necora puber* (Decapoda: Portunidae). Marine Biology 148: 609-619. Tallack, S. M. L. 2002. The biology and exploitation of three species in the Shetland Islands, Scotland: *Cancer pagurus*, *Necora puber* and *Carcinus maenas*. PhD Thesis. NAFC/UHI. Tallack S. M.L., 2007. Size-fecundity relationships for *Cancer pagurus* and *Necora puber* in the Shetland Islands, Scotland: how is reproductive capacity facilitated? J. Mar. Biol. Ass. UK. 87: 507-515.	
OVERALL PERFORMANCE INDICATOR SCORE:			**80**
CONDITION NUMBER (if relevant):			**NA**

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PI 2.2.2 – Secondary species management strategy

PI 2.2.2		There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guidepost	There are **measures** in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **partial strategy** in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **strategy** in place for the UoA for managing main and minor secondary species.
	Met?	Y	Y	Not scored
	Justification	There is a partial strategy in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery. The main secondary species is the velvet crab. The species has been assessed using the RBF. PSA tables are in Appendix 1.2.2. The Productivity attribute was score 1.33 and the Susceptibility attribute was score 1.28 leading to a MSC PSA derived score of 97 The OSF Inshore Fisheries Management Plan set out management measures for velvet crab. There is a MLS of 70 mm and it is prohibited to land berried females. The fishing method can be considered as a partial strategy itself, it is expected that post-release mortality of undersized velvet crab may be low as they are catch usually alive, with no injuries and low capture-related stress. According to OSF, 10% of fishermen equip creels with escapement vents on a voluntary basis, escapement vents not being mandatory. Velvet crab catches are monitored. Fishing practices in place avoid unobserved mortality due to ghost fishing from lost creels. In case of bad weather, creels are set in deeper.OSF Code of Practices include a clause related to recovery of lost fishing gear. According to OSF and fishermen met during the site visit, lost of creels is infrequent. The Code of Practice also advice undersized crabs to be carefully released and returned to sea as soon as possible. SG100 is not scored as per FCR 7.10.5.3.		
b	Management strategy evaluation			
	Guidepost	The measures are considered **likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species).	There is **some objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the UoA and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the UoA and/or species involved.
	Met?	Y	Y	Not scored

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PI 2.2.2		**There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**		
	Justification	There is some objective basis for confidence that the partial strategy will work, based on some information directly about the UoA and/or species involved, the fishery meeting SG80. Bycatch monitoring is in place to show that bycatch level is low. Main secondary species is velvet crab. Velvet crab has been assessed using the RBF, the PSA tables are in Appendix 1.2.2. The Productivity attribute was score 1.33 and the Susceptibility attribute was score 1.28 leading to a MSC PSA derived score of 97. Minor secondary species are lobster, horse mackerel and lesser-spotted dogfish. Lobster has been scored using the RBF, the PSA tables are in Appendix 1.2.2. The Productivity attribute was score 2.17 and the Susceptibility attribute was score 1.20 leading to a MSC PSA derived score of 85. The combined Channel Groundfish Survey (CGFS)-North Sea International Bottom Trawl Survey (IBTS) index indicates that the horse mackerel stock continues to be at a low level although some signs of recovery are observed. Lesser-spotted dogfish stock size indicator has increased over the time series. SG100 is not scored as per FCR 7.10.5.3.		
c	Management strategy implementation			
	Guidepost		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a).
	Met?		Y	Not scored
	Justification	There is some evidence that the measures/partial strategy is being implemented successfully. Bycatch monitoring is in place to show that bycatch level is low. The OSF Inshore Fisheries Management Plan set out management measures for velvet crab and lobster. For velvet crab, there is a MLS of 70 mm and it is prohibited to land berried females. For lobster, a MLS of 88 mm (moving to 90 mm one year thereafter). The fishing method can be considered as a partial strategy itself, it is expected that post-release mortality of undersized velvet crab may be low as they are catch usually alive, with no injuries and low capture-related stress. Velvet crab has been assessed using the RBF, the PSA tables are in Appendix 1.2.2. The Productivity attribute was score 1.33 and the Susceptibility attribute was score 1.28 leading to a MSC PSA derived score of 97. Lobster has been scored using the RBF, the PSA tables are in Appendix 1.2.2. The Productivity attribute was score 2.17 and the Susceptibility attribute was score 1.20 leading to a MSC PSA derived score of 85. The combined Channel Groundfish Survey (CGFS)-North Sea International Bottom Trawl Survey (IBTS) index indicates that the horse mackerel stock continues to be at a low level although some signs of recovery are observed. Lesser-spotted dogfish stock size indicator has increased over the time series.		

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PI 2.2.2		**There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**		
		SG100 is not scored as per FCR 7.10.5.3.		
d	Shark finning			
	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?	Y	Y	Not scored
	Justification	It is highly likely that shark finning is not taking place. Lesser-spotted dogfish is a minor species, this a small shark species Althoug few creelers could retained it as a complementary bait, this species is discarded, whole body without fins being cut on-board. SG100 is not scored as per FCR 7.10.5.3.		
e	Review of alternative measures to minimise mortality of unwanted catch			
	Justification	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of all secondary species, and they are implemented, as appropriate.
	Met?	Y	N	Not scored
	Guidepost	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main secondary species. Unwanted catches of main secondary species are velvet crab undersized individuals and berried females. A review of the potential effectiveness and practicality of the use of escapement vents has bee carried out in 2015 by the Heriot-Watt University, the fishery meeting SG60. Whilst recent research in Orkney has demonstrated the effectiveness of escape gaps in reducing the catch and hence can minimise mortality of undersized crabs, the research has not yet been published and OSF report that escape gaps cannot currently be implemented as a mandatory technical measure, with such an action requiring public consultation and the resulting enforcement by Marine Scotland. Although approximately 10% of fishermen equip creels with escapement vents on a voluntary basis, alternative measures to minimise mortality of unwanted catch velvet crab have not been implemented and so SG80 is not met. SG100 is not scored as per FCR 7.10.5.3.		
References		Coleman M.T. and Rodrigues E., 2017b. Logbook and Observer Report: Orkney Shellfish Research Project. Orkney Sustainable Fisheries Ltd. No 21, pp 25.		

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PI 2.2.2	**There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**
	ICES 2017g. Horse mackerel (*Trachurus trachurus*) in Divisions 3.a, 4.b-c, and 7.d (Skagerrak and Kattegat, southern and central North Sea, eastern English channel). ICES advice on fishing opportunities, catch, and effort – Greater North Sea Ecoregion. Published 29 September 2017, DOI: 10.17895/ices.pub.3027. ICES 2017h. Lesser-spotted dogfish (*Scyliorhinus canicula*) in Subarea 6 and divisions 7.a-c and 7-j. ICES Advice on fishing opportunities, catch, and effort Celtic Seas, Greater North Sea, and Oceanic Northeast Atlantic Ecoregions. Published 6 October 2017, DOI: 10.17895/ices.pub.3179. OSF Code of Practice Rodrigues, E. 2015. Effectiveness of escape panels for reducing undersized catch in the Orkney brown *Cancer pagurus*. 3pp. Unpublished.
OVERALL PERFORMANCE INDICATOR SCORE:	**75**
CONDITION NUMBER (if relevant):	**3**

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PI 2.2.3 – Secondary species information

PI 2.2.3		Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impacts on main secondary species			
	Guidepost	Qualitative information is **adequate to estimate** the impact of the UoA on the main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species.	Some quantitative information is available and **adequate to assess** the impact of the UoA on main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species.	Quantitative information is available and **adequate to assess with a high degree of certainty** the impact of the UoA on main secondary species with respect to status.
	Met?	Y	Y	Y
	Justification	Quantitative information is available and adequate to assess with a high degree of certainty the impact of the UoA on velvet crab with respect to status, the fishery meeting SG100. Information to assess velvet crab productivity and susceptibility attributes is adequate. Marine Scotland Science assesses the velvet crab stock. Information on the amount of vevelt crab landed is recorded and available. Information about the amount of velvet crab discarded is monitored through the logbook programme and the observer programme.		
b	**Information adequacy for assessment of impacts on minor secondary species**			
	Guidepost			Some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status.
	Met?			Y
	Justification	Some quantitative information is adequate to estimate the impact of the UoA on lobster, horse mackerel and lesser-spotted dogfish with respect to status, the fishery meeting SG100. Logbook programme and observer programme are undertaken since 2013 as part of the. The quantity of horse mackerel used as bait by creelers is recorded and available. Information to assess lobster productivity and susceptibility attributes is adequate. Marine Scotland Science assesses the lobster stock and horse mackerel, and lesser-spotted dogfish stock size indices are assessed by ICES.		
c	Information adequacy for management strategy			
	Guidepost	Information is adequate to support **measures** to	Information is adequate to support a **partial strategy**	Information is adequate to support a **strategy** to manage **all** secondary

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PI 2.2.3		Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.		
		manage **main** secondary species.	to manage **main** secondary species.	species, and **evaluate** with a **high degree of certainty** whether the strategy is **achieving its objective**.
	Met?	Y	Y	N
	Justification	Information is adequate to support a partial strategy to manage velvet crab, the fishery meeting SG80. Information to assess velvet crab productivity and susceptibility attributes is adequate. Marine Scotland Science assesses the velvet crab stock. Information on the amount of vevelt crab landed is recorded and available. Information about the amount of velvet crab discarded is monitored through the logbook programme and the observer programme. SG100 is not meet as there is no strategy in place to manage all secondary species.		
References		Coleman M.T. and Rodrigues E., 2017a. Logbook and Observer Report: Orkney Shellfish Research Project. Orkney Sustainable Fisheries Ltd. No 21, pp 25. ICES 2017g. Horse mackerel (*Trachurus trachurus*) in Divisions 3.a, 4.b-c, and 7.d (Skagerrak and Kattegat, southern and central North Sea, eastern English channel). ICES advice on fishing opportunities, catch, and effort – Greater North Sea Ecoregion. Published 29 September 2017, DOI: 10.17895/ices.pub.3027. ICES 2017h. Lesser-spotted dogfish (*Scyliorhinus canicula*) in Subarea 6 and divisions 7.a-c and 7-j. ICES Advice on fishing opportunities, catch, and effort Celtic Seas, Greater North Sea, and Oceanic Northeast Atlantic Ecoregions. Published 6 October 2017, DOI: 10.17895/ices.pub.3179. Marine Scotland Science 2017. Fish and Shellfish Stocks. Published by the Scottish Government, May 2017..		
OVERALL PERFORMANCE INDICATOR SCORE:				**95**
CONDITION NUMBER (if relevant):				**NA**

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PI 2.3.1 – ETP species outcome

PI 2.3.1		The UoA meets national and international requirements for the protection of ETP species The UoA does not hinder recovery of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	Effects of the UoA on population/stock within national or international limits, where applicable			
	Guidepost	Where national and/or international requirements set limits for ETP species, the effects of the UoA on the population/stock are known and **likely** to be within these limits.	Where national and/or international requirements set limits for ETP species, the **combined effects of the MSC UoAs** on the population/stock are known and **highly likely** to be within these limits.	Where national and/or international requirements set limits for ETP species, there is a **high degree of certainty** that the **combined effects of the MSC UoAs** are within these limits.
	Met?	Not scored	Not scored	Not scored
	Justification	Not scored as there are no national or international requirements that set limits for ETP species (FCR v.20 SA3.10.1.1).		
b	Direct effects			
	Guidepost	Known direct effects of the UoA are likely to not **hinder recovery** of ETP species.	Known direct effects of the UoA are **highly likely** to not **hinder recovery** of ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the UoA on ETP species.
	Met?	Y	Y	Y leatherback turtle Y basking shark Y otter Y dolphins Y seal N minke whale
	Justification	ETP species that may overlap with the Orkney brown crab creel fishery includes minke whale, dolphins, seals, otters, leatherback turtle and basking shark. Known direct effects of the UoA are highly likely to not hinder recovery of ETP species. Minke whale Northridge et al (2010) investigated the occurrence of entanglement of minke whale in Scottish waters. It was determined that Orkney Islands may have a relative elevated risk of minke whale entanglement. Overall, Northridge et al (2010) concludes that it cannot be said that entanglements of minke (or orther) whales in Scottish waters represent a serious threat for conservation. The assessment team has been provided with entanglements data by the SMASS. Since 2010, SMASS has had records of entanglement of 2 minke whale in Orkney. However, it has not been confirmed which fishing gear was involved in these entanglements. The assessment team therefore determined that SG80 is met. Given the risk level of minke whale entanglement and the potential occurrence of unreported entanglements, a high degree of confidence cannot be achieved and therefore SG100 is not met. **Dolphins** Gillnets, driftnets and trammelnets account for the majority of harbour porpoise and bottlenose dolphin bycatch in UK waters. No concern has been raised regarding incidental capture of dophins by brown crab creels in Orkney during meetings with fihsermen, management agencies and nature conservation organisations. The assessment tyeam determined that SG100 is met. Seal Incidental catch of grey seals and harbour seals in gillnets has been widely reported. Since 2010, SMASS has had 3 records of incidental catch of seals in Orkney: one grey seal (Billia Croo near		

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PI 2.3.1		The UoA meets national and international requirements for the protection of ETP species The UoA does not hinder recovery of ETP species		
		Stromness) and two harbour seals (Wideweall Bay, South Ronaldsay). However, it has not been confirmed which fising gear was involved in these entanglements. No concern has been raised regarding incidental capture of seals by brown crab creels in Orkney during meetings with fihsermen, management agencies and nature conservation organisations. The assessment team determined that SG100 is met. **Otter** Otters are known to be attracted by fish and crustaceans which are used as bait or caught in creels, and a survey of drowned otters in lobster creels off the Uists (Hebrides) showed that the majority drowned while foraging in depth of 2-5 m. Crab creels were considered not to pose such a threat as the gear was usually set on sandy seabed in deeper water. No concern has been raised regarding incidental capture of otters by brown crab creels in Orkney during meetings with fihsermen, management agencies and nature conservation organisations. The assessment tyeam determined that SG100 is met. **Leatherback turtle** The leatherback turtke is the only sea turtle considered to have a regular and normal occurrence in UK waters. In the last 20 years, the most significant incidental catch of leatherback turtles in UK waters has been by inshore pot fisheries (whelk and crustaceans) and pelagic drift nets. The leatherback turtle sightings indicate a higher occurrence in west of Eire, northwest of Scotland, the Irish Sea and English Channel. No concern has been raised regarding incidental capture of leatherback turtle by brown crab creels in Orkney during meetings with fishermenn, management agencies and nature conservation organisations. The assessment tyeam determined that SG100 is met. **Basking shark** No concern has been raised regarding incidental capture of basking sharks by brown crab creels in Orkney during meetings with fihsermen, management agencies and nature conservation organisations. None of the stakeholder met were aware of any entanglement of basking shark in Orkney Islands. The assessment tyeam determined that SG100 is met.		
c	Indirect effects			
	Guidepost		Indirect effects have been considered and are thought to be **highly likely** to not 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	There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species. The creel fishery does not interact with the food sources of ETP species. Fishing vessels could potentially affect seabirds loafing habitats, however the intensity of disturbance appears to be minor to negligible. According to OSF and fishermen met during the site visit, lost of creels is infrequent meaning that the level of ghost fishing is very low. Fishing practices in place avoid unobserved mortality due to ghost fishing from lost creels. In case of bad weather, creels are set in deeper.OSF Code of Practices include a clause related to recovery of lost fishing gear.		
References		Northridge S., A. Cargill, A. Coram, L. Mandleberg, S. Calderan and B. Reid, 2010. Entanglement of minke whales in Scottish waters; an investigation into occurrence, causes and mitigation. Sea Mammal Research Unit, University of St Andrews, SAC, Hebridean Whale and Dolphin Trust. Final Report to Scottish Government CR/2007/49, June 2010. Pierpoint, C., 2000. Bycatch of marine turtles in UK and Irish waters, JNCC Report 310, 32 pages, ISSN 0963 8091.		

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PI 2.3.1	The UoA meets national and international requirements for the protection of ETP species The UoA does not hinder recovery of ETP species
	Ryan C., R. Leaper, P. G. H. Evans, K. Dyke, K. P. Robinson, G. N. Haskins, S. Calderan, N. van Geel, O. Harries, K. Froud, A. Brownlow and A. Jack, 2016. Entanglement: an emerging threat to humpback whales in Scottish waters. International Whaling Commission, SC/66b/HIM/01. 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.
OVERALL PERFORMANCE INDICATOR SCORE:	**95**
CONDITION NUMBER (if relevant):	**N/A**

PI 2.3.2 – ETP species management strategy

PI 2.3.2		The UoA has in place precautionary management strategies designed to: • **meet national and international requirements;** • **ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place (national and international requirements)			
	Guidepost	There are **measures** in place that minimise the UoA-related 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 UoA'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 UoA's impact on ETP species, including measures to minimise mortality, which is designed to **achieve above** national and international requirements for the protection of ETP species.
	Met?	Y	Y	N
	Justification	There is a strategy in place for managing the UoA'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. Whale species and bottlenose dolphin are under a grouped UK Biodiversity Action Plan (BAP); the harbour porpoise, basking shark have their own UK BAP, and sea turtles are under a grouped UK BAP. However, the work previously carried out by the UK BAP is now focussed at the country-level rather than UK-level, and the UK Post-2010 Biodiversity Framework published in July 2012 has succeeded the UK BAP. OSF has developed a Code of Practices for Crab Suppliers (a copy has been provided to the assessment team). This Code of Practices include a section related to the record and report of any accidental capture of ETP species in a ETP species logbook. Also is included the notice of the British Divers Marine Life Rescue (BDMLR) - Large Whale Entanglement Awareness that explains and describes what to do in the event of a entanglement of whale in fishing gear. Fishing practices in place avoid unobserved mortality due to ghost fishing from lost creels. In case of bad weather, creels are set in deeper. OSF Code of Practices include a clause related to recovery of lost fishing gear. According to OSF and fishermen met during the site visit, lost of creels is infrequent.		

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PI 2.3.2		**The UoA has in place precautionary management strategies designed to:** • **meet national and international requirements;** • **ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.**		
		In April 2017, the Scottish Creel Fishermen's Federation (SCFF) published a booklet "Reducing the risk of entanglement in creel ropes for marine animals" produced in collaboration with the BDMLR, Scottish Natural Heritage, Whale and Dolphin Conservation, SMASS and the Hebridean Whale and Dolphin Trust. It cannot be said that a comprehensive stragtegy is in place, preventing the fishery from meeting SG100.		
b	Management strategy in place (alternative)			
	Guidepost	There are **measures** in place that are expected to ensure the UoA does not hinder the recovery of ETP species.	There is a **strategy** in place that is expected to ensure the UoA does not hinder the recovery of ETP species.	There is a **comprehensive strategy** in place for managing ETP species, to ensure the UoA does not hinder the recovery of ETP species
	Met?	N/A	N/A	N/A
	Justification	Not score as there are requirement for protection and rebuilding through national ETP legislation (FCR v.2.0 SA3.11.2 and SA3.11.2.1)		
c	Management strategy evaluation			
	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 measures/strategy will work, based on **information** directly about the fishery and/or the species involved.	The strategy/comprehensive 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	N
	Justification	There is an objective basis for confidence that the measures/strategy will work, based on information directly about the fishery and/or the species involved. The assessment team concludes that there are no interactions with leatherback turtles, basking shark, otter and dolphins. Interactions with seals are not rare and although some whale entanglements may be unreported, interactions with whales seem to be low ehought not to represent serious threat for their conservation and recovery. SG 100 is not meet as there is no quantitative analysis specific to Orkney brown crab fishery-ETP speices interaction.		
d	Management strategy implementation			
	Guidepost		There is some **evidence** that the measures/strategy is being implemented successfully.	There is **clear evidence** that the strategy/comprehensive strategy is being implemented successfully and is achieving its

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PI 2.3.2		**The UoA has in place precautionary management strategies designed to:** • **meet national and international requirements;** • **ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.**		
				objective as set out in scoring issue (a) or (b).
	Met?		Y	N
	Justification	There is some evidence that the measures/strategy is being implemented successfully. Based on the information provided in the background section, the assessment team concludes that there are no interactions with leatherback turtles, basking shark, otter and dolphins. Interactions with seals are rare and interactions with whales are rare and low ehougth to not represent serious threat for conservation and recovery. SG100 is not met as actions for the conservation of the species set in the species BAP are not clearly implemented for the Orkney brown crab fishery.		
e	Review of alternative measures to minimize mortality of ETP species			
	Guidepost	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality ETP species, and they are implemented, as appropriate.
	Met?	Y	Y	N
	Justification	There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate. Northridge et al (2010) investigated the minitgation measures that could be implemented to minimise the UoA-related mortality of ETP species. A OSF FIP Workshop held in 2015 reviewed management measures to reduce the risk of ETP species entanglements and incidental catch. OSF has developed a Code of Practices for Crab Suppliers (a copy has been provided to the assessment team). This Code of Practices include a section related to the record and report of any accidental capture of ETP species in a ETP species logbook. Also is included the notice of the British Divers Marine Life Rescue (BDMLR) - Large Whale Entanglement Awareness that explains and describes what to do in the event of a entanglement of whale in fishing gear. In April 2017, the Scottish Creel Fishermen's Federation (SCFF) published a booklet "Reducing the risk of entanglement in creel ropes for marine animals" produced in collaboration with the BDMLR, Scottish Natural Heritage, Whale and Dolphin Conservation, SMASS and the Hebridean Whale and Dolphin Trust.		
References		Northridge S., A. Cargill, A. Coram, L. Mandleberg, S. Calderan and B. Reid, 2010. Entanglement of minke whales in Scottish waters; an investigation into occurrence, causes and mitigation. Sea Mammal Research Unit, University of St Andrews, SAC, Hebridean Whale and Dolphin Trust. Final Report to Scottish Government CR/2007/49, June 2010. Pierpoint, C., 2000. Bycatch of marine turtles in UK and Irish waters, JNCC Report 310, 32 pages, ISSN 0963 8091.		

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PI 2.3.2	**The UoA has in place precautionary management strategies designed to:** • **meet national and international requirements;** • **ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.**
	Ryan C., R. Leaper, P. G. H. Evans, K. Dyke, K. P. Robinson, G. N. Haskins, S. Calderan, N. van Geel, O. Harries, K. Froud, A. Brownlow and A. Jack, 2016. Entanglement: an emerging threat to humpback whales in Scottish waters. International Whaling Commission, SC/66b/HIM/01. 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. UK species BAP http://jncc.defra.gov.uk/page-5167 OSF Code of Practices for Crab Suppliers
OVERALL PERFORMANCE INDICATOR SCORE:	**80**
CONDITION NUMBER (if relevant):	**N/A**

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PI 2.3.3 – ETP species information

PI 2.3.3		**Relevant information is collected to support the management of UoA impacts on ETP species, including:** • **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	Information adequacy for assessment of impacts			
	Guidepost	Qualitative information is **adequate to estimate** the UoA related mortality on ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Qualitative information is **adequate to estimate productivity and susceptibility** attributes for ETP species.	Some quantitative information is **adequate to assess** the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for ETP species.	Quantitative information is available to assess with a high degree of certainty the **magnitude of UoA-related impacts, mortalities and injuries and the consequences for the status** of ETP species.
	Met?	Y	Y	N
	Justification	Some quantitative information is adequate to assess the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. Northridge et al (2010) investigated the occurrence of entanglement of minke whale in Scottish waters. Overall, Northridge et al (2010) concludes that it cannot be said that entanglements of minke (or orther) whales in Scottish waters represent a serious threat for conservation. Ryan et al (2016) investigated the entaglements of humpback whale in Scottish waters and concluded that humpback whales occur in very low abundance in Scottish waters. Sewell and Hiscock (2005) investigated the environmental effect of different fishing gears used within UK European marine sites including potential effect of ETP species. The SMASS records incidental catches of amrine mamals, and since 2010, 2 entanglements of minke whale and 3 entanglements of seals have been reported, with no confirmation of the fishing gear involved. Based on the information from the sources cited above, it was determined that that there are no interactions with leatherback turtles, basking shark, otter and dolphins. Interactions with seals are not rare and interactions with whales seem to be low ehought not to represent serious threat for their conservation and recovery. SG100 is not met as some incidental catches can occur without being reported.		
b	Information adequacy for management strategy			
	Guidepost	Information is adequate to support **measures** to	Information is adequate to measure trends and	Information is adequate to support a **comprehensive**

DNC

PI 2.3.3		**Relevant information is collected to support the management of UoA impacts on ETP species, including:** • **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.**		
		manage the impacts on ETP species.	support a **strategy** to manage impacts on ETP species.	**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	Information is adequate to measure trends and support a strategy to manage impacts on ETP species. Northridge et al (2010) investigated the occurrence of entanglement of minke whale in Scottish waters. Overall, Northridge et al (2010) concludes that it cannot be said that entanglements of minke (or orther) whales in Scottish waters represent a serious threat for conservation. Ryan et al (2016) investigated the entaglements of humpback whale in Scottish waters and concluded that humpback whales occur in very low abundance in Scottish waters. Sewell and Hiscock (2005) investigated the environmental effect of different fishing gears used within UK European marine sites including potential effect of ETP species. The SMASS records incidental catches of marine mamals, and since 2010, 2 entanglements of minke whale and 3 entanglements of seals have been reported, with no confirmation of the fishing gear involved. Based on the information from the sources cited above, it was determined that that there are no interactions with leatherback turtles, basking shark, otter and dolphins. Interactions with seals are not rare and interactions with whales seem to be low ehought not to represent serious threat for their conservation and recovery. SG100 is not met as some incidental catches can occur without being reported.		
References		Northridge S., A. Cargill, A. Coram, L. Mandleberg, S. Calderan and B. Reid, 2010. Entanglement of minke whales in Scottish waters; an investigation into occurrence, causes and mitigation. Sea Mammal Research Unit, University of St Andrews, SAC, Hebridean Whale and Dolphin Trust. Final Report to Scottish Government CR/2007/49, June 2010. Pierpoint, C., 2000. Bycatch of marine turtles in UK and Irish waters, JNCC Report 310, 32 pages, ISSN 0963 8091. Ryan C., R. Leaper, P. G. H. Evans, K. Dyke, K. P. Robinson, G. N. Haskins, S. Calderan, N. van Geel, O. Harries, K. Froud, A. Brownlow and A. Jack, 2016. Entanglement: an emerging threat to humpback whales in Scottish waters. International Whaling Commission, SC/66b/HIM/01. 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.		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**
CONDITION NUMBER (if relevant):				**N/A**

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PI 2.4.1 – Habitats outcome

PI 2.4.1		The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.		
Scoring Issue		SG 60	SG 80	SG 100
a	Commonly encountered habitat status			
	Guidepost	The UoA is **unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.
	Met?	Y	Y	N
	Justification	Commonly encountered habitats are coarse sand/mixed sediment and rock and biogenic reef The UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. The distribution of fishing effort is well understood. Traps are passive gear types that rely on bait to attract the target species. Although trap fisheries are generally considered to have slight impacts on the habitat, traps can impact biogenic structures (e.g. sponges, corals) through crushing or entanglement. Crushing and scouring effects can result if traps are dragged across the bottom during retrieval or during periods of strong currents (e.g. storms, tides). Eno et al (2001) examined the effects of fishing with crustacean traps on benthic fauna in UK through qualitative and quantitative experiments. This study examined the effects of lobster and crab traps being hauled from rocky substrates in southern England, and found that the habitats and their communities appeared relatively unaffected by potting. Other studies indicate that traps cause minimal damage to habitats. Although the above evidence supports the determination that the fishery meets SG80, there is no direct evaluation of the Orkney brown crab creel fishery impacts on habitats, preventing the fishery from meeting SG100		
b	VME habitat status			
	Guidepost	The UoA is **unlikely** to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.
	Met?	Y	Y	Y
	Justification	There is evidence that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm. VMEs are mussel and native oyster beds, burrowed mud, cold-water coral reefs, deep-sea sponge aggregations, kelp beds, seagrass beds, maerl beds, offshore deep sea muds, offshore subtidal sands and gravels, seamount communities and tide-swept algal communities and coarse sands with burrowing bivalves. Mussel and native oyster beds, Northern sea fan and sponge communities, flame shell beds, burrowed mud, deep-sea habitats and seamount communities are not present in Orkney Islands. Creels fishing effort distribution shows that creels are not set on maerls beds and seagrass beds.		

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PI 2.4.1		**The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.**		
		Eno et al (2001) examined the effects of fishing with crustacean traps on benthic fauna in UK through qualitative and quantitative experiments. This study examined the effects of lobster and crab traps being hauled from rocky substrates in southern England, and found that the habitats and their communities appeared relatively unaffected by potting.		
c	**Minor habitat status**			
	Guidepost			There is **evidence** that the UoA is highly unlikely to reduce structure and function of the minor habitats to a point where there would be serious or irreversible harm.
	Met?			NA
	Justification	There are no minor habitats, fishing activies occur only on the two commonly encountered habitats.		
References		Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors), 2011. Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh. pp. 191. Coleman M.T. and Rodrigues E., 2017c. Succorfish Report. Orkney Shellfish Research Project. Orkney Sustainable Fisheries Ltd. No 20, pp 18. DFO. 2010. Potential impacts of fishing gears (excluding mobile bottom-contacting gears) on marine habitats and communities. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/003. Eno N. C., D. S. MacDonald, J. A. M. Kinnear, S. C. Amos, C. J. Chapman, R. .A Clark, F. St P. .D Bunker and C. Munro, 2001. Effects of crustacean traps on benthic fauna. ICES Journal of Marine Science 58: 11-20.		
OVERALL PERFORMANCE INDICATOR SCORE:				**90**
CONDITION NUMBER (if relevant):				**N/A**

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PI 2.4.2 – Habitats management strategy

PI 2.4.2		There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	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 all MSC UoAs/non-MSC fisheries on habitats.
	Met?	Y	Y	N
	Justification	There is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above. A Pilot Pentland Firth and Orkney Waters Marine Spatial Plan has been published in 2016. The Plan sets out an integrated planning policy framework to guide marine development, activities and management decisions, whilst ensuring the quality of the marine environment is protected. This pilot plan was prepared in parallel with the Scotland's Nationa Marine plan and will establish a useful basis for the preparation of separate regional marine plans. A network of MPAs helps to protect nationally important marine wildlife, habitats, geology and undersea landforms. Developing Scotland's network of MPAs is part of a wider strategy to meet the Scottish Government's commitment to a "clean, healthy, safe, productive and biologically diverse marine and coastal environment that meets the long term needs of people and nature". Scotland's MPAs includes Nature Conservation MPAs (NCMPA), Special Areas of Conservation (SAC), Special protection Areas (SPA) and Sites of Special Scientific Interest (SSSI). There are 3 Nature Conservation MPAs and 4 Special Areas of Conservation in Orkney Islands. The fishing method itself can be considered as a partial strategy to avoid habitat impacts as well as fishing operations with fishermen lifting their creels rather than dragging them during hauling and setting their creels in deeper waters during bad weather. OSF Code of Practices include a clause related to recovery of lost fishing gear. According to OSF and fishermen met during the site visit, lost of creels is infrequent. SG100 is not met as there is no specific strategy in place due to the low risk posed by the fishery.		
b	Management strategy evaluation			
	Guidepost	The measures are **considered likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/habitats).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on **information directly about the UoA and/or habitats** involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on **information directly about the UoA and/or habitats** involved.
	Met?	Y	Y	N
	Justification	There is some objective basis for confidence that the measures/partial strategy will work, based on information directly about the UoA and/or habitats involved. Traps are passive gear types that rely on bait to attract the target species. Although trap fisheries are generally considered to have slight impacts on the habitat, traps can impact biogenic structures (e.g. sponges, corals) through crushing or entanglement. Crushing and scouring effects can result if traps are dragged across the bottom during retrieval or during periods of strong currents (e.g. storms, tides). Eno et al (2001) examined the effects of fishing with crustacean traps on benthic fauna in UK through qualitative and quantitative experiments. This study examined the effects of lobster and		

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PI 2.4.2		**There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.**		
		crab traps being hauled from rocky substrates in southern England, and found that the habitats and their communities appeared relatively unaffected by potting. SG100 is not met as there is no testing about habitats impacts specific to the Orkney Islands brown crab creel fishery.		
c	Management strategy implementation			
	Guidepost		There is **some quantitative evidence** that the measures/partial strategy is being implemented successfully.	There is **clear quantitative evidence** that the partial strategy/strategy is being implemented successfully and is achieving its objective, as outlined in scoring issue (a).
	Met?		Y	N
	Justification	There is some quantitative evidence that the measures/partial strategy is being implemented successfully. A network of MPAs helps to protect nationally important marine wildlife, habitats, geology and undersea landforms. Developing Scotland's network of MPAs is part of a wider strategy to meet the Scottish Government's commitment to a "clean, healthy, safe, productive and biologically diverse marine and coastal environment that meets the long term needs of people and nature". Scotland's MPAs includes Nature Conservation MPAs (NCMPA), Special Areas of Conservation (SAC), Special protection Areas (SPA) and Sites of Special Scientific Interest (SSSI). There are 3 Nature Conservation MPAs and 4 Special Areas of Conservation in Orkeny Islands. Traps are passive gear types that rely on bait to attract the target species. Although trap fisheries are generally considered to have slight impacts on the habitat, traps can impact biogenic structures (e.g. sponges, corals) through crushing or entanglement. Crushing and scouring effects can result if traps are dragged across the bottom during retrieval or during periods of strong currents (e.g. storms, tides). Eno et al (2001) examined the effects of fishing with crustacean traps on benthic fauna in UK through qualitative and quantitative experiments. This study examined the effects of lobster and crab traps being hauled from rocky substrates in southern England, and found that the habitats and their communities appeared relatively unaffected by potting. SG100 is not met as there is no testing about habitats impacts specific to the Orkney Islands brown crab creel fishery.		
d	**Compliance with management requirements and other MSC UoAs'/non-MSC fisheries' measures to protect VMEs**			
	Guidepost	There is **qualitative evidence** that the UoA complies with its management requirements to protect VMEs.	There is **some quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.	There is **clear quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.
	Met?	Not scored	Not scored	Not scored
	Justification	Not relevant. The UoA does not impact VMEs, there is no other MSC UoA within the UoA's management area and the brown crab creel fishery is the main fishery in Orkney Islands (FCR SA3.14.3).		
References		Coleman M.T. and Rodrigues E., 2017c. Succorfish Report. Orkney Shellfish Research Project. Orkney Sustainable Fisheries Ltd. No 20, pp 18.		

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PI 2.4.2	There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.
	DFO. 2010. Potential impacts of fishing gears (excluding mobile bottom-contacting gears) on marine habitats and communities. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/003. Eno N. C., D. S. MacDonald, J. A. M. Kinnear, S. C. Amos, C. J. Chapman, R. .A Clark, F. St P. .D Bunker and C. Munro, 2001. Effects of crustacean traps on benthic fauna. ICES Journal of Marine Science 58: 11-20. Marine Scotland 2015b. Scotland's National Marine Plan – A Single Framework for Managing Our Seas. The Scottish Government, Edinburgh 2015. Marine Scotland 2016. Pilot Pentland Firth and Orkney Waters Marine Spatial Plan. Prepared by the Pilot Pentland Firth and Orkney Waters Working Group. The Scottish Government, Edinburgh 2016. OSF Code of Practices for Crab Suppliers
OVERALL PERFORMANCE INDICATOR SCORE:	**80**
CONDITION NUMBER (if relevant):	**NA**

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PI 2.4.3 – Habitats information

PI 2.4.3		Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat.		
Scoring Issue		SG 60	SG 80	SG 100
a	Information quality			
	Guidepost	The types and distribution of the main habitats are **broadly understood**. OR If CSA is used to score PI 2.4.1 for the UoA: Qualitative information is adequate to estimate the types and distribution of the main habitats.	The nature, distribution and **vulnerability** of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. OR If CSA is used to score PI 2.4.1 for the UoA: Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats.	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats.
	Met?	Y	Y	Y
	Justification	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats. Benthic habitats around Orkney Islands have been mapped and benthic habitats mapping is available through the European Marine Observation and Data Network (EMODnet) and Joint Nature Conservation Committee (JNCC). Benthic habitats are dominated by inshore rock and biogenic reef and coarse sediment and offshore sand and coarse sediment. VMEs and are: mussel and native oyster beds, seapens and burrowing megafauna in circalittoral fine mud, cold-water coral reefs, deep-sea sponge aggregations, kelp beds, seagrass beds, maerl beds, offshore deep sea muds, offshore subtidal sands and gravels, seamount communities and tide-swept algal communities and coarse sands with burrowing bivalves. Distribution of VMEs is mapped. Mussel and native oyster beds, seagrass beds (*Zostera noltii*), Northern sea fan and sponge communities, cold-water coral reefs, flame shell beds, burrowed mud, deep-sea habitats and seamount communities are not present in Orkney Islands. Maerl beds are found in Orkney Islands waters. Maerl is extremely slow growing and maerl beds create a complex, open structure that supports diverse associated communities of red seaweeds and animals including juveniles stages of a range of commercially important species. Subtidal seagrass beds of *Zostera marina* and *Ruppia maritima* are found in Orkney Islands waters. Eelgrass beds are considered to be scarce in Scotland and have an important role in the ecosystem by stabilising sediments, protecting the coast from waves action and being a nursery area fro many commercially important species.		
b	Information adequacy for assessment of impacts			
	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. OR	Information is adequate to allow for identification of the main impacts of the UoA on the main habitats, and there is reliable information on the spatial extent of interaction and on the timing and	The physical impacts of the gear on all habitats have been quantified fully.

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PI 2.4.3		**Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat.**		
		If CSA is used to score PI 2.4.1 for the UoA: Qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats.	location of use of the fishing gear. OR **If CSA is used to score PI 2.4.1 for the UoA:** Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats.	
	Met?	Y	Y	N
	Justification	Information is adequate to allow for identification of the main impacts of the UoA on the main habitats, and there is reliable information on the spatial extent of interaction and on the timing and location of use of the fishing gear. Traps are passive gear types that rely on bait to attract the target species. Although trap fisheries are generally considered to have slight impacts on the habitat, traps can impact biogenic structures (e.g. sponges, corals) through crushing or entanglement. Crushing and scouring effects can result if traps are dragged across the bottom during retrieval or during periods of strong currents (e.g. storms, tides). Eno et al (2001) examined the effects of fishing with crustacean traps on benthic fauna in UK through qualitative and quantitative experiments. This study examined the effects of lobster and crab traps being hauled from rocky substrates in southern England, and found that the habitats and their communities appeared relatively unaffected by potting. The spatial and temporal extent of the brown crab creel fishing activity within and surrounding Orkeny Islands have been investigated. The physical impacts of creel fishing on all habitats have not been quatified fully, preventing the fishery form meeting SG100.		
c	Monitoring			
	Guidepost		Adequate information continues to be collected to detect any increase in risk to the main habitats.	Changes in habitat distributions over time are measured.
	Met?		Y	Y
	Justification	Adequate information continues to be collected to detect any increase in risk to the main habitats. The succorfish program continues and provides information on the spatial and temporal extent of the brown crab creel fishing activity. Changes in habitat distribution are monitored by the Marine Spatial Plan and updated regurlarly.		
References		Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors), 2011. Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh. pp. 191. Coleman M.T. and Rodrigues E., 2017c. Succorfish Report. Orkney Shellfish Research Project. Orkney Sustainable Fisheries Ltd. No 20, pp 18. Marine Scotland 2015b. Scotland's National Marine Plan – A Single Framework for Managing Our Seas. The Scottish Government, Edinburgh 2015.		

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PI 2.4.3	Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat.
	Marine Scotland 2016. Pilot Pentland Firth and Orkney Waters Marine Spatial Plan. Prepared by the Pilot Pentland Firth and Orkney Waters Working Group. The Scottish Government, Edinburgh 2016. Joint Nature Conservation Committee http://jncc.defra.gov.uk/default.aspx?page=1729
OVERALL PERFORMANCE INDICATOR SCORE:	**95**
CONDITION NUMBER (if relevant):	**N/A**

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PI 2.5.1 – Ecosystem outcome

PI 2.5.1		The UoA 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	Ecosystem status			
	Guidepost	The UoA 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 UoA 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 UoA 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	P
	Justification	The UoA 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. Orkney Islands are part of the Celtic Seas EcoRegion. ICES 2016 Celtic Seas Ecosystem overview concludes that the overall fishing pressure on commercial fish and shellfish stocks in the ecoregion has decreased and the overall fishing mortality for shellfish, demersal and pelagic fish stocks has reduced since two decades. Crab potting has not been identified as impacting threatened and declining fish species, seabirds and marine mamals, and as leading to habitats abrasion and substrate loss. Predator-prey relationship for the brown crab and associated non-target species are well understood. Planktonic and early benthic life stages provide an important food sources for fish species. Adults brow crab feed primarily on benthic invertebrates such as bivalves, small crustaceans and barnacles, but will also scavenge for food as demonstrated by their capture in creels baited with various fish species. In the adult stage of their life cycle, brown crabs have few predators. The Marine Life Information Network assessed brown crab as having an intermediate intolerance, high recoverability low sensitivity to pot fishing. Given the generalist role of brown crab and velvet crab in the ecosystem, as well as the range of other benthic and bentho-pelagic predators and scavengers present in the stock areas, it is likely that functional group composition, community distribution and trophic dynamics would be virtually unchanged from natural background levels. Species composition may be impacted by fishing, given that removal of crabs is likely to reduce competition for other benthic predators and scavengers, but it seems unlikely that any changes would be major in comparison with the natural range of variation. Although there is some evidence the UoA 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 no specific ecosystem modelling conducted in Orkney Islands to conclude that there is full evidence, SG100 being partially met.		
References		ICES 2016b. Celtic Seas Ecoregion – Ecosystem overview. ICES Ecosystem Overviews. Published 04 March 2016, version 2, 13 May 2016. Neal K.J. and E. Wilson, 2008. Cancer pagurus Edible crab. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Networrk: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available from: https://www.marlin.ac.uk/species/detail/1179		
OVERALL PERFORMANCE INDICATOR SCORE:				**90**

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PI 2.5.1	The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function.
CONDITION NUMBER (if relevant):	N/A

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PI 2.5.2 – Ecosystem management strategy

PI 2.5.2		There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function.		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guidepost	There are **measures** in place, if necessary which take into account the **potential impacts** of the fishery on key elements of the ecosystem.	There is a **partial strategy** in place, if necessary, which takes into account **available information and is expected to restrain impacts** of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	There is a **strategy** that consists of a **plan**, in place which contains measures to **address all main impacts of the UoA** on the ecosystem, and at least some of these measures are in place.
	Met?	Y	Y	N
	Justification	There is a partial strategy in place, if necessary, which takes into account available information and is expected to restrain impacts of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance. The potential impacts of the Orkney brown crab creel fishery on the ecosystem structure and function is managed at the international level under the EU framework, at the national level under UK and Scottish regulations and the regional/local level. A Scotland's National Marine Plan has been published in 2015. The Plan has been developed in accordance with the EU Directive 2014/89/UE which came into force in 2014 and introduces a framework for marine spatial planning and aims to promote the sustainable development of marine areas and the sustainable use of marine resources. The Plan sets objectives specific to the marine environment. A Pilot Pentland Firth and Orkney Waters Marine Spatial Plan has been published in 2016. The Plan sets out an integrated planning policy framework to guide marine development, activities and management decisions, whilst ensuring the quality of the marine environment is protected. This pilot plan was prepared in parallel with the Scotland's Nationa Marine plan and will establish a useful basis for the preparation of separate regional marine plans. A network of MPAs helps to protect nationally important marine wildlife, habitats, geology and undersea landforms. Developing Scotland's network of MPAs is part of a wider strategy to meet the Scottish Government's commitment to a "clean, healthy, safe, productive and biologically diverse marine and coastal environment that meets the long term needs of people and nature". There are 3 Nature Conservation MPAs and 4 Special Areas of Conservation in Orkney Islands. The OSF Inshore Fisheries Management Plan set out management measures for shellfish. A MLS is in place for brown crab, velvet crab, lobster and green crab. It is also prohibited to land velvet crab berried females. OSF Code of Conduct lists best practices to minimise impacts on the marine environment. Athough a Marine National Pland and a Pilot Pentland Firth and Orkney Waters Marine Spatial Plan have been published in 2015 and 2016, respectively, it cannot be said that the plan contains measures to address all main impacts of the UoA on the ecosystem, preventing the fishery from meeting SG100.		
b	Management strategy evaluation			

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PI 2.5.2		**There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function.**		
	Guidepost	The **measures** are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ ecosystems).	There is **some objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the UoA and/or ecosystem involved
	Met?	Y	Y	N
	Justification	There is some objective basis for confidence that the measures/partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved Orkney Islands are part of the Celtic Seas EcoRegion. In the ICES 2016 Celtic Seas Ecosystem, crab potting has not been identified as impacting threatened and declining fish species, seabirds and marine mamals, and as leading to habitats abrasion and substrate loss. Given the generalist role of brown crab and velvet crab in the ecosystem, as well as the range of other benthic and bentho-pelagic predators and scavengers present in the stock areas, it is likely that functional group composition, community distribution and trophic dynamics would be virtually unchanged from natural background levels. Species composition may be impacted by fishing, given that removal of crabs is likely to reduce competition for other benthic predators and scavengers, but it seems unlikely that any changes would be major in comparison with the natural range of variation. No concerns have been raised about the impacts of the Orkney brown crab creel fishery on the wider ecosystem structure and function. SG100 is not met as there is no testing about the efficiency of the partial strategy in place.		
c	**Management strategy implementation**			
	Guidepost		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a).
	Met?		Y	N
	Justification	There is some evidence that the partial strategy is being implemented successfully. The OSF Inshore Fisheries Management Plan set out management measures for shellfish. A MLS is in place for brown crab, velvet crab, lobster and green crab. It is also prohibited to land velvet crab berried females. Form the meeting with MS Compliance, teher is a high degree of compliance with regulatins in place. The Pilot Pentland Firth and Orkney Waters Marine Spatial Plan was published in 2016 and sets out an integrated planning policy framework to guide marine development, activities and management decisions, whilst ensuring the quality of the marine environment is protected. MPAS has been established in Orkany Islands. SG100 is not met as there is no clear evidence that the partial strategy is implemented succeffully and is achieving its objectives.		
References		Marine Scotland 2015b. Scotland's National Marine Plan – A Single Framework for Managing Our Seas. The Scottish Government, Edinburgh 2015.		

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PI 2.5.2	There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function.
	Marine Scotland 2016. Pilot Pentland Firth and Orkney Waters Marine Spatial Plan. Prepared by the Pilot Pentland Firth and Orkney Waters Working Group. The Scottish Government, Edinburgh 2016. OSF Code of Practices for Crab Suppliers
OVERALL PERFORMANCE INDICATOR SCORE:	**80**
CONDITION NUMBER (if relevant):	**N/A**

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PI 2.5.3 – Ecosystem information

PI 2.5.3		There is adequate knowledge of the impacts of the UoA on the ecosystem.		
Scoring Issue		SG 60	SG 80	SG 100
a	Information quality			
	Guidepost	Information is adequate to **identify** the key elements of the ecosystem.	Information is adequate to **broadly understand** the key elements of the ecosystem.	
	Met?	Y	Y	
	Justification	Information is adequate to identify and broadly understand the key elements of the ecosystem. There is considerable information available with regards to key biotic and abiotic elements of the Celtic Seas EcoRegion, the North Sea and Orkney Islands inshore waters. There is a substantial programme of environmental monitoring undertaken by a range of organisations in Orkney. The EMEC carries out monitoring of sea surface temperature (SST), OSF monitors bottom temperatures and Orkney Marine Services monitors SST, water quality, the marine intertidal and non-native species. Marine Scotland Science monitor environmental parameters including salinity and sea surface temperature through their Scottish Coastal Observatory Programme including at Scapa Pier in Orkney. ICES (2016b) and Baxter et al (2011) provides detailed information and description of the biotic aspect including plankton, fish communities, benthic communities, marine mammals, birds.		
b	Investigation of UoA impacts			
	Guidepost	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, but **have not been investigated** in detail.	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and **some have been investigated in detail**.	Main interactions between the UoA and these ecosystem elements can be inferred from existing information, and **have been investigated in detail**.
	Met?	Y	Y	N
	Justification	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and some have been investigated in detail. Serious or irreversible harm to ecosystem structure and function as would be indicated by trophic cascade, depletion of top predators, severely truncated size structure of target species and non-target species, changes in species biodiversity has not been observed. However it cannot conclude that the main interactions between the UoA and these ecosystem elements have been investigated in details, preventing the fishery from meeting SG100.		
c	Understanding of component functions			
	Guidepost		The main functions of the components (i.e., P1 target species, primary, secondary and ETP species and Habitats) in the ecosystem are **known**.	The impacts of the UoA on P1 target species, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are **understood**.
	Met?		Y	Y
	Justification	The impacts of the UoA on P1 target species, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are known and understood.		

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PI 2.5.3		There is adequate knowledge of the impacts of the UoA on the ecosystem.		
		Information is available to understand the main functions of brown crab, species used as bait, velvet crab, lobster and habitats. Information on brown crab and non-target species catch, on interaction with ETP species and on the spatial extent of interaction with habitats is available.		
d	Information relevance			
	Guidepost		Adequate information is available on the impacts of the UoA on these components to allow some of the main consequences for the ecosystem to be inferred.	Adequate information is available on the impacts of the UoA on the components **and elements** to allow the main consequences for the ecosystem to be inferred.
	Met?		Y	N
	Justification	Adequate information is available on the impacts of the UoA on these components to allow some of the main consequences for the ecosystem to be inferred. Information on brown crab and non-target species catch, on interaction with ETP species and on the spatial extent of interaction with habitats is available. The brown crab catch data are available, quantity of bait used is available by species, non-target species catch is recorded through the observer and lobbook programmes, studies investigates the interaction of the brown crab creel fishery with ETP species and the spatial extend of the interaction with habitats has also been investigated by the succorfish programme. SG 100 is no tmet since there is no information on impacts on all elements of the ecosystem.		
e	Monitoring			
	Guidepost		Adequate data continue to be collected to detect any increase in risk level.	Information is adequate to support the development of strategies to manage ecosystem impacts.
	Met?		Y	Y
	Justification	Adequate data continue to be collected and Information is adequate to support the development of strategies to manage ecosystem impacts. Information and data are routinely collected and include catches of target and non-target species, spatial distribution of fishing effort, observer prohramme.		
References		Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors), 2011. Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh. pp. 191. Coleman, M.T. and Rodrigues, E. 2017a. Orkney Shellfish Research Project: Orkney brown crab (*Cancer pagurus*) tagging project. Orkney Sustainable Fisheries Ltd. Report no. 19, 21 pp. Coleman M.T. and Rodrigues E., 2017c. Succorfish Report. Orkney Shellfish Research Project. Orkney Sustainable Fisheries Ltd. No 20, pp 18. Coleman M.T. and Rodrigues E., 2017b. Logbook and Observer Report: Orkney Shellfish Research Project. Orkney Sustainable Fisheries Ltd. No 21, pp 25. ICES 2016b. Celtic Seas Ecoregion – Ecosystem overview. ICES Ecosystem Overviews. Published 04 March 2016, version 2, 13 May 2016.		

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PI 2.5.3	There is adequate knowledge of the impacts of the UoA on the ecosystem.
	Marine Scotland Science 2017. Fish and Shellfish Stocks. Published by the Scottish Government, May 2017. Ryan C., R. Leaper, P. G. H. Evans, K. Dyke, K. P. Robinson, G. N. Haskins, S. Calderan, N. van Geel, O. Harries, K. Froud, A. Brownlow and A. Jack, 2016. Entanglement: an emerging threat to humpback whales in Scottish waters. International Whaling Commission, SC/66b/HIM/01. 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.
OVERALL PERFORMANCE INDICATOR SCORE:	**90**
CONDITION NUMBER (if relevant):	**N/A**

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8.1.1.3 Principle 3 – Effective Management – Evaluation Tables

PI 3.1.1 – Legal and/or customary framework

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainability in the UoA(s); 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	Compatibility of laws or standards with effective management			
	Guidepost	There is an effective national legal system **and a framework for cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and **organised and effective cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and **binding procedures governing cooperation with other parties** which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	Y	Y	Y
	Justification	Scotland, as part of the EU and UK, has a well-established and effective legal framework for the management of fisheries. The main UK enabling legislation is the Sea Fish (Conservation) Act 1992 and more recently the Scotland Act 1998 sets out the powers devolved from UK Government in London, to the Scottish Government in Edinburgh. The 2010 Marine (Scotland) Act is an Act of the Scottish Parliament which provides a framework which is intended to balance competing demands on Scotland's seas. The Scottish Government has powers to take non-discriminatory fishery conservation measures within 12 nm. 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 Order, to manage inshore fisheries out to 6 nautical miles, under the terms of the Sea Fisheries (Shellfish) Act 1967. Implementation of this framework is via an established hierarchical structure of management bodies, including DG Mare, Defra (the UK Managing Authority), Marine Scotland and OSF, the Inshore Fisheries Group for the Orkney Islands. Therefore, there is an effective national legal system and **binding procedures governing cooperation with other parties** which delivers management outcomes consistent with MSC Principles 1 and 2 and **SG 100 is met.**		
b	Resolution of disputes			
	Guidepost	The management system incorporates or is subject by law to a **mechanism** for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a **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 UoA.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes that is appropriate to the context of the fishery and has been **tested and proven to be effective**.
	Met?	Y	Y	Y
	Justification	Given the largely inshore nature of the fisheries, and the fact that it is effectively managed by the IFG with the guidance and support of Marine Scotland. The management		

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PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainability in the UoA(s); 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.**		
		system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective. This is evidenced in the planning system on the Scottish mainland and in Shetland that has a proven decision-making and appeals process. The management system or fishery acts proactively to avoid legal disputes or rapidly implements binding judicial decisions arising from legal challenges. Management bodies do this through encouraging preapplication consultation and providing guidance. Therefore, the management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective and SG 100 is met.		
c	Respect for rights			
	Guidepost	The management system has a mechanism to **generally respect** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **observe** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **formally commit** to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	Y	Y	N
	Justification	Although fishing is an important economic activity in the Orkney Islands, there are no groups of people who are, by custom, dependent upon food for living or livelihoods in the Orkney Islands. Fishers and other related stakeholders in the Orkney Islands have a number of established rights under both UK and EU law, with no limitations in terms of resource access, and there is a comprehensive level of labour and other human rights. The vessel licensing system fully commits to the legal and customary rights of existing participants in the fishery. Licensed vessels, which incorporates all participants with a track record of commercial participation, have full access to the fishery. Access rights are preserved by transference of entitlements within fishery sectors and is lost only through non-use. The respect of legal rights for people depended on fishing for livelihood is also highlighted in Scotland's National Marine Plan (2014), which includes a policy statement that the "cultural and economic importance of fishing, in particular to vulnerable coastal communities" should be taken into account when deciding on uses of the marine environment and the potential impact on fishing. The management system therefore has a mechanism to observe the legal rights of people dependent on the fishery for food or livelihood and SG80 is met. The management system does not formally commit to their legal rights; hence SG100 is not met.		
References		Marine (Scotland) Act 2010 http://www.legislation.gov.uk/asp/2010/5/introduction National Marine Plan (2014)		
OVERALL PERFORMANCE INDICATOR SCORE:				**95**

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PI 3.1.1	**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainability in the UoA(s); 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.**
CONDITION NUMBER (if relevant):	**N/A**

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PI 3.1.2 – Consultation, roles and responsibilities

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	Roles and responsibilities			
	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	The roles and responsibilities for management are well understood for all areas relevant to this fishery. The Scottish Government established a network of regional Inshore Fisheries Groups (IFGs) following a pilot in 2009. In 2013 Orkney Sustainable Fisheries was recognised as the IFG for Orkney. At *local level*, OSF therefore has a non-statutory management role for waters out to 6 nm, which it implements in close consultation with the other three local fishers stakeholder organisations, and this is clearly laid out in the Orkney Inshore Fisheries Management Plan (Jan. 2017), a document approved by the OSF Board (which include creel fishermen, other fishers and processors) and reviewed by Marine Scotland to ensure it is coherent with the higher level objectives in the 2015 Inshore Fisheries Strategy. Marine Scotland Compliance is also represented locally by two full-time fisheries officers who are based in an office in Kirkwall. At a *national level* Marine Scotland is responsible for stock and marine ecosystem management (mainly via MS Science in Aberdeen), MCS (via MS Compliance) and wider fisheries management and governance (via MS Planning and Policy). Marine Scotland is the Scottish Government's directorate responsible for the integrated management of Scotland's seas, as laid out in the Marine (Scotland) Act 2010. Scottish Natural Heritage (SNH) is the Scottish public body responsible for the country's natural heritage, especially its natural, genetic and scenic diversity, and is thus responsible for licensing activities rated to ETP species. The statutory organisations mentioned above have clear mandates, in most case based upon law, and the majority of non-statutory organizations are either resulting from EU law (e.g. the POs) or from directives from the Scottish Government, with clear stated roles in fisheries management. Therefore, Organizations 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 and SG 100 is met.		
b	Consultation processes			
	Guidepost	The management system includes consultation processes that **obtain relevant information** from the main affected parties, including local knowledge,	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The

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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**		
		to inform the management system.	management system demonstrates consideration of the information obtained.	management system demonstrates consideration of the information and **explains how it is used or not used**.
	Met?	Y	Y	N
	Justification	Following a series of devolution steps, fisheries management, especially for a predominantly coastal (e.g. < 6 nm) fishing activity such as brown crab is now largely, but not exclusively, managed at local level. The creation of the non-statutory IFGs in particular has seen the management role passed to local bodies such as OFC who, in close consultation with Marine Scotland, have developed their own inshore fisheries management plan. This plan, and it subsequent updates (it is considered a 'living' document) is developed internally but with regular consultation with other local stakeholder groups and is externally reviewed by Marine Scotland to ensure it is compliant with the high level objectives of the 2015 Inshore Fisheries Strategy. The OSF Board – which is composed of a wide range of representatives from the catching and processing sub-sectors in the Orkney Islands, meets quarterly to discuss the progress of scientific research, the status of Orcadian fisheries and their management, and any issues arising therefrom. The three Marine Scotland operational divisions are invited, with MS Science regularly attending, with the others attending as necessary. The minutes of these meetings are recorded and available upon request. Outside of OSF, the other two bodies (the Orkney Fisheries Society and the Orkney Fishermen's Association) meet regularly, and liaise with OSF (as the IFG) regularly (SG 80 is therefore met). These mechanisms have improved engagement by the governing bodies with the industry, but the management system does not explicitly demonstrate consideration of the information and explains how it is used or not used (SG 100 not met).		
c	Participation			
	Guidepost		The consultation process **provides opportunity** for all interested and affected parties to be involved.	The consultation process provides **opportunity and encouragement** for all interested and affected parties to be involved, and **facilitates** their effective engagement.
	Met?		Y	Y
	Justification	The consultation process includes public consultation on key development decisions and on policy development by the Scottish Government. This provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement (SG 100 is met).		
References		Marine Scotland (2015). Scottish Inshore Fisheries Strategy 2015. 4 pp. OSF (2017). Orkney Inshore Fisheries Management Plan'. 14 pp.		
OVERALL PERFORMANCE INDICATOR SCORE:				**95**
CONDITION NUMBER (if relevant):				**N/A**

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PI 3.1.3 – Long term objectives

PI 3.1.3		The management policy has clear long-term objectives to guide decision-making that are consistent with MSC fisheries standard, and incorporates the precautionary approach.		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guidepost	Long-term objectives to guide decision-making, consistent with the MSC fisheries standard and the precautionary approach, are **implicit** within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach are **explicit** within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach, are **explicit** within **and required by** management policy.
	Met?	Y	Y	Y
	Justification	Clear long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach, are explicit within and required by management policy. The EU is legally obliged to maintain or restore fish stocks at sustainable levels (Maximum Sustainable Yield; MSY), and adhere to good environmental management practices that follow the precautionary principle as enshrined in Union law. The precautionary principle is a binding principle of European Union law and must be applied to EU policies during their formulation and when they are implemented. The precautionary principle was also included in the establishment of the CFP and the Council's General Approach for the CFP reform. At Scottish policy level, long-term objectives are embedded into the Scottish Inshore Fisheries Strategy, 2015, in particular Outcome 4. This covers both stocks (P1), habitats and ETP species (P2). It should be noted that the ICES MSY framework – where ICES advises on the preferred level of fishing mortality – incorporate the precautionary approach (ICES adopted the Precautionary Approach in 1998). The Scottish Marine Plan (2015) explicitly states that "Where evidence is inconclusive and impacts of development or use on marine resources are uncertain, reasonable efforts should be made to fill evidence gaps and decision makers should apply precaution within an overall risk-based approach" and High Level Marine Objective 21 is that "The precautionary principle is applied consistently in accordance with the UK Government and Devolved Administrations' sustainable development policy".		
References		Marine Scotland (2015). Scotland's National Marine Plan - A Single Framework for Managing Our Seas. 144 pp Marine Scotland (2015). Scottish Inshore Fisheries Strategy 2015. 4 pp.		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				**N/A**

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PI 3.2.1 Fishery-specific objectives

PI 3.2.1		The fishery-specific management system 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	Objectives			
	Guidepost	**Objectives**, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **implicit** within the fishery-specific 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-specific 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-specific management system.
	Y	Y	P	N
	Justification	The Orkney Inshore Fisheries Management Plan is the *de facto* fisheries management plan for brown crab. Whilst it is not limited only for brown crab, it recognises that brown crab represents 74% by volume and 51% by value of Orkney's inshore fisheries landings and this fishery is the main focus of the plan. A specific section of the FMP devoted to the creel fishery is being developed, but is still in draft. The management plan has a number of specific objectives for inshore fisheries in Orkney, but these are not disaggregated into short and long-term timelines, but can be considered as long-term in nature, thus partially meeting SG 80. There are short-term objectives as part of OSF's Research Objectives / Strategy 2017 – 2020, focusing mainly on P2 issues, but these are not explicit within the fisheries management plan. Therefore SG 80 is not fully met.		
References		Marine Scotland (2015). Scottish Inshore Fisheries Strategy 2015. 4 pp. OSF (2017). Research Objectives / Strategy 2017 – 2020.		
OVERALL PERFORMANCE INDICATOR SCORE:				**70**
CONDITION NUMBER (if relevant):				**4**

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PI 3.2.2 – Decision-making processes

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.		
Scoring Issue		SG 60	SG 80	SG 100
a	Decision-making processes			
	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	There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives. The 'Orkney Inshore Fisheries Management Plan' is a live document, which is periodically updated to reflect new research information and resultant management decisions. Last revised in January 2017, its next revision is likely to be when the proposed Inshore Fisheries Bill is passed, probably sometime in 2018. According to the 2017 version of the plan, it is the intention to internally review the plan on an annual basis, with any changes requiring approval by the OSF Board. Decision-making in this fishery is mainly based around the quarterly IFG board meetings, which are usually linked to internal meetings and feedback from research (i.e. from ICIT), as well as other meetings with the Orkney Fisheries Association and the Orkney Fishermen's Society. These meetings allow issues to be raised, and decisions made on all aspects of the fishery relevant to the local level. Marine Scotland is invited to participate at these quarterly IFG meetings and one or more of it three operational divisions usually participate. All IFG meetings are minuted and are available on their website. The consistent quarterly board meetings at the IFG (OSF), as well as the regularly reviewed Orkney Inshore Fisheries Management Plan are evidence that decision-making takes place on a regular basis and that the results are embedded into the fisheries planning process and therefore meets SG 80.		
b	Responsiveness of decision-making processes			
	Guidepost	Decision-making processes respond to **serious issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to **serious and other important issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to **all issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	Y	Y	N
	Justification	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.		

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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.**		
		Local decision-making is largely based around the quarterly meetings of the IFG (OSF). At these meetings issues associated with the fishery are raised, including Orkney-based research (mainly via the ICIT), as well as any wider national research relevant to the fishery produced by Marine Science (who are invitees to these meetings). In addition there are regular meetings with Marine Scotland in Edinburgh and Aberdeen to discuss policy / management / control and science issues respectively. The industry is also strongly linked to the management system, both through the IFG as well as other representative mechanisms such as the Scottish Fishermen's Federation (of which the Orkney Fisheries Association is a member). Marine Scotland Compliance is also represented locally and engage with this fisheries management, albeit mainly via Edinburgh. The results of this decision-making is adopted in various ways, including via (i) OSF Board Meeting minutes (which are published on the OSF website[12]), (ii) updates to the Orkney Inshore Fisheries Management Plan (usually done annually or after any significant change in management approach is agreed) which is published online and (iii) via Marine Scotland in terms of changes to legislation and the wider fisheries management regime. Between them they cover all serious and other important issues, resulting in a largely inclusive and transparent approach. However, it cannot be said that it definitively addresses all issues so fails to reach the SG 100.		
c	Use of precautionary approach			
	Guidepost		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		Y	
	Justification	Decision-making processes use the precautionary approach and are based on best available information. As a Scottish fishery, its management must meet High Level Marine Objective 21 is that "The precautionary principle is applied consistently in accordance with the UK Government and Devolved Administrations' sustainable development policy" . Over the last few years, due to OSF's partnership with Heriot Watt University's International Centre for Island Technology (ICIT) campus in Stromness, decision-making is strongly science-driven. As with all Scottish fish stocks, there is an annual stock assessment updated by Marine Scotland Science, which utilises ICIT / OSF inputs for this fishery. In general, these decisions are precautionary in nature. Examples include the use of 0.25 for natural mortality (M) (most crustacean assessments use 0.1), and the key management tool, minimum landing-size, is 140 mm (is well below size age maturity ogives) and is being voluntarily increased to 150 mm. This meets SG 80.		
d	Accountability and transparency of management system and decision-making process			
	Guidepost	Some information on the fishery's performance and management action is	**Information on the fishery's performance and management action is available on request**, and	Formal reporting to all interested stakeholders **provides comprehensive information on the**

[12] http://www.orkneysustainablefisheries.co.uk/?page_id=752

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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.**		
		generally available on request to stakeholders.	explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	**fishery's 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	Information on the fishery's 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. OSF has a public website that includes a research section that provides the status of various species-specific research projects, including brown crab. As OFC have an open information policy, any research report or other IFG outputs would be made available on request, if not already on the website. OFC does not make its financial records available, although the annual accounts would be freely available through Companies House. Whilst there is no formalised set of explanations on decision-making, OFC Board Meeting Minutes, which are published online, will usually provide some degree of transparency on how decisions are arrived at. If not, further explanation can be requested from OSF and any non-confidential information willingly provided. Marine Scotland also has a number of online resources and publications relevant to this fishery, including stock , catch and other information. The brown crab fishery in general, including the Orkney creel fishery assessment area, undergoes an annual stock assessment, which is published online and includes a description of the assessment, the current state of the stocks and a brief summary of the current management advice. This advice is developed by MS Science and the results sent to MS Planning and Policy, with a high level summary provided to the IFGs, who are able to comment if necessary. In addition, the fishery participates in the ICES 'Working Group on the Biology and Life History of Crabs' (WG Crab), thus providing a scientific linkage (inc. stock models and management refence points) with wider European brown crab stock management. In summary, considerable amount of information is published on the internet (e.g. the annual stock assessment and OSF's board decisions) or available upon request, and thus meets SG 80. However, there is no formal, regular and comprehensive review of management decision-making in this fishery, so fails to meet SG 100.		
e	Approach to disputes			
	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	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.

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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.**		
		same law or regulation necessary for the sustainability for the fishery.		
	Met?	Y	Y	Y
	Justification	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges. The UK Government's Sea Fish (Conservation) Act 1992 forms the basis for the implementation of the EU Common Fisheries Policy (2371/2002). The act establishes licensing, MCS and penalty procedures and also includes appeal procedures. The legal framework is clear and unambiguous. Outside of the main fisheries legislation, there is full and transparent right of appeal via the normal national judicial route, and even EU law. Although in the context of the Orkney fishery this has rarely been tested (simply because there has been no requirement, see next), the legal apparatus has been tested and proven effective in many other fisheries (including non-shellfish fisheries in other parts of Scotland). According to Marine Scotland Planning and Policy, no legal challenges have been made against this fishery's management system to date. This is likely due to the simple scale of the fishery (e.g. a single static gear type operating only from Orkney and relatively small in scale), but is also likely to be a consequence of a local management system that, in coordination with the authorities at national level, is generally proactive in ensuring stakeholder participation and agreement in developing harvest control rules and embedding them in a practical legislative framework. For example, the minimum carapace width of 150 mm proposed for adoption at national level has already been in place locally on a voluntary basis. This approach means that legal challenges can usually be pre-empted. SG 100 is therefore achieved.		
References		Marine Scotland (2015). Scotland's National Marine Plan - A Single Framework for Managing Our Seas. 144 pp. See http://www.gov.scot/Resource/0047/00475466.pdf OSF website (http://www.orkneysustainablefisheries.co.uk/?page_id=752) Jim Watson, Marine Scotland, pers. comm., 5 September 2017		
OVERALL PERFORMANCE INDICATOR SCORE:				**85**
CONDITION NUMBER (if relevant):				**N/A**

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PI 3.2.3 – Compliance and enforcement

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.		
Scoring Issue		SG 60	SG 80	SG 100
a	MCS implementation			
	Guidepost	Monitoring, control and surveillance **mechanisms** exist, and are implemented in the fishery and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance **system** has been implemented in the fishery 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 and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	Y	Y	N
	Justification	A monitoring, control and surveillance system has been implemented in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules. Marine Scotland Compliance is responsible for enforcing fisheries within fisheries waters. Based in Edinburgh, the Fisheries Monitoring Centre has a number of sea, air and other assets at its disposal nationally. There are two fisheries officers based full-time in the Orkney Islands, with a main office in Kirkwall. Given the inshore, static nature of this fishery, most enforcement is land-based, involving inspections of landings as they come ashore on the pier in Stromness or elsewhere on the Orkney islands. If required, MS Compliance can contract in rigid inflatable boat (RIB) patrols for specific operations, which are carried out about twice a year in Orcadian waters. All inspections are recorded on the MS Compliance MCS database, providing location and results of inspections. If potential infractions are detected, then the details are recorded, with location, samples and photographic and other evidence retained. There is no annual plan for MCS in Orkney, but instead a two week rolling risk assessment is used. The Orkney fisheries officers assess local compliance risks, and forward their risk assessment to the regional office in Ullapool, and then onto Edinburgh. There is a conference call every Friday to discuss emerging risks, and responses, if any. The high levels of compliance (from the 1,259 sea and land inspections over 2013 – 2016, no cases have been brought and only one formal warning) suggest that the MCS system has demonstrated an ability to enforce relevant management measures, strategies and/or rules and thus achieved SG 80. Although the system is appropriate for the size and nature of the fishery, due to the limited sea time available, it cannot be said with certainty that this is a comprehensive system, and therefore it fails to achieve SG 100.		
b	Sanctions			
	Guidepost	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, **are consistently applied** and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and **demonstrably** provide effective deterrence.
	Met?	Y	Y	Y
	Justification	Sanctions to deal with non-compliance exist, are consistently applied and demonstrably provide effective deterrence.		

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PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.		
		Sanctions exist for non-compliance e.g. non- or mis-reporting, or landing under-size catch, but to date have never had to be imposed in this fishery. This, coupled with the high level of inspections, demonstrates that the sanctions are effective. This also supports the premise that this is a highly compliant fishery. This therefore reaches SG 100.		
c	Compliance			
	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
	Justification	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. The regulations for this fishery are fairly simple and are based around the minimum carapace width of ≥140 mm (although locally 150 mm is practised and enforced by the buyers). There is no statutory restriction on landing of berried female crabs, but they are by universal custom returned to the sea (and excluded in a local Code of Practice). There are no regulations on creel mesh size, but escapement of undersized brown crabs is enhanced by the use of 60 mm mesh on the creels and escape gaps are widely used. Compliance with technical measures is considered to be very high, with only 19 advisories issued by MS Compliance for landing under-size crabs over the past four years. There is a high degree of cooperation between the industry, local researchers (e.g. via ICIT) and the local MS Compliance officers. The latter two groups regularly observe landings and visit the main crab processing factories, providing important information for the effective management of the fishery. Combined with the very low level of non-compliance detected, this suggests that SG 100 is achieved.		
d	Systematic non-compliance			
	Guidepost		There is no evidence of systematic non-compliance.	
	Met?		Y	
	Justification	There is no evidence of systematic non-compliance. Compliance levels in this fishery are considered by MS Compliance to be very high. From the 1,259 sea and land inspections over 2013 – 2016, no cases have been brought and only one formal warning (for a buyer who did not wish to report his purchases). Most advisories (19 over the last 4 years) have been for small quantities being recorded as landed under-size. This suggests that levels of non-compliance (e.g. for the MLS rule) are low, and a combination of regular landings inspections, strict rules for not buying under-size crab and a voluntary MLS of 10 mm above the legal minimum suggests there is no systematic non-compliance in this fishery and thus reaches the SG 80.		
References		Data and information provided by Marine Scotland Compliance		

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PI 3.2.3	Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.
OVERALL PERFORMANCE INDICATOR SCORE:	95
CONDITION NUMBER (if relevant):	N/A

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PI 3.2.4 – Monitoring and management performance evaluation

PI 3.2.4		**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	Evaluation coverage			
	Guidepost	There are mechanisms in place to evaluate **some** parts of the fishery-specific management system.	There are mechanisms in place to evaluate **key** parts of the fishery-specific management system	There are mechanisms in place to evaluate **all** parts of the fishery-specific management system.
	Met?	Y	Y	N
	Justification	There are mechanisms in place to evaluate key parts of the fishery-specific management system. The stock status and management regime is formally reviewed annually by MS Science and their results published by Marine Scotland. Whilst this is not a detailed audit it is sufficient to assess whether the management regime is broadly fit for purpose. In addition, the IFG's Orkney Inshore Fisheries Management Plan is a live document, which is periodically updated to reflect new research information and resultant management decisions. Whilst not specific to this fishery, it is wide-ranging coving the key fisheries of Orkney (including the brown crab fishery), environmental issues and in line with its marine spatial planning remit, with other maritime activities relent to these waters. It also covered local shellfish research, as well as management measures, and thus is reasonably comprehensive. Last revised in January 2017, its next revision is likely to be when the proposed Inshore Fisheries Bill is passed, probably sometime in 2018. A combination of the quarterly OSF board meetings (which includes invited representatives from local scientific research and Marine Scotland), feedback from these meetings into updating the Inshore FMP, higher level stock assessment and performance evaluation on behalf of Marine Scotland, suggests that the key parts of the fishery-specific management system are being met and thus this meets SG 80. However there is no comprehensive regular review of all parts of the fishery-specific management system and thus this fails to meet SG 100.		
b	Internal and/or external review			
	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 fishery-specific management system is subject to regular internal and occasional external review. According to the January 2017 version of the Orkney Inshore Fisheries Management Plan (FMP), it is the intention to internally review the plan on an annual basis, with any changes requiring approval by the OSF Board. In addition, elements of the FMP may be reviewed at the quarterly board meetings. These periodic changes to the FMP are also scrutinised by Marine Scotland and other statutory bodies, thus constituting an occasional external review. This therefore meets SG 80. According to the same FMP, an external audit is also required, and it is envisaged that a review panel comprising ICIT, Marine Scotland, two OSF Directors and a representative		

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PI 3.2.4		**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.**
		from the Orkney Islands Council would meet annually to review and evaluate the work of OSF for the previous 12 months and endorse plans for the year ahead. An annual report from such a review process will be a public document and available on the OSF website. As it is less than 12 months since this intention was declared, no such review has been undertaken to date. This therefore does not meet SG 100.
References		OSF (2017). Orkney Inshore Fisheries Management Plan'. 14 pp
OVERALL PERFORMANCE INDICATOR SCORE:		**80**
CONDITION NUMBER (if relevant):		**N/A**

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8.1.2. Appendix 1.2 Risk Based Framework (RBF) Outputs

RBF was used to score PI 1.1.1 Brown crab stock status and P1 2.2.1 Secondary Species Outcome. The justification of the use of the RBF is available on the MSC website:
https://fisheries.msc.org/en/fisheries/osf-orkney-brown-crab-creel-fishery/@@assessments

Initially, for secondary species, the use of the RBF was announced for velvet crab, European lobster and green crab. However, European lobster and green crab have been determined to be minor species. Other minor species were identified during the site visit for which RBF has not been used. Therefore, the assessment team opted to consider only velvet crab, the main secondary species, in the PSA analysis and the RBF outputs for lobster is not presented.

When scoring PI 1.1.1, both the Consequence Analysis (CA) and Productivity and Susceptibility Analysis (PSA) are used.
When scoring PI 2.2.1, the PSA alone is used.

8.1.2.1 Appendix 1.2.1 Consequence Analysis CA for Principle 1

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Table 16. Principle 1 CA Scoring Template - Target Species

PRINCIPLE ONE: Stock status outcome	Scoring element	Consequence subcomponents	Consequence Score
	Brown crab, Cancer pagurus	**Population size**	
		Reproductive capacity	
		Age/size/sex structure	80
		Geographic range	
Rationale for most vulnerable subcomponent	The workshop agreed that most of the population sub-components are closely related. Geographic range was considered to be the least vulnerable sub-component, because the Orkney stock comprises part of an extensive brown crab stock around the UK. Reproductive capacity was also considered to be a low vulnerability sub-component because recent studies on size of maturity in both Orkney, and more widely across other sites in the UK, showed that the size at 50% maturity in female brown crabs in Orkney was 97mm carapace width (CW) (Haig *et al*., 2016) which is significantly lower than the current (140mm CW), new (150mm CW) and operational (153mm CW) minimum landing size (MLS) in Orkney. It was concluded that the fishery is highly unlikely to be impacting reproductive capacity. The workshop considered that either the population size or age/size/structure could be considered as the most vulnerable sub-component. Whilst some attendees considered that population size was likely to be the most vulnerable sub-component and may be impacted by the fishery, there was no long time series of stock abundance data, but the short time series of LPUE data suggested no recent changes in abundance, and that the specific nature of the exploitation pattern in the brown crab fishery in which the fishery takes disproportionate numbers of different sexes from different geographical areas and is size selective, meant that **the age/size/sex structure** was the sub-component which was most likely to be vulnerable to exploitation.		
Rationale for consequence score	There may be some detectable changes in size structure due to exploitation, but the observed stability of average sizes of males and females indicated only minor detectable changes in size structure and hence it is likely that there is minimal impact on population dynamics and the fishery does not have an adverse effect on long-term recruitment dynamics. There is a small differential in average size average between males and females. Although the sex distribution of catches varies by area, the ratio of overall removal of males to females is around 1:1 and has changed little over the past 20 years. Whilst some possible changes have been detected, they are of such a low magnitude that there is overall minimal impact on population dynamics, so a consequence score of 80 is appropriate. Size structure is used as a key determinant of exploitation rate by Marine Scotland Science and whilst there has been no obvious trend in mean size of both males and females in recent years (see figures below), the estimate of fishing mortality from the most recent assessment by Marine Scotland Science is slightly higher than that estimated in the three previous assessments (Mesquita *et al*., 2017). It cannot be concluded therefore that there are “insignificant” changes in age / size / sex structure, so a consequence score of 100 is not met.		

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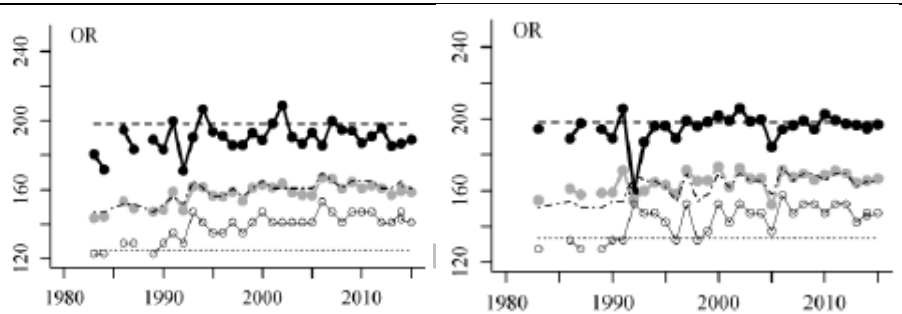

Brown crab mean size in landings (grey circles), mean size of the largest 5% of individuals (black circles) and length at first capture (open circles) in Orkney 1981-2015. Males, left and females, right. (Source: Mesquita *et al*., 2017)

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8.1.2.2 Appendix 1.2.2 Productivity-Susceptibility Analysis PSA

8.1.2.2.1. Principle 1 – Brown crab

PI number	1.1.1	
A. Productivity		
Scoring element (species)	**Brown crab, *Cancer pagurus***	
Attribute	**Rationale**	**Score**
Average age at maturity.	Growth rate varies between areas, and animals will typically reach 140 mm carapace width (CW) at four to six years old. The size at first maturity for female brown crabs in Orkney was estimated at 97 mm CW (Haig *et al*., 2016). However ageing using neurolipofuscin-based techniques (Sheehy and Prior, 2008) suggest that there is substantial variation of size at age, and so from a precautionary view, this attribute is scored as medium risk, (5-15 years).	**2**
Average maximum age	The brown crab is a long-lived large decapod crustacean. Crabs are thought to live for at least 15 years in Orkney, although in the western English Channel, Sheehy and Prior (2008) estimated a maximum age of around 9 years. A score of medium risk (10-25 years) is appropriate.	**2**
Fecundity	Females produce up to three million eggs (Bennett, 1995; Tallack, 2007).	**1**
Average maximum size	Not applicable	**n/a**
Average size at maturity	Not applicable	**n/a**
Reproductive strategy	Broadcast spawner. Fertilised eggs are carried for up to nine months over the winter, until they hatch (Thompson *et al*., 1995; Tallack, 2007).	**1**
Trophic level	Brown crabs mainly eat benthic invertebrates, particularly bivalves, small decapods and barnacles. Trophic level is approximately 3.	**2**
Density dependence	It is possible, but unlikely, that depensatory dynamics at low population sizes (Allee effects) will be observed. Medium risk.	**2**
B. Susceptibility		
Fishery only where the scoring element is scored cumulatively	Susceptibility scores are given for three different gear types in which *Cancer pagurus* may be caught: Creel fishery (target) Hobby fishing (target) Scallop dredger (bycatch)	
Attribute	**Rationale**	**Score**

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Areal Overlap	Creel fishery: most fishing for brown crabs takes place within 6 nm of the coast (Figure 7; Coleman and Rodrigues, 2017b). Although Figure 7 suggests that the fishery overlaps with only a small proportion of the crab stock, this is based upon data from vessels fitted with the Succourfish position-recording device, and RBF workshop attendees considered that these data may under-represent the distribution of fishing effort. The assessment team concluded that a precautionary medium risk score (10-30% overlap) was appropriate. Hobby fishing: <10% overlap, as there is minimal effort in the crab fishery through hobby fishers. Scallop dredger: <10% overlap, as there are only 2 active boats fishing part of the year in Orkney and therefore minimal overlap with the crab stock.	**2** **1** **1** **Combined: 2**
Encounterability	Creel fishery: this is a pot fishery using attractive bait, so the chance to encounter the brownt crab is high. Hobby fishing : High risk Scallop dredger: High risk	**3**
Selectivity of gear type	Creel fishery: a) The size at 50% maturity for brown crabs in Orkney was estimated at 92 mm CW for males and 97 mm CW for females (Haig *et al.*, 2016). The offshore component of the fishery has a low catch of juvenile crabs (<5%), but in the inshore component of the fishery there is a much higher likelihood of catching juvenile crabs. It was noted that with a creel full of mature crabs, juvenile animals are unlikely to enter. Evidence from the observer programme suggests that no more than 50% of creels will catch brown crabs of 90mm CW or below. Therefore individuals less than the size at maturity are regularly caught, and a medium risk score of 2 is allocated to this attribute. b) Brown crabs at half the size at maturity will be approximately 45-50mm CW. The mesh size of the creels allows brown crabs of around 70 mm CW to escape, so crabs at less than half the size at maturity can escape or avoid the gear and a medium risk score of 2 is allocated to this attribute. Hobby fishing: Same as commercial creel fishery.	**a) 2** **b) 2** **a) 2** **b) 2**

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	Scallop dredger: Brown crabs can escape scallop dredges as tow speeds are around 2.5 knots. Brown crabs are only rarely caught therefore in scallop dredges, and most captures are of larger crabs over 130mm CW. Individuals less than the size at maturity (92mm males; 97mm females) are rarely caught and can escape or avoid gear.	**a) 1** **b) 1** **Combined: 2**
Post capture mortality	Creel fishery: As *Cancer pagurus* is the target species, a default score of 3 is given. Evidence provided at the site visit demonstrated that survival of discarded undersized brown crab is very high, but all commercial-sized brown crabs are removed from the stock and therefore post capture mortality is high. Hobby fishing: As above. Scallop dredger: *Cancer pagurus* is not the target species in the scallop dredge fishery, but any bycatch is likely to be dead.	**3** **3** **3**
Catch (weight) only where the scoring element is scored cumulatively	MSC Certification Requirements v2.0 PF4.4.4 states that when there are fisheries other than the UoA which may impact on the stock (in this case a hobby fishery and bycatch in the scallop dredge fishery), then the fisheries should be weighted as described in Table PF6. Using Table PF6, the weighted values would be as follows: Creel fishery (70 – 100% of entire removals), so weighted 4. Hobby fishing (unknown catches, but likely to be minimal (<25%) and actually probably <0.1% of total). Weighted 1 Scallop dredger (unknown, but only 2 active vessels, part year, and low catchability and so catches are likely to be minimal (<25%) and actually probably <0.1%). Weighted 1 However, there is no quantitative information on the catches by hobby fishermen or as bycatch in the scallop fishery, and the catch by commercial creel fishermen is expected to be more than 99% of the total catch. In line with PF4.4.5.1, the assessment team took a precautionary approach and concluded that "the susceptibility score for the overall PSA should be based on the attributes of the gear with the highest susceptibility score". **The overall susceptibility score is therefore based on the score for the commercial creel fishery.**	

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8.1.2.2.2 Principle 2 - Secondary species

Velvet crab PSA Rational Table

PI number	2.2.1	
A. Productivity		
Scoring element (species)	**Velvet crab, *Necora puber***	
Attribute	**Rationale**	**Score**
Average age at maturity.	50% maturity for females of 43.8 mm CW, 50% maturity for male of 52.8 mm CW: approximately 1.5-2 years old Lee J. T., R. A. Coleman, M. B. Jones, 2006. Tallack, S. M. L. 2002. Tallack S. M.L., 2007.	**1**
Average maximum age	Natural mortality-derived estimates suggests longevity <10 years (Shetland data suggests that 95% of the population would live to 5.2 years). This is echoed by the general life history of this species.	**1**
Fecundity	Studies carried out in Orkney and Shetland estimated fecundity at between 5,000 and 278,000 eggs per female. Majority of mature females have >20,000 eggs. Hearn A. R. 2004. Lee J. T., R. A. Coleman, M. B. Jones, 2006. Tallack S. M.L., 2007.	**1**
Average maximum size	Not applicable	**n/a**
Average size at maturity	Not applicable	**n/a**
Reproductive strategy	Egg bearing females	**1**
Trophic level	Velvet crabs feed on both animal and algal material, with brown algae being the dominant item found in gut content analysis.	**2**
Density dependence	It is possible, but unlikely, that depensatory dynamics at low population sizes (Allee effects) will be observed. Medium risk.	**2**
A. Susceptibility		
Fishery only where the scoring element is scored cumulatively	Brown crab creel fishery, there are no other MSC fisheries certified impacting velvet crab stock.	
Attribute	**Rationale**	**Score**
Areal Overlap	Most fishing for brown crabs takes place within 6 nm of the coast. Figures below suggests that the fishery overlaps with only a small proportion of the velvet crab stock, and RBF workshop attendees considered that velvet crab are targeted differently, on different habitat and using different baits. This suggested an areal	**2**

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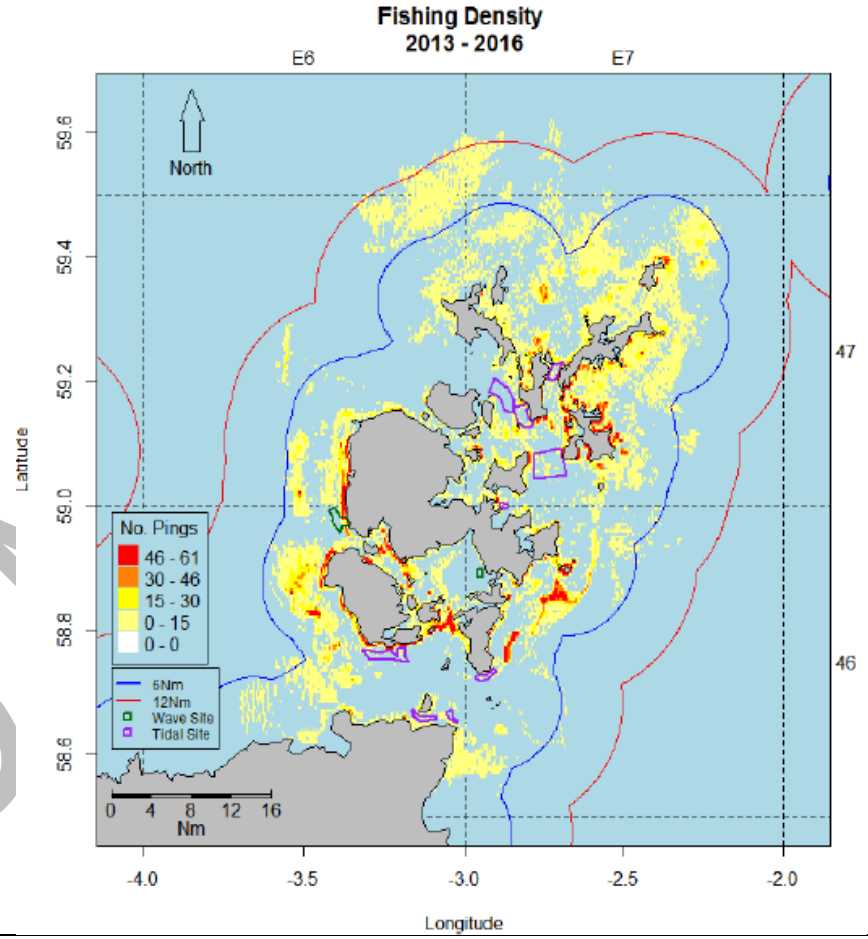
overlap less than 10%. However, based on the 2017 observer programme report, velvet crab makes up approximately 20% of total observed catch composition and catches are observed frequently most of the months from March to December except in April and December, suggested that the species is seeing between 30% and 65% of days spent on the fishing grounds. Therefore, the assessment team concluded that a precautionary medium risk score (10-30% overlap) was appropriate.



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	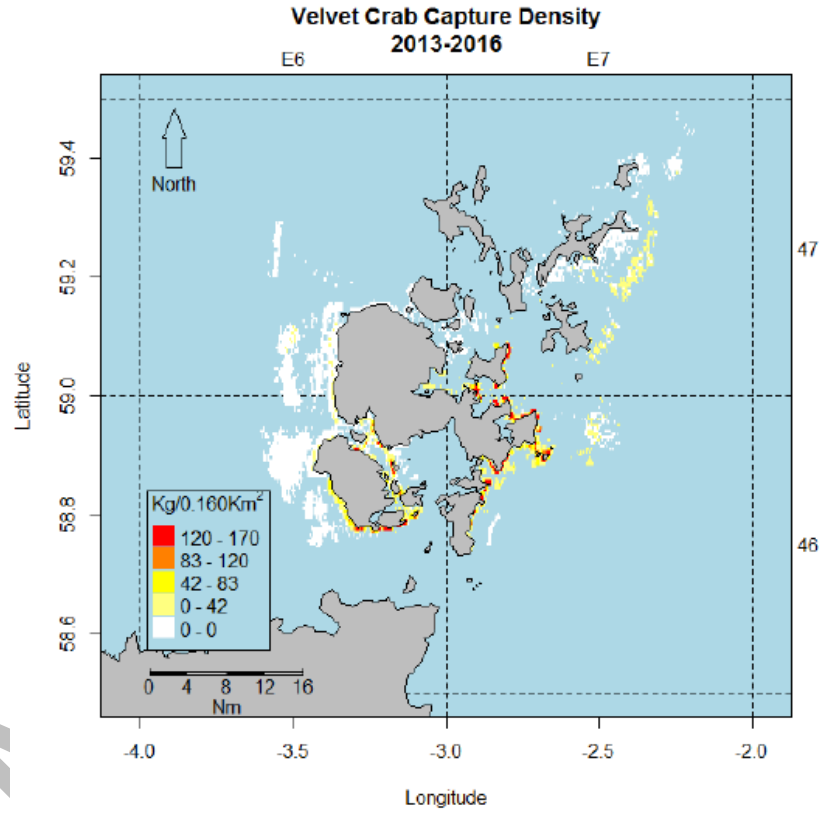	
Encounterability	This is a pot fishery using attractive bait, so the chance to encounter the velvet crab is high.	**3**
Selectivity of gear type	a) 50% maturity for females of 43.8 mm CW, 50% maturity for male of 52.8 mm CW. Based on the 2017 observer report, velvet crabs less than 50 mm are not caught (see figure below). Both males and females less than 55 mm are rarely caught, so a low risk score is allocated. b) Velvet crabs at size at maturity can escape or avoid the gear and a low risk score of 1 is allocated to this attribute.	**a) 1** **b) 1**

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	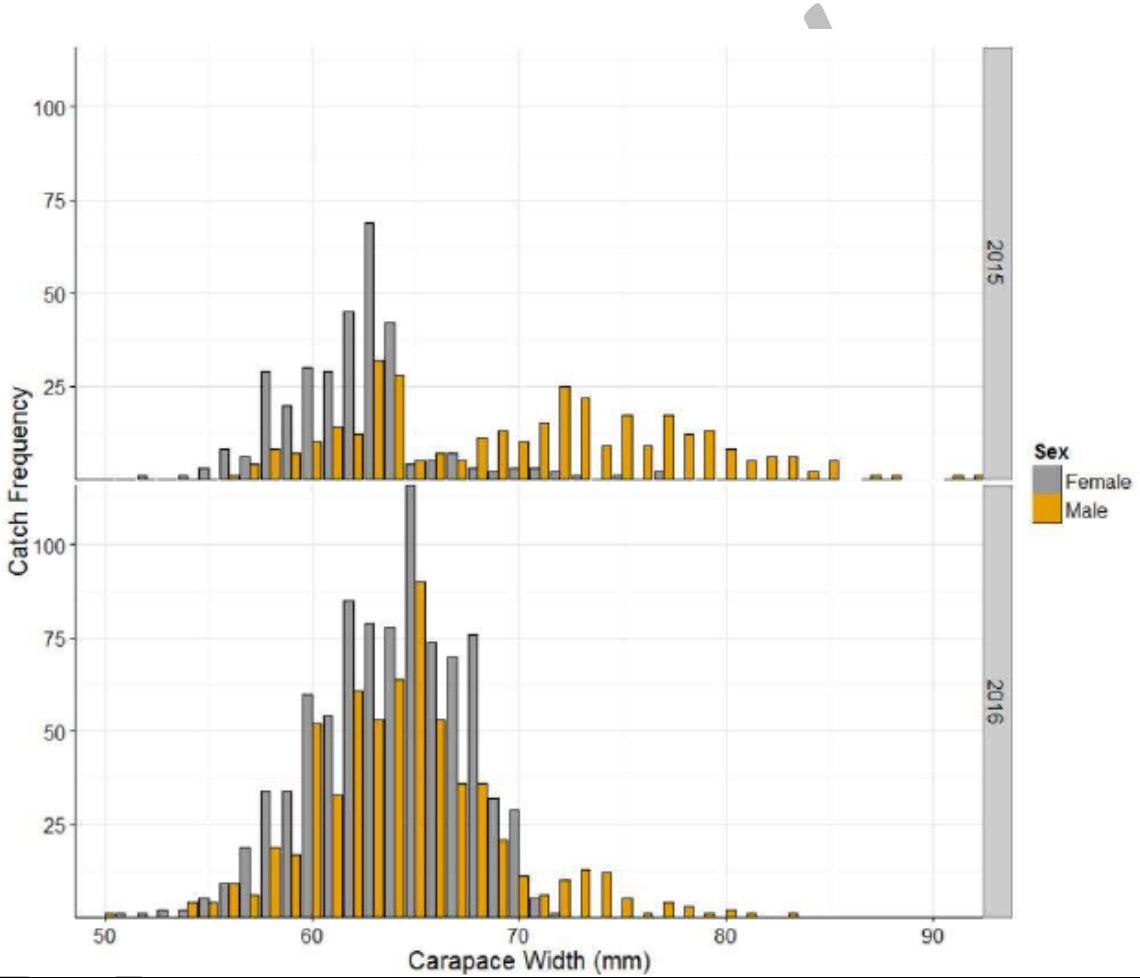	
Post capture mortality	Evidence provided at the site visit demonstrated that survival of discarded undersized velvet crab is very high, but all commercial-sized velvet crabs are removed from the stock and therefore post capture mortality is high.	**3**
Catch (weight) only where the scoring element is scored cumulatively	NA	**N/A**

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8.1.2.3 RBF Outcomes

8.1.2.3.1 Principle 1 – Broww crab

The CA score is 80 and the PSA score is 84. Table PF7 shows the rules for use of CA and PSA scores to determine the final overall score of PI 1.1.1. When CA score is 80 and PSA score is ≥80, the overall score awarded shall be at the midway point between CA and PSA, which is **82**.

							Productivity Scores [1-3]								Susceptibility Scores [1-3]						Cumulative only							
Scoring element	First of each scoring element	Family name	Scientific name	Common name	Species type	Fishery descriptor	Average age at maturity	Average max age	Fecundity	Average max size	Average size at Maturity	Reproductive strategy	Trophic level	Density Dependance	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	PSA Score	Catch (tons)	Weighting	Weighted Total	Weighted PSA Score	MSC PSA-derived score	Risk Category Name	MSC scoring guidepost	Consequence Score (CA)	Final MSC score (per scoring element)
1	First	Cangridae	Cancer pagurus	Brow n crab	Invertebrate	Creel	2	2	1	2	2	1	2	2	1.67	2	3	2	3	1.88	2.51			0.00		84	Low	≥80	80	82

8.1.2.3.2 Principle 2 – Secondary species

Velvet crab

The productivity and susceptibility attribute scores are 1.33 and 1.43, respectively. The PSA score is 1.95 which corresponds to a MSC PSA-derived score of 96.

Scoring element	First of each scoring element	Species Grouping only ID 'At Risk' species by selecting associated species group	Species Grouping only Number of species in species group w hich this species represents (N/2)	Family name	Scientific name	Common name	Species type	Fishery descriptor	Average age at maturity	Average max age	Fecundity	Average max size	Average size at Maturity	Reproductive strategy	Trophic level	Density Dependance	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	PSA Score	Catch (tons)	Weighting	Weighted Total	Weighted PSA Score	MSC PSA-derived score	Risk Category Name	MSC scoring guidepost
1	First			Portunidae	Necora puber	Velvet crab	Invertebrate	Baited creel	1	1	1			1	2	2	1.33	2	3	1	3	1.43	1.95					96	Low	≥80

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8.1.3. Appendix 1.3 Conditions

As per 7.21.2, where the CAB makes a decision not to award certification and fail the fishery, the report:

- 7.21.2.1 Shall not specify any mandatory conditions or defined actions that would need to be undertaken before the fishery could be reconsidered for certification in the future;
- 7.21.2.2 Shall outline draft and non-binding conditions for any PIs that score more than 60 and less than 80;
- Shall clearly specify that the conditions outlined are non-binding and serve to provide and indication of the actions that may be required should the fishery should have been certified.

Table 17 presents the non-binding and non-mandatory conditions for PIs with score more than 60 and less than 80 and drafted by the assessment team to provide an indication of the actions that the fishery may implement to address the issues identified.

Table 17. Non-binding conditions for the OSF Orkney brown crab creel fishery

Performance Indicator	**PI 1.2.1 Harvest Strategy – There is a robust and precautionary harvest strategy in place.** **80a** - the harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving stock management objectives reflected in PI 1.1.1 SG80. **80f –** There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.
Score	65
Rationale	80a A harvest strategy which includes a restrictive entry licensing scheme and a minimum landing size is expected to achieve the stock management objectives of maintaining catch rates of brown crabs at or above current levels and therefore SG60 is met. Whilst MSS undertake regular assessments of the status of the brown crab stock in Orkney, there is no formal annual process by which the stock assessments are translated into management advice to Marine Scotland in Edinburgh and hence potential management action. Stock assessment and research work undertaken locally by OSF and Heriot-Watt University will feed back to OSF as the IFG in Orkney. Whilst such scientific advice may trigger OSF to consider additional management measures, OSF has no formal legislative power, and therefore any new management measures proposed by OSF must be taken up and progressed by Marine Scotland. There is no clear mechanism in place to allow Marine Scotland to act quickly to introduce management measures if brown crab stock status in Orkney declined rapidly. Whilst there have been recent consultations on increasing the minimum landing size (which was implemented) and introducing limits on the number of creels (which was not implemented), it is not clear that the current harvest strategy is responsive to the state of the stock and therefore the SG80 is not met. 80f Whilst recent research in Orkney has demonstrated the effectiveness of escape gaps in reducing the catch and hence can minimise mortality of undersized crabs, the research has not yet been published and OSF report that escape gaps cannot currently be implemented as a mandatory technical measure, with such an action requiring public consultation and the resulting enforcement by Marine Scotland. Alternative measures to minimise mortality of unwanted catch of brown crab have not been implemented and so SG80 is not met.

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Condition	Evidence should be provided that the harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving stock management objectives reflected in PI 1.1.1 SG80. Evidence should also be provided that alternative measures to minimise UoA-related mortality of unwanted catch of the target stock are implemented as appropriate.
Performance Indicator	**PI 1.2.2 Harvest control rules & tools – Therea are weel defined and effective HCRs in place.** **80a -** Well defined HCRs are in place that ensure that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock fluctuating around a target level consistent with (or above) MSY.
Score	75
Rationale	There are no current limits on creel numbers and no TAC in place, the likelihood is that the MLS (the assumed HCR) will not be either increased or decreased in relation to changes in stock status primarily due to market considerations, and there is no well-defined mechanism in place to allow OSF or Marine Scotland to act quickly to introduce management measures in the Orkney brown crab fishery. t cannot be concluded therefore that there are well-defined HCRs that would ensure that exploitation rates would be reduced or that susceptibility would be reduced quickly in response to significant detrimental trends in stock indicators. Therefore, SG80 is not met.
Condition	Evidence should be provided that well defined HCRs are in place that ensure that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock fluctuating around a target level consistent with (or above) MSY.
Performance Indicator	**PI 2.2.2. Secondary species management strategy - There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.** **80e -** There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the main secondary species and they are implemented as appropriate.
Score	75
Rationale	Whilst recent research in Orkney has demonstrated the effectiveness of escape gaps in reducing the catch and hence can minimise mortality of undersized crabs, the research has not yet been published and OSF report that escape gaps cannot currently be implemented as a mandatory technical measure, with such an action requiring public consultation and the resulting enforcement by Marine Scotland. Although approximately 10% of fishermen equip creels with escapement vents on a voluntary basis, alternative measures to minimise mortality of unwanted catch velvet crab have not been implemented and so SG80 is not met.
Condition	Evidence should be provided that alternative measures to minimise UoA-related mortality of unwanted catch of main secondary species are implemented as appropriate.
Performance Indicator	**PI 3.2.1 Fishery-specific objectives – The fishery–specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.** **80a -** 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-specific management system.
Score	70
Rationale	The Orkney Inshore Fisheries Management Plan is the *de facto* fisheries management plan for brown crab. Whilst it is not limited only for brown crab, it recognises that brown crab represents 74% by volume and 51% by value of Orkney's inshore fisheries

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	landings and this fishery is the main focus of the plan. A specific section of the FMP devoted to the creel fishery is being developed, but is still in draft. The management plan has a number of specific objectives for inshore fisheries in Orkney, but these are not disaggregated into short and long-term timelines, but can be considered as long-term in nature, thus partially meeting SG 80. There are short-term objectives as part of OSF's Research Objectives / Strategy 2017 – 2020, focusing mainly on P2 issues, but these are not explicit within the fisheries management plan. Therefore SG 80 is not fully met.
Condition	Evidence should be provided that 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-specific management system.

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8.2. Appendix 2 Marine Scotland FISH1 Form and OSF voluntary logbook sheet

Marine Scotland FISH1 Form

FSF1-2015.02 Rev 3

MARINE SCOTLAND COMPLIANCE
Fishery Office:

The Scottish Government
Riaghaltas na h-Alba

ALL SPECIES 10M AND UNDER WEEKLY LANDING DECLARATION FORM

Email:

PLN

Vessel Name

Port of Departure: Please select

Owner/Master

Signed

Port of Landing: Please select

Address

Total Pots Fishing (1)

Fishing Activity Date (2)	Lat/Long (3)	Stat Rect / ICES Area (3)	Gear (4)	Mesh Size (4)	Species (5)	State (6)	Present-ation (7)	Weight (8)	DIS (9)	BMS (10)	Number of Pots Hauled (11)	Landing or Discard Date (12)	Transporter Reg, Not Transported or Landed to Keeps (13)
									☐	☐			
									☐	☐			
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Comments and Buyers Information (14)	

All relevant fields/entries are mandatory and **must** be entered by the signatory

Email to Marine Scotland

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Example of logbook sheet for the OSF voluntary logbook scheme (Source: Client)

Orkney Sustainable Fisheries Ltd

Vessel Name: ..... Target Species: .....

Species Key:
BC – Brown Crab
EL – European Lobster
VC – Velvet Crab
GC – Green Crab

Example Sheet

Date	Total Pots Lifted	Soak time (days)	Species	Weight Landed (Kg)	Percentage Undersize in Numbers (0 - 100%)	Percentage Discarded in Numbers (0 - 100%)	By-catch	Other Comments
01/04/15	250	2	BC	200	30	3	4x dogfish 2x Wrasse	Lots of White Crab
			EL	10	2	0		
			VC	100	3	1		
			GC	50	1	25		
02/04/15	250	2	BC	250	25	14	2x Conger 1x Cod 1x Octopus	3 creels broken
			EL	6	2	1		
			VC	150	4	4		
			GC	25	1	0		
03/04/15	300	3	BC	300	25	25	3x Rockling 3x Ling	1 string (25 creels) lost
			EL	9	0	0		
			VC	200	4	12		
			GC					
			BC					
			EL					
			VC					
			GC					
			BC					
			EL					
			VC					
			GC					
			BC					
			EL					
			VC					
			GC					
			BC					
			EL					
			VC					
			GC					

Example Sheet

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8.3. Appendix 3 Peer Review Reports

(PCDR AND ALL SUBSEQUENT REPORTS)

The report shall include the unattributed reports of the peer reviewers in full using the 'MSC peer review template' available on the MSC website forms and templates page here.

The report shall also include the explicit responses of the team that include:

a. Identification of specifically what (if any) changes to scoring, rationales, or conditions have been made.
b. A substantiated justification for not making changes where peer reviewers suggest changes but the team makes no change.

[Note that if undertaking peer reviews before Peer Review College is operational; CABs shall ensure that the 'Contact information' table in the Peer Review report is removed before inserting in this report.]

(Reference: FCR 7.14.11 and sub-clauses)

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8.4. Appendix 4 Stakeholder submissions

Whale and Dolphin Conservation's submission

WDC Scottish Dolphin Centre, Spey Bay, Moray, IV32 7PJ, UK
T +44 (0) 791 869 3023 F +44 (0)1343 829 065 E fiona.read@whales.org W whales.org
WDC is a company limited by guarantee. Registered in England No. 2737421. Registered Scottish Charity No. SC040331.

Ruth O'Connell
Fisheries & Aquaculture Administrator
SAI Global / Global Trust Certification
Quayside Business Park, Mill Street
Dundalk
County Louth
Ireland

Ruth.O'Connell@saiglobal.com

24th August 2017

Dear Ruth O'Connell,

WDC comments on the OSF Orkney brown crab creel - Marine Stewardship Council Fishery Announcement

Thank you for the opportunity for WDC to provide comments on this fisheries assessment. Given our area of interest, we have only focused on marine mammals.

We have concerns about entanglements of marine mammals (mainly humpback whales (*Megaptera novaeangliae*) and minke whales (*Balaenoptera acutorostrata*)), and basking sharks (*Cetorhinus maximus*) in creel fisheries in Scottish waters. In Scotland, half of minke whales stranded and post-mortemed from 1990 to 2010 showed signs of entanglement (Northridge *et al.*, 2010) and entanglements in creels are a known cause of death for humpback whales in Scottish waters (*e.g.*, Ryan *et al.*, 2016). Non-fatal entanglements are also a serious welfare issue for marine megafauna. Entangled animals may carry gear for many weeks/months which significantly compromises their health due to reduced mobility, impaired foraging and severe gear-related injuries.

WDC recently produced waterproof 'Best Practice Guideline' booklets for reducing marine megafauna entanglements in creel fisheries in collaboration with the Scottish Creel Fishermen's Federation (SCFF), Scottish Natural Heritage (SNH), Scottish Marine Animal Stranding Scheme (SMASS), British Divers Marine Life Rescue (BDMLR) and the Hebridean Whale and Dolphin Trust (HWDT). For more details and copies of the guideline booklets see: http://www.scottishcreelfishermensfederation.co.uk/entanglement.htm. We would recommend contacting all these organisations in relation to the assessment.

We would like to see the risk and assessment of marine megafauna entanglements included in the brown crab fishery assessment, including the reporting of 'lost gear'.

We hope you find these comments useful and would be happy to discuss these comments further.

WHALE AND DOLPHIN CONSERVATION
WDC

A world where every whale and dolphin is safe and free

 © SAI Global Limited Copyright 2009 - ABN 67 050 611 642

Kind regards,

Fiona Read

Policy Officer – End Bycatch

References

Northridge, S., Cargill, A., Coram, A., Mandleberg, L., Calderan, S. and Reid, R. 2010 Entanglement of minke whales in Scottish waters; an investigation into occurrence, causes and mitigation. SMRU report to Scottish Government, CR/2007/49. 57 pp.

Ryan, C., Leaper, R., Evans, P.G.H., Dyke, K., Robinson, K.P., Haskins, G.N., Calderan, S., van Geel, N., Harries, O., Froud, K., Brownlow, A. and Jack, A. 2016. Entanglement: an emerging threat to humpback whales in Scottish waters. Presented to the Scientific Committee Meeting of the International Whaling Commission, 2016, SC/66b/HIM/01. 11pp.

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Assessment team's response

Fiona Read, Policy Officer – End Bycatch
Whale and Dolphin Conservation Scottish Dolphin Centre
Spay Bay, Moray
IV32 7PJ
UK

Re: Your submission regarding the MSC Full assessment of the OSF Orkney brown crab creel fishery

April 12th , 2018

Dear Fiona,

The audit team appointed to conduct the full assessment of the OSF Orkeny brown crab creel fishery has reviewed your submission provided prior to the site visit.

The audit team would like to thank you for having taken time to formally participate in site visit through a conference call, and for providing comments in regards to the risk of entanglement of marine megafauna entanglement in creel gear.

I'm pleased to provide you with the audit team's responses to the specific issues raised in your 24th August 2017 letter .

The MSC Fisheries Standard comprises three core Principles including Principle 2 which covers the environmental impact of the fishery under assessment.

Principle 2

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

Performance Indicator 2.3.1 evaluates the impacts of the fishery under assessment on the Endangered, Threatened and Protected (ETP) species, including the marine megafauna entanglement in creel gear.

ETP Species considered in this assessment are listed in the table below.

ETP species in Scotland waters that may overlap with the Orkney brown crab creel fishery. Source: Scottish Natural Heritage, CITES, IUCN Red List.

Group	Species	National Legislation	Status
Dolphin	Bottlenose dolphin, *Tursiops truncatus*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), ASCOBANS
	Harbour Porpoise, *Phocoena phocoena*	Conservation Regulation 1994	European Protected Species (Annex IV of the European

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			Habitats Directive), ASCOBANS
Whale	Humpback whale, *Megaptera novaeangliae*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), listed in CITES Appendix I
	Minke whale, *Baleanoptera acutorostrata*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), listed in CITES Appendix I
	Fin whale, *Balaenoptera physalus*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), listed in CITES Appendix I, listed in IUCN Red List as endangered
	North Atlantic right whale, *Eubalaena glacialis*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), listed in CITES Appendix I, listed in IUCN Red List as endangered
Seal	Grey seal, *Halichoerus grypsus*	Conservation Regulation 1994, Marine (Scotland) Act 2010, The Protection of Seals Order 2014	Protected
	Harbour seal, *Phoca vitulina*	Conservation Regulation 1994, Marine (Scotland) Act 2010, The Protection of Seals Order 2014	Protected
Sea turtle	Leatherback turtle, *Dermochelis coriacea*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), listed in CITES Appendix, listed in IUCN Red List as vulnerable
Shark	Basking shark, *Cetorhinus maximus*	Wildlife and Countryside Act 1981	Protected
Otter	Otter, *Lutra lutra*	Conservation Regulation 1994	European Protected Species (Annex IV of the European Habitats Directive), listed in CITES Appendix I

The assessment team reviewed the available information including the two references you provided to evaluate the impacts of the fishery

Whales can potentially get entangled in creels buoy lines. The species that are most likely to be encountered in Orkney Islands waters are minke whale and in a lesser extend humpback whale, fin whale and North Atlantic right whale being rare to absent in Orkney waters.
Northridge et al (2010) investigated the occurrence of entanglement of minke whale in Scottish waters. The overlap between the relative creel fishing density and aggregated minke whale sighting in the same ICES rectangles has been analysed to determine a relative risk level of entanglement around Scotland. The area

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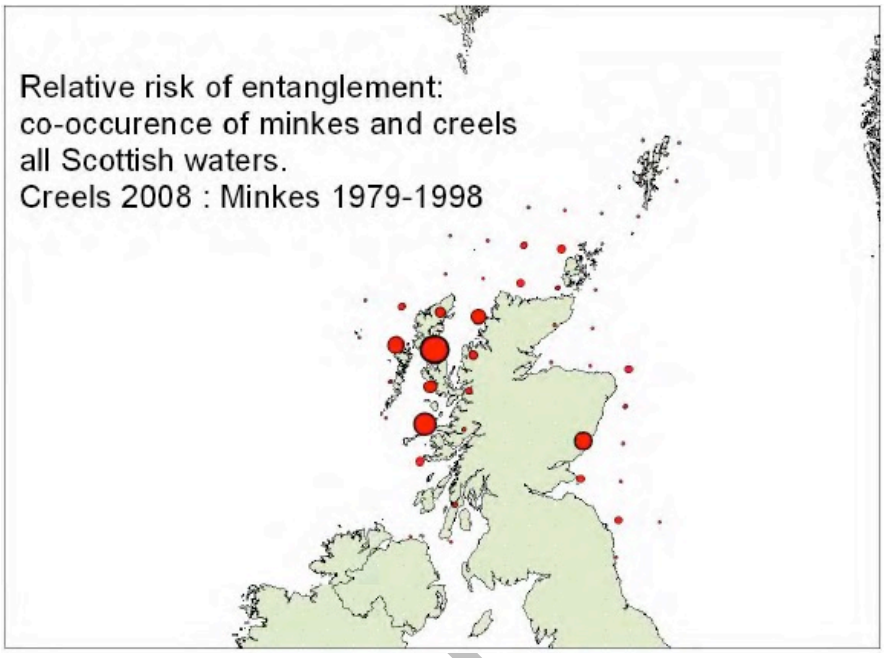
with the higher risk of minke whale entanglement is central Hebrides (West Scotland), and Orkney Islands may have also a relative elevated risk of minke whale entanglement. Overall, Northridge et al (2010) concludes that it cannot be said that entanglements of minke (or orther) whales in Scottish waters represent a serious threat for conservation. However it should receive continued attention because of the protected status of whale species.



Relative risk entanglement. Source: Northridge et al (2010).

Ryan et al (2016) investigated the entanglement of humpback whale in Scottish waters by analysing the temporal and spatial distribution of humpback whale sightings and entanglements collected from different data base and a marine mammal survey (only in Hebrides). Scottish waters are not currently a key habitats for humpback whale, they occur in very low abundance and there is a small number of observations. From 1992-2016, there were 3 sightings of humpback whale and 2 entanglements observed in creel gear in Orkney Islands. The authors estimated the entanglement risk and considered that the risk of entanglement in creel fisheries is high. The study concludes that there would be a concern for the recovery of humpback whale populations if the species would increasingly inhabit Scottish waters.

Gillnets, driftnets and trammelnets account for the majority of harbour porpoise and bottlenose dolphin bycatch in UK waters (Sewell and Hiscock 2005).There are reports of harbour porpoise being entangled in creel ropes but the number are not though to be significant (Sewell and Hiscock 2005).
No concern has been raised regarding incidental capture of dolphins by brown crab creels in Orkney during meetings with fishermen, management agencies and nature conservation organisations.

The assessment team has been provided with entanglements data by the Whale and Dolphin Conservation which obtained them from the Scottish Marine Animal Stranding Scheme (SMASS). Since 2010, SMASS has had 2 records of entanglement of whale in Orkney: two minke whale (Thurso, Holm). However, it has not been confirmed which fishing gear was involved in these entanglements.

According to OSF and fishermen met during the site visit, lost of creels is infrequent meaning that the level of ghost fishing is very low. Fishing practices in place avoid unobserved mortality due to ghost fishing from lost creels. In case of bad weather, creels are set in deeper.OSF Code of Practices include a clause related to recovery of lost fishing gear.

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No concern has been raised regarding incidental capture of basking sharks by brown crab creels in Orkney during meetings with fishermen, management agencies and nature conservation organisations. None of the stakeholder met were aware of any entanglement of basking shark in Orkney Islands.

Based on the information and data reviewed, the assessment team concludes that there are no interactions with leatherback turtles, basking shark, otter and dolphins. Interactions with seals are not rare and although some whale entanglements may be unreported, interactions with whales seem to be low enought not to represent serious threat for their conservation and recovery.

The assessment team considered the booklet “Reducing the risk of entanglement in creel ropes fro marine animals” published by Scottish Creel Fishermen’s Federation and produced in collaboration with the BDMLR, Scottish Natural Heritage, Whale and Dolphin Conservation, SMASS and the Hebridean Whale and Dolphin Trust.

I would like to once again thank you for having taken the time to communicate your concerns to the assessment team.

Yours sincerely,

Géraldine Criquet
SAIG Fisheries Team Leader

References

Northridge S., A. Cargill, A. Coram, L. Mandleberg, S. Calderan and B. Reid, 2010. Entanglement of minke whales in Scottish waters; an investigation into occurrence, causes and mitigation. Sea Mammal Research Unit, University of St Andrews, SAC, Hebridean Whale and Dolphin Trust. Final Report to Scottish Government CR/2007/49, June 2010.

Ryan C., R. Leaper, P. G. H. Evans, K. Dyke, K. P. Robinson, G. N. Haskins, S. Calderan, N. van Geel, O. Harries, K. Froud, A. Brownlow and A. Jack, 2016. Entanglement: an emerging threat to humpback whales in Scottish waters. International Whaling Commission, SC/66b/HIM/01.

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.

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8.6. Appendix 5 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 18. Surveillance level rationale

Year	Surveillance activity	Number of auditors	Rationale

Table 19. Timing of surveillance audit

Year	Anniversary date of certificate	Proposed date of surveillance audit	Rationale

Table 20. Fishery Surveillance Program

Surveillance Level	Year 1	Year 2	Year 3	Year 4

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8.7. Appendix 6 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)

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