



Ensuring Long Term Sustainability From Scotland's Marine Resources - Remote Electronic Monitoring (REM) Consultation

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marinescotland

Enhancing sustainable fisheries management - Remote Electronic Monitoring

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Responding to this Consultation

We are inviting responses to this consultation by 7th June 2022

Please respond to this consultation using the Scottish Government's consultation hub, Citizen Space (<http://consult.gov.scot>). Access and respond to this consultation online at <https://consult.gov.scot/marine-scotland/remote-electronic-monitoring> . You can save and return to your responses while the consultation is still open. Please ensure that consultation responses are submitted before the closing date of 7th June 2022.

If you are unable to respond using our consultation hub, please complete the Respondent Information Form to:

REM Team
Sea Fisheries Division
Marine Scotland
Scottish Government
Area 1B North
Victoria Quay
Edinburgh
EH6 6QQ

Handling your response

If you respond using the consultation hub, you will be directed to the About You page before submitting your response. Please indicate how you wish your response to be handled and, in particular, whether you are content for your response to be published. If you ask for your response not to be published, we will regard it as confidential, and we will treat it accordingly.

All respondents should be aware that the Scottish Government is subject to the provisions of the Freedom of Information (Scotland) Act 2002 and would therefore have to consider any request made to it under the Act for information relating to responses made to this consultation exercise.

If you are unable to respond via Citizen Space, please complete and return the Respondent Information Form included in this document.

To find out how we handle your personal data, please see our privacy policy: <https://beta.gov.scot/privacy/>

Next steps in the process

Where respondents have given permission for their response to be made public, and after we have checked that they contain no potentially defamatory material, responses will be made available to the public at <http://consult.gov.scot>. If you use the consultation hub to respond, you will receive a copy of your response via email.

Following the closing date, all responses will be analysed and considered along with any other available evidence to help us. Responses will be published where we have been given permission to do so. An analysis report will also be made available.

Comments and complaints

If you have any comments about how this consultation exercise has been conducted, please send them to the contact address above or at REMConsultation@gov.scot.

Scottish Government consultation process

Consultation is an essential part of the policymaking process. It gives us the opportunity to consider your opinion and expertise on a proposed area of work.

You can find all our consultations online: <http://consult.gov.scot>. Each consultation details the issues under consideration, as well as a way for you to give us your views, either online, by email or by post.

Responses will be analysed and used as part of the decision making process, along with a range of other available information and evidence. We will publish a report of this analysis for every consultation. Depending on the nature of the consultation exercise the responses received may:

- indicate the need for policy development or review
- inform the development of a particular policy
- help decisions to be made between alternative policy proposals
- be used to finalise legislation before it is implemented

While details of particular circumstances described in a response to a consultation exercise may usefully inform the policy process, consultation exercises cannot address individual concerns and comments, which should be directed to the relevant public body.

1. Introduction

Scotland's seas are rich and diverse, hosting an abundance of marine life providing a healthy, low carbon source of food as well as a source of employment for Scotland and the international community. As set out in the Scottish Government's Fisheries Management Strategy¹, we have a responsibility as managers of this public resource to ensure that fishing takes place sustainably and responsibly, and that fishing activity is accountable, delivers confidence for consumers and the wider public as regards the products offered.

As we look to deliver responsible and sustainable management, the way in which we deliver accountability and confidence needs to evolve. Embracing technology such as Remote Electronic Monitoring (REM) and advancements in Machine Learning (ML) provides opportunities not just to modernise the way in which we manage, but to deliver savings for the public good by improving our processes and capabilities.

The proposals detailed within this consultation paper are set within this context, by ensuring we fully capitalise on the benefits that can be brought through the use of technology to:

- Improve our capacity to monitor fishing activity at sea and increase compliance with legislation for all vessels fishing in Scottish waters;
- Enhance our scientific capability and knowledge, supporting sustainability of fish stocks and the management of our natural resources;
- Deliver the confidence and accountability that consumers and members of the public want to see from our seafood products;
- Improve fishing data to help the fishing industry co-exist with other marine users, better assist marine planning, and build resilience in our fishing fleets and our fish stocks.

Rolling out the use of REM and ML technology offers real opportunities to position Scottish seafood not only as being of the highest quality, but also as being one of the most sustainable and well managed products. It is our strong belief that REM should be seen as a positive tool by the fishing industry and we want to work with stakeholders to develop and deliver this in partnership, to ensure that the framework we put in place is workable and that it delivers a level playing field to all fishing vessels legally harvesting fish in our waters.

The proposals set out within this paper focus on the following:

1. The general principles of REM. We would welcome all stakeholders views on these points as they will apply across fleet segments – not just those being consulted at this stage.
2. Formal Consultation on mandatory REM requirements in the:
 - 2.1. Pelagic sector. Defined as Refrigerated Sea Water /Chilled Sea Water (RSW/CSW) and freezer trawls fishing with a mesh size of 70mm or less within Scottish waters, targeting mainly mackerel and herring, with a significant catching capacity whilst delivering high quantity and value seafood

¹ [Future fisheries: management strategy - 2020 to 2030 - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/future-fisheries-management-strategy-2020-to-2030/pages/1-introduction.aspx)

products. **We will be implementing this requirement following consultation, but will seek views on aspects of the policy.**

2.2. Scallop dredge sector. **We will be implementing this requirement following consultation, but will seek views on aspects of the policy.**

3. Initial views sought regarding REM in the:

3.1. Demersal sector. Defined as mobile vessels with an overall length of 12 metres and over specifically large whitefish and mixed fishery vessels fishing in Scottish waters. **We are not seeking to formally consult on the implementation of REM for this sector, but would like to seek initial views from stakeholders on a range of options.**

With regards to the inshore sector, specifically vessels with an overall length of 12 metres and under, we are not seeking specific views on monitoring and tracking solutions in this consultation. The Bute House Agreement includes a number of fisheries management proposals for inshore waters², including a commitment to extend tracking and monitoring solutions for all commercial fishing vessels by the end of the current parliamentary session. These proposals will be subject to consultation in 2022.

Following the principle set out within the Fisheries Management Strategy, that a one-size-fits-all approach to management should be avoided in order to take account of the variations in fishing practices across different fleet sectors, and the need for proportionality, the proposals for these different sectors vary in coverage, specification and timescale for implementation.

1.1 Context

Since 2012³ it has been a requirement for all EU and UK fishing vessels 12m and over to be fitted with a Vessel Monitoring System (known as VMS) which transmits a vessel's positional data to a satellite and then sends it to a national or international body that monitors vessels' position, course, speed and other parameters.

The coupling of VMS data with electronic logbook data is currently the most practical and cost-effective way to describe the spatial dynamics of fishing activities. At present the International Council for the Exploration of the Seas (ICES) requests VMS and logbook data from ICES member countries via an annual data call, with the data products (spatial distribution of fishing effort and surface and subsurface abrasion) used as a basis for advice to fisheries managers within the EU. Currently, the UK has a memorandum of understanding with ICES which enables the UK to ask for advice products directly. It should also be noted that VMS data is also accessible to Marine Scotland Science (MSS) staff for a variety of relevant analyses. While the methodologies and workflows for processing VMS data are well-developed there are a number of short-falls, particularly in regards to the uncertainty of inferring fishing activity from vessel speed for mobile bottom-contacting fishing gears, the inability to infer fishing activity for static gears, and the relatively long intervals between VMS pings (1-2 hours).

² [Scottish Government and Scottish Green Party: draft shared policy programme - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/draft-shared-policy-programme-2021/pages/100-to-110.aspx)

³ [Council Regulation establishing a Community control system for ensuring compliance with the rules of the common fisheries policy 2009](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009R0012)

In addition to VMS, vessels may also carry an Automatic Identification System (AIS) which transmits a ship's identifier, course and speed to those around it as a safety measure to alert others to their presence, activity, and to avoid collision. Since 31 December 2020, this has formed part of retained EU law in the UK, subject to certain amendments to allow it to operate⁴.

However, over the last decade a variety of electronic technologies that can be applied to a fishing vessel to support more comprehensive fisheries-dependent data collection have been developed. These include electronic reporting, electronic monitoring, and transmitted or archival Global Positional Systems (GPS).

The ICES Working Group on Technology Integration for Fishery-Dependent Data (WGTIFD) has defined a common vocabulary of electronic technologies to be used within the ICES community⁵, as follows:

- **Electronic Monitoring** (more commonly referred to as Remote Electronic Monitoring (REM) within the UK) – the use of imagery, sensors, and GPS to independently monitor fishing operations, effort, and/or catch.
- **Imagery** - The use of one or more cameras to collect single images or video.
- **Sensor** - Digital or analogue devices used to detect or measure fishing operations such as vessel movements, fishing gear operation, and other characteristics.
- **Transmitted or Archival positional data systems** – GPS systems that collect and transmit data from the vessel or gear during a fishing trip (or archive data on the vessel, and then transmit at the end of a fishing trip(s)) (e.g. AIS, VMS)
- **Machine Learning (ML)** – Applications of artificial intelligence that provide systems with the ability to automatically learn and improve from experience while analysing both image-based and non-image based data.

Given our view that a blanket “one size fits all” approach for the deployment of monitoring solutions is not likely to be proportionate or appropriate, we need to tailor the technologies deployed to match the nature and profile of our fishing fleets. This will likely result in simplified REM systems for some fleets (or fleet segments) that do not necessarily feature all the components as defined by WGTIFD.

REM as a monitoring and data collection tool was first trialled in Scotland during 2008. At the time it was utilised as part of a large scale monitoring scheme in the Scottish fishing industry during the time that the Cod Recovery Plan (CRP) (2009-2016) was in place, offering a Fully Documented Fishery (FDF) monitoring scheme. Vessels took REM on-board in return for incentives, namely additional cod quota and

⁴ [Protocol Notification: The Common Fisheries Policy \(Amendment etc.\) \(EU Exit\) Regulations 2019 - gov.scot \(www.gov.scot\)](https://www.gov.scot/protocol-notification-the-common-fisheries-policy-amendment-etc-eu-exit-regulations-2019)

⁵ [Working Group on Technology Integration for Fishery-Dependent Data \(ices.dk\)](https://www.ices.dk/working-group-on-technology-integration-for-fishery-dependent-data)

an increased days at sea allowance. The FDF scheme enabled Marine Scotland officials to build up a considerable level of expertise and experience of operating an REM scheme successfully, and provided a clear demonstration that REM can work as an effective compliance tool. It also acted as the catalyst for comprehensive development of REM technology in a scientific context⁶, with ongoing research into best practice for extracting accurate scientific data from CCTV footage, developing methodologies for the assessment of fish and shellfish stocks using REM, and investment and development of ML software which can deliver automated image recognition of fish caught as they are processed on on-board conveyor belt systems.

In addition, to benefit from the dispensation provided in The Regulation of Scallop Fishing (Scotland) Order 2017⁷ (to use 10 dredges per side in the 6-12 nautical mile zone) a number of scallop dredge vessels already have an REM system (including GPS, winch sensors and two cameras) installed on-board. Marine Scotland officials use the REM data generated to confirm that a vessel is not exceeding prescribed dredge numbers in Scottish territorial waters and ensuring adherence to the rules governing Marine Protected Areas (MPA).

There are many international examples of REM being introduced and used successfully, including being implemented in a compulsory fleet-wide manner, for example in Chile⁸ and New Zealand⁹. Several of these programmes monitor pelagic fisheries including the mid-water purse seine fishery for small pelagics in Chile, the tuna purse seine fisheries in the Indian and Atlantic oceans¹⁰, the mid-water Pollack fishery in Alaska¹¹, and the Atlantic herring and mackerel midwater trawl fisheries¹². In a European context, work continues to be undertaken by the European Commission and the European Fisheries Control Agency (EFCA) to consider how and where REM may be deployed within the EU fleet.

It should be noted that given its devolved competence to legislate in this area, the Scottish Government, seeks views by means of this consultation to expand the usage of REM as regards Scottish vessels (and all other vessels fishing in Scottish waters). In developing this policy, the Scottish Government intends to work closely with other UK administrations to ensure that REM policies and requirements are aligned across the 4 nations.

The Scottish Government's policy of EU alignment aims to maintain and advance the high standards that Scotland enjoyed as part of the European Union. The current EU position on REM is being discussed as part of the development of the revised EU

⁶ Geoff French, Michal Mackiewicz, Mark Fisher, Helen Holah, Rachel Kilburn, Neil Campbell, Coby Needle, Deep neural networks for analysis of fisheries surveillance video and automated monitoring of fish discards, *ICES Journal of Marine Science*, Volume 77, Issue 4, July-August 2020, Pages 1340–1353, <https://doi.org/10.1093/icesjms/fsz149>

⁷ [The Regulation of Scallop Fishing \(Scotland\) Order 2017 \(legislation.gov.uk\)](https://www.legislation.gov.uk)

⁸ [Electronic monitoring in Chile: testing, implementation, and iteration | Future of Fish](#)

⁹ [Progress of electronic monitoring in the Snapper 1 trawl fishery | Fishing and aquaculture | NZ Government \(mpi.govt.nz\)](#)

¹⁰ [Cetaceans and tuna purse seine fisheries in the Atlantic and Indian Oceans : interactions but few mortalities | Request PDF \(researchgate.net\)](#)

¹¹ [Microsoft Word - Electronic Monitoring in Alaska 1.14.10.docx \(npfmc.org\)](#)

¹² [4.Herring-and-Mackerel-Fishery-Electronic-Monitoring-Project_Final-Report.pdf](#)

Control Regulation. The EU is committed to delivering sustainable and responsible fisheries management, delivering compliance with key pieces of legislation such as the landing obligation, and recognises REM as an important tool in demonstrating that compliance and delivering accountability, although it has not yet agreed scope, specifications and timescales for delivery for REM systems. The proposals outlined within this consultation paper align in principle with the EU's existing fisheries management policies and progress the EU's current position by mandating the introduction of REM for key parts of the fishing fleet. The addition of 3rd country vessels – such as Norwegian and Faroese – needs to be considered as well.

The concept of a 'level playing field' is an important one and is central to the implementation of REM – put plainly, all vessels, whether Scottish or non-Scottish, will face the same requirements. We know from experience the damage that can be done if measures are applied inconsistently. During the Cod Recovery Plan (2009-2016), many of the measures introduced only applied to the Scottish fleet rather than across all vessels fishing in Scottish waters and we saw a situation whereby Scottish vessels would see their activities constrained whilst non-Scottish fishing vessels fishing alongside them could continue as before. For that reason, REM will be applied fairly and equally to all vessels licensed to fish in Scottish waters, regardless of nationality.

1.2 Why REM?

The benefits from REM can be significant, particularly when cameras and sensors are used. The benefits derived from REM systems can vary from fleet to fleet but cover a number of main areas, as set out in the sections below.

Enhancing knowledge and understanding

REM technology offers a range of scientific benefits, by supporting and enhancing existing fisheries-dependent data collection methods such as independent fishery observers, statutory returns (i.e. logbook or FISH1 forms), and, in the case of vessels of length 12 metres and over, VMS. REM technologies can improve the timeliness, resilience, quality, cost-effectiveness and accessibility of scientific data to ensure the data utilised for fisheries management decision-making is of high quality.

The implementation of REM and ML on fishing vessels could, in the future, ease the reporting burden and duplication of effort on behalf of fishers and fisheries compliance organisations by automating vessel activity and catch reporting and flagging spurious data. At present, the technology available does not seem to be capable of replacing Fish1 forms or logbooks; but while existing methods of reporting will continue, the possibility of technology advancing to supplement or even replace this system should be considered.

Delivering confidence and accountability

REM can enhance our abilities to demonstrate accountability in fishing practices, to deliver confidence that fishers are complying with the rules and regulations which are in place, and to supplement existing enforcement tools used as part of a world-class compliance system. REM can also be used to prove compliance with existing

regulations: for example, to counter perceptions that vessels are acting illegally (e.g. fishing in a restricted area) when in fact no illegal activity is taking place. Used properly, REM would be able to demonstrate sustainable practices and adherence to the rules. At a time when markets are increasingly focussed on sustainability, traceability and accountability, the presence of REM on-board will help vessels respond to market and consumer drivers and should help in the overall context of seeking accreditation for different fish stocks.

REM can also act as a deterrent to any non-compliant activity, such as discarding, high grading, or misreporting and can create a level playing field for all vessels that use it within a fishery as long as rules are applied fairly and consistently and where there are appropriate levels of monitoring and analysis.

Many Scottish registered fishing vessels fish not only in Scottish waters but also in wider UK waters and beyond into other Coastal State areas. Whilst the primary purpose of this consultation is to consider the operability of REM inside Scottish waters, the Scottish Government can also require measures to be applied to Scottish vessels when they are fishing outside of Scottish waters. With that in mind, it would be possible for us to mandate that applicable¹³ Scottish vessels use REM regardless of where they are fishing. This would add to the richness of data that we collect and also assist from a fisheries compliance perspective, delivering confidence and accountability in fishing practices. We recognise that this may mean that Scottish fishing vessels would have more monitoring technology than others when outside of the Scottish zone, but also consider that it would help demonstrate our ambition and role as a leading fishing nation.

Question 1: Do you agree that Scottish vessels required to use REM in the Scottish zone should also have REM operational when operating outside of the Scottish zone?

Possibly through a license condition, non-Scottish vessels, if at any time they are fishing in Scottish waters, could be required to provide all of the fishing trip's data for analysis – otherwise these vessels could behave exactly as desired once having left Scottish waters.

Marine spatial planning

There are considerable challenges in managing human activities in the marine environment where space is at a premium and in high demand from a range of industries and multiple users. The higher spatio-temporal resolution of positional data collected by REM systems in comparison to VMS, combined with sensor data, allows for the spatial distribution of fishing activity to be mapped. The approximately 10-second polling interval of REM GPS data logging permits complete charting of vessel tracks and the sensor data and/or camera(s) establishes accurate activity on location. Such data could be an essential resource to the fishing industry in evidencing their use of space in marine spatial planning consultations and in demonstrating their activity in a particular area or at a given time. In addition this

¹³ I.e. those we are applying the requirement to. In this instance, the pelagic and scallop dredge fleets.

data could be used to minimise gear conflict between fishing industry sectors and encourage better use of space.

Resilient systems

Fisheries, fishers and both fishery-dependent and fishery-independent data collection have all been severely impacted by the COVID-19 pandemic. In many fisheries this has resulted in a combination of sampling programmes being suspended and, when operational, limited observer availability due to quarantine rules. Globally, however, REM programmes have been only marginally impacted demonstrating the resilience of remote monitoring in its ability to provide continued uninterrupted data collection regardless of external extenuating factors. These benefits highlight the advantages of having multiple monitoring methods to ensure an evidence base for continued fisheries management in unprecedented situations.

2. General principles

2.1 Use of data

Scotland's marine environment is a national asset and a shared natural resource. Marine Scotland, as the directorate of the Scottish Government responsible for the integrated management of Scotland's seas, collects data as part of necessary monitoring activities in Scottish waters.

REM data are collected either through legal frameworks, or sometimes as part of voluntary pilot schemes. Under both circumstances, data that can identify living people are personal data that are protected by law, and only kept for as long as it is strictly necessary. Data that can lead to direct identification of people are only kept for a period long enough to either examine them for legal compliance, or select a subset of data for examination. Once this process is completed the data are deleted from systems, in accordance with strict retention periods.

Across this type of monitoring, the overall information about activities is often used to analyse wider patterns. This type of analysis can range from understanding the impact of displacement of activities, or understanding the overall effort required for a certain catch for example. For this type of analysis, data are anonymised and aggregated to a point where no individual can be directly or indirectly identified. Data products that represent these analyses will sometimes be made available to wider society as evidence for changes in policies or legislation.

When monitoring activities in Scottish waters involves other bodies that store or process the data for Marine Scotland, it is still Marine Scotland that is responsible for the protection of the data. Contracts include clear requirements for protecting the personal data, and Marine Scotland has a legal obligation to report any breach in protecting personal data.

To be clear, Marine Scotland does not share a vessel's REM data with external bodies without the authority of the vessel owner, unless we are under a legal obligation to do so (e.g. on legitimate request by prosecution or other law enforcement bodies).

Operationally, the data transfer from some vessels can be complicated. For example, pelagic vessels operate at a significant distance away from land when actively fishing, and so transmitting any live data to shore requires both a complicated system and is expensive. The use of “live” data, video or still images, will vary from fleet segment to fleet segment. Scottish vessels will be required to submit data to Marine Scotland Compliance when reaching port. Non-Scottish vessels in turn will submit data to their Fisheries Monitoring Centre (FMC), who can then in turn provide that data to Marine Scotland on request.

2.2 Costs

The exact costs for REM will vary depending on the system specifications put in place, the different costs charged by commercial operators, and the number of cameras and / or sensors which are deployed.

Systems will vary across fleet segments. Moreover, exactly how data is stored and transferred for analysis can affect the final cost of a REM system.

Costs can be broadly split into three categories: 1) the initial upfront cost of hardware (system and installation), 2) the cost of data transfer and system software / licences, 3) the ongoing maintenance of hardware and replacement kit. It should be noted that these are estimates only.

Item ¹⁴	Estimated costs for pelagic vessels for a camera system	Estimated costs for demersal vessels for a camera system	Estimated costs for scallop vessels for a camera system
Estimated system cost	£6,300 - £9,000	£6,500 - £6,800	£4,000 - £6,000
Estimated installation cost	£1,000- £3,000	£2,000 - £2,500	£500 - £1500
Estimated Annual running cost	£700 - £2,500	£1,000	£350-£650

In addition to the varying costs of REM systems, different parts of the fishing fleet will have different financial capabilities, and the affordability of REM systems will vary from vessel to vessel and business to business. It may be appropriate in some cases for public funding to be provided to support the upfront purchase cost of REM equipment (for example, Marine Scotland is providing £1.5 million under the Modernisation of the Inshore Fleet Programme), and possibly in the form of grant funding via the Marine Fund Scotland. Any grant funding provided would be for Scottish vessels only although non-Scottish vessels may wish to engage with their relevant authorities regarding potential funding avenues which may be available.

¹⁴ It should be noted these are estimates only based on: [REM Technical Guidelines and Minimum Requirements \(europa.eu\)](#)

When considering the costs to businesses, we must also consider the benefits to industry from having REM on board, particularly in being able to demonstrate vessels are fishing sustainably and ethically, and in line with legislation. As a result, the quality and reputation of the Scottish fishing industry will benefit.

Question 2: Do you foresee any barriers to vessels meeting the costs associated with the REM systems themselves? This includes upfront and ongoing costs. And if so, please provide details.

2.3 Penalties

Breaches of these policies, for example having a non-functioning REM system, will have penalties applied under current structures (namely fixed penalty notices, and possible prosecution through courts depending on severity and regularity).

We believe that, in the vast majority of cases, fishers seek to fish within sustainable limits and to adhere to the rules and regulations that are in place. That said, the environmental consequences of not adhering to existing legislation can be significant. It is hoped that the introduction of REM will act as a deterrent of harmful and illegal fishing practices.

The REM systems proposed within this consultation paper are able to detect non-compliance with legislation, deter it in the first instance, and deal with it appropriately and proportionately if it happens. With that in mind an appropriate offence provision will be provided for within the REM legislation. Penalties could be applied for the following reasons (though not exclusively):

- Not having REM on board when fishing
- REM breaking down for reasons other than force majeure
- Failure to provide REM data on request within a clearly defined time limit.

Penalties for non-compliance currently include;

- A Fixed Penalty Notice (FPN) offered as an alternative to reporting to the Crown Office and Procurator Fiscal Service (COPFS) for prosecution
- Direct reporting to COPFS for prosecution

At present any vessel found to have a non-functioning VMS system can have their authority to sail removed until a time that evidence is provided (from a qualified person or company) that the system is fully functioning. It is envisaged that this restriction would be applied in respect of REM.

These penalties would also be applied to non-Scottish vessels fishing in Scottish waters.

3. Pelagic vessels (RSW and freezer vessels)

3.1 Overview of Proposal

As set out in the Fisheries Management Strategy, Scottish Ministers intend to introduce legislation to the Scottish Parliament making it a legal requirement that all pelagic vessels licenced to fish within Scottish waters (The Scottish Zone) will have a fully operational REM system installed on board. As noted above, pelagic vessels are defined as Refrigerated Sea Water /Chilled Sea Water (RSW/CSW) and freezer vessels, over 12 metres, fishing for small pelagics and blue whiting. The requirement to have an REM system on-board which complies with Scottish Government legislation will extend to all Scottish vessels, as well as other pelagic vessels from outside Scotland, fishing in Scottish waters.

The latest data from 2020 shows there were 22 vessels in the Scottish pelagic fleet, and around 155 non-Scottish vessels fishing for pelagic species in the Scottish Zone (though not necessarily landing in Scottish ports). The main species caught are mackerel, horse mackerel, herring and blue whiting, with the catching season running from late summer to February, depending on species.

Question 3: Are you aware of any issues we need to take account of when we apply REM across all pelagic fishing fleets fishing in Scottish waters on a level playing field basis? If so, please provide details

Question 4: do you agree with the definition of pelagic vessels provided and are there any unintended consequences from using this definition?

3.2 Timeline

Unlike scallop dredge REM, using REM on pelagic vessels in Scottish waters is a new concept. Pelagic REM can be a complex system which requires sufficient lead-in time to support implementation across all vessels. Vessels will need to source, procure and install REM systems which meet the parameters required in legislation. This process will understandably take time, and for that reason, the lead-in period will allow for systems to be installed and operational by a specific date.

Taking into account the complexities around implementation of REM, we recognise that a lead-in time will be useful for vessels to enable them to properly kit out their vessels prior to the mandatory requirement to have REM on-board taking effect. Given the actions involved in the manufacture, purchase and installation of REM to a number of vessels at the same time, we propose that this lead-in time could be around 12 months.

Question 5: how much lead-in time should pelagic industry be given to prepare for compliance with the mandatory REM requirement?

3.3 The benefits of REM in the pelagic sector

There are significant scientific and compliance benefits from having REM on board pelagic vessels, along with the general benefits around marketability and demonstrating sustainability, as indicated in the sections above.

For science, REM can provide additional verification that data collected via scientific programmes is valid. This would allow a REM system to confirm that what is being caught (species, volume, sizes) is the same as what is being landed. To have certainty over the current landings data, it is important to know that no slipping or discarding is taking place. Having this certainty will result in significantly improved input data into stock assessments. In addition, access to additional data gathered by pelagic vessels as they subsample their catch at regular intervals, particularly to confirm individual fish length and weight data, will significantly add to the data set available to scientists, and hence improve the reliability and resilience of scientific stock assessments and advice.

For compliance purposes, REM provides a system to demonstrate compliance with relevant legislation. In the case of pelagic vessels this is mainly the landing obligation, but also includes legislation on high grading, slipping of catch, and misreporting (all of which is legislation designed to support the sustainability of fishing activities). To do this the REM system needs to be able to confirm how much the vessel has caught and how much the vessel has landed. These two pieces of data will deliver confidence that what has been caught has been retained.

The introduction of the landing obligation in 2015 was intended to end the wasteful practice of discarding fish at sea and, along with it, also address associated issues with slipping and high-grading. There is limited evidence that the landing obligation has been successful in its primary objective: rather, there is evidence that discarding/slipping and high-grading continues within the fleet. By high-grading we mean selecting out the most profitable fish from a catch, and discarding those which are less profitable – a practice which has been illegal since 2009. By slipping, we mean fish caught in a net and released into the sea without being brought on board the vessel. By misreporting we mean vessels intentionally reporting catch in one area when it has been caught elsewhere – in breach of existing legislation.

Without enhanced surveillance and monitoring at sea it is difficult to see how such practices can be effectively deterred or appropriate enforcement action taken.

Currently, Marine Scotland's compliance priorities are determined on a risk basis. This includes activities such as boardings and visits to fish markets and processing factories. Activity at sea is monitored remotely and through boardings undertaken by Marine Protection Vessels (MPVs) and using aircraft surveillance. The practice of discarding is unlikely to happen when an MPV is known to be in the area acting as a deterrent. However, existing resources cannot cover all of the sea, all of the time.

Pelagic vessels are capable of catching large quantities of fish within short periods of time. The scale of waste, should discarding occur, is therefore significant. The introduction of REM to the pelagic fishing fleet should deliver confidence that discarding no longer takes place in this high-volume, high-profit fleet segment.

Question 6: Do you agree with the scientific and compliance benefits of REM for the pelagic fleet as set out in this document? Are there other benefits which you can consider, including to industry, the environment, or local communities?

3.4 The REM System

3.4.1 System requirements

In order to deliver the optimal level of benefits set out in section 2.3, we are seeking for REM systems, coupled with existing monitoring systems, to be able provide the following information:

- Confirmation of fishing activity taking place and location of fishing activity
- Weight of fish caught, retained and landed (providing there are no disparities between these figures will give confidence that no discarding has taken place)
- Species composition of fish caught
- Video footage of the sub-sampling for length and weight undertaken by the crew

In our view, this information can best be captured using a camera system to cover the various stages of the fishing operation, and by supplementing this with sensor data as needed to capture the information needed for both compliance and scientific purposes.

In addition to using cameras, we think there is considerable benefit to be gained from having access to net sensor data, which some pelagic vessels will already have on board. Access to net sensor data would provide an increased confidence level for both science and compliance purposes, to verify that what is caught in the net is retained and landed (with a comparison possible with landing data). However, we understand that this technology may not be available on-board all pelagic vessels and that there would be costs associated with requiring its presence above and beyond the costs already identified within the costs section above. This might mean a significant change in proposed costs – i.e. whether we can utilise existing sensors, or if new sensors would need to be installed. We are therefore seeking views on whether this is required at this point.

3.4.2 System specification

We propose that the REM system on-board a pelagic vessel should, as a minimum, be able to:

- Provide visual verification of fishing activity taking place, along with sensor data to indicate shooting and hauling of nets. Sensors would be placed to indicate shooting and hauling of nets.
- Provide visual verification via cameras that no discarding or slipping is taking place. It would also be helpful to position an additional camera(s) over the side of the vessel where the net is brought alongside to monitor bycatch of vulnerable species e.g. cetaceans.
- Provide visual confirmation of pump rate (via cameras) to aid with verification of catch data and estimation of weight of catch.

- Provide visual confirmation of separators to determine which tanks are receiving what fish at what time.
- Provide visual data via positioning of camera above the vessel's subsampling station, to include confirmation of length and weight (grams) data of the subsample in order to supplement the scientific data set.
- Provide GPS information – position information should be recorded at a minimum frequency of every 10 seconds, meaning this is more reliable than VMS information. This would allow the interpretation of location data and would aid in deterring and detecting misreporting.
- Provide pump rates – with the manufacturer's specification on the maximum that can be pumped in a set time, the camera visual will provide data for how long pumping was in operation. Between these two figures, the maximum amount of fish expected to have been brought on board can be calculated and compared against reported figures.
- Provide visual data by positioning the camera above any open channel/separator in order to estimate species composition and collect length and/or weight data if possible or as candidate footage for Machine Learning (ML) development.

Question 7: do you agree that the system as outlined in this section should be able to meet the benefits described in Section 3.3? For clarity, these are summarised as follows:

- Improved data for scientific purposes and analysis
- Improved tool for compliance purposes to assess conformity with existing fishing legislation and rules

Question 8: do you foresee any specific operational problems with the system specification set out within the document? If yes, what?

Question 9: do you believe that we should require net sensor data as part of the system specification at this point?

4. REM for scallop dredge vessels

4.1 Introduction

During development of the Fisheries Management Strategy, it was made clear that Scottish Ministers intend to lay legislation in the Scottish Parliament making it mandatory for a fully operational REM system to be installed on-board scallop dredge vessels.

The introduction of REM legislation for all scallop dredge vessels in the Scottish zone needs to be considered in the context of existing provisions in the Regulation of Scallop Fishing (Scotland) Order 2017¹⁵ ("the 2017 Order"). In accordance with the 2017 Order a number of scallop dredge vessels are already equipped with REM systems (including GPS, winch sensors and cameras).

¹⁵ <https://www.legislation.gov.uk/ssi/2017/127/made>

4.2 The Regulation of Scallop Fishing (Scotland) Order 2017

On 1 June 2017, the 2017 Order came into force, introducing new measures for the conservation of king scallops, in order to help improve the management of effort in the Scottish fishery and to help increase the spawning stock biomass (the total weight of fish in a stock that are old enough to reproduce).

Under the 2017 Order, two different management arrangements (relating to dredge restrictions) are currently in force to help control and monitor dredge effort in the 0-12 nautical mile zone. A vessel fishing inside 12 nautical miles of the Scottish coast must ensure that either:

1. Any tow bar deployed is no more than 7.5 metres in length; no more than 2 two bars are deployed at any time; and no more than 8 dredges are towed per side at any time;

Or

2. A fully functioning REM system (GPS, winch sensors, cameras) is installed on-board that allows analysts in Marine Scotland Compliance to verify the number of dredges being deployed at sea. Vessels with an appropriate REM system can fish with up to 8 dredges per side in the 0-6 nautical mile zone, and with up to 10 dredges per side in the 6-12 nautical mile zone.

The provisions in the 2017 Order requiring the use of REM systems on-board were introduced using powers contained in the Sea Fish (Conservation) Act 1967 and the Sea Fisheries Act 1968, in order to ensure that restrictions relating to the number of scallop dredges are complied with.

4.3 The Fisheries Act 2020 (“2020 Act”)

The 2020 Act provides Scottish Ministers with new legislative powers which allow them to introduce broader REM requirements. For example, in relation to scallop dredge operations, REM requirements do not now necessarily need to be linked to the gear i.e. the number of scallop dredges being deployed. More specifically, the 2020 Act provides the Scottish Ministers with new powers to make regulations about the use and design of equipment used to monitor sea fishing for conservation (e.g. to ensure fishing restrictions in Marine Protected Areas are respected) or fishing industry purposes.

4.4 Proposal

The proposed new legislative instrument is focussed on REM systems being fully operational on vessels carrying and/or deploying scallop dredge gear in the Scottish zone, and therefore needs to be considered alongside the current provisions (relating to gear restrictions) in the 2017 Order, as follows:

4.4.1 Restrictions on number of scallop dredges for king scallops (Articles 4 and 5 of 2017 Order).

Marine Scotland intends to separate REM requirements from the restrictions on number of dredges for king scallops. Therefore, provision will be made that would apply to all vessels operating in the Scottish zone, and would maintain limits on the number of dredges that can be deployed when fishing for king scallops as follows:

- In the 0-12 nautical mile area within the Scottish zone, no more than 8 dredges can be deployed from each of the port and starboard sides of the boat (no more than 16 dredges in total).
- In the 12-200 nautical mile area within the Scottish zone, no more than 14 dredges can be deployed from each of the port and starboard sides of the boat (no more than 28 dredges in total).

During Marine Scotland's 2014 consultation on new controls in the Scottish King Scallop Fishery¹⁶, some larger vessel owners and processors expressed opposition to a 8 dredge per side limit due to economic impact¹⁷. On consideration of the different sectors of the scallop dredge fleet, Marine Scotland accepted that vessels willing to install REM would be allowed to deploy 10 dredges per side in the 6-12 nautical mile area within the Scottish zone (Article 4 as read with Article 6 of the 2017 Order). The intention is to provide existing vessels that have a historic track record of fishing in the 6-12 nautical mile area with 10 dredges per side, verified by REM equipment, with permission to continue to do so.

Tow bar restrictions are superfluous when REM (including cameras) is in operation. Vessels currently operating under the tow bar restrictions established under Article 5 of the 2017 Scallop Order would need to take no further action in order to comply with the proposed gear limits set out above (i.e. they are already required to deploy no more than 8 dredges per side in the 0-12 nautical miles area within the Scottish zone).

4.4.2 REM requirements (Article 6 of the 2017 Order)

In effect, the intention is to make provision in the legislation which substantively replicates (see 'REM System Specification' below) the current REM requirements (Article 6 of the 2017 Scallop Order) for all scallop dredging. The scope of these requirements will be broader in that they will apply to all vessels (Scottish and non-Scottish) carrying and/or deploying scallop dredge gear in the Scottish zone, regardless of scallop species being prosecuted and number of dredges being deployed.

We consider that such an approach genuinely enhances our ability to demonstrate accountability in fishing practices, to deliver confidence that scallop fishers are complying with legislative rules and regulations. Cameras are a corroborative tool used to determine when fishing activity is being carried out, helping to address alleged fishing incursions into protected areas.

¹⁶ [Consultation on new controls in the Scottish King Scallop Fishery 2014 \(www.gov.scot\)](http://www.gov.scot)

¹⁷ [Consultation on New Controls in the Scottish King Scallop Fishery 2014 - Outcome Report - gov.scot \(www.gov.scot\)](http://www.gov.scot)

Our view is that if the technology should be deployed consistently across the scallop dredge fleet it will ensure that the intention is not undermined by one or a small number of 'rogue' vessels for whom we currently cannot, but need to, prove fishing activity on location.

Question 10: Are you aware of any issues we need to take account of when we apply REM requirements consistently across all scallop dredge vessels in the Scottish zone, regardless of scallop species being targeted or number of dredges being deployed? If so, please provide details.

4.5 The benefits of REM on scallop dredge vessels

There are significant fisheries management and compliance benefits from having REM on board scallop dredge vessels. The Scottish Government has fostered open discussion and close collaboration with the full spectrum of national scallop fishing interests via the Scottish Scallop Sector Working Group. Convened in 2019, this group is the principal mechanism for ensuring industry involvement as regards scallops, as we extend the use of REM and consider other policy developments.

The high spatial resolution positional data generated through REM systems which identifies where and when (including the time taken and distance covered by tow) a vessel is fishing is valuable in a range of circumstances at local and national levels. Extending the use of REM for the dredge sector will act as a tool to deter and detect non-compliant activity and provide a more detailed profile of the fishing fleet, particularly in Scotland's inshore area, where space is at a premium and our fisheries evidence base can be improved. More consistent spatially rich fishing activity data can help the sector co-exist with other marine users and better assist in marine planning, licensing and research.

The REM camera function is an effective enforcement solution by monitoring compliance with legislative rules and regulations when vessels are at sea, specifically:

- to validate that the number of dredges deployed at sea do not exceed statutory limits; and,
- to function as a corroborative tool to prove (or disprove) fishing activity on location, for example when in close proximity to a restricted area and ensuring compliance with marine protection legislation.

Looking ahead, it may be possible that camera systems on scallop dredge vessels could be used to monitor catch composition and that scientists could obtain the biological data (age and measurements of scallops) required for stock assessments by analysing video footage or images rather than sampling landings at markets and processors. Purpose designed REM development work is ongoing but preliminary studies suggests that the shape and orientation of scallops and the catch sorting and handling systems on board dredgers make this particularly problematic, compared to fin fish identification and measurement systems. Work will continue to ascertain if improvements can be made to allow the accurate length measurements and age readings of scallops using on-board camera systems.

4.6 REM System Specification

In general, the REM requirements set out in Article 6 of the 2017 Order have proven an effective tool for monitoring the scallop vessels within scope of the provision.

These REM requirements currently include winch sensors and at least 2 digital cameras. Sensors are mounted on the vessel to capture location and activity data. GPS and other data such as speed, direction and winch movement detection are provided to ascertain vessel location and what fishing activities the vessel is engaged in at that location. The two cameras are positioned to monitor all fishing activity on location.

The intention is therefore to essentially replicate these established REM provisions in the new legislative instrument (but widen their application to ensure that all vessels carrying and/or deploying scallop dredge gear in the Scottish zone have a fully operational REM system installed on-board that meets the standards required).

At present, the legislation specifies video imagery of 1080 pixels per frame. As this does not allow for continuous video streaming and only still images, making analysis difficult, Marine Scotland intends to introduce a requirement that the REM system must have the ability to record footage to a minimum of 5 Frames Per Second (FPS).

Question 11: Do you agree that REM requirements on vessels carrying and/or deploying scallop dredge gear in the Scottish zone should be broadly aligned to existing REM requirements provided for in Regulation 6 of the 2017 Order? Please explain your answer.

Question 12: Do you consider that any other changes (in addition to the ability to record footage to a minimum of 5 FPS) should be made to the REM system specification?

5. REM for large demersal vessels

We know that REM can deliver significant benefits for other parts of the fishing fleet and want to consider how these benefits can best be realised in the future for fleet segments other than pelagic and scallop vessels. REM needs to be used proportionately, both in terms of which vessels are required to carry REM and also in relation to the type of REM which is used. Tailoring our approach and the technology we use to make sure we deliver the right outcomes is important.

For larger demersal vessels, specifically those targeting whitefish and also those targeting a mixed Nephrops and whitefish fishery [e.g. Large Demersal 22 m and over – using 120 mm or Large Nephrops 18 m and over - using between 80 mm – 119 mm] in an offshore context (i.e. beyond 12 nm of the coast), the deployment of REM on-board would help to deliver a range of benefits similar to those set out in section 2.3 for pelagic vessels.

We are seeking views on a range of options for deployment of REM to these parts of the fleet fishing within Scottish waters.

One option is the use of a reference fleet. This is likely to involve placing an REM system on a limited and defined number of Scottish vessels, in order to provide reference data for both compliance and science purposes. The system would be likely to involve a mixture of cameras and sensors in order to monitor fishing activity and to deliver the various benefits set out above. By using a reference fleet, costs would be kept to a minimum, and the data could be used to inform management decisions for both fishing operations and stock assessments. Reference fleets could also be used to provide a benchmark for compliance with rules and regulations, particularly around the discarding of fish; however it should be noted that there is difficulty in ensuring the performance and behaviour of a reference fleet is representative of the full fleet. Data for REM equipped vessels could be compared to non-REM vessels and should discrepancies arise, this could be used to require more robust monitoring in the case of expected infringements.

This option is likely to only apply to Scottish vessels, rather than all vessels (domestic or international) fishing in a particular fleet segment. It could also act as a precursor to wider rollout, by acting as a trial to help refine the technical requirements. In this way a reference fleet could act as a stepping stone to further rollout at a future point should it be needed. It would, however, mean that at least in the initial stages there would be no level playing field between Scottish and non-Scottish vessels.

Another option is broader rollout of REM for all vessels fishing as part of specific fleet segments. This would have the advantage of providing more blanket coverage, and provide greater certainty in delivering the benefits outlined above. It would also ensure that REM could be delivered on a level playing field basis, so that the same requirements would apply to Scottish and non-Scottish vessels. This requirement would require significantly more development and a longer lead in time for implementation, however these complexities may be outweighed in terms of broader benefits.

We are seeking views from stakeholders on the relative merits of each of these options, and also views on whether there are any alternative options which should be considered. We plan to take a staged approach to the deployment of REM on-board these fleet segments, recognising the need to have a workable Catching Policy in place first, and also recognising the considerable resource required to develop this proposal further. We want to take a co-management approach to the future rollout of REM and plan to discuss these options and the outcome of this consultation with our Fisheries Management and Conservation Group (FMAC) and others as appropriate. We will also consult further and more widely if required.

Question 13: what is your view in relation to the various options outlined for deployment of REM to parts of the demersal fleet as outlined in this section?



6. Respondent information form

Please Note this form **must** be completed and returned with your response.

To find out how we handle your personal data, please see our privacy policy:
<https://beta.gov.scot/privacy/>

Are you responding as an individual or an organisation?

- Individual
 Organisation

Full name or organisation's name

Phone number

Address

Postcode

Email

The Scottish Government would like your permission to publish your consultation response. Please indicate your publishing preference:

- Publish response with name
 Publish response only (without name)
 Do not publish response

Information for organisations:

The option 'Publish response only (without name)' is available for individual respondents only. If this option is selected, the organisation name will still be published.

If you choose the option 'Do not publish response', your organisation name may still be listed as having responded to the consultation in, for example, the analysis report.

We will share your response internally with other Scottish Government policy teams who may be addressing the issues you discuss. They may wish to contact you again in the future, but we require your permission to do so. Are you content for Scottish Government to contact you again in relation to this consultation exercise?

- Yes
 No



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