# Project UK Fisheries Improvements:

# North Sea Plaice & Lemon sole FIP Steering Group

**Review of alternative measures to encourage the development and implementation of technologies and operational methods that minimise mortality of unwanted catch or ETP species**

**Background**

The MSC Fisheries Assessment Methodology requires that fisheries adequately take into account the MSC Principles & Criteria, in relation to gear selectivity, namely that fisheries should “**make use of fishing gear and practices designed to avoid the capture of non-target species (and non-target size, age, and/or sex of the target species); minimise mortality of this catch where it cannot be avoided, and reduce discards of what cannot be released alive”** (Criterion 3B.12).In addition, FAO (1995), states that “selective and environmentally safe fishing gear and practices should be further developed and applied, to the extent practicable, in order to maintain biodiversity and to conserve the population structure and aquatic ecosystems and protect fish quality. **Where proper selective and environmentally safe fishing gear and practices exist, they should be recognized and accorded a priority in establishing conservation and management measures for fisheries.”**

To ensure this, the MSC has recently added a “Review of alternative measures” to several performance indicators to encourage the development and implementation of technologies and operational methods that minimise mortality of unwanted catch or ETP species”, the desired outcomes being:

* To motivate fishers to continually “think smart” about their impact on the environment (species and habitats); both in delivering the sustainable impact most efficiently, and continuing to reduce their impact beyond that.
* To balance this desire with efficiency by not spending a lot of money and time generating only marginal improvements.

To achieve this for species, the scoring issue has been added to the P1 Harvest Strategy (PI 1.2.1) and P2 Species Management PIs (PI 2.1.2, 2.2.2, 2.3.2) requiring fisheries to continually review alternative measures to encourage the development and implementation of technologies and operational methods that minimise mortality of unwanted catch or ETP species, taking into account the practicality of the measures, their potential impact on other species and habitats and on the overall cost of implementing the measures.

Fisheries need to either review alternative measures that are shown to minimise mortality of the species or species group in question. Fisheries also need to consider alternative measures to reduce impacts on habitats. Fisheries should also take account of the potential for both positive and negative impacts of alternative measures on species and habitats when considering whether such measures should be implemented.

Alternative measures should avoid capture of the species in the first place or increase its survivability if released. Alternatively, in the case of in-scope species, they could utilise the unwanted catch in some way so that it would no longer be ‘unwanted’. If there are no unwanted species, the scoring issue on reviewing alternative measures does not need to be scored in that PI.

**Alternative Measures Definition:** Fishing gear and practices that have been shown to minimise the rate of incidental mortality of the species or species type to the lowest achievable levels.

**Alternative Measures Scoring** **Guideposts**

**SG 60** There has been **a review** of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock/secondary species/ ETP Species.

**SG 80** There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock/secondary species/ ETP Species. and they are implemented as appropriate.

**SG 100** There is a **biannual** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock/secondary species/ ETP Species., and they are implemented, as appropriate.

**Estimated Scoring for Lemon Sole and Plaice (Alternative Measures)**

**Note:** This Scoring estimate is based upon that of the SFSAG North Sea Cod Assessment by ME Certifications Ltd and current implementation systems for alternative measures, it’s subject to change based on new understanding of management activity and MSC and CB scoring of “Review of alternative measures”.

**PI 1.2.1 – Harvest strategy (f) SG60**

Discarding of Plaice & lemon sole below the legal minimum landing size or commercial size is the principal cause of unwanted mortality. The effectiveness of technical measures to reduce bycatch is monitored through annual ICES assessments that use discard data to estimate unwanted mortality. Technical measures are available and have been installed in some cases, however the approach by managers and fishers is neither systematic or regular, hence the scoring of SG60

**PI 2.1.2 – Primary species management strategy (f) SG60**

There is unwanted catch of species where there is insufficient quota to cover the total quantity caught, requiring discarding. If quota is insufficient at vessel, PO or national level, then generally this can be rectified via quota swaps.

However Lemon sole is potentially a ‘choke species’. Choke species have been under extensive discussion since the introduction of the landings obligation, which requires this fishery to cease all discarding of quota species by 2019. There is also unwanted catch generated if undersized individuals are taken – these were previously required to be discarded under Regulation 850/1998, but as the landings obligation is phased in are increasingly required to be landed.

The ICES Plaice advice for the greater North Sea Ecoregion 2017 (DOI:

10.17895/ices.pub.3197) Identifies the limiting species in the plaice fishery below. As Lemon sole is rarely targeted it’s much harder to deliberate.

*“Results from a North Sea mixed fisheries analysis are presented in ICES (2017c). For 2018, assuming a strictly implemented discard ban (corresponding to the “Minimum” scenario), whiting would be the most limiting stock, being estimated to constrain 24 out of 42 fleet segments. Haddock is the second most limiting stock, constraining eight fleet segments. Additionally, if Norway lobster was managed by separate TACs for the individual functional units (FUs), Norway lobster in FU 6 would be considered the most limiting stock for ten fleet segments. Conversely, in the “Maximum” scenario, saithe and Eastern Channel plaice would be least limiting for 20 and 11 fleet segments, respectively. Finally, if Norway lobster was managed by separate TACs, Norway lobster in FUs 7, 5, 33, and 4. Non-FU would be the least limiting for nine, two, one and two fleet segments, respectively. For those demersal fish stocks for which the FMSY range is available, a “range” scenario is presented that minimizes the potential for TAC mismatches in 2018 within the FMSY range. This scenario returns a fishing mortality by stock which, if used for setting single-stock fishing opportunities for 2018, may reduce the gap between the most and the least restrictive TACs, thus reducing the potential for quota over and undershoot. This “range” scenario*

*suggests that the potential for mixed-fisheries mismatch would be lowered with a 2018 TAC in the lower part of the FMSY range for Eastern English Channel plaice and saithe, and in the upper part of the range for cod and North Sea plaice.”*

Scotland has an excellent track record of putting in place management aimed at reducing discards, including real-time closures for juvenile cod, as well as EU real-time closures for juvenile cod, haddock and saithe, the introduction of square-mesh panels and other selectivity improvements in the *Nephrops* fleet and other measures tested and implemented as part of the ‘conservation credits’ (FMAC) scheme (e.g. CCTV, echo sounders and cameras on the net, separator trawls). The Gear Innovation Technical Advisory Group solicits ideas from skippers as part of the Scottish Industry Discards Initiative and the testing of these ideas is supported by 300 days of SFF observers. Seafish also have a ‘discard action group’ which acts as a clearing house for research and information and a forum for discussion.

England is also engaged in research aimed at the reduction of discards including the CEFAS project

This question is also under discussion at EU level at present, because key EU regulations aimed at reducing unwanted catch (e.g. 850/1998, the Cod Recovery Plan) are not compatible with the landings obligation and other elements of the reformed CFP. It remains to be seen how this will work out since the EU without fails leaves these decisions to the last minute, but more flexibility is required to reduce unwanted landings where discarding is no longer allowed.

On this basis, the discussion on how to reduce unwanted catch has been ongoing and is intensive at present; it is considerably more than ‘biennial’. Various measures have been tested and when shown to work, however they are only sometimes implemented and not necessarily as appropriate. SG60 is met.

**PI 2.2.2 – Secondary species management strategy (e) SG80**

The review system at Scottish, English and EU level make no distinction between primary and secondary stocks, so the analysis is the same.

**PI 2.3.2 – ETP species management strategy (e) SG80**

**ETP Species present in Geographic area:** Allis Shad, Porbeagle, Grey Seal, Spurdog, Common Skate, Starry Ray

The ongoing review and improvement of management in relation to discards is described in detail in the rationale for PI 2.1.2e – this also applies to all the species here except grey seal. For grey seals in Scotland, the SMRU advice (annual) includes an assessment of seal bycatch in commercial fisheries (mainly in static net fisheries); they have a unit dedicated to monitoring and evaluating bycatch of all marine mammal species in fisheries, as well as from fish farms, turbines etc. This includes a review of, and recommendations on, measures such as pingers to reduce mortality in applicable situations (not this fishery). On this basis, and given that interactions with grey seals are very low according to observer data, the team concluded that this was sufficient for SG80 to be met.

**Organisations & Research into Alternative Measures applicable to the North Sea Lemon Sole & Plaice Fisheries**

**Global**

**1.ICES/FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB)**

The ICES-FAO Working Group on Fish Technology and Fish Behaviour (WGFTFB) has been set up with the goal of providing a forum for global synthesis of scientific knowledge of fishing technology, fish behaviour, and their application in conservation and sustainable utilization of world’s marine resources.

Recent topic group work of the WGFTFB that is relevant to this review is listed below:

**Technical Innovation in Spreading Trawls**

The purpose of this Topic Group was to provide a synthesis of recent technological advancements in the spreading of mobile trawls. Contributions were collected over a three-year period (2014–2016) from 29 participants representing 17 countries. Moving beyond basic doors and beams, the Topic Group revealed 17 new and leading innovations in the topic, although in many cases scientific literature is still absent on their engineering and catching performance. They include:

1. **Manoeuvrable trawl doors - Norway**
2. **Controllable trawl doors – Iceland**
3. **Xstream trawl doors - Denmark**
4. **Flipper trawl doors - Denmark**
5. **Ekkó trawl doors - Iceland**
6. **Batwing trawl doors - Australia**
7. **Jumper door – the Netherlands**
8. **Semi-pelagic trawl doors Sumwing and pulsewing – the Netherlands**
9. **Hydrorig i and ii – USA and the Netherlands**
10. **Demersal seine rope dynamics**
11. **Knot orientation**
12. **Kites/depressors**
13. **Self-spreading plate gear – Denmark and Norway**
14. **Self-spreading semi-circle plate gear – Norway**
15. **Wing trawling system – USA**
16. **Use of high strength netting material**

The findings represent a snapshot in time; it is a picture of innovative technology un- der development. Looking forward, we are encouraged by the rate of R&D in this field. We see examples of academia, government, and industry all working on innovative concepts. The development and commercialization of novel products by door manufacturers is a particularly encouraging sign.

**Non-Extractive Sampling**

The topic group on Non-Extractive Sampling was to summarize current needs for non-extractive sampling (e.g. regulatory restrictions, sampling threatened or endangered species, sampling in sensitive or protected habitats), inventory currently avail- able equipment and techniques, and to identify current gaps between available technology and sampling needs. The major findings of the group are as follows:

1. Examples of a switch from fishing gear to non-extractive optical survey technique exist, but in general, the fisheries research community currently has little focus on sampling mortality or how to reduce it during routine investigations.
2. Techniques for modelling mesh selectivity are well developed and can facilitate designing fishing gears with reduced need for at-sea trials and catch of fish.
3. The bottleneck in more widespread use of optical techniques for fisheries investigations is not the imaging technologies, but the facilities for effective storage, catalogue, and analysis of image data.
4. Automated image processing for marine fisheries data are still in the development stage. It is recommended that FTFB members make effort to develop tools for image and video analysis and cataloguing and made available to the wider user communities.

**Application of Change Management in the Fishing Industry**

The purpose of this Topic Group was to retrospectively evaluate case studies related to change in the fishing industry against the Kotter model of change management, explore models of human behaviour that may contribute to resistance to change, and identify and categorize circumstances and approaches that led to the successful and unsuccessful introduction of change in fisheries. Seven case studies were presented, although not all were evaluated against the Kotter model. The group also explored two additional case studies, which were also evaluated against the Kotter model. The main outcomes of the topic group are as follows:

1. Retrospective case studies identified some or all the steps of the Kotter model, but no step was considered to determine success or failure.
2. Elements of successful change programs were suggested: size of the stake- holder group, stature of participants, clarity of purpose or vision, closures or lawsuits forcing mandatory change, and health of fishery resource or profitability of the fishery.
3. Vessel ownership (non-operator/corporate v. owner/operator) influences appetite and attitude toward change.
4. Readiness to change is an important element in understanding how change occurs, and can be a useful addition to the Kotter model, which focuses on inertia and process.
5. Simplification of regulations might engage fishers in useful innovation in- stead of harmful innovation.
6. Application of the Kotter model to two case studies highlighted the importance of a careful definition of the vision of a change initiative.
7. Contributions from social scientists with experience in human behaviour and the commercial fishing industry are needed to validate and support our understanding of human decision-making.
8. ICES Strategic Initiative on the Human Dimension (SIHD) should be in- formed of topic group findings and explore opportunities for collaboration.
9. Preparation of an extensive retrospective review for publication that at- tempts to categorize circumstances and events that contribute to successful and unsuccessful change initiatives in fisheries should be considered.

**Contact probability of selective devices**

The main purpose of this topic group was to summarize current and past work in relation to contact probability, and methods to investigate and quantify contact probability, to improve contact probability in selective devices to achieve desired outcome of the devices. During the two meetings (2015 in Lisbon and 2016 in Merida), the topic group discussed and elaborated:

1. Definition of “contact” and “contact probability” in the context of selectivity devices,
2. Means and methods to investigate and estimate contact probability of selectivity devices,
3. Importance of contact between fish and the hear for the functioning of successful selectivity devices, and
4. Reasons that a developed selectivity device/concept did not work as desired with regards to contact.

The group concluded that a more detailed investigation and discussion of contact probability between fish and selection device is essential to further improvement of existing and the development of new selective devices. This was also reflected in the numerous contributions to this topic group. However, aside from the general investigation on the contact probability for a given selective device, information on the contribution of different factors influencing the contact probability is often missing.

**European Union**

**1.DISCARDLESS**

Working for less discards: Strategies for the gradual elimination of discards in European fisheries

* **Programme:** Horizon 2020 – the Framework Programme for Research and Innovation (2014-2020)
* **Instrument**: Collaborative project
* **Total Budget:** €5,551,000.00
* **EC Contribution:** €5,000,000.00
* **Duration:** March 2015 – February 2019 (48 months)
* **Coordinator:** National Institute of Aquatic Resources, Technical University of Denmark (DTU Aqua), Denmark
* **Consortium:** 31 partners from 12 countries

**The DiscardLess** projectaims to provide the **knowledge, tools,** and **methods** required for the successful reduction of discards in European fisheries. To achieve this, DiscardLess will work through collaborations between scientists, stakeholders and policy makers to support and promote practical, achievable, acceptable and cost-effective discards mitigation strategies, and to make the EU landing obligation functional, credible and legitimate.

The **collaborative approach** of DiscardLess aims to ensure that the developed tools, information and strategies will provide relevant, acceptable and cost-effective means with a wide uptake in society which will result in the achievement of the goals of the landing obligation.

A comprehensive list of the work that Discardless has published, supported and funded can be found [here](http://www.discardless.eu/scientific_publications)

**2.Project MINOUW**

The **MINOUW Project** is made up of over 15 different maritime science institutes and bodies from across Europe, and brings together scientists, fisherman, NGOs and policy makers.

It aims to encourage the adoption of fishing technologies and practices that reduce unwanted catches, and contribute to the eventual elimination of discards in European fisheries and avoid damage to sensitive marine species and habitats.

The Main goal is to develop and demonstrate technological and socio-economic solutions that enable and incentivise fishermen:

**1) Avoid unwanted catches**,

OR

**2) Where this cannot be reasonably or practically achieved, to utilise them productively and sustainably.**

Solutions will be developed and demonstrated in a case-by-case analysis of the main types of European fisheries. They will be based on, in order of priority, **avoidance**, **selection**, and **utilisation**. Finally, they will be practical: technologically feasible, environmentally sustainable, and economically viable.

The MINOUW project aims to create **“a positive change in the sea”** by placing fishers at the core of actions to reduce unwanted catches and discarding practices, and by using multi-stakeholder engagement in the design and implementation of actions to bring about that change. The project has 4 distinct work areas:

### **Conducting research**

To understand the nature of discards and their impact in ecological, socioeconomic and technical terms, the project includes 17 case studies spread across 7 countries, featuring fisheries based on trawl gears, purse seines, dredges, traps, pots, nets and loglines.

### **Finding solutions**

We identify, develop and test innovative technological and social solutions to avoid unwanted catches, and assess their suitability and practicality, their effect on the level of discards, and the impact of any reduction on the local marine ecosystem.

### **Sharing knowledge**

Key to the project is the exchange of skills, information, knowledge and practices. From research and data to new technologies or innovations, we are building a broader understanding of the problem and potential solutions among stakeholders at all levels.

### **Recommending policies**

As well as a review of the European policy framework, and raising awareness of its main aspects in the fishing industry, the project will provide policy recommendations aiming to incentivise selective fishing and the best use of unwanted catches brought on land.

See web link [here](http://minouw-project.eu/)

**3. GearingUp (CEFAS, FundingFish, Mindfully Wired Communications)**

The GearingUp project mixes stakeholders from fisheries science and industry-led innovation to dedicated fisheries-focused communication specialists and active fishers.

The project aims to help fishermen, net makers and fisheries managers find practical solutions to reduce unwanted catches in commercial fisheries. Launched to help identify solutions for different vessels to meet challenges of the Europe-wide ‘Landing Obligation’ (LO), the project brings together data on gear selectivity trials that have taken place in the North Sea and North Western Waters since 2002 and makes it available via an online tool. GearingUp users have access to precise results from the applications of gear innovations anywhere, anytime, so they can make an informed decision about modifications to their fishing gear. the web-based tool allows the user to search over 450 data entries regarding gear selectivity allowing the user to choose search categories and find a gear trial that suits a specific fishery, region and vessel

See [here](https://gearingup.eu/about-us/) for web link

**4. North Sea Advisory Council (NSAC) Paper: Managing Fisheries within the Landing Obligation (Ref.14-1617)**

This paper describes a wide range of measures that could in combination, potentially contribute to the reduction of the risk of chokes in mixed demersal fisheries. In listing these various measures, we are clear that there is no panacea. The relevance of each measure will depend on the circumstances of each fishery – type of discard, target species, fishing grounds, vessel characteristics, catch composition, gear adaptations etc. The purpose in listing and discussing each measure, is to create a sufficiently large menu, or tool box, for regulators and stakeholders to draw on to provide as many options as possible. Their application will have to be weighed, taking the specifics of each case into account.

This paper presents NSAC’s advice on some of these approaches and suggests who should take responsibility for particular actions to help mitigate the risk of choking. In doing so it considers both measures that could be implemented now or in the near future and those where changes may take place over a longer term.

The Paper covers:

**Predictive analysis**

* To what extent it is possible to predict when chokes will arise.

**Avoidance, information sharing and gear selectivity**

* Avoidance
* Information sharing
* Real-time closures
* Precautionary areas
* Move-on policy
* Seasonal closures
* Gear selectivity

**The application of TACs**

* Data Limited Stocks
* Use of FMSY ranges
* Grouping of TACs o Removing TACs
* By-catch quota
* Prohibited species
* Zero TAC species

**Quota Management Considerations**

* Domestic quota management
* Quota uplifts
* Quota swaps & transfers

Parallel work is being undertaken in the NWWAC, which may have considerable relevance to this advice and should be considered, in particular the development of a choke mitigation tool. Next steps for the NSAC will be to work further with the Member States and the Scheveningen Group to develop a choke mitigation tool for the North Sea.

The paper can be found [here](http://nsrac.org/wp-content/uploads/2015/12/14-1617-Managing-the-Fisheries-within-the-Landing-Obligation.pdf).

**Scotland**

1. **Fisheries Innovation Scotland (FIS)**

Fisheries Innovation Scotland is a legally constituted, non-profit-distributing organisation, with the remit of bringing together government, scientists, industry and other key stakeholders within a formal structure to lead an on-going programme of research, knowledge exchange and education. FIS aims to deliver expert advice to help inform the governance and management of sustainable fisheries, the fishing industry and related supply chain throughout Scotland.

It is envisioned that FIS through its activities will meet many of the innovation objectives currently listed under the provisions of Article 26 of the European Maritime and Fisheries Fund. The core focus is on innovations which will contribute both directly and indirectly to expanding the knowledge base needed to preserve Scottish fisheries for future generations.

In a European context, FIS works with existing bodies, such as the Regional Advisory Councils; the European Commission and ICES, with an aim to developing research links with other European fisheries with specific shared interests.

**FIS Objectives & Priorities**

* To provide information and support to our members, governments, public bodies and other organisations in order to inform fisheries policies and management.
* To advance, and to encourage the advance of, expertise, science and management of and in relation to prosperous and environmentally sustainable fisheries in Scotland.
* To establish, enable and encourage education, research and training relating to Scotland’s marine fisheries.
* Wherever possible contribute to and enhance the public’s knowledge and understanding of fisheries in and surrounding Scotland and elsewhere.

**FIS work specifically focused on Gear Selectivity**

# **FIS011-A: Innovation in selectivity (Nov 201)**

Developing and facilitating a range of possible future FIS projects in innovation in selectivity through on-net or alternative technologies

**Main Contractor(s):** MRAG

View [**Final Report**](http://www.fiscot.org/media/1380/fis011a.pdf) **here**

**Project Overview**

The introduction of the EU landing obligation poses a significant challenge for fisheries. Whilst there have been important advances in improving selectivity in fisheries in recent years, there is still a need to find solutions for reducing discards by improving selectivity in the broadest sense. The project has four sections: to provide a review of the state of knowledge and technical advances in selectivity; to identify novel ideas and innovations from other disciplines and sectors that may be relevant to improving selectivity; to identify possible funding sources to support future research on selectivity; and to provide a research plan that will serve as a framework for future multidisciplinary research on selectivity.  These objectives are achieved through review of existing literature and consultation with experts, stakeholders and potential co-funders, both in the UK and internationally.  The project provides a framework for future research, drawing fresh ideas and innovations from beyond the fisheries sector. The products of this future research, whilst indirectly linked to the outputs of this project, are intended to support Scottish fishers in respect to adapting to the EU landing obligation by bringing about improvements in selectivity.

# **FIS011-B: SMARTFISH Selective retention** (May 2016)

# Developing and facilitating a range of possible future FIS projects in innovation in selectivity through on-net or alternative technologies

**Main Contractor(s):** University of Aberdeen

**Project Overview**

Mitigating the impacts of the landings obligation (LO) will require the Scottish fishing industry to implement a range of different strategies. This project develops plans for implementing two complementary strategies — spatial selectivity and gear selectivity —  in the Scottish demersal industry which is heavily impacted due to the mixed nature of fish in the North Sea and west of Scotland. Building on from the successful implementation of area closures by the industry, the project outlines a detailed plan for enhancing spatial selectivity through improvements to real-time information flow within the industry to rapidly identify areas to be avoided (“hotspots”). This plan is informed by expertise in the US Pollock fishery and developed through consultations with the Scottish fishing industry. A comprehensive review of relevant geo-referenced databases is undertaken to identify any barriers to improved information flow. To improve gear selectivity in the industry the project develops a highly innovative design for a gate that releases unwanted discards and bycatch by integrating state-of-the-art image analysis, artificial intelligence and underwater engineering (SmartTrawl). This enhanced gear selectivity would improve compliance with the LO and deal with by-catch mitigation for non-quota species such as the vulnerable sharks, rays and other charismatic megafauna. To achieve both goals the project facilitates a knowledge exchange between fishing industry and technology experts and scientists from the U.S. and Norway having direct experience with by-catch reduction. Stakeholder engagement with the Scottish industry is a strong theme. The technical requirements and a future work scope for implementing both plans are summarised in the form of draft proposals for enhancing selectivity and potential funding sources are identified as well as prospective partners for future programme of work. The project capitalises on world-leading expertise in selectivity enhancement and promotes the innovative use of emerging technologies, e.g., the use of hotspot mapping and image processing of trawl footage.

View [Final Report here](http://www.fiscot.org/media/1382/fis011b.pdf)

**2. Marine Scotland Science: Selectivity in Trawl Fishing Gears (Funded by Discardless)**

In this manual, Marine Scotland Science (MSS) describe the different stages of the fish capture process, highlight how different parts of the gear may influence selection and identify possible design changes which can alter the selectivity of the gear. The intention is to make fishermen, net makers and fisheries managers more aware of the possible modifications that can be made to their gears so that they can design and develop gears with a selective performance suitable for their fishery.

MSS have also assembled a catalogue of fact sheets which provide brief descriptions of many of the catch comparison and selectivity trials that have taken place in the North Atlantic and adjacent seas. This is again to highlight the potential gear modifications that can be made and to provide an indication of their likely effect. It is important to bring together this type of information and to disseminate it as broadly as possible, as not only will the preferred selective performance differ at a fishery by fishery level, but it may also vary at a vessel by vessel level, as individual fishermen may wish to tailor their gears to the specific catch and quota restrictions they may face and/or to optimise their response to the prevailing market forces.

The catalogue of factsheets is by no means exhaustive; indeed, it is just a starting point, and it is anticipated that the web version will be added to and built upon.

Please see web link [here](http://marine.gov.scot/data/selectivity-trawl-fishing-gears).

**3.Scottish Gear Innovation and Technology Advisory Group (GITAG)**

Established in August 2015, GITAG is an industry-based body with Marine Scotland participation, and is hosted by the Scottish Fishermen's Federation (SFF). As Scotland moves to full implementation of the Landing Obligation in 2019, GITAG hopes to foster flexible working partnerships between active fishermen, industry and public bodies, gear technologists and science; aimed at scoping and contracting projects, trialling innovations to existing gear categories, piloting new gear configurations and types with associated data collection and appropriate scientific analysis. The Group will also be responsible for the industry-wide dissemination of project-related knowledge, research results and best practice, recommending a suite of evaluated gear.

This industry group was set up to stimulate innovation in the development of fishing gear technology aimed at trialling and proving new processes and techniques. They aim to assist the Scottish fishing industry's transition to the operational requirements of the phasing in of the Landing Obligation, whilst protecting economic viability.

The group is expected to remain operational until 31 December 2019, and will operate in line with the Scottish Government’s policies on sustainability, diversity and equality.

Membership of GITAG consists of representatives from industry, comprising the SFF and other industry representatives with a direct interest in this work, and officials from Marine Scotland's Policy and Science units. Individual fishermen may also be seconded onto the group as and when required, as determined by the needs of individual projects. GITAG is 100% grant funded under the EMFF programme. The funding structure will be appropriate to the EMFF regulatory requirements for the programme measure in that it will require match funding to be provided by Marine Scotland.

* **Phase 1** (August 2015 to May 2016) establishment of GITAG, appointment of Project Manager and initial tranche of projects. Total budget £111K
* **Phase 2** (June 2016 to December 2019) running of a 3-year programme and commissioning gear trials. Total budget £1.083m

Details of individual projects supported by GITAG can be found on the Scottish Fishermen’s Federation [website](http://www.sff.co.uk/encouraging-results-from-fishing-trials-with-new-trawl-design-for-reducing-unwanted-catches/).

**4.Conservation Credits Scheme**

The Conservation Credits Scheme works to improve fisheries management by adopting best practices in stock conservation. It is an innovative scheme and the first of its kind in EU waters. It has had to build consensus towards solutions that secure economic returns along with a long-term future for fish stocks. The scheme has been successful in gaining the commitment of industry, It has also gained international recognition, with several other countries replicating either part of or the whole scheme. As the name implies, the Scheme credits fishermen for adopting conservation measures with a currency of value to them – additional days at sea.

The Scheme is run by Scottish Government and advised by a steering group of around 25 members that brings together decision makers (government), end users (the fishing industry) and other stakeholders (including scientists and NGOs). The steering group meets monthly to assess the progress of the Scheme and discuss matters arising. This forum gives all members a degree of ownership, which helps ensure buy-in from the fishing sector.

**Measures set up under the scheme**:

Under the revised Cod Recovery Plan in 2009 there is a commitment to reduce cod mortality by 25%. The Conservation Credits Scheme has opted to achieve the reduction through a two-tiered approach, first by cod avoidance (thereby reducing discards) and then by a reduction in effort (reducing total catch). Cod avoidance is being done by several measures. These include:

**Area Closures (real time, amber avoidance areas, seasonal and permanent)**

A series of Real Time Closures (RTCs) have been set up in Scottish waters. The mechanism for triggering a RTC is either a predetermined number of cod (all cod, not just spawning cod) per hours fishing in a sample, or the analysis of Vessel Monitoring System (VMS) data and associated landings. There should be a maximum of 9 closures in place at any given time with an aim of having at least 6 closures in place at all times. Samples are taken either by Scottish or Norwegian inspection vessels, and fishermen are encouraged to advise the government about areas of high cod density.

The RTC is set automatically for a period of 21 days, which has been shown to be long enough for cod aggregations to disperse. Each RTC has an area of a maximum of 50 square miles, and there cannot be more than three RTCs in each Commercial Impact Zone (of 25 miles radius). Vessels are notified of the closures by letters to associations, email, radio, etc... In 2008 RTCs were implemented on a voluntary basis and compliance was almost 100% by fishermen both from the Scottish fleet involved in the Scheme and by foreign vessels fishing in Scottish waters. In November 2009 the Scheme is well on the way to achieving the target number of 140 RTCs, which should lead to a reduction in cod mortality of around 10% this year.

The second level of conservation areas in Scottish waters are called “amber” areas. These areas are identified by cross-referencing VMS position data with landings data extrapolated from vessel log books; the data can be aggregated over any chosen period (1 month - 12 months) and using various thresholds of landings per unit effort. Using the average data for all vessels operating in a certain square a gradient of probability of high cod abundance can be obtained for a given time. These amber areas are revised quarterly. Vessels can sign up to avoid these areas to earn additional days-at-sea.

Finally, Scotland has determined there should be several permanent or seasonal closed areas. These include the permanent “windsock”, which has been in place for several years and the seasonal “long hole”, which is closed from December to April, when it is sampled and a decision taken as to whether it should be reopened. This area is well known as an important place for spawning cod. Further seasonal closures include Pappa Bank (January until March), the Coral Edge (January until February) and the Stanhope Ground (February to April). Unlike the long hole, these latter three areas are automatically re-opened at the end of the closed period.

**GEAR REGULATIONS (one net rule, selective gear)**

Participants in the Conservation Credits Scheme must comply with a “one net rule”. This ensures only the regulated gear is used and facilitates enforcement.

**England**

**1. Young’s Seafood Ltd. & CEFAS Project Trawlight**

The overall aim of this scoping study was to determine whether artificial light can be used to alter selectivity in fishing trawls. There is currently limited information on the effect of light on the behaviour of fish during the capture process. A simple experiment was conducted to identify changes in fish behaviour as a response to artificial light.

The twin rig trawler *Providence* was chartered for four days during the Nephrops fishing season in October2015, November 2015 and February 2016. Fishing took place on the edge of the Farne deeps North Sea fishing grounds. Two designs of artificial light were tested; light-lines, a string of fibre optic lights designed by Marine Scotland and light-rings, compact LED units designed by SafetyNet. The vessels own commercial twin-rig trawl was used for the trials; one rig was modified by attaching either the light-lines or the light-rings to the square mesh panel, the other had no additions or modifications to provide a direct comparison. In all, eight tows were conducted during the trials, although only four tows were valid due to gear breakdowns and technical difficulties with the light technology. There was only sufficient data to analyse tows where light-rings were used.

Overall, there was a 40% reduction in the number of fish caught at lengths <24cm in the experimental trawl with the light-rings compared with the standard trawl. The most abundant commercial species, Nephrops, whiting, plaice and dab also showed reductions in the numbers caught in the experimental trawl:

* 47% reduction in the number of Nephrops with carapace length below 28mm
* 69% reduction in the number of whiting at lengths below 15cm
* 39% reduction in plaice catches between 24-25cm lengths
* 58% reduction in dab between lengths of 15-18cm

The low catch rates and the number of tows should be considered when drawing any conclusions. Although the scoping study has yielded limited data, it was clear that differences were seen between the trawl with Light-rings when fished alongside a trawl without lights. In particular, the reduction in catches of fish below minimum reference size. Although other differences between the trawl rigs, which may have effected selectivity, could not be ruled out, it is considered that there is sufficient information from this study to warrant further investigation of this technology. This type of innovative technology could assist vessel operators to avoid catches of unwanted fish in the context of the landing obligation. There could be a potential economic advantage; fishers would maximise their catch quota and reduce the amount of low value fish landed for the non-human consumption market.

**2.CEFAS Catch Quota Trials**

A trial was undertaken in 2015 with 18 vessels in the North Sea. Each vessel was fitted with Remote Electronic Monitoring (REM) and was required to operate under a discard ban for North Sea (Area IV) cod. Additional quota for use in fully documented fisheries provided for under the 2015 quota regulations was allocated to participants.

The main aims of the trial were to:

* provide evidence and experience from the scheme in advance of the demersal landing obligation being phased in from 2016;
* investigate the potential of using market grading data for reference fleet monitoring;
* better understand the impact of the Catch Quota scheme and the landing obligation on the fishing industry

Fishing operations were monitored for compliance with the requirement to retain and land all catches of cod by means of an audit of REM data and CCTV footage. In addition, the distribution of size-grades of landed cod was analysed as a means of providing an indication of possible high-grading amongst participant and non-participant vessels. Compliance monitoring and grade comparisons were both indicative of compliance with the scheme. In addition, cod length data generated from CCTV footage also correlated closely with the landed size distribution calculated from market grading data. These measures provide confidence that, as in previous years, there is a good level of compliance with the scheme.

The report considers the extent to which REM monitored vessels can be considered as representative of the wider fleet (i.e. to act as a ‘reference fleet’). The results show a significant variation spatially and temporally in the size distribution of cod catch by participant vessels and more recent analysis suggests significant spatial variance between participant and non-participant vessels. Such variance is likely to impact the level of confidence that can be drawn from monitoring a subset of vessels and therefore further analysis in this area is recommended.

Some of the trial participants have reported specific adaptations to avoid juvenile cod. These have included adding square mesh panels, increasing mesh size above legislative minimum requirements and behavioural adaptations. The main behavioural adaption reported has been avoidance of areas with known high levels of undersize fish. Work is ongoing in 2016 to study spatial variance between participant and non-participant fleets. This work has the potential to provide evidence of the reported spatial avoidance by the FDF fleet.

It is considered that there is the potential for REM to provide a means of retrospective auditing of real-time, industry-reported data such as juvenile fish abundance. This could allow juvenile real time closures to be triggered accurately and in genuinely real time. In addition, REM can be used to generate spatial and temporal trends in length frequency data with potential for scientific use.

See web link [here](https://www.gov.uk/government/collections/catch-quota-trials-reports)

**3. Seafish Gear Selectivity Trials**

Seafish has carried out several selectivity trials in the South West of England to support fishermen through the ban on discarding over quota fish, specifically Haddock in the SW trawl fisheries.

In recent years there has been an increase in the number of haddock found in the inshore grounds of South West England, this combined with the inshore trawlers small quota for haddock in the area could potentially lead to a choke scenario, so this fishery was chosen as a focus

Seafish's South West regional team, the Seafish Gear Technologist and CEFAS collaborated to put together the project and Clive Palfrey, a local net maker, helped redesign the trawl bringing the top panel of the net even closer to the seabed, to just under 800mm (as haddock tend to swim just off the bottom of the seabed). With support from the net maker and skipper, Seafish undertook the gear development and then set up the gear on the vessel. CEFAS assisted, using their expertise in catch sampling and putting together scientific analysis of the results.

The initial testing of the trawl was on the Looe trawler, MFV Swiftsure, with skipper Richard Chapman. Both the vessel's usual net and the new design were filmed using underwater cameras to show how the trawl was performing on the seabed and how fish were reacting to the net. This footage enabled an accurate measurement of the height of the new trawl to be made. The height was as expected to be in the region of 800mm compared to the skipper's usual trawl standing around 3 metres from the seabed.

The preliminary results were very promising, showing a marked reduction in the catch of haddock without any appreciable loss of other bottom living species. This was vital as a major part of this first sea trial was to ensure that the new net was catching enough bottom living species that the vessel would still be viable despite the loss of some of its haddock catch. However, Further trials will need to be undertaken to assess whether it will be commercially viable for the SW inshore fleet to use a trawl of this design.

**4.CEFAS Gear Selectivity Guide**

530 combinations of selectivity trial results for UK fisheries from in an excel spreadsheet, see [here](http://www.discardless.eu/scientific_publications).