



CHARTING A COURSE TO
SUSTAINABLE UK FISHERIES

Toward CFP implementation: Barriers and Opportunities

Recommending options to achieve full catch accountability



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Executive summary

Vast amounts of energy and money have been used to establish new objectives and principles for the reformed Common Fisheries Policy (CFP), and to achieve a viable interface with the fishing industry who must deliver these objectives.

The prime feature of the reformed CFP is the transition from unaccounted discarding (often obliged by a flawed system) to a system where all fish count against quotas. The opportunities this creates could be significant – *provided* catch accountability is established:

- The incentive to make value from each kilo of fish caught will spur sustainable behaviour;
- Quotas can be increased, prescriptive regulations abandoned;
- The objective of high and continuous yields (based on true, real-time data) can be met.

Much progress has been made in terms of plans, guidance, investments and assessment of consequences from the policy. The situation at sea, however, is vastly different from what was intended: discarding of fish continues; control is inadequate or absent; incentives for Member States and fishermen to account for catches are weakening. Something needs to change to reverse this situation.

The CFP *has* succeeded in curbing fishing effort and rebuild fish stocks. But, while the number of fish stocks at or under MSY is increasing, the actual productivity of these stocks - in terms of amount of fish generating income and food - is highly out of tune with their potential. Uncertainty and lack of guidance are hindering fishermen from doing their best when confronted with the circumstances at sea.

The gap between *potential* and *realised* value from fish stocks is exacerbated by:

- A weak conceptual framework;
- Poorly integrated/unreconcilable priorities for CFP implementation;
- A complicated decision system with overlapping responsibilities;
- Lack of clear direction for full and joined-up CFP implementation.

Realising the full benefits of the reformed CFP is therefore impeded not only by implementation failure, but also by the 'compliance gap' resulting from failure to control full catch accountability. Full implementation would create a level playing field within the EU and in relation to nations with whom EU share fish stocks.



The approach for CFP implementation

This paper uses the premise of full catch accountability, twinned with results based management, as the starting points from which to critique and propose changes to the current system of Technical Regulations. These are entirely compatible with the intended outcomes of the reformed CFP: the first (full catch accountability) is a clear obligation in the CFP, the second (results based management) flows from the opportunity to manage the output of stocks directly rather than manage the input of fishermen's efforts and use of methods. Results-based management has been underlined by the responsible EU institutions as the preferred management principle of choice, but a road-map to navigate toward this is missing. The implementing regulations now being carried through therefore remain unclear, muddled and contradictory.

We believe that full catch accountability and results-based management must guide the implementation of the CFP. Quota allocations, and the use of exemptions, must be based on detailed accounts of fishing mortality: hence catch accountability and the promotion of fully documented fisheries. This will benefit fishermen who deliver full accountability - where fully documented fisheries are given the benefit of *output* management - while other fisheries (where catches are not fully accounted for) will need supplementary regulation and control that takes account of the uncertainties regarding the full mortality effect of their fishing.

In addition to managing the resource, it is necessary to develop the quota allocation system. Relative Stability stands but there are numerous ways to improve quota transferability in order to solve issues such as the choke species problem.

The management of our fish stocks is based on knowledge about the resource. Current data is insufficient – in terms of quality and quantity - and models and processes too rigid to take account of recent stock development or climate changes. The MSY requirement and the choke problem accentuate the need for a reform of the advice delivered by ICES. Real-time advice must be advanced to secure the basis for the policy.

Recommendations

Full catch accountability and results-based management must guide the implementation of the CFP. The policy must be advanced by a programmed phasing-in of new measures. To ensure a level playing field, REM vessels must be given the full benefit of their documentation of catches. Our *outline* recommendations are given below. Further explanation and context are given throughout the body of this document:



1. Full quota top-up for REM vessels and reduced or no top-up for non-REM vessels
2. Free choice of gear for REM vessels - except for rules related to bottom impact and by-catches of protected species.
3. Simplified exemptions for REM vessels. The main point is that catches are recorded and accounted for.
4. In addition to this quota exchange, solutions must be developed between and within Member States in order to alleviate the choke species problem.
5. The present advisory system allowing TAC/Quota decisions to be made on basis of outdated data-sampling and advisory processes is not up to par with policy commitments. The advisory system must be reformed with regard to data sampling and production of real-time advice.

The process

The aim of this paper is to stimulate a discussion of coherent concepts for full CFP implementation: finding common ground on which to build policy recommendations that have broad industry buy-in and support by illustrating a viable concept for a coherent CFP management approach that takes account of fishermen's interest and ability to work with the policy rather than against.

The first step on this journey is to test "industry reaction" to the proposals contained in this paper. Based on this initial and narrow feedback, the project will reach out for alliance-building and dialogue with other suitable EU and national institutions. The dialogue will cover the conceptual framework for CFP implementation, Brexit consequences and opportunities, improvement of the advisory system and the building of an aligned "project catalogue" that may demonstrate and accelerate the transition to the new CFP.

The paper does not aim to cover management issues related to secondary ecosystem effects such as bottom impact and by-catches of mammals and birds. Neither does the paper cover economic distribution (e.g. principles for quota allocation).



1. Background

Fishing into the Future (FitF) is interested in improving the contributions the fishing industry can make to fisheries science and data collection, with a view to informing and improving fisheries management and policy. Recent progress on this issue was made through the development of the Guidelines for Industry Science Data Collection – work which was funded by Seafish in the UK.

FitF is a collaborative initiative which seeks to work in partnership with – and add capacity to – other organisations who share similar goals and objectives. We are in the process of examining the central paradoxes which undermine progress toward Fully Documented Fisheries (FDF) and we are being supported in this process by *Mogens Schou* of Aquamind, alongside notable fisheries scientists, fishermen, fisheries representatives and fisheries regulators.

This paper marks the first steps on this journey; it will describe the issues that weaken current CFP compliance and propose workable solutions that address these. We will use this paper as a convening tool, around which to discuss and build consensus for policy recommendations that have the potential to succeed in terms of CFP implementation. The production of this paper is an initial response to a call from the philanthropic funding body FundingFISH, who are looking to support projects that tackle the barriers to achieving Fully Document Fisheries (FDF) across the board.

2. A coherent approach for fisheries management

The concept of 'Natural Capital' has gained support over recent years. It provides a new lens through which to view the way we manage natural resources. Natural Capital can be seen in four broad categories (World Bank):

1. Extractable renewable resources (capture fisheries, natural forests, soil, and water).
2. Cultivated renewable resources (crops, livestock, aquaculture, and forest plantations).
3. Non-renewable resources (oil, gas, coal, and minerals).
4. Ecosystems that provide regulating services (watershed management, climate regulating services, and nature-based tourism).

Management of Natural Capital has assumed many forms in the past, depending on: the type of natural resource; ownership; tradition; policies; technological advances. The public management of



open-access (or partly open) resources has often taken the form of a combination of “pressure strategy” and prescriptive management. This has been, and still is, the case in fisheries management, where *pressure* is exerted to contain fishing effort and *prescriptive* regulations define fishermen’s use of fishing gear.

The cost of such management – for public administration and the industry itself - is immense. This, for managing a resource where the public interest is basically limited to setting the proper levels of utilisation and ensuring that these levels are not exceeded. In 1996, C.S. Holling put the problem like this: *“As the human population grows and natural resources decline, there is pressure to apply increasing levels of top down, command, and control management to natural resources. Solutions to this pathology of natural resource management cannot come from further command and control (regulations) but must come from innovative approaches involving incentives leading to more resilient ecosystems, more flexible agencies, more self-reliant industries.”*

From the standpoint of society, the objectives of Natural Capital, management of fisheries should be to:

1. **Ensure accountability**

Accountability is a “first”. The setting of utilization levels has little meaning if they are not observed. Furthermore, accountability ensures a level playing field with regard to the balance between economic results and environmental impact. Human activity often results in unexpected negative costs that end up being paid by society or other users of the natural resources who did *not* choose to incur these costs (an ‘externality’). For example, pollution from industrial production results in costs covered by the public; and the CFP discard regime resulted in reduced TAC’s where the reduction was paid by all fishermen including those with little or no discards.

2. **Ensure sustainable use**

Sustainability is often understood as a principle to ensure the *protection* of natural resources. This is misleading. Sustainability is a concept for *utilization* of resources to the long-term benefit of mankind. The distinction is important. “Conservation” entails restricting the use of resources while “utilization” applied on basis of accountability spur optimization of the resource.

3. **Ensure economic progress**

The Brundtland definition of sustainability sees economic progress in context of fair



distribution, with attention given to developing sectors. The CFP intends to contribute to coastal economic development by including some specific social priorities.

The reformed CFP is aligned with these three objectives, but the EU has made life difficult for itself: it has decided to reform both the *resource* and *institutional* policies at the same time, adding confusion to an already complex process. It is remarkable that, given the need to address the competing demands of these different types of policy, the responsible authorities have not yet synthesised a conceptual approach for its implementation. Such a concept would be relatively simple to establish if a clear distinction were to be made between the objectives and responsibilities lying with the public on the one hand, and the methods applied by those exploiting the resource on the other.

Each of the policy objectives for the management of Natural Capital – accountability, sustainability and economics - are treated in more detail below.

2.1. Ensuring accountability

Full catch accountability offers immense opportunities through direct management of the output (managing how much is taken out of the resource) compared to input management (managing input of fishing effort, gear etc.).

The pre-reform EU management was based on a discard regime, where discards were obliged in some situations, and incentivised in others. Unaccounted discarding took place and high discarders taxed the resource in an uncontrolled way, thereby undermining the negotiated allocations of quota seen in Relative Stability with catch levels above agreed catch opportunities.

From the mid-1980s onward, tackling discards gave rise to vast amounts of new rules and regulations. Layer-by-layer these aimed at reducing fishing effort and increasing selectivity through the implementation of prescriptive gear and other regulations. More than 20 years later the Commission's green paper in 2009 still saw excessive discarding as a main threat to stocks – the regulations had not succeeded.

The current reformed CFP has introduced full catch accountability, thereby *potentially* allowing for proper management of the stock. The Basic Regulation states that catches shall count against the quotas and be landed. Whether the fish is landed or not is, however, of little biological importance: accountability itself will incentivize fishermen not to discard fish from their quota holdings.

How does one ensure that catches at sea are actually counted against quotas? A discard ban has existed since 2002 where high grading was banned, but with no measurable effect on discards. How



can the full discard ban, now including even less valuable fish, be expected to meet compliance? The answer is that compliance cannot be expected if neither incentives nor control are put in place. The Commission and Member States (MS) have made considerable efforts to guide and inform fishermen about discards, but they have done little or nothing to control or incentivize fishermen to count and land the fish they catch. Accountability has therefore **not** yet been established – and none of the potential benefits are being seen.

Counting all catches is also the prerequisite for accurate management of fish stocks. The CFP is based on TAC/quotas being set and managed to ensure Maximum Sustainable Yield (MSY). It seems obvious that we can't manage what we don't measure; hence accountability is the decisive element for the MSY policy.

Note: In this paper accountability is understood as the counting of all catches - or fishing mortality, against quota holdings and the documentations of this being done.

2.2. Ensure sustainability

Fish stocks in EU waters are improving. Fishing effort and fishing mortality has gone down and more and more stocks are, by definition, “fished sustainably”.

The MSY objective in the CFP focuses on a speedy increase to the level of MSY for individual stocks: *“The CFP shall aim to ensure that exploitation of resources restores and maintains populations of harvested species above levels which can produce the maximum sustainable yield by 2015 where possible and at the latest by 2020 for all stocks”* (excerpt 1380/2013).

This MSY objective is based on a 1st generation approach that ignores ecosystem functioning in terms of stock dynamics and species interactions. [Analyses](#) indicate an order of 40% less yield than by applying an ecosystem based MSY approach. It also ignores fishermen's ability to target individual species in mixed fisheries and thus catch the given fishing opportunities.

The Basic Regulation preamble states that: *Management decisions relating to maximum sustainable yield in mixed fisheries should take into account the difficulty of fishing all stocks in a mixed fishery at maximum sustainable yield at the same time”,* and the Multi Annual Plans (MAPs) have introduced fishing mortality ranges. This offers some help but fails to explain how the reform will transform from a policy to *protect* the resources into a policy gaining the highest *sustained output* of food from the resource. For the many fish stocks in good shape the important challenge is not to manage TAC levels, but to ensure that the levels set are respected, and to ensure that the fish can actually be caught without colliding with irrelevant regulatory boundaries.



It is a collective failing that so much political capital has been invested - by the political system and NGO's - in the setting of the MSY target and subsequent attempts to oblige the system to "follow scientific advice" on one hand, whilst so little effort has been focused on improving the scientific advice that is needed to bring this about. This paper does not expand on the "science failure" but it is noted:

- That a number of Member States fail to supply data - or even obstruct data exchange.
- That protocols for the inclusion of fishermen's data in advice has not been developed, despite some fully documented fisheries supplying data for a number of years.
- That advice is normally based on data that can be 1½-2 years old, and fails to include reliable up-to date information on recruiting year classes - or changes in model references.
- That modelling of advice is based on static approaches and on single species thinking in terms of both trophic and economic context.
- That EU as a client and ICES as a science provider have failed to assess and include new methods to advance advice to information in real-time.

In 2013 [SCAR-Fish advised](#): *"The reformed CFP requires more data and more areas to be covered by data. Also the discard ban and the resulting "choke species" issue require better advice in terms of analytical and real-time qualities and with regard to manageable options when choosing MSY solutions."*

In the thinking of this paper, a sustainable utilisation of the natural capital (i.e. fish) starts with a comprehensive and accurate real-time knowledge about the size, distribution and likely development of the stock.

The second step is to define a policy for the utilisation of the stocks that allows for a high continuous catch from each stock. This policy must take account of two facts, a) not all stocks can produce maximum yield (MSY) at the same time because of predation interrelationship and b) not all stocks can be fished at MSY because catch composition in mixed fisheries do not necessarily reflect the composition of TAC's.

Projects as [FMSY](#) and [MyFish](#) may provide CFP legislators with an adequate and perceptive MSY text as they aim to bridge the gap between science and advice.



2.3. Ensure economic progress

This paper is based on the notion that management should be decentralised to the lowest appropriate level to obtain effectiveness and equity, ensuring decisions and management are pertinent and relevant to the fishing and social interests directly involved. Furthermore, leaving management decisions with the industry will establish a user-driven demand for science and innovation. Accountability and results-based management will put the correct drivers for CFP implementation in place. This will not, however, solve the problem of choke species overnight.

EU-level economic progress depends on policy decisions being tailored to the varying ecosystems in Community waters. For example, applying MSY, exemptions and the fleet-composition all differ between single species fisheries such as those seen in the Baltic, to the highly multispecies fisheries of the Mediterranean. The pressure put on fishermen to oblige with the ideal TAC/quota perception of all fish being caught in a 100 % selective fishery must take account of this. Projects such as MyFish and DiscardLess have been initiated to support this development, but there seems to be a lack of policy inclusion.

It is worth noting at this point that no work has yet been done to understand the impact and distribution of externality costs (i.e. costs being born by those who didn't choose to incur them) caused by the former discard regime.

Economic progress at the Member State level depends on the resources being allocated to the most efficient user. Other priorities are also enshrined with the CFP. This paper notes that small scale fisheries (SSF) are valued by other factors and that Relative Stability is an allocation matrix that stands. However, despite these constraints, untapped opportunities exist: Transferable Fishing Concessions (TFCs) allow for better catch distribution, help alleviate the choke problem and may benefit SSF.

The ability of the fisher to match his catches with his quotas holds a substantial economic gain. This depends on a portfolio of solutions playing together. This is discussed in Chapter 3.



2.4. The coherent approach

A coherent approach to the problems posed by implementing the CFP can be achieved if the relevant authorities are clear about objectives and their priority. This translates in to: a) applying accountability and MSY in context of sea basin ecosystems and b) prepare for a revised MSY approach.

1. **Be clear about strategy:** Improve the knowledge base through innovative data sampling and real-time advice. Release the forces of ingenuity in industry and science through results-based management. Establish first mover opportunities to demonstrate and accelerate implementation.
2. **Be clear about coherence:** Ensure implementing rules support – not obstruct - objectives and strategy.
3. **Be clear about responsibilities and process:** The Commission must take responsibility for progress and compliance, and the Commission must put pressure on Member States to act on their responsibilities.

This may sound straightforward, but various barriers stand in the way of putting the policy into operation. These are discussed in the following chapters.



3. Designing policy implementation: addressing barriers

This paper considers full catch accountability as the primary prerequisite and driver for the sustainable practises that will underpin the CFP objectives, and lead to the best possible economic result from a complex resource base. For that reason, it is essential to address the barriers to full catch accountability. Such barriers are a result of ecosystem characteristics, the regulatory system, and they are also inherent in the fleets and fisheries that have developed under the pre-reform CFP.

3.1. How accountability can work

The CFP principle of full catch accountability entails that the yearly EU TAC/quotas are fixed without deductions for discards. The chosen total fishing mortality is translated directly into the TAC and resulting Member State (MS) quotas.

This means fishermen pay from their quota holding for each kilo fish he catches. Ideally this is documented for each individual vessel through a reliable system such as Remote Electronic Monitoring (REM).

For many vessels REM is not an immediate solution. In this case accountability can be achieved by reserving a certain percentage of the TAC, and resulting national quotas, in an “accountability pool” to cover unaccounted catches. If an individual Member State can demonstrate that the unaccounted catches for certain fleets are lower than the estimate, they may access part of the MS pool for these fleets. If the Member State chose to mount REM on every vessel it will be allowed to fish its entire pool while the Member State choosing not to do anything will get no access to the pool.

The effect of the approach is:

- Reversal of the burden of proof: Member States will have to demonstrate an accountability scheme in order to get access to the national “accountability pool”
- An incentive to use REM.
- A reduction of externality costs for Member States who wish to distinguish between fleets when applying for access to the accountability pool.
- Incentivising selective fishing and monitoring in order to improve the statistical documentation of reduced discards for fleets not using REM.



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The approach is closely aligned with the CFP. In effect no viable alternative has been pointed out. Article 15 (1380/2013) requires all catches to be counted against quotas and article 33.5 (1224/2009) requires that all catches shall be charged against the quotas applicable to the Member State.

The PECH Committee [research paper](#) on MSY discussed the model in 2016: *“under catch quotas (landings plus discards) implementation error is avoided, but only if all catches of quota species are accounted for. Full catch accountability can be achieved by observers or remote electronic monitoring, i.e. fully documented fishery (FDF). A fisheries management could be improved by a quid-pro-quo or tiered approach, when groups of fishers (or Member States) deploying FDF are entitled to catch their full quota shares, whereas groups of fishers (or Member States) without FDF would be assumed to discard; these assumed discards would be subtracted from their quota share.*

The obligation to account for all catches lies with each individual fisherman, as well as the Member State. As Commissioner Vella stated (European Parliament question E-000088/2015): *“If the Commission finds that the quota available to Member State has been exhausted, the fishing activities for the stocks concerned are prohibited. If a Member State has exceeded the allocated quota, the Commission can make deductions from future quotas in accordance with the rules of the Control Regulation.”*

If the Commission finds that registered catches plus estimated discards exceed the agreed catch levels, the Commission is obliged to consider the pay-back scheme (art 105, Reg. 1224/2009).

The conclusion is that accountability can be established as a practical and simple management measure and it does not require REM for all vessels.

Accountability pools can be introduced for selected stocks in the 2019 TAC/quota regulation. The pool ensures accountability, it offers an incentive to document catches and fish selectively and it does not impose mandatory obligations for Member States or fishermen.

The model is illustrated in annex 1.



3.2. Removing barriers to accountability

Full catch accountability rules. We face a transition, however, that poses sizeable challenges for the industry. The success of implementation depends on the regulatory set-up and solutions to facilitate the transition. This is not presently the case.

The CFP is not a coherent system of legislation. The reformed Basic Regulation is a patchwork of principles, sometimes inconsistent; and detailed prescriptive rules, sometimes contradicting. Implementing regulations such as technical rules and control have not yet been adapted to the new policy, and discussions of the possible adaptations shows that legislators have little faith in the main pillar of the reform: That all catches will be counted. Therefore, the transition from prescriptive management to results-based management is blurred by lack of faith in, and understanding of, the principle of full catch accountability. When viewed alongside direct obstruction to the agreed reform and negligence of its enforcement, these are the main political barriers threatening full catch accountability.

For the fisherman, the main barrier to assume accountability is loss of income. This problem is caused by:

1. Adverse regulation.
2. Chokes, ecosystem characteristics and exemptions not properly used.
3. Rigid allocation of fishing opportunities.
4. Low adaptability in some fleets and fishing practises.

3.2.1. Prescriptive rules

Management of fish stocks is conceptually simple: To catch the maximum amount of fish that a stock can provide year after year in such a way that lets juveniles grow to value before they are caught. In the reformed CFP, the first is obtained by MSY and the transition to full catch accountability - catch quotas instead of landing quotas. This leaves the issue of size composition in catches. Up to now the CFP has promoted a very simple size paradigm: "Fish only the largest fish". Through technical regulations, gear rules, by-catch rules etc. the policy level has guided fishermen's activity at sea in detail. Selective harvesting is complex, and it has become clear that the distance between prescriptive regulations and the fisher's appreciation of the situation at sea is causing unacceptable waste of resources and poor economic returns.

To achieve optimal utilization of the resource the fisherman should be able to choose how to fish, according to the variability of the circumstances at sea. User-driven innovation would then take the lead in developing selective fishing methods. For that reason, free choice of gear must be the guiding



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principle - except for regulation to protect sea-bed and habitats. This allows fishermen to deal with the choke issue on their own terms. Full catch accountability already applies; the question is what the effect will be in relation to size composition, and to what extent it should be managed.

The answer is to introduce catch metrics. Technical rules are an indirect way of managing the fishing mortality; catch metrics *remove* the need for detailed technical rules. Focus lies instead on size composition of catches rather than on the gear and the fishing method. Catch metrics define an *output* result, for instance a given proportion of the catch below Minimum Conservation Reference Size (MCRS).

Catch metrics already apply in the advice given by ICES when targeted mortality is translated into advice in tonnes. If the average age/size of the fish in a stock decrease over time, ICES will reduce the TAC advice to counteract an increasing mortality.

The use of catch metrics at EU and Member State level will depend on the fisheries in question. A simple approach is to require a maximum percentage (e.g. 10%) of the catches to be below MCRS. Another more precise tool is to set a maximum fishing mortality that Member States' catches may induce on the stock. With a maximum fishing mortality, the Member States may distribute the mortality according to national priorities by allowing some fisheries to include smaller specimens - for example in mixed fisheries - on condition that catches count with a factor higher than 1. This can be done via the market size norms.

In single species fisheries, such as cod, where the big fish are relatively valuable, there is no need to take catch metrics on-board. Free choice of gear is likely to reduce mortality on its own, and [Trials](#) suggest that this occurs. Even in fisheries where free choice of gear may incentivise catches of smaller fish there is no need to use 'belt and braces' when catch metrics are employed. REM and the standard provision to sort fish according to size will ensure a real time picture of fishing mortality and size distribution in the various types of fisheries.

In single species fisheries where price-relations do not favour big fish, it could be argued that it is acceptable to allow smaller fish to be caught (at a lower TAC) with the same, or even an increased, economic turn-over. This paper does not discuss Balanced Harvesting, but note that catch metrics can serve a variety of harvesting strategies. The sanction - or pay-back, would be to reduce quotas for the subsequent year for a Member State exceeding either the TAC or the mortality ceiling. This tool is in the Control Regulation. If Member States, nationally or on a regional level, wish to introduce gear regulations to influence mortality, they may do so.



The 'catch metric' approach allows for:

- free choice of gear,
- tailoring catch accounting to the individual fisheries metiér
- tailoring catch accounting to the changes in species and size composition (for example in situations with large recruiting year classes).

This makes the vast number of provisions regarding gear type and use superfluous, and it allows for externality costs to be neutralized.

The use of catch metrics is in accordance with the reformed CFP. It is in effect a logic consequence of full accountability, which is a "what you catch" output management, as opposed to the previous "how you catch" input management.

Catch metrics will incentivise the fisher to continuously optimise methods and gear, and science will benefit from fishermen being new 'customers'. Catch metrics with REM makes the ban on selling fish under MCRS for consumption superfluous. The hinge factor for this management to work is full catch accountability as defined in article 15 (1380/2013), including the use of REM covering a substantial part of catches.

A revision of the Technical Regulations is currently being considered in the European Parliament and Council. The Commission proposal indicates important simplifications of the regulatory framework, but the principle of top-down management is retained. The Parliament however has proposed a significant [amendment](#) (art 17 and 26) regarding:

- Fishing vessels with full documentation of catches and discards shall not be required to land non-marketable catches, provided that they are counted against quotas.
- Pilot projects that explore and develop systems of full documentation of catches and discards based on measurable targets and objectives, for the purpose of a results-based management of fisheries. The projects may derogate from technical measures.
- The Commission shall define the technical specifications of a system for the full documentation of catches and discards.

The amendments show that the Parliament is taking full catch accountability, free choice of gear and catch metrics on-board with the purpose of exploring the opportunities for a results-based implementation of the CFP.



3.2.2. Chokes and exemptions.

The CFP includes various exemptions to alleviate the choke species problem. The term 'exemption' is somewhat misleading, as several of the tools qualify as a natural and integrated mechanism for the industry to interface with a complex resource. These management tools should therefore be broadened as much as possible in respect of the overarching principle of full accountability. The tools should also incentivise innovation in fisheries, as fleet structure and fishing methods will have to adapt to the changed playing field. This change should be driven by the economic interests of the industry.

Inter-species flexibility

This provision allows catches that are either a) caught in excess of quotas or b) catches of species of which the Member State has no quota, to be deducted from the quota of the target species. The rule goes against the accountability principle and it entails a double book-keeping where authorities count catches against the quota for one species and biologists count against another species. The use of the rule will imply that fishermen gain an incentive to "fill-up" with non-quota catches even if the need is not there.

Rather than accepting non-quota catches, such occurrences should be dealt with under de-minimis, or in an amendment to article 105 in the Control Regulation (1224/2009). The pay-back should then take effect as in Commission Reg. [2017/2309](#). This however does not remove the problem which in many cases relates to quota allocation mechanisms. This is discussed in chapter 3.2.5.

De minimis

Up to 5% of the annual catches can be exempt from the landings obligation. This provision applies i.a. when selectivity is difficult to achieve and there are provisions for the documentation of catches. Catches under the provision shall not be counted against the relevant quotas; however, all catches shall be fully recorded.

Taking into account the ongoing high levels of discards, and the transitional problems moving to full catch accountability, this paper considers the de minimis rule as helpful in choke situations. It should apply for REM vessels only in order to ensure documentation of the recording.

Catches being recorded - but not counted - against individual quotas respect the need for correct data for advice. Subsequent TAC/quotas will be reduced and the "cost" thus paid by all fishermen with quota access.



Year-to-year flexibility

'Year-to-year flexibility' does not seem a strong tool to resolve choke situations. It is useful in the sense that it departs from the "use it or lose it" approach, and it could be explored further in context of Multi Annual Plans, a real-time based advisory system and a more continuous management than the present calendar year approach offers.

High survivors

The landing obligation does not apply to species for which scientific evidence demonstrates high survival rates. Determining what counts as a high survival rate poses a challenge to scientists due to the high level of variability in the survival rate, reflecting ever-changing conditions (fishing gear, trawling-time, season, age, treatment on deck etc.). [STECF](#) stated: "Survivability – a huge debate". This has led to both a decision stale-mate and some non-controllable rules such as time-length, depth of towing and requirement of immediate release. This problem can, however, be properly addressed on the basis of the mind-set inherent in the CFP, which allows costs and benefits from discarding to be internalised in the catch quota management.

The solution is to provide an exemption for species considered to be sufficiently capable of survival. The exemption then applies as follows:

1. Releasing is allowed for fish under MCRS.
2. Released catches count on the vessel quota with a percentage of the catch that reflects expected average mortality for the given species.
3. Vessels with REM can use the exemption.

This approach will ensure that fishermen are accountable for the mortality they inflict on the stock, and, more importantly, they have the incentive to minimise unwanted catches and discards thereof. In effect this approach is robust enough to allow for free discarding of fish under MCRS, which underpinned the large-scale Danish REM trials for 8 years.

The approach entails that catch of a species with an average survivability of 40% will count 60% against the fisher's quota holding. Setting the survivability (and hence the catch account) allows for some useful modifications. For low level stocks the account can be set at a precautionarily high level. On the other hand, for a sound stock such as plaice where the phasing-out of discards in the sole/plaice fishery is difficult, it is possible to set a relatively low account percentage provided the actual catches are recorded. The resulting next-years TAC reduction will then be paid by all fishermen, including low-discarders. In the long run, letting the "next fisher" pay is not viable. The long-term answer to the problem is to innovate methods that compare with best practises, or suffer the economic extinction of the fleet.



Low-volume chokes

The ecosystem poses difficult choke problems for low-volume and protected species. A lot is done to develop technical solutions, but it is also necessary to consider management of these species in respect of the various sea basin characteristics. In this paper, low-volume species are defined as species that will choke even with an optimal allocation between all fisheries irrespective of nationality. This includes protected species. Special tools should be considered for low-volume species where transferability tools have been used to the full extent. With this condition the following tools should be applied in order to underpin accountability:

1. **For quota regulated stocks** the TAC should be fixed at a level that takes account of the mixed fishery and which is above the precautionary approach (art. 2.2. 1380/2013). Discard exemptions may apply depending on species survivability. The count against quotas is set on a precautionary high level, and it may be differentiated according to fishing method and best practise documented through REM.
2. **For non-quota stocks** not under analytical assessment, it is necessary to establish reference points and trigger indicators with regard to acceptable fishing mortality. It is not advisable to manage these stocks within an “others” category, as it may result in overfishing of individual species. Discard exemptions as under point 1.
3. **For protected species** it is advisable to define a catch or reference limit, to oblige all catches to be released, to record all catches and to count these against the limit with a suitable factor reflecting survival for the species in question.

This approach will ensure a given level of protection of the species, it will ensure accountability, it will maximise economic output in mixed fisheries, and it will stretch the quota holdings through a properly defined discard exemption.

The exemptions and flexibilities in the Basic Regulation have been discussed in various fora; a.o. in the NSAC [report](#) of October 2017.

3.2.3. Exemptions from control measures and accessory regulation

The Control Regulation and a number of control provisions in other regulations are developed before the reformed CFP. REM offers a full and continuous documentation of all important control aspects. The REM solution should be integrated with the upcoming revision of the Control



Regulation and REM vessels should be exempted from a number of control provisions such as stowing and notification of gear, restricted landings to designated ports, prior notification rules etc.

Management and control of fleet tonnage and engine power saw the light with the MAGPs (Multiannual Guidance Programmes) in the mid-eighties. The aim of the programmes was to curb overcapacity, excess fishing effort and mortality. This link between overcapacity and excess fishing mortality will cease to exist with full catch accountability and the regulation of capacity should exempt fleet segments covered by REM.

3.2.4. Quota substitution

ICES [present](#) mixed-fisheries projections in terms of catch for a number of demersal stocks. For stocks where the FMSY range is available, a “range” scenario is presented that minimizes the potential for TAC mismatches. This scenario returns a fishing mortality by stock which, if used for setting single-stock fishing opportunities, may reduce the gap between the most and the least restrictive TACs, thus reducing the potential for chokes.

However, this is not a great help as the TAC’s are split into Member State quotas according to Relative Stability, which does not reflect composition in catches. The range approach would benefit from being included: not only in the TAC but in the resulting Member State quotas as well.

A model could look as follows:

- A reference TAC based on ICES choke-reducing mortality is set for each relevant stock.
- The upper TAC level is indicated for each stock on a single stock basis.
- These levels are reflected in the Member State quotas.
- Each Member state may choose a quota portfolio with quotas at the upper level and with a total value (for example in cod equivalents) that aligns with the reference value.

This ensures that the single species management concept is retained, but quota flexibility is increased. The approach can be modulated on the basis of trophic interrelationships between species; given the scientific basis is developed.

An obvious alternative is to set all TAC’s at the upper level and accept that some Member States will not be able to utilise their catch opportunities. The resulting incentive to discard non-quota catches will have to be contained through REM. This would be a de facto change of Relative Stability. The best alternative is to set all TAC’s at the upper level and calculate a value-balanced in-year quota exchange between Member States that minimises the choke effect for each year. The modalities



for such a quota exchange agreement would have to be established by Member States in a Relative Stability compliant way under the swap system (art. 16. 1380/2013).

3.2.5. Allocation and chokes

Transferable Fishing Concessions (TFC) may be seen in context of permanent fleet adaptation or day-to-day matching of catches with quota holdings. The first entails the transfer of permanent rights, typically in the form of a given share of a national quota. The second type of transfer is an in-year leasing - or swapping; there are no changes in share ownership.

TFCs are a contentious management tool. Discussions should focus on the ability of TFC designs to meet defined objectives, and to assess the dynamic consequences associated with that. Our Western economy is a market-based, where half of the turn-over is spent on policy prioritised areas. TFCs can produce wealth *and* be managed to deliver to socioeconomics at the same time. This paper, however, focuses on in-year transferability as a means to contain chokes. The considerations are equally valid in relation to climate-migration of stocks.

3.2.5.1 Transferability within EU Member States

Member States have wide opportunities to establish transferability, illustrated by the following:

a. Producer Organisations & cooperatives

PO's are managing fishing allocations in some Member States. The flexibility with regard to matching catches with quotas depends on the individual PO. While the system limits the freedom of the individual fisher, it may prevent fishermen from establishing a 'corner of the market' of sensible choke species. A number of Member States employ variants of the PO-pool under the Common Market Regulation (CMO). Some fishermen have established coop-pools outside the CMO.

b. TFC-pools

This type is a lease/swap "home-banking system" that allows individual fishermen to swap and lease quota according to his own choice, and depending on the demand-supply situation. Danish TFC pools are managed by the industry. The Fisheries Agency sees each pool as "one vessel" in the sense that vessels are allowed to overfish their individual quotas as long as the pool total is not exceeded. This allows fishermen to land and sell fish without having a quota and retrospectively lease-in the amount needed. The system does not have a formalised protection against speculation in chokes, but, as with a fisherman-managed system, social pressure may apply.

c. Risk-pools



Risk pools are used in USA. Here fishermen combine their quotas of overfished species and chokes to reduce the risk for the individual fisher. Members of the pool who catch the relevant species are covered by the pool. The condition for participating in the pool is that spatial fishing plans are adhered to. These plans are updated by the fishermen for example through [eCatch](#): *“Knowing where by-catch events occur is one way to avoid problems. eCatch gives captains an easy way to capture the location of their by-catch events, visualize them on a map, and share with other members of their local community. eCatch operates on a “give get” principle, meaning if you choose to share your by-catch locations you will receive a generalized map of by-catch from other eCatch users in your fishery.”*

Sharing of knowledge and by-catch avoidance tactics is relevant, even if sharing of quotas is not involved. Spatial management may be developed in order to direct fishing effort in the increasingly dynamic ecosystem. Spatial management, including real-time closures and precautionary areas, should be considered as a tool to inform fishermen’s decisions rather than obliging them through a new layer of regulations.

An example of this is the [pilot project](#) in the Bristol Channel, which is providing daily reports of spurdog by-catch, using a grid reference system. An REM system, supplemented by vision software, may further qualify conditions regarding by-catches and automatize sharing of information in real-time.

Practical innovation needed

The design of a pool may well combine elements from the various types mentioned above. Member States and fishermen should not hesitate to discuss pool objectives and design elements. The basic design must be based on sea basin characteristics, fisheries (métiers), level and type of fisher-organisation etc. Technological innovations and developments will also offer new opportunities. In some years, blockchains may automatically show the optimal real-time distribution of quota holdings in defined systems and allow for rule-based, or personal, transactions in a peer-to-peer industry-wide network, operating within appropriate national boundaries.

3.2.5.2 Transferability between EU Member States

Member States may, after notifying the Commission, exchange all or part of the fishing opportunities allocated to them (Art 16.8 1380/2013). Even though this provision is widely used already, the options for more advanced uses have not been explored.

In general, Member States have been reluctant to consider swaps beyond the bilateral 1:1 model, where the quota exchange between the two Member States is in balance with regard to amount or value. More effort should be done in order to establish flexibilities with regard to transferring quota. Another major problem appears to be the reluctance to open a discussion on Relative Stability



between Member States. Allocation of quotas between groups or individuals at the National level (National quota management) may also hinder transnational swapping. A technical evaluation of various models might facilitate new solutions; for example the ones floated here:

a. Roll-over arrangements between Member States

Member States may, on bi- or multilateral bases, establish swapping arrangements that even out imbalances due to Relative Stability. The swap could be concluded every year following the December TAC/quota decisions. This solution has already been in use.

b. EU buffer

The 'inter-species exemption' is an example of a negative impact of a regulation (however unintended), which is used in situations where the Member State has no quota for a choke species. The problems associated with this could be alleviated through swaps or even unilateral transfers. A buffer could be set aside at the EU-wide level in the yearly TAC/quota regulation for the relevant stocks, which is then used to cover non-quota catches. Such catches should *still* be discouraged, however, through an amended article 105 (1224/2009) as this buffer would only be used in extreme circumstances. Alternatively, and in full respect of Relative Stability, the buffer may be used as a basis for continued exploitation of the target species, while the choke species itself is counted against the buffer and discarded.

The buffer would incentivise Member States to solve the problem between themselves before a buffer is established.

c. Unilateral transfers

In some areas, Member States have choke issues on high volume stocks on which they do not have a quota. The direct consequence of this is unaccounted catches and discards. As long as this failure goes uncorrected, it will block proper documentation of catches. Member States that *do* have sufficient quota of the stock in question may offer a quota transfer for free, on the condition that all catches are accounted for, with suitable controls applied using REM where appropriate. Transfers lower than the level of unaccounted catches would benefit all players, as unwanted catches would cease to tax the TAC.

d. Transnational pools on Member State level

Member States spend considerable time on bilateral talks regarding possible swaps. Instead, they could announce their 'demand-supply' profile on a common webpage in order to create transparency as a basis for swaps. The pool may be served by an algorithm that suggests more



complicated swaps involving several Member States. The model could be considered to cover 3rd countries such as Norway and UK after Brexit. Relative Stability would then be an issue.

e. Transnational pools at the individual fisherman level

It is possible to establish a transnational pool, where leasing and swapping of in-year quotas takes place between individual fishermen, or their POs, in full recognition of Relative Stability and the Member State prerogative to manage national quotas.

The outline is that:

- The Member State wishing to participate at the beginning of every quota year decides the acceptable quota share that may be leased out by their individual fishermen, or PO's, and for the stocks chosen by the Member State.
- The quota boundaries for the Article 16 swap is registered with the Commission and each realised swap is subsequently registered.
- The MS may allow free leasing within the quota limits and other conditions (such as maintaining a pre-defined value balance).
- A technical facility is established to manage the pool. A web based facility allowing for relevant boundaries to be attached to the individual fisher or PO participating in the system will function like a home banking system. Such a [system](#) is in operation.

This may need a flexible interpretation of art. 16 (1380/2013).

3.2.5.3. Transferability with third countries

The CFP aims to ensure sustainable exploitation of stocks shared with third countries through a.o. the exchange of fishing opportunities (art. 33.2. 1380/2013). Brexit makes it relevant to consider the opportunities for a more flexible exchange system. Relative Stability and the Commission's negotiating prerogative will, however, be put in jeopardy if Member States can swap with 3rd countries. Given that the main choke problem in some areas is associated with allocation rather than biology, more thinking should be done in this area. All exchange arrangements must be based on a level playing field. Mandatory REM should be considered for the various types of transfer systems in order to ensure fair and transparent competition.

3.2.6. TAC advice

Alleviating the choke problem depends on advice that makes sense to fishermen in real-time when they are fishing. The current system is not able to provide advice that serves both the policy objectives and the earnings of the industry adequately.



The current data *source* for advice is insufficient in terms of data amount, data quality and data actuality (real-life). The current static approach to *modelling* of advice fails to fully include dynamics (climate). The current advisory *process* is complex, being based on layers of working group and committee work over an extended period. The result is advice reflecting data often up to two years old, and possibly an outdated ecosystem situation. Apparently, neither the science community nor the clients – i.e. the European Commission – have acted to address this. The political level does not seem to appreciate the impact of these knowledge gaps, or the opportunities available to make progress on this issue.

Why not a daily Fish-Forecast?

Machine learning seems to offer a viable comprehensive solution to the problem. Increasing amounts of data can be sampled, distributed and computerised in real time and at low costs. Machine learning may:

- Offer instant and continuous stock assessment.
- Use data sets that cannot be processed in current models.
- Use data from fishing vessels with fewer demands on sampling protocols than now.
- Offer dynamic adaptation to climate and other baseline changes.

The European Commission should pilot ‘shadow advice’ for a few concrete stocks based on machine learning, and do a parallel evaluation of the opportune modalities for a generalised approach, including the incorporation of data on a broad scale from fishing vessels. Horizon2020 should open a call to develop the use of machine-learning for fisheries advice and make sure that science competences on machine learning are involved.

3.3. The institutional issue and policy transition

The decision machine:

The up-side of CFP institutions is a highly qualified and engaged community. The down-side is a complicated decision/dialogue-system. Regionalisation is meant to bring management closer to the interested parties, but system failures are threatening. Regionalisation itself is divided: Advisory councils and formal regional cooperation (Scheveningen, Baltfish) are in separate bodies with separate interests and there is an overlapping responsibility with regard to the “right of initiative” between the regional level and the Commission.

The effect is that (not withstanding new demands on the industry, such as full catch accountability) the consequential adaptation of the regulatory system and control is not in place. This is



compounded by substantial divergence in conceptual understanding of the content and direction of the reform. Some see full catch accountability as just a piece of added regulation, some see it as a disruptive change of policy - from input regulation to output regulation. In effect it is the latter but may end as the first.

Policy transition

The transformation of the new policy into operative management calls for strategic choices. Fishing is likely the most diverse and complicated industry in EU: The biological systems, variety in fleets, production structures developed to align with the old policy, and opposing political and economic interests.

How does one encompass this diversity in the new legislation? The risk is a return to micromanagement, which will limit the adaptability and dynamics of the industry. It is crucial that the industry is offered the opportunity to innovate and develop on its own terms. The condition for this must be that the public interest, with regard to the resulting fishing mortality (or environmental impact), is safeguarded. In other words: deliver full catch accountability (including REM) and leave it to fishermen how to fish. This is the essence of results-based management.

The Basic Regulation is opening for an approach where trials and pilots may spearhead the CFP (art 14 and 38. 1380/2013). More interesting is the European Parliament's [proposal](#) for technical measures. The proposals entail that fishermen may be exempted from gear regulations and from landing undersized fish on a trial basis. The condition for these exemptions is that a system of full documentation of catches - based on measurable targets - is put in place.

Scientific trials of this type have always been an option for the science community and Member States. We call on Member States to seize see this opportunity to innovate, and influence new approaches through the Technical Regulations with the intention of facilitating the transition to results- based management.

Trials must, therefore, be constructed in such a way that their recommendations and outputs are readily internalised as part of regular legislation. This was done for the trials for fully documented fisheries 2009-2105. This was probably the largest EU fisheries trial ever, covering about 40 % of all cod catches in the North Sea.

The Control Regulation (1224/2009) includes the necessary provisions to ensure full catch accountability in accordance with article 15 in the Basic Regulation. However, given the importance of the new principle of full catch accountability, the up-coming revision of the Control Regulation must explicitly define the tools to ensure compliance. The principle of "accurate documentation of catches" as stated in article 15 is not being complied with, and has not been given precise definition



irrespective of the knowledge gathered from fully documented fisheries by REM since 2008. The Control Regulation must therefore define the technical specifications of a system for the full documentation of catches and discards, and outline criteria for its use and consequences for fisheries of *not* applying REM.

4. Documentation and accounting of catches

Catch Quota Management for Fully Documented Fisheries (FDF) using REM has been extensively trialled in Denmark and UK (2009-2015). Germany, The Netherlands and Sweden have participated as well.

The trials were based on a very simple incentive driven logic: A fisher counting all catches against his quota holding, and documenting this, received a quota increase that reflects the discard level for the stock in question. Numerous reports have deemed the trials successful. REM is effective, selective fishing has improved and discards have dwindled to insignificant levels.

From 2015 full catch accountability has been gradually introduced as a CFP requirement (art. 15 1380/2013). At the same time, TAC's are topped-up, based on the logic that fishermen have to count all catches. This logic is correct, except for the fact that the necessary control has not been established and unaccounted discarding continues. The consequence is that fishing mortality increases, and the pursuit of MSY becomes a theoretical exercise. Increases in TAC's may, in some areas, lead fishermen with sufficient quota to increase high-grading. Control of at-sea behaviour is very difficult. High grading of fish has been illegal since 2002, but it is well known and statistically proven that large quantities of sellable fish have been illegally discarded. An illustration to this effect was presented in the Danish REM report 2009 (Annex 2).

Catch accountability must be ensured either by REM or by a statistically based account where calculated discards are deducted from quota holdings of Member States and vessels not using REM. The EU-backed principle of a level playing field necessitates this, if compliant fishermen and Member States are not to be disfavoured.



4.1. Remote Electronic Monitoring (REM)

The following account provides a workable REM solution. It includes findings from the WWF report [*Remote Electronic Monitoring, published in September 2017.*](#)

No other method of monitoring is able to record the “decision point” where a fisher decides to retain or discard a fish. Well-designed catch handling procedures can also allow the amounts of fish retained and discarded to be quantified and measured, thus removing the need for human observers controlling and gathering data at sea.

REM has been trialled on a range of vessels, and in different fisheries, including whitefish trawlers, Nephrops trawlers, gillnetters, longliners, beam trawlers, pelagic trawlers and under-10-metre vessels. The conclusion of all these trials was that REM – when coupled with CCTV - can allow fishing effort to be monitored, catches to be verified and discarding to be detected.

REM has demonstrated itself as an efficient compliance and scientific tool, capable of providing the observations required to monitor adherence to the Landing Obligation, whilst also supplying large quantities of good-quality scientific and management data at the same time. The main benefits from using REM are:

1. **Effective**

REM is the only method available that can effectively monitor the Landing Obligation. No high-grading regulations were enforced before the introduction of REM. The system is becoming intelligent (e.g. optical reading of species and sizes) and it can be coupled with a risk based algorithm (e.g. singling out catch compositions) that call for in-person control.

2. **Delivers more for less money**

It is necessary to establish comprehensive at sea controls to monitor the Landing Obligation. An observer programme is expensive and requires large numbers of observers; while REM will be less expensive and less intrusive, and will produce data that can be used for multiple purposes. REM is economical and efficient, and technological developments makes it increasingly affordable, even for very small vessels.

3. **Increased and improved data**

REM allows data to be collected over a longer period, and is being used in several UK and DK research projects. Rather than sending observers to sea for one or two research trips, the fishermen can collect the data over a longer period, record the data and imagery using REM,



and have the data and results verified by an onshore analyst. This removes bias introduced by seasonal variations, or from having an observer on board. It increases the timescales of a project: data availability goes up, costs of collecting the data go down.

4. **Faster access to data**

Currently observer coverage for scientific research purposes is low but costs are relatively high; and the data takes time to be manually entered on to a database, checked and then formatted for annual stock assessment purposes. This process can take a year to complete. REM sensor and positional data can be available in near-real time, while video review data can be completed and uploaded shortly after receipt of the raw data. This in turn can allow managers and fishermen to respond more quickly to events on the fishing grounds.

5. **Alignment with market requirements**

REM can be integrated with traceability and thus offer not only traced catch registration but also validation of the information. In this way the “stamp” of sustainable behaviour can be integrated in the production line, from catch to consumer, rather than being an accessory feature offered under certification schemes such as MSC.

The function of the REM system can be seen here: [Link](#)

The Norwegian discard ban:

The Norwegian discard ban has repeatedly been pointed out as a model for the EU. This is a mistake. The Norwegian system entails rules such as: shift of fishing grounds and depths, gear, by-catch allocation schemes, accepted overfishing and price neutralizing systems to contain overfishing. Furthermore, Norwegian stocks, fisheries and traditions are uniform compared to the situation in EU; *and* Norway has more inspection vessels. The “cultural” phasing-in of the Norwegian system took several years and, even though the Norwegian system is superior to the former EU discard regime, discarding still occurs when changing conditions are in favour of this.

The principal difference lies with the Norwegian system as a ‘command-and-control’ system with a high level of fisher acceptance, while the EU approach is based on full accountability and incentives rewarding this; including results-based management.



4.1.1. Introducing REM to the CFP

As presented here, REM is a prerequisite for the CFP landing obligation. It may be introduced as an obligation for near-all fishing vessels in line with the traditional introduction of controls. This will take a long time, however, and it will meet a lot of resistance if not applied uniformly. A mandatory system may succeed for certain groups of large vessels, but for the majority of the fleet the applicable incentives to use REM are strong enough to be relied upon in a voluntary phasing-in of the system. This process should be based on the following elements:

1. Full accountability will incentivise the use of REM and a level playing field in general. The principles entail that REM vessels can enjoy full quota top-up, while non-REM vessels will have no top-up, or a reduced top-up that reflects discards in the fleet segment in question.
2. REM vessels may enjoy more flexible exemptions from the Landing Obligation.
3. REM vessels may have free choice of gear, except for regulations aimed at protecting the sea bed.
4. REM vessels may be exempted from a number of control provisions.
5. REM should be brought to empower traceability and thus increase market trust and product value.

The REM introduction may take place in “trial -mode”, or move beyond trials to a legally based phasing-in of REM-licenses for given stocks or fleets. An illustration of an REM introduction with the first 3 elements is given in annex 1.

4.1.2. REM operation and sanctioning

Operation

The technical operation and prospects for cost efficient and more intelligent systems are covered in a number of reports and knowledge exchange fora, such as <http://eminformation.com/>. REM will allow for an important extension of the risk-based control, which has mainly focused control on fishermen with a history of non-compliance. The current on-line registration of data from logbooks and sales notes makes it easy to study the registered catch compositions of individual vessels. At the simplest level, a catch with only large fish would be worthwhile checking for discards by looking at the video frames from the hauling of the gear, while “normal” catches could be checked at a low frequency. The risk factor can be determined by algorithms that continuously assess catch compositions related to time, area and gear.



REM is becoming more and more intelligent. Recent advances streamline data, as sensor systems define the critical control points – e.g. hauling of gear and gutting fish - as opposed to periods of steaming, meaning that a large amount of footage does not have to be inspected.

The burden of proof and sanctioning

The voluntary phasing-in approach entails a contractual situation rather than top-down management based on legal sanctions and the burden of proof. Reversal of the burden of proof becomes a real opportunity.

Transgressions of conditions for REM vessels may be sanctioned over the REM-license; the “REM-contract”. In cases of non-compliance, licence conditions are tightened or the license is completely withdrawn for a period, profits may be confiscated etc. Ultimately the vessel loses the REM-license and falls back to the supervised system.

In this approach, it is the responsibility of the fisher to ensure the documentation required. In case the REM malfunctions he has the responsibility to produce a credible explanation or suffer automatic consequences.

Reversing the burden of proof, and attaching sanctions to licenses and profits instead of relating them to individual Member State’s legal practises of fining and confiscation, will establish a level playing field with regard to Member State sanctioning.

Full documentation is essentially the fisherman’s demonstration of compliant practises - much in line with the thinking behind certification. The fisherman becomes responsible for the documentation and the fisherman should, accordingly, be the owner of REM data.

4.1.3. Costs of using REM

REM is becoming the most affordable and efficient option for monitoring catches and collecting scientific data. The cost of reviewing the whole UK >10m fleet at 10% video review has been estimated to €5.6million for 2017. This represents a 22% reduction compared to 2015. Conversely, the costs associated with traditional monitoring and scientific data-gathering methods are increasing.

The costs of using an REM system for one vessel are estimated to be € 5,960 per year. This includes the purchase of hardware and analysis software, full installation, maintenance and the inspections review of 10% of the video footage.



Financially, every UK vessel over 10m in length could be installed with REM and have 100% of the sensor data, and 8% of the video, reviewed for a cost equivalent to 25% of the 2015 monitoring, enforcement and observer programme budget (UK data). The financial argument clearly shows that REM is a viable option.

Source: [Remote Electronic Monitoring](#), September 2017.

4.2. Real-time, validated data for scientific advice

Like many digital technologies, REM is developing rapidly in terms of efficient and intelligent data sampling and reading. Vision-systems, combined with machine learning, will enable high resolution multi-data sampling from CCTV footage; it will also allow for automatized review of footage. Studies are shared here: <http://eminformation.com/> [REM On-board Fishing Vessels: Now and Tomorrow](#)

4.3. Aligning documentation, control and certification

The CFP includes rules to ensure traceability and support responsible consumption of products marketed in the Union. “All fisheries products shall be traceable from catching or to retail stage” (Art. 58 of Council Regulation 1224/2009). The provisions were to be adhered to by 1st January 2012. In spite of community financing, the system has only been partly implemented through a variety of individual systems in Member States.

Traceability establishes a registration path of responsible conduct, which is important for the public control and management of resources, as well as for certification schemes - [MSC](#) already uses traceability. The critical problem of traceability is whether the information put into the system is correct; the most critical issue related to the CFP is whether all fish are counted and kept on-board. Currently, Member States do not control this, and neither the Commission nor the European Parliament have prioritised control of this core CFP principle. MSC assess sustainable practises on the basis of anecdotal information, control reports and similar uncertain information and has not made a move for accurate documentation as required in the CFP

REM ensures a validation of all catches taken by REM vessels. It will allow for a full review of all log-book registration and offer a one-string data platform that may be used by control as well as for certification. In effect, REM validated and traced fisheries - harvested at sustainable levels - would not require an expensive and time-consuming process of certification to qualify as a sustainable fishery, and retailers satisfied with their own brand might suffice with the REM'ed and traced documentation.



5. Aligning international rules

Brexit will result in major changes in fisheries jurisdiction. It will be difficult to conduct 3 separate but interrelated bilateral negotiations between the three parties, and a “North Sea Commission” solution has been put on the table. Like the former International Baltic Sea Fisheries Commission it may cover national zones only. Such a commission will likely include gear regulations and control in its work.

The difference in Norwegian and EU rules has caused a number of problems. The most severe difference between the Norwegian discard ban and the EU discard obligation is no longer an issue with the reformed CFP.

For many years, TAC/Quota negotiations have been difficult and time consuming. It is a paradox that so much attention has been given to this and so little attention to catches actually taken. In order to establish a sustainable practice - and level playing field - it will be necessary to ensure that TAC/quotas reflect a comparable fishing mortality inflicted on the fish stocks by the negotiating parties. Here REM will have to be employed.

The principle of full accountability will also allow each party a high degree of freedom with regard to implementing national regulation, and still retain a level playing field with regard to the taxing of the fish stocks. A party applying prescriptive rules might accept a 3rd party not having to comply as long as fishing mortality is in accordance with the agreement and fully documented.



6. Recommendations

Full catch accountability and results-based management must guide the implementation of the CFP. The policy must be advanced by a programmed phasing-in, or by first-mover pilot projects. To ensure a level playing field, REM vessels must be given the full benefit of their documentation of catches and resulting fishing mortality.

6.1 Managing the resource:

1. Establish full quota top-up for REM vessels and a precautionary or no top-up for non-REM vessels (annex 1).
2. Allow free choice of gear for REM vessels - except for rules related to bottom impact and by-catches of protected species. Monitor fishing mortality and introduce necessary catch metric targets on Member State level. The European Parliament proposal for amendments to the Technical Regulation can serve as a guideline - if less cautiously formulated than at present.
3. Assume a simplified approach to exemptions for REM vessels. The main point is that catches are recorded and accounted for.
4. Phase-out adverse exemptions, such as catches counting on alternative species or not counting at all.
5. Simulate effects of FMSY ranges applied on Member State level (quota substitution) and test the political interest.
6. Make traceability work in a transparent and common operation to assure and improve markets.

6.2 Managing allocations

1. The Commission should put pressure on Member States to cooperate on difficult swaps. Buffer mechanisms and other ways to contain the choke problem caused by Member States having none or negligible amounts of high volume stocks are needed.
2. Member States must do more to explore pools and other in-year transfers.

6.3 The resource base

1. Define a data sampling strategy at the community level, which aims to sample and qualify all fisheries data in relation to advisory needs.



2. Develop protocols for sampling of extended fisheries data (ask ICES to engage actively in the work).
3. Develop efficiency and quality in data sampling based on REM and the added opportunities in form of vision systems data-reading algorithms etc.
4. The Commission and ICES should develop real-time advice based on machine learning methods. Be sure to involve scientific and commercial knowledge directly engaged in the area.
5. Prepare for the 2nd generation MSY to improve overall yield.

6.4 Immediate action

1. With immediate effect: the European Commission must ensure Member States fully understand their obligation to account for all catches, and establish quota reservations where catch accountability is uncertain. [EFCA](#) must advise and audit Member States.
2. The Commission must include a TAC/quota reservation - an accountability pool - in the TAC/quota proposals for 2019. An illustration of this is in annex 1.
3. The trilogue on the revision of the Technical Regulation must take on board the Parliament's amendments regarding REM, and elaborate the text to facilitate the broad introduction of REM, thereby committing the Commission to establish a common framework for REM in context of results-based management.



Annex 1

Integration of catch accountability in the yearly TAC/Quota regulation.

Following the reform, the TAC/Quotas are based on all catches being accounted for. Thus, the now used quota top-ups should not apply but TAC/quotas simply be set as “catch” figures, meaning that targeted fishing mortality and TAC/quotas are aligned. In order to contain unaccounted catches, the yearly TAC/Quota Regulation reserves a certain percentage of the TAC/Quotas to cover these catches (accountability pool). The reserve is based on an ICES range estimate of unwanted catches. It may be set at high or low level depending on the situation for the stock in question. For fully documented fisheries the pool share will simply be set free without deductions.

Member States decide how to access the pool. They can choose to do nothing, to use a REM solution or to single out certain fisheries with low discards. If, for example, the reserved pool is 25% of the TAC/Quotas and a Member State can statistically show that discards in a gill net fleet is 5% a proportionate part of the reservation can be accessed by that fleet. The model entails that small-scale fisheries (gill netters) with low discard can access the accountability pool without using REM (CCTV solutions).

Integration of exemptions in the yearly TAC/Quota regulation.

Results-based management, including free choice of gear, is based on full documentation of catches, hence REM is required here. Similarly, effects of exemption differ markedly from REM vessels to other vessels. It therefore makes sense to include free choice of gear and exemptions in the yearly TAC/Quotas where the provisions can be tuned and adapted to the individual stocks and be monitored in context of the TAC/Quotas they relate to. Later, they may be entered into other regulations. In the model below REM vessels:

- Are allowed to discard under sized fish of a few species with high survivability. In this case plaice may for example be released in mixed sole/plaice fishery. The account percentage is set individually for each of the chosen species each year
- Are exempted from rules relating to selectivity in fishing gear.

This survivability exemption makes detailed regulation on survivability management superfluous. The figure does not have to be aligned with “exact survival” - it will never be anyway. As long as the stock is sound, deviations will not be consequential for stock survival only for distribution of economic externality effect between fleets.



COUNCIL REGULATION fixing for 2019 the fishing opportunities.

Article 15

- i. For certain stocks in Annex I, the TAC reflects that all catches are counted against Member States catch opportunities. Member States ensure catch accountability through fully documented fisheries or by setting aside reservations to cover catches not directly accounted for.

Vessels participating in fully documented fisheries may access a proportionate share of the reservation without deductions. Other vessels may access a proportionate part of the reservation with a deduction based on scientific documentation of discards from the type of fishery.

- ii. Release of catches at sea may take place for certain stocks and in fully documented fisheries. Catches released count against quota holdings proportionately to the fixed reference level of discard-mortality for the species in question.

- iii. Vessels participating in fully documented fisheries may be exempted from gear regulations except for beams and chains. Exemptions shall be approved by the Commission pending a Member State plan for managing and monitoring the effects on fishing mortality in accordance with the reference mortality applied by ICES as a basis for the advice for the relevant stock.

ANNEX I

Species:	Plaice	Zone:	IV North Sea
Belgium	6.447 (1) (2) (3)		
Denmark	20.951 (1) (2) (3)		
Germany	6.043 (1) (2) (3)		
France	1.209 (1) (2) (3)		
The Netherlands	40.292 (1) (2) (3)		
UK	29.816 (1) (2) (3)		
Union	104.758 (1) (2) (3)		
Norway	7.885		
TAC	112.643		
<p>1) Of which 25% is reserved for the accountability pool. The reservation may only be released on basis of Member States measures to ensure full catch accountability as outlined in article 15.i. Member States inform the Commission about the allocation of catch opportunities to fully documented fisheries and the reservation of catch opportunities to cover unaccounted catches from other fleet segments</p> <p>2) Of which fish under mcrcs may be released according to article 15 ii. The released catches count 60% against quota holdings.</p>			



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3) Vessels participating in fully documented fisheries are exempted from Regulation 1380/2013 article 15.11 (the use of catches of species below mcrrs shall be restricted to purposes other than direct human consumption)

Annex 2

Danish trials with Fully Documented Fisheries for 6 vessels started in September 2008. High-grading was a known phenomenon and Danish fishermen were expected to high-grade even as Danish fleets normally use relatively large meshed gear due to fishing mainly for larger species (e.g. cod) and less for smaller species (e.g. haddock and whiting).

The results from the trials were rather illuminating. Following the trials which established full documentation and accounting for all catches - including discarded fish, fishermen *immediately* changed behaviour.

The figure indicates a relatively high level of high-grading in the months until August 2008 and a complete stop for high-grading with the start of the trial in September. Now the small sizes in size norm 4 and 5 (yellow and red) suddenly appear in the accounted and landed catches.

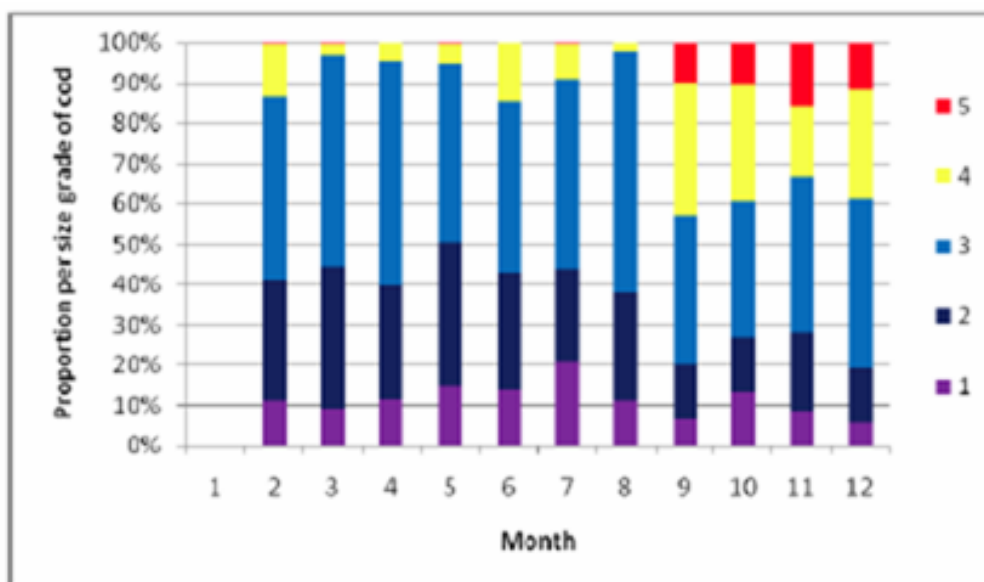


Figure 3. Proportion of cod per size grade per month for 2008 for the trial that have landed cod caught in the North Sea and the Skagerrak. The data for January is non typical and therefore not included.

High-grading has been prohibited since 2002. With the landing obligation also fish below mcrs must be landed. This fish has even lower value than the high-graded fish. How EU expect the extended landing obligation to be complied with in a situation with no control and no incentives remains untold.