

Case Study Report, Task 7.3

Synthesis and recommendations for Discard Mitigation Strategies by case study

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Case Study: Northern North Sea and Northwestern Waters

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Main Authors: Nick Bailey (Editor), MSS, Beneficiary 9. With contribution from numerous participants from DTU Aqua (Beneficiary 1), U Strath (Beneficiary 5), KU-IFRO (Beneficiary 6), SEAFISH (Beneficiary 8), MI (Beneficiary 14).

Task Leader: Clara Ulrich

DTU, Beneficiary 1

WP Leader: Kåre Nolde Nielsen

UIT, Beneficiary 26

1 What has been going on in this case study during the last 12 months?

Initial discussion about the nature and scope of this case study have taken place during the last 12 months. In particular, decisions have been reached about the more detailed focus for the work and the area of coverage. This is principally a case study covering the more northern parts of the North Sea (ICES IVa and deeper regions of IVb), the Skagerrak (ICES area IIIaN) and the west coast of Scotland and northern part of Ireland (ICES VIa). The main focus is on the various towed gear fisheries (mainly bottom trawls and seines) targeting various mixtures of demersal fish (cod, haddock, whiting etc), groundfish (eg anglerfish and megrim) and *Nephrops*. Some of these fisheries have historically recorded high rates of discarding and in some situations this still continues depending on the mix of species, the distributions of the fish populations and the fishing activity and the availability of fishing opportunities (TACs). The reason for linking the North Sea with the West of Scotland is twofold: i) a number of the fish stocks have distributions which straddle the two areas and they are now assessed as one unit and ii) significant numbers of vessels, particularly from the Scottish fleet, fish in both areas.

The case study aims to draw on outputs from a number of work packages bringing these together in a framework involving modelling tools to investigate various potential discard reduction scenarios and input from a range of stakeholders. Stakeholders (fishermen, NGOs, policy etc) involvement from around the case study area is considered crucial in order to ensure the analysis is directed at the most relevant issues and to ensure there is common understanding during the dissemination of outputs from the case study work.

1.1 Important changes in stock development, discard data and ecosystem

Within the CASE study area the main source of information and advice on principle fish stocks is the International Council for the Exploration of the Sea (ICES). ICES also provides ecosystem overviews covering the North Sea and Celtic Seas areas.

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

The Greater North Sea Ecoregion is a temperate coastal shelf sea divided into a deeper, northerly region and a shallow area to the south characterised by large river input and strongly mixed water. The North Sea has relatively high productivity with episodic changes leading to cycles of variability in key components such as pelagic and demersal fish. Zooplankton communities have changed in species and size composition. Fishing over many decades reduced the number of large fish in the North sea and fishing mortality was high – this industry, along with oil and gas extraction, is the predominant human activity in the Case Study Area. Since the early 2000's, however, fishing effort has declined, mortality has reduced and the incidence of large fish is increasing. Species distribution maps show higher abundances of gadoids and ground fish in the Northern parts of the North Sea (the Case Study area) while in the south the plaice population has increased dramatically. Overall there is some evidence of a shift towards benthic production.

To the West of Scotland on the Malin shelf area of the Celtic Seas the region is heavily influenced by oceanic inputs. In recent years, temperature and salinity changes have been observed which potentially affect distribution, migration and spawning onset of a number of pelagic and demersal species. Ocean warming appears to be responsible for changes in zooplankton distribution. Fishing pressure has generally decreased across this region since around 1998 and the combined F to Fmsy ratio is now close to Fmsy – although some stocks in the Case Study Area (notably Atlantic cod) are still experiencing high mortality rates.

The most recent assessments of exploited stocks within the case study area were conducted by ICES in 2015. The left hand part of the diagram below illustrates the state of the main commercial stocks in the North Sea, comparing the 2015 outcome with the year before. The majority of stocks are fished at or below Fmsy and SSB has been improving (green shading). A noticeable difference between 2014 and 2015 advice is the improved fishing opportunities as shown on the right hand side of the diagram – for the majority of stocks catching opportunities increased. This potentially created a more ‘favourable’ environment for the introduction of the Landing Obligation than might have been the case had catching opportunities decreased.

North Sea

States of stocks

Fishing Opportunities (advice)

Stock	2014		2015		2014			2015		
	F	SSB	F	SSB	Landing	%	Basis	Landing	%	Basis
Cod	Red	Red	Red	Red	26713	-20	Man Plan	40419	15	MSY
Haddock*	Green	Green	Green	Green	48176	8	MSY	61930	30	MSY
Whiting	Light Green	Grey	Light Green	Grey	13678	-15	Man Plan	13957	-15	Man Plan
Saithe*	Green	Red	Green	Red	72854	-15	Man Plan	68601	-6	Man Plan
Plaice	Green	Green	Green	Green	128376	15	EU man plan	159197	15	EU man plan
Sole	Red	Green	Red	Green	10973	-8	EU man plan	11921	0.1	EU man plan
Hake	White	White	White	White				96651	6	MSY
Herring	Green	Grey	Green	Grey	429797	-9	man plan	518242	16	Man plan

On the west coast of Scotland the picture is also improving but at a slower rate and there are a number of notable exceptions including cod and whiting. These two species are estimated to be below safe biological limits and in the case of cod, fished well in excess of Fmsy – In both cases the states of the stocks attracts a zero TAC (bycatch only fishery). Some stocks, on the other hand have been increasing in recent years and catching opportunities have also increased. Good examples of these are anglerfish and megrim and also Nephrops.

Estimates of overall discards occurring in the key stocks within the case study area are available from the ICES assessments (see link above). For some species, particularly in the North Sea, the quantities of discarded fish have been falling and this is particularly noticeable in N Sea cod and haddock. For some

species, however, discarding remains relatively high (for example whiting) and in the case of hake in the North Sea has actually been increasing in recent years owing to changes in the spatial distribution of this species. On the west coast of Scotland, cod discarding remains a serious issue. These overall observations frequently mask particular issues connected with certain types of towed fishing gear and detail at a more disaggregated level is available in the report of the STECF EWG on Fisheries Dependent Information.

<https://datacollection.jrc.ec.europa.eu/dd/effort>

In due course this information will be available in a more accessible form through the DISCARDLESS atlas which is currently under development.

1.2 Important changes in terms of fisheries and stakeholders perception

The STECF AER Report (STECF 15-07) indicates that in the North Sea there have been important changes in the fisheries in recent years. Most notable has been a reduction in employment and in the number of vessels since 2008, although overall vessel power started to increase again. Gross profit increased slightly, while net profit increased more markedly –driven by Danish and UK performance and facilitated by reduced fuel costs, some higher TACs and good prices for some species. Comparable analysis for the West of Scotland component of the case study area is not separately available. Results for the NE Atlantic fishing fleet suggests that in the most recent years, gross profits have been recorded by most Member States including those operating regularly in the West of Scotland area. This represents an improved picture before 2011 when a number of countries recorded losses.

Based on limited feedback from stakeholders so far (largely through routine fisheries management discussions), there has been increased optimism at the improved states of many of the stocks, particularly in the North Sea. On the west coast, improvements in groundfish (eg anglerfish and megrim) have also been viewed positively. On the other hand, the introduction of the Landing Obligation has raised a number of concerns, particularly relating to potential choke species (especially hake) and in cases where the TAC is currently zero (eg West Coast cod). In some countries, such as Denmark, quota management arrangements and higher TACs appear to have created a more favourable environment for dealing with the Landing Obligation, although the stakeholders opinion remain very negative on the regulation.

In Scotland, SEAFISH have been conducting analysis to investigate the extent and likely effects of 'choke' situations and the potential to find solutions to mitigate the problem. Some modelling suggest that swaps would be beneficial but it is not clear yet to what extent this is happening already and how much more scope there is to use this approach.

1.3 Important changes in management

The case study area has been subject to fundamental changes in fisheries management over the last 10 years or so. Following the decline of the cod stocks in the area, a cod recovery plan was developed and introduced stringent TAC constraints and an effort regime designed to reduce fishing mortality. This

remains in place at present although is subject to legal discussion on its continuity and nature in the frame of the new CFP.

In 2015 the Landing Obligation scheme was introduced for pelagic species, and Discard Plans were developed for the first round of introductions of demersal species in 2016. Discussions were progressed within Regional Groups and by the ACs operating in the two areas of the case study, NSAC and NWWAC. Plans were submitted to the EU Commission in spring 2015 and evaluated by STECF during the summer. In the North Sea, a gear based approach was adopted and for TR1 vessels haddock and plaice were the selected species. For TR2 vessels the species introduced were Nephrops and sole. Saithe was also introduced but only for vessels where the proportion of saithe in the catch was high. In the West of Scotland, the approach was based on catch thresholds with vessels required to land all haddock when their catch of demersal species exceeded 10% of the total catch and required to land all nephrops when their catch of Nephrops exceeded 30% of the total catch. The Discard Plans contained some applications for the use of the high survivability exemption and for the use of de minimis provision.

Alongside the developments of the plans, activity in Member States has included regular conversation with industry and NGO stakeholders in groups such as the Scottish Discards Steering Group and the Danish CFP DialogForum. These have been formed to consider the problems created by the Landing Obligation and to start to develop methods (improved selectivity etc) in order to address the issue.

Discussions have started on the next stage of the Landing Obligation in preparation for 2017 and additional species are being discussed. Arguably, the first year of the regulation saw the introduction of the 'easier' species. As the deadline of 2019 approaches when all TAC species will be introduced, some of the difficulties discussed above (choke species etc) will likely be come more acute. To this end the North Sea (Scheveningen) Regional Group has hosted a couple of workshops (open to other Regional Groups) to explore topics such as quota exchange and mitigating choke effects. There remains considerable concern over the timing of the introduction of cod to the scheme and whether, by then, it will no longer be the subject of a cod recovery plan. There is a strong belief that measures within the cod plan confound the successful introduction of the Landing Obligation for this species. This is a particular problem on the West coast of Scotland where there is currently a zero TAC and where cod is frequently caught alongside haddock, anglerfish and a variety of other species.

2 The Year behind us: What has DiscardLess produced in this case study during the last 12 months?

Various Work package activities have been getting underway which will contribute to the Northern North Sea, West of Scotland case study.

2.1 Impact assessments

2.1.1 Ecosystem scale

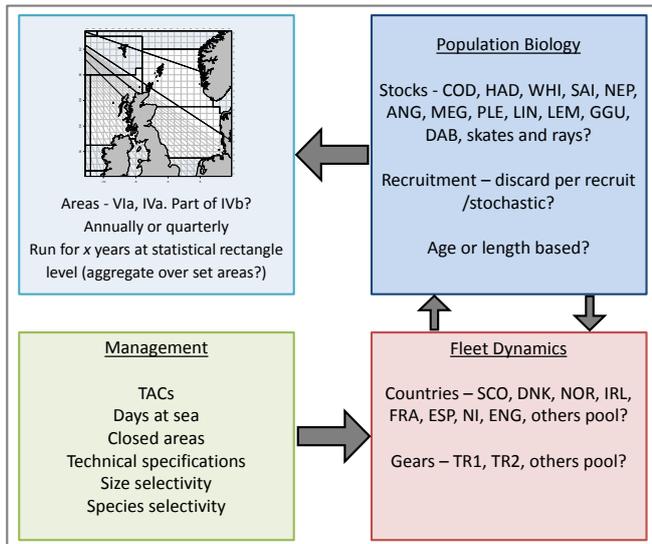
DTU undertook an extensive literature review on the ecological and technical aspects of discarding has been performed in WP1 (Deliverable D1.1). Later, a further review of the knowledge regarding the role of discards in the North Sea ecosystem was performed by Ulrich (2016), summarising the information collected under DiscardLess WP1 and in additional publications and fora. It is noted that the scientific knowledge is still uncertain. Seabirds and benthic scavengers are the main populations feeding on discards, and it is estimated that their populations are rather large. So it is assumed that they might be able to buffer the food shortage linked to the landing obligation; although it may be considered that a gradual reduction of discards might be better for the ecosystem stability than an abrupt elimination. The main threat identified is whether the opportunistic scavengers will increase predation and domination on more sensitive species, mainly among seabirds. It is suspected that Nephrops stocks could have been enhanced by fish discards, but the scientific evidence for this is weak and observations are scarce.

More generally, the landing obligation has fuelled an important scientific debate regarding whether selective fishing on adults is ecologically preferable to the catching of juveniles in a “balanced harvesting” approach. This question is still unresolved, and balanced harvesting is likely not technically and economically operational in mixed fisheries like those in the North Sea. Nevertheless, this investigation challenges the established paradigm of concentrating fishing mortality on few adult age classes of few commercial species. Ultimately, it is argued that the most important ecological benefits are obtained by limiting fishing mortality overall.

Strathclyde University have been further developing their E2E model (End to End ecosystem model). The case study will consider mainly the demersal roundfish fleets fishing in the North Sea and West of Scotland. During 2015 an existing ecosystem model, StrathE2E, developed for the North Sea (Heath, 2012; Heath et al 2014) has been configured to include the West of Scotland. The model aggregates fish stocks and other biological components of the ecosystem into trophic groups but identifies distinct 12 fleets. To examine the effects of discarding the model requires estimates of the weight of fish discarded per unit weight caught by fleet. Preliminary work has begun on a fleet based model that will use length frequency data by ICES rectangle from the IBTS to derive discard rates by fleet and area that can be input to StrathE2E to explore new discarding scenarios. In addition during 2015 further work on estimating discards of data poor species using the approach of Heath and Cook (2015) was undertaken. The new model enables estimation of discards, stock biomass fishing mortality and recruitment for species such as common dab, lemon sole, flounder and witch.

Marine Scotland and Strathclyde have begun developing a spatial fisheries model. It is hoped this will permit the relative benefits of various scenarios for reducing discards to be compared. Scenarios involving spatial measures such as closed areas or short term avoidance measures and selectivity changes are obvious candidates to consider.

The principle elements are illustrated in the diagram below



2.1.2 Fishery scale assessment

KU-IFRO has conducted an extensive literature review on the economic and social aspects of discarding. This review has been performed in WP2 (Deliverable D2.1 and D2.2). As under 2.1, the review by Ulrich (2016) further summarised this knowledge together with additional publications and reports. It is noted that the linkages between MSY and the landing obligation are unclear. The landing obligation is not a direct mean to achieve MSY, but rather an objective in itself. Several North Sea stocks are already fished at FMSY in spite of important discards. Many bioeconomic impact assessments have been performed on several North Sea mixed-fisheries fleets. They mainly highlight the impact of “choke species”, where the early TAC exhaustion of the least productive stock or of a stock with limited historical fishing rights in the region would lead to fishery closure and under-exploitation of the most productive stocks compared to their single-stock management objectives. The increased fishing costs have also been estimated for some fisheries. The various policy adjustments possible in the frame of the landing obligation can though mitigate or even nullify the short-term negative economic impact for some fleets. Additionally, it is noted that with the recovery of the North Sea cod, some “choke effects” might be less severe than predicted by the available economic models.

There are many ways by which fishers could improve their fishing patterns to better adjust to fishing opportunities. Many options already exist, and new industry-led solutions could be developed. But proper mechanisms incentivising them to do so are needed; otherwise the risks of non-compliance are real. At this stage, it is thus not possible to predict how the fishing industry will actually react, and practical experience will be gained over the next five years.

Fcube (North Sea – West of Scotland, Clara Ulrich):

A study overarching both H2020 DiscardLess and FP7 MYFISH as well as ICES WGMIXFISH and STECF 15-04 has been completed, investigating the use of MSY ranges to reduce the potential choke effects using Fcube as a contribution to a potential mixed-fisheries management plan (Ulrich et al., submitted). It shows that when stocks are within safe biological limits, it may be possible to find an annual compromise within the MSY ranges that minimise mismatches across single-stocks TACs.

Ulrich C., Vermard Y., Dolder P.J., Brunel T., Jardim E., Holmes S.J., Kempf A., Mortensen L.O., Poos J.J., Rindorf, A., *Achieving Maximum Sustainable Yield in mixed fisheries. A management approach for the North Sea demersal fisheries. ICES Journal of Marine Science. submitted*

Also, the mixed-fisheries work is in constant development, including e.g. inclusion of by catches species, better economic data and improved inclusion of uncertainty. The FCube model runs so far either as Business as Usual (discard ratios as in ICES) or Full Implementation (all discards landed, no changes in selectivity).

Fishrent (North Sea – West of Scotland, Ayoe Hoff and Hans Frost):

The Fishrent model is being calibrated for the the Danish demersal fishery in the North sea. The model has been set up to allow gradual introduction of the landings obligation, with some species included in 2016 and all in 2019. Calibration is in progress and updated in parallel with calibrating a model for the long term consequences of the landings obligation for the total Danish fishery (following up on the study by Ravensbeck et al., 2015). In connection with the Danish project, the implementation of the landings obligation in Denmark is being reviewed for the species of interest for the Danish demersal fishery in the North Sea. Initial baseline scenarios have been run, covering Business as usual (long term MSY management plans, discard allowed) and full compliance (all quota species landed by 2019).

LOEB (North Sea – West of Scotland, SEAFISH)

We finished our modelling exercise based on 2013 baseline and published the final report, which is available on <http://www.seafish.org/media/Publications/Seafish LOEIA Final Report 290216.pdf>

2.2 Avoiding unwanted catches

2.2.1 gear technology

One of the objectives of this topic is to promote the use of technological developments to reduce the capture of unwanted species. In this regard MSS are participating in and providing advice to the Gear Innovation and Technology Advisory Group (GITAG). This is an industry group that has been established to stimulate innovation in the development of fishing gear technology that will assist the Scottish fishing industry phase in the Landing Obligation, while protecting economic viability. To date, four gear proposals are being developed and trialled by fishing skippers and net makers. A similar initiative is being established in Denmark, complementing the work done in DiscardLess by a national plate-form called FAST-TRACK (<http://www.fast-track.dk/>)

In addition trials were held under the auspices of the Fishing Industry Science Alliance (FISA) to examine the effect of mesh size, twine number and lifting bag on the selectivity of Nephrops (*Nephrops norvegicus*). FISA is a joint initiative between industry and science and as with GITAG much of the review work in WP3 of DISCARDLESS is being used to provide advice and support to these initiatives

Fishing trials to investigate the possibility of using innovative technologies to improve fish selection took place on the RV Alba na Mara. A prawn trawl with a separator panel was fished and side emitting fibre optic light cables were attached to the fishing line and to the leading edge of the horizontal

separator panel. Fish that went above the panel were caught in the upper codend and fish that went below the panel were caught in the lower codend. Fewer fish entered the upper codend during night time tows with the light cables switched on. It is not clear, however, whether the fish are reacting directly to the light cable or that they are behaving differently because they are more aware of the net due to the additional illumination provided by the light cable.

2.2.2 fishing strategies

Parallel to any developments of fishing strategies to tackle the demands of the landing obligation, the UK organisation Seafish (www.seafish.org) has undertaken an economic impact assessment investigating existing or known policy measures. The assessment was undertaken in two phases, both of which assumed no changes to fishing patterns (fishing strategy change). First, an analysis of the choke species was performed which investigated what could have happened had the landing obligation been imposed in 2011, 2012 and 2013 (Russell, Curtis, et al. 2015). The effects were substantial, with species like hake and saithe most likely to trigger early closures due to rapid quota exhaustion. Second, a bioeconomic scenario analysis was undertaken to estimate the potential future consequences of the landing obligation up to and including 2022. The different scenarios all have a focus related to existing policy measures available withing the Landing Obligation and tested the relative benefit of the different policy arrangements such as quota uplift, catch allowance for zero-TAC stocks, de minimis, interspecies flexibility and survivability (Russell, Mardle, et al. 2015).

The model examines the changes in fleet revenues due to the gradual introduction of landings obligation in 2016-2019. Results suggested that the landing obligation is likely to have relatively limited impact on the UK fleet in 2016 and, despite some choke points, total revenue could exceed revenue earned in 2013 because the fleet can land and sell catch that was previously discarded (the analysis holds fish prices at 2013 levels). Once all demersal quota stocks become subject to the landing obligation on 1 January 2019, however, the negative impacts on the UK fleet are likely to be substantially greater and policy levers included in the model do not address the choke points caused by data-poor quota stocks (Russell, Mardle, Curtis, et al. 2016, p100). This work points to the need for the development of additional measures to cope with the landing obligation.

A “challenge experiment” was performed (on national funding) in Denmark (the MINIDISC project), and the results are being analysed further as part of DiscardLess WP4. 12 Danish trawlers have been operating during 6 months using their standard gear and a “free gear choice” alternatively, where technical rules were relaxed. All vessels operated with Fully Documented Fishery including CCTV. A publication summarising results is being submitted (Mortensen et al). Also, further investigations are being conducted on the possible avoidance of saithe through spatial displacement. Additionally, sustained work is going on to integrate mixed-fisheries considerations into a management plan, and this might contribute to the future mixed-fisheries management plan (MAP) for the North Sea (Ulrich et al., in review).

Mortensen L.O, Ulrich C., Eliassen S., Olesen H.J., subm. Technical regulations in a catch quota management world: is it time to ease some rules?

'Challenge' experiments have also been conducted in Ireland and in Scotland. Results of these are being worked up and are expected to demonstrate the difficulty of consistently avoiding unwanted catch.

Marine Scotland Science have had previous experience developing techniques to avoid high abundance areas of cod in connection with the EU cod recovery plan and the use of Real Time Closures. This work is expanding to consider high abundance areas of other species and a FISA project has been awarded to Aberdeen University to develop a method leading to a more real-time method for signalling areas to avoid (eg containing lots of undersized fish or high abundance of quota limited species. This will make of observer data and also survey information.

2.3 Optimal use of unavoidable unwanted catches

2.3.1 from deck to first sale

Key to the implementation of the landing obligation and understanding what vessels actually catch is the ability to record and have assurance that reported catches are precisely that. In other words that everything is accounted for. Towards this end, various pilot studies using CCTV have been underway for sometime. In Scotland during 2016 there are expected to be some vessels continuing to carry CCTV –equipment although the number of boats this year is expected to be more limited. Similarly, in Denmark a CCTV scheme has been in operation for some time (Mortensen et al., submitted) and is expected to continue.

Mortensen L.O., Ulrich C., Olesen H.J., Bergsson H., Berg C.W., Tzamouranis N., Dalskov J., Effectiveness of fully documented fisheries to estimate discards in a participatory research scheme. Submitted

Alongside the use of cameras to record what is going on onboard vessels, work to estimate the bulk of catch which comes on board has also been undertaken in Scotland. The key thing here is to estimate what was the bulk of catch coming aboard – the sum of the various components either stored on board or discarded under de minimis or because they are non-quota species etc should combine to give the same weight as that brought on board. Photographic visual techniques and weight shackle methods are being trialled. Extensive work is ongoing, summarising knowledge on the accuracy and use of CCTV and Remote Electronic Monitoring, based on the many trials performed across the North Sea.

The use of CCTV raises questions about the capacity of the authorities (science and/ or compliance) to observe and monitor many hours of CCTV. Sampling of the overall amount is clearly one requirement but in addition to this, 'smarter' methods of analysis are also required. MSS has been successful in securing Scottish Government 'Contract Research Funds' to develop an image analysis approach to identifying fish observed by the CCTV cameras. During the DiscardLess project it is expected that species identification and size measurement will be refined – the work is being conducted by East Anglia University.

In both Scotland and Denmark there has been some progress made on the handling of unwanted material on board vessels and the capacity of ports to deal with the material once it is brought ashore. One interesting development in Denmark is the design and build of a purpose built vessel for handling unwanted catches under a landing obligation. This work is in the early stages.

2.3.2 Products to the value chain

Only limited progress has so far been made on value chain adjustments in this case study area, but a number of initiatives are ongoing. Some analyses of existing landings facilities in Denmark were undertaken as part of Deliverable D6.1, and the quantity and variability of potential landings of what was previously discarded was mapped across harbours and seasons.

2.4 Policy outreach

DISCARDLESS members have been involved at various levels in discussing with a variety of stakeholders the work of the project in the context of the landing Obligation. This discussion has taken place in national forums such as the Scottish Discards Steering Group, in the ACs (various project members have been invited and presented information to the ACs) and in regional groups such as the Scheveningen Group and NWW group.

2.5 Summary

A good deal of work is in progress at the moment. At this stage it is too early to produce a coherent summary. One observation, however, is that it seems unlikely in this case study area that the measures available within the CFP Regulation to assist with dealing with unwanted catches will be adequate to tackle the many issues arising and that avoidance, selectivity, market uses and changes to management structures will be required.

3 The Year ahead of us: What do we expect for the next year?

A key event for 2016 is a stakeholder event to which many of the players involved in the case study Area will be invited. Several options are potentially available for this event and at present it seems likely that the IIFET Conference in Aberdeen in July will be used to advertise a more focussed event in August. Discussions with stakeholders have already taken place, but a more focused workshop will be helpful to think creatively. The plan is to encourage suggestions for solutions within the case study area that can be tested in the modelling packages – critical here is to get input from skippers etc (not just industry leaders) and to hear the views of NGOs etc.

It is highly likely that next developments in the LO at Regional Group level will inform some of the direction of travel for this case study and in particular the problems of 'choke species are likely to be prominent in 2016.

Attention was drawn earlier in the year to another project, the SUCCESS project, which addresses some of the problems from a different angle. It is expected that some discussion at the IIFET meeting will take place to explore how to interchange information and knowledge effectively

Further progress with most of the WPs is expected in 2016 and it is hoped that the various pieces of modelling work will progress to the point where they can be used to test the implications of a number of management strategies for dealing with the LO. For example:

Fcube (North Sea – West of Scotland)

The work will continue in 2016, in order to expand the model (e.g. to include bycatch species), improve and streamline the code for better simulation setup, focus on changes in selectivity by fleet etc. One more paper is expected submitted in 2016.

Fishrent (North Sea – West of Scotland, Ayoë Hoff and Hans Frost):

The calibration of the model will be completed during 2016, and the results of business as usual and full compliance reported. Alternative scenarios will be defined (de minimis and other exemptions) in cooperation with the Danish Ministry of food and Agriculture, and the results of simulating these reported.

LOEB (North Sea – West of Scotland, SEAFISH)

Most recent Seafish plans for 2016 are not fully related to bio-economic modelling. It is planned to update the choke analysis with 2015 fleet activity and discards data and collect information about the change in business performance (costs and earnings) due to implementation of LO. Our focus this year will mostly depend on the end users needs (industry and government). In case we see the need we might continue working on bio-economic modelling in the second half of the year.

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