The UK Scallop Fishery

Current trends, future management options and recommendations

Final report

October 2018

POSEIDON
AQUATIC RESOURCE MANAGEMENT

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Abbreviations

AFBI	Agri-Food and Biosciences Institute
AIS	Automatic Identification System
ALDFG	Abandoned, Lost and Discarded Fishing Gear
ANIFPO	Anglo-Northern Irish Fish Producers Organisation
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CFP	Common Fisheries Policy
CPUE	Catch per unit effort
DAERA	Department of Agriculture, Environment and Rural Affairs, Northern Ireland
DAS	Days at sea
DEFA	Department of Environment Food and Agriculture, Isle of Man
Defra	Department for Environment, Food and Rural Affairs, UK
EEA	European Economic Area
EEZ	Exclusive Economic Zone
ETI	Ethical Trading Initiative
EU	European Union
F	Fishing mortality
FA	Fishermen's Association
FAO	Food and Agriculture Organization of the United Nations
FIP	Fisheries Improvement Project
FNET	Food Network for Ethical Trade
FTA	free trade agreement
GGGI	Global Ghost Gear Initiative
GSA	Global Seafood Assurances
HR	Harvest rate
ICES	International Council for the Exploration of the Seas
IFCA	Inshore Fisheries and Conservation Authority
ILO	International Labour Organisation
IoM	Isle of Man
iVMS	Inshore Vessel Monitoring System
LPUE	Landings per unit effort
LTMP	Long term management plan
MCA	Maritime and Coastguard Agency
MCZ	Marine Conservation Zone
MEY	Maximum Economic Yield
MFPO	Manx Fish Producer Organisation
MLS	Minimum landing size
MMO	Marine Management Organisation
MNR	Marine Nature Reserve
MPA	Marine Protected Area

MS	Marine Scotland
MSC	Marine Stewardship Council
MSS	Marine Scotland Science
MSY	Maximum Sustainable Yield
NAFC	North Atlantic Fisheries College
NCMPA	Nature Conservation MPA
NFFO	National Federation of Fishermen's Organisations
NGO	Non-Governmental Organisation
NI	Northern Ireland
PO	Producer Organisation
PUKFI	Project UK Fisheries Improvement
RFS	Responsible Fishing Scheme
RIFG	Regional Inshore Fishery Groups
SAC	Special Area of Conservation
SAGB	Shellfish Association of Great Britain
Sedex	Supplier Ethical Data Exchange
SFF	Scottish Fishermen's Federation
SICG	Scallop Industry Consultation Group
SPAs	Special Protection Areas
SSMO	Shetland Shellfish Management Organisation
SWFPA	Scottish White Fish Producer Association
SWFPO	South Western Fish Producer Organisation
SWOT	Strengths, weaknesses, opportunities and threats
TAC	Total Allowable Catch
TURF	Territorial User Rights Fisheries
TS	Territorial Sea
UK	United Kingdom
UN	United Nations
UWTV	Underwater Television
VHF	Very High Frequency
VMS	Vessel Monitoring System
WAG	Welsh Assembly Government
WWER	Western Waters Effort Regime

Executive Summary

The scallop sector is one of the highest value commercial fisheries in the UK. It supports highly productive catching sector and processor businesses that have a collective interest in the sustainable management of scallop stocks around the UK.

The UK's withdrawal from the EU and its Common Fisheries Policy (CFP) represents an opportunity to prioritise and re-structure future UK fisheries management. As one of the UK's most valuable fisheries that is predominantly targeted within UK waters, the effective management of the scallop sector should be a priority.

The last ten years has seen significant growth in the number of scallop vessels, particularly in the 10-15m category that are not included in the Western Waters Effort Regime (WWER).

There has been a recent continuing decline in landings per unit effort overall and in all main fishery areas targeted by the UK scallop fleet[1]. The economic impact of this recent decline has been masked by higher scallop prices.

Over a third of vessels (36%) with scallop entitlement do not land scallops. This latent capacity has the potential to increase fishing capacity by 60% in terms of kW power compared to the current active fleet. While it is unlikely that all this capacity will become active, only Area 7 currently has an overall cap on effort and this only applies to over 15m vessels. Economic drivers are important, as in recent years more licenses have been activated and more boats have entered these fisheries despite reducing catches per unit effort.

Environmental management measures associated with the UK's expanding Marine Protected Area (MPA) network and offshore developments result in fleet displacement. Effective spatial management and constructive engagement with other sectors is needed to provide sufficient consideration of the scallop sector in marine planning and to avoid gear conflict.

There is a pressing need for an effective management response to these numerous pressures on the scallop sector and this is required at individual fishery and UK level.

If management is to be responsive to the status of stocks, then stock boundaries must be well defined, and stock management reference points prepared. Scallop stock assessments are still in development and in most areas the science is still lacking to determine stock reference points to be able to set Maximum Sustainable Yield (MSY) based targets (with the exceptions of the English Channel and Shetland waters). Some assessment areas continue to be defined by activity (such as VMS) rather than biological stock indicators. Stocks should be defined using biological evidence to ensure appropriate levels of stock management can be agreed.

Long term management plans (LTMPs) should be developed for the specific stock management areas identified. These plans should contain harvest strategies that are consistent with high level biological and socio-economic objectives and that should be set out in a UK-wide scallop strategy. Appropriate management tools are needed to deliver agreed harvest strategies and these should be determined by the management groups developing the LTMPs

A UK-wide management strategy and associated management groups should be developed that will:

- Define the stock management areas;
- Oversee development of individual LTMPs;
- Set high level biological and socio-economic objectives for the LTMPs;
- Seek to minimise or mitigate displacement resulting from LTMP and MPA management actions; and
- Provide oversight of the sector as a whole to ensure best practice (e.g. in stock assessment and gear conflict).

The Western Waters Effort Regime was designed to cap fleet activity by Member States in certain seas and for certain metiers. It was not designed to control overall effort in relation to stock status in any of the fisheries so regulated. It is not fit for purpose as a stock management tool in the scallop fishery as it does not respond to the status of stocks and significant parts of the fleet are not included.

A short-term improvement would be an effort-based regime that is applied to all vessels actively fishing for scallop that is more responsive to the status of stocks. Total effort allocations could be adjusted and varied

[1] The only exception being that the declining trend in LPUE the Northern North Sea stabilised from 2015 to 2016.

between and within years. Effort limits could also be set for particular areas depending on status and proportionally allocated based on historical fleet activity. However, this should only be a transitional arrangement while stock boundaries are defined and LTMPs for those stocks developed.

The introduction of a UK scallop strategy and LTMPs also provides opportunities for the simplification and harmonisation of technical regulations on scallop gear used across the UK's devolved administrations. These presently are overly prescriptive, complex and disjointed. Re-defining technical regulations should not constrain gear development and subsequent adoption by regulators and the fleet. Instead innovations should be incentivised to support improvements to stock status and/or reducing the environmental footprint of the fishery.

The development of a UK-wide scallop strategy and ongoing management by each administration, brings with it the need for sector participation in a UK scallop management group. UK-wide sector representation exists in the form of the Scallop Industry Consultation Group (SICG) that could be further defined via development of a Constitution and mandate. Most industry consultees felt reasonably well-informed of sector issues and adequately represented, but some sub-sectors may be under-represented. This does not indicate an immediate need for additional representative bodies.

A UK management group will be relevant to all devolved nations, which suggests all would be keen to participate. Northern Ireland, Scotland and Wales have what could be termed national groups representing scallop interests. England could develop such representation, e.g. through the National Federation of Fishermen's Organisations (NFFO) or the Shellfish Association of Great Britain (SAGB). This would also give a reasonable balance and size to the management group with 4 industry participants alongside 4 managing authority members and scientists.

These national groups could be mandated to ensure that processors and the currently under-represented sub-groups (small scale and non-sector) in their home nation are informed and have the opportunity to engage with those representative bodies. This may require some financial assistance to support the operation of national meetings linking into UK meetings and to increase engagement efforts with all sectors.

Ethical responsibility is becoming part of fisheries supply chain certification, which may become increasingly important to maintain or increase UK scallop future market share. With ongoing media and NGO focus on ethical fishing, there is a clear need and opportunity for the sector to demonstrate its good performance. From November 2018, the Maritime and Coastguard Agency (MCA) will inspect all UK vessels in relation to the International Labour Organisations (ILO) Work in Fishing Convention (ILO 188) and provide the required certification. This should enable the sector to demonstrate the vessel's and the sectors' compliance.

Another key future development for this and other sectors is the UK's exit from the EU. Over 90% of UK landings of this non-quota species are from UK waters. The issues of access and finfish quota shares are less impacting to the scallop sector than the other potential consequences of Brexit. However, knock-on effects, such as the displacement of activity to scallop from quota fisheries are possible and continued access to the Baie de Seine and other fisheries in French EEZ waters are very important to UK vessels. As most UK scallops are exported to the EU, future access to the EU market is of critical importance to the sector. There will be major consequences for the sector if access to migrant labour is constrained, particularly the shore-based, scallop processing sector that is highly dependent on migrant labour.

1 Introduction and objectives

1.1 Context

Poseidon Aquatic Resource Management Ltd (Poseidon) was commissioned by the South Western Fish Producer Organisation Ltd (SWFPO) on behalf of the Scallop Industry Consultation Group (SICG) to undertake a review of the UK king scallop, *Pecten maximus*, (hereon 'scallop') sector.

1.2 Objectives

The objectives of the work are as follows:

- Provide an overview of the current trends and performance of the UK scallop fishery, including England, Wales, Scotland, Northern Ireland and Isle of Man;
- Explore topic issues identified by the SICG including stock assessments, latent capacity, sectoral representation, harmonisation of management, Brexit, gear conflicts, environmental footprint and ethical fishing;
- Undertake a SWOT (strengths, weaknesses, opportunities and threats) analysis of UK scallop sector; and
- Provide recommendations for the client group to consider.

1.3 Approach

1.3.1 Desk based review

Poseidon undertook an extensive review of available resources, including economic analysis reports, scientific reports, government and management authority reports, as well as analysis of Marine Management Organisation (MMO) landing statistic and Vessel Monitoring System (VMS) databases to inform a desk-based review of the UK scallop sector. Data limitations specific to each source are provided in Appendix 1.

1.3.2 Consultation

Regional consultation was undertaken with industry, scientists and government across the UK and Isle of Man. The list of stakeholders consulted is available in Appendix 2. Consultation was on a confidential basis: all responses contributed to the analysis, but no views of specific organisation/ individuals are reported. Interviews were undertaken face-to-face and via telephone, structured around an interview-prompt agreed with the SICG steering group (see Appendix 3). A project update was provided at the SICG meeting on 7th June 2018, which provided additional opportunity to consult with members of this group.

1.4 Report structure

The report is structured around the key topic areas identified by the SICG, with the following sections:

1. Introduction and objectives (this section)
2. Overview of UK scallop landings, including spatial fleet activity
3. Fleet structure and performance, including latent entitlements
4. Sectoral representation
5. Biological status of scallop stocks
6. Scallop fisheries management
7. Gear conflicts
8. Environmental footprint and interactions
9. Ethical fishing
10. SWOT analysis of UK scallop sector
11. Horizon scanning, including EU exit considerations
12. Recommendations

2 Overview of UK scallop landings

2.1 Overview of landings

Scallop is the third most valuable species landed by UK vessels (after mackerel and *Nephrops*), worth £66.5 million in first sales value in 2016 (Figure 1) and a five-year average of £59.5 million.

Scallop landings by weight have not followed the same trend, with a significant decrease from 2012 to 2014. Since then annual landed weight has fluctuated around 27,000 tonnes, which remains above the longer-term average between 2003 to 2016 (Figure 2).

Figure 1: First sales value (left) and landings weight, tonnes (right) of scallop landings by UK registered vessels from 2012 to 2016. [Data source, MMO, 2017a]

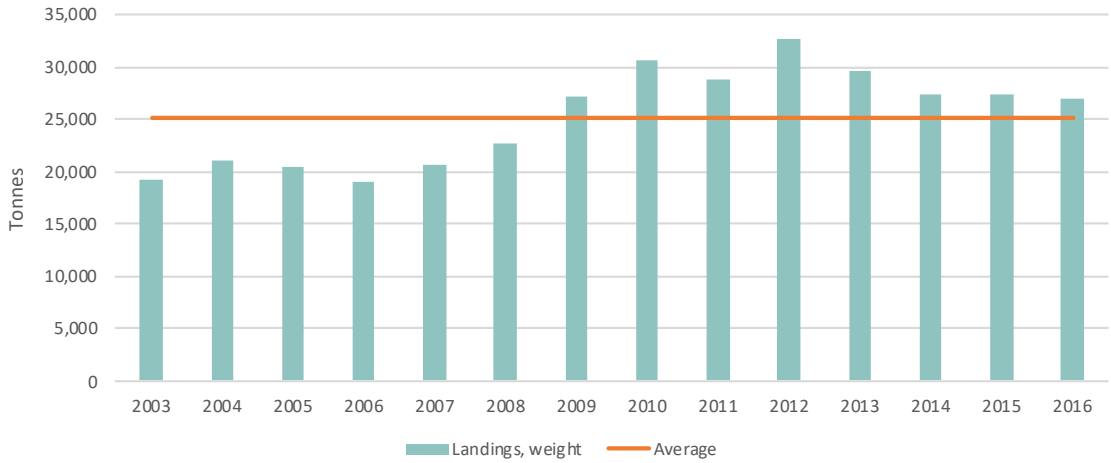


Figure 2: Long term trend in scallop landings (tonnes) by UK registered vessels from 2003 to 2016. [Data source, EU DCF, 2018]

Scallop dredgers catch and land 95% of all UK scallop production (based on 5-year average from 2012 to 2016), other passive gears (diving) account for 3%, with the remainder taken as bycatch in other trawl fisheries.

Scotland-registered vessels account for the majority of the landings by value (56% on average, Figure 3), followed by English vessels (29%), Northern Irish (7%), Isle of Man (5%) and Wales (3%).

UK vessels that are 15m and over in length account for the highest proportion of landings by weight (71% on average, Figure 3), followed by 10 to 15m vessels (22%) and under 10m vessels (7%).

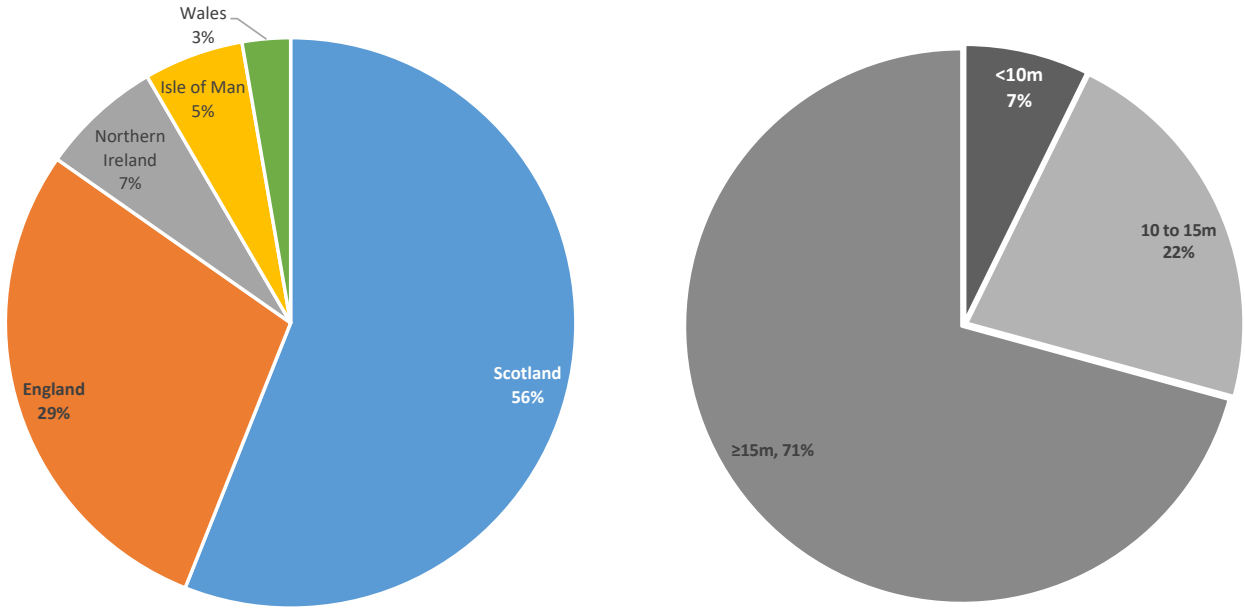


Figure 3: Left: Proportion of UK scallop landings value by UK vessel nationality. Right: Proportion of UK scallop landings weight by vessel length category for vessels <10m, 10 to 15m and 15m and over. [Based on 5-year average from 2012 to 2016. Data sources, MMO, 2017a; EU DCF, 2018]

2.2 Spatial analysis of fleet activity

Based on landing statistics analysed from 2012 to 2016, it is evident that UK scallop dredgers operate around the entire coastline of the UK. The largest quantity of landings is taken from the Irish Sea (Figure 4) involving all home nations and the Isle of Man, followed by the Western English Channel where landings are dominated by English registered vessels, then West of Scotland, which is dominated by Scottish landings. The Eastern English Channel, Central and Northern North Sea also have significant landings, mainly taken by Scottish vessels (based on analysis of 2012-2016 data).

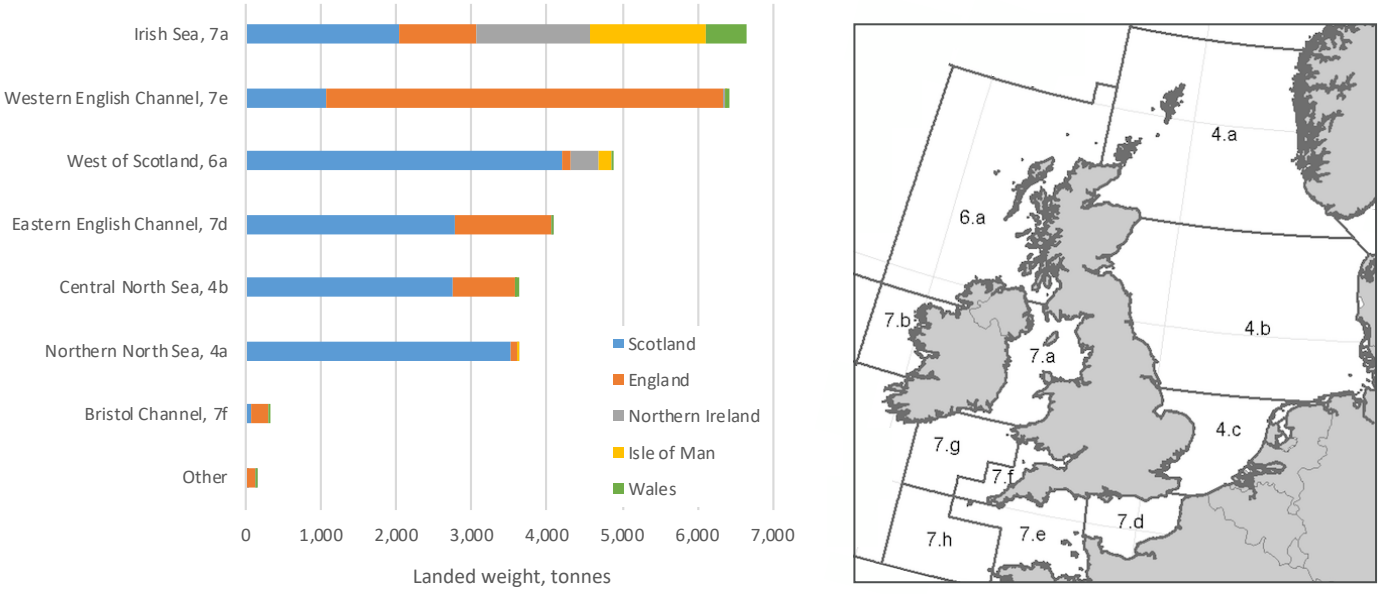


Figure 4: Left: UK national annual average landed weight of scallop by ICES statistical area [Based on 2012-2016 landings; Data source, MMO, 2017a] Right: ICES statistical areas (ICES, 2016).

Scallop landings by all vessels in 2016 are presented by ICES rectangle in Figure 5. The pattern of landings mirrors the findings from Figure 4, and highlights particular hot-spots around Isle of Man (Irish Sea), and Western and Eastern English Channel (including within the French EEZ, Baie de Seine).

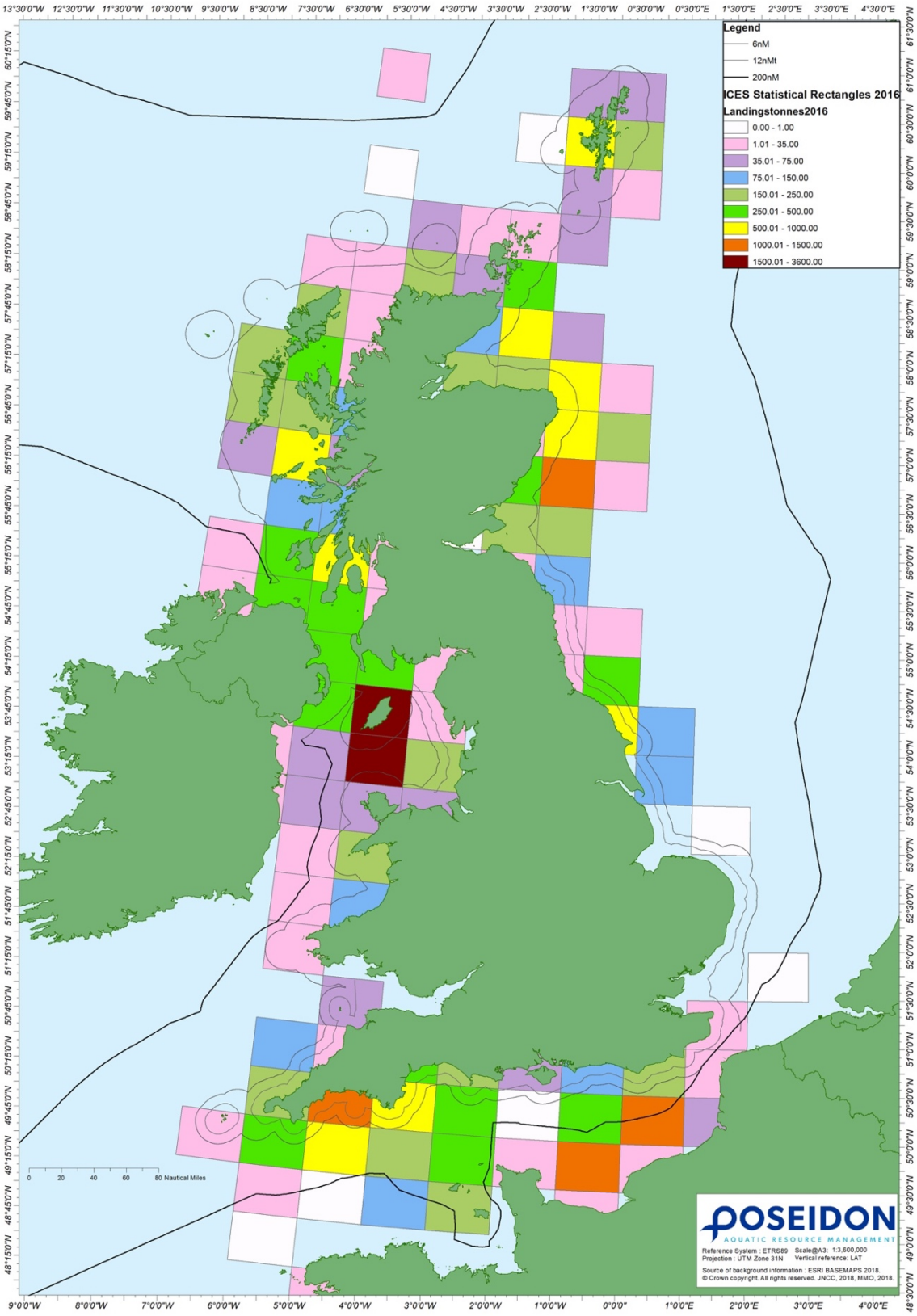


Figure 5: UK scallop landings weight by ICES rectangle in 2016 [Data source, MMO, 2017a]

VMS data for scallop dredge vessels ≥15m indicating the value of scallop landings in 2016 (Figure 6) shows distinctive scallop grounds targeted by these vessels in 2016. VMS for 12-15m vessels was not available; these and other data limitations are described in Appendix 1.

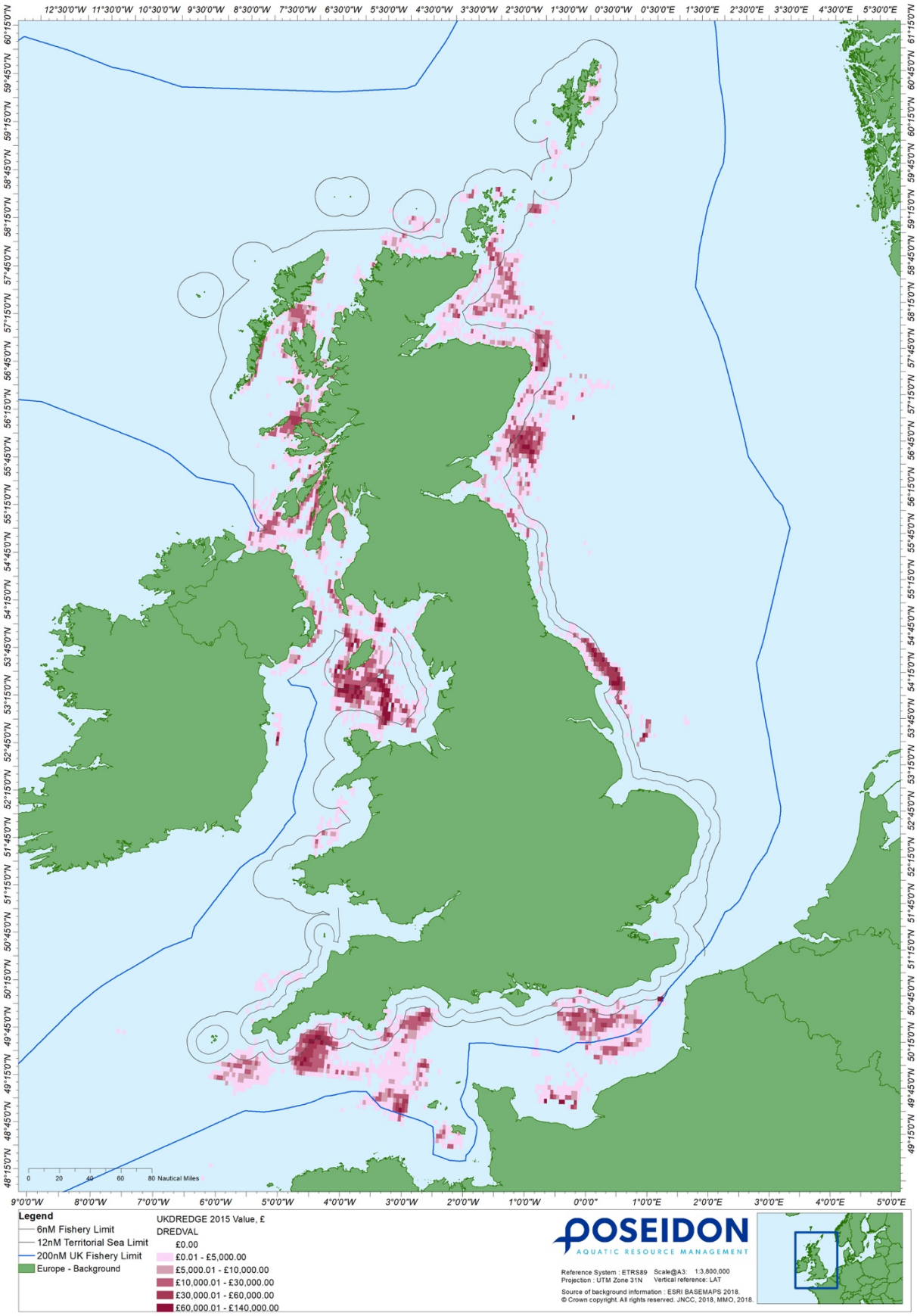


Figure 6: Vessel Monitoring System data indicating value of catch by dredgers in 2015 [Data source, MMO, 2017b]

3 Fleet structure and performance

3.1 Current status and trends

3.1.1 Fleet structure

The number of active scallop vessels (i.e. vessels of any length catching scallop using mechanised dredge operating full-time, part-time or seasonally) varies annually and throughout the year dependant on the vessel owner's decisions related to changing gears and target fisheries.

In total, 325 UK vessels caught some quantity of scallops in 2016 (Seafish, 2017). Based on MMO iFISH database data to trip level, Seafish (2017) recorded 203 scallop revenue-dependant vessels (i.e., where scallop account for ≥61% of total income) in 2016, including 40 vessels under 10m in length.

The number of scallop revenue-dependant vessels has grown steadily from 135 in 2008 to 203 in 2016, although has been relatively stable in terms of total numbers from 2014 to 2016 (Figure 7).

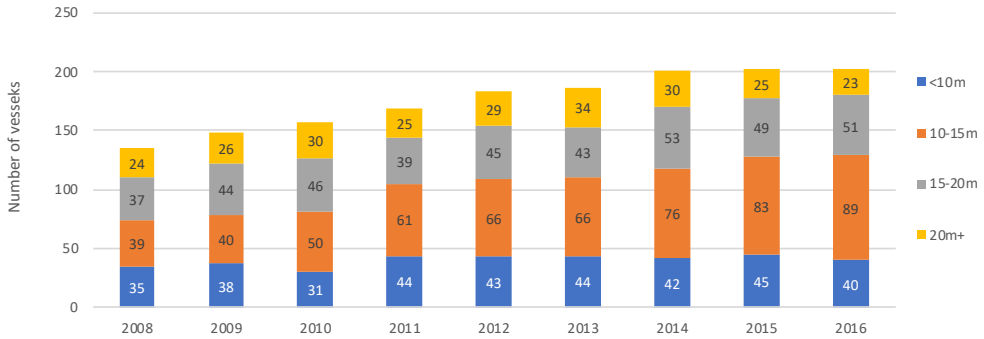


Figure 7: Number of UK scallop revenue-dependent vessels by length category, not including low activity vessels (annual fishing income all species <£10K) [Figure adapted from Seafish, 2017. Data source, Seafish, 2017 based on MMO data]

The linear trends in growth of UK scallop revenue-dependant vessels by vessel length category is presented in Figure 8. In terms of growth in vessel numbers from 2008 to 2016, there is relative stability in the number of vessels 20m+ (overall reduced by one vessel, equating to a decrease of 4%), increases in number of vessels within the under 10m category (growth of +14%) and 15-20m category (growth of +38%), and the most substantial growth in the number of vessels in the 10-15m length category (+128% growth).

While total vessel numbers have remained relatively static from 2014 to 2016, the number of vessels within the 10-15m category has continued to increase over this period (Figure 8).

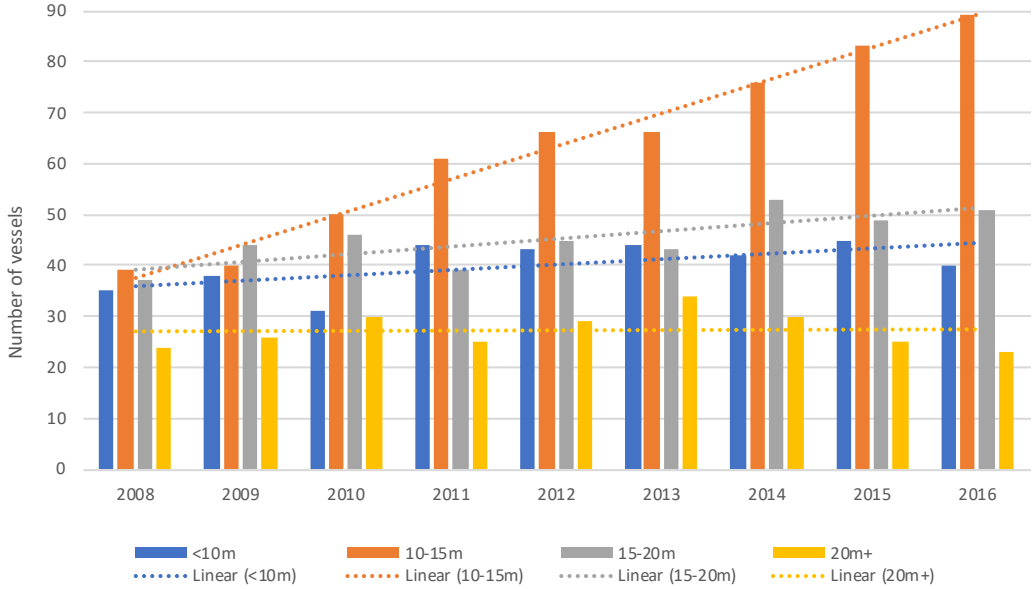


Figure 8: Linear trends in growth of number of UK scallop revenue-dependent vessels by length category, not including low activity vessels (annual fishing income all species <£10K) [Data source, Seafish, 2017 based on MMO data]

In addition to increased vessel numbers, new and/or upgraded vessels may also have improved efficiency in relation to power and catch handling systems.

3.1.2 Fleet performance

Seafish published economic analysis of the UK scallop sector in December 2017 (Seafish, 2017). This assessed trends in scallop landings, dredging days at sea (DAS) and landings per unit effort (LPUE) (see Figure 9 and Figure 10). Dredging DAS include all vessel lengths for UK scallop revenue-dependant vessels (i.e., where scallop is ≥61% of income).

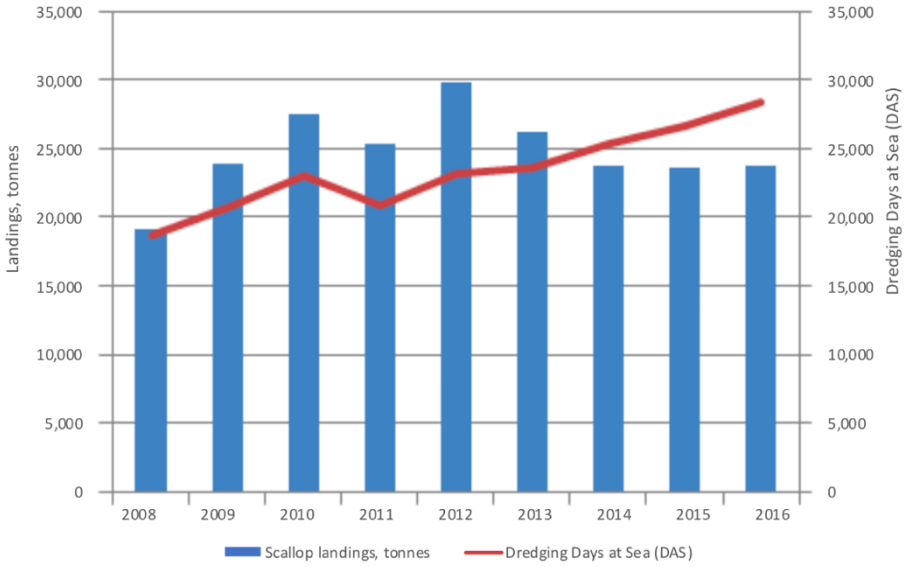


Figure 9: Total annual landings of scallops and dredging days at sea by UK scallop revenue-dependent vessels. [Source: Seafish, 2017, based on MMO data]

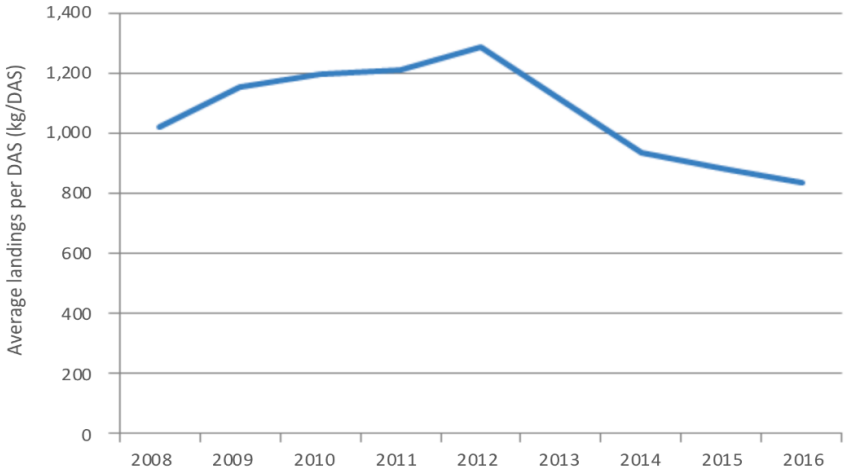


Figure 10: Average scallop landings per dredging day at sea by UK scallop revenue-dependent vessels [Source: Seafish, 2017, based on MMO data]

Key findings for UK scallop revenue-dependant vessels are:

- From 2013 to 2016, dredging days at sea increased annually, while scallop landings by weight decreased annually (Figure 9).
- Average scallop landings per dredging days at sea have dramatically fallen since 2012 (Figure 10).
- 2016 has the lowest LPUE within the timeseries, while dredging days at sea are at their highest.

The Seafish (2017) report goes on to explore all combinations of effort including landings per kW day at sea, landings per dredge per day at sea, and landings per dredger per hour-at-sea. All show the same declining trend in LPUE since 2013.

Trends for specific ICES statistical areas were also examined including West of Scotland, Irish Sea & Celtic Sea, English Channel, South & Central North Sea and Northern North Sea. All areas show declining LPUE since 2013, with the exception of the Northern North Sea where LPUE decreased from 2013 to 2014, but increased from 2015 to 2016 (Seafish, 2017).

3.1.3 Latent entitlements

In the context of this work latency is defined as a vessel with UK scallop entitlement that does not land scallops, either due to targeting other fisheries or due to that vessel being inactive (i.e. no annual fishing income). Vessels 10m and over are required to have scallop entitlement to legally land king scallop by mechanical dredge; vessels under 10m do not require a scallop entitlement.

In 2016, the MMO recorded 217 vessels over 10m in length with scallop entitlement[2] actively landing scallops; 90 of these were Scottish registered, with the majority (59) being over 15m; 66 were English registered, with the majority (45) 10-15m in length; 32 Northern Irish registered, 24 Isle of Man registered and 5 Wales registered (Figure 11).

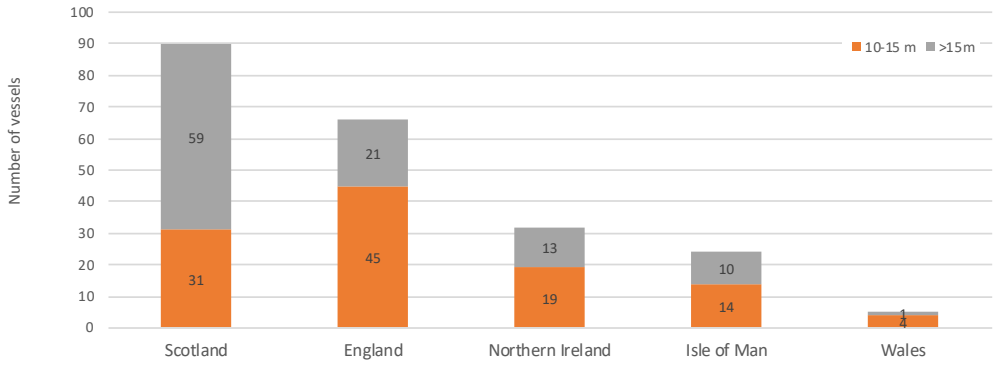


Figure 11: Number of UK scallop entitlements for vessels actively scallop fishing in 2016. Note does not include <10m vessels that do not require scallop entitlement [Data source, MMO, 2017c]

The latest MMO scallop entitlement statistics available[3] indicate that for >10m vessels with UK scallop entitlement, 217 land king scallops; 106 do not, but target other fisheries and 18 are inactive (Figure 12). Over a third of >10m vessels (36%) with scallop entitlement do not land scallops (Figure 12). This represents significant potential for effort to increase across the UK scallop sector. This latent capacity in >10m vessels has the potential to allow 57% increase in fleet size in terms of vessel numbers and to increase fishing capacity by 60% in terms of kW power compared to the current active fleet.

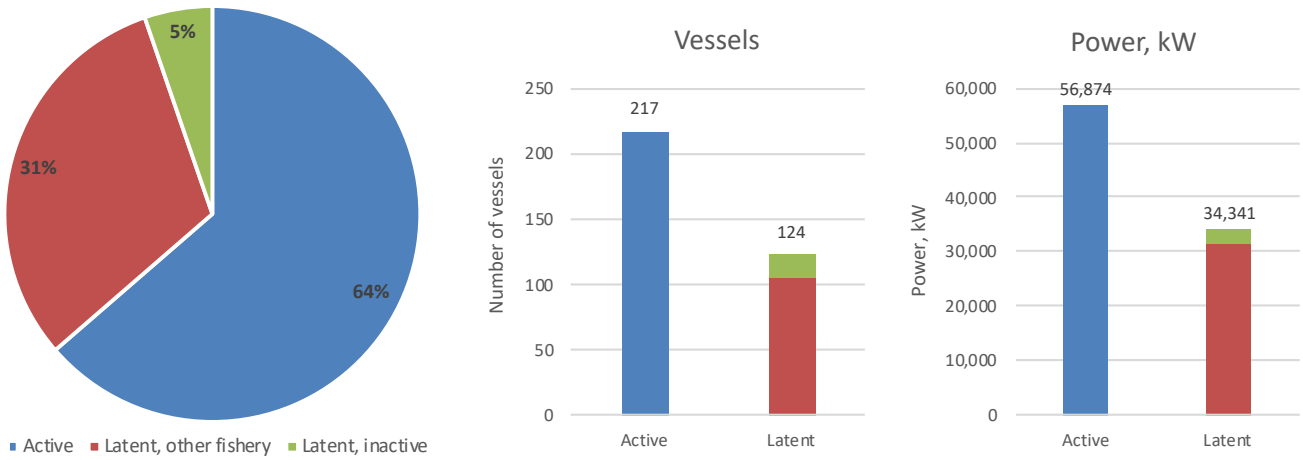


Figure 12: Left: Proportion of UK vessels with scallop entitlement in 2016 that are actively landing scallops (Active), not landing scallops, but targeting other fisheries (Latent, other fishery) or inactive (Latent, inactive). Right: Number of vessels and associated power (kW) within these categories of active and latent. [Data source, MMO, 2017c]

[2] To commercially fish for king scallop *Pecten maximus* by mechanical dredge, the fishing licence of a UK vessel >10m in length must have a scallop entitlement attached to it.
[3] Based on statistics collated on 31.12.2016

The highest level of scallop entitlement latency is seen in the English fleet, where 86 vessels with scallop entitlement did not land scallops in 2016, representing 57% of this fleet (Figure 13). Scotland, Wales and Northern Ireland also demonstrate latency within their fleets.

Figure 13: Proportion of vessels with scallop entitlement in 2016 that are actively landing scallops (Active), not landing scallops, but targeting other fisheries (Latent, other fishery) or inactive (Latent, inactive) by country [Data source, MMO, 2017c]

Scallop entitlement latency exists within both 10-15m and >15m vessel length categories (Figure 14). In England, the majority of latent vessels by number are within the 10-15m segment (53 vessels), compared to 33 vessels >15m. In Scotland, the majority are >15m (14 vessels) compared to 10-15m (10 vessels). There are 7 latent vessels in Wales, 4 in Northern Ireland and one in each of Isle of Man, Guernsey and Jersey.

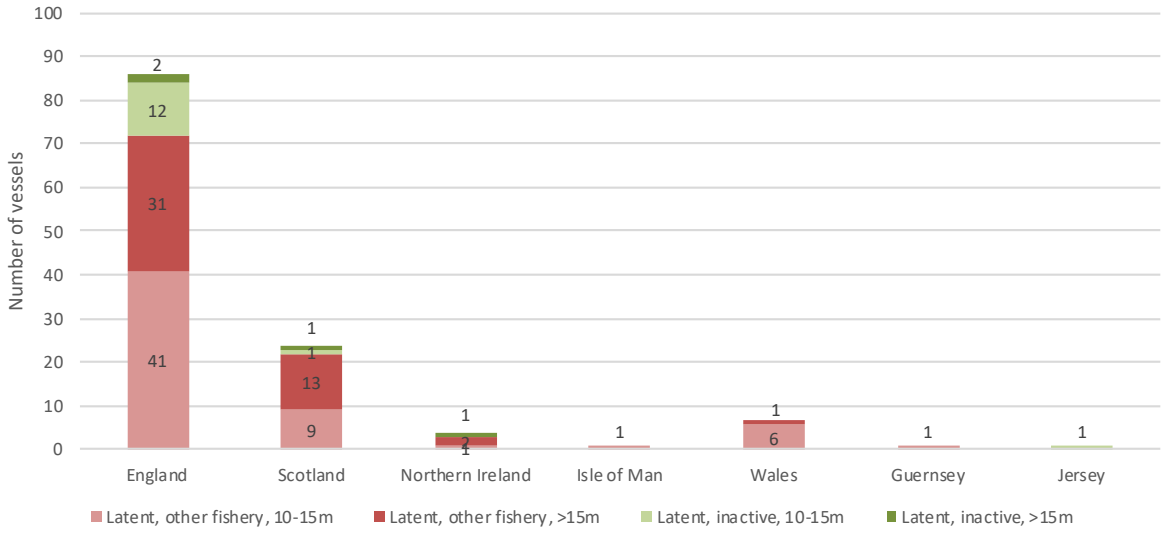


Figure 14: Number of latent vessels by vessel length category (10-15m and over 15m) and country [Data source, MMO, 2017c]

Trends in total number of vessels with scallop entitlement from 2008 to 2016 are presented in Figure 15. Since 2008, the number of active vessels has increased by 47% and the total number of latent vessels has decreased by 51%.

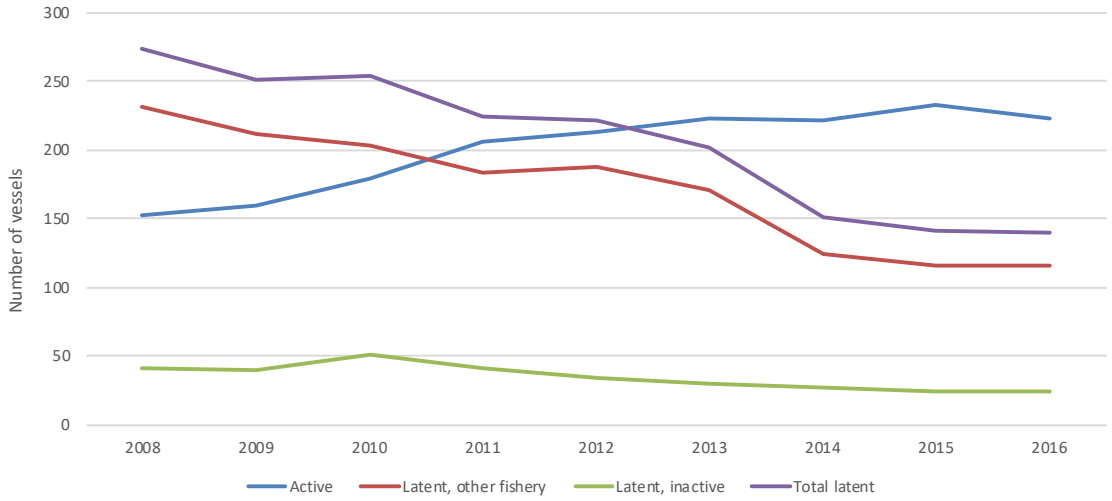


Figure 15: Trends in number of vessels with scallop entitlement from 2008 to 2016 that are actively landing scallops (Active), not landing scallops, but targeting other fisheries (Latent, other fishery) or inactive (Latent, inactive). [Data source, MMO, 2017c]

3.1.1 Other latent capacity

In the previous sections latent capacity has been explored in relation to latent scallop entitlements and is therefore only applicable to vessels >10m in length, that require a scallop entitlement to commercial land scallops by mechanised dredge.

Currently vessels that are 10m and under in length are completely unrestricted from entering the fishery and could begin targeting scallop at any time. This represents potential for significant increases in the numbers of vessels <10m resulting in increased capacity entering the scallop fishery across all UK administrations.

3.2 Issues and developments

3.2.1 Issues

Latent capacity provides the potential for a rapid and significant increase in fishing capacity and without effective management, this can result in increased fishing effort. Latent scallop entitlements do not expire, and effectively are tradable, i.e. they can be bought by existing vessel owners and new entrants if available. Scallop entitlements therefore have a value within the industry, which presents challenges if their removal / freezing is proposed.

Consultation has highlighted the complexities of latent scallop entitlements with strong arguments focused on the importance of retaining flexibility within the UK fleet (particularly in English waters), promoting natural growth and new entrants, and avoiding unmerited inflation of the market share held by currently active scallop vessels.

Some consultees suggest that capacity should be prevented from entering the fishery through effective management measures such as days at sea, rather than freezing/removing entitlements. Indeed, it is argued that where effort restrictions are in place (such as the Area 7 Western Waters Effort Regime), removing latent entitlements would not affect the stock because scallop landings are governed by days at sea restrictions (for ≥15 m vessels).

There was a view from some consultees that economic drivers manage latent capacity: when LPUE is low, there would be less attraction for latent entitlements to be activated and to enter the fishery. However, there is evidence of more vessels entering scallop fisheries despite data showing that LPUE has been declining in recent years. With good scallop prices, economic drivers have been stronger influences and more latent capacity has become active.

The presence of latent entitlements causes uncertainty and is a management risk. Newly active vessels in the >15m sector will dilute the available days at sea. Furthermore, newly active <15m vessels, including <10m vessels, that are not restricted within the WWER, would impact the scallop stock and LPUE.

During consultation it was suggested that area-specific entitlements might be appropriate, to account for WWER effort control or any future management structure that has an over-arching effort restriction. This could be a potential consideration of a LTMP, as management develops and specific stock areas are defined.

3.2.2 Current developments and management actions addressing UK latent entitlements

Scottish and Isle of Man administrations have worked to address latent scallop entitlements. In 2015 after a Scottish Licencing Review consultation, Marine Scotland took action to 'freeze' scallop dredge entitlements attached to Scottish licences where those entitlements had not been active for 7 years, i.e. from 2008 to 2014 inclusive. Marine Scotland Science scallop stock assessments, advising no increase in effort, formed the evidence base for the decision to freeze scallop entitlements.

The freeze did not remove the entitlement altogether but suspended the entitlement of specified vessels to scallop dredge until further notice. This remained applicable if the entitlement was transferred as part of a licensing transaction (Marine Scotland, 2014). In total 45 licence entitlements were frozen, from a total of 150 and as of July 2018 there remain the same 105 operational Scottish scallop entitlements). No further reviews of scallop entitlement use have been undertaken by Marine Scotland, it is therefore unknown if further scallop entitlement freezing might be applicable to other Scottish licences.

This management measure was not welcomed by those Scottish vessel owners whose entitlements were frozen, as they considered it a valuable asset allowing potential future flexibility in fishing practises, but it was supported by Scottish science, government and industry-advisors.

The Isle of Man introduced a restrictive licensing regime for king scallops in 2016, which ensures latent entitlements cannot become active. This process was based on a four-year reference period (covering fishing seasons from 2011/12 to 2014/15), track record, and number of days fished, and ensured licences for vessels that demonstrated commitment to and dependency on the king scallop fishery. Measures are also in place to consider the release of additional licences, using documented criteria, if assessment shows that the king scallop stock can sustain additional effort.

Drivers for managing latent capacity within the Scottish and Isle of Man administrations are linked to managing growth in the fishing capacity available to harvest the scallop stocks.

It is noted that Area 7, where the majority of scallop landings by English vessels are taken (see Figure 4), is subject to the WWER limits for over 15m vessels. Current evidence shows significant growth in vessels within the 10-15m length category, which are not subject to the WWER. For this reason, future scallop management structures must encompass all vessels of all lengths.

3.3 Opportunities

On balance, the presence of latent entitlements limits the ability to effectively manage the scallop sector. The majority of industry and SICG members consulted support the freezing of latent entitlements.

Trends in catch rates supports an approach to freeze/remove latent scallop entitlements in all devolved administrations to maintain and potentially decrease effort across the UK scallop sector, including in areas where effort control is currently in place.

There is also an opportunity to continue work of the Scottish and Isle of Man administrations to reduce and remove latent scallop entitlements with routine review.

4 Sectoral representation

4.1 Current status and trends

This section considers whether the industry is adequately represented and informed of relevant developments and how future sectoral representation could be shaped. Here 'industry' could be considered to include just the catching sector or to include wider industry players: buyers, processors and others in the supply chain.

The figure below shows the various fishing industry groups that are involved to some degree in scallop sector representation. It illustrates the regional and overlapping nature of current sector representation. These are catching sector groups and while some may have regular dialogue and investment in processors, only the SICG specifically includes processors as members.

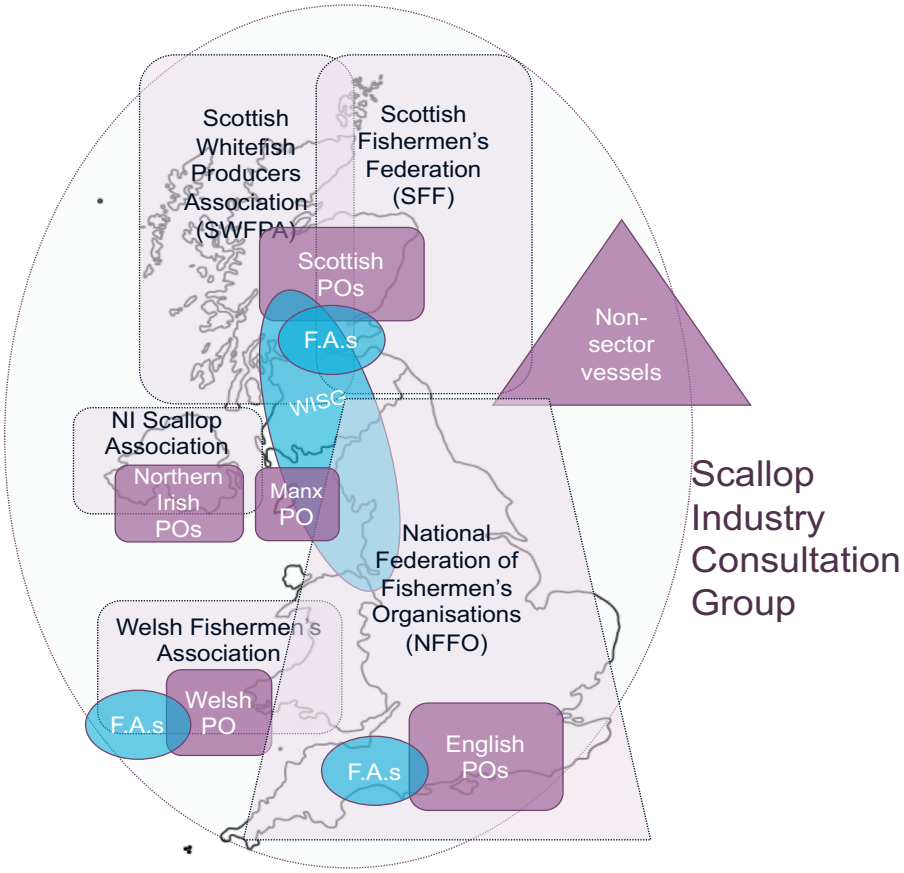


Figure 16 Illustration of scallop industry representation [F.A. = Fishermen's Association, P.O. = Producer Organisation]

Sector representation differs from consultation of the sector by management authorities. Although official consultation is much easier if authorities only need to approach (and receive responses from) representatives rather than individual license holders, individual stakeholders should retain the option to respond directly to government proposals affecting them[4].

No single organization currently represents the whole UK sector. Of the existing groups, the SICG is considered by the authorities to be a *de facto* sector representative as it has the broadest membership, including vessel owners, POs and processors. Although the SICG was formed with a specific remit for consultation on the WWER, which meant membership reflected that purpose with a focus on >15m vessels, its membership has extended over time to include some small vessel owner-operators.

Those involved with the SICG suggest current members have links with around 90% of production but fewer than 40% of scallop vessels by number. SICG also includes managing authorities and as such is not solely an industry group. It is active and has the broadest participation of existing groups. Creating a UK-wide scallop

[4] This is in line with UK government consultation principles (2018). See https://www.gov.uk/government/publications/consultation-principles-guidance

industry group could be progressed readily by the SICG. This would require re-formulation of the group's terms of reference and membership to reflect its new role as a representative body.

Historically, the UK scallop industry was represented by the Scallop Association, which ceased operations in 2015. Presently, representation is primarily by separate national associations in the home nations and Producer Organisations. These are considered below.

Targeting a non-quota species may mean that scallop vessel owners are less compelled to be members of Producer Organisations (POs), but many are members. They may view them as an important way to be kept informed of developments in the fisheries sector as well as the scallop sector specifically. As POs are an EU construct, their status may change post-Brexit, but they are widely-regarded as important industry groups. They are expected to continue in the same capacity, but with a new legal status.

In **Scotland** national representation is currently through the Scottish White Fish Producer Association (SWFPA), which is a constituent member of the Scottish Fishermen's Association (SFF), and were asked by some Scottish vessel owners to establish a Scallop Committee to represent their interests. It is considered by some to mainly represent mainly the larger vessel interests. Consequently the Western Inshore Scallop Group (WISG) was established in 2017, representing inshore vessels (around 27 vessel owners in the current membership) across the western coast of Scotland, England and Wales. At a sub-regional level, scallopers are also members of:

- Shetland Shellfish Management Organisation (SSMO) and Shetland Fishermen's Association
- Orkney Fishermen's Association
- Western Isles Fishermen's Association
- Clyde Fishermen's Association
- Fife Fishermen's Association

The Shetland Fishermen's Association, Orkney Fishermen's Association and Fife Fishermen's Association are all constituent members of the SFF.

Marine Scotland estimates that approximately 50% of scallop dredging fishermen are represented on these associations, which is in line with findings in the rest of the industry.

For **English** scallop interests, it is mostly the Producer Organisations that have taken on the representation of the sector. Due to their quota management remit, the POs are perceived to mainly represent the larger vessel interests rather than inshore vessels. There are also regional fishermen's associations that may include scallop vessels.

In **Northern Ireland**, the two POs (also members of the SICG) include many scallop vessel owners. Since 1993 the Northern Ireland Scallop Association has also acted as a representative body, currently with over 25 members. They hold meetings as and when required to address emerging issues. Recently the association has been working with NI scientists to identify suitable inshore areas for re-seeding scallops.

In **Wales**, skippers may be members of the national representative body, the Welsh Fishermen's Association, via regional associations:

- South and West Wales Fishing Communities Ltd
- Cardigan Bay Fisherman's Association Ltd
- Llyn Fisherman's Association
- North Wales Fishermen's Co-operative

4.2 Issues and developments

Some of the key issues to address for sector representation discussed further below are:

- Appropriate representation
- Information dissemination
- Effective participation
- Need for UK-wide representation

4.2.1 Appropriate representation

There is concern that the small-scale sector (under 15m) and the 'non-sector' (referring to those that are not members of POs) are not well represented. This is a perennial issue for fisheries as the sector operates in often remote locations and can be highly dispersed. Some operators also choose to remain independent and not to be members of associations as they do not see sufficient benefit from the fees and time spent attending meetings.

The population of operators that most consultees consider to be not adequately represented within the UK scallop sector are either difficult to engage with or do not wish to engage with the wider industry. A representative body can only:

a. Inform potential members that it exists and is open to relevant members;

b. Facilitate membership and participation (see 'effective participation' below)

In Canada membership of a recognised association is compulsory. Compulsory membership is not required in the UK with the current management arrangements (as engagement with all licence-holders is possible), but this should be considered were management to move towards co-management and self-policing by the sector. If associations become responsible for the compliance of operators, there should be compulsory membership to avoid 'free-riders' within the sector.

4.2.2 Information dissemination

Information is currently disseminated through the SICG, POs and associations emailing their members and also through the industry press. Most vessel owners/skippers will attend PO/Association meetings which are normally scheduled in advance with due regard to members' commitments and are occasional (monthly at most, but normally quarterly). Some skippers have also set up WhatsApp/messenger groups to share information with the group. Most of the skippers consulted felt they were reasonably well informed through these various channels of communication.

Social media such as Facebook, Twitter, Snapchat and WhatsApp are useful low-cost methods of quickly reaching large numbers of people. However, those consulted tended to be dismissive of the use of social media for information dissemination. Without effective moderation, groups can be easily dominated by certain posters or digress into irrelevant topics. Most consultees concluded that email and communication via their PO/Association was adequate.

4.2.3 Effective participation

The participation of industry operators in meetings is a challenge. Fishermen operator are often at sea and do not work office hours. This illustrates one of the important roles of industry representatives; to be at meetings when their members cannot attend. Employing staff to represent a group requires resources that many industry associations lack.

Inshore interests are often under-represented in industry for similar reasons. There is a need for some form of inshore representation to engage with regional inshore management and the WISG has recently been established to represent inshore vessels along the Scottish, English and Welsh west coasts in recognition of this. The small number of inshore scallopers operating full time in other devolved administrations would make it difficult for scallop-specific inshore associations to be viable at a regional level.

Active fishermen often lack the time, money (lost earnings) and/or inclination to attend meetings themselves, which is particularly the case when meetings are:

a. During fishing seasons/times;

b. Scheduled during office hours;

c. Lacking focus; and

d. Not showing results.

Scallop meetings will inevitably clash with fishing seasons (as scalloping is year-round) and the involvement of other stakeholders means that they are likely to be scheduled for office hours. Therefore, the scallop sector benefits from some form of representation to engage effectively with non-fishing stakeholders.

4.2.4 Need for UK-wide representation

UK-wide representation by a single body does not currently exist. The general message from most industry consultees was that they feel reasonably informed of sector issues and adequately represented (noting that some sub-sectors may be under-represented). This does not suggest an immediate need for UK-wide representation.

The development of UK-wide scallop management brings with it the potential need for UK-wide sector representation. A UK scallop management plan would require a UK scallop management group. This should be a multi-stakeholder group including catchers, processors, managing authorities and scientists (which is not far from the SICG now). An official management group should seek appropriate and proportionate industry representation, which could take several forms:

a) A broad grouping of industry interests (like SICG today)

b) A single sector representative body (i.e. a UK scallop association)

c) Selected participants (based on interest and knowledge)

d) Representatives from each devolved nation (England, Northern Ireland, Scotland, Wales)

The large numbers involved in the SICG might be considered unworkable in the context of a management group. A single representative body (option b) is another possibility, whereby one (newly-established) body represents the whole industry on the UK scallop management group, which may be difficult for some to accept. Option c) is the approach taken by the Isle of Man Scallop Management Board, which contains Manx interests and also invited participants from visiting fleets (rather than representatives). The stakeholders involved report that this recently established group (2017) works well for the Isle of Man. This approach may suit each devolved administration. It could be difficult for a similar management group at a UK-wide scale to justify the inclusion of a few selected industry participants.

Given the geographic scope of the group and the nomadic nature of some fleets, it will be relevant to all devolved nations, which suggests all would be keen to participate. It may therefore be that option d) is most likely for industry participation. Northern Ireland, Scotland and Wales each have what could be termed 'national' groups to represent scallop interests. England could develop such representation, e.g. through the NFFO, or the Shellfish Association of Great Britain (SAGB).

Each national industry body could be required to ensure that processors and the currently under-represented sub-groups (small scale and non-sector) in their home nation are informed and can engage with those representative bodies. This may require some financial assistance to support the operation of national meetings linking into UK meetings and to increase engagement efforts with all sectors.

4.3 Opportunities

Overall the current representational arrangements have evolved to address needs and those consulted say they are reasonably well informed and well represented. There is recognition that small scale vessels and non-sector vessels are under-represented in many industry representative groups. This may be because some are difficult to engage with and others do not want to be involved.

Mandatory participation in any representative organization is not necessary unless management evolves to require this (i.e. with a greater emphasis on self-policing and cost recovery).

There is not an evident need for UK-wide representation with the present management regime.

Should a UK management plan be developed, it may be expected to be steered by a multi-stakeholder group. This would require effective UK-wide industry participation, which may be best provided through national industry representative groups.

National industry representative groups exist in all but England and this could be addressed through the establishment of an English scallop committee under the NFFO or the SAGB along the same lines as in Scotland.

These national groups should be encouraged (and financially assisted) to see that all industry stakeholders (inshore and offshore vessel interests and buyers/processors) are informed and have the option to engage with the group.

5 Biological status of scallop stocks

5.1 Current status and trends

5.1.1 Scallop distribution

King scallops (hereon scallop) have distinct habitat preferences of muddy sand, sand and fine sandy gravel and are present from extreme low-water down to 100m depth, most commonly from 20-70m. Scallop are filter-feeding bivalve molluscs with a preference for moderately strong tidal flows and reduced exposure to strong wave action.

Around the UK scallop distribution is aggregated in some areas (Irish Sea, west coast of Scotland, English Channel) and invariably patchy in others (east coast of Scotland and England and Welsh coast).

Scallops are hermaphrodites (i.e. both male and female) and can become reproductively mature at approximately 3 years (60mm to 90mm in shell length). Spawning occurs from April to September. Recruitment is generally highly variable between years and mixing (heterogeneity) between aggregations is speculated to be dependent on inter-annual variability of oceanic currents.

After an initial phase (approximately 30 to 40 days) in the plankton, maturing and adult scallops are considered to be relatively sedentary (Marshall and Wilson, 2009) with little mixing of adults across larger areas (Orensanz et al., 2006). Although largely sedentary, adult scallops can swim using water jets ejected around the hinge of the shell and use this unusual movement as an escape strategy (Marshall and Wilson, 2009).

5.1.2 UK scallop stock boundaries

Marine Scotland scallop assessment areas, the English Channel assessment areas, Irish Sea and North Sea assessment areas are provided in Figure 17.

Stock assessment areas have been defined through a range of methods, including by analysing VMS data to define distinguishable fishing grounds/zones (Scottish areas), and through biological analysis (English Channel).

The English Channel has been divided into 6 stock assessment areas. This is based on knowledge of (Bell et al, 2018):

- Evidence of transport and distribution of scallop larvae;
- The largely sessile behaviour of post-larval scallops;
- Sporadic (rather than regular) larval interchange;
- Regional differences in growth rates; and
- Regional differences in fishery management.

Of note, for the Western English Channel evidence of slow growing inshore areas around Cornwall, faster growing areas around Lyme Bay and the presence of offshore scallop beds appear to have been key in defining these stock assessment areas.

The defined Scottish stock assessment areas have not been informed by regionally specific biological evidence, such as growth rates. Instead, assessment areas are defined on the basis of ICES statistical areas, with the delineation of areas historically informed by VMS data indicating specific scallop fishing grounds (this is informally reviewed regularly to ensure assessment areas remain appropriate).

In reviewing the approaches used for defining stock assessment areas, it is considered by this report that if management is to be responsive to the status of stocks, then defined boundaries that are supported by biological evidence is preferential over other methods.

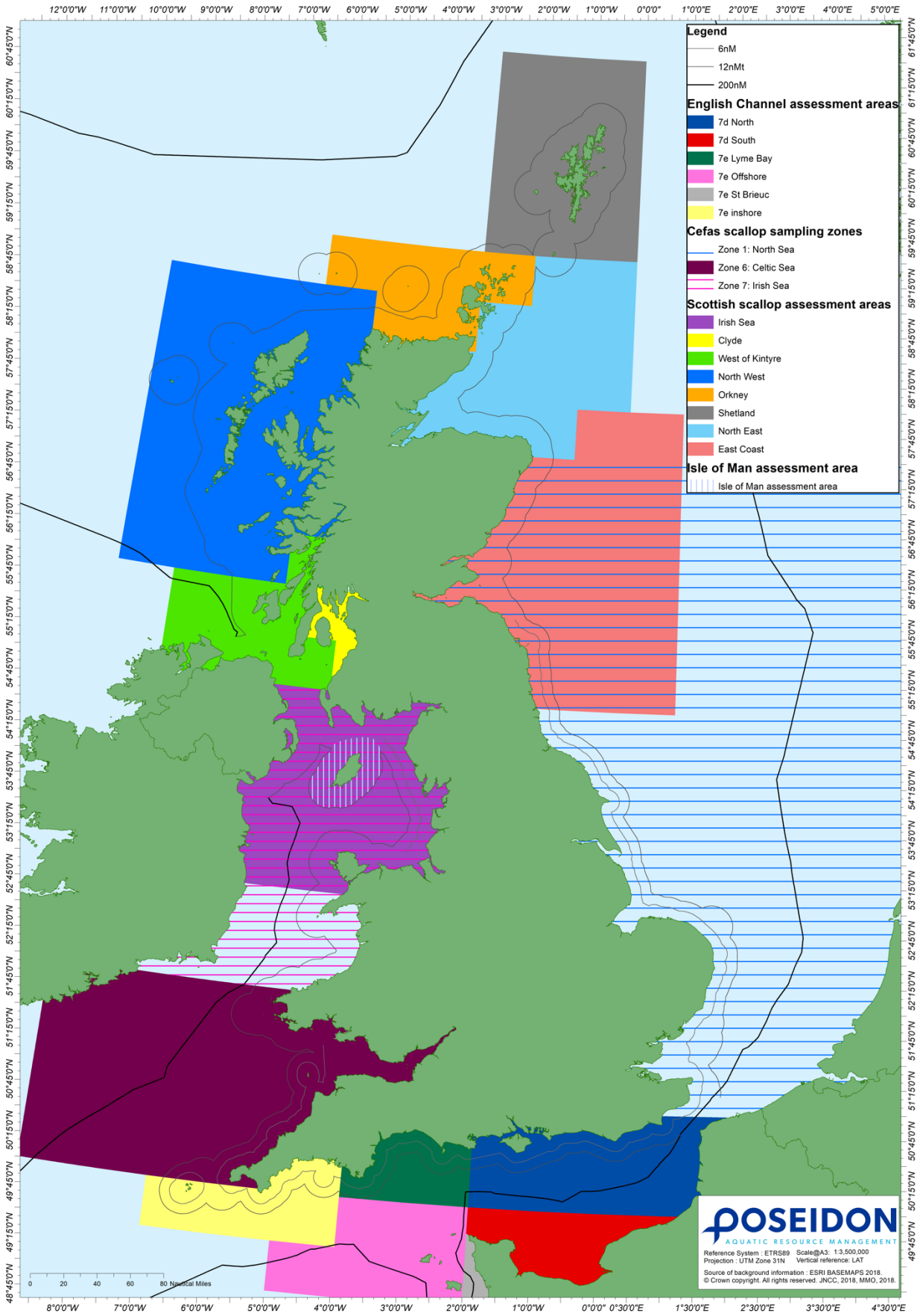


Figure 17: UK Scallop assessment areas

5.1.3 UK scallop stock assessments

Details of stock assessments that have been undertaken around the UK are summarised in Table 1, including assessment methods, stock status, fishing mortality and advice where available.

Table 1: Summary of stock assessments and status for scallop fisheries targeted by UK vessels

Stock	Fishery	Assessment method	Stock status	Fishing mortality	Advice
7.e.I Western English Channel Inshore Cornwall (Cefas: Bell et al, 2018)	UK vessels including large (≥15m) vessels with extensive operating range and smaller (10-15m) vessels with (generally) more localised range.	Dredge surveys in the main fished beds (with survey catch rates converted to absolute biomass via a gear-efficiency coefficient). In addition, underwater TV survey undertaken in non-dredged regions.	Estimated total harvestable biomass (from dredge and UWTV surveys): 16,965 tonnes	Fishing mortality (F) = 0.45 Harvest rate (HR) on dredged portion of stock (Cohort model): 35.3% HR range (for entire stock area incl. UWTV survey): 16.2-20.9%	Target HR for dredged portion of stock to achieve MSY proxy: 24.5% Current F and HR on dredged portion of stock are above that which would achieve MSY.
7.e.L Western English Channel Lyme Bay (Cefas: Bell et al, 2018)	UK vessels including large (≥15m) vessels with extensive operating range and smaller (10-15m) vessels with (generally) more localised range.		Estimated total harvestable biomass (from dredge and UWTV surveys): 6,465 tonnes	F = 0.42 HR on dredged portion of stock (Cohort model): 32.5% HR range (for entire stock area incl. UWTV survey): 21.0-28.4%	Target HR for dredged portion of stock to achieve MSY proxy: 21.0% Current F and HR on dredged portion of stock are above that which would achieve MSY.
7.e.O Western English Channel Offshore (Cefas: Bell et al, 2018)	UK vessels including large (≥15m) vessels with extensive operating range and smaller (10-15m) vessels with (generally) more localised range. Fleet of smaller French vessels fishing inshore and targeting Baie de Saint Brieuc (which is outside the Offshore assessment area).	Dredge surveys in the main fished beds (with survey catch rates converted to absolute biomass via a gear-efficiency coefficient)	Estimated harvestable biomass (from dredge survey areas): 12,622 tonnes	F = 0.35 HR on dredged portion of stock (Cohort model): 28.6%	Target HR for dredged portion of stock to achieve MSY proxy: 32.8% Current F and HR on dredged portion of stock support achieving MSY.
7.d.N Eastern English Channel North (Cefas: Bell et al, 2018)	UK vessels including large (≥15m) vessels with extensive operating range and smaller (10-15m) vessels with (generally) more localised range.	Dredge surveys in the main fished beds (with survey catch rates converted to absolute biomass via a gear-efficiency coefficient)	Estimated harvestable biomass (from dredge survey areas): 18,726 tonnes	F = 0.65 HR on dredged portion of stock (Cohort model): 48%	MSY candidate: 25% Current F and HR on dredged portion of stock are well above that which would achieve MSY.
7.d.S Eastern English Channel South (Cefas: Bell et al, 2018)	UK vessels including large (≥15m) vessels with extensive operating range and smaller (10-15m) vessels with (generally) more localised range. Fleet of smaller French vessels fishing inshore in southern part of English Channel and targeting Baie de Seine.	No UK assessment. IFREMER routinely assessed Baie de Seine part of 7.d.S	N/A	N/A	N/A

Stock	Fishery	Assessment method	Stock status	Fishing mortality	Advice
Baie de Seine IFREMER (ICES, 2017)	IFREMER assess the Baie de Seine scallop annually, using data collected during a summer scientific survey. In 2017, the COMOR47 survey undertook 171 dredge hauls within Baie de Seine (located in French territorial waters) and the "Near Outside"		The results of the assessment show, for all the areas surveyed, the best recruitment ever seen in the historical dataset, a better number of adults than previous years.		The exploitable biomass is estimated at 48,572 and 18,783 tons, respectively to the Baie de Seine and the "Near Outside"
Scotland East Coast (Marine Scotland Science: Dobby et al, 2017)	Fleets targeting the east coast include 14 vessels operating year-round from Aberdeenshire ports from Fraserburgh to Montrose, 15 nomadic vessels (14-32m) from Isle of man, English Channel and Scarborough.	Time Series Analysis (TSA) Using catch-at-age, catch, biological and survey data.	SSB increased during 2000s but has been declining since 2013. SSB in 2016 (total over ages 3–10+) = 9728 t. SSB is currently below the last ten-year average, but around the time-series average (since 1991)	Fishing mortality declined from 2000 to 2011, but since then has doubled. F in 2015 (average over ages 4 – 6) = 0.225 Models predict F in 2016 to fall to 0.16, which is just above the time series average.	There are no reference points for this stock. MSS advice is for no increase in effort; safeguard spawning stock at a level that will support Maximum Sustainable Yield (MSY).
Scotland North East (Marine Scotland Science: Dobby et al, 2017)	Fleets targeting the north east coast include 29 large (>12m) nomadic Scottish vessels targeting the inner and outer Moray Firth, and also to the east of the northern Orkney Isles.	Time Series Analysis (TSA) Using catch-at-age, catch, biological and survey data.	SSB has decreased from its peak in 1994 to 1998, at which point SSB steadily and gradually increased up to 2013. Since 2013, SSB has declined sharply and in 2016 was below the time-series average. SSB in 2016 (total over ages 3-10+) = 9,275 t	Fishing mortality, F in 2015 (average over ages 4-6) = 0.132. While fishing mortality has overall increased from 1984 to 2016, it has fluctuated greatly over this time period. Current F (2015) is around the 5-yr, 10-yr and time-series average.	
Scotland – Shetland (North Atlantic Fisheries College, NAFC, 2017 and Marine Scotland Science: Dobby et al, 2017)	Small inshore vessels operating within 6 nautical miles under licence from the Shetland Shellfish Management Organisation (SSMO)	Virtual Population Analysis (VPA) Using size-at-age data from landings and stock surveys.	Stock abundance has fluctuated around 65 million scallops from 2005 to 2015. Stock biomass has declined since 2012.	Target reference point for LPUE: 25.91 scallops per dredge hour Currently LPUE is fluctuating around the TRP.	MSS advice is for no increase in fishing effort and consideration of measures to protect spawning stock.
Scotland - North West (Marine Scotland Science, 2017)	Fleets targeting the north west area include 10 (>10m) vessels operating locally and 6 nomadic vessels from Oban and Isle of Man.	Time Series Analysis (TSA) Using catch-at-age, catch, biological and survey data.	SSB peaked in 2000 and then fell to 2007, since then it has grown steadily to reach 17,581 t in 2016. It is currently above the time-series average.	F in 2015 (average over ages 4-6) = 0.141	There are no reference points for this stock. While recent recruitment has been high and fishing mortality stable, at or below long term average, the MSS advice is for no increase in effort.
Scotland - West of Kintyre (Marine Scotland Science: Dobby et al, 2017)	Fleets include 15 vessels (9.9m to 20 m in length) targeting the area regularly; 3 local (<10m) vessels; and up to 6 vessels from the Isle of Man.	Time Series Analysis (TSA) Using catch-at-age, catch, biological and survey data.	SSB in 2016 (total over ages 3-10+) = 10,451 t Recruitment has increased since 2000, highest SSB recorded in 2012, since then SSB has remained relatively stable.	F in 2015 (average over ages 4-6) = 0.144	

Stock	Fishery	Assessment method	Stock status	Fishing mortality	Advice
Scotland – Clyde (Marine Scotland Science: Dobby et al, 2017)	2-3 large vessels from Campbelltown, a number of <12m vessels from Girvan, Stranraer and Tarbert, 6 vessels from the Isle of Man.	Lack of survey data and limited port sampling pre 2011 means that the time series is not long enough to allow a stock assessment to be undertaken.	Unknown	Unknown	Not available
Irish Sea (Marine Scotland Science: Dobby et al, 2017)	Fleets targeting the Irish Sea include 18 large (14-24m) nomadic Scottish vessels targeting Luce Bay, Burrow Head and around Isle of Man.	No surveys have been undertaken by MSS and age composition data are insufficient for an analytical assessment.	Unknown	Unknown	Not available
Scotland – Orkney (Marine Scotland Science: Dobby et al, 2017)	Three local vessels which work year-round, plus an additional visiting vessel at various times of the year	Insufficient data for an analytical assessment and no surveys in this area	Unknown	Unknown	Not available
North Sea Cefas, red-bag scheme, 2014 **Irish Sea** Cefas, red-bag scheme, 2014	Samples were to be collected by commercial vessels, passed to processors and the flat shells retained for Cefas. 7 sampling areas were established, but only data for two areas were sufficient to allow analysis		Insufficient data to model stock	Unknown	Not available
Irish Sea and West of Scotland AFBI, Northern Ireland (ICES, 2017)	Fleets targeting scallops landed into Northern Ireland include 59 vessels, 53% are under 12m in length. ICES rectangles 37E4 and 37E5 have highest landings.	Approximately 40 stations are surveyed annually. Four dredges are towed for 30 minutes at each randomly selected station. All scallops which are caught are aged, length recorded and total weight, muscle weight and gonad weight taken.	Stock not modelled. Results show that of 15 sampling stations, one has consistent catch records from 2016 to 2017, 7 show a decrease in catches and 7 show an increase in catches.	LPUE shows an upward trend in tonnes/day between 2000 and 2016	Not available
Irish Sea Welsh survey (ICES, 2017)	Early stage stock assessment is conducted as a delay-difference model. It is intended that age data will become incorporated to implement an age-structed cohort-based model. The advice provided from this stock assessment will take in to account environmental damage, by incorporating an environmental limit which will be based on research indicating the maximum amount of dredging that could be tolerated by a particular area.			Unknown	Not available
Isle of Man territorial waters (Bangor University, 2017)	94 vessels from Isle of Man, Wales, Scotland, England and Northern Ireland have licences to fish within Isle of man territorial waters (3-12 nmiles), and 42 vessels within 0-3 nmiles.	Based on recruitment and length-based abundance indexes informed by survey	Stock modelled using ICES data poor stock methods, analytical assessment methodology to be used for 2018/19. Evidence of recruitment impairment found.	Found to be high	Advice for TAC: 2563 t (including a precautionary buffer of 20%). Actual TAC adopted: 3,202 t (with no buffer).

The lessons from the above are that:

1. The UK are key participants (16 of the 27 members) in the ICES Scallop Assessment Working Group (WGScallop).
2. With the exception of some Scottish stocks, the status of UK scallop stocks is still largely unknown. There is renewed activity in this area, for instance the stocks in the English Channel are in the final stages of assessment, thus providing a first benchmark for establishing a time series for this area (Bell *et al*, 2018).
3. Related to the point above, as yet there are no stock status reference points for any UK scallop stocks e.g. target or limit reference points. This is a key tool in enabling adaptive management (see next).
4. Discussions with stakeholders suggested that a move to adaptive management e.g. where fishing mortality is controlled based upon agreed reference points is essential in order to limit the boom and bust cycle associated with many marine fisheries.
5. It is noted that the inclusion of both the English Channel fishery (under a UK Fisheries Improvement Project, PUKFI stage 1) and all other English and Scottish scallop fisheries (in PUKFI stage 2) will support the move towards the development of coherent harvest strategies and control rules that will provide the basis for adaptive management of these fisheries in the future.

5.2 Issues and developments

5.2.1 Developments

The English Channel scallop stock assessments undertaken by Cefas (Bell et al, 2018, see Table 1) represent the first set of results from a highly collaborative project between the fishing industry and government fisheries scientists in English waters. The scallop industry (catchers and processors) worked with Cefas in designing data collection methods for undertaking dredge and underwater TV surveys. The surveys will occur annually allowing regular stock assessments for these defined areas in the English Channel; this will be fundamental to support and inform future scallop management decisions.

In 2018 the scallop stock assessment project is being expanded into the North Sea and Celtic Sea. This development has been realised as a result of the industry-led agreement that the scallop industry will fund the initial annual dredge surveys via a voluntary levy administered through the UKs key scallop processors.

In addition to the scallop stock assessment work, an MSC pre-assessment and subsequent Fisheries Improvement Plan (FIP) and Action Plan have been developed for the UK English Channel fishery as part of the Project UK Fisheries Improvement (PUKFI) Stage 1. PUKFI Stage 2 began in 2018 and includes scallops in Scottish waters, North Sea and Irish Sea. When developed, the FIP and Action Plans provide a program of work towards achieving MSC certification, including data requirements and required management measures to support certification.

Principle 1 of MSC covers stock status and addresses the following performance indicators:

- Stock status
- Harvest strategy
- Harvest control rules and tools
- Information and monitoring
- Assessment of stock status (i.e., assessment methodology)

5.2.2 Issues and opportunities

Consultation highlights some concern over reduced levels of stock, catches and LPUE, while others consider some inshore grounds on the west coast to have become more productive. Consultees note a cyclical pattern in scallop stocks, with good grounds rotating around the UK on a 7-8 year cycle.

The potential use of reference points is understood and encouraged by many, with a desire to manage perceived over-fishing and link management to stock status.

There can be a disconnect between stock survey results and what is seen on the ground, which is linked to the locations of surveys and gears used. This would benefit from further industry involvement, within the remits allowed within scientific survey methodology (e.g. the requirement for random samples, consistency between data-sets etc.).

In terms of financing, many consultees agree it is appropriate for industry proactively to support stock assessments, such as through a mandatory levy system. This could be through ring-fencing an additional contribution under the Seafish levy scheme.

Others consider that processors have a key-role to play in supporting this. There are 11 main UK scallop processors and 8 take the majority of scallop landings. This relatively small number of companies provides an opportunity to encourage responsible processing and promote good management of the scallop stocks. However, as not all scallops are landed through these main processors, a mandatory scallop levy, administered through Seafish is considered the most appropriate approach.

The level of scallop-specific scientific expertise within UK is recognised, across Cefas, Marine Scotland Science (MSS), Agri-Food and Biosciences Institute (AFBI), and Bangor University. Different approaches to stock assessment are used due to different data collection / availability and length of time series. For example, NAFC in Shetland use catch rates and the management system is more biologically meaningful; Cefas and Bangor University use biomass surveys, while MSS use catch rates and time series data for catch, age and juveniles to assess changes over time.

It is very difficult to adopt the same approach when different methodologies have been established and data sources are different. However, a UK-wide scallop strategy with an associated management group provides the opportunity for peer review and continuous improvement.

6 Scallop fisheries management

6.1 Current status and trends

FAO's working definition of 'Fisheries Management' is (FAO, 1997):

The integrated process of information gathering, analysis, planning, consultation, decision-making, allocation of resources and formulation and implementation, with enforcement as necessary, of regulations or rules which govern fisheries activities in order to ensure the continued productivity of the resources and the accomplishment of other fisheries objectives.

With the exception of a few regional and local examples, such as the Shetland inshore scallop fishery and the Isle of Man fishery, management planning is currently limited. Reviewing current management therefore defaults to a consideration of 'regulations' that apply to the scallop sector. Even without a management plan, the measures applied should be informed by the science and benefit from industry input. Below we consider the current measures and the actions of the management authorities.

6.1.1 EU level management

The UK is required to manage its fisheries in line with the EU's CFP and this will be the case throughout the transition period post-Brexit to 2021. The latest iteration of the CFP is EU Reg. 1380/2013, which includes objectives of stocks being at Maximum Sustainable Yield (MSY) by 2015 or no later than 2020; long-term management planning and increased regionalisation. It also requires that the precautionary approach, an ecosystem approach and that the best available scientific advice is used in decision-making.

For scallop fisheries there is no EU long-term management plan (LTMP) for this non-quota species under the Common Fisheries Policy (CFP) and there is no regional or UK-wide management plan for the species or the sector. The CFP regulation states that "*For stocks for which no multiannual plan has been established, exploitation rates delivering maximum sustainable yield should be ensured by setting catch or fishing effort limits. If available data is insufficient, fisheries should be managed by using approximative parameters.*"

Scallops are not subject to an EU Total Allowable Catch (TAC), but there are management measures in the form of technical regulations and effort regulations, which are briefly described below.

Technical regulations

Scallop dredges are exempt from many gear regulations (see EU Reg. 227/2013) as they are recognised as a highly targeted fishery and are required to justify this with not less than 95% of landings being bivalve molluscs.

Detailed technical regulations have been developed by UK and devolved management authorities in relation to scallop. Table 3 summarises the complex and varying scallop gear requirements under the devolved administrations. There is a lack of harmonisation across the gear specifications introduced by the devolved administrations.

An EU-wide minimum landing size of 100mm is in place (except ICES 7a north of 52° 30′ N, 7d: 110 mm), but this has been increased to 105mm and 110mm by the Scottish devolved management regimes.

Effort management

The Western Waters Effort Regime (WWER)[5] sets out the maximum levels of annual fishing based on kW days. The WWER was designed to cap fleet activity by Member States in certain seas and certain metiers. It was not designed to control effort in relation to stock status in any of the fisheries so regulated. It is not fit for purpose as a stock management tool in the scallop or any other fishery as it does not respond to the status of stocks. Significant sectors of the Member State fleets are not included.

Since 2003, in ICES Area 7 the United Kingdom has been allocated a total of 3,315,619 kW days[6], and in ICES Area 6, the UK has been allocated 1,974,425 kW days. Effort allocation is fixed and does not change year to year. Only vessels greater than 15m in length are curtailed by the WWER (apart from in the Irish Biologically Sensitive Area). Effort (days at sea) may be traded between countries if a member state has exhausted their allocation.

[5] EC Regulation EC No 1954/2003 on the management of the fishing effort relating to certain Community fishing areas and resources and implementing regulation EC No 1415/2004.
[6] With an additional 720,000 kW days from the Baie de Seine agreement

Figure 18 illustrates how varied the effort is per vessel with 9 vessels accounting for 53% of the effort increase. Also 29 vessels show reduced effort in Area 7 compared to previous years, which to an extent offsets the increases. This indicates how flexible the current effort management regime is as vessels can opt to fish in a variety of areas (e.g. Area 7 based vessels moving from Area 7 into Area 4 and vice versa), which is attractive to operators. However, it also indicates the inability of management to closely control this activity. Vessels are likely to target certain areas where fishing is found to be better than elsewhere and therefore over the long-term a cyclical pattern develops with vessels moving between areas as LPUE reduce. This is an industry reaction to resource status, rather than precautionary management and has been a feature of successful scallop exploitation for decades.

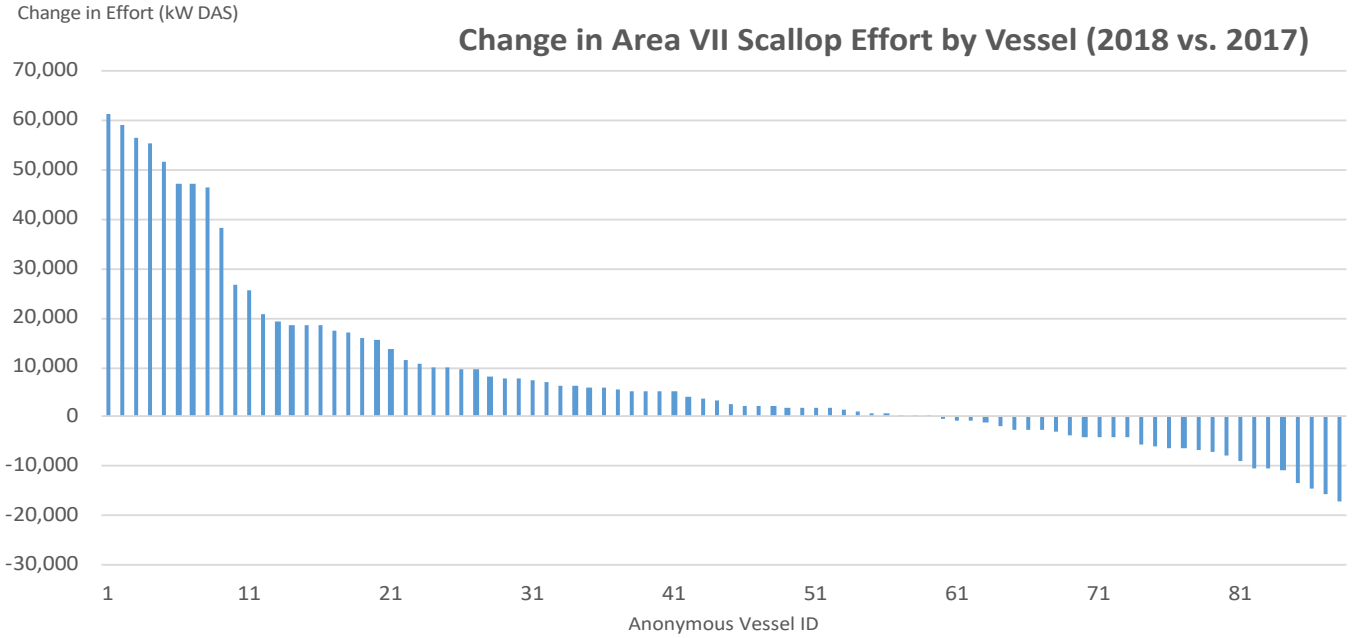


Figure 18 Change in Area VII scallop effort by vessel (2018 vs 2017) [Source: MMO]

In nearly all fisheries, management does not receive real-time information: a TAC responds to the assessed status in previous years. In the WW scallop fishery, information in terms of LPUE is relatively timely, but the status of the resource can only be assumed from this information.

The question is therefore whether the management tools available in UK scallop fisheries are responsive enough to the status of stocks and will they be applied to the extent required? Crucially the landings per unit effort are currently down, as is the value per unit effort (despite higher prices). These trends indicate that the Area 7 fishery is under pressure and management action is required. While the total days in the following quarter can be reduced in response to this, WWER is a relatively crude management tool as:

a) It only applies to over 15m vessels, which has led to growth in the under 15m sector;
b) Allocations do not relate to the fishery specific areas, only overall effort; and
c) Managing total fleet effort is not an accurate way to control the level of fishing mortality per stock.

The WWER was designed to control fleet access, it is not an effective effort management tool in its current form.

Other regulations

All EU vessels are subject to the EU control regime (1224/2009) requiring vessels over 12m to have VMS and vessels over 10m to submit daily catch logbooks to Member State authorities. There are also various general & specific regulations relating to hygiene, food safety, transportation and labelling of food stuffs, but the focus in this section is on fishery management.

6.1.2 UK Management

Fisheries is a matter that is overseen by the UK's Department for Environment, Food and Rural Affairs (Defra), but it is a devolved matter within the UK (with the exception of WWER). The UK must ensure the EU's CFP is applied through its legislature and this is set out (along with fisheries-related devolved regulation) in the Blue Book (MMO, 2017). These national measures do not include UK-wide management of the scallop resource: there is no UK scallop management plan.

Leaving the CFP allows a re-prioritization of fisheries management and the opportunity to apply best practice (see the Fisheries White Paper Box). This suggests that scallops, as one of the UK's most valuable fisheries located predominantly in UK waters, should be a priority for management and that the future management of scallops should be developed in line with best practice. The scallop fishery requires a UK-wide strategy and appropriate long-term management planning that relates to the biological status and extent of the stocks.

Specific legislation and management arrangements have developed to manage scallop fisheries in each home nation as well as the Isle of Man where UK vessels regularly operate. The regulations applied in each are described below and summarized in Table 2 overleaf. The specific technical regulations associated with each are presented in Table 3 (also overleaf).

The Fisheries White Paper: Sustainable fisheries for future generations (Defra, 2018)

The Fisheries White Paper: Sustainable fisheries for future generations, published in July 2018, is a UK Government policy document setting out a range of fisheries policy matters and proposed new approaches to fisheries management. Below are some key aspects from the White Paper that are relevant for the UK scallop sector.

Western waters effort regime: Defra and MMO will also work with scientists, stakeholders and industry to develop an effective method for sustainable management of non-quota stocks in the Western Waters. This will include exploring the use of management systems such as catch limits and technical measures in place of the existing effort regime for certain shellfisheries, to determine whether these would be more appropriate for particular species and fishing methods, and more effective in achieving sustainable fisheries. The outcome overall could be a combination of new multi-species and stock specific management plans, backed up by appropriate control and enforcement including the use of modern technology such as vessel monitoring systems and cameras.

Management: Defra will review how fishing opportunities are managed in England, including use of effort systems, quota or a combination of the two approaches. It is recognised that commercial fishing opportunities are "currently regulated mainly by quota, which is the system supported by most fisheries scientists, industry representatives and other stakeholders around the world". Furthermore it notes that where effort only fisheries management systems have been used in other countries, "there are reports that key stocks have not been managed sustainably".

Technological advances are recognised as driving greater efficiency with modern smaller boats achieving higher catch rates than previously. The UK Government will "consider new criteria to define low impact inshore fishing vessels to replace the current 'under 10 metre' category." For inshore vessels this will include consideration of "a targeted scientific trial using an effort (days at sea) based regime in place of a quota regime for some low impact inshore fisheries."

Quota apportionment will continue using the established Fixed Quota Allocations (FQAs) methodology as set out in the UK Quota Management Rule. However, other methodologies will be explored, such as zonal attachment, to help inform how additional fishing opportunities might be allocated.

In addition, the UK Government will look at the establishment of a reserve quota drawing on any additional fishing opportunity in England, to be allocated by the MMO in accordance with the new criteria, through a tendering or auctioning system.

Maximum Sustainable Yield: the UK Government will continue to work under the principle of maximum sustainable yield and is committed to reaching 2020 targets to effectively regulate harvesting and end overfishing. In addition the UK Government supports the setting harvest rates that restore and maintain fish stocks at least to levels that can produce MSY. This will mean agreeing catch rates that are based on the best available science, or other precautionary management measures that conserve those stocks.

Environmental management: the UK Government will pursue an ecosystem approach to fisheries management that aims for more sustainable management and accounts for, and seeks to minimise, impacts on non-commercial species and the marine environment generally.

The UK Government seeks a proportionate approach to regulation which makes sure that those who are compliant are able to fish and those that are not cannot; and that those who have the highest impact on stocks and ecosystems will be subject to the tightest requirements.

Data: the UK Government seeks to use technology to support the collection and use of data and information to develop a much more transparent regime, learning from coastal states such as Norway, Iceland and the Faroe Islands.

Table 2 Scallop fishery management measures in UK's devolved administrations and the Isle of Man

Administration & Latest reg. year	Entry limits	MLS (mm)	Seasons (open)	Curfew	Closed Areas
England (MMO) 2012	UK license	100 and 110*	No	No	Irish Sea closed area. & IFCA bylaws.
Northern Ireland (DAERA) 2008	UK license	110	1st November to 31st May	Monday to Friday and between the hours of 0600-2000	Strangford Lough to protect *modiolus* since 2003
Scotland (MS) 2017	UK license	105**	No	No	None specified
Wales (WAG) 2010	UK license 221kW engine limit	110	1 June, / 1 May to 31 October.	No	Within 1nmile of baseline. And numerous specified bay areas.
Isle of Man (DEFA) 2016	IoM license, VMS, Bag limit reporting	110	1st Nov to 31st May	6am to 6pm	5 closed areas for stock recruitment

* The MLS is set by the EU Tech Con 850/98.
Whole area, except ICES 7a north of 52º 30′ N and 7d: 100 mm. ICES 7a north of 52º 30′ N and 7d: 110 mm
**Likely to increase to 110mm soon, except Irish Sea and Shetland (where 110 already applies)

Table 3 Scallop fishery technical regulations in UK's devolved administrations and the Isle of Man

Administration	Reg year	Max no. dredges (total)	Tow bar max length (m)	Teeth per dredge	Min tooth spacing	Dredge width	Belly ring	Netting cover min mesh
England (MMO) **(Additional IFCA byelaws out to 6nm.)**	2012	16 (to 12 nm)	5.5	9 (outside) or 8 (inside) relevant area [1] & teeth are ≤12mm. 6 (if less than 80cm width)		85cm		
	Other gear requirements: each dredge not to exceed 150kg. No more than one row of belly rings. Each tooth no more than: (a) 22 mm if dredge of 80 cm or more in width; or (b) 12 mm if < 80 cm in width.							
Northern Ireland (DAERA)	2008	12	5.5	9	75mm	915cm aggregate width	75mm	100mm
Scotland (MS)	2017	16 (0-6nm) 20 (6-12nm) 28 (>12nm)	7.5					
Wales (WAG)	2010	6 (1-3nm) 8 (3-6nm) 14 (6-12nm)	3 (1-3nm) 4 (3-6nm) 6.8 (6-12nm)	8 (22mm in dia and 110mm in length)		85cm wide max dredge width.		
	Other gear requirements: 150kg Max dredge weight.185mm max dia. tow bar.							
Isle of Man (DEFA)	2010		185mm	9	75mm	0-3 762cm agg. 3-12 1067cm agg	75mm	100mm

[1] "the relevant area" means that part of ICES division 7a which is north of the line 52° 30N but outside the Scottish zone, and all of ICES division 7d.

The recent revision to scallop regulation in Scotland sought to remove latent capacity and increased the MLS from 100 to 105 with the intention of moving to 110mm. Regional measures are to be developed and applied through three Regional Inshore Fishery Groups (RIFGs) established in 2016 and management groups in Orkney and Shetland. These will propose either voluntary management measures or they will advise Marine Scotland where statutory measures are required. An early example of how this devolved management can work is the voluntary closure of Loch Sunart by the West Coast RIFG in advance of legislative changes by Marine Scotland. The RIFG also has an objective to explore scallop management options in west coast waters and the Clyde[7]. An exception to this RIFG model is operating in Shetland where Marine Scotland has devolved management powers to the Shetland Shellfish Management Organisation (SSMO) under a Regulating Order. The local management applied in Shetland is proving to be successful and (despite a recent NGO objection to its re-assessment[8]) remains the UK's only MSC-certified scallop fishery.

Marine Scotland also develops area-specific Fishery or Marine Conservation Orders that may include the exclusion of scallop dredging in certain areas, for example Lamlash Bay, Luce Bay and Sands and South Arran MPA. These are spatial management measures relating to environmental objectives rather than fisheries objectives as they relate to preventing benthic impact on habitat features by fishing.

In England further byelaws affecting scallop fishing are developed by a number of the regional Inshore Fisheries and Conservation Authorities (IFCAs) and apply out to six nautical miles[9]. For example, in Cornwall, a maximum boat limit (16.46m) and a curfew (7pm-7a) are applied to scallop vessels operating within the IFCA district. Devon & Severn also applies a curfew, along with a permit system for a seasonal fishery (July-September). Sussex has stopped dredging within 3 miles of the coast.

The technical measures set out in byelaws are not always consistent with and may be more restrictive than English national measures. For example, the Cornish 'Methods of fishing (dredges) byelaw[10] stipulates no more than 6 dredges a side rather than 8 (or 6 if dredges are less than 80cm width) and a towing bar of less than 5.18m instead of 5.5m. It also imposes other technical restrictions where the English regulation does not set specifications such as belly ring diameter of 75mm and mesh size of 100mm. The latest iterations of IFCA byelaws are reviewed against existing local and English regulations to try and ensure there is no inconsistency or conflict. Nevertheless, these layers of regulation with varying technical, seasonal and spatial restrictions make for an overly-complex regulatory framework.

National or regional regulations may also specify area closures that are associated with European marine sites (Natura 2000 sites) or Marine Conservation Zones (MCZs) if sites have interest features that are considered vulnerable to scallop dredging. These area closures are specifically to address environmental objectives and the management of scallop vessels in relation to these is considered in Section 8.

There are currently few examples of area closures for fishery objectives, other than in the Isle of Man where a number of bays have permanent or seasonal closures. There are five areas in the Isle of Man already designated as Fisheries closed or Restricted areas for the enhancement of scallops. Very limited fisheries are permitted in these areas, mainly to provide information to inform management of the areas. The NI industry recently proposed three re-seeding sites and a fourth potential site in inshore areas to better ensure recruitment to NI fisheries (AFBI, 2017).

It should be noted that the multi-jurisdictional nature of Irish Sea fisheries area, combined with numerous stock assessment boundaries within the Irish Sea (including those considered by Marine Scotland Science, Isle of Man and Cefas, see Figure 17), has led to a complicated management situation.

The most advanced stock assessment in the Irish Sea is undertaken in Isle of Man territorial waters, with subsequent TAC set for this area. However, the stock structure of scallops within the Irish Sea has not been formally delimited, leading to a potential mismatch between fisheries management (TAC for Isle of Man territorial waters) and stock boundary (Irish Sea).

[7] RIFG Newsletter, Spring 2018. http://ifgs.org.uk/files/3315/2293/2006/rifg-newsletter-spring-2018.pdf
[8] https://www.theguardian.com/environment/2018/jun/20/shetland-scallop-fishery-retains-eco-label-despite-dredging-protests
[9] A 2017 submission by the Association of IFCAs has proposed extending their remit out to 12 miles when the UK leaves the EU. http://www.association-ifca.org.uk/Upload/IFCA%20future-management-Final%20.pdf
[10] https://secure.toolkitfiles.co.uk/clients/17099/sitedata/Byelaws%20and%20orders/Cornwall_SFC/Methods-of-fishing-dredging-.pdf

Isle of Man Scallop Management

The Department of Environment Food and Agriculture (DEFA) manages fisheries in the territorial waters of the Isle of Man (out to 12nm), including important queen scallop (*Aequipecten opercularis*) as well as king scallop fisheries. A 2012 Fisheries Management Agreement between the IoM government and the devolved administrations of the UK sets out how the Isle of Man's extended territorial sea (3-12nmiles) should be managed, i.e. in compliance with the CFP and allowing fair access to UK vessels, which is reciprocated.

DEFA recently noted that "There is strong evidence to indicate that the Isle of Man king scallop fishery has expanded significantly, with year-on-year increases in vessel numbers and landings and a corresponding decrease in landings per unit effort (LPUE)." As a result, management of the king scallop fishery was the subject of a DEFA consultation in the spring of 2016 considering management in the 0-3 mile nautical mile zone and the 3-12nm zone (the extended territorial sea) separately.

The intention of the 0-3 nm zone is to apply a zoned management approach to both protect sensitive habitats and scallop nursery areas. DEFA recognised the need to limit effort within the 0-3 zone. To limit effort there has been more restrictive licensing of this zone since 2016 and the Isle of Man Government approved the development of an inshore zoned model incorporating a marine nature reserve, within which two primary zone types will be included; 'Conservation' and 'Fisheries Management'. Of these areas, Niarbyl Bay and Laxey Bay (a combined area of 950 hectares) were closed in 2009 and were reseeded with over 200,000 juvenile scallops in a ranching project. In 2018, a series of nine Marine Nature Reserves were created, within which the use of mobile gear is prohibited (these include the previous Closed Areas). At present, Ramsey Bay Marine Nature Reserve is the only MNR which has a specific Fisheries Management Zone, which is managed by the Manx Fish Producers Organisation.

For the 3-12nm zone DEFA sought to reduce latent capacity in the fleet and current effort levels. Curretnly, 91 vessels are licenced to fish for scallops within the 3-12nm, 32 of which are Isle of Man registered. The majority of the remainder are either Northern Irish or Scottish. The requirement to land to Manx ports was proposed in December 2017 as a means of effectively controlling the daily catch limits set. However, after concerns were raised by the UK Fisheries Administrations on the potential impact of this measure on licenced vessels from other jurisdictions, this was rescinded. Instead, electronic reporting, regular at sea inspection and strong sanctions (6 licenses have been suspended to date for mis-reporting) help to ensure visiting vessels comply with the bag limits.

In contrast to other scallop fisheries around Britain and Ireland, the IoM fishery sets a TAC (of 3,203t for 2017/18) with daily catch limits to spread the fishery over the 7 months of the fishing season. All IoM scallopers are part of the Manx Fish Producer Organisation (MFPO).

6.1.3 Joint management

The French scallop sector recently submitted a proposal for a joint management framework including the Baie de Seine fishery in the French EEZ, but not inside the French 12 nautical mile limit. This proposed extending the closed season for all UK vessels (including under 15m vessels); change in size of rings on dredges; and using the landing obligation for scallops. Discussions are ongoing and Defra is about to launch a consultation. Such discussions are a necessary part of responsible joint management and should be fully engaged with. The alternative is more limited access to stocks outside UK waters, which has economic consequences for those vessels currently engaged in those fisheries.

6.1.4 Management elsewhere

A 2010 review of scallop management considered case studies in North America, Australasia and France. These provide positive examples of improved management of scallop fisheries using a variety of tools: some move to quota, others retain effort as the primary tool. Within this variety of management approaches, a number of underlying principles across all case studies were noted (B D & J S Beukers-Stewart, 2010):

1. Stock biomass should be built up.
2. The age structure of the population should be improved so that scallops remain in the water longer to mature and reproduce. This provides population resistance to disturbances such as fishing pressure, disease and environmental changes.
3. New recruits and juveniles must be afforded protection, they represent the fisheries future.

4. Either management regimes need to be rigorously enforced (e.g. the North East American fishery) or fishers need to be involved in the management of their fishery and preferably be afforded a level of ownership of the resource on which their livelihoods depend (e.g. the Canadian and New Zealand fisheries).
5. Mapping complex benthic habitats has been used in many of these examples to allow best spatial management of resources.
6. In most cases by-catch reduction measures were in place.

For all the case studies reviewed, the authors found that successful management:

- Responded to the status of the resource (as identified by science as well as industry indicators);
- Had to make difficult decisions in terms of capping effort and then bringing it into line with what the fishery could sustain.

The authors went on to note that "one of the fundamental problems with the [UK] fishery at the moment is that there is no ownership of the resource by the fishermen and they therefore compete to catch the most fish.". It led to them recommending "a UK management plan for the 0-6nm sea area that is set within a framework of zones considering all users." The proposed structure would ultimately reflect the devolved nature of fisheries in the UK: a UK-wide overarching plan setting in place common objectives, principles, minimum standards and guidance on good practice; more regionalised plans reflecting the scallop populations and management jurisdictions (i.e. IFCAs in England, Regional Marine Plans & IFGs in Scotland; national plans for Northern Ireland and Wales).

6.2 Issues and developments

6.2.1 Management objectives

Even though the UK is leaving the EU's CFP, it will continue to have international commitments requiring it to manage fish stocks sustainably, including the UN commitment to maintaining or achieving exploitation levels in line with MSY.

Other coastal states such as Australia, have sought to progressively manage their fisheries towards Maximum Economic Yield (MEY); encouraging fishing to the most profitable level, which generally means at a lower level of effort (typically 10-20% less than at MSY). The policy decision between MSY and MEY is a socio-economic one; authorities may choose MEY as it should not only suit those operators remaining within the sector, but also the most efficient fishery suggests the smallest fishing footprint. Conversely policy-makers may choose MSY as it is the maximum fishing possible at a sustainable level and so gives the largest fishing opportunities, which could then be allocated to the largest number of operators.

In the short-term at least, MSY targets are expected, which could then transition to MEY in the longer term when MSY is achieved.

To achieve a harvest strategy of the scallop stocks being at or above MSY requires that:

a. The science & information is sufficient to measure MSY and current fishing mortality (F) and stock levels in relation to MSY reference points and

b. The harvest control rules applied to the fishery are adequate (sufficiently robust and responsive) to maintain those levels.

In relation to (a) the science on many UK scallop stocks is improving, but there is still more to be done to adequately inform management. In relation to (b) the tools currently used (effort management through licensing, curfews, a MLS and the WWER) are not adequate.

6.2.2 Management tools

Input controls (such as licensing and effort management) and output controls (such as quota) are part of a suite of management tools. None can be expected to be effective if they are applied in isolation without a comprehensive management framework where all of the management elements are considered.

The priority is for a comprehensive scallop management framework to inform fishery-specific management plans. These can then inform management groups which tools should be applied. It will be clearer what tools would be effective and which of these stakeholders involved consider workable when specific scallop management plans are being formulated. Until that point, any decision on specific management tools is simply theoretical and based on experiences in other fisheries.

A UK-wide management strategy may well not advocate one management measure over another for plans to use, but may point out the pros and cons of each in the context of UK scallop management.

6.2.3 Fleet definitions

Certain management objectives may lead to differentiated management between sections of the fleet. This may be in terms of large and small vessels or vessels in different regions (England and Scotland) For social objectives, some authorities may wish to avoid consolidation in the small-scale fleet, perhaps through the allocation of regional inshore or community effort/quota. In so doing, management must determine what is the most appropriate categorization of small and large vessels. They must also ensure measures are in place in all sections of the fleet.

6.2.4 Technical regulations

The current variety and complexity of dredge gear specifications across UK devolved legislation is unnecessary. The impact of some gear specifications on selectivity or seabed impact can be comparatively small and being overly prescriptive removes the incentive to develop new dredge gear and prevents subsequent adoption of new gears.

6.3 Opportunities

There is a major opportunity (and indicators suggest it is a necessity) to improve scallop fishery management so that it is responsive to the state of stocks.

Brexit creates a timely occasion to focus management priorities for the UK fishery. Scallop is the third most valuable fishery behind mackerel and *Nephrops*, which will both be subject to international agreement when the UK is an independent coastal state. Scallop fisheries should therefore be a top priority for UK-based management.

There is also a need for bi-lateral joint management agreements on stocks fished outside the UK EEZ such as the Baie de Seine and Isle of Man fisheries.

The improving science associated with scallop stocks creates the opportunity to identify appropriate biologically-based scallop management units. This is exemplified by the ongoing Fishery Improvement Plan (FIP) for Channel Scallops that is developing sustainable harvest strategies based on improved assessment advice.

Individual scallop management units would require their own long-term management plans (LTMPs) that could be guided by a UK-wide scallop management strategy that is consistent with the UK fishery policy: setting high level objectives relating to the stock and the sector; and advocating best practice in terms of management tools and oversight (appropriate stakeholder participation within fishery management groups).

In the short term, improved management of the scallop fishery could build on existing management, which to an extent is effort-based (scallop entitlements and the WWER). There should therefore, at a minimum, be substantial revision to the current management regime while longer term plans are being developed for defined scallop stocks. A transitional arrangement could see the revision of UK scallop entitlements to new area-based entitlements, which could also remove latent capacity or curtail the risks associations with activation in stock areas already under pressure. The WWER post-Brexit could evolve into an effort management regime that (a) includes all scallop vessels, (b) extends to all other areas, and (c) is be responsive to the state of stocks in those areas.

These refinements to the effort system seem to point to the need for allocation of a limited effort pot between specific fishing areas and specific fleets. This allocation should of course be equitable and applicable to the entire fleet, which is only likely to occur through industry involvement in fishery management groups. A UK-wide scallop group could propose the fundamental principles of effort allocation, with the actual allocations advised by specific scallop management groups, with scientific support.

In the long term, however, LTMPs should be developed for managing specific scallop stocks, and any transitional arrangements should not be at the expense of developing effective long-term management. The management groups associated with each LTMP should determine the most appropriate management tools to effectively deliver the agreed harvest strategies. Those harvest strategies should at a minimum relate to the MSY of the particular scallop stock but could ultimately be set to target the Maximum Economic Yield (MEY)[11].

[11] The difference between MSY and MEY: MSY is focused on sustainable harvest levels that generate the largest quantity of sustainable catch (i.e. maximises revenue), while MEY is focused on sustainable catch or effort levels that creates the largest difference between total

The revision of UK scallop management also allows the technical regulations in place throughout the UK to be re-examined. Some gear specifications have a limited effect on selectivity or seabed impact (compared to spatial management). The introduction of a UK scallop strategy and LTMPs also provides opportunities for the simplification and harmonisation of technical regulations on scallop gear used across the UK's devolved administrations. These presently are overly prescriptive, complex and disjointed. Regulations should be simplified and harmonised wherever possible with gear technical specifications only set where necessary to avoid confusion and constraints on gear innovation. Re-defining technical regulations should not constrain gear development and subsequent adoption by regulators and the fleet, but innovations should be linked to improving stock status and/or minimising environmental footprint.

7 Gear conflicts

7.1 Current status and trends

Scallops prefer clean sand, sandy gravel or fine gravel substrates with 1-2 knots current in less than 100 m water depth. This environment is also suitable for many other invertebrates and finfish and can be important for both other mobiles gears such as bottom trawls, as well as static gear e.g. pots and anchored gillnets. This inevitably leads to the potential for conflict between mobile and static gear, particularly in inshore areas. The consequences of gear conflict are many. This includes gear loss, resulting in both *economic losses* from time searching for lost gear and if necessary its replacement, as well as the *environmental impacts* of lost gear, including ghost fishing, habitat degradation and the contribution to marine plastic load (Macfadyen *et al*, 2009).

There are no statistics on the frequency or nature of fishing gear conflict in the UK. Discussions with stakeholders suggest that conflicts between the smaller, locally-based scallop vessels with static gear is rare, as they usually know where local potters / netters operate and have a reasonable communication network with them. In addition, much of the inshore waters, esp. in the SW and mid-Channel, are clearly zoned.

In general, most stakeholders do not think that conflict between scallop vessels and other gears in the UK is a major issue, especially as developments in navigation and communication systems, as well as the advent of social media, have all helped delineate the location of fishing gear and reduce the potential for conflict. This said, a number of stakeholders said that an increase in potting effort, and an overall reduction in fishable areas due to other pressures in the marine space (e.g. marine protected area development and wind farming in particular) suggest that drivers for gear conflict still exist. Marine Scotland (2015) also suggests that deliberate gear vandalism or theft is on the increase.

There are a number of associated issues, such as:

1. There are no statutory requirements for gear conflict or resolution. Most approaches are voluntary e.g. through best practises and guidelines.
2. Gear vandalism and theft are common law offences, but difficult to prove and prosecute successfully.
3. There are no systems to monitor or report gear conflict.

7.2 Issues and developments

Gear conflict, when it occurs, has a number of consequences that need to be considered.

7.2.1 Economic

The loss of gear, either partially or when large proportions of the gear are carried away or destroyed, represent a considerable economic loss to the fisher. These costs include replacement of the lost or damaged gear, as well as the costs of time, fuel and crew wages in both trying to recover lost gear and lost fishing opportunities. There are also costs associated with increasing gear marking efforts. One hypothetical study, based on the Western Channel gillnet fishery, estimated the economic costs of gear lost and subsequent 'ghost fishing' per vessel are over €10,456 per year, with costs for the fishing fleet as a whole estimated at slightly less than €420,000. These figures are made up of almost equal contributions from the depreciated value of the lost gear, and the lost value-added from the ghost catches (Brown *et al*, 2005). Some estimates put the cost of marine litter for the UK fishing industry at over €33 million a year (Environment Agency, 2002).

7.2.2 Environmental

Abandoned, lost or otherwise discarded fishing gear (ALDFG) may impact on the environment, including:

revenues and the total costs of fishing (i.e. maximises profit). MEY generally equates to lower harvest rates in comparison to MSY. The UK government white paper proposes MSY as the target for UK fisheries.

- **Continued catch of target and non-target species**. Fishing gear can continue to catch fish, although this depends on the state of the fishing gear when control is lost. Most gear will lose fishing efficiency over time, it may continue to fish for many years.
- **Physical impacts on the benthos**. ALDFG fragments may be dragged along the bottom by strong currents and wind, potentially harming fragile organisms like sponges and corals. Accumulation of litter in offshore sinks can lead to the smothering of seabed communities.
- **Introduction of synthetic material into the marine food web**. Plastic fishing gear will gradually disintegrate through abrasion, movement and other processes, but will exist for many years as microscopic plastic fragments and fibres (microplastics) that can be incorporated into the food chain.

7.2.3 Social

A key socio-economic impact is the navigational dangers of ALDFG to marine users. It is very difficult to rate or compare the magnitude of the wide range of socio-economic, as literature is very scarce and there are particular problems in quantifying and comparing social costs. There are both direct and indirect social costs associated with lost fishing gear. Direct costs can include an erosion in professional relationships between different fishing segments which may lead to increased potential for further conflict. Indirect costs are more associated with the social and economic costs associated with increased marine litter and subsequent ghost fishing and other environmental impacts.

Another social impact of gear conflict relates to the reputational damage of the entire non-local scallop fleet, as a result of individual gear conflict episodes. This can tarnish the entire non-local fleet, while the majority operate to avoid gear conflicts.

7.3 Opportunities

There are a number of opportunities to reduce the risk of conflict between the scallop and other fishing fleets. Many of these have been captured in the recently published 'Development of a 'Best Practice Framework for the Management of Fishing Gear' (Huntington, 2017).

7.3.1 Communication

Good communication on the location and nature of vulnerable fishing gear between different fleet segments, and between locally-based and nomadic vessels is essential. This can be in the form of informal communications between vessels fishing in a certain area or via more formal communications - usually by fishing or producer organisations - that provide periodic information on their activities and management measures (e.g. temporary closure of certain areas to other gears) as required. There are a number of barriers to such communication – a lack of information on, or access to, different stakeholders is one, and language and other cultural barriers can occur, esp. between the UK and its mainland European neighbours.

7.3.2 Monitoring systems

The use of Automatic Identification Systems (AIS) also assists communicating the identity, presence and activity of fishing vessels in the vicinity of vulnerable gear. In addition, the role out of inshore VMS (iVMS) will also enable the greater accountability of smaller vessels.

7.3.3 Gear marking

Regulations for the marking and identification of fishing gears were first introduced into EU fisheries under Article 2 paragraph 2 of Commission Regulation (EEC) No. 1381/87. This regulation was amended by Commission Regulation (EC) No 1805/2005 of 3 November 2005 detailing the frequency of deployment of intermediary marking buoys. This was followed by a mass of Member State legislation enacting these regulations at national levels in EU waters. The UK's Sea Fishing (Marking and Identification of Passive Fishing Gear and Beam Trawls) (England) Order 2006 sets out measures to reflect Commission Regulation 356/2005, as amended by 1805/2005 and covers English vessels (wherever they may be) and all other vessels including Welsh, Scottish, Northern Irish and foreign vessels in English waters as appropriate. For inshore vessels, under the Marine and Coastal Access Act 2009, the Inshore Fisheries and Conservation Authorities (IFCAs) can make byelaws to regulate the marking of fishing gear boxes, such as the Northumberland IFCA 'Marking of Fishing Gear and Keep Boxes' byelaw. However most other IFCAs do not have any providing for gear marking in coastal waters, although they are anticipating these will be required in the near future (Robert Clark, CFO Southern IFCA, pers. comm).

7.3.4 Zoning

Zoning is a proven approach to the spatial management of gear conflict, with the Inshore Potting Agreement (off south Devon) and the mid-Channel potting zones are well known examples. Scotland is also piloting a number of inshore fishing zones to manage gear conflict. No fishing / restricted gear zones are more acceptable if (i)

their destination is well justified and evidenced and (ii) they allow other fishing activities to occur when the risk is lower e.g. at certain times of the year when, say static gear fishing is not practiced. Zoning can be enforced through by laws with the English and Welsh IFCAs, and the IFGs in Scotland, as well as via licensing conditions.

8 Environmental footprint

8.1 Current status and trends

The text below discusses the key issues resulting from interactions between scallop dredging and the marine environment.

8.1.1 Effects on benthic habitat

The impact of scallop dredging on habitats and benthic communities is well studied (Auster et al., 1996; Bradshaw et al. 2000; Currie and Parry, 1996; Currie and Parry, 1999; Eleftheriou and Robertson, 1992; Jennings et al., 2001; Kaiser et al. 1996; Kaiser et al. 2006; Løkkeborg, 2005). It is understood that bottom fishing activities, such as demersal otter trawl, beam trawl and scallop dredging, are capable of reducing habitat complexity and changing benthic community composition by either direct modification of the substratum or removal of/damage to fauna with subsequent ecological effects, such as exposed organisms becoming more vulnerable to predation (Auster and Langton, 1999; Jennings and Kaiser, 1998).

Kaiser et al. (2006) undertook a meta-analysis of 101 experimental fishing impact studies in order to identify the types of fishing gear that have the greatest impact on the seabed and on the groups of organisms that are most vulnerable to fishing activities. An expansion of this meta-analysis was reported on in 2018 (Sciberras et al. 2018).

These meta-analyses concluded that the recovery time of habitats and biota impacted by scallop dredging varies depending on the type of habitat and local conditions. Recovery time can vary from a few days in high tidal and wave swept areas, to months in less exposed sand and muddy sand areas, and to years across sensitive biogenic reef habitats. The level of impact also varies depending on how extensively these areas have been fished; areas of high fishing effort are likely to be maintained in a permanently altered state, inhabited by fauna adapted to frequent physical disturbance.

In summary, most studies indicate that benthic communities in areas subject to a long history of scallop dredging will have become simplified to a suite of species that are relatively resistant to fishing disturbance (Currie & Parry 1996; Bradshaw et al. 2002; Brown 2013).

8.1.2 Bycatch

Scallop dredges are considered to be relatively ‘clean’ compared to other types of mobile fishing gear, such as beam trawls (Kaiser 2007), but do capture a variety on non-target species. Typical bycatch species include fish (flatfish, dog fish, skates, rays, monkfish and dragonets), crustaceans (edible crabs, swimmer crabs, spider crabs and hermit crabs), echinoderms (brittlestars, starfish and sea urchins), molluscs (bivalves and gastropods), and cephalopods (octopus and cuttlefish) (Bradshaw et al. 2001; Craven et al. 2013). Commercially valuable species are retained in some cases, particularly edible crabs and monkfish in the Isle of Man dredge fishery (Beukers-Stewart et al. 2001; Brown 2013; Craven et al. 2013) and cuttlefish in the English Channel dredge fishery (Enever et al. 2007) but the majority of by-catch is discarded, and often in a damaged or dead state (Beukers-Stewart et al. 2001; Jenkins et al. 2001).

8.1.3 Effects on target species

Scallop fisheries are well known for exhibiting dramatic fluctuations in recruitment, landings and abundance (Paulet et al. 1988; Orensanz et al. 1991; Beukers-Stewart & Beukers-Stewart 2009).

Fishing activity may itself contribute to these fluctuations. Reductions in scallop population density, and removal of larger scallops capable of producing more eggs (Beukers-Stewart et al. 2005; Kaiser et al. 2007b) as a result of fishing may result in reduced fertilisation success and recruitment (Macleod et al. 1985; Stoner & Ray-Culp 2000; Vause et al. 2007). Furthermore, scallops physically impacted by dredges but not captured, or captured and subsequently discarded, are likely to attract predators and be highly susceptible to predation (Jenkins et al. 2004). Damaged scallops can also show reduced growth rates and reproductive outputs as energy is diverted to shell repair (Beukers-Stewart et al 2005; Kaiser et al. 2007).

Increased mortality and reduced recruitment have the potential to negatively affect the long-term sustainability of

scallop fisheries in the UK. Consultation suggests perception that some areas, particularly inshore, are over-fished and sufficient seed stock is not left.

8.2 Issues and developments

8.2.1 Increasing environmental restrictions

Marine Protected Areas (MPAs) are one of the tools used to protect the marine environment, whilst ideally also enabling its sustainable use. MPAs are clearly defined geographical areas that are designated, through legal or other means, on the basis of the habitats and species (i.e. the features) known to be present within them. The term MPA applies to a variety of types of designated sites, including Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Marine Conservation Zones (MCZs) and Nature Conservation MPAs (NCMPAs). There is a network of MPAs, existing and proposed, that cover approximately 23% of UK inshore (within 12 nm) and offshore (beyond 12 nm) waters (Joint Nature Conservation Committee [JNCC], 2018).

MPAs have 'management measures' attached to them. Once designated, an MPA assessment is undertaken. This assessment may be undertaken by different organisations depending upon the location of the MPA (e.g. in English inshore waters from 6 nm to 12nm assessment is led by the MMO, and from 0 nm to 6 nm, by IFCAs). The assessment will consider, where relevant, what impact fishing activity is having on the designated features of the MPA. Where the assessment concludes that commercial fishing activity may have a significant effect, the next step is to identify how to avoid or mitigate the impacts; this includes potential management measures, which are recommended in consultation with a range of sector and industry representatives. Management measures within MPAs in inshore waters are typically introduced through a byelaw or other statutory provision, which sets out the affected area within the MPA and the fishing activity restrictions, be they spatial or temporal.

Management measures relating to scallop dredging within MPAs vary throughout UK waters, ranging from dredging being prohibited from entire designated sites, through to partial or zonal exclusions. Issue raised in consultation that engagement of industry in this process of developing management measures typically comes late on – implying decisions have already been made and input from fisheries interests will be immaterial.

A number of MPAs seek to conserve and protect marine habitats, including habitats of relevance to scallop fisheries, such as estuaries, large shallow inlets and bays, and reefs, and a number of MPAs that overlap with commercially exploited scallop grounds already have management measures that restrict scallop dredging. Measures vary by MPA, ranging from dredging being prohibited from the entire designated sites, through to partial or zonal exclusions that aim to protect particular features of sites or limit fishing effort within the MPA.

As the MPA network expands (noting that a third tranche of 41 proposed new MCZs are being consulted upon in Summer 2018), it can be expected restrictions within designated sites could become more common, with potential for displacement of fishing activity leading to gear conflict as scallopers seek alternative grounds. Throughout the UK there is already significant overlap between MPAs and scallop grounds, see Table 4 which details restrictions per designated area across Scotland, England, Wales and Northern Ireland. Whilst not opposed to MPAs in principle, fishermen have expressed concerns about fishing areas being 'closed down' as a result of cumulative restrictions upon their activities from several different sources (see 'Other restrictions' below).

Concerns have also been raised about the inconsistent and limited policing of fishing activity within MPAs, with examples provided of vessels fishing within prohibited areas and there being no apparent means to detect or stop them.

8.2.1 Other restrictions

Acting in combination with existing restrictions on scallop dredging activity, fishing may also be expected to be restricted and displaced by existing and planned offshore activities and developments.

Whilst some offshore sectors (e.g. oil and gas, aggregate dredging) show limited change in levels of activity, others may result in increased conflict in some areas where proposed development overlaps with scallop fishery activity. A prime example of such conflict is that associated with offshore wind farm development; in Scotland, areas in which offshore wind farms are being constructed or are planned overlap with key fishery grounds in the Moray Firth and off the Firths of Forth and Tay. Plans for further rounds of offshore wind farm development in UK waters were announced in 2018 by The Crown Estate and Crown Estate Scotland.

Table 4: Restrictions on dredging within Marine Protected Areas

Region	Restrictions on dredging within MPAs	Relevant MPAs	Statutory (or other) provision for MPA management measures	Interactions between MPAs and scallop dredging
Scotland - inshore waters (to 12nm)	Dredging prohibited from entire site	East Mingulay SAC Loch Creran MPA / SAC Loch Laxford SAC Loch Sunart MPA / SAC Noss Head MPA (which adjoins with the former Sinclair Bay closed area) Sanday SAC South Arran MPA St Kilda SAC / SPA Treshnish Isles SAC / SPA Upper Loch Fyne and Loch Goil MPA Wyre and Rousay Sounds MPA Wester Ross MPA	Inshore Fisheries Orders Marine Conservation Orders	In Scottish waters there is notable overlap of MPAs with known areas of scallop dredging (based on VMS data). Management measures relevant to scallop dredging within MPAs are well developed and enacted through Fisheries Orders and Marine Conservation Orders. Measures variously prohibit dredging from either the entire designated site, or from features of importance within the site. Restrictions are provided via closed areas, curfews, seasonal closures and limits based on vessel size.
	Partial exclusion of dredging; activity limited by curfew, seasonal closures and/or maximum vessel tonnage	Loch Sween MPA Lochs Duich, Long, and Alsh MPA / SAC (which is within the southern inner sound seasonal closed area) Luce Bay and Sands SAC Small Isles MPA		
Scotland – offshore waters (beyond 12nm)	Dredging prohibited from entire site	Braemar Pockmarks SAC Norwegian Boundary Sediment Plain MPA Scanner Pockmark SAC Anton Dohrn Seamount SAC Rosemary Bank Seamount MPA Solan Bank SAC West Shetland Shelf MPA	Joint Recommendation (to European Commission by UK and other relevant Member States) in progress	
	Zonal exclusion of dredging to protect particular designated features	Faroe-Shetland Sponge Belt MPA Firth of Forth Banks Complex MPA North-East Faroe-Shetland Channel MPA East Rockall Bank SAC Geikie Slide and Hebridean Slope MPA The Barra Fan and Hebrides Terrace Seamount MPA Wyville-Thomson Ridge SAC		
Wales - inshore waters (to 12nm)	Partial exclusion of dredging	Cardigan Bay SAC Lleyn Peninsula and the Sarnau SAC	Management measures within MPAs are provided through existing byelaws, which identify closed areas.	In Welsh waters there is limited overlap of MPAs with known areas of scallop dredging (based on VMS data).
Northern Ireland - inshore waters (to 12nm)	Dredging prohibited from entire site	Waterfoot MCZ	Dredging activity regulated by existing measures (e.g. byelaws) MPA management measures proposed in some cases, but yet to be enacted	In waters off Northern Ireland there is some overlap of MPAs with known areas of scallop dredging (based on VMS data). Management measures within MPAs are currently provided through existing byelaws, which identify closed areas.
	Zonal exclusion of dredging to protect particular designated features	Rathlin Island SAC / MCZ Outer Belfast Lough MCZ Skerries and Causeway SAC Strangford Lough SAC / MCZ The Maidens SAC (proposed management measures to be confirmed)		
Northern Ireland – offshore waters (beyond 12nm)	Management measures yet to be confirmed	Pisces Reef Complex SAC		

England - inshore waters (to 12nm)	Dredging prohibited from entire site	The Manacles MCZ Lyme Bay SAC Torbay SAC	Dredging activity restricted by byelaw	In English waters there is some overlap of MPAs with known areas of scallop dredging, particularly off Northumberland, off Liverpool Bay/Cumbrian coast, and off the south-west coast (based on VMS data). For the most part, management measures within MPAs are provided through existing byelaws, which identify closed areas.
	Zonal exclusion of dredging to protect particular designated features	Fal and Helford SAC Isles of Scilly Complex SAC and MCZs Land's End and Cape Bank SAC Plymouth Sound and Estuaries SAC Start Point to Plymouth Sound and Eddystone SAC Folkestone Pomerania MCZ Chichester and Langstone Harbours SPA Beachy Head West MCZ West of Walney MCZ Shell Flat and Lune Deep SAC Drigg Coast SAC Cumbria Coast MCZ Cromer Shoal Chalk Beds MCZ Flamborough Head SAC Northumbria Coast SPA Runswick Bay MCZ Tweed Estuary SAC	Dredging activity regulated by existing measures (e.g. byelaws, voluntary agreements)	
	Partial exclusion of dredging; activity limited by curfew, seasonal closures and/or maximum vessel tonnage	Plymouth Sound and Estuaries SAC Beachy Head West MCZ Shell Flat and Lune Deep SAC Holderness Inshore MCZ Humber Estuary SAC / SPA Flamborough Head SAC Northumbria Coast SPA Runswick Bay MCZ	Dredging activity regulated by existing measures (e.g. byelaws, voluntary agreements)	
England – offshore waters (beyond 12nm)	Expected zonal exclusion of dredging to protect particular designated features	South Dorset MCZ Offshore Overfalls MCZ Offshore Brighton MCZ Bassurelle Sandbank SAC Farnes East MCZ North East of Farnes Deep MCZ Dogger Back SAC Western Channel MCZ	Management measures are still in development in most cases, to be provided by Joint Recommendation	

8.3 Opportunities

The perception that dredging is damaging to the animals and habitats on the seafloor means that there is ongoing interest in developing dredge gears that are considered to be less intrusive and therefore less damaging to benthos. Alternative gears have been developed and trialled, with the N-Virodredge the most cited example. Consultation for this report suggests that, whilst the industry welcomes innovation, alternative gear types trialled to date have typically been found to be less effective and result in reduced catches. Furthermore, advances in gear technology are often not possible due to stringent gear requirements, e.g. as stipulated within the Scallop Fishing (England) Order 2012 (see management section 6.3).

The MPA network aims to protect sensitive habitats, and across many MPAs there are existing management measures that limit control of scallop dredging activity. There are opportunities to build on the effectiveness of this network from both a conservation and co-existence perspective.

One potential opportunity expressed during consultation was Territorial User Rights Fisheries (TURF). A TURF-Reserve is a management system that allocates harvest access rights to a restricted number of fishermen in a spatially defined area (TURF), within the wider context of a multi-use marine nature reserve (MNR) (Bloor et al., 2018). This approach could be feasible for certain inshore areas that are typically targeted by a small number of small vessels, however it becomes problematic when considering the wider UK sector that operates around the UK.

9 Ethical fishing

9.1 Current status and trends

Whilst 'sustainable sourcing' has been on fish buyers' minds for some time now, the specific issue of ethics is a much more recent concept, echoing the trend 'from environmental to social' can be seen in many of the private standards and labelling initiatives.

At the international level, the International Labour Organization (ILO) sets labour standards that are backed by a supervisory system that helps to ensure that countries implement the conventions they ratify. ILO's Convention no. 188 Work in Fishing Convention (ILO, 2007a) is highly detailed and specific to fishing vessels. Requirements of ILO's Convention no. 188 include the following:

- Business is conducted lawfully and with integrity.
- Work is conducted on the basis of freely agreed and documented terms of employment with legal compliance.
- All workers are treated equally and with respect and dignity.
- Work is conducted on a voluntary basis with no forced or compulsory labour.
- All workers are of an appropriate age.
- All workers are paid fair wages.
- Working hours for all workers are reasonable.
- All workers are free to exercise their right to form and/or join trade unions and to bargain collectively where permitted by law.
- Workers' health and safety are protected at work.
- Workers have access to fair procedures.
- Business is conducted in a manner that embraces sustainability and reduces environmental impact.
- Progress and compliance are monitored.

Implementation of the ILO 188 Work in Fishing Convention into UK Law has recently been confirmed and will be effective in November 2018.

In the UK, the Modern Slavery Act (2015) now requires companies to report on their measures to prevent and eradicate slavery and human trafficking in their supply chains. The UK remains Tier 1 (the most favourable ranking) in the U.S. Government's 2018 Trafficking in Persons report[12]. Most of the larger EU and US seafood processors use national legislation on minimum wages, overtime rules, collective representation, child labour and other aspects of worker welfare. This is relatively straightforward to apply and monitor on land. However, it may be less easy to evaluate the social and ethical compliance levels in third countries where national legislation might be less detailed or well implemented, or greater still at sea, where it is difficult to manage or monitor crew welfare, especially when in high seas.

The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations (1997) includes measures to encourage improvements in the safety and health of workers at sea. Owners must also ensure their crews follow safe working practices and that all equipment on board is properly installed and maintained.

Various approaches have been taken by industry to comply. There are a number of private sector and not for profit codes and best practice frameworks, such as Sedex (the Supplier Ethical Data Exchange[13]) and the Ethical Trading Initiative. One major UK fish processor, New England Seafoods, use the ETI Base Code as their starting point. This is used throughout this supply chain, both in their own factories as well as in supplier vessels and factories. In June 2017 a number of leading UK food companies formed the 'Food Network for Ethical Trade that work together to share best practice in supply chain risk assessment and collaboration on joint areas of risk.

The Marine Stewardship Council (MSC) is considering inclusion of labour issues in their environmental standard. They will require a declaration by MSC certified fisheries that they are free from unacceptable labour practices and are able to supply evidence to support this claim by the end of 2018 and are consulting on a set of auditable social requirements or a declaration that will be implemented in the MSC Chain of Custody Standard in 2018. This may include recognition of solutions offered by other standard setting organisations.

[12] See https://www.state.gov/j/tip/rls/tiprpt/2018/index.htm
[13] E.g. the Sedex Members Ethical Trade Audit (SMETA) Best Practice Guidance

9.2 Issues and developments

According to the Seafish 2017 pilot survey of employment in the UK fishing fleet (Seafish 2017), a sample of UK 37 scallop dredgers had 70% UK, 18% EU and 12% non-EEA crew. This compares with 47% UK, 18% EU and 36% non-EEA on *Nephrops* trawlers and was similar to other large (>18 m) demersal trawlers. Smaller mobile and all static gear vessels had >95% UK crew.

Scallop dredgers are almost all full-time, year-round employers, unlike most other UK fisheries. Seafish also found that scallop dredgers had the highest average gross monthly wage (£2,640) of the six vessel classes examined[14], almost twice the average across the whole sample. It also determined that 74% were based on crew share (average monthly gross salary £2,811), 13% on agency (£1,605), 7% on a fixed wage (£2,469) and 7% unknown (£3,675). In contrast, both the larger (>18 m) demersal trawlers and the nephrops trawlers had 28% agency payments, whose cost to the vessel was much lower than share or fixed wages. The majority of vessels in these two segments in the sample were registered in Scotland (94% of demersal trawlers over 18m and 53% of *Nephrops* trawlers). The numbers of agency workers found on demersal trawl vessels over 18m may account for these vessels having the highest proportion of seasonal/shifting jobs across all fleet segments.

This all suggests that – in terms of the larger vessels included in Seafish's samples - scallop dredging is a relatively stable, well-paid fishing opportunity. An earlier survey in Scotland in 2015 showed similar results, with crew sharing being the main wage structure (>85%) and lower proportion of agency workers compared to other large mobile fleets. The Scottish survey also provides an estimated monthly wage for different crew positions and shows that scallop dredge deckhands earn around £2,072 on share schemes and £1,100 on contract schemes. These figures – in contrast with the wider UK results, are lower than the other mobile gears (Marine Scotland Science, 2016).

Recent press coverage has highlighted concerns around forced labour in the fishing industry, with some citing examples within the UK scallop sector. However, industry-commissioned reports present a contrary view. A Seafish Report in 2015 entitled 'Focus on Ethical Issues in Seafood – UK Profile (Seafish, 2015) concludes that "*for certain parts of the UK seafood industry, the risk of labour abuse would now appear to be negligible, and certainly far lower than a decade or so ago*". It then states that "*in the UK fishing industry, the main risk relates to the employment of non-EEA nationals working on UK vessels outside UK territorial waters, and therefore not covered by UK immigration law. Working conditions may be governed through industry-led codes of practice, rather than the application of UK employment law. For example, the Scottish Fishermen's Federation adopted such a code of practice in 2009 for the employment of non-EEA fishing crew, covering among other things, conditions of employment*". An independent report for Anglo-Northern Irish Fish Producers Organisation (ANIFPO) conducted a number of interviews with non-EEA nationals working for ANIFPO in Kilkeel (Human Rights at Sea, 2017) and concluded that no evidence of deliberate, systematic or inadvertent violation of human rights had been detected in the sample research findings.

One of the main issues is the lack of a comprehensive ethical framework for UK fisheries, especially those working on a crew share wage scheme. The ILO rules are too generic, more tailored towards fixed rate or contract fishing. The current version (#1) of the RFS, whilst recognised to be a useful tool, is insufficiently comprehensive on this issue to be of real use. With the current spotlight on ethical considerations, new schemes are being developed, which could help to address this issue, but also risks confusing and alienating fishers as schemes evolve. Ethical certification is also seen by some of the industry to be a further distraction from fishing and an additional cost, although they do recognise the need to be differentiated from less ethical businesses. Smaller, owner-operated vessels also do not see the relevance of ethical certification (they are either fishing single-handed or employ relations or known local crew).

9.3 Opportunities

With the current press and NGO focus on this issue, there is a need for the sector to respond and demonstrate its *bona fides*. As demonstrated by MSC's intention to include "*high risk fisheries and at-sea supply chain entities*" in audits against a third-party labour standard by 2020, the inclusion of ethical responsibility in fisheries supply chain certification is inevitable.

MSC's latest round of public consultation in March 2018 showed that "*there is not yet an internationally*

[14] The other five were (i) demersal trawlers <18 m, (ii) demersal trawlers >18 m, (iii) nephrops trawlers, (iv) passive gear and (iv) other vessels

applicable 'norm' or standard for at-sea labour practices"[15]. The Seafish RFS – which was never intended to be a comprehensive ethical standard - is now being transferred to the Global Aquaculture Alliance's Global Seafood Assurances (GSA), who are developing a new version of the RFS standard to ensure ILO 1888 compliance[16]. This should be in place sometime in 2019 (Libby Woodhatch, pers. comm., 18 July 2018). This will effectively become the first vessel-based ethical third-part certified standard suitable for the UK that is ILO 188 compliant.

It is recognised that third party certification is not suitable for all operators in the UK scallop fleet, and that more cost-effective solutions may be more appropriate for smaller, short-range operations working with a predominantly local crew on a share wage. Such vessels also tend to be much lower risk in terms of non-ethical behaviour.

The commitment to ensuring ILO 188 compliance as part of MCA checks from November 2018 should provide the necessary independent verification of ethical operation. The sector should engage with the MCA to ensure effective implementation.

A year after its introduction (around November 2019) the MCA implementation of ILO 188 should be reviewed and based on this review consider whether additional actions are necessary, such as encouraging certification under the RFS v2 standard throughout the sector.

[15] https://improvements.msc.org/database/labour-requirements
[16] See http://www.seafish.org/about-seafish/news-and-events/news/responsible-fishing-scheme-to-move-to-new-home-as-seafish-signs-memorandum-of-understanding-with-the-global-aquaculture-alliance-gaa-

10 SWOT of UK scallop fishery

Strengths

- High value, economically important species; third highest valued fishery in UK.
- Strong price and low fuel costs have maintained high value of fishery.
- Regional scallop Fisheries Improvement Projects (FIPs) underway and driving change:
  - Project UK (PUKFI) stage 1 for English Channel is in the process of implementing its Action Plan, and
  - PUKFI stage 2 for West of Scotland, Irish Sea and North Sea recently commissioned.
- Majority of industry responsibly fish with respect to MPAs and closed areas.
- Well-informed, passionate, participatory and active industry.
- Significant knowledge and expertise in the field of stock assessment.
- Strong scallop sector cohesion via the SICG.
- Strong UK participation in the ICES WGScallop.

Weaknesses

- Current low LPUE due to increased effort and lower landings across all areas.
- Significant uncontrolled growth in the number of 10-15m vessels joining the sector and some growth in >15m vessels also (i.e., enacting their scallop entitlement or larger vessels purchasing entitlements and aggregating them).
- The presence of latent entitlements causes uncertainty and a management risk.
- Bad press and reputation linked to ethical practises of some individuals or gear conflict issues.
- Heavy gear and habitat environmental impacts well understood and inevitable due to gear specifications.
- Lack of technical mechanism for enforcement, including lack of VMS on under 12m vessels and lack of gear in-out technology for all vessels.
- Lack of UK-wide management structure.
- Lack of stock reference points.
- Latent capacity in >10m vessels.
- Unrestricted access for <10m vessels.

Opportunities

- Management to be appropriate to the stock and stock boundaries.
- Management to be responsive to the stock status through the introduction of reference points and associated harvest control rules.
- Generate positive messages of responsible fishing.
- Opportunity to gain MSC certification in the long-term.
- Create additional communication channels with other industries to highlight importance of scallop grounds.
- Better engagement with small-scale and non-sector scallop vessels and operators.

Threats

- Potential for significant capacity to enter fleet from >10m vessels enacting their scallop entitlement.
- Potential for <10m vessels that do not require scallop entitlement to enter the fishery (somewhat limited by gear requirements, but clearly possible given current number of <10m vessels).
- Stock collapse if LPUE continues to rapidly decline.
- Further loss of ground due to offshore energy developments.
- Unrestricted setting of static gear by other non-quota sectors.
- Continued uncertainty about the outcome of Brexit and the implications for UK fishers.

11 Horizon scanning

When the UK leaves the EU, it will become an independent Coastal State with rights and obligations under the UN Convention on the Law of the Sea to control and manage UK territorial waters and Exclusive Economic Zone (out to 200 nautical miles or the median line with other states).

The UK will be responsible for the management of natural marine resources in this area and will be able to control and manage access to UK waters including fisheries. With this comes international obligations to cooperate with other Coastal States over the management of shared stocks.

After nearly 50 years of alignment with the EU, the impact of Brexit is expected to be far reaching and it is difficult to predict all potential consequences, some of which may be unexpected. It is an issue that inevitably influences the debate on future considerations and is mentioned throughout this report as it is expected to have some impact on nearly every aspect to some extent (e.g. how will fisheries and the environment be managed? how will the science be funded and carried out?). For the UK fisheries sector, some of the key issues emerging from Brexit are:

- Quota share
- Access to waters
- Trade
- Labour

The sections below explore how these issues relate to the UK scallop sector specifically.

The immediate future post-Brexit on March 2019 may not be very different to the current regime. It has been agreed that the UK will operate under a transition agreement until 2021, which is to include abiding by the rules of the CFP. The UK will have a year or so when it is not part of the annual EU negotiations but has committed to abide by them. Following this, the UK as an independent coastal state will negotiate with the EU and other independent coastal states (Norway, Iceland and the Faroe Islands) regarding access and quota share for shared biological resources (fish stocks).

At the latest SICG meeting (June, 2018) it was reported that it is expected, but still to be confirmed, that effort swaps can continue over the transition period. It has been indicated that WWER is considered operable and will brought into UK law post-Brexit. Nevertheless, the specifics of WWER and other management arrangements post-transition are still to be decided.

11.1 Quota

As scallop stocks are not subject to quota at EU level, it is not expected that future Coastal States Agreements will include scallop stocks. It will be for the UK, and devolved administations, to determine whether outputs controls such as quota play any role in the post-Brexit future. Similarly, the 'repatriation of UK quota' in foreign ownership through strengthening economic link requirements will have no direct impact on the scallop sector. If more whitefish & *Nephrops* quota become accessible to UK fishing vessel owners, there may be some displacement moving out of scallop effort by the smaller vessels that fish scallop seasonally into the whitefish/*Nephrops* sectors.

The Government's response to the House of Lords report on Brexit and Fisheries states that it "*will abide by its obligations and responsibilities under international law (such as the UN Convention on the Law of the Sea – UNCLOS, and the UN Fish Stocks Agreement – UNFSA) and stands ready to co-operate with adjacent states to ensure that shared and straddling stocks are managed sustainably and effectively. We want to avoid the risk of over-fishing at all costs."* (UK Government, 2017).

There are some shared scallop resources between the UK and Ireland and between the UK and France that, as parties to the UN fish stocks agreement, could require cooperation in the management of shared resources. Neither of these countries currently operates a quota system for scallop. The management section discusses French joint management proposals.

11.2 Access to waters

When the UK triggered Article 50 in April 2017, the EU Council commenced negotiations with the UK on the future relationship between the EU and the UK. Having reached an agreed level of progress on parts of the

Withdrawal Agreement, on 23rd March 2018 the EU council published its Guidelines, effectively setting out its negotiating position with the following relevant text:

As regards the core of the economic relationship, the European Council confirms its readiness to initiate work towards a balanced, ambitious and wide-ranging free trade agreement (FTA) insofar as there are sufficient guarantees for a level playing field. This agreement will be finalised and concluded once the UK is no longer a Member State. Such an agreement cannot however offer the same benefits as Membership and cannot amount to participation in the Single Market or parts thereof. This agreement would address:

i. *trade in goods, with the aim of covering all sectors and seeking to maintain zero tariffs and no quantitative restrictions with appropriate accompanying rules of origin.*

ii. *In the overall context of the FTA, existing reciprocal access to fishing waters and resources should be maintained;*

iii. *appropriate customs cooperation, preserving the regulatory and jurisdictional autonomy of the parties and the integrity of the EU Customs Union;*

iv. *disciplines on technical barriers to trade and sanitary and phytosanitary measures;*

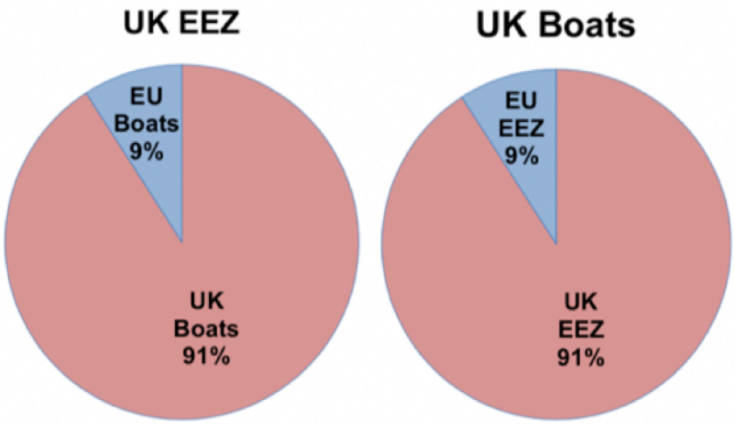
v. *a framework for voluntary regulatory cooperation;*

The EU has thus far stated that a future trade deal post-Brexit will be conditional on access to the UK EEZ being maintained for EU vessels. This is a requirement that can be implemented by the UK as an independent coastal state; it does not require the UK to be part of the CFP or a customs union. For other independent coastal states such as Iceland and Norway, EU vessels are permitted access based on an agreement between the EU and the coastal state and is applied through licensing that Iceland and Norway respectively control.

As Figure 19 illustrates, only 15% of EU scallop catches are in the UK EEZ and only 9% of UK scallop catches are outside the UK EEZ. Scallops are a more localized resource than other fisheries as on average it is estimated EU boats landed 10 times more fish and shellfish (by weight) from the UK EEZ in 2016, or six times more by value, than UK boats did from other areas of the EU EEZ (Napier, 2017). UK fishing activity outside the UK EEZ is mainly associated with the French Baie de Seine fishery in the Channel and NI scalloper activities where fisheries extend into Irish waters along the North and East Coasts of Ireland.

The inability to swap WWER Days at Sea with France has potential to lead to reduced fishing opportunities for UK vessels. A further reduction of fishing opportunities may arise if no access arrangements can be agreed with the French post Brexit e.g. for the Baie de Seine. While other beneficial opportunities could be explored such as modifying the WWER making it adaptive to stock status and broadening its coverage to all vessel lengths.

Overall, while many UK operators would not wish to have their opportunities in Irish or French scallop fisheries constrained, access is less critical to the UK scallop sector (or indeed the EU scallop sector) than for other fisheries.



Scallops	Weight ('000 t.)		Value (£ m)	
EU Boats				
from EU EEZ	24.2	85%	£56.9	85%
from UK EEZ	4.2	15%	£9.9	15%
from Elsewhere in NE Atlantic*	0.0	0%	£0.0	0%
TOTAL	28.3	100%	£66.7	100%
UK Boats				
from EU EEZ	2.6	9%	£6.0	9%
from UK EEZ	25.5	91%	£60.1	91%
from Elsewhere in NE Atlantic	0.0	0%	£0.0	0%
TOTAL	28.1	100%	£66.2	100%
UK EEZ				
UK Boats	25.5	86%	£60.1	86%
EU Boats	4.2	14%	£9.9	14%
TOTAL	29.7	100%	£70.0	100%
Ratio (EU:UK)	1.6 : 1		1.6 : 1	

Figure 19 Breakdown of estimated weights and values of scallops landed by EU and UK fishing boats in 2016 [Source: Napier, 2017 * 'Ratio' = ratio of EU boats' landings from UK EEZ to UK boats' landings from EU EEZ. EU EEZ excludes Baltic, Madeira & Azores.]*

11.3 Trade

While access and quota shares are perhaps the most emotive aspects of Brexit, trade is the issue with the greatest potential impact on the seafood sector.

In 2016 the UK landed £689 million, exported £1,640 million and imported £3,073 million (MMO, 2017). For scallops the balance in reversed and the UK exported three times the value of scallops than it imported (£128 million in exports compared to £41.4million imports).

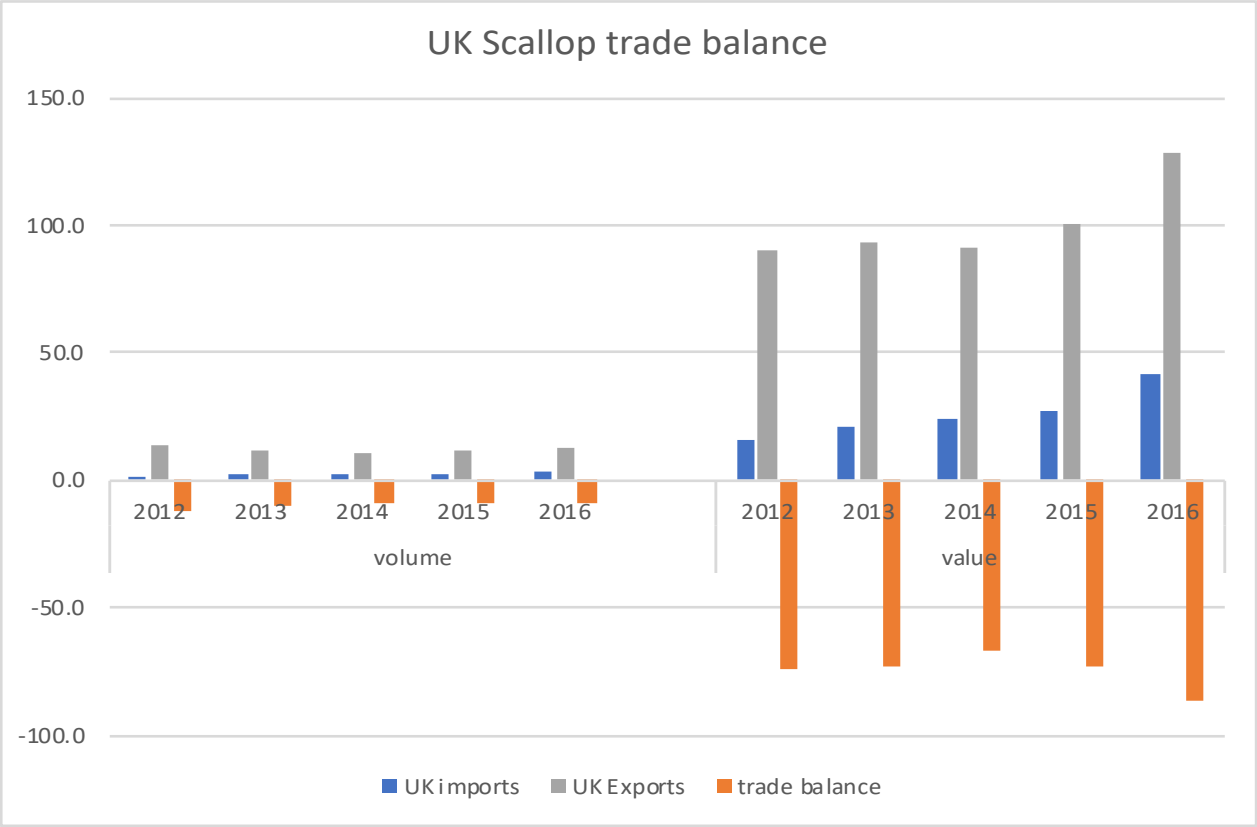


Figure 20 UK trade in scallops 2012-2016 [Source: MMO, 2017].

It is the stated desire and intent of the EU and UK to establish a zero-tariff arrangement across EU/UK borders. As the EU Council stated, it seeks to achieve an agreement with the UK that includes:

"i) trade in goods, with the aim of covering all sectors and seeking to maintain zero tariffs and no quantitative restrictions with appropriate accompanying rules of origin."

However, it also gave a reminder of the risk of a no-deal: *"Being outside the Customs Union and the Single Market will inevitably lead to frictions in trade. Divergence in external tariffs and internal rules as well as absence of common institutions and a shared legal system, necessitates checks and controls to uphold the integrity of the EU Single Market as well as of the UK market. This unfortunately will have negative economic consequences, in particular in the United Kingdom." (EU Council, 2017)*

For the UK scallop sector, which is so reliant on exports to the EU, any restricted access or tariff that is applied will result in negative impacts.

Recent analysis for Marine Scotland that modelled the impact on trade for ten key seafood species under different trade deal scenarios found that "*fleet sectors targeting non-quota species (crab and scallop) and the salmon aquaculture industry, which do not stand to gain from quota increases under the zonal attachment principle, suffer the negative impacts of higher tariffs and non-tariff measures without the benefits of a reallocation of quotas. Therefore, they experience a contraction in output value with the imposition of EU-Norway type tariffs (and non-tariff measures), and a greater contraction with WTO Most Favoured Nation tariffs and non-tariff measures. These are of the order of –0.6% for salmon and –4.4% for scallop.*' (ABP Mer, 2018)

The impact on salmon is moderated by the large proportion of exports that go to non-EU countries (mainly the USA) and current UK trade with most non-EU countries is not based on preferential trade agreements, thus it already faces the WTO MFN tariffs and higher non-tariff measures' (ABP Mer, 2018). However, as king scallop is a premium product that is primarily traded live or fresh, it would be very difficult to substitute access to adjacent EU markets with other markets outside the EU.

11.4 Labour

Labour issues associated with the scallop sector are considered in more detail in section 9. As leaving the EU single market means revoking the free movement of goods and people, in this section we specifically consider the issue of access to labour. The expectation of those voting to leave the UK is that it will be up to the UK to determine how many EU citizens it will allow to get work visas for the UK. This could, however, be contingent upon the deal that is ultimately agreed between the EU and the UK. The UK's future situation may also influence the willingness of European Economic Area (EEA) nationals to work in the UK, either due to the perceived welcome for immigrant workers and/or less favourable exchange rates.

The scallop sector employs staff from the EEA in catching and processing sectors.

Catching sector employment by nationality was collected by Marine Scotland most recently for 2015, when it found that around 80% of scallop dredger crew were UK, around 10% EEA and 10% non-EEA. Employment of UK nationals had increased slightly since 2013 when more non-EEA crew were employed (Figure 21). From the sampled crews, Romanian and Latvian crews accounted for the majority of fishers from the EEA – 48% and 35%, respectively. Filipino and Ghanaian crews account for the majority of crews from non-EEA countries – 80% and 15%, respectively.

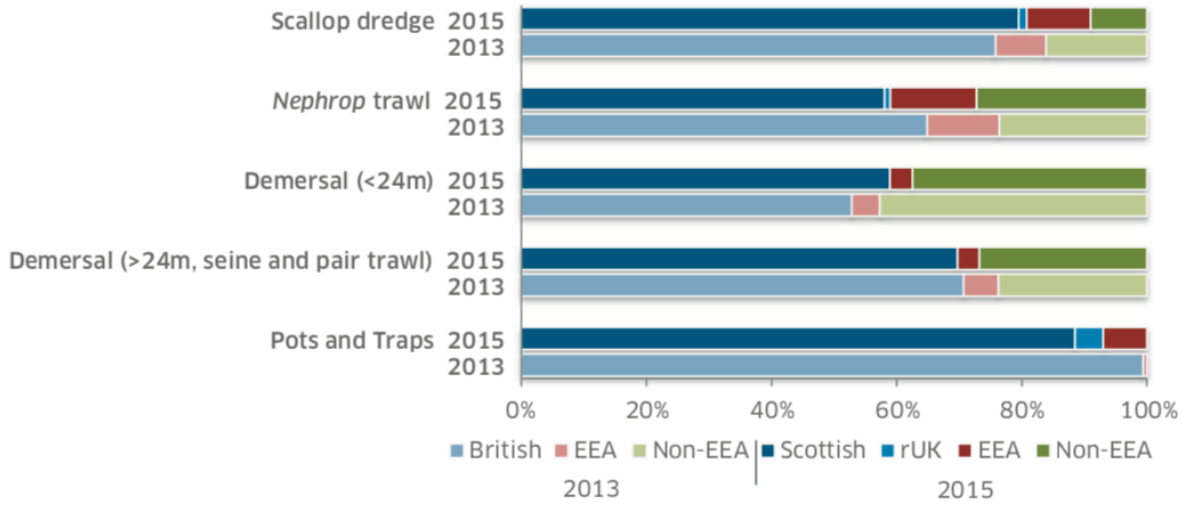


Figure 21 Proportion of crew by nationality and sector in 2013 (n=810) and 2015 (n=749) [Source: Marine Scotland Science, 2016]

A recent survey of labour in the seafood processing sector by Seafish found that EEA workers represented 49% of the total surveyed workforce employed in the seafood processing sector in 2017 (Seafish, 2018). The respondents from processing companies also indicated that the low availability of suitable candidates is a key barrier to recruitment in the seafood processing sector: The availability of suitable workers was identified as the key barrier to recruitment by 38% of respondents to the quarterly survey. Reasons for this include "EEA staff being less willing to come to the UK" (19% of respondents) and "lower availability of staff with suitable skills sets/experience" in fish processing (8% of respondents) (Seafish, 2018). It is also evident from the survey that the ability to replace EEA staff with British staff will be very difficult for an industry that is generally perceived to be unappealing to British workers.

12 Recommendations

A series of recommendations, specific to the topics explored within this report, is provided in Table 5.

Table 5: UK scallop review recommendations

Topic	Ref	Action
Management	1a	Develop an overarching UK-wide scallop management strategy that states the management principles upon which individual scallop plans are based. UK-wide oversight will ensure cohesive management of the whole sector (e.g. to minimise & mitigate displacement issues due to individual fishery management actions).
	1b	Long-term Management Plans (LTMPs) should be developed for each scallop stock.
	1c	LTMPs should be informed by fishery management groups that have substantial involvement from industry.
	1d	When management groups are established and proven to be effective, they can form the basis of a co-management approach where industry has greater ownership and responsibilities within fisheries management.
	1e	Agree harvest strategies (based on the UK-wide policy) and appropriate harvest control rules for each UK scallop stock (which may vary depending on the stock levels associated with the fishery).
	1f	Review technical measures with a view to harmonization and simplification.
	1g	In the short-term Brexit provides an opportunity to revise the Western Waters Effort Regime to make it more area-specific and responsive to stock status.
	1h	Any revised control regime must be applied to the whole fleet (not only >15m vessels).
	1i	In the medium term, as longer stock assessment time series become available, stock-specific management systems should be developed.
	1j	Management of fishing opportunities should be differentiated. Inshore fishing opportunities could be ring-fenced to address social/regional objectives. The definition of inshore should be agreed across administrative bodies.
	1k	Challenges to the allocation of fishing opportunities are perhaps inevitable. Working through management groups that include industry representation is one of the best ways to ensure allocations of fishing opportunities are equitable.
	1l	Spatial management measures should be applied for fishery management objectives in important stock recruitment and nursery areas.
Latent capacity	2a	The Scottish scallop dredge entitlement freeze and Isle of Man restrictive licensing regime should be maintained.
	2b	Review Scottish scallop dredge entitlement freeze criteria to ensure it remains appropriate (i.e. tonnage of scallops that qualifies a vessel as active, which is currently 1 tonne; time period of inactivity, which is currently 7 years; evidence required to demonstrate that an affected vessel is rigged and capable of fishing for scallops by mechanical dredge). Identify if the scheme has had any identifiable effects to Scottish effort uptake.
	2c	Introduce a scallop dredge entitlement freeze across other UK countries based on reviewed /agreed criteria, if this is identified by administrations as being necessary.

Topic	Ref	Action
Latent capacity (continued)	2d	Devolved administrations periodically review latent capacity across all UK administrations.
	2e	Establish a framework for releasing frozen entitlements if scientific evidence supports increase in effort e.g. based on historic track record, application process or alternative approach.
Sectoral representation	3a	National industry representative groups exist in all but England and this could be addressed through the establishment of an English scallop committee under the NFFO or SAGB along the same lines as Scotland.
	3b	These national groups should be encouraged (and financially assisted) to see that all industry stakeholders (inshore and offshore vessel interests and buyers/processors) are informed and have the option to engage with the group.
	3c	Consider revising the remit of SICG to include UK-wide comprehensive industry representation.
Biological stock	4a	Encourage / request and support review of scallop stock boundaries to be based on biological evidence, where this is not already established.
	4b	SICG to make a request to ICES Scallop Working Group to provide advice on the best /optimised approach for UK scallop stock assessment.
	4c	Explore potential for funding package to support ongoing stock assessments, including industry, government and other funding streams.
	4d	Encourage / request and support establishment of biological and fishing mortality reference points for scallop stocks, where this is not already established.
	4e	Develop management mechanisms and measures that are appropriate to stock boundaries, stock status and the specific devolved administration fisheries (see recommendations provided under management ref: 1a-1l).
Gear conflict	5a	The SICG should develop (i) good practice for avoiding gear conflict (see the GGGI best practice guidelines and others) and (ii) prepare a protocol / Standard Operating Procedure for vessels accidently interacting with other fishing gear, including reporting procedures (see below). This can be done generically for all the scallop fleet, or locally where particular conflict issues exist (see the Code of Conduct 2017 – 2018 for Solway Scallop and Static Gear Fishermen in the Luce Bay and Wigtown Bay areas of the Solway Firth).
	5b	Increased formal and informal communication between different sectors on the risks of gear conflict and the need for spatio-temporal management measures. This could be via social media, email and at sea communication (e.g. VHF and satellite phones).
	5c	AIS and other vessel identifiers should be switched on when fishing in areas with a higher risk of conflict to ensure that they can be warned of the presence of vulnerable fishing gear.
	5d	The scallop sector establishes and maintains a reporting system for gear-related interactions with other gear types. This should be periodically reviewed, and appropriate steps taken to address higher risk areas (e.g. via increased communication or if justified, use of spatial-temporal management).
	5e	SICG maintains an up to date register of permanent, seasonal and temporary restricted gear zones that is provided to skippers, if possible as navigation plotter update files or available via marine tracking software / smartphone apps.
	5f	Maintain constructive engagement and communication between scallop dredge and potting industry sectors to proactively mitigate the occurrence of gear conflict.

Topic	Ref	Action
Gear conflict continued	5g	Where gear conflict is recurring, consider appropriate management such as zonal management to allow different sectors to work the same grounds at different times of the year.
	5h	Scallop vessels picking up ALDFG should be encouraged and assisted to land this ashore in a responsible manner.
Environment	6a	Encourage proactive and inclusive engagement with industry when developing management measures within MPAs.
	6b	Implement VMS or inshore VMS (iVMS) for all vessel lengths, to allow identification of key grounds to inform gear conflict and other developments and allow appropriate evidence related to fishing restrictions within MPA areas.
	6c	Review technical gear measures with a view to supporting innovation that has been demonstrated to lead to more sustainable practises, e.g. lower footprint, less intrusive gear etc.
	6d	Improve the knowledge of offshore developers by presenting the impacts to the UK scallop fishery of offshore renewable developments at a FLOWW meeting (Fishing Liaison with Offshore Wind and Wet Renewables Group).
Ethical fishing	7a	Companies develop a joint commitment to ethical behaviour at a senior level, embedding this in organisational policies and procedures, e.g., including: • Fishers work agreements • Welfare and integrity • Health and safety • Entitlement to work • Human rights • Living remuneration • Rest periods • Crew discrimination This could then be published in the form of a 'Transparency in Supply Chains' statement in accordance with Section 54 of the UK's Modern Slavery Act (2015).
	7b	Development of ethical risk assessment systems at sector and organisational levels
	7c	Engage with the Maritime and Coastguard Agency (MCA) to ensure effective implementation of ILO 188 (which is effective for UK vessels from November 2018).
	7d	Review implementation of ILO 188 in 12 months' time, and based on this review consider whether alternative approaches are necessary, such as RFS v2 standard.
	7e	Encourage vessels to utilise an online vessel safety file facility that includes ethical aspects and is a good procedure for filing relevant documentation for all vessel crew, including medical certificates, health and safety, training certificates etc.
	7f	Ensure that effective grievance mechanisms are in place and are fairly and transparently monitored an acted upon. In addition, a 'whistle-blowing' mechanism could also be introduced.
	7g	Where possible and appropriate, move to a crew share wage scheme. It may be necessary to develop sector benchmarks to establish how this works.
	7h	Instil a culture of zero tolerance for unethical behaviour throughout the supply chain.
	7i	Prepare a publicly available sector position paper, which is reviewed and updated periodically, demonstrating that the large majority of scallop vessels operate in an ethical and sustainable manner.

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Appendix 1: Data Limitations

Landing statistics

Limitations of landings data include the spatial size of ICES rectangles (e.g. surface area of an ICES rectangle). This can misrepresent actual activity within this area e.g. indicating activity across the entire ICES rectangle, when it may be focused in a specific location within that ICES rectangle. A further limitation of landings data is the potential under or over-reporting of landings, which may occur as a result of estimating catches (as opposed to accurate weighing) and not reporting catches that fall below the acceptable limit as defined within the UK Registration of Buyers and Sellers (i.e. when purchases of first sale fish direct from a fishing vessel are wholly for private consumption, and less than 30 kg is bought per day).

VMS data

Limitations of VMS data are primarily focused on the coverage being limited to vessels ≥15 m (noting that while vessels ≥12 m require VMS, data is not available from the MMO for under 15 m vessels). It is important to be aware that where mapped VMS data may appear to show inshore areas as having lower (or no) fishing activity compared within offshore areas, this is not the case because VMS data do not include vessels typically operating in inshore area (i.e. which typically comprises of vessels <15 m in length). This is particularly important when considering the activity in inshore areas.

Vessels ≥12 m have required VMS since 2012, however the MMO highlight that "*the introduction of the requirements for these vessels to have on-board VMS and e-logbook systems was introduced gradually across the UK fleet and as such it was only by the end of 2016 that all these vessels were migrated over to have these systems on-board, especially the VMS data*." (MMO, *pers comm*). It is expected that 2017 VMS data for 12-15m vessels will be published by the MMO for the first time in February 2019. Data will not be made available for annual periods prior to 2017.

In relation to 2016 scallop dredge data, it has not been possible to analyse the MMO dataset due to the presence of null values within the dredge dataset. In highlighting this to the MMO they responded that "*in previous years when we have published this data, all fields that have no value were filled with zeros. This was overlooked when publishing the 2016 data and this is the reason for the fields with null values/no content. The data in the table is accurate and complete as much as possible."* (MMO, *pers comm*).

Overall, data limitations were managed by ensuring accurate interpretation of the data and clear understanding of its scope (i.e. VMS data provided by MMO includes vessels ≥15 m in length, omitting those from 12 m to <15 m).

Appendix 2: UK Scallop Consultation – List of Consultees

Type	Name	Organisation	Email communication	Interviewed
Industry	Bill Brock	Brighton & Newhaven	Invited for input	Interviewed
Industry	Barry Young	Brixham Trawler Agents	Invited for input	
Industry	Iain Spear	Coombe Fisheries	Invited for input	Interviewed
Industry	Paul Trebilcock	Cornish PO	Invited for input	
Industry	Mark Greet	Falfish	Invited for input	
Industry	Sean Irvine	JD Trawling	Invited for input	Interviewed
Industry	Juliette Hatchman	Macduff	Invited for input	Interviewed individually and at group meeting
Industry	Sarah Pilgrim	Macduff	Invited for input	Interviewed at group meeting
Industry	David Beard	Manx Fish PO	Invited for input	Interviewed
Industry	Paul Leeman	Ni Scallop Association	Invited for input	Interviewed
Industry	Harry Wick	NIFPO	Invited for input	
Industry	Mark Webber	Ocean Fish	Invited for input	
Industry	Alex Passmore	Passmore Fishing / More Processing	Invited for input	Interviewed
Industry	Alan McCulla	Sea Source/ANIFPO	Invited for input	
Industry	David Leiper	Seafood Ecosse Ltd	Invited for input	
Industry	Mike Shark	Skipper	Invited for input	Interviewed
Industry	Mike Park	SWFPA	Invited for input	
Industry	Femke de Boer	SWFPA	Invited for input	Interviewed at group meeting
Industry	Gary Buchan	SWFPA	Invited for input	Interviewed individually and at group meeting
Industry	George Jack	SWFPA	Invited for input	Interviewed at group meeting
Industry	Ian Fletcher	SWFPA	Invited for input	Interviewed individually and at group meeting
Industry	Steven Girgan	SWFPA	Invited for input	Interviewed individually and at group meeting
Industry	John MacAlister	SWFPA, Chariman of Scallop Committee	Invited for input	Interviewed individually and at group meeting
Industry	Jim Portus	SWFPO	Invited for input	Interviewed
Industry	Tom Nicholson	TN Trawlers	Invited for input	
Industry	Derek Meredith	Vessel manager	Invited for input	Interviewed
Industry	Mark Roberts	Welsh Fishermen's Association	Invited for input	Interviewed
Industry	John King	West Coast Sea Products	Invited for input	
Industry	John Hermse	Western Inshore Scallop Group	Invited for input	Interviewed
Industry	Malcom Morrison	SFF	Invited for input	Interviewed at group meeting
Government	Paddy Campbell	DEARA	Invited for input	
Government	Roy Griffin	DEARA	Invited for input	

Type	Name	Organisation	Email communication	Interviewed
Government	Bill Badger	Defra	Invited for input	Interviewed
Government	Helen Hunter	Defra	Invited for input	Interviewed
Government	Sarah Clark	Devon & Severn IFCA	Invited for input	
Government	Karen McHarg	*IoM gov*	Invited for input	*Interviewed*
Government	Andy Read	IoM gov	Invited for input	
Government	Eamon Murphy	Marine Scotland	Invited for input	Interviewed
Government	Simon Dixon	MMO	Invited for input	Obtained scallop entitlement data; interviewed
Government	Kevin Williamson	MMO	Invited for input	
Government	Martyn Youell	MMO	Invited for input	
Government	Hubert Gieschen	MMO	Invited for input	
Government	Garry Dando	MMO	Invited for input	Email communication re VMS data
Government	Malcolm MacLeod	MS	Invited for input	Interviewed
Government	Simon Pengelly	Southern IFCA	Invited for input	Interviewed
Government	Michael Jones	WAG	Invited for input	
Government	Stuart Evans	WAG	Invited for input	
Government	Janet Perry	WAG	Invited for input	
Science	Mike Kaiser	Bangor University	Invited for input	Interviewed
Science	Ewen Bell	Cefas	Invited for input	
Science	Andy Lawler	Cefas	Invited for input	
Science	Helen Dobby	Marine Scotland Science	Invited for input	Interviewed
Science	Anne McLay	MSS	Invited for input	Interviewed
Science	Arina Motova	Seafish	Invited for input	Interviewed
Science	Hazel Curtis	Seafish	Invited for input	Interviewed
Science	Nathan de Rozarieux	Tegen Mor	Invited for input	

Appendix 3: UK Scallop Consultation – Interview Prompt

UK Scallops

Consultation, May-June 2018

POSEIDON
AQUATIC RESOURCE MANAGEMENT

Photo: Keith Hiscock

Background

Poseidon have been commissioned by the Scallop Industry Consultation Group (SICG) to review the UK scallop fishing sector. In particular we will examine the following issues identified by the SICG:

- UK scallop stock assessments
- Fleet capacity & latency
- Sectoral representation among stakeholders
- Scallop fishery management throughout UK
- Brexit considerations
- Gear conflicts
- Environmental footprint
- Ethical supply

We will review reports and datasets to produce an evidence-based report on the UK scallop sector.

We will undertake a SWOT (strengths, weaknesses, opportunities and threats) analysis and horizon scanning to explore future sector developments. This, together with consultation with industry, management and scientists will inform future good management opportunities and recommendations for the UK scallop sector to consider.

Your details

Name:	
Company/ Organisation:	
Sector:	Catching / processing/ managemen enforcement/ scientific
Vessel details:	Size: Name:
Where you fish:	
When you fish:	

We would appreciate your input to the following questions. Answers will be treated confidentially.

1. Scallop stocks

A range of surveys are undertaken on scallop stocks around the UK – current data suggests the status of scallop stocks are mixed, with some in good shape and others in decline.

a. Have you noticed any long-term trends in scallop stocks and their distribution?

b. Do you target specific stocks or areas? Does this change seasonally or annually?

c. Are you aware of the use of stock biomass and LPUE (kg/dredge/hour) reference points in scallop fisheries?

d. How do you think evidence gathering exercises / surveys might be funded in the future?

2. Fleet capacity & latency

The scope of this work covers all UK dredge vessels legally permitted to catch and land scallops.

a. What do you consider to be latent capacity? And does it exist within the UK scallop sector?

b. What issues arise due to latent capacity?

c. Does latent capacity effect scallop stocks or effort uptake in restricted effort management areas?

d. Would removal of latent capacity in restrictive effort management areas benefit the scallop stock?

3. Sectoral representation

The UK scallop dredge fleet includes under 10m, 10-15m and >15m vessels that operate locally inshore and nomadically inshore and offshore. We would like to understand the level of representation across the UK scallop fishery.

a. What industry groups are you a member of?

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b. Where do you get scallop industry information from?

c. Do you feel well-informed of developments relating to the scallop sector?

d. How would you like to be informed? Regular meetings, email, website, social media, nationally vs locally?

e. Are you represented as much as you want to be? If you are not member of an association, why is that?

f. Do you need scallop-specific industry representation?

g. Do you feel that any particular sector is under represented? And if so how could they be incorporated into discussions?

4. Scallop fisheries management

Scallop fisheries management varies across UK jurisdictions, including Scotland, Northern Ireland, England and Wales, together with the Isle of Man.

a. Are you aware of all the management requirements where you fish?

b. Is the current management regime working? If no, what is not working and why?

c. Are management controls adequate to ensure stock sustainability?

d. What could improve management of the scallop sector?

e. Is the Western Waters Effort management regime effective? Does it impact your operation? If not, what do you think could be done to improve the system?

5. Brexit considerations

Post Brexit the UK will be an independent coastal state retaining a commitment to UN Stocks agreement to co-operate on shared stocks.

a. Are you aware of the possible impacts of Brexit on the scallop sector?

b. What will be the main consequences of Brexit for the scallop sector?

c. Will the scallop sector benefit, stay broadly the same or be disadvantage by Brexit?

d. Have you changed anything or made any plans as a result of Brexit?

e. What are your priorities on issues such as continued open boarder trade, continued access to grounds and joint stock management?

6. Gear conflicts

The effect of displacement (due to restricted access or exclusion from areas) leading to gear conflict.

a. What fisheries conflict with scallop gear?

b. What are the main reasons for conflicts arising? (e.g. communication, gear marking, unclear jurisdiction, etc.)

c. How are conflicts resolved?

d. What are the trends in gear conflict between scallop gear and other fisheries over the past five years? (e.g. increased or decreased and why?)

e. What is your view on spatial management for gear?

f. Would you support the development of a strategy on gear conflict?

7. Environmental footprint

Considering the benthic impact of scallop dredging, recovery rates and overlap with the marine protected areas network.

a. Are you supportive of protected areas and restrictions on fishing within them?

b. Have you been involved in discussions on scallop fisheries in marine protected areas? And do you feel you have had enough involvement in decisions?

c. Do you feel VMS data provides a sufficient representation of scallop fishing distribution?

d. Are there benefits to the scallop industry from protected areas and associated closures?

e. Are there any alternative dredge types that may be practicable? Are you aware of any results of trials?

8. Ethical supply

Focused on ethical and social responsibilities.

a. Are buyers asking for social / ethical standards (e.g. RFS, ETI, ILO, etc.)?

b. If so, what barriers are there for scallop vessels achieving these e.g. operational, cost, cultural or other?

c. How can these barriers be overcome so that the potential risk of non-compliance is eliminated across the scallop sector?

d. How can reputational damage be tackled, reduced or eliminated?

Thank you for your input. Please contact Rod, Tim or Fiona for any further details.

rod@consult-poseidon.com tim@consult-poseidon.com fiona@consult-poseidon.com

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