

Marine Scotland Science

Review of Management Options for the Landing Obligation



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The views expressed in this report are those of the researcher and do not necessarily represent those of the Scottish Government or Scottish Ministers.

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Acronyms

CFP Common Fisheries Policy

CCTV Close Circuit Television

EU European Union

FAO Food and Agricultural Organisation, United Nations

FDF Fully Documented Fishery

ICES International Council for the Exploration of the Seas

LO Landing Obligation

MLS Minimum Landings Size

MS Member State

MSY Maximum Sustainable Yield

PO Producer Organisation

RAC Regional Advisory Committee

REM Remote Electronic Monitoring

STECF Scientific, Technical and Economic Committee for Fisheries

TAC Total Allowable Catch (which is currently the limit of what can be landed)

VMS Vessel Monitoring System

Executive Summary

Key Findings

- Widespread support exists for innovative solutions to support the Scottish fleet in living with the landing obligation
- Improvements to quota trading and the strengthening of fishing rights were regarded as important tools
- A consensus found the option of pooling quota and creating a 'buffer zone' as a pragmatic approach
- Effective monitoring and enforcement is perceived as a necessity in fostering the required adjustments to behaviour such as compliance and improved selectivity

Summary of Findings

1. The remit of this report was to investigate possible management options that have the potential to contribute towards the implementation of the landing obligation in Scotland. It focuses upon management options for catch after it has been caught and landed on deck. Through a review of best international practices and a series of key expert and stakeholder interviews, this report identifies strong support for the use of innovative management mechanisms to aid the implementation of an effective and practical landing obligation.

Improving the tradability of quota

2. The report found evidence of widespread support for improvements to the mechanisms that permanently and temporarily transfer quota at a European level and within Scotland. The central tenet of this was a desire to facilitate an improvement in transparency and efficiency. A common perception given was that trading mechanisms in Europe and Scotland exhibit a high degree of information inefficiency and a lack of transparency. There was a broad agreement that these instances of market failure are likely to constrain access to quota and inflate leasing prices. A management option that received a high degree of support was for the creation of centralised information points and the adoption of the Danish model that uses public online trading platforms for international and national quota swaps. Support for improving quota trading in this manner was based upon the perception that such changes could create a downward pressure on quota price and scarcity. The ability to execute real-time trades and improve the ability to buy quota on the way back into harbour was perceived as a useful tool.

Allocating and managing additional quota

3. A consensus within the interviews was that the most appropriate way to allocate any additional quota occurring from the shift to catch quotas was on the basis of current FQA holdings. However, a significant degree of support was given to the option of managing this quota and/or ring-fencing a proportion of national quota holdings and managing this as a 'buffer zone'. Buffer zones are a tool to protect against the overfishing of national quota and could work to account for uncertainty and irregularities in the transition period while affording vessels some security against accidental catches. Support for this mechanism was contingent on effective

management of any 'pooled' quota as it would be susceptible to the problems that affect open-access resources. The report outlines economic and social controls that operated in countries utilising a similar system and discusses the possibility of tying access to pooled quota to monitoring provisions.

4. While the pooling of quota was most often supported at a government level – in line with government's ability to effect net societal/welfare gain in which some individuals will lose out-, the option of POs pooling and managing quota in a similar fashion was also identified. This received mixed support from the industry, with a general argument that this should be a voluntary arrangement. Similar private agreements between fishermen, called Risk Pools, operate in Denmark and the US and have been reported to have reduced transaction costs, improve access to quota for accidental bycatch and have been used in tandem with technology to reduce fishermen's risk of catching choke-species.

Monitoring

5. Catch quotas will be harder to monitor than landings quota. Concern was expressed for monitoring arrangements under the landing obligation as it is crucial for European Maximum Sustainable Yield targets and the fostering of compliance and improved selectivity in Scotland that Member States and the EC know exactly what is being caught. The attitude towards the use of Remote Electronic Monitoring (REM) was divided: generally the industry questioned its effectiveness while all others identify it as the only effective method for monitoring the landing obligation. Anxiety over the impact of REM on the TR1 and TR2 fleets can be viewed as indicative of REM's potential effectiveness. The use of carrot-and-stick schemes designed at fleet/sector level was put forward as a solution. Options to foster a level-playing field at a European level were identified and supported, such as access to 100 per cent of national quota entitlements released with fleet use of REM.

Enforcement

6. A view held by most of the stakeholders and experts interviewed was that unless the landing obligation is perceived as being enforced from the get-go and illegal discarding carries a high financial cost, it is unlikely that the behaviour changes required (compliance and more selective fishing) will be generated. Support was indicated for the use of strong financial penalties for illegal discarding and illegal landings in order to create the correct economic incentives.

Section 1. Introduction

Background

1.1 A central component of the Common Fisheries Policy (CFP) reform (EU regulation 1380/2013) is the progressive elimination of the discarding of species subject to catch limits in all commercial EU fisheries. Discarding is the practice of throwing catch back into the sea dead or dying. With the introduction of the obligation to land all catches, Article 15 of the new CFP basic regulation prohibits the discarding of species subject to catch limits (TAC and quotas species) and those subject to minimum size limits in the Mediterranean. The gradual introduction of the landing obligation begins in 2015 for the pelagic fisheries, extending to all fisheries in the Union in the following years. This reform represents a fundamental shift in the management of EU fisheries, with a key component of the landing obligation the movement away from the monitoring of landings as a measure of TAC/quota uptake to the monitoring and regulation of catches.

1.2 The elimination of discarding in EU commercial fisheries is a progressive policy that will bring an end to a wasteful practice. However, significant unease exists across Member States (MS) as to how the landing obligation will affect the operations of vessels within national fleets. As catches once discarded will have to be landed and accounted for with quota, the commercial operations of some vessels will become constrained and demand for quota, an already scarce resource, will increase. The Council of Ministers have designed exemptions and flexibilities to alleviate this situation. The proportion of the catch currently discarded is expected to be added to the quota as an additional amount, as a so-called 'quota uplift'¹ (though this could still result in a lower TAC from year to year as the state of the stock with regards to MSY will also need to be taken into account) and various exemptions have been written into the legislation including species not covered by catch limits; species where high survivability can be demonstrated and; limited volumes of permissible discards which can be triggered under certain conditions, the so called *de minimis* exemptions, as well as inter-species and inter-annual quota flexibility mechanisms

1.3 Despite these exemptions and flexibilities, the impact of 'choke species' remains a key concern. The so-called 'choke species' phenomenon represents a situation wherein a lack of quota for one species – the choke- may prevent vessels from going to sea despite plenty of quota being held for other stocks. In many cases, firms may be unable to continue operating, with large quantities of quota uncaught after the choke species binds. Faced with the prospect of going out of business, incentives for non-compliance with the landing obligation will be created. There is therefore a strong onus upon Member State governments to implement discard reduction strategies that will help reduce the catches of unwanted and undersized species and to implement policies that will allow fleets to stay at sea for longer and utilise allowable catches, while simultaneously incentivising compliance and behaviour change at an individual level.

¹ In reality, the allocated TAC will not distinguish between 'business-as-usual TAC' and 'uplift TAC' but will be expressed as a single tonnage figure. The uplift can be estimated by fisheries managers, for example using evidence-based rules of thumb derived from known pre-ban discard rates eg $X\%$ or Y tonnes of total TAC of stock W will be additional.

Scope and Rationale for the Study

1.4 By the time the landing obligation comes into full force (2019), it is likely that catch compositions, fleet characteristics and the final shape of how the aforementioned flexibilities and exemptions will operate will have altered the 'big picture' of how the landing obligation will affect the Scottish fleet. Moreover, it will be a few more years before the impact of the ban on behaviour and the operations of the flexibilities are understood. In order to facilitate the successful implementation of the landing obligation in Scotland, this report represents an initial stage within a Marine Scotland Science multidisciplinary research project that aims to appraise how discards can be reduced in Scottish commercial fisheries. The remit of this paper is to produce a review of the best management practices and policies from around the world that reduce unwanted bycatch and discards and to explore the potential that these options hold for Scotland.

1.5 An underlying principle of the paper is that discarding is a multifaceted problem that happens for a number of reasons and that the level and pattern of discarding varies between and within fisheries. It therefore stands to reason that the most successful approach is likely to adopt a tool-box approach - the use of a number of different policies and management options that will work together to produce the desired outcome. This will involve a mix of both technical and administrative measures. While the wider Marine Scotland Science multidisciplinary research project will focus upon the introduction and development of technical measures that will help fishermen to alter their catch and avoid the catching of unwanted species and undersized fish, this paper focuses upon management options that will determine what happens to fish once they are landed on deck. The management of catch and the use of quota will have an important contribution to how the landing obligation works in practice as even with the best precautionary actions that allow fishermen to alter their catch compositions with choices regarding location, time and gear, it is almost inevitable that individual catches will not exactly match the *ex-ante* portfolio of catch rights.

1.6 This report uses a desk-based review of international policies and evidence from a series of key informant interviews to provide a qualitative analysis of the various management options that have the potential to create positive conditions for the operation of the landing obligation in Scotland. It identifies widespread support for several policies at all governance levels: across the EU, within the new regional structures, at a Scottish national level and within the POs and the operations of individual firms. Where possible it analyses the potential impacts and limitations of the different options.

Methodology

1.7 The objective of this paper is to produce a background review of bycatch and discard reduction measures used internationally and to test their potential contribution for the implementation of the landing obligation in Scotland's mixed fisheries. This report was conducted in two stages. An initial desk-based study was used to produce a synthesis of past and current international policies that aim to reduce bycatch and/or discarding. The focus was upon the use of social and economic policies in countries operating a discard ban (New Zealand, Iceland and Norway) and in countries that operate bycatch reduction strategies (Denmark, the

United States, Canada and Australia). From this, key themes and management strategies were identified: quota allocation, quota tradability, catch quotas, risk pools, buffer zones, non-market catch balancing mechanisms (carry forward/back, deemed values, species equivalent), monitoring, enforcement and bycatch utilisation. The identified management options were then subject to an initial high-level vetting process that assessed their applicability to the Scottish context. This removed options such as the use of species equivalence and allowable discard rates which would not be available in an EU context.

1.8 The method chosen to collect data to assess the feasibility of the options for the Scottish context was a series of key informant interviews with experts and stakeholders connected to the commercial fishing industry. Key informant interviews, based upon a semi-structured format, were chosen as it allowed the report to benefit from and utilise the first-hand knowledge of a wide range of participants. Qualitative in depth interviews were chosen in order to allow for the free flow of ideas and information in order to generate recommendations, view points and new ideas. A total of 20 individuals were identified as potential contributors. The selection method was based upon a process of identifying groups and organisations from which key informants should be drawn. The groups identified were: the Scottish fishing industry, government agencies, academia, international fisheries managers and 'others' including NGOs and industry-related bodies. From these groups, individuals were chosen for their specialised knowledge and experience and were balanced to allow for a divergent mix of interests and perceptions.

1.9 A total of 16 individual in depth interviews were carried out: academia (3), Scottish Producer Organisations (3), Scottish Fishing Association leaders (2), Fisheries Compliance (1), NGOs (1), international fisheries managers (3), international fishermen (1), and other industry related bodies (2). This was then supplemented by information provided by 2 other fisheries managers in Denmark and New Zealand. While the intention was to structure the interviews as in depth conversations, an interview grid (Annex 2) was created to ensure that specific data was gathered. The questions were grouped in themes: international quota swapping, allocation of TAC increases, quota management, monitoring, enforcement and bycatch utilisation. With the interviews structured on a thematic basis, identifying and categorising patterns within the responses was relatively straight forward. This was aided by the use of a descriptive coding system to group together the responses to specific questions, issues or management options. Once grouped, a content analysis worked to identify trends, such as a consensus behind the effectiveness of a management measure or else for evidence of scepticism and a rejection of the suitability and practical use of the idea discussed. Once the transcripts were fully analysed, the data was fed into the original structure of the paper that was based upon the themes identified in the initial desk-based study.

Section 2. Discarding in Theory and Practice

2.1 Discarding occurs when unwanted catch is caught during the targeting of commercial fish stocks. This incidental catch is called bycatch and is usually thrown back into the sea dead or dying, i.e. discarded. Though discarding is an incredibly wasteful practice, it is not purposeless. Under the current operation of landings quotas, fishermen are able to discard parts of their catch in order to affect the composition of their landed catch. The principal intent is to increase the landed value of the catch and avoid landing illegal catches. The current ability to discard therefore represents a value to fishermen.

What are the causes of discarding?

2.2 A consensus within the literature is that patterns and levels of discarding vary highly across fisheries and even within fisheries, with the act of discarding often driven by a multitude of changing economic, sociological, environmental and biological factors (Catchpole et al., 2005).

Market forces

2.3 A strong economic incentive exists for fishermen to discard species of low or nil commercial value. This type of discarding tends to occur in mixed fisheries where it is almost inevitable that a mixed catch will be caught. Discarding in this situation can be driven by a lack of demand as some species are culturally unpopular amongst consumers and also by the use of less selective gear. For example, dab is an abundant species in the North Sea but the Scottish fleet only lands around 15 per cent of its dab quota, with high bycatch and discard rates reported. The key driver is the low market price of dab caused by low consumer demand. In this situation, the landing price of dab does not offset the costs of retaining and landing the species as it takes up valuable hold space and requires labour to sort and ice, which could instead be used for more valuable species.

2.4 Market forces also work to incentivise a form of discarding associated with pre-market selection. Illegal 'high grading' is incentivised as target species that are of a small size (but above the Minimum Landing Size MLS) or in a poor condition are discarded for specimens that will receive a higher price. In Scotland, high-grading is believed to be relatively common in the demersal and Nephrops sectors and 'slipping' (the deliberate lowering of the net to allow the fish to escape but they do not survive) has been witnessed in the pelagic sector. Market forces drive this behaviour as fishermen aim to increase their profits by using their quota to land larger, more valuable fish.

Regulatory measures

2.5 A principle aim of the regulatory measures implemented through the CFP is to bring fishing mortality to a rate consistent with achieving Maximum Sustainable Yield (MSY). MSY represents the point at which the largest catch or yield can be taken continuously from a stock under existing environmental conditions. The intent is to allow the population to be indefinitely productive, with maximum fishing opportunities balanced against the threats of stock overexploitation and eventual collapse.

Regulatory measures can take several forms; input controls that manage fishing effort such as entry limitation and Days at Sea restrictions; output controls that manage catch such as Total Allowable Catch (TAC) and quotas; and technical measures such as gear restrictions and spatial and temporal closures. Despite the vital and necessary operation of these regulations, there are circumstances in which the regulations can incentivise discarding.

Minimum Landings Sizes

2.6 MLS regulations refer to the smallest length at which it is legal to keep on board or land a species, with sizes varying on a species by species basis. The intent is to create an incentive for fishermen to avoid juvenile fish, in an effort to protect spawning (an individual will survive to the size of first maturity and have an opportunity of spawning at least once) and to allow the individual to grow and add to the future biomass of a catch, thereby increasing the economic yield. Currently, fish caught under MLS must be discarded. A key factor contributing to the discarding of MLS is the use of less selective gear.

Total Allowable Catch and Landing Quotas

2.7 Currently, quota entitlements provide a legal right to land a specific weight of fish. Fishermen are able to catch fish for which they do not hold quota and then discard to meet the legal landings requirement. While quota induced discarding is often created by quota restraints that reflect an imbalance between stock abundance and quota holdings, this type of discarding is exacerbated by the use of less selective gear, individual fisher choices regarding location and timing of fishing activity, the mixed nature of Scottish fisheries and the mechanisms through which quota is managed and allocated at a regional and national level.

Types of Discarding

Type of Discarding	Driver	Influenced by
Catching of fish under legal Minimum Landing Size discarded	Regulatory	MLS regulations, non-selectiveness of gear and mesh sizes
Quota Restraint	Regulatory	Imbalance between stock abundance and quota holdings, mixed fishery and catch compositions, less selective gear, overcapacity
Quota Management	Administrative	Imbalance between quota holdings and catch composition at national and individual level, overcapacity, inefficient trading mechanisms
High-grading of target species of lower quality (size and condition)	Market	Landings quotas, market values, hold capacity, overcapacity and poor economic performance
Bycatch discarded due to nil or low market value	Market	Low market demand for less popular species, constraints on hold space, less selective gear, mixed fishery and catch composition
Bycatch Regulations	Regulatory	Imposition of rules governing what proportion of landed catch may be of one species or another

Table 1. Types of discarding

Quota Allocation and Fisheries Management

2.8 The mechanisms through which quota is allocated and managed can create pressures to discard. A key driver of discarding is a misalignment between quota holdings and catch compositions. This is induced at several levels within the allocation process and influenced by a number of factors.

Relative Stability

2.9 European TACs are allocated between MS through the principal of Relative Stability. Relative Stability came into operation in 1983 and largely reflects a political allocation of fishing opportunities. Relative Stability is a key driver of discarding across European fleets as it produces a gross imbalance between national quota portfolios and catch compositions given the changing nature of relative abundances of species. While a general objective within the CFP is that if a Member State has too few quotas for some species it should swap quotas with other Member States, mechanisms for facilitating this are often regarded as inefficient. In Scotland, a key current issue concerns hake stocks, which have recently recovered and are currently more abundant (Baudron and Fernandes, 2014). While an uplift was awarded in autumn 2013, on the basis of Relative Stability, Scotland receives a relatively small share of the total TAC, with swaps from other countries generally infrequent given the species' high value.

Overcapacity

2.10 Overcapacity creates a strong downward pressure upon the efficient use of quota as it restricts the ability of quota to move to where it is needed. Under conditions of overcapacity, demand for quota is strong and it tends to be spread thinly across a fleet that is in excess of its optimal operating capacity. Under these conditions, demand for quota far is in excess of supply. Incentives to discard are created as fishermen find it difficult to purchase or lease in additional quota. This situation not only limits the quantity of quota that individual fishermen hold for individual species but the portfolio of quota holdings will be constrained and unlikely to reflect true catch compositions. On account of the high fixed costs which define overcapacity, market drivers of discarding are also promoted as under conditions of excess capacity fleets tend to forgo profits and the general economic performance and rent of the fishery is dampened. This incentivises fishermen to maximise the prices they receive for fish through illegal acts such as high-grading. Technical overcapacity exists across the European fleet and within Scotland.

Quota Transferability

2.11 With the misalignment between quota holdings and catch compositions a key driver of quota-induced discarding, inefficient or absent mechanisms that inhibit quota from being moved to where it is needed will incentivise fishermen to discard catches rather than lease in additional quota. Under conditions of inefficiency, the market price of quota is likely to increase as transaction costs will be high.

Discarding of Commercial Species by the Scottish Fleet

- **Whiting:** Whiting is an important bycatch in the *Nephrops* fisheries and is discarded when caught as bycatch in other whitefish fisheries (haddock) due to its low price.
- **Saithe:** Saithe is discarded principally by the TR1 fleet due to low quota holdings and by the TR2 offshore fleet due to a reported lack of selectivity.
- **Hake:** Hake is a bycatch in cod fisheries as is abundant in the North Sea. It is discarded due to quota restrictions and a lack of international swaps. Discarded by TR1 fleet is reported to be due to a lack of quota and by the TR2 offshore fleet due to a lack of selectivity.
- **Dab:** Dab has a high discard ratio on account of its high abundance in the North Sea and its low market value. The Scottish fleet utilises around 15% of its dab quota, with the majority of catches caught as bycatch and subsequently discarded, predominantly by the North Sea TR1 fleet.
- **Cod:** A high discard rate within the Scottish fleet due to an abundance of cod in the northern part of the North Sea. Due to catch composition rules, in particular in TR2 are a driver for discards, limited individual quota and high quota lease prices.
- **Sole:** It is reported that discards of sole are relatively low, on account of the high market value and ability of fishermen to avoid unwanted bycatch of the species.
- ***Nephrops*:** Discarded principally by the TR2 inshore fleet.
- Mackerel and Herring: Illegally high-graded / slipped by the Scottish pelagic fleet
- **Skate:** Issues surrounding skate for the TR2 *Nephrops* trawl fisheries. Low quota holdings and low market value.

Discarding of Commercial Species by the Scottish Fleet

Species	Area	Fleets	Drivers of Discarding			
			Market	Abundance	Quota Restriction	Other
Dab	North Sea	TR1	Low Market Value	High abundance in the North Sea		
Whiting	North Sea West Coast	TR1 <i>Nephrops</i> Inshore	Low Market Value (TR1)		Quota restraints (West Coast, <i>Nephrops</i>)	
Saithe	North Sea	TR1 TR2 offshore			Low quota holdings (TR1)	Lack of selectivity (TR2)
Hake	North Sea	TR1 TR2 offshore		High abundance in the North Sea	Restricted quota and low individual holdings (TR1)	Lack of selectivity (TR2)
Cod	North Sea West Coast	TR1 TR2		Abundance in northern part of North Sea	limited individual quota and high rent prices	Catch composition rules (TR2)
Nephrops	North Sea West Coast	TR2 inshore	High-grading			
Herring	North Sea	Pelagic	High-grading			
Mackerel	North Sea	Pelagic	High-grading			

Table 2. Discarding of Commercial Species by the Scottish Fleet

Fleet Sectors and the Landing Obligation

Pelagic fleet

2.12 The main catches of pelagic stocks in the North Sea are for herring and mackerel. While discard rates for the pelagic fisheries are generally low, it is estimated that high rates occur during ‘slippage’ events, a form of high-grading. The decision to slip a catch can occur following the haul of a catch that contains a large percentage of smaller-sized pelagic species that would produce a lower market value than a catch of larger-sized individuals. Slipping can also occur following a catch that is particularly mixed, or for practical reasons when there is insufficient storage space on board a vessel to accommodate the entire catch from an individual haul.

2.13 This type of discarding is carried out by the Scottish pelagic fleet and is driven by profit-maximising behaviour. The expected impact of effectively stopping the illegal practice of high grading will be a reduction in the sector’s profit margins. However, a strong consensus within the interviews was that even if the discard ban is strongly enforced and monitored, this sector will remain profitable: the reduction in profits is not enough to render the fleet unprofitable. This is partly due to the low operating costs of the sector following its transition to a concentrated number of highly-efficient vessels.

2.14 Moreover, the financial effect upon the sector- a reduction in profits as smaller fish are landed- may only occur in the short-term. Just now, the premium is for 500g mackerel; therefore fish below this size are often discarded. Under the landing

obligation, the market may not be able to source enough 500g fish to fulfil orders. It will therefore become more reliant on a mixed catch, which may cause the price of smaller mackerel to increase. Profits may, therefore, recover in the medium term. In addition, the pelagic sector is unlikely to be affected by a choke species that could potentially work to undermine its ability to utilise its quota holdings for the key target species. If this case did arise, the regional pelagic sectors in the North Sea operate a high number of swaps and transfers that could be used to facilitate a solution.

TR1 and TR2 Fleets in the North Sea and West Coast of Scotland

2.15 From the interviews, it is clear that the major concern lies with how the landing obligation will affect the TR1 and TR2 fleets in the North Sea and on the West Coast. As identified in Table 2, both these fleets discard various species for a variety of reasons, with several of these likely to become choke species under the landing obligation. For the TR1 fleet, cod, hake, dab, saithe and whiting have the potential to constrict operations, while for the TR2 fleet problems will arise with cod, haddock, hake and whiting.

2.16 The key issue is the extent to which these fleets will have access to a full year fishery, even with quotas increase under the uplift as access is given to 100 per cent of the discards for the key whitefish species. Marine Scotland Science modelling forecasts in 2013 depicted that the North Sea would be closed to 60% of the Scottish fleet from the end of August if vessels maintained current fishing practices with only cod, haddock and whiting subject to a discard ban and a quota uplift equivalent to 75% of current discards. Moreover, even with the expected quota uplift it will still be possible for quotas to decrease. Since it is reported that a considerable degree of discarding by the TR2 fleet is driven by a lack of gear selectivity, a first point of contact will be to improve the use and enforcement of selective gears that are effective.

Section Summary

2.17 Discarding by the Scottish fleet is shaped by a combination of often interacting forces such as; market conditions, regulation, Relative Stability, and national quota allocation and management policies. The Scottish pelagic, TR1 and TR2 fleets have individual discarding and bycatch patterns and is often influenced by the region in which they operate. Though the pelagic fleet will be financially affected by the Landing Obligation in the short to medium-term, the principal concern within the interviews was the impact of Landing Obligation on the TR1 and TR2 fleets in the North Sea and West Coast of Scotland.

Section 3. The Allocation and Management of extra Quota arising from not discarding

The Quota Uplift

3.1 'Quota uplift' has been coined as a shorthand expression for the difference between the TAC awarded under a landing obligation and the TAC that would have been awarded in the same period under the business-as-usual baseline. While this represents 'additional quota' (than would otherwise have been available), it is not referring to changes in TAC from one year to the next which may be positive or negative.

3.2 Under Article 16 (2) of the CFP reform, overall fishing opportunities will undergo a transition from representing a fixed landings quota to a catch quota. Based upon the assumption that under the landing obligation all TAC species caught will be landed (discounting the specific exemptions), a TAC change will accommodate the landing obligation, for species where discarding has occurred, and consistent with MSY commitments. This effectively results in the transfer of a proportion of the fish previously in the discard column of ICES advice into the catch column. Provided that the stock is at MSY and any flexibilities and exemptions are accounted for, this uplift will be allocated to Member States in order to provide quota for the catches previously discarded. While the effectiveness of the uplift will be marred by its allocation between Member States on the basis of Relative Stability, difficult policy decisions will need to be taken regarding how the uplift is allocated at a national level. In reality, the allocated TAC will not distinguish between 'business-as-usual TAC' and 'uplift TAC' but will be expressed as a single tonnage figure. In practice, the uplift can be estimated by fisheries managers, for example using evidence-based rules of thumb derived from known pre-ban discard rates eg $X\%$ or Y tonnes of total TAC of stock W will be identified as 'uplift'.

The Catch Quota Principle

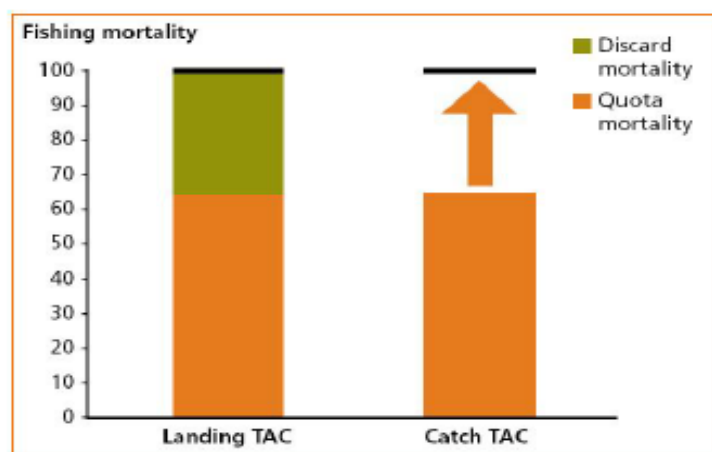


Figure 1. The Catch Quota Principle. Source: European Commission 2011:24

3.3 This section examines the different management and allocation options that exist for how the uplift can be used. An essential point to make is that the further away in time the catch quota system moves from implementation, the more difficult the visibility of the uplift in aggregate allocations will become. If quota is to be

managed in a specific way, it would therefore be crucial to disaggregate the amount or percentage of quota awarded in the uplift from the total quota allowance. This percentage or tonnage can then be ring-fenced for future use. For instance, if the total allowable catches / landings of Scottish cod increase by 10 per cent relative to the business-as-usual baseline, 10 per cent of the catch total could be ring fenced on an annual basis. This data can be accessed from ICES advice. Quotas for some stocks with an 'uplift' may actually be lower on a year-to-year basis. Of course, fisheries managers may decide to ring fence any amount of quota they choose, not necessarily the 'uplift' proportion. But the step change in allocations which may occur when the Landing Obligation comes into force provides a rationale and opportunity to allocate some proportion of quotas according to some other basis than Fixed Quota Allocations held on vessel licences ie the concept of an uplift provides cover for fisheries managers to allocate quota differently from the norm.

Allocation Options for the Quota Uplift

Vessel Discard Rates

3.4. Within the history of UK fisheries policy, fishing opportunities have generally been allocated on a historical basis. One option is therefore to allocate the uplift according to the historical discarding patterns of the fleet. The objective of this would be to 'reward' the sectors of the Scottish fleet that have high discarding ratios with a high proportion of the uplift. This may produce a better alignment between quota holdings and catch compositions and may also work to support the broad social objective of supporting the vessels likely to incur high financial costs as a result of the landing obligation. It would however mean that those who have worked to reduce their discard rates would lose out.

3.5 A practical limitation to the use of this allocation is the lack of rigorous data on discarding patterns and bycatch compositions, in particular at an individual vessel level. Apart from a few selective studies of specific fisheries and sectors, there is a distinct lack of data as to how much and of which stocks vessels have historically discarded. In the interviews, one PO noted that basing this allocation on an area basis, while not great, would work to overcome the lack of data on discarding rates at an individual vessel level. This uncertainty regarding current levels of discarding opens the door for this allocation to be based upon arbitrary decisions which could accentuate issues of equity and efficiency within the allocation and create political costs.

3.6 Crucially, while this allocation may work to protect the high discarding vessels- with many likely to be exposed to the risk of bankruptcy- it undermines crucial economic incentives for improved selectivity. An opinion put forward in the interviews was that on the basis of social justice, this option could be politically attractive as it would help the industry through a transition stage in which the government was unable to adopt an adequate policy. The general consensus within the interviews was that this policy would be likely to undermine the overall impetus of the discard ban and have an adverse effect upon positive behaviour change. Condie et al., (2013) stress that the impact of a shift to catch quotas on the entire fleet is unknown. They conclude however that the more constraining the quota, the greater the incentives to avoid bycatch.

3.7 As mentioned, avoiding unwanted catches is the first step in managing the discard ban. A preferential allocation to high discarding vessels and weaker businesses would therefore be unwise as it would undermine the economic incentives to change behaviour (fish more selectively). The trade-off is that while the incentives would be realised, high discarding vessels would be exposed to the high financial costs of the landing obligation, with the likelihood that some firms would go bankrupt if unable to find and purchase quota. An issue with the two criteria discussed is that information on discarding patterns is lacking, therefore the process would likely be influenced by the industry's knowledge of discarding patterns and levels. Using this to inform an administrative allocation poses the risk that the use of such asymmetric information could lead to an unrepresentative allocation as it would be rational for fishers to inflate their 'needs' in order to gain higher quota allocations, thereby reducing the financial impacts.

Equal allocation across vessels

3.8 When introducing quota for previously discarded bycatch in the Canadian groundfish fishery, fisheries managers divided the new quota evenly across the number of vessels. While this may work towards a type of equitable allocation, this criteria would do little to improve the matching of quota holdings with actual catch compositions. In practice, this allocation would produce an inequitable allocation as by taking no account of vessel's individual operations or investments, it would work to severely constrain the financial operations of some vessels while benefiting others.

Initial Allocation Mechanisms and Criteria

Mechanism/ Criteria	Objective	Examples	Benefits	Risks
Administrative: Equal Catch Quota Amounts	Equitable allocation, Simple Administration	Atlantic Canadian Fisheries, Canadian Groundfish Fishery	Administratively straight forward	Unrepresentative of individual vessels size, power, catch compositions and existing quota holdings; would not aid the alignment of quota holdings and catch compositions; would cause bankruptcies amongst high discarding vessels and weaker business, while benefiting low discarding vessels
Administrative: Historical Performance	Equity Efficiency Protects high discarding vessels	Icelandic ITQs, Dutch demersal North Sea Fishery, UK FQA system	Alignment of quota holdings to catch compositions, relatively uncontentious. Popular as it would protect the high- discarding vessels	Lack of data renders this an arbitrary and contentious in practice; by protecting high discarding vessels, economic incentives to avoid bycatch removed.
Administrative: Allocation on proportion of current quota holdings	Equity Administratively simple	TAC increases	Administratively simple, likely to be perceived as fair	May increase pressure on weaker business; takes no account of actual catch composition or individual discard patterns
Market: Auction	Efficiency Administratively simple Protects high discarding vessels	Chilean Patagonian Toothfish fishery, New Zealand for new quota	Protects against the use of the asymmetric information from industry; deters vessels with low discarding receiving disproportionately high quota uplift; protects economic incentives to avoid bycatch.	Likely opposition from industry; inefficient or unprofitable businesses may go out of business if they cannot compete, quota likely to end up in hands of those with money.

Table 3. Initial Allocation Mechanisms and Criteria

Allocated on the basis of FQA holdings

3.9 Another option is to allocate the uplift to reflect individual vessels current proportions of quota holdings either awarded or purchased under the FQA system. In the interviews, several participants commented that this would represent a 'fair' allocation as it reflects individual operations and quota investments. However, against this general consensus, one interviewee came out in strong opposition to an allocation on the basis of FQAs. One of the reasons for this was the notion that allocation via FQAs would channel the uplift (intended to cover discards) to the wrong places i.e. this allocation would not necessarily go to vessels with high discard ratios of bycatch, which might be targeted by other vessels. While it is likely that the initial allocation would produce some inefficiency, internal trading and leasing arrangements within Scotland could help to move the quota awarded in the uplift to the high discarding firms. This would, however, be likely to increase the financial

pressure upon weaker/high discarding firms, with others benefiting from the additional quota allocated to them. The second reason put forward in opposition to this allocation was that allocation via FQAs would turn the quota uplift into a tradable asset. Instead, it was argued the value of the uplift should be at the point of use: it should hold no financial value until it is used to cover catch as it comes out of the water. Allied to this was the notion that the industry should not have to 'buy the right to avoid discarding' i.e. pay to use the uplift.

Market Mechanisms

3.10 Alternatively, a market mechanism could be used to allocate the uplift through a sale of the additional quota units. In the current Scottish FQA system, quota trading frequently takes place but fishers do not possess a legal entitlement that denotes ownership of a 'right'. FQAs instead provide a basis for allocation from a public resource. Therefore, at the point of 'sale' specific terms would have to convey that the nature of the bought asset was not a right or an ownership entitlement but, in keeping with the FQA system, would represent an entitlement to catch x amount of fish on an annual basis.

3.11 Theoretically, an auction mechanism could work to deter vessels with low discarding levels from accessing extra quota and thus disproportionately benefiting. Moreover, it would facilitate the alignment of quota with vessels with high discarding patterns- thereby offering some protection against bankruptcies- while working to retain elements of the economic incentives to avoid bycatch and change behavioural patterns as a competitive financial element governs access to the bycatch quota. The issue is that as quota is scarce commodity that is desired by all, it is likely that in practice quota would be bought up by richer vessels. Also, this mechanism does not currently fit with the nature of Scottish fishing rights which are not privately owned. This scheme is also likely to be opposed by the industry, firstly as it could be perceived as channelling revenue from the industry to the government, and the traditional fear of auctioning surrounding the buying of quota by foreign vessels. To counteract this, the revenue generated could be channelled back into compliance and enforcement of discard ban, research or aiding changes in gear, and possible checks and balances could be put in place to make sure that the quota uplift or bycatch quota is aligned to current quota holdings in Scotland.

3.12 Ultimately, the issue with using the market mechanism is that while theoretically the uplift may go to the higher discarding vessels as their willingness to pay would be higher, it is likely that quota would be bought up by those that have money. Therefore, the uplift would not necessarily be used to accommodate vessels under the landing obligation but would instead allow the operations of some vessels to increase while others went out of business.

Overview

3.13 The consensus within the interviews was that the most appropriate way to allocate the uplift to the fleet was on the basis of current FQA holdings. Overall, this was seen as the fairest method of allocation as it took into account the investments made by specific quota holders. As one contributor noted it was best to avoid as much as possible the sense that the uplift was an added 'bonus'. Therefore, the ability to filter it to the fleet as an unspecified tonnage increase would be most

appropriate. From an industry view point, it was noted that any other administrative allocation that had a specific economic or social agenda was likely to cause political problems, primarily due to the fact that distributional allocations create winners and losers. As everyone cannot be pleased, any allocation that had a distributive goal could potentially create perceptions of inequity. More generally, there was agreement that as the first step in mitigating the problems associated with the discard ban is the reduction of unwanted catches, any allocation that would undermine the economic incentives to alter behaviour towards more selective fishing was unwarranted. Allocating so as to protect weaker businesses would be counter-beneficial to the whole landing obligation and cause greater problems in the long run.

Managing the Uplift

3.14 Despite the general consensus that allocation of the uplift should be done on the basis on current FQA holdings, numerous short-run and long-run concerns were raised regarding the allocation of the full uplift to the fleet. The common denominator that underwrote the tensions identified concerned the objective for the uplift: the uplift should not be used in a way that creates the economic incentive for fishermen to target the additional quota. Instead, the uplift should be managed so as to cover continuing accidental catches that now have to be landed and accounted for with quota. A key theme within the interviews was to design mechanisms that fix the value of the quota in the uplift at the point of use, therefore prohibiting the uplift from acquiring an asset value that would be targeted.

A Government Controlled Buffer Zone

3.15 A management mechanism put forward in the first interview, which was subsequently supported across the board, was the option of holding back a proportion or even all of the uplift and managing this centrally in some sort of pool format that would act as a buffer zone. All but one expert interviewed believed that the management of this buffer zone was a role for government; however the option of integrating this at PO level is discussed later. The objective would be to use this pool to act as a 'buffer' against any over-quota fishing. Theoretically, the government would hold these buffer pools centrally and when a vessel caught fish for which it did not have quota, it could draw down from this pool. The intent would be to allow the government to smooth out the rough edges and account for unintended consequences occurring as a result of the implementation of the Landing Obligation.

3.16 The withholding of quota to act as a buffer against overfishing of national TACs and quota is used in a number of countries. Similar schemes are used in Denmark where quota is held centrally by the government in order to facilitate a new entrants scheme. In the US, buffer zones are used to ensure no overfishing by placing a buffer between catch limits and targets. The intent is to account for uncertainty, variability and risk (Semmens, 2008). As well as acting as a safeguard against accidental catches that individuals cannot cover with quota, evidence from the interviews identified other ways in which the use of a buffer zone could potentially alleviate a number of problems that may arise in line with the landing obligation.

Limit the incentive to catch

3.17 If the uplift is allocated out to the fleet, the vessels are given an incentive to use the quota to target fish. The issue with this appears to be derived from a perception held by several in industry, academia and policy that the uplift should be used to cover discards, rather than to allow vessels to expand operations through a quota increase.

3.18 If the quota is held back and accessed under controlled conditions to cover unexpected landings, this incentive can be mitigated. An important shift required in order to facilitate the landing obligation concerns the way in which quota is used- it will be required to prove an ex ante right to catch and go to sea and also an ex post resource to cover unexpected and unavoidable catches. The latter part of this depends upon quota being available for this purpose, with this purposefully constrained by the TAC/quota system. A narrative from the interviews was that quota needs to be set aside for this purpose.

Protecting quota entitlements and the 'right to fish'

3.19 A concern expressed in the interviews was that on account of the landing obligations, the security of FQA entitlements might be affected. Currently, an FQA awards the holder with the right to land a certain amount of fish. Under the landing obligation the right to land will be replaced with the right to catch. A problem will arise when a vessel 'accidentally' catches fish for which no quota is held. Even with improved selectivity and behaviour, a complete reduction in bycatch and matching of quota holdings to catch compositions is unrealistic. One group interviewed exhibited extreme nervousness regarding how this almost inevitable situation would impact upon others' rights, as it seems likely that with no buffer or pool system in place, quota from other fishers who had not yet used their quota would be rescinded. While theoretically if there is unused quota that could be requisitioned in this way, it could presumably be available to purchase for the right price. However, a general theme from the industry interviews was that some fishermen often prefer to use their quota rather than lease it for a higher price. If quota could not be sourced and Scotland overshoots its EC allocation, it would face a penalty. While Member States are allowed to borrow up to 10% of quota from the following year, this is a short-term solution which will only serve to reduce future opportunities. This has the potential to undermine the security of the current FQA entitlements if there is the possibility that quota will be removed from some fishers to cover others. Having a buffer pool to cover the 'accidental' catches that are almost inevitable could go some way in alleviating the practical impact of this insecurity.

Government access to quota to facilitate swaps

3.20 At a national level across Europe, difficult decisions are going to have to be made regarding the transfer of national quota holdings into other species via international swapping mechanisms. Many of the decisions will be hard to make, as species of lower value on paper may have to be accessed in exchange for more valuable current holdings. For instance, as Scotland holds a high proportion of the North Sea haddock quota, this could be used to trade for quota of other species quota that acts as a choke on the industry. It was commented by one individual interviewed that these decisions would be hard for the industry to make as it goes

against their general business interests. However, it is likely that POs and the industry will continue to be a better judge of what is in their interests than the government; it will just be that their interests will have changed. The thinking within the interviews was that these decisions will have to be made by government, therefore government will need maximum control over a good percentage of the quota in order to facilitate this without recalling tonnage allocated to the fleet.

Managing a Buffer Pool: Mitigating the Open Access Dilemma

3.21 Buffer quotas are used around the world for a variety of reasons. A first step in designing the management framework for a buffer quota in the context of a landing obligation would be to clearly define the objective of the buffer quota: in this case this would likely concern the intent to cover accidental over-quota catches, and remove the economic incentive to target the uplift. In effect, what it would try and achieve is to place the value of the quota in the buffer at the point of use. It would be important to make it clear that the intention of the buffer-quota was to minimise total fishing mortality and aid compliance, as this quota would be accessed in order to cover unexpected catches which the vessel could not cover by personally obtaining additional quota.

3.22 The key issue for this management option is that the choke species that will affect the Scottish fleet are commercial target species. If they are pooled, it is almost inevitable that perverse economic incentives will be created that expose the pool to open access problems as individuals will attempt to draw down from the pool as much as possible. Therefore, the creation of the right incentives will depend upon the implementation of internal management mechanisms within the pool to tightly control access to the buffer quota. The key message that needs to be conveyed is that access and use of the quota in this buffer is not a given. Several management options are offered by the literature on common pool problems, which has arisen in the last few decades in response to increasing globally pervasive concerns regarding environmental degradation and resource depletion (Ostrom et al. 2002) and from fisheries management policies used internationally.

Access conditions

3.23 One organisation interviewed made a strong request that access to quota in the buffer pool be correlated to good practice. For instance, the ability of a vessel to access the buffer quota could depend upon their compliance record in line with the use of specific degrees of gear selectivity, real-time and spatial closures, and VMS information could be used to check that vessels were not fishing in areas that are well-known for high abundances of the species for which inadequate quota was held. This would create a link between access and the incentives to alter behaviour. The amount that could be accessed could depend upon the adoption of CCTV (higher rates for those who had adopted this monitoring mechanism) or could be correlated to current FQA holdings.

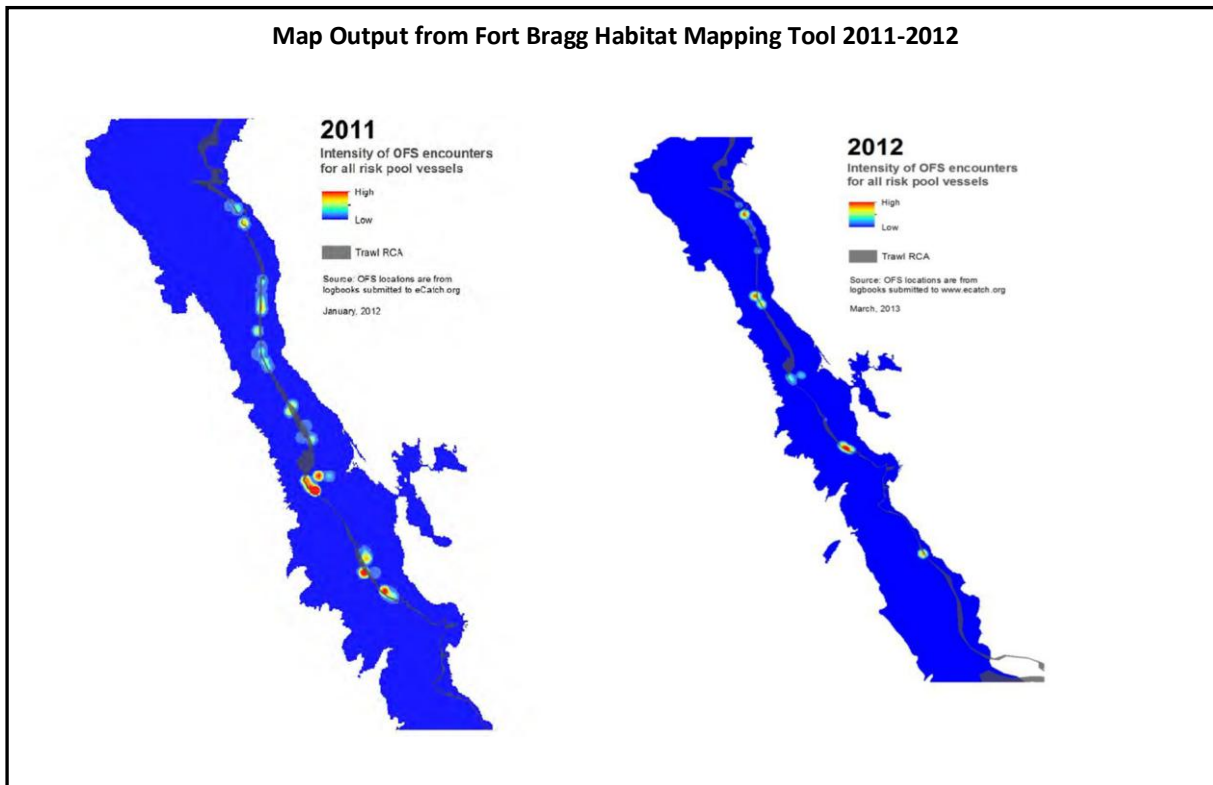


Figure 2: Map Output from Fort Bragg Habitat Mapping Tool 2011-2012. Source: Fort Bragg Groundfish Association, Summary Report 2011 and 2012.

3.24 Another option is to tie access to the buffer-pool to participation in schemes that would help identify areas of high risk for choke species. In the waters off the Californian coast, a programme of habitat mapping is used to identify areas of high risk in catching choke species, with this used by fishers to avoid such areas. The implementation and effectiveness of this Risk Pool is reported to rest upon a high degree of data-sharing through the collection of up-to-date, low cost and accurate data on the location, quantity and species of chokes species caught. A web-based application called eCatch (www.ecatch.org) was created to allow fishers to document where and when they fish and what and how much they catch, using a modern tablet interface (e.g., an iPad). The technology allows fishers to easily capture and log information on web-based maps and share this information with others in near real-time. This has allowed the members of the Risk Pool to know almost immediately where, when and how much of the choke species has been harvested. Areas of high-risk can be identified, which allow the Pool managers to adaptively managed regional fishing plans by updating spatial restrictions and rules. Vessels' VMS data can also be used to ensure that fishers are not purposefully targeting choke species or fishing in areas of high-risk.

3.25 A similar approach can be identified in the Dutch plans for the landing obligation as they recently announced plans for a new EFF funded projected called the 'Fisherman's Dashboard'. The project aims to develop a dashboard that helps fishermen avoid discards. The dashboard collects, combines and visualises catch statistics and information on fishing grounds to predict the chance of discards per area. Also the system aims to help fishermen exchange information with colleagues.

This approach would work best for species that are found in aggregations (e.g. saithe), rather than those that are widely distributed.

Social pressures

3.26 In several Canadian and US fisheries where similar pooling arrangements operate, the use of social pressures has proved useful. For instance, many pools post a list of the individuals using the pool and the rate at which they use the quota. This form of incentive is most effective when conducted at a local level, therefore organising the information on a geographical or sectoral basis could be more effective.

Economic Incentives

3.27 Removing the economic incentives to access the buffer zone will be crucial to its success. The fundamental point is that use of the buffer-quota should not be costless: vessels should pay a price for using the quota that mirrors the price of quota on the market, with a preference to set the market price so that there is an incentive to first-off purchase quota to cover the catch. The implementation of economic incentives to only using the pool as a last resort will be crucial.

Withhold the Economic Value of the Catch

3.28 One option is to allow vessels to draw down from the pool but when the catch is sold through the normal market mechanisms, the vessel receives no profit for the fish caught with pool quota. The vessel would receive revenue from the sales to cover the fixed costs of going to sea and the costs of boxing, icing and the landings commissions associated with the catch. Any value received from the sale above this would be held back. This would work to remove the economic incentive to target catch covered by the pool as they would use up hold capacity and labour for it, but receive no profit.

3.29 A similar instrument is used in Iceland, which is applied to catches in excess of a five per cent carry-back provision. In this circumstance, the vessel must supply their catch to the local auction house, where proceeds are split between the government (80 per cent) and the vessel owner (20 per cent). The 20 per cent that the vessel owner received is to pay for the variable costs of fishing, mainly the crew wages. The revenue received flows to a special development fund run by the Ministry of Fisheries. The amount of fish surrendered to the auction cannot exceed 10 per cent of an owner's total holdings (Sanchirico, 2006 MP). Information required would be: quantity landed, price of fish and operating costs. This would work to remove the economic incentive to target catch covered by the pool as they would use up hold capacity and labour for it, but receive no profit. Further research would be required to establish how this could work in practice (such as the actual costs of boxing, icing and returning to port).

Implement a Levy System

3.30 Borrowing from the New Zealand approach, a levy could be applied to each unit of catch that is caught and landed in lieu of quota and has to be covered by quota from the central pool. This levy could be set to mirror the price paid for quota, and indeed above the marginal cost of obtaining more quota, in order to create the incentive for vessels to lease in quota and only use the pool as a last resort. Different

species could have different rates applied to them in order to offer the greatest incentives to avoid species with low TACs. The key is to set the price at a point that weakens the economic incentive to target the pool, while not setting the price so high (above market price of fish) that an incentive to discard illegally remains.

New Zealand Fisheries Management

New Zealand fisheries are managed by an ITQ system that is supported by other management tools such as minimum length size, seasonal restrictions, spatial restrictions and gear/method restrictions. A key criticism levied at the use of ITQs is that when this method is used to manage multispecies fisheries, bycatch and discarding becomes an issue as it is very difficult to know ex ante the catch composition: it is almost inevitable that individual fishers' species mix of catch will not exactly match their ex ante portfolio of catch rights (Sanchirico et al MP 2006/30/6). 'Catch-quota balancing' regimes were therefore introduced in New Zealand from 1986 to account for incidental catches.

From 1986-2001, New Zealand authorities offered fishers a number of way in which to balance excess catches:

- Pay a deemed value (tax on over-quota landings)
- Surrender catch not covered by quota
- Carry over up to 10% of ITQ from previous year or bring forward up to 10% of the ITQ from the next year
- Lease or buy additional quota for the species caught
- Use the Bycatch Trade Off System- trade ITQ of one species for ITQ of another species.

In 2001, the catch-balancing regime was simplified with the intent to reduce transaction costs and simplify the transfer of harvesting rights between fishers. Annual catch entitlements (ACE) were introduced, which allowed the harvesting right for a given fishing year to be split from the long term property right (Townsend, McColl and Young, 2004). Importantly, in 2001 the deemed value payment replaced the quota trade-off system as the main instrument for managing bycatch, prior to 2001 this option was the last resort for fishers to balance their catch (Auckland). The combination of a TAC/quota and deemed value system resembles the two-part system used routinely in cap-and-trade emissions trading systems. Governments can set a carbon tax and simultaneously award some volume of free credits for reasons of equity. If the tax is greater than the price at which the allocated credits will trade, then no tax payments are made.

Figure 3. New Zealand Fisheries Management

3.31 In New Zealand a deemed value system is used to effectively place a tax upon and landings not covered by quota.

What is a deemed value payment?

3.32 The primary purpose of the deemed value system is to provide an economic incentive for firms to cover catch with available quota. If the vessel is unable to lease in additional quota, a deemed value is paid to cover the portion of the catch without quota. A fee is charged for each unit of catch landed above quota. The aim is to set deemed values so that fishermen prefer to obtain quota on the market rather than pay the deemed value. While in economic terms, this system can be interpreted as having a tax element, the New Zealand Ministry of Fisheries (the Ministry) has successfully defended in court that deemed values are a service not a tax (Walker paper 2008).

How is the deemed value set?

3.33 In theory, the intent is to set the levy rate at the point that provides sufficient incentive to land the over-quota catch (and not illegally discard) while creating a simultaneous disincentive not to target the species and use the pool (Sanchirico et al., 2006). To achieve this, New Zealand authorities set the fee (per kg landed) above the lease price of quota for the amount and below the landed price of the fish. The effect is fishermen have an incentive to lease quota (lower cost than the levy) and to land the catch and not discard (landed price received is above the levy). If the levy is paid and a fisher subsequently finds quota to cover the catch, the deemed value (levy) will be refunded (Diamond, 2004). If deemed values are not paid, the fishing permit is suspended and fishing without a permit is a criminal offence.

3.34 In practice, deemed values are set as a proportion of the commercial value of landed fish, with port prices used as the main indicator of market value. The proportion is reported to be 60% of port price or sometimes lower (Sanchirico et al., 2006). Deemed values therefore change when port prices and overharvest levels change (the more overharvest happens to a species in quota management system, the higher the species deemed value should be set)

3.34 In theory, the margin between the deemed value and the price of quota should be sufficient to more than offset the transaction costs of acquiring additional quota, therefore the deemed values should be set above the marginal value of additional quota units. From 2007, the Minister of Fisheries allowed deemed values to be reviewed on an annual basis. This is because if the deemed value is set too low (below the market value of quota) it provides an incentive for fishers to fish on deemed values instead of acquiring quota to balance their catch. This would depress the quota price. From a biological perspective, a low value would not protect the TAC for the stock. Moreover, if the deemed value is set too high (above market price of fish) an incentive to discard the fish instead of acquiring quota is created. This is especially the case if the bycatch constitutes a choke species for a stock that the vessel has uncaught quota for.

3.35 A 'ramping' rate can be used to discourage against large catches in excess of quota. As outlined in the table below, if a vessel brings in a catch that is in excess of its quota by 20 per cent, the per kg levy is \$2.76. If the illegal catch is in excess of 40% of quota holdings, the levy increases to \$3.22 per kg and so forth. Vessels cannot land no-quota catches in excess of 200% of their quota holdings.

ACE holdings (%)	Differential deemed value rate (\$)
20	2.76 per kg
40	3.22 per kg
60	3.68 per kg
80	4.14 per kg
100	4.60 per kg

Source: Walker and Townsend (2008)

3.36 A benefit of the deemed value system is that high value single target species used a different deemed value, with the annual deemed value rates set at twice the landed value. The result is that these fisheries tend to only be targeted by vessels with quota, as the financial penalty of balancing is so high. For these high value species, vessel must hold minimum quota compositions before vessels can legally target them (Walker and Townsend, 2008).

How should the deemed value be set?

3.37 It has been argued that deemed value should also depend upon other sources, and a standard model has been developed by Wang (2009) based upon the conclusion that deemed values are not just related to port prices and quota prices, but should take into account catch composition, operating costs and the number of active firms in the target fishery. Moreover, as many target species have more than one bycatch and sometimes several target species have the same bycatch, therefore some reflection of the target and bycatch relationship would also be instructive. A potential future research project could be to develop a more advanced model to illustrate these problems based on this bioeconomic model of deemed value management.

What would be required for this to operate in Scotland?

3.38 Three key challenges have been identified in implementing this approach in Scotland.

Information

3.39 The key issue with this instrument is the difficulty in achieving the correct rate. This requires regulators to possess substantial amounts of information on the dynamics of the stock and the cost structure of the industry. At a minimum, information on port prices and leasing prices would be needed. Moreover, it would be preferable to operate a more dynamic model that would acquire additional information on catch compositions, operating costs and the number of active firms. Currently, Marine Scotland possesses information on port prices. However, due to the shadowy nature of quota leasing activities in Scotland, no accurate and reliable information is held over quota leasing or sale prices. Even once this information was held; setting the correct price would be a challenging task but could be achieved through a process of trial and error.

Improve Leasing Arrangements

3.40 Many of the international systems (Denmark and New Zealand) that rely on using ex post quota sourcing to cover over-quota catches have developed sophisticated and efficient markets for trading quota. This allows vessels to source and lease in quota relatively easy and with fewer transaction costs. In Scotland, quota trading exists and has done for a long time. However, neither Marine Scotland nor Defra have officially sanctioned quota trading. Until this occurs and a formal open market is encouraged, the efficiency of this process will be hindered by high transaction costs and no information will formally exist as to market prices and levels of activity.

3.41 One option is to remove the condition that FQAs need to be tied to a licence, thereby facilitating the ability of real-time swapping which will be a necessity once the landing obligation comes in. From this, an online trading platform could be established that would facilitate information sharing, transparency and efficiency. Opening up the hitherto shrouded 'market' could also facilitate a downward pressure upon leasing costs (reducing and removing transaction costs) thereby aiding the ability of fishers to afford quota.

3.42 If an open public trading system was created, private companies could be established which would facilitate the matching of individuals paying the different deemed value rate with those that still have quota remaining. Such a firm (FishTech Ltd) was established in New Zealand in 2003, with the gains from the trade split evenly between the parties after Fish Tech takes a percentage. Initially in 2003, this system attracted in 12 participants and reduced total deemed value payments by around \$400,000. In 2004, the number of participants had risen to 40, resulting in a total net reduction of deemed values around \$600,000 (MP). In addition, another company (Solutions-Multipliers) was established in New Zealand to service the fishing industry, which operates an annual arbitrage pool at the end of the year to minimise deemed value payments among any group of willing participants.

Political will

3.43 One of the largest obstacles to this will be the political will necessary, firstly to move in this direction within the quota allocation consultation process but also to introduce what is effectively a tax. In New Zealand, fishers are awarded compensation for illegal catch, 50% of the value of the catch, suggesting that a tax alone would incentivise a continuation of discarding. Despite the notable theoretical benefits a taxation instrument yields, they are little used in practice. This is largely due to the associated political costs as it is viewed as a means of transferring profits from the industry to the government.

Additional allocative choices: Allocate to individual vessels but hold the quota centrally

3.44 An option suggested by an industry representative was that while the uplift should be 'owned' and held by government, it should still be allocated out to individual vessels on an in-year basis. The rationale stressed for this is that while quota in the uplift should not be given any financial value that can be traded (i.e. allocation via FQA) it should have a value to individual vessels in that they know they have x units of species x to draw down from. However, while there is quota in the pool they can access, this very clearly belongs to the government. Individual vessels would be allocated a ring-fenced specific proportion of the buffer pool, which they could access when they accidentally caught fish for which they held no quota and no quota (via leasing etc.) was available. While this mechanism would be useful as it would avoid creating a race for the buffer quota, it would require allocation via some criteria. If FQAs were used for this, the fixed non-transferable nature would mean that the uplift would not necessarily go to cover discarding practices (either through the initial allocation and would be unable to move after), therefore some allocation relative to historical discard rates (vessel discard rates per area) may have to be used. A strong point of departure within the discussion on this mechanism was whether fishers should have to 'pay' to access the quota, with the PO in question

arguing strongly against this. While this may be beneficial to the fleet as it would avoid an increase in the cost of fishing, it would likely dampen economic incentives to fish more selectively.

Identifying the Costs

3.45 One of the obvious drawbacks of this mechanism is the additional administrative costs it would place upon Marine Scotland in terms of time and resources. It is likely that a cost-benefit analysis of this option would need to be carried out to ensure that the costs were proportionate to the expected gains

Identifying Appropriate Stocks

3.46 If the administrative costs are deemed too high for the wide-spread use of government pools or there is political unease at holding back large proportions of the quota, the option exists to apply this mechanism to specific stocks.

3.47 Analysis could be carried out to determine for what species the pools would be most effective.

- For instance, it is accepted that even with the uplift there may not be enough hake quota to cover catches. Therefore, it may be useful to remove the incentives to catch this species by pooling all of the uplift. However, some individuals have invested substantially in high value hake quota.
- Dab quota could also be pooled as it has a high abundance relative to quota and discarding is driven by low market values.
- This mechanism could be very suitable for cod given the very low level of individual quotas.
- Government buffers could also be used for bycatch species such as anglerfish, megrims, Greenland halibut, blue ling, and tusk. Although by-catch species have a relatively low importance in terms of catch in tonnes, they have the potential to become important choke species.

Overview

3.48 The notion of the government retaining some proportion of the uplift was endorsed by all groups interviewed as a pragmatic approach. It was commented by one group that while long term the concept of government controlled quota was not desirable, given the short time frame in which to design a system, the notion of government retaining a part of the uplift seemed like a sensible option. In managing any pooling of quota, a 'tool-kit' approach that used several access mechanisms working in cohesion would likely produce the best result, i.e. the use of economic and social incentives as well as the development of access conditions that have an intentional impact upon behavior.

3.49 In relation to the fundamental economic incentives, the option of withholding the economic value of the catch as used in Iceland (para 3.28-3.29) may be more practical as it requires less information. Data on each fleet segment's operating costs would be required, whereas the New Zealand levy system model would require minimum information on sale and leasing prices. From a practical view point the first option may be preferable. However, the use of a levy/ deemed value system appears a more robust mechanism: while withholding the economic value (profit) of the catch

undermines the economic incentive to use the pool, the use of a levy can be designed to: incentivise the purchase or leasing of quota from the market, avoid large use of the pool (ramping rates) and create different price differentials for high value/low TAC species. The key point is to make sure that fishermen have to pay to use quota in the catch and to create strong economic incentives not to draw down from the pool in the first place.

Section Summary

3.48 In line with the shift from landings to catch quota, uplift in quota for some stocks will accommodate the Landing Obligation. The nature of the uplift will be tempered by MSY commitments, which may entail the quota for some stocks actually being lower on a year-to-year basis. The effectiveness of the uplift in covering previously discarded catches will also be dulled by allocation via Relative Stability.

3.49 If the decision is taken to allocate any uplift in quota across the Scottish fleet, several options exist. It could be allocated on the basis of historical vessel discard rates (at an individual-vessel or regional level), equally across all vessels, on the basis of contemporaneous FQA holdings or through market mechanisms. The consensus within the interviews was that any uplift should be allocated on the basis of FQA holdings. The general arguments were; that it would be perceived as fair; it would avoid criticism of political objectives; it took account of the individual quota investments and the ability to filter the uplift through an unspecified tonnage increase would avoid the uplift being viewed as a 'bonus'.

3.50 A management option that received a broad base of support in the interviews was for the government to hold back a proportion of the uplift (or a proportion of national quota holdings). This would create the possibility for some quota to be used as a buffer against over-quota fishing. Vessels would then have controlled access to this to cover over-quota catches. A key rationale put forward in support of this was that the uplift should be used to cover accidental catches under the Landing Obligation and the creation of economic incentives to target the 'additional' quota should be avoided. It is likely that any 'pooling' of quota, either a central government or PO level, would be susceptible to open-access problems. Based upon the use of this pooling mechanism in Denmark and the US and the operation of catch-balancing mechanisms in Iceland and New Zealand, several economic, social and access-related policy options have been identified to mitigate this problem and help vessels responsibility avoid being bound by accidental catches.

Section 4. International Quota Swapping

4.1 The Poseidon Report (Poseidon 2013) that appraised the potential economic impacts of the CFP discard reform on the UK fleet was based upon the assumption that current international swapping patterns and arrangements would continue. A misalignment between quota holdings and catches at a European level can contribute to discarding by national fleets. There is therefore scope for examining potential changes at a regional and European level that could help facilitate a workable Landing Obligation. One of the fundamental changes within the new CFP was the introduction of regionalised decision-making, with the new regional structures offering the opportunity for improvement.

Renegotiate TAC Allocations

4.2 The gross imbalance between national quota portfolios and catch compositions given the changing nature of relative abundances of species stems from the allocation of European fishing opportunities through the principle of Relative Stability. After several years of negotiation, agreement on the Common Fisheries Policy was finalised in 1982 and came into effect in 1983. Relative Stability was structured to award Member States fixed allocations of fishing opportunities that reflected their historical levels of fishing both in and out-with EU waters and to reflect regions of social and economic dependence (Holden, 1999). Relative Stability is often criticised for locking overcapacity into the EU fleet, working against business innovation and mitigating Europe's adaptation to marine climate change (Coelho, 2011).

4.3 One option would be to move away from the concept of Relative Stability or to renegotiate its terms with the intention of producing Member State quota holdings that more aptly reflect current patterns of abundance and distribution. This would represent a long-run objective strategy, as it would be a politically arduous and likely lengthy process. A consensus within the interviews was that, politically, Scotland would be unlikely to support a movement away from Relative Stability. It was argued by several participants that the Scottish industry and Scottish Government hold themselves as benefactors of the current system. Under any movement away from Relative Stability, Scotland is foreseen as the potential biggest net loser in carrying the costs of a new allocation framework. While in the near future this policy was regarded as unlikely, one interviewee noted growing support for a movement away from Relative Stability on the Continent, with another identifying similar support in the Baltic area, in particular in Sweden.

Increase the Efficiency of International Quota Swapping Arrangements

4.4 An alternative short-run approach would be to improve the impact of Relative Stability by increasing the efficiency of international quota swapping arrangements and moving to better international quota exchange models. A general objective within the CFP is that if a Member State has too few quotas for some species, it should swap quotas with other Member States. Theoretically, quota swapping and leasing arrangements offer the opportunity to correct inefficiencies within initial allocations: quota is leased and swapped in a manner that transfers the quota to the more efficient operators (thereby encouraging the use of capital equipment to full capacity and the lowering of average fixed costs) while promoting the full utilisation of quotas.

4.5 A recurrent theme within the interviews was that the mechanisms in place to support international quota swaps are slow, cumbersome and inefficient. From the interviews a number of possible changes were identified with the potential to improve this process and enhance quota swapping efforts to remove some of the rigidities imposed by Relative Stability. It was commented that facilitating quota trading to improve compliance is not rocket science: a market can be created that facilitates quota exchange. This mirrors the European Commission's initial CFP reform proposal in 2011 for a movement towards tradable fishing concessions. While this was motivated by the EC's identification of fleet overcapacity and inefficiency as the two main issues threatening the EU fisheries sector in 2009, increasing the tradability of quotas has the potential to play a vital role in facilitating the landing obligation. This mechanism was however opposed by a number of countries, with Scotland fearful of Scottish quota being bought up by foreign companies. While the creation of a European ITQ system is, in the short-run, likely to be a political non-starter, alternative policies can be pursued that will aim to open up quota trading between Member States without going against the ideological grain of privatising rights.

Centralised Information Point

4.6 One issue highlighted within the interviews was that the system of quota swapping relies upon the breadth of contacts and information that POs or Marine Scotland have on quota availability and who holds it across Europe. As one PO commented, the ability to source international trades depends upon their contact book and friendships. This was reaffirmed by another industry leader. An option that received general support within the interviews was the facilitation of a centralised or regional service that provided transparent information on quota holdings and those wishing to trade in order to facilitate contact and provide a better idea of the breadth of ownership at an international level.

4.7 In Denmark, New Zealand, the US and Canada this has been a role recently taken up by private firms who provide a neutral point of contact and help facilitate the transfer. POs or individual vessels wishing to conduct international trades and swaps would sign up to the service and provide information on what quota they are willing to swap and what quota or price would be required. As in the countries aforementioned, the process could take place online. The effect of such a service is reported to be a reduction in transaction costs as the costs of searching and brokering quota are reduced. While the POs interviewed commented that this would be helpful, another argued that it would make little difference as it believed Scotland had little to swap with other nations. While money could be traded, a perception of the industry is that most international quota holders prefer quota for quota swaps. Overall, improving transparency, information efficiency, quota trading and reducing transaction costs have the potential to facilitate international swaps, which are a useful tool to aid compliance and alleviate choke species.

Create a Centralised European/Regional Trading Platform

4.8 While increasing the information efficiency of EU swapping arrangements was generally held as beneficial, most of those interviewed also supported a further movement towards the creation of a central European trading platform. A 'trading platform' refers to software used by investors and traders to place trades and monitor accounts. They are most commonly associated with finance, wherein trading arrangements developed over time from being based on manual transactions between brokers to traders, to now being carried out by electronic systems that investors use to place orders over a network between financial intermediaries. These systems have evolved to allow for live price streaming and near real-time execution of trades.

4.9 Under this scenario, all transactions would be processed through one point, with this possibly reflecting a regional sea-basin level. In addition to the creation of centralised, accessible information on where particular species quota was available and what swap composition or price was required, the service could facilitate and broker the trades. The key benefit highlighted, alongside potential reductions in transaction costs, was increased transparency. It was pointed out by a PO interviewed that while fisheries policy tends to be administrative, vessels and firms operate in the free-market where business decisions are made. Transparency is one of the theoretical conditions required for a free-market to be efficient and overall it is likely that increased transparency will not hurt. However, the view of one PO was that an open transparent system would undermine their long standing swaps already in operation, as if this information was made available the possibility of hijacking would occur- other firms using under-table deals to disrupt the swaps and undermine their competitors. This perception was based upon a voiced perception that within quota swapping arrangements there existed a high level of dishonesty and malintent- that a handshake on a deal is no guarantee. In response to this, it is evident that any sort of trading platform would have to be tightly regulated in order to ensure maximum transparency across all participants. Secondly, in line with basic economic theory regarding markets, it is likely that this lack of trust between firms and POs comes from the initial lack of transparency within the system.

4.10 An obstacle to the creation of a trading platform at a European level is the variance across Europe as to how quota is managed. Some Member States such as France do not have an internal management structure to facilitate this, while others such as Denmark operate ITQs. This situation would require a period of rationalisation. The view within the interviews, particular amongst some industry representatives, was that if this obstacle could be overcome increased transparency in trading would be a positive contribution.

Unlocking systematic aversion to swapping

4.11 From the interviews, it is evident that a lack of information and transparency are not the only constraints impeding international quota swaps. A tendency is for many Member States to hold on to quota that remains unused, rather than engaging in international swaps. This is often driven, it is claimed, by the economic motivation to influence the price of fish, for example, if Spain was to swap hake quota with Scotland this might work to drive down prices. Politically-influenced management decisions will also factor into this as countries such as France, or indeed individual POs, operate non-tradable and non-flexible internal distribution mechanisms that restrict how quota can be accessed and traded internationally.

4.12 Since much of the detail regarding the big picture of how the landing obligation will work at a regional level is on-going (such as how the inbuilt flexibilities will operate), the ability to predict behaviour patterns over the next few years is difficult. However, in terms of how the landing obligation will affect individual Member States attitude towards quota swapping, there are two broad possibilities. The first is that quota swaps between Member States will become more difficult to achieve as States that were previously willing to swap away quota, or that held on to unused quota, will now need to use this in order to prevent the species from becoming a choke species. Alternatively, the landing obligation and the new regional structures could offer a potential route to overcoming these rigidities, as if other Member States are getting a truly mixed catch, international swaps will therefore be in their interest.

4.13 One of the ways in which the latter can be encouraged is through creating pressure upon MS to implement the landing obligation on a level playing field. A tool to achieve this is to build upon the current work being undertaken by the regional Discards Atlas Project that is attempting to identify discarding patterns across the different MS and fleets. Currently, there is a significant degree of uncertainty as to what species will constitute a choke species for other fleets and at what point each species will act as a bind. MS government could be pressured into improving their engagement with international swaps by creating transparent information on what quota compositions each MS will need for its fleets to stay at sea for specific durations. Effectively, it is known that a MS is likely to be unable to cover catches for a species after a specific month, if the fleet is not tied up this would suggest that discarding is still occurring or else catch is being landed illegally. This sort of transparency could pressurise national governments into making the hard decisions required, such as trading target species quota for fish that on paper has less value.

Identifying Choke Species on a European Fleet by Fleet Basis

4.14 For each commercial quota species where discards occur that do not have high survivability:

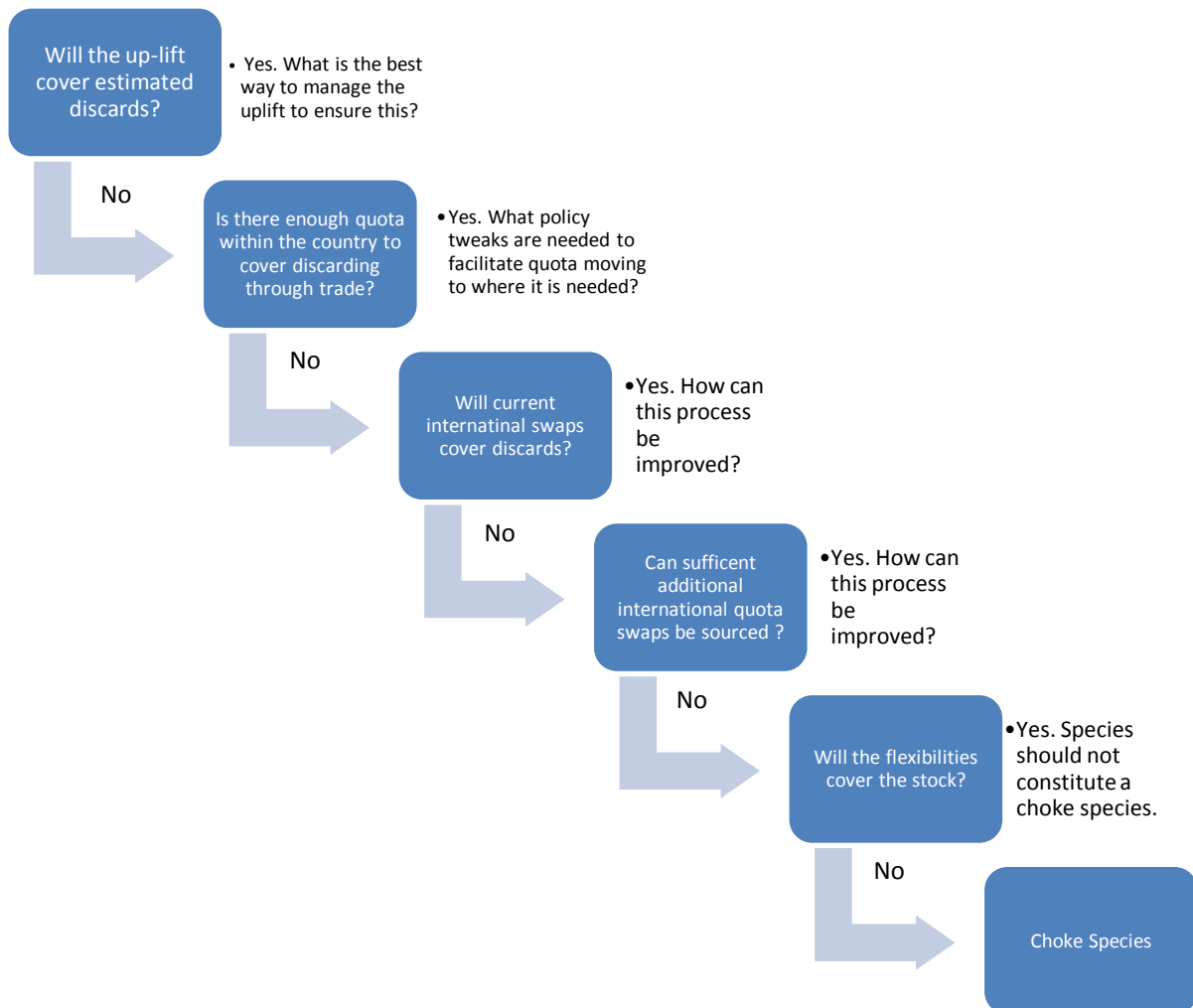


Figure 4. Identifying Choke Species on a European Fleet by Fleet Basis

4.15 An exercise of this sort, creating information on choke species on an EU fleet-by-fleet basis will be required when drawing up the advanced trading agreements within the regional plans. Once the choke species of each fleet was identified it could be assessed: whether the uplift will be sufficient; if there is enough spare quota nationally to cover previously discarded catch; if international quota swaps are sufficient; if additional international swaps can be facilitated; and then if the flexibilities allowed in the legislation will be sufficient to cover the previously discarded catch. The information required for this at fleet levels includes: effort, landings composition, discard composition and individual fleets quota allocation.

Publicised Record of EC Infractions

4.16 The extent to which the mixed catches of other Member States will facilitate better conditions for international swaps will depend upon a level-playing field approach to the implementation and enforcement of the landing obligation. One idea put forward by a PO representative was that the public record of EC sanctions taken against Member States should be actively publicised. It was argued that this could improve the transmission of this information across fleets and facilitate a high degree of public pressure upon governments to implement strong enforcement measures.

Ring-fencing Scottish Quota for Trading Agreements

4.17 In interviews with the industry, the ability to open up and increase the efficiency and transparency of international swaps was typically welcomed. However, the sticking point was a perception that even if these mechanisms could be improved, it would help little as the Scottish fleet does not possess enough 'spare' quota to swap with other Member States. It was commented that while some international operators will accept an in-year transfer of quota for money, this is generally quite rare.

4.18 Examining the Scottish POs average uptake of allocated quotas 2008-2012, it is evident that for the key target species in the North Sea (cod, haddock, whiting and saithe) the uptake rate is almost 100 per cent. Table 2 indicates slightly more flexibility amongst the West Coast of Scotland stocks; however these may need to be used in the future to cover previously discarded catch.

4.19 It seems apparent that if Scotland does need to access international quota swaps, valuable quotas that are currently targeted may have to be sacrificed to alleviate choke species problems. One option is for POs or the government to ring-fence amounts of quota for species they know to be in demand internationally, and use this pool to conduct trades as and when the need arises. Mechanisms for ring-fencing Scottish quota to be used to secure quota for choke species are discussed in subsequent chapters.

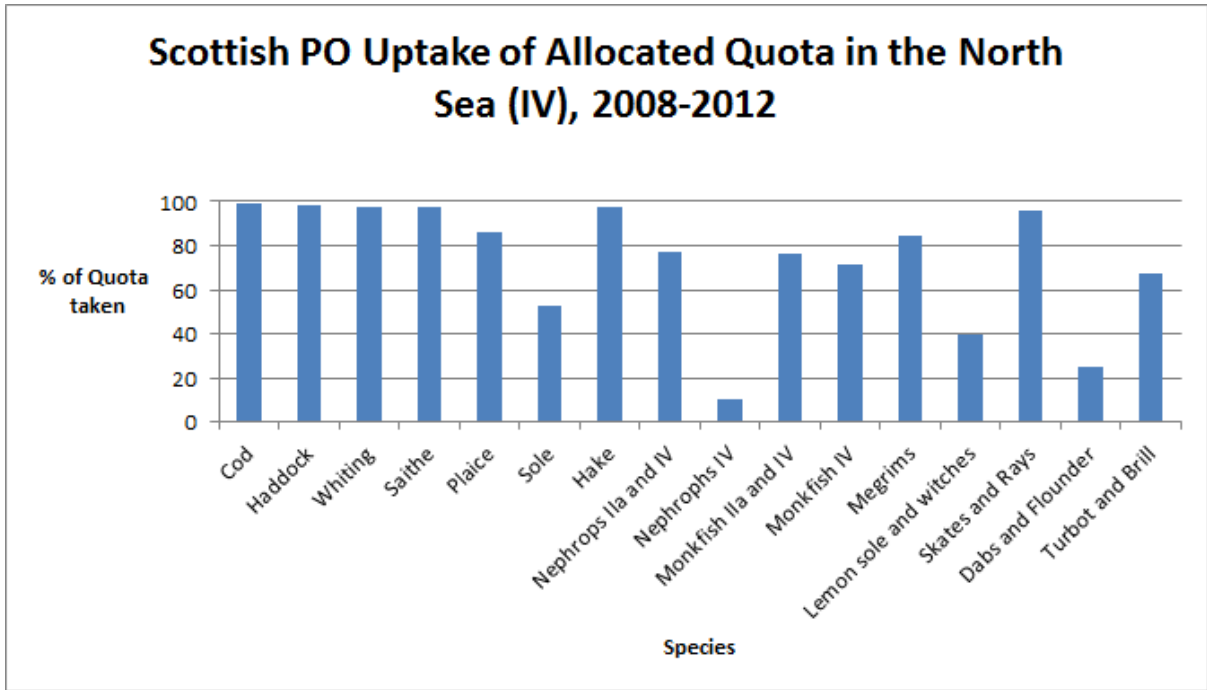


Figure 5. Scottish PO Uptake of Allocated Quota in the North Sea. Source: Marine Scotland

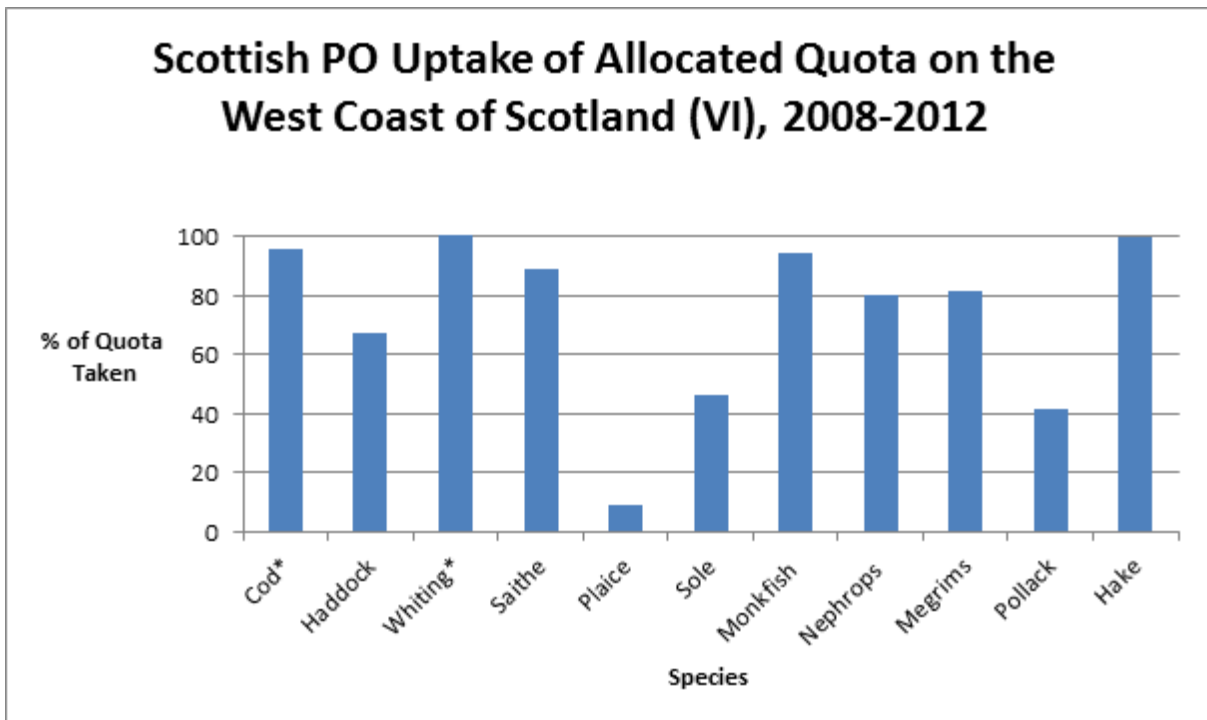


Figure 6. Scottish PO Uptake of Allocated Quota on the West Coast. Source: Marine Scotland

Section Summary

4.20 Discarding by the Scottish fleet is often influenced by a misalignment between quota holdings and catch compositions at a national level. An option discussed within the interviews was to move away or renegotiate Relative Stability. This was, at best, identified as a long-term strategy as it was perceived that Scotland would be a net loser of any re-allocation.

4.21 An alternative that received a high level of support across the board was the option of improving the practical impact of Relative Stability by improving international quota swapping conditions. An option that received a high level of support was for the creation of a centralised European information point and/or trading platform as it was identified that this may improve the efficiency, proficiency and cost of international trading.

4.22 Several obstacles were identified in the realisation of this option: increased transparency may undermine long-term swap deals, the ability for Member States to facilitate international swaps is inhibited by variance in internal management mechanisms (French administrative system vs Danish ITQs), and political aversion to swapping unused national quota exists. Analysis and publication of choke species at a European-wide fleet level was put forward as a way to make quota swapping in the interests of Member States. A perception put forward by some in the industry was that while increased transparency was beneficial, the issue was that Scotland had little to offer other countries. One option is to ring-fence portions of Scottish quota for international swaps.

Section 5. Quota Management and the Landing Obligation

5.1 A pivotal concept that has evolved throughout this study is that if an effective and practical landing obligation is to be facilitated in Scotland, innovative changes will be required as to how quota is managed. In one interview it was argued that if the Scottish fishing industry is to weather the landing obligation, quota management mechanisms could not go forward as they are. Across the board, the need for change was emphasised in relation to the management of quota allocated to the TR1 and TR2 fleets.

5.2 In Section 4, the improved alignment of quota holdings with catch compositions at a regional and European level was identified as a mechanism that could help facilitate the operation of the landing obligation. Connected to this, a strong theme within the interviews was that it was also imperative that improvements of this sort took place within Member States. As one interviewee commented, it is important that within Scotland some fishermen do not sit on unused quota while other firms are faced with the prospect of going out of business. It was identified that changes to how quota is managed, accessed and traded in Scotland have the potential to reduce quota-induced drivers of discarding and alleviate some of the pressures that will be caused by choke species. The potential benefits of improved quota management arrangements include: to improve the efficient movement of quota to where it is needed; to facilitate the optimal use of quota at market price; to aid compliance and; to keep the fleet at sea for longer and ensure other more plentiful quotas are utilised.

Catch Balancing

5.3 While fishers can often alter their catch compositions through choices regarding, location, time and gear, it is almost inevitable that an individual's catch will not exactly match their ex ante portfolio of catch rights. ITQ programmes in Iceland, New Zealand, Australia and Canada have developed 'catch-balancing' tools that could be used to manage over-quota catches under the discards ban.

Non-market mechanisms

5.4 Of the mechanisms highlighted above, carry-over and bring-back rules are probably the most common form of catch balancing rules within global ITQ fisheries. However, it should be noted that from 2001, New Zealand stopped using a carry-forward system as they found carry-over and bring-back rules create very complicated accounting problems. As already mentioned, New Zealand fisheries managers moved to the use deemed value payments, which along with the option to make fishermen surrender the catch, require a buffer pool to be in operation for with these likely to be organised at a regional level.

5.5 While these mechanisms can offer welcome flexibilities, a consensus within the interviews was that tools such as 'carry back' and 'forward' are short-term remedies and not a pragmatic approach. In particular, carry-backward remedies are likely to cause future constraints on the vessel – i.e. possibility of keeping it in operation this year to go out of business next year.

Instrument	Definition
Market:	
Permanent transfer	Transfer of a share of the TAC (quota/FQA holding) in perpetuity
Temporary transfer	Transfer or lease of a quota share
Retrospective balancing	Period of time allotted to fishermen to match catches with quota holdings
Non-market:	
Carry-forward	Ability to 'bank' any unused quota to be used in the next fishing year
Carry-backward	Ability to borrow a proportion of next year's expected quota holdings to use this year
Deemed value	A per unit fee is charged on catches landed in excess of holdings
Species equivalence	Ability to convert quota of one species into quota of another at a pre-specific conversion ratio
Surrender	Fishermen allowed to land fish that do not account against their quota holdings by surrendering catch to the government

Table 4. Catch Balancing Mechanisms

Market mechanisms and FQA Tradability

5.6 An alternative approach, which has proved popular and effective in the aforementioned countries, is the use of market transactions to correct inefficiencies in the initial allocation of quota holdings. By facilitating the permanent and temporary transfer of quota, quota can move to where it is needed thereby allowing vessels to access additional quota needed to cover bycatch and over-quota catch. The concept of increasing the tradability of quota within Scotland was a recurrent theme within the interviews, and was supported across the board as a tool to help facilitate the landing obligation. This was strongly promoted in several interviews (two academics, an NGO, two POs and by all international fisheries managers spoken with). One PO did not support this as a tool. Support in the interviews tended to cluster around concepts regarding improvements in trading and improvements made to leasing markets.

Current Quota Trading Arrangements in Scotland

5.7 Quota trading (permanent transfers and leasing) occurs at a significant rate within Scotland, with one interviewee describing these arrangements as so numerous to be almost continuous. Ever since the introduction of restrictive licencing, fishers have traded whatever assets they could, with this evolving from the trading of licences, to the freeing up of the PO swap system in the 1980s, to the current active trading of quota between vessels. Despite quota trading being recognised as an essential and important part of the Scottish industry, the trading of quota has never been officially sanctioned by Marine Scotland or Defra. In one interview, it was stressed that until this occurs the conditions that affecting quota trading in Scotland will be obscured by a lack of transparency and information.

5.8 In Scotland, current trades are arranged through lawyers or agencies, which will impose brokerage costs. As trades represent private legal agreements there is a distinct lack of open, public information on trading, prices, quota availability and where quota is being held as oppose to who holds FQAs. The likely effect is that these conditions undermine the efficiency of the 'market', which will impact upon the market price. The notion that asymmetric information poses problems for efficiency

is through high transaction costs is supported in Pinkerton and Edwards (2009) observation of quota leasing in British Columbia halibut fishery.

5.9 One of the key concerns regarding the impact of the landing obligation is that it will work to increase quota prices as vessels willingness to pay will increase. Both the POs and SeaFish evidence suggests that the recent rise in quota leasing prices was at least partly driven by the catch quota trials, undertaken by only part of the fleet. A consensus is that this stands as an indication of the effect the landing obligation will have upon quota prices, vessels willingness to pay will increase as if they cannot access more quota, they will be forced to tie up. Globally, the effect of leasing costs upon fleets has received recent attention and it has become a concern of the industry within Scotland. However, when one examines the international literature covering the concern over high lease prices and the effects these have, the issue is not with the practice and principle of quota leasing and using market mechanisms to allocate quota, rather with how the markets were operating. This narrative in the international literature mirrors a strong theme in the interviews that leasing markets within Scotland had to be opened up and made transparent.

5.10 In the interviews, the motivation for increased tradability encompassed not only a desire for increase efficiency, lower costs and greater access to quota (which was identified as crucial for the economic viability of vessels under the landing obligation) but improving quota trading arrangements were identified as fundamental to supporting compliance. Compliance with the discard ban will depend upon costs at the margin: if a vessel has fish on board for which it does not hold quota, what will happen to the fish depends upon the relative costs of the alternatives: the cost of buying/leasing in additional quota, the cost of landing illegally and the cost of discarding. The rational decision-maker will choose the least of these three costs therefore policies which can contribute to freeing up and reducing the cost of quota leasing should be positively pursued.

Management Options

5.11 As one interviewee stated, under the Concordat Scotland has the ability to strengthen fishing rights without going against the ideological grain of privatizing rights.

Real-time trading platforms

5.12 An option that received a high level of support in the interviews was the use of real-time trading mechanisms to improve quota-leasing arrangements. These systems are used in Iceland, Denmark, Canada, US and New Zealand. Internationally, the use of real-time trading has helped implement discard bans and discard reduction strategies as they allow for the use of retrospective balancing-fishers can purchase quota either on their way back into port once they know their true catch composition or else within a fixed time period. Within these countries, online trading platforms have reported success in reducing transaction fees when searching and brokering quota. In the different countries, private companies or private organisations have formed to facilitate this process. For instance, in Denmark

fishermen who wish to trade in real-time join one of the seven Fishing Pools, who then collectively work via one common website. In Denmark, the Fish Pools use an online system (www.puljefiskeri.dk) to conduct trades. The government does not actively participate in the trading market: the Fish Pool system and private brokerages have combined to promote a well-functioning quota market. A similar operation is found on the West Coast of the US, where privately owned brokerage companies have developed to facilitate real-time market transactions. In New Zealand, Stewart et al., 2011 report that added transparency provided by online trading has reduced asymmetric information on the market by providing fishers and processors with complete information on market prices.

5.13 The key barrier to this sort of mechanism operating in Scotland concerns the FQA system and the option of removing the link between licence and FQA holdings. The purpose of this link was to prevent the trading of quota but since this is no longer relevant, the rationale for this link has diminished. If the real-time transfers were recorded, through some private or public online trading platform, this would create much more accurate information over who actually holds FQAs. The current public record of FQA holders only shows the licence the FQA is attached to and not the current owner of the FQA if a trade has recently occurred. Overall, the removal of the link and the facilitation of documented real-time trading would facilitate trading efficiency, the alignment of quota with catches and therefore compliance, and the provision of information regarding ownership and quota leasing prices could be used to support other policies such as the use of deemed values which requires accurate information on market prices. This also allows for the use of 'retrospective balancing', the ability to source quota after landing catch in order to cover over-quota catches.

5.14 While the governments of these countries have supported and facilitated the creation of open markets and public real-time trading platforms, evidence demonstrates that national fisheries policy has been designed to increase efficiency and flexibility, these have been balanced with social objectives that have likely constrained efficiency gains. One interview stated that this platform could be managed online, as most TR1 and TR2 vessels have phones and computers on board. An online system could work to promote efficiency and optimal uptake of quota at the market price.

5.15 The creation of a more transparent and public trading platform was supported across the board within the interviews. Apart from one PO, it received a considerable degree of support from industry representatives, with it commented that the industry had pushed for the notion of an open trading mechanism for a while in order to produce more transparency particularly in relation to prices. It was commented that while some individuals will carry the costs of this- those who benefited from the lack of transparency- it would be beneficial to the whole of the industry as it could contribute to stopping heat building up within the trading system, specifically towards the end of the year. One interviewee stated that it should be feasible for Marine Scotland to create and run a programme that could monitor all daily trades to keep a hold of where quota sits in order to monitor uptake. However, there could be some administrative constraints upon how the platform would work due to the fact that quota is managed by the POs. Currently for an individual to lease out quota, this has to be signed off by the PO and checked against landings data in order to make sure it has not already been captured. This constraint led to one

commenter stating that it may be the case that the platform would have to be managed and operated by the POs on behalf of members.

Limits on Transfer Window

5.16 An additional policy put forward by one industry representative was that the government could move to place limits upon the window of time allowed to transfer quota. For instance, operators would have until October to transfer 90% of the quota they didn't want to use. The rationale was that towards the end of the year, many traders hold on to quota in order to increase pressure upon the market price. By introducing this trigger and creating a requirement for individuals to release quota, the intent would be to remove this pressure and thereby create a downward pressure upon price.

Allow FQAs to be sold in segments

5.17 One option is to create the requirement that FQAs cannot be sold as whole units but must instead be sold as divisible segments- total units would be disaggregated into e.g. 10 equal sized bundles that would then be sold. Restrictions could be placed on how many of the segments an individual or group could be in order to avoid concentration and the FQA units segments being bought by the larger operators i.e. out of 10 segments, an individual firm can purchase no more than 3.

5.18 The rationale for this is that currently FQA holdings tend to be sold as a single unit. The costs of purchasing this can often be excessive and unaffordable for many fishers. By forcing FQA holdings to be disaggregated (presumably with some sort of cap to prohibit the infinite disaggregation of FQAs) it is assumed that it would increase the movement and volume of permanent transfers which would make quota more accessible to fishermen who could only afford to purchase smaller bundles. There is also the possibility that this would create a downward pressure upon price. If this was the case, this policy would be beneficial for operators wishing to purchase more quota in order to increase operations or to cover catches that were traditionally discarded.

5.19 A comment coming from the industry was that while government intervention in this way could produce a positive outcome, it was keen for the government to avoid an overly prescriptive approach to this policy. A possibility put forward was that for a sale, 20 per cent of the holding had to be sold in small bundles with the rest free to be allocated according to the seller's preference.

5.20 Another issue is the impact this would have upon fleet structure. In terms of the economic impacts, evidence from New Zealand, the US, Canada and Denmark suggests that if this change was used in combination with real-time trading platforms, the transaction costs of trading in smaller units could be reduced. The issue is, however, that the wider economic impacts of this policy are uncertain as it has the potential to influence fleet ownership structures. The issue is that the effect of ownership structures (corporate, large vessels versus family-run firms) upon profitability and efficiency is uncertain. If for instance, the larger vessels are more efficient and profitable, it would be unwise to create structures that facilitate the movement of quota away from these vessels to smaller, family run sectors that may be more dependent on subsidies to survive. However, the concept of large quota allocations being held by companies is perceived as posing the risk that the holdings

may at some stage be sold to non-Scottish companies. Moreover, if FQA entitlements are able to be sold as divisible units this could also create a much larger number of 'owners'. While this idea can be politically attractive, in reality it has the potential to undermine productivity and the performance of the fleet. It could contribute to quota being spread too thinly across too many operators, with an increase in the number of boats contributing towards overcapacity and high fixed costs. This possibility of creating more owners may in fact produce a greater misalignment between quota holdings and catches, with demand for quota increasing as it is spread thinly across the fleet.

Balancing social objectives with increased tradability

5.21 There is often a socio-political concern that increase tradability of quota will facilitate a concentration of quota holdings amongst the larger, corporately owned vessels that can afford additional quota. However, in several other countries including Denmark, US, Iceland, New Zealand, Canada and Mexico have implemented regulations that limit quota concentration.

Owner-operator Conditions

5.22 In the Danish ITQ-Pelagic Program and the ITQ-Demersal Program, individual registered fishermen who derive more than 60% of their earnings from fishing are eligible to receive shares for use on a registered fishing vessel. This aims to ensure that only active fishermen can use the quotas on active fishing vessels thereby enabling benefits from the operations to accrue to the fishing communities in which the fishermen are based.

Aggregation limits on quota ownership

5.23 This is one of the most popular methods of attempting to alleviate issues of quota concentration.

Country	Regulations
Alaskan Halibut and Sablefish fishery	A limit of 0.5-1.5% is placed upon individual holdings of halibut or sablefish catch shares based upon area.
British Columbia groundfish fishery	4-10% of a species' yearly catch limit
Denmark	Concentration of shares is limited however, the share ownership limits are higher for the industrial and the pelagic fishery and the limits are lower in the demersal fishery where business operations are usually smaller and tied to local communities.
Gulf of Mexico Red Snapper fishery	6.02% of total IFQ shares
Iceland	12% of cod, 20% for haddock, saithe and Greenland halibut, 35% for redfish. An additional cap prohibit any entity from holding more than 12% of the value of all combine quota shares for all ITQ stocks.
New Zealand	Current caps range from 20-45% of TAC, and for one species a 10% limit in each management area.

Table 5. Examples of International Limits on Quota Ownership Aggregation

Risk Pools: The Collective Management of Choke Species Quota

5.24 One option, which is a modified version of the Government Buffer Zone, is for quota for high-risk species to be pooled between vessels and/or within POs. The objective is to identify choke species and manage quota for them in such a way as to remove the incentive to target them. This then frees up the available quota to cover incidental catches that fishermen are unable to avoid. Some POs already operate unofficial pools for bycatch species (lemon sole, dabs and plaice) in order to cover the overfishing of some members by the under fishing of others. This option represents POs taking a more active role in managing quota for the choke species by adopting the Risk Pool model used in the US, Canada and Denmark which are reported to have produced incredible results with dramatic reductions in the catch and use of choke species quota.

Why, Where and How

5.25 Risk Pools have become a popular method in several fisheries for managing the existence of choke species. In the US, they arose as private agreements between fishermen who were extremely anxious over the existence of choke species. In contrast, in Demark they were initially designed to mitigate the transaction costs and high levels of income risk associated with acquiring quota by the market. Risk Pools can therefore be designed to have a dual-function: to provide a system through which fishermen can access quota for incidental bycatch of certain

high-risk species, and to reduce the transaction costs incurred when searching for and brokering quota transfers and leases. This latter function can contribute towards compliance levels as FAO analysis of behaviour under the New Zealand discard ban indicates that discarding continues when the costs of entering into a complex system of quota leasing is perceived as too high (FAO, 1997). As already discussed, reducing the costs of acquiring extra quota to cover incidental catch is vital to the progressive elimination of discarding in European fisheries.

5.26 Typically, Risk Pools have been organised on an ad-hoc, private basis between fishermen. From this, cooperatives have been formed that manage the quota in the Pool, with a key component of the tool that fishermen sign membership agreements that include rules that work to help fishermen avoid catching choke species in the first place. Measures include rules on gear selectivity, the use of spatial and temporal closures, monitoring provisions and in Canada, fishermen must submit fishing plans that specify the area, method and means of harvesting the target species and the rates of associated incidental catch of constraining choke species. Several Risk Pools also use technology to inform fishers of areas of high risk for choke species, with access to the pooled quota depended upon compliance with all the rules.

How could this operate in Scotland?

5.27 An option is for POs to adopt and develop a pooling system based upon the model above. An example would be that for species such as cod and hake- for which individual quota holdings tend to be low and at an aggregate level will be insufficient to cover catches under the landing obligation even with the uplift-POs could run either compulsory or voluntary schemes in which their members would contribute part or all of their quota for these species to the pool. The key benefit would be increase security for member vessels through increased access to quota for bycatch caught unintentionally, thereby allowing them to stay at sea longer and utilise their other quotas.

Open-Access Concerns

5.28 The key difference between the operation of Risk Pools and current pooling arrangements is that current arrangements only cover species for which the quota is not easily exceeded. A key issue with the operation of this system in Scotland is that most of the choke species represent valuable, commercial species. Therefore, a key issue related to this approach is that if Risk Pools are used for choke species that have a high value, open-access problems will emerge if the Pools are not subject to a high degree of internal management. As for the operations of a Government Buffer Zone concept, the objective of the pools would be to remove the economic incentive to target the pooled quota. Facilitating this will require a considerable degree of internal management and a fundamental shift in how quota for these stocks is viewed by fishermen. Instead of fishermen using quota to target these stocks, this quota would be held in reserve to cover incidental catches and allow the PO and its members to fully utilise its other quotas. The issue is that this sort of trade-off between stocks can be hard to realise, with the choke species such as cod and hake worth more per tonne than other more abundant target species such as haddock.

5.29 From the discussions with the POs, it is likely that alongside the need to use the management mechanisms outlined in Table 6 above, additional economic

incentives may be required to facilitate participation. One PO commented that its members would be opposed to the notion of pooling quota- in particular the vessels that had invested heavily in expensive choke species quota as there was little likelihood they would be happy to have others use it. One option would be to develop a match-funding style of system, whereby if a fisherman contributed a share of his quota to the government pool, this would be met with a contribution from the government. The quota from the government could come from the uplift if enough of this was held back. Something along these lines would be required to entice fishermen who had invested considerable amounts of money into buying up choke species quota such as hake.

Case Study: Pacific Whiting Risk Pool Cooperative

This Risk Pool is specifically for fishermen whose primary target species is whiting, and who are willing to commit that all their fishing for this species will be done under the Cooperative rules. The Risk Pool managed quota for the 'constraining species' that limit the whiting catch. In 2011, there were 16 members vessels in this Coop.

Each member must contribute quota in line with a '**Minimum Pool Commitment**'- this is reflective of the amount of quota each individual holds for the constraining species. Of this Minimum Commitment, 50 per cent stays with the member as a private holdings and 50 per cent is transferred into the **Cooperative Reserve Account**.

Management Mechanisms: Once the Reserve is created, the Cooperative works out an '**Initial Reserve Ratio**' (IRR)- all of the bycatch quota committed to the Reserve is divided by all the whiting (target species) to be harvest by all Coop member. This is used to determine how a member may access the reserve account. For instance, if a member uses 120% of the IRR when using their own private holdings, they are forced to stand down for a defined period. At any time, a member can 'top up' their own private holdings in the Coop by adding any more of their quota holdings outside of the pool.

In managing the rate of use, a **Current Reserve Ratio (CRR)** is periodically calculated- this reflects the balance of all the unused bycatch quota committed to the Coop divided by all the un-harvested quota of the target species at that point. The CRR can have a green or red status. When it is red, a shift to stricter fishing rules is initiated as the Coop is burning up its bycatch quota too quickly to be able to take all of its target species quota. Rules include a stand down for fishers exceeding the IRR, and they are now allowed to fish again until a return to a green status. Time and spatial closures may also be enforced and expanded.

Using the Coop Quota: A member first draws down from his own 50% private holding- there is a 1st check point when a member uses half their share, and a second when it is all used. Once the private holding is used, a member can then draw down from the Reserve. However, there are limit on this process. For some species, individual are not allowed to use more than 20% of the Reserve for some specie, and for other no more than 5 times their contribution to the pool, not to exceed 20% of the pool total.

End of Year Balancing: Unused quota goes back to member pro-rata to their contribution minus use and members who use more bycatch quota than they contributed will pay an amount based on its ex-vessel value to be distributed pro-rata to those who used less than they contributed.

Figure 7. Pacific Whiting Risk Pool

5.30 Alternatively, the Risk Pools could be less dynamic and operate only for bycatch species such as anglerfish, megrims, Greenland halibut, blue ling, and tusk. This was the approach that received the most support from the industry. There was a clear dismissal of anything valuable to Scotland being pooled (cod, saithe) as the industry tends to believe these species will be dealt with in the first instance through the banking and borrowing and transferability requirements. A comment was that pooling for these species was unwanted as the tonnages were too large- however, this assumes that all of the quota for the species would be pooled as opposed to individuals having the choice to pursue voluntary and private agreements within POs which tends to be how these systems operate internationally. Instead, there was support for the pooling of 'others' or the more marginal species such as halibut and turbot. It was commented that these could be pooled internally within Scotland at government or PO level. Reference was made to the operation of this system in Norway, whereby a pool of 'others' is created that has a fixed TAC, fishers can then use this TAC to cover certain species by whatever means they want i.e. by using 80% for turbot and only 20% for halibut. The issue with this is that with group TACs, control is lost over individual species mortality.

Mechanism	Effect
Correlate access and use of the Pool reserve to good practice	Vessels must demonstrate: use of selectivity, use of CCTV and REM, compliance with closures
Use technology to identify areas of high risk	Create accessible information to help fishers avoid choke species and use VMS data to make sure vessels are not fishing in known areas of high-abundance of choke species.
Social pressures	Post a list of the individuals using the pool and the rate at which they use the quota
Economic incentives	Withhold/reduce the economic value of the catch for choke species and use funds as subsidies for selectivity improvements, CCTV and technology needed for mapping projects.
Limits on use	For some species individuals not allowed to use more than x per cent of pool reserve.
Use of Initial and Cooperative Reserve Ratios to manage uptake	Penalties and periods of stand down if a vessel is using up the pool too quickly
Financial incentives not to use the pool	End of year balancing: Unused quota goes back to member pro-rata to their contribution minus use and members who use more bycatch quota than they contributed will pay an amount based on its ex-vessel value to be distributed pro-rata to those who used less than they contributed.
Incentives for participation	Some form of match-funding system when vessels agree to pool a share of their holdings

Table 6. Internal Management Options for Risk Pools

Enforcement

5.31 It is well known and openly admitted by the POs that they often have rogue members who put the operations of the vessels in the PO as a whole in jeopardy. This is due to non-compliance with rules such as landing over quota. A point stressed by the POs is that they are often powerless to stop this. This is often governed by the fact that can often not afford to throw the vessel out as it will take its

quota allocation with it to a competing PO. In discussing what would need to change in order to facilitate compliance with Risk Pool rules, one PO stated that new enforcement powers- outlined in Section 5.3- would be required to make sure free-riding did not occur. The success of Risk Pools in the US and Canada is reported to be based not only upon the attitude of fishermen- collective will to work together- but importantly due to the strong monitoring regime, with 100 per cent of vessel activities covered by an observer scheme.

Overview from the interviews

5.32 One academic argued that it would be more effective for the uplift to be managed by the POs in some form of Risk Pool, rather than being held centrally by the government. The POs were split in their response: while one was generally supportive of the idea of Risk Pools, one was non-committal with another strongly against. The main concerns of the POs were the lack of collective action that operated within Scottish fisheries, and a general feeling that their members would be unwilling to allow quota to be managed in a pool for others to use. Overall, it was agreed that Risk Pools offered an innovative solution for the demersal fleet but the management and design of them would have to be carefully considered due to the potential for free-riding and open-access conditions.

Bottom-up Management: Demonstrating the right to catch before leaving harbour

5.33 One of the key concerns regarding the landing obligation is what will happen to landed catches for which no quota is held by the individual. Even with the best intentions, an individual's catch will not exactly match their ex ante portfolio of catch rights. This has the potential to undermine the security awarded by the 'right to catch' as if quota cannot be leased in or provided centrally to cover the catch landed, the potential is for quota to be taken of other fishers who have not yet used their entitlements. An alternative to the other management options discussed is to facilitate a bottom-up system of management whereby before a vessel can go to sea for a trip, it must demonstrate that it has adequate quota holdings to cover the expected catch. In the next two years, industry and government monitoring programmes will bring together a better picture of true catch compositions. This could be disaggregated to a fleet and area level in order to provide a picture of what quota portfolio would be 'adequate' to allow a vessel to go to sea. This data could be used to create a base-line picture of the quota requirements for each fleet segments. Under this system, while a vessel might have adequate quota for X,Y,Z but not for species A which it is evidently going to catch, it is not allowed to go to sea until that quota is sourced .

5.34 This was a management method strongly supported by all the POs spoken with, and by academics and industry-related organisations. The POs commented that this situation already posed a significant degree of risk upon the POs operations in terms of overfishing quota. A vessel within their membership may have 1 ton of cod quota, but the PO knows that if it goes to sea it will catch often vastly in excess of this. However, currently if they hold this one tonne they are entitled to go to sea to catch it. As one PO representative commented, while they can try and persuade the vessel not to go to sea, they only have the power to sanction and fine the vessel once it comes back in and lands a catch over its quota. Legal processes prohibit the

POs from stopping this practice, with vessels reportedly complaining to Marine Scotland who fail to support the POs in this enforcement role. It is clear that the industry wants the tools to be able to enforce the landing obligation at a grass-roots level.

5.35 From the industry engagements, it appears that the opposition to this comes from the Government. One argument against this could be that as a bottom line, it is the responsibility of POs to enforce their own rules amongst their members. While the POs believe their inability to control members comes from a lack of power, it could be argued that it in fact comes from a lack of will as the POs do not want to have to remove vessels from their membership in fear of losing a proportion of their total quota allocation. A point made by the industry was that they don't want to throw out poorly behaving vessels, they want to be able to control them. One industry representative commented that POs ability to enforce needs to be enlivened with the ability to act in real-time. While sanctions can be made which stop a vessel going to sea, these often take weeks to organise as it has to go through a formal, legal process. Support for making the POs a legal entity in themselves, and giving them more power to control their members was a strong view coming from the industry. Scottish licensing arrangements are currently being reviewed.

Mixed Fisheries Management

5.36 The option also exists for a fundamental change to the way in which fisheries are managed. A broader, multi-species perception of fisheries management has received increasing attention on account of the unintended, detrimental effect of managing fisheries through a single-species focus (Garcia et al., 2003; Pitkitch et al., 2004; McLeod et al., 2005). The fisheries targeted by the Scottish fleet are mixed fisheries: actual catch compositions do not reflect the intentions of fishers in terms of targeted species or quota holdings. Vessels targeting cod in the North Sea are also likely to catch haddock, whiting and saithe. Ignoring the mixed nature of fisheries leads to discarding: if the quota for one species is exhausted early in the season, vessels continuing to fish for other species for which quota is available will be forced to discard any of the original species caught. Even within ITQ fisheries, which offer the most flexibility in terms of matching quota holdings to catches, the mixed nature of fisheries created a significant discarding problem.

Mixed Catch Quotas

5.37 The Client Earth Fish Credit System introduces a new type of mixed catch quota. Each species caught in a specified fishing region is worth a particular number of 'credits'. Fishers can choose what they catch and in what quantity for each species, as long as it does not exceed their total credits allowance. Therefore there would be no need to discard or worry about going over quota for a species. Almost all technical regulations are eliminated to increase fisher flexibility. Everything caught is recorded and landed - including most bycatch species. To ensure fishers can maximise the return from their credits allowance, a proportion of credits can be traded between active fishers. Compliance and best practice are rewarded with extra credits.

5.38 While the Client Earth system presents an interesting solution, the issue with multi-species management regimes is that they tend to create one quota to cover a wide array of species. This means that control over individual species catches is lost. While mechanisms are designed to incentivise fishers not to catch the species with low TACs, which are often valuable and can have low TACs due to overfishing, the outcome is unlikely to be satisfactory. While individual species quotas are not entirely appropriate for mixed fisheries, there is a reason you have them in the first place- to control the harvest of under-pressure stocks.

Holding back TACs

5.39 One option discussed in one of the interviews was to hold back TACs from the outset in order to match the choke species. This could happen at an ICES, EU or Scottish level. The key issue that makes this largely infeasible is that it would likely lead to the underutilisation of quota and would reduce the operations of the fleets, possibly quite substantially.

Section Summary

5.40 Evidence from the interviews shows broad support for changes as to how quota is managed in Scotland. The focus was upon quota for the TR1 and TR2 fleet and for adjustments to improve quota trading and leasing arrangements as opposed to any fundamental shift towards privatization.

5.41 The creation of a public online trading mechanism was regarded across the board as a good way to improve the transparency and efficiency of quota trading and leading in Scotland. Another option, put forward by the industry, was for a limit on quota transfer windows in order to avoid the system 'over-heating'. On the whole, support was indicated for measures that would improve the temporary and transfer of quota.

5.42 The use of Risk Pools in the US and Denmark was considered within the interviews. This received varying degrees of support. A common theme from the industry is that pooling arrangements within POs, or any pooling between groups of fishes should be private voluntary agreements between fishermen, as is the case in Denmark and the US. While the benefits of Risk Pools was understood to be a reduction in transaction costs and improved availability to quota to cover over-quota catches, such mechanisms are susceptible to problems of open-access and free-riding. Internal management mechanisms in the US give evidence of how these can be overcome

5.42 A recurring management option put forward by the POs was for the extension of powers to enable them to implement real-time restrictions on vessels going to sea with inadequate quota. This form of 'bottom-up enforcement' is used in Iceland.

6. Monitoring and Enforcement

6.1 The landing obligation presents a number of crucial challenges regarding monitoring and enforcement. An academic interviewed stressed that as it embodies a shift from the monitoring and regulation of landings to catches, it is fundamental to know exactly what is being caught. A discard ban is harder to control than landings regulations or illegal landings as discarding as it is an event that happens at sea. Within the interviews, there was a strong consensus that the landing obligation will require new, improved and more intelligent monitoring, control and surveillance mechanisms. The issue is not just with monitoring what is brought on board and retained but with what is being discarded under the allowances and flexibilities. A point put forward by STECF is that there may be limited opportunities for verification of the discarded catch under the *de minimis* and survival provisions, with this situation requiring a fundamental review of the roles of scientific observers.

6.2 Within the CFP framework, the Scotland Government has a significant degree of latitude in terms of the design and implementation of monitoring and enforcement mechanisms for the landing obligation. What will be measured from a European level is whether or not a Member State's method is seen to be enforcing the landing obligation. If the EC believes that the landing obligation is not being enforced in a Member State, it is likely to be proactive in penalising said state and it will be monitoring the progress closely. Identified options and their likely impacts are discussed below.

6.3 Effective monitoring and enforcement of the discard ban is necessary for several reasons:

- **Compliance:** The behaviour of individuals will be influenced by the cost of the alternatives at the margin. The price of discarding illegally therefore has to be perceived as high, or at least higher than the cost of purchasing additional quota. The cost of discarding will be informed by monitoring and enforcement and the practicalities of the control measures put in place. This is crucial as the incentives for non-compliance will be significant for those vessels faced with the prospect of going out of business.
- **Improved selectivity:** The first approach in helping the fleet weather the discard ban is to improve selectivity as this will help vessels avoid the catching of undersized and unwanted species. While the industry is often supportive of selectivity improvements, there is often a waning in the practical application of the technology as it is often perceived by the industry as costly, with it commented that the gear often lets targeted as well as the intended non-targeted fish escape. In order to create strong economic incentives for vessels to adopt greater selectivity (in gear and fishing behaviour), it is crucial that vessels experience the economic constraints of the discard ban upon their operations. It is through this pressure that behaviour can be altered. If illegal discarding still occurs, the potential of this incentive structure will be nullified.
- **Avoid a return to precautionary TACs:** A potential outcome is that if illegal discarding takes place under the landing obligation, a return to precautionary TACs could be triggered- TACs that hold back a proportion of the total catch to cover estimated discards. While there is great fear over the financial impact of the landing obligation, even with the uplift amounting to often 100% of

species quotas, a subsequent reduction or removal of this would be financially disastrous for the fleet. Weathering the short-term economic hardship that will result from a high level of control is therefore crucial to the long-term operation of the fleet.

- **Creating medium-long term security:** A point made by one industry representative was that landings will likely increase with the uplift. If the fleet is allowed to operate in an open system- one without adequate monitoring under which discarding continues- the pressure upon mortality will increase which will lead to future stocks going down. This would be exacerbated if other controls upon effort were removed in order to give the fleet the freedom to fit into the new system. In order to prevent this, it was commented that it is crucial for the government to be tough and control the fleet in order to protect the medium-long term operations of the fleet. The point made was that the government cannot assume that the fleet, unmonitored, will behave under the landing obligation and that the government has to be tough or else the industry will not change its behaviour.

Mechanisms and Tools for Effective Monitoring

Remote Electronic Monitoring

6.4 A Remote Electronic Monitoring (REM) system has been proposed by the EC (2011b:8) as a method for monitoring and enforcing the landing obligation. REM uses CCTV, hydraulic sensors and VMS data to record hauling and sorting activities. The hydraulic sensors can be used to identify at which points in the footage this activity occurred and VMS to cross-check against electronic logbook data. REM systems are used in Denmark, the US and in the Scottish Catch Quota Scheme. In Denmark, REM has been used as a key component in a project designed to reduce bycatch and discarding. Vessels who agree to electronic monitoring are rewarded with a catch quota- a quota uplift that carried the stipulation that every vessel must register all catches and discards, with discards counted against individual quota and only fish under the minimum size allowed to be thrown overboard. The Danish project has been described as radical in its use of the economic incentive of an uplift to encourage vessels to accept monitoring. The use of catch-quotas has been reported to be “*a very desirable incentive for the fishers who are willing to take full responsibility for documenting their actual catches and thereby also discards*” (Gezelius, 2008). The Danish project indicates that high-quality video monitoring is possible which could aid the monitoring of the catch composition and help with prosecution of offenders.

Potential Impacts and Effectiveness

6.5 In the interviews, the industry’s perception of the effectiveness of REM was to generally see it as limited. Specific points were raised concerning the system’s value for money and general effectiveness as it was commented that crews would be tempted to turn the equipment off or cause it damage. Aside from these partisan observations, a genuine concern from the industry was the effect that the legitimate use of REM would have upon the demersal sector, with this leading to the fleet being tied up quickly and the economic ramifications of this. As one interviewee stated, all that cameras would see were vessels filling up in two days rather than four.

6.6 The industry's resistance to this tool is interesting as it provides some perspective on the potential effectiveness of REM for monitoring catches and enforcing the landing obligation. In effect, it is likely that REM would prove instrumental in effectively enforcing the landing obligation.

- **Demersal fleet:** The key issue regarding REM lies with the impact of an effective landing obligation upon the demersal fleet. The known reality is that if full control is realised there is the potential for a large number of vessels to be tied up half way through the year, with this likely to occur if there was full control of hake catches within the North Sea. The issue is not only the strong resistance that comes from these fleets, but the wider social, economic and political issues as this would disrupt the whole supply chain.
- **Pelagic fleet:** For the pelagic fleet, circumstances are different. In response to increased evidence of slipping, it was commented in one interview that there is a general consensus within the scientific community that the use of REM is the only way to enforce the discard ban amongst the pelagic fleets, especially given the failure of the 2011 high-grading ban. In preparation for their consultation on pelagic sector, Defra have revealed that all English pelagic vessels over 24m in length will be monitored by REM, with these three vessels covering 90% of the sector's fishing mortality. The monitoring of the landing obligation on the Scottish pelagic sector through REM will be relatively straight-forward as even with full monitoring and enforcement it was referenced by several in the interviews that the businesses in this sector will be unlikely to face bankruptcy as a result.
- **Other sectors:** One interviewee commented that it is important to remember that some sectors actually have a lot to gain from the installation of cameras and may take them voluntarily. An example given was prawn trawlers that operated in the Firth of the Forth. It was noted that cameras can be used within this fishery to demonstrate that cod represents less than 1% of their catch composition. This would then be used to argue that these vessels should not be constrained by DAS as they were not damaging cod stocks. Ultimately, the point is that cameras may be viewed as a beneficial tool for some vessels as they will verify what is going on and support good behaviour and fishing practices.

Discussion

6.7 Excluding the POs and one Fishing Association, a consensus within the interviews was that the use of REM was the only way to achieve effective enforcement. Within this cohort, the general narrative was that electronic monitoring was the only tool that was capable of monitoring a high enough percentage of catches and to carry this out at sea. The issue is that the use of REM is unpopular amongst the industry. This stems from the likely success of REM in monitoring catches as it will work to effectively drive home the economic costs of the discard ban upon individual vessels.

6.8 A crucial outcome of the interviews was that while the economic impact of REM upon the demersal fleet was well understood, from all parties not representing POs, a strong belief was that the solution to this came not from side-stepping REM but instead from changing how quota for this sector was managed. The principle

reason for this was to make sure that the economic incentives to alter behaviour are not avoided.

A Solution: Design innovative benefit schemes

6.9 While the use of REM remains a contentious issue, the solution put forward by several experts is to design a series of innovative benefit schemes in order to facilitate a progressive approach towards the management of the landing obligation.

- **Ring-fencing quota:** An option exists for the government to ring-fence quota and use it to create carrots to reward and incentivise specific behavioural changes. The Scottish Government could adopt the Danish approach and allow vessels that agree to REM access to the uplift, with the option of two ramped rates for those with and without REM. Under this mechanism, the degree of access that individual vessels have to the buffer quota could be based upon monitoring provisions. One academic interviewed commented that the quota uplift has in many ways gifted Member States with a unique carrot to create fundamental progressive change in how fisheries are controlled. However, this needs to be used from the start. It is likely that if the political will is present at the beginning to use uplift or quota in such a manner, this will be regretted in the future as change may have to be forced upon the fleet without this economic and political safeguard.
- **European-led change:** A comment reiterated in the interviews was that unless the use of REM is rolled out across Europe, there will be little incentive for governments such as Scotland to adopt it for their own fleet. With fishermen tending to be conscious of the operations of others and what is going on around them, the creation or perception of a 'level-playing field' is vital for compliance. Incentives and pressures should therefore operate at a European or regional level. One option suggested was that at a European level, Member States should be awarded only 90 per cent of their quota, with the other 10 per cent allocated out if the Member States uses REM to facilitate full control. While 10 per cent was referred to within the interviews, further research could be conducted with the industry to ascertain the level required to produce a sufficient incentive.
- **Creating the right package:** Another recurring theme within the interviews was that REM could be sold on a sector by sector basis if the right 'package' of carrots and sticks was presented. For a sector such as the pelagic fleet it could be access to the full catch quota; for vessels that have low-nil discards, such as the prawn trawlers mentioned, it could be the removal of Days at Sea restrictions; for others, specific gear restrictions. One interviewee commented that for the demersal fleet, it is unlikely that such a package exists right now. However, it was believed that a key to unlocking this could be innovative ways in which quota could be accessed for unintentional bycatch. For instance, one of the pooling mechanisms discussed that allowed vessels to draw down from in order to keep them at sea for longer. In essence, the fleet needs the security to operate under REM.

Observer Programmes

6.10 An alternative system would be to create observer schemes which would place certified observers on vessels in order to visually monitor and report upon a vessel's catch and what species and size of fish it was discarding. An observer programme is used to enforce the discard ban in Norway, however the efficacy of this is questionable as illegal discarding is suspected in Norway. Nonetheless, successful observer schemes do operate in the US and Canada, with the success of these models resting upon the fact that 100 per cent of every vessel's activity is covered by an observer (Condie, at al., 2013).

6.11 Revealed in interviews with fisheries managers and fishermen in the US and Canadian fisheries is that while observer schemes were chosen as the initial monitoring mechanism, there have been recent attempts to move towards an REM system. The reason for this shift appears to be primarily financial. In the US and in Norway, the high cost of observer schemes was initially financed through public subsidy paid by the government, with the intention that these subsidies would gradually be removed. In the Norwegian case, the intent was that the industry would eventually cover 100 per cent of the costs of the scheme, with this increasing in increments of 10 per cent per year. A movement towards REM has become popular amongst the industry as public funding has been reduced in the US and Canada.

Potential Impacts and Effectiveness

6.12 Currently, Marine Scotland observes less than 1 per cent of vessels' activities. If an observer programme was to play any pivotal role in Scotland's monitoring and enforcement of the landing obligation, this would have to be substantially increased, and the current scientific observers replaced/supplemented with control observers. As commented by fisheries managers operating observer programmes, anything less than 100 per cent coverage creates incentives for discarding as well as animosity between fishers as a level-playing field is not in operation. In terms of the resources this would require, this is exacerbated by the need to have two observers on board (to cover the EU Working Time Directive) to ensure that there is always at least one observer monitoring trip activity. This would create high administrative costs, with US and Canadian fisheries reporting that monitoring costs are \$500 per day per vessel, with similar figures put forward by the EC (2011b:6) for Norway. It is estimated that Norwegian authorities carry out 2,200 boat inspections a year at a cost of £86 million (MRAG, 2010).

6.13 There are also several practical difficulties with the effectiveness of observer schemes. Under EU law, observers are allowed on board only following invitation and with the agreement of the skipper and observers have no enforcement rights. During attempts to enforce the 2011 high-grading ban, observers were often denied access to vessels. Overall, with less than 100 per cent coverage, there would be ample opportunity for fishermen to continue discarding when they are not being observed and to toe the line when they are. If observers were denied access, this would generate a great deal of uncertainty as to illegal discarding levels.

Discussion

6.14 In respect to control, a strong consensus within the interviews was that observer schemes are not relevant to Scotland. It is likely to be extremely costly, impractical and ultimately not an effective policy

Industry Mechanism/Reference Fleets

6.15 One system put forward by a PO was based upon the use of the current observer schemes that are being launched by the industry that are attempting to establish the levels and patterns of discarding at present. The idea is that this data would be used to put together a comprehensive picture of discarding patterns as to ascertain what true catch compositions different fleet segments tend to obtain. The role for compliance would then be to check that the landed catch of vessels correlated to the expected picture. If there is a discrepancy, observers should then be put on board.

6.16 There are several issues with this system. Firstly, it is reactive to bad behaviour as opposed to creating incentives for good behaviour and it is inevitable that some degree of discarding will continue, with fishermen likely to become aware of what landed compositions they can get away with. This would produce a 'leaky' system of compliance which would undermine the creation of the much needed incentives for better selectivity and compliance.

6.17 This system is quite similar to the use of reference fleets, which have been discussed within the RACs and STECF. A reference fleet is a set of vessels operating in a fishery which represents the entire fleet. This system is used in Norway, with the vessels used considered to especially trustworthy. The issue with this sort of monitoring and enforcement system, as STECF point out, is that it does not create a level playing field within the fishery- which the reference fleet are fully monitored; the vessels outside of this are not directly monitored and therefore have fewer incentives to comply.

Enforcement

6.18 A component of how well the discard ban will work depends upon the budget given to the compliance team, this is ultimately a Ministerial decision and therefore has the potential to be driven by a political value judgement. The position of Marine Scotland Compliance is that it will enforce the landing obligation to the best of its ability given the resources made available. If mechanisms to implement full control are not given a high degree of political backing, it will aim for strategic measures that can target vessels in such a way as to maximize the impact of enforcement.

Penalties for illegal discarding and illegal landings

6.19 As well as boarding and the seizure of illegal catches, there is a strong case to be made for implementing strong financial penalties for illegal discarding and illegal landings. The potential exists for the government to create mechanisms which will allow the fleet (in particular, demersal vessels) controlled access to additional quota if catch is caught accidentally. However, if vessels continue to catch (and land) catches in excess of original quota holdings and the allowances cannot be covered by quota sourced on the market, it is important that the financial penalty for this is high. Hatcher (2013) demonstrates that in a mixed species quota fishery affected by

choke species, if the expectation is of a large penalty for discarding or landings illegally, this will create incentives for more selective fishing. If the cost of discarding is positive but less than the cost of landing illegal catch, fishers will be likely to avoid bycatch but continue discarding the choke species. This implies that the most effective way to alter a fisher's behaviour towards greater selectivity and compliance is the implementation of large penalties for discarding and landing over quota fish. The issue is not just that illegal discarding will occur, but that vessels will land illegally and in order to cover this illegal catch, unused quota will have to be taken from other operators. This has the potential to undermine any security attached to the 'right to fish' which would ultimately undermine the collective response to the choke species problem that could be fostered through the use of Risk Pools and Buffer Zones and exacerbate the incentive for non-compliance.

Bottom-up Enforcement: Demonstrating the right to catch before leaving harbour

6.20 As discussed in paragraphs 5.33-5.35, the POs interviewed put forward the option that vessels would have to demonstrate the right to catch (adequate of quota holdings relative to expected catch) before they can leave harbour. This option received a broad base of support from the POs, academics and industry-related organisations.

Discussion

6.21 It is crucial that the landing of illegal catch (for which no quota is held and buffer pool like allocations have been exhausted) is met with severe financial repercussions and repeat offenders face stricter penalties such as the suspension and removal of licences. This tougher enforcement stance towards a discard ban is seen in Iceland, where illegal discarding and illegal landings are met with financial penalties, the revoking of fishing rights and even jail sentences (Johnsen et al 2007). Despite this, low levels of discarding still occur (Condie et al, 2013). In comparison, in Norway legal action is only taken when the catch is demonstrably caught on purpose- such as in closed areas if it is not reported. As already covered, in New Zealand a tax is placed upon illegal landings. What seems unclear, however, is where the authorities find the quota to cover these illegal landings. The bottom line is that even if financial penalties are placed upon illegal landings, the catch still needs to be covered by quota from within the system.

6.22 One possibility put forward within the interviews was of creating some sort of transition period for enforcement, where strong enforcement could be aimed for but the initial years of this would factor in some room for lenience in order to avoid the widespread criminalisation of fishermen overnight. This would represent a structured period of reasonable tolerance, with specific levels of tolerance allowed. The issue is that while most new management regimes do follow some sort of transition period, the view from Marine Scotland Compliance was that the time from now 2014 until the implementation dates was the transition period, and this would not hold for the landing obligation.

6.23 While the likelihood that vessels will have their operations constrained by the landing obligation is viewed as an anathema, it was commented by two separate interviewees that if this does not occur, and vessels are not forced to stop fishing, it is likely that something will be wrong from a compliance perspective. In this situation,

it is likely that fishermen will be discarding illegally. A carrot and stick approach to monitoring and enforcement was held as a progressive approach, with a common theme displayed in the interviews that there was the need for a perception from the beginning that the ban is being enforced. Moreover, that there has to be an expected financial cost to illegal discarding and illegal landings and that such actions will be met with some degree of financial repercussion. The general theme was that if a high financial cost is not associated with non-compliance, it is unlikely that the required change in behaviour towards more selective fishing will not be generated.

Section Summary

6.24 A discard ban is harder to control than landings regulations or illegal landings as discarding is an event that happens at sea. It was stressed within the interviews that effective monitoring and enforcement could play a vital role in creating the economic conditions that will produce compliance and a shift towards more selective gear, as well as working to safeguard against a future return to a pre-cautionary TAC.

6.25 The attitude towards the use of REM was split: while the industry tended to view it as having limited effectiveness, it was argued in all the other interviews that it presented the only effective method for monitoring the landing obligation. There was broad support for the use of REM in the pelagic sector, with a key reservation the economic impact upon the operations of TR1 and TR2 vessels. This could be taken as suggestive evidence that REM represents an effective tool. In working to overcome the industry's distaste for REM, the general solution put forward was for the use of benefit schemes, tailored at a fleet to improve the security of operations under REM.

6.26 The interviews showed very little support for an observer scheme, with one fishing Association putting forward the option of a Reference Fleet Mechanism.

6.27 Strong support existed across the board for monitoring and enforcement mechanisms that can help foster a level-playing field at a European level.

6.28 At a Scottish national level, a consensus was that unless the landing obligation is perceived as being enforced from the get-go and that illegal discarding carries a high financial cost, it is unlikely that the behaviour changes required (compliance and more selective fishing) will be generated. The most comprehensive solution was for use of financial penalties and effective monitoring to associate a high cost with illegal discarding.

6.29 Creating a strong perception that the landing obligation is being effectively enforced may help in cultivating social and moral pressures that can affect individual and group behaviour.

Section 7. Bycatch Utilisation: Balancing the Incentives to Land

7.1 Policies encouraging the full utilisation of bycatch have been used in several countries operating a discard ban, in particular Iceland, New Zealand and the US North Pacific fisheries. The UK industry fears that as a result of the landing obligation, vessels will end up with a lot of species for which there is no demand. Policies designed to increase the utilisation of bycatch have the potential three-fold effect of assuaging this possibility, help to overcome the perceived wastefulness associated with discarding, and counteract the driver to discard species that have no or little commercial value. Ideally, fish that would have been discarded but that are now landed should be used for human consumption when they are above the MCRS. However, where this is not possible, the remaining discards should be directed towards the production of usable products.

Human Consumption

7.2 The development of new markets for the bycatch of less popular species can create an incentive to land catches that typically have low or no economic value or when their value is less than the opportunity cost of taking up limited hold space. Discarding of species that have a lack of market demand is reported by Borges (2013) as the main cause of discarding across Europe and accounts for one-third of discards by the English trawler fleet (Mangi and Catchpole 2012). Several national marketing programmes have been implemented to promote the sale of bycatch.

- Iceland operated a development programme alongside its discard ban with the objective of demonstrating to fishermen and the trade that markets existed for less valuable species and promoted these amongst consumers. A 'bycatch bank' was set up in 1989 that purchased blocks of non-commercial species from boats and arranged taste panels, promotion schemes and sales to restaurants. As a result, megrim, witch/pole dab and rough dab are now specific fisheries in Iceland and other species are caught and traded through normal channels.
- The DEFRA-funded project 'Fishing for the Markets' aims to increase the market sales of unfamiliar and less-popular fish caught by the English trawler fleet. The extent to which this sort of programme would be useful in Scotland depends on the extent to which discarding is caused by weak or absent demand for the less popular species.

7.3 A strong view amongst the majority of individuals interviewed was that the notion of the Scottish industry being forced to land catch that was not marketable and held little value was something of a red herring. In contrast, a perception of one PO was that the key issue was how the requirement to land previously discarded catches would affect the market, with a specific anxiety over the possibility of market gluts and the consequent effect upon price.

7.4 The landing obligation only applies to species with TACs, therefore if a species is caught for which no quota regime and TAC exists, it can still be discarded. In areas such as the North Sea, the issues regarding the landing obligation largely revolves around the requirement to land catches of species such as hake, saithe and cod. Most TAC species are easily marketable and the view of one academic was that the demand for fish was so strong that the additional landings would be met with

demand. Species such as dab, which have low market value could be the target of publicity campaigns to promote demand. The European Commission (2012) has stated that POs will receive funding for the marketing of new products. Rebranding campaigns such as the Chilean sea bass project can be successful. However, developing new markets for discarded species is rare and requires widespread changes to processing side as well as advertising and marketing campaigns.

7.5 One issue surrounding the need to land catches for commercial TAC species is that while the market for species such as cod can be filled with catches of lower value, consumer preferences for species such as saithe and hake may be more fickle. The likelihood that the market will be filled with less quality catches is a reality as fishermen will no longer be able to high-grade. This, therefore, suggests that fundamental changes will have to take place in terms of the buying of fish- both at fish markets, from processors and within retail.

Non-human Consumption

7.6 An alternative is to exploit possible channels for utilisation geared towards non-human consumption. Under the landing obligation, for all species under catch limits, MLS will be replaced by replaced by minimum conservation reference sizes (MCRS). Fish below the MCRS will have to be landed but the sale of catches below MCRS will be limited to uses other than human consumption. The conversion of discards not fit for human consumption into useful commodities falls into 6 categories:

- reduction to fishmeal and fish oil
- ensiling
- composting
- rendering
- freezing for use as bait
- Anaerobic digestion with energy recovery.

7.7 In Catchpole and Mangi's 2012 assessment of the potential for bycatch utilisation in the UK, the conversion of fish by-products into fishmeal, fish oil, animal feed and pet feed has been identified as the most promising route. These options reflect; the state of current infrastructure in the UK, an interest by the different processors to expand current and new business models, and the least cost options for the catching sector as these commercial outlets buy discards directly from the fishermen, thus channelling income direct to fishermen and removing the industry's need to dispose of landed discards. Ensiling, liquefied fish, has been identified as a potential use, with the major ensiling plants based in Scotland. 'Waste' operations, such as composting and anaerobic digestion, are considered the least desirable partly because the costs to the catching sector will be higher (median UK gate fees for composting are £43/tonne).

7.8 Fish sold to by-product processing companies receive a lower price in comparison to the markets for human consumption. In order to improve linkages between the catching sector and facilities processing bycatch for non-human consumption, the reduction of transaction costs should be encouraged. Investment to improve existing capacity, supply routes and local containment prior to collection will be needed. Uncertainty over future discard quantities limits planning at this

stage. From reviewing the distribution of processing facilities across Scotland, it is likely that new connections between these sectors will depend firstly on species, with shellfish not taken by ensiling plants, and location. The fishmeal producer United Fish Industries is located in Aberdeen, the ensiling firm Scanbio in Fort William and Rossyew, an animal, pet and aqua feed producer, is situated in Greenock.

7.9 The Northern Bluefin tuna is an example of a stock that was once taken as incidental catch and now operates as one of the world's most valuable yet heavily overexploited commercial stocks (Safina 1998). It is therefore important that incentives do not develop to purposefully target bycatch species as new markets develop and values increase. On account of the low price received when discards are used for non-human consumption, it can be assumed this is less of a risk with this option. However, the re-direction of discards towards non-human consumption could act as a disincentive to land and create compliance issues.

Section Summary

7.10 While discarding represents a wasteful practice, it is crucial that this practice is not shifted to land. There is sufficient scope to increase the prospects that less valuable and marketable species are used productively once landed.

7.11 Models of good practice in improving the marketability of less popular species are witnessed in the Iceland 'bycatch bank' and the DEFRA 'Fishing for the Market's scheme. In working to alter consumer attitudes to species such as saithe and hake, fundamental changes will be required at all supply levels.

7.12 While a general perception exists that fish should be used, where possible, for human consumption, research suggests there is scope to convert fish unsuitable for human consumption into useful commodities such as fishmeal, ensiling and bait. This is likely to require improvements and investment into improving the linkages between the catching and processing sectors.

Section 8. Conclusion

8.1 The remit of this paper was to provide a review of management options for the implementation of the landing obligation in Scotland. The evidence base for the report was produced from an analysis of available information regarding current best international practices concerned with bycatch and discarding reductions and from a series of key informant interviews with stakeholders and experts connected to the Scottish fishing industry. The paper provides evidence that amongst representatives of the Scottish fishing industry and key industry experts, considerable support exists for the use of innovation in implementing the landing obligation in Scotland.

8.2 Within the interviews, the management options that received support tended to work towards improving the alignment between quota holdings and catches and create social, economic and legal incentives for fishermen to adjust their behaviour and fish more selectively. A recurring theme was that the management rules regarding what happened to a catch governed by the landing obligation once it comes on board (specifically rules governing monitoring and enforcement and the extent of quota affordability and accessibility) will be key determinants of whether behavioural changes and a movement towards greater selectivity in fishing practices is realised. Greater selectivity is likely to come at a cost for individual fishermen; incentives and appropriate management mechanisms will be therefore be vital in insuring that at the margin the cost of adjustment is less than that of discarding or landing illegally. As Heath et al (2014) point out, while the use of management and legislative measures to improve selectivity will likely be technically and economically costly and challenging, forcing adjustments in fishermen's behaviour has the potential to deliver economic advantages alongside conservation gains through an increase in catch weight value.

8.3 In terms of the management options discussed, two were identified across the board as having high relevance to Scotland. The first concerned adjustment in the quota trading mechanisms both within Scotland and at a European level. An almost unanimous agreement existed across the participants that quota swapping, leasing and trading arrangements are beneficial as they work to correct inefficiencies within initial allocation. Nonetheless, a strong message was that the mechanisms for quota trading within Scotland and across Europe exhibit a high degree of information inefficiency and a lack of transparency. In terms of correcting this, the option that received greatest support was for the facilitation of online and real-time trading platforms.

8.4 Political and value-based attitudes were most commonly referred to as the key obstacles to facilitating greater transparency and tradability. Several interviewed suggested several ways in which these constraints could be lessened such as through the operation of quota transfer windows, greater information on where quota is held (as opposed to FQAs) and research into the catch compositions of national fleets and the point at which they encounter specific choke species. More than a few

pressed a general point that policies which attempt to free up and reduce the cost of quota leasing, and hence the cost of compliance, should be a priority.

8.5 Alongside support for changes to facilitate flexibility and transparency in the transfer of quota, evidence from the interviews uncovered strong support for adjustments to be made for how quota is managed, specifically for the TR1 and TR2 fleet. The option of pooling quota, either at a central government level or within POs in order to cover unavoidable catches, received a high level of support. The notion of the Government holding back a proportion of national quota holdings and managing this centrally was viewed as a pragmatic response by all but one interviewee, who preferred to see this solely as a role for the POs.

8.6 The application of international pooling systems in Scotland, or the extension of current unofficial PO pooling techniques, requires considerable future research in order to examine the managerial requirements required to mitigate issues such as free-riding. If this option was taken forward in any form, evidence from the operation of the US West Coast Whiting Pool, which has developed a highly effective internal management policy, provides a good starting point for the design of pooling systems within Scotland, in particular for POs. An outcome of the data provided by international fisheries managers is the potential for this management option to create incentives for behavioural change alongside the initial intention of creating a buffer to account for irregularities and uncertainty. In the US and Canada, where similar schemes have reported considerable success, social incentives and technology are used to compliment economic incentives to fish more selectivity and avoid unwanted catch and choke species. A key lesson Scotland could learn would be the design of carrot-and-stick access conditions that reward good behaviour related to both selectivity and compliance.

8.7 In relation to the issues of monitoring and enforcement, a strong consensus from the interviews was that effective controls were a prerequisite and that individuals had to associate a high financial risk with illegal landings and illegal discarding. This was vital for compliance and in creating conditions in which fishermen will make the crucial adjustments to fishing practices. From industry and non-industry representatives, the most common view was that Remote Electronic Monitoring (REM) is the only way to achieve effective monitoring. REM uses CCTV, hydraulic sensors VMS data to record hauling and sorting activities. Secondly, a strong argument was made from industry and non-industry contributors for a movement towards bottom-up management, most commonly through the ability of POs to exercise real-time powers to stop vessels going to sea if they held inadequate quota quantities or compositions.

8.8 Overall, the examination of international practices has proved formative in assessing the management options for implementing and management of the landing obligation in Scotland. However, a point to press is that the majority of countries operating discard and bycatch reduction strategies- notably Canada, the

US and New Zealand- all have relatively high levels of sovereignty regarding the design of fisheries policy and the control of national waters. In Europe, the situation is complicated by the shared management of stocks through the CFP. An issue that is likely to undermine efforts related to the creation of a real and perceived level playing field as to how the landing obligation is implemented, enforced and observed across the various Member States.

8.9 Looking forward, what can be advocated based upon the attitudes and perceptions garnered within this report is for Scotland to build upon the precedent set in other EU Member States, such as Denmark, in order to create a platform for effective and innovative behavioural change at European and regional level.

Bibliography

- Arnason, R. "On catch discarding in fisheries." *Marine Resource Economics* 9 (1994): 189–207.
- Baudron and Fernandes. "Adverse consequences of stock recovery: European hake, a new "choke" species under a discard ban?" *Fish and Fisheries*, 2014
- Borges, L. "The evolution of a discard policy in Europe." *Fish and Fisheries* October 2013
- Boyce, JAR. "An economic analysis of the fisheries bycatch problem." *Journal of Environmental Economics and Management* 31(1996):314–336.
- Catchpole, T.L., et al. "Using inferred drivers of discarding behaviour to evaluate discarding mitigation measures." *ICES Journal of Marine Science* (2013)
- Catchpole, T.L., et al. "Discarding in the English north-east Nephrops norvegicus fishery: the role of social and environmental factors." *Fisheries Research* 72 (2005):45-54
- Catchpole, T.L., Frid, C.L.J, and T. S. Gray. "Discards in North Sea fisheries: causes, consequences and solutions." *Marine Policy* 29/5 (2005):421-430
- Cefas. *The English North Sea Catch-Quota pilot scheme- Using REM as a verification too*. Final Report, July (2011)
- Clucas, Ivor. *A Study of the Options for Utilisation of Bycatch and Discards from Marine Capture Fisheries*. FAO Fisheries Circular, No.928 FIIU/C928. Rome: FAO, 1997.
- Condie, H.M., Catchpole, T. L., and Grant, A. "Reducing discard and unwanted catch; the impact of catch quotas and a discard ban on English North Sea other trawlers." *ICES Journal of Marine Science* (2013)
- Coelho et al. "Rights Based Management and the Reform of the Common Fisheries Policy: The Debate." *International Journal of Latest Trends in Finance & Economic Sciences* 1/1 2011: 16-22
- Condie., Catchpole, T.L., and A. Grant. "The short-term impacts of implementing catch quotas and a discard ban on English North Sea otter trawlers." *ICES Journal of Marine Science*, Nov 2013
- Crean, K., and Symes, D. "The discard problem: Towards a European solution." *Marine Policy* 18 (1994):422-434
- Dalskov et al., Danish Catch Quota Management trials- application and results. Danish AgriFish Agency. 2012
- Diamon, S.L. "Bycatch quotas in the Gulf of Mexico shrimp trawl fishery: can they work?" *Reviews in Fish Biology and Fisheries* 14 (2004):207-237

Diamond, D. and Beukers-Stewart, B, D. "Fisheries Discards in the North Sea: Waste of Resources or a Necessary Evil?" *Reviews in Fisheries Science* 19/3 (2011):231-245

European Commission. *Impact Assessment of Discard Reducing Policies*. Final Draft Report. (June 2011a)

European Commission. *Impact Assessment of Discard Reducing Policies: Case Study Annex*. (March, 2011b)

European Commission. CFP reform – the discard ban. Available: http://ec.europa.eu/fisheries/reform/docs/discards_en.pdf. 2012

Fort Bragg Groundfish Association. *Fort Bragg- Central Coast Risk Pool*. Summary Report, 2011. <http://www.morrobaycommunityquotafund.org/wp-content/uploads/2012/10/CCSGA-FBGA-TNC-Public-Risk-Pool-Report.pdf>

Gezelius, S. "Management response to the problem of incidental catch in fishing: A comparative analysis of the EU, Norway and the Faeroe Islands." *Marine Policy* 28 (2008): 360-368

Gillman, E., Passfield, K. and Katrina Nakamura. *Performance Assessment of Bycatch and Discards Government by Regional Fisheries Management Organizations*. IUCN: Switzerland, 2012

Hall, Stephen, J. "Managing bycatch and discards: how much progress are we making and how can we do better?" *Fish and Fisheries* 5 (2005): 134-155

Hatcher, Aaron. "Implications of a Discard Ban in Multispecies Quota Fisheries." *Environmental Resource Economics* Sept (2013)

Heath, Michael R., Robin M. Cook, Angus I. Cameron, David J. Morris and Douglas C. Speirs. "Cascading ecological effects of eliminating fishery discards" *Nature Communications* 5/3893 (2014)

Holland, D.S, and Jason E. Jannot. "Bycatch risk pools for the US west Coast Groundfish Fishery." *Ecological Economics* 78 (2012): 132-147

Isaksen, Bjornar. *The Norwegian approach to reduce bycatch and avoid discard*. Institute of Marine Research, Bergen Norway. FAO library: 377555.

Jacquet, J.L. and D. Pauly. "The rise of seafood awareness campaigns in an era of collapsing fisheries." *Marine Policy* 31/3 (2007):308-313

Jensen, L. S, Koebbe, J, and Keith R. Criddle. *Pooled and Individual Bycatch Quotas: Exploring Tradeoffs Between Observer Coverage Levels, Bycatch Frequency, Pool Size and the Precision of Bycatch Estimates*. Economic Research Institute Study Papers, Utah State University, 2004.

Keller, K. *Discards in the world's marine fisheries. An update*. Rome: FAO, 2005

MRAG. *Towards sustainable fisheries management: International examples of innovation*. MRAG (2010)

North Sea Advisory Committee. *The Use of Bycatch Quotas- The North Sea as a Case Study*. Final Draft, 11 October 2007. Available: http://nsrac.org/wp-content/uploads/2009/08/wp02_wd20080923_WWF_Bycatch_Quota_Paper.pdf

Pascoe, S. *Bycatch management and the economics of discarding*. FAO Fisheries Technical Paper 370, Rome: FAO, 1997

Pascoe, S, et al., "Use of Incentive-Based Management Systems to Limit Bycatch and Discarding." *International Review of Environmental and Resource Economics* 4 (2010): 123-161

Petter, Jahn and Soren Eliassen. "Solving complex fisheries management problems: What the EU can learn from the Nordic experiences of reduction of discards." *Marine Policy* 35/2, 2011: 130-139

Pinkerton, E and Danielle N. Edwards. "*The elephant in the room: The hidden costs of leasing individual transferable fishing quotas*." *Marine Policy* 33/4 (2009):707-713

Poseidon Aquatic Resource Management LTD. *A study review of the potential impact of proposed CFP discard reform*. Final Report, October 2013

Teisli, M, F., Roe, B., and Robert L. Hicks. "Can Eco-Labels Tune a Market? Evidence from Dolphin-Safe Labelling." *Journal of Environmental Economic and Management* 43/3 (2002):339-359

SeaFish, "Discards- new developments 2009" Available: http://www.seafish.org/media/Publications/Discards_NewDevelopments_2009.pdf

Sanchirico, James N, Daniel Holland, Kathryn Quigley and Mark Fina. "Catch-quota balancing in multispecies individual fishing quotas" *Marine Policy* 30/6 (2006):767-766

Semmens, K A. *Buffering Uncertainty: Setting Annual Catch Limits Under the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006*. ProQuest, UMI Dissertation Publishing 2012

Shotton, R, Case studies on the allocation of transferable quota rights in fisheries. FAO Fisheries Technical Paper 411. Rome: FAO, 2001.

Scientific, Technical and Economic Committee for Fisheries (STECF) – Landing Obligation in EU Fisheries - part II (STECF-14-01). 2014. Publications Office of the European Union, Luxembourg, EUR 26551 EN, JRC 88869

Walker, Scott and Ralph Townsend. Economic analysis of New Zealand's Deemed Value System. IIFET 2008 Vietnam Proceedings

Wang, Jin. Modelling deemed value catch balancing regime in New Zealand multi-species fishery. The University of Auckland, 2009. Available: https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=NZAE2007&paper_id=31

Witherall, D. Pautzke, C., Fluharty, D. "An Ecosystem Based Approach for Alaska Groundfish fisheries." *ICES Journal of Marine Science* 57(2000): 771-777

Valdemarsen, J.M., and O. Nakken. *Discard in Norwegian fisheries. Workshop on Discards in Nordic Fisheries*, 18-20 November, Sophienberg, Solt, Rungsted, Denmark 2002.

Annex 1: Overview of Management Options Identified

Management Options	Objective/Outcome	Country Example	Strengths	Weaknesses/Limitations
Government Controlled Buffer Zone	Allow vessels to access quota for incidental over-quota catches	Denmark, United States	<ul style="list-style-type: none"> • Value of additional quota held at point of use • Tool to cover uncertainty and variability with catches • Can be used as incentive for REM • Can work to protect individual holdings • Allows vessels to stay at sea for longer • Access rules can be designed to change behaviour (increased selectivity) 	<ul style="list-style-type: none"> • Open-Access Issues • Administrative role for government • Industry may not want a high proportion of quota held centrally • Might be more efficient for industry to manage this type of pooling system
Deemed Value Payment for Over-quota catches	Mitigate open-access conditions in quota pooling systems	New Zealand	<ul style="list-style-type: none"> • Can be set to incentivise the purchase of quota before use of pooled quota and to land over-quota catch • Ramping rates can be set to protect critical choke species • Revenue used to promote selectivity and research 	<ul style="list-style-type: none"> • Requires information regarding quota prices cost structure of industry and landings price • Would require changes to quota trading mechanisms to produce information on quota prices • Practical issues in setting the right levy price
Withhold the Economic Use of the Catch	Mitigate open-access conditions in quota pooling systems	Iceland	<ul style="list-style-type: none"> • Creates disincentives to use quota pool • Revenue used to promote selectivity and research 	<ul style="list-style-type: none"> • Requires information on variable costs of vessels

Management Options	Objective/Outcome	Country Example	Strengths	Weaknesses/Limitations
Renegotiate TAC Allocations	Improve alignment between quota holdings and catch compositions		<ul style="list-style-type: none"> • Potential beneficial impact upon overcapacity at EU level • MS holdings more accurately reflect current patterns of abundance and distribution 	<ul style="list-style-type: none"> • Long-run objective • Likely to be politically arduous and lengthy process • Scotland likely to be net loser
European/Regional Open Trading Platform	Improve alignment between quota holdings and catch compositions		<ul style="list-style-type: none"> • Increase international quota swapping • Improve information and efficiency or current mechanisms 	<ul style="list-style-type: none"> • Political fear of Scottish quota leaving Scotland • Requires collective action and consent at EU level
Retrospective balancing	Allow fleet to cover incidental catches	New Zealand	<ul style="list-style-type: none"> • Promotes compliance • Helps vessels access cover incidental catches 	<ul style="list-style-type: none"> • Required changes to quota trading arrangements •
Online real-time public trading platform in Scotland	Improve quota trading mechanisms, improve alignment between quota holdings and catch compositions, allow fleet to cover incidental catches	Canada, Denmark, US, New Zealand, Iceland	<ul style="list-style-type: none"> • Promotes compliance • Helps vessels access additional quota • Improves information and efficiency of trades • Can be designed to prevent concentration of quota holdings • Potential to reduce leasing costs 	<ul style="list-style-type: none"> • Requires changes to quota management • May promote concentration of fleet
Allow FQAs to be sold as small units	Improve alignment between quota holdings and catch compositions	New Zealand	<ul style="list-style-type: none"> • Allows vessels to hold quota portfolios that more accurately reflect true catch • Wider socio-economic benefits (new entry) 	<ul style="list-style-type: none"> • Potential to change ownership structure of fleet with uncertain consequences

Management Options	Objective/Outcome	Country Example	Strengths	Weaknesses/Limitations
PO managed Risk Pools for Choke Species Quota	Allow fleet to cover incidental catches	Denmark, Canada, US	<ul style="list-style-type: none"> • May be more effective than Government buffer Zone • Create downward pressure upon catching choke species • Can be designed to incentivise behaviour changes (greater selectivity) 	<ul style="list-style-type: none"> • Administrative burden for POs • May undermine the quota investments of some • Enforcement issues for POs • Open-access issues have to be addressed
Demonstrating the Right to Catch	Enforcement of the discard ban		<ul style="list-style-type: none"> • Additional powers to POs to enforce ban • Bottom-up enforcement often increases legitimacy 	<ul style="list-style-type: none"> • May not be practical given licences changes • Political objection to giving POs this power
Mixed Fisheries Management TAC/Quota Regime	Improve alignment between quota holdings and catch compositions		<ul style="list-style-type: none"> • Gives fishers more control over their catches • Quota regime more accurately reflects distribution and abundance of stocks 	<ul style="list-style-type: none"> • Control over single species los • Practical application far off- highly theoretical
Remote Electronic Monitoring	Monitoring and Enforcement	Denmark, US, Canada	<ul style="list-style-type: none"> • Most effective method for full control • Aids compliance • No great effect on pelagic fleet • Can be used to provide evidence for the removal of additional regulations (DAS) • Potential for level playing field within Scotland 	<ul style="list-style-type: none"> • Likely to expose demersal fleet to risk of bankruptcy/reduction in operations • Political contentious • Issues with creating level playing field across Europe

Management Options	Objective/Outcome	Country Example	Strengths	Weaknesses/Limitations
Observer Programmes	Monitoring and Enforcement	US, Canada, Norway	<ul style="list-style-type: none"> • More acceptable to some in industry 	<ul style="list-style-type: none"> • Unlikely to be effective • High cost and administration
Reference Fleets	Monitoring and Enforcement		<ul style="list-style-type: none"> • More acceptable to some in industry • Less costly than observers 	<ul style="list-style-type: none"> • Reactive to bad behaviour • Room for illegal discarding to continue • No level- playing field
High financial penalties for illegal discarding	Enforcement	Iceland, US, New Zealand	<ul style="list-style-type: none"> • Incentives for compliance • Incentives for greater selectivity 	<ul style="list-style-type: none"> • Reduce operations of some vessels
Increase demand for low value species	Utilize bycatch	Iceland, US	<ul style="list-style-type: none"> • Increase prices for low value fish • Aids compliance- incentive to land • Greater utilisation of resources- less waste 	<ul style="list-style-type: none"> • Could create incentive to target fish and overexploited • Development of new markets rare
Use bycatch for non-human consumption	Utilize bycatch	New Zealand, US, Canada, Denmark	<ul style="list-style-type: none"> • Greater utilisation of resources- less waste • Fishermen receive better price for bycatch • Aids compliance- incentives to land 	<ul style="list-style-type: none"> • Could create incentives to target new species

Annex 2: Interview General Questions Grid

Allocation/Management of the Uplift
In terms of managing any up-lift, what do you think the key objective should be?
What do you foresee as the best way to achieve this? i.e. allocate out to individuals or create mechanisms for POs or Government to manage some quota centrally?
What criteria for individual/PO allocations?
In terms of a Government Buffer Pool, what do you perceive as the draw backs/obstacles to this? What are the benefits? How do you see this operating in practice?
What do you foresee as the policy solution to mitigating free-rider and open-access concerns when pooling quota?

Quota Management
What changes do you think need to happen within Scotland to facilitate the landing obligation?
What role do you see for improvements in trading? How do you see this operating? What are the obstacles/benefits?
In relation to pooling systems, what is your knowledge regarding current examples of this in Scotland?
In relation to Risk Pools, do you believe they are relevant to the Scottish situation? What do they have to offer? What are the obstacles? At what level should they be managed? For what species?
What internal management mechanisms do you see as most appropriate?
What monitoring and enforcement mechanisms needed to support this?

Monitoring and Enforcement?
How crucial to do you think adequate monitoring and enforcement will be for facilitating the ban?
How much freedom does Scottish policy have in terms of designing enforcement measures? How much steer has been given by EC?
What do you think will be required to facilitate adequate m/e? /From your experience, what would be an adequate monitoring/e system?
What is your opinion of use of observers? CCTV and REM? How would these work in practice?

Bycatch Utilisation
To what extent do you think that the issues raised regarding the requirement to land all species (depressed market prices, species with no value) will be realised?

Annex 3: Overview of Key Points from Interviews

	International Quota Swapping	Government Buffer Zone	Increased tradability	Risk Pools	Monitoring and Enforcement	Bycatch issues
Academic 1	Room for improvements- better arrangements for exchange needed but obstacles often political		Any improvements in trading help – Danish system good example of what can be achieved		CCTV best option but need to level playing field.	
Academic 2	Renegotiating relative stability unlikely – best way improve trading mechanisms. Supports online trading/centralised information.	Better to operate at PO level- need to remove economic incentive to target pool. Tax and withhold profit.	Improving internal leasing key- increased tradability do no harm. Need to make it more efficient, transparent to help with leasing. Improving quota trading and management key for compliance. Move towards open public trading.	Risks pools fine only if strong economic measures in place- tax (deemed values) can be effective but very hard to set	Make selective gear mandatory- needs to be monitored. Only option CCTV and observers- CCTV more effective as it. Need to place a high cost on illegal discarding- CCTVs achieve this.	
Academic 3	Room for improvement- facilitation of better market mechanisms good here (i.e. transparency and information)	Better run by POs	POs should work any pooling mechanisms. Strong role for greater tradability of quotas.	Quota should be given to POs to manage if any pooling is in operation- POs most effective for this	CCTV best option.	

Government Agency	Current arrangements inefficient- lack of information key problem. Need greater transparency (regarding MS mixed catches and choke species) to open up MS willingness to trade. Movement away from Relative Stability increasingly likely. Support online trading/centralised information.	Strongly agreed. Need to remove incentive to catch.		Risks Pools run by industry fine- but not 100% of quota- some ring fenced for government control.	CCTV only way to effectively manage and enforce discard ban. Need better transparency at EU level regarding enforcement to generate level-playing field	Most over-quota catch easily marketable. Fundamental issue with NS hake, saithe and cod- catching too many of big sizes.
Industry-related body	Clunky, slow cumbersome- answer (theoretically) is to create a market/quota exchange here, issue is with political limitations. Supports online trading/centralised information.	Support	Option under concordat for SG to make fishing rights really strong. Increase security and tradability vital to LO. Supports online trading platform		Demonstrate right to go to sea before leaving harbour- demonstrate sufficient quota. Need carrot and stick approach- use CCTV but get rid of rest of controls (effort and gear)	Idea of problems of weird and wonderful species- red herring. LO applies to species with TACs, in most cases market for species to be landed.
Industry-related body	Depends upon drawing up or Regional discard plans- create quota trading/exchange place at regional sea basin level. Need to understand choke species problems across all EU fleets Supports online trading/centralised information.	Support in short-run. In the long-run, not a great idea but given time constraints- practical approach.	Current quota management cannot go on as it is- need to improve trading mechanisms. Supports online trading platform.	Issue is the POs are not collaborative but competitive. Need strong economic control/depends on the stock.	Demonstrate right to go to sea before leaving harbour- demonstrate sufficient quota	

Industry PO 1	Supports notion of more efficient trading/ centralised information mechanisms but pessimistic of impact- other not want to swap.	Supports notion of proportion of quota held centrally but needs strong internal measures	Need to reduce pressure on lease costs vital. Supports online trading.	ok for minor species- never accepted for major species such as hake.	Demonstrate right to go to sea before leaving harbour- demonstrate sufficient quota More powers to POs	Fear of undermining the markets - reduce price.
Industry PO 2	Anxiety over transparency at EU level for swaps- undermine current agreements	Yes to government pool but needs to be allocated to individuals and ring fenced for their use.	Either a pooling system or ITQ works- the current intermediate does not.		POs want ability to vary licences and stop vessels going to sea on a real-time basis.	
Industry PO 3	Supports online trading system for Europe but information not a problem.		Improve tradability key in fixing initial inefficient allocations from FQA system- supports online trading platforms.	Pooling systems don't work.	POs need more powers to control members.	
Industry FA 1	System adequate- want 'use it or lose it' provisions built in Trading platform good idea but quota ownership/management mechanisms differ too much across Europe.	Supports some notion of buffer pool – against top slicing to create this.	Industry pushed for trading platform for years- government who has resisted. Help with quota leasing- leasing a good thing, high price is not. Real-time swapping key for LO. Govt not got appetite for this. Want 'use it or lose it' rules within a transfer window and other triggers to stop market heating up at end of year.	Risk Pools for lower end species fine. Not for hake and cod.	CCTV vital- if not members openly admit if not being monitored will continue discarding. Govt needs to give POs more powers to have real-time effect to stop vessels misbehaving.	

Industry FA 2	Visible long term solution is trade- ITQs at European-level theoretical solution to this. Not going to improve international allocation unless some things given up- can see a movement away from RS as a partial solution.		Trade is the solution.			
NGO	Improved efficiency key- supports online trading, greater transparency.	Strongly supports	Increased tradability vital- Online trading platform vital to ease up quota leasing issues	Risk pools for some species.	CCTV vital.	
International Fisheries Manager 1	Ease of quota trading key to correct initial inefficiencies in allocation		Ease of quota trading key to correct initial inefficiencies in allocation	Risk Pools have a potential role to play in managing bycatch and choke species- hugely successful elsewhere	CCTV vital. When observers used- need 100% coverage- expensive. When used, state funding required- when state funding pulled, industry want CCTV.	
International Fisheries Manager 2	Flexible international trading key- European ITQs not in short-run, so need to correct inefficiencies now	Supportive of Government buffer zones (can be used to meet several objectives)	Public online trading platforms supported for across Europe.	Risk pools highly successful- Denmark referenced as a model for private operations between fishermen or POs	CCTV most effective, issue is political will.	

International Fisheries Manager 3			Trading vital tool in aligning quota with catches- ITQ best. Online trading good	Risks Pools supported- evidence of success from West Coast and Whiting fishery	Same as International Manager 1:. When observers used- need 100% coverage- expensive. When used, state funding required- when state funding pulled, industry want CCTV. CCTV most effective. Compliance is crucial- need to know what is being caught	
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