Countering a climate of instability: The future of relative stability under the Common Fisheries Policy

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Abstract

European fisheries are at a critical juncture. The confluence of political change and environmental change, along with the challenges of past Common Fisheries Policy reforms such as the landing obligation, creates a once in a generation opportunity for a paradigm shift in fisheries management in the region. This paper sets out a series of arguments for why the status quo situation for the governance of European Union fisheries, especially for shared Northeast Atlantic fisheries is very likely unsustainable under these new circumstances. At stake is confidence in, and support for the management of the regions shared fisheries, the economic viability of fisheries and sustainability of stocks. Brexit is an additional incentive to unlock the potential of existing, but little used mechanisms within the Common Fisheries Policy to allow the reimagining of fisheries management and governance in the Northeast Atlantic. Three of these tools and mechanisms are (1) Quota swapping, (2) Article 16 quota uplift provisions; (3) and Article 15 flexibility mechanisms. These mechanisms can be adopted by individual Member States for fleets in their waters or in the case of quota swapping be applied across Member States and may help stabilize fisheries under these stressors.

Keywords: Common Fisheries Policy, relative stability, climate change, landing obligation, Brexit.

Introduction

Climate-driven changes in stock range and distribution are already unfolding in many places around the globe. Projections in terms of fisheries suggest that if the 'business as usual' scenario continues, more than 800 species of marine fish and invertebrates are expected to shift towards the poles 65 percent faster than if the low-emission scenario of two degrees Celsius is achieved (Gattuso et al., 2015). Countries in northern Europe are already feeling this change acutely as commercially important species like mackerel move north, following the changed habitat of its food sources of phytoplankton and zooplankton. In fact, mackerel, as well as other important commercial fish species like cod, capelin and haddock, are present to one extent or another as far north as the waters of the Svalbard archipelago (Berge et al., 2015; Brander et al. 2003; Haug et al., 2017; Svenning et al., 2015).

Yet the European Union (EU) often struggles to apply available policy and fisheries governance instruments to handle this change effectively. Its system for allocating quota has not changed substantially in 30 years. Changes in fisheries governance are urgently needed, and not just because of climate change. Brexit (the departure of the United Kingdom from the European Union) will very likely require renegotiating long-standing quota agreements and will fundamentally change the ways in which fisheries in the Northeast Atlantic will be governed (Phillipson and Symes, 2018; McAngus et al., 2018). Existing rules and regulations followed by

all Member States (such as relative stability and associated stability keys, which set out the proportion of each year's total allowable catch (TAC) to the Member States) will need to be renegotiated with an independent United Kingdom (UK). Practices such as quota swaps across borders will also be impacted by the loss of the EU's third largest fishing nation. This effect of Brexit will be nothing short of the remaking of fisheries management and governance in the Northeast Atlantic in general, and for the EU specifically. Nevertheless, despite increasing Member State concerns about species range shifts from climate change or expansion due to stock recovery, policy efforts are piecemeal and uncoordinated. When adding in Brexit, the uncertainties for EU fisheries in the future are further exacerbated. Policy changes need to address both shifting distributions in stocks and Brexit to be effective.

This paper sets out a series of arguments on why the status quo situation for the governance of European fisheries, especially shared Northeast Atlantic fisheries is very likely unsustainable under these new circumstances. It begins by outlining the Common Fisheries Policy's (CFP) relative stability principle and associated relative stability keys. It documents recent CFP reforms and makes the case that the nexus of the CFPs landing obligation (a ban on discards), the emergence of choke species (where insufficient quota for some species prevents vessels from catching their quota for other species), and climate change induced shifts in species distribution mean the capacity of EU practices to cope with change has been, or soon will be, exceeded. The implications of Brexit are explored, not only for relative stability and the CFP, but for the management and governance of Northeast Atlantic fisheries more generally. The paper then describes options and opportunities to work within and to amend relative stability keys to address these multiple challenges to the Common Fisheries Policy.

The Common Fisheries Policy and relative stability

European fisheries are a classic example of an international fishery with many straddling stocks and a few highly migratory fish stocks. The CFP was introduced in 1983 to deal with complexities of managing the shared fisheries of EU Member States. Scientifically determined total allowable catches (TACs) are one of the main regulatory mechanisms of the CFP and are set annually for most fish stocks by the Council of fisheries ministers on advice from International Council for the Exploration of the Sea (ICES) and political negotiations among member states (Carpenter et al., 2016; Hoefnagel et al., 2015). These TACs are intended to ensure sustainable fisheries while extracting as much of the resource as possible (Carpenter et al., 2016). For stocks that are shared and jointly managed with non-EU countries (especially Norway, Faroe Islands and Iceland, and potentially in the future, the UK), TACs are agreed upon bilaterally for fixed time periods. The relative roles of political negotiation and science in setting TACs is a point of contention between the European Commission, Member States, the fishing industry and environmental NGOs.

The allocation of a secure share of the TACs between Member States is central to the functioning of the CFP. Member States are allocated a fixed share of the TACs as national quotas (Lado, 2016; Symes, 2012) and this fixed percentage is known as the relative stability key and varies depending on the stock/species in question (Hoefnagel et al., 2015; Lado, 2016; Sobrino and Sobrido, 2017). The original TAC allocations in 1983 were based on three elements: (1) Historical catches by Member States; (2) losses of fishing opportunities due to the extension of fisheries jurisdiction by coastal countries in the 1970s; and (3) the special needs of coastal

communities with a strong dependence on the fisheries sector. The UK and Ireland also negotiated the "Hague Preferences."(Sobrino and Sobrido, 2017) whereby they accepted lower quotas than they desired in return for a mechanism to ensure that if TACs were low, they would have a preference to catch them, despite the allocation keys under the basic relative stability keys. The original three allocation elements have not been fully applied since 1983. In fact, new relative stability keys for the accession of new Member States and new stocks have been based on historical catches only, although the way in which historical catches have been calculated has varied considerably (Lado, 2016).

There are some instances where allocation keys have been modified to adapt to changing circumstances, though. For example, the revision of Baltic Sea cod keys following advice from ICES that cod stock was in fact two separate biological stocks led to new allocation keys being agreed upon by consensus amongst the Member States concerned. Also, changes were made to the allocation keys for the Northeast Atlantic blue whiting to maximize fishing opportunities under a new management regime adopted in 2005 involving non-EU "third" countries. The fishing opportunities allocated to Member States under relative stability could not be effectively exploited under the new management regime and the Member States reached a political agreement to revise the relative stability key to make allocations consistent with real fishing patterns. These two examples show that, if necessary and when forced by external factors, the Member States can agree to modify relative stability keys for specific stocks to make them consistent with fishing activity (Lado, 2016). These examples demonstrate a relative level of flexibility that may prove critical under the effects of climatic stressors, as well as the impending effects of losing the UK fishing grounds under Brexit.

CFP reform and emerging challenges to relative stability

In 2013, the CFP underwent a reform to address fisheries management challenges caused by changing social, economic and environmental conditions in EU fisheries, which will have implications for how it handles future challenge. The challenges that led to this reform have been extensively documented (Andersen et al., 2009; Carpenter et al., 2016; Khalilian et al., 2010; Laxe, 2010; Lado, 2016; Symes, 2012), and a series of major reforms were proposed to address them. No changes were made directly to the principle of relative stability or to the relative stability keys, though, and this omission may be critical when it comes to how future changes in fish stock distribution are handled. One of the reforms, though, the creation of the landing obligation, particularly impacts the alignment of TAC allocations with actual harvests by Member State and has as such implications for the future of the relative stability keys. We therefore focus on this CFP reform specifically and relate it to the emerging and actual implications of climatic stressors and Brexit in the same areas and the likelihood that this may undermine the basic principle of relative stability under the CFP. In this context the emerging and actual issues that will be discussed are (1) the EU landing obligation in general; (2) the importance of choke species within this context; (3) managing for climate change and stock range shifts.

The EU landing obligation

The landing obligation (European Commission, 2013) is mandatory for all species subject to TAC limits and Minimum Conservation reference sizes in the Mediterranean and was phased in from 2015 to 2019. The landing obligation was created because the CFP had been criticized for

enabling the discarding of unwanted catch or undersized fish in EU fisheries (De Vos et al., 2016; Uhlmann et al., 2019; Veiga et al., 2016). Elevated discard levels in the EU prior to its ban occurred for variety of reasons (Lado, 2016) including:

- Economic, in terms of retaining on board only the most valuable fish;
- Legal, such as the requirement to discard undersized fish and over-quota catch; and
- Unintended consequences of national quota allocation mechanisms where many vessels did not have quotas for stocks they caught even if their Member States still had sufficient quota.

No matter the reasons for discarding, the landing obligation reduces the practice of discarding and "*encourage[s] fishers to internalize the costs of catching unwanted fish and motivate[s] them to avoid unwanted catch, for example by altering their fishing practices*." (European Commission, 2013). In practice, the landing obligation is less comprehensive than the intent of the 2013 legislation (Stockhausen, 2019). From 2015 to 2018 the European Commission has adopted over 15 'discard plans' under delegated acts (European Commission, 2019). These plans identify fisheries and species entering the landing obligations and applicable exemptions by sea area for a period of three years. Species can be exempted from the landing obligation on the basis that they may survive after returning them to the sea, or the provision of a specific *de minimis* discard allowance (less than 5%) under certain conditions. Borges and Lado (2019, p.35) comment that:

> *Although the discard plans were originally planned as an intermediate legislative measure to be substituted gradually by the agreed multiannual management plans in each sea basin, these are now well-established legislative procedures that*

continue to be adopted and amended regardless of the adoption of a corresponding multiannual plan.

The impact of choke species

One unintended consequence of the landing obligation for the commercial fishers throughout Europe is the possibility of early fishery closures due to 'choke species.' Choke species are defined as fish stocks where catch entitlements are in such short supply that catching them can bring about an early end to fishing due to quota exhaustion (Hoff et al., 2019; Lado, 2016; Mortensen et al., 2018; Schrope, 2010). Choke species are particularly problematic in European waters because of the mixed stock nature of many fisheries. Under these circumstances, once fishers meet the TAC for the choke species, they are required to end their fishing operations and return to shore. Choke species may be unavoidable when catches exceed biologically determined TACs. However, catches could also be under the TAC, but the relative stability key for that stock may not match catches by a Member State's fleet. In this case, the fleet may not have access to quota to cover the catch, even though the TAC for the stock has not been exceeded. In other circumstances, a Member State may have sufficient quota under relative stability, but not have effective and/or timely or mechanisms for transferring that quota to fleets or vessels who have insufficient quota (Lado, 2016). Prior to the landing obligation, these circumstances would have led to discarding, ensuring that the fishers did not face the economic consequences of choke species.

Due in part to choke species, Condie et al., (2014) estimated that potential first year revenue losses in the North Sea demersal finfish fleets could average 31% in the first year of the landing

obligation. This would fall to a 15% mean loss by the third year of the discard ban. They also found the potential for variability in revenue changes between fleets, depending on whether the primary stock targeted by a fleet had the most limiting catch quota and the rate at which it is caught relative to other stocks (Condie et al., 2014). Veiga et al. (2016) explored the likely social cost (associated with increased labour intensity and potential creation of black markets for small scale fisheries catch) and economic cost (increased labour and storage costs and potentially reduced revenues for retained non-target species) impacts of the landing obligation to the EU's small-scale fisheries. They concluded that the long- term impacts are unpredictable while the short to medium term social economic and ecological costs in small scale fisheries are likely to be greater than the benefits of the landing obligation. Hoff et al., 2019 (p. 125) write that:

> *The choke issue could be more severe for stocks managed by non-transferable quota shares such as in France and Spain. Although long-term profits are expected to increase, some vessel businesses may not have the financial resources to overcome the severe economic losses predicted during the first years of implementation.*

Management consequences of changes in fish stock distribution

The significance of changes in climate on Northeast Atlantic fish species distribution and its implications for fisheries management is demonstrated by the North Atlantic mackerel (*Scomber scombrus*) wars (Hannesson, 2013; Jensen et al., 2015; Spijkers and Boonstra, 2017; Spijkers et al. 2018). Until 2009, a coalition and agreement existed among the EU, Norway, Iceland and the Faroe Islands over agreed TACs for mackerel in the Northeast Atlantic. In 2010, although the EU and Norway bilaterally agreed to TACs, they were not prepared to relinquish quota entitlements under a different allocation key in recognition of the increased numbers of mackerel

207 in Faroese and Icelandic waters (ICES 2016). The increased presence of mackerel created the
208 incentive for Iceland and the Faroes to set unilateral quotas. Iceland and the Faroe Islands
209 increased their catches and effectively exited the agreement . The failure to reach agreement over
210 the management of the stock led to the withdrawal of MSC certification for the mackerel fishery
211 in 2012 (recertification for some of the fishery occurred in 2016). ICES evaluated management
212 plan options for the mackerel fishery in 2017 following a request from Norway, the EU, and the
213 Faroe Islands (ICES, 2017). Although there is no management strategy for mackerel agreed by
214 all parties involved in the mackerel fishery, Norway, the EU, and Faroes have agreed an
215 arrangement for a long-term management strategy for mackerel (Anon, 2017). Iceland and
216 Greenland continue to set unilateral TACs (ICES, 2016).
217
218 The unintended consequences of policies such as the landing obligation are additionally
219 amplified when the TAC allocation for a stock is mismatched with the changing distribution and
220 hence catch of a stock. Baudron and Fernandes (2015) and Staby et al., (2018) describe the
221 increasing abundance of common hake (*Merluccius merluccius*) in the North Sea. They note that
222 range expansion and population increase pose management challenges. Baudron and Fernandes
223 (2015) describe how expansion could lead to the closure of a valuable demersal fishery for cod,
224 haddock and whiting. This is because the TAC for hake in this area is very small compared to
225 other species since it was scarce when relative stability keys were established using a reference
226 period in the 1970s. With a discard ban and no, or limited, means of acquiring quota to cover
227 catch, the fishery could be closed once the small hake quota is taken, and fishers will be unable
228 to catch other species even though their quotas will not have been reached. Hake are now
229 included in the multispecies models that provide predation mortality for the North Sea single-

species stock assessments better informing management (Staby et al., 2018).

This change in distribution pattern of a commercial fish species is not unique, however. Ongoing research shows that the distribution of fish stocks in Europe's waters and impacts on EU Member States fisheries will continue throughout the 21st century and be a major destabilizing factor in the management of Europe's international fisheries (Arnason, 2012; Brander et al., 2003; Fernandes et al., 2017; Mullon et al., 2016). A report by ICES (2016) conducted at the request of the European Commission, explored distributional shifts in fish stocks that may have taken place since 1985 in relation to TAC management areas. Twenty-one species were reviewed and 16 were found to have some changes in their distribution. Eight species, anchovy, cod, hake, herring, mackerel, plaice, horse mackerel, and common sole, were found to have substantial changes in distribution between TAC management areas or into areas not presently covered by TACs. A further eight species (anglerfish (two species), blue whiting, megrim (one species), sprat, whiting, haddock, and saithe, also demonstrated changes in distribution, but these did not affect proportions with TAC management areas. For all 16 species demonstrating changes in distribution, environmental conditions, especially temperature was the main influencing factor (ICES, 2016). The case of snow crab in the Arctic and management disagreements between Norway and the EU represent another climate change induced distribution change of a commercially valuable species that may contribute to destabilize fisheries management in the high north (Tiller and Nyman, 2015; Tiller and Nyman, 2017).

Arnason (2012) compellingly argued that climate change will continue to be a challenge to the CFP and cause ongoing tensions between EU member States and with non-EU members such as

253 Norway, Iceland, Faroe Islands and the UK in the future, unless there is a fundamental change in
254 relative stability keys for impacted species and mechanisms to enhance the transferability of
255 Member State TAC shares as well the transferability of individual fishers' and fleet shares of a
256 Member State's TAC within the EU.
257
258 Climate proofing the CFP is part of the EU Strategy on Adaption to Climate Change via 'Action
259 6: 'Facilitate the climate-proofing of the Common Agricultural Policy (CAP), the Cohesion
260 Policy and the Common Fisheries Policy' (European Commission 2017). 'Further Promoting
261 climate change adaptation, risk prevention and management' is one of the eleven priorities of the
262 Commission's proposal for a Common Strategic Framework which provides a common set of
263 rules for the European Structural and Investment funds, including the European Maritime and
264 Fisheries Fund. (European Commission, 2015). The European Commission recognizes that the
265 CFP can play a role in increasing the resilience of the marine and coastal environment to the
266 impacts of climate change. Considerations like these, along with a coherent overall climate
267 strategy, would support a more direct CFP-based argument for adjusting relative stability
268 allocation keys when the need for can be attributed to climate change effects. Russel et al.
269 (2018), however, comment that their systematic documentary analysis and key stakeholder
270 interviews about EU climate actions show that consideration of climate change impacts and
271 possible adaptation actions in EU fisheries policy is low.
272
273 **Brexit**
274 For the EU and its fishers, the likely UK exit (Brexit) from the EU (Burns et al., 2016; House of
275 Lords, 2016) will fundamentally change the relative stability keys of the CFP, especially for EU

Member States whose fleets currently fish in UK waters (McAngus et al., 2018; Phillipson and Symes, 2018). The reason for this first and foremost rests on the fact that the first step, as an independent coastal state, the UK will regain full responsibility for all aspects of fishing activity and management within a national 200 mile Exclusive Economic Zone (EEZ) under to the UN Convention on the Law of the Sea (UNCLOS, 1982). The UK's fishery policy and management will be independent of the EU's CFP. Napier (2016) estimated that from 2012–2014, EU fishing vessels, including UK vessels, landed, 1.1 million tonnes of fish and shellfish per year in what would be the UK's EEZ and that post-Brexit would no longer be part of the equation for relative stability keys for the EU. In fact, fishing vessels from EU countries other than the UK landed 58% of catch in this area, worth some £400 million or 43% of the value of all landings in the UK's presumptive EEZ (Napier, 2016).

Many fish stocks in the UK's presumptive EEZ straddle international boundaries with EU and non-EU countries. The United Nations Fish Stocks Agreement (FSA) furthermore also makes ongoing international collaboration between the UK and its neighbours both necessary and inevitable. What is less certain are the form and outcomes of negotiations over the right of UK and EU vessels to fish in each other's waters (Phillipson and Symes, 2018). The EU will in fact have to renegotiate its share of the TAC for stocks that are shared with the UK and other non-EU neighbouring countries such as Norway and the Faroe Islands. It is also likely that these negotiations will be influenced by the importance for the existing party of retaining full access for their caught and processed fish to EU markets without punitive tariffs, which was also acknowledged by the UK House of Lords (2016). They concluded that "*There is a likelihood that the [UK] Government may come under pressure to balance the negotiations over a future*

fisheries relationship, including quota shares and access arrangements, against the negotiations over trade in fish products with the EU."

The EU has bilateral negotiations yearly with other nations, and the UK post-Brexit will become a new partner in these as an independent coastal state (McAngus et al., 2018). The EU will retain much of its market power during these negotiations, naturally, but will have lost the UK's contribution to its bargaining position on northern fisheries especially (Phillipson and Symes, 2018). This is especially true when you factor in that it is not just trading in shared stocks that is the focus of these negotiations, but also on reciprocal trading of quotas between nations. In the recent negotiations with Norway for example, the UK traded for Norwegian quotas for cod, saithe and haddock (*Melanogrammus aeglefinus*) in the Barents Sea in exchange for blue whiting (*Micromesistius poutassou*), cusk (*Brosme brosme*), Greenland halibut (*Reinhardtius hippoglossoides*) and other species in EU waters, as well as some quotas in Greenland's EEZ including golden redfish (*Sebastes norvegicus*), Greenland halibut and capelin (*Mallotus villosus*). With a much smaller asset pool post Brexit, the trades will be more costly, and less efficient adjustment mechanisms (including markets) will operate. The EU, after Brexit, may be facing a situation where the much smaller size of its remaining fisheries may undermine the stability of the CFP. Particularly impacted will be the EU's ability to adjust to shifts in fish distributions under climate change.

Options and opportunities to work within and to amend relative stability keys under stressors

Landing obligation, choke species, and range shifts due climate change are some of the issues

that will have a destabilizing effect on the EU relative stability keys, and in turn the CFP. This situation may be exacerbated by Brexit. Brexit will likely see restrictions on EU vessels fishing in UK waters. However, and more significantly, it will lose UK fish stocks from the bargaining power that it currently has with its northern neighbours over fisheries management. EU Member States have several options available to address these challenges. For the purposes of this paper, we will focus on three of these tools and mechanisms namely quota swapping, Article 16 quota uplift provisions and Article 15 flexibility mechanisms. These mechanisms can be adopted by individual Member States for fleets in their waters or in the case of quota swapping be applied across Member States and may help stabilize fisheries under these stressors.

Quota swapping

Member States have used *quota swapping* since 1983 to address allocation imbalances in relative stability keys. Quota swaps introduce an element of flexibility that has likely contributed to the longevity of relative stability (Lado, 2016), since without this flexibility mechanism, the rigidity of the fixed allocation keys would have undermined the CFP. Quota swaps are reported to the Commission and exchanges are registered in the Fishery Data Exchange System (FIDES) to allow for quota accounting. The practice of quota swapping takes place at different levels including that of individual fishers, Producer Organizations, and Ministries or special administrations. Hoefnagel et al. (2015) describes four types of swaps: Swaps of one quota stock for another; Swaps of quota for effort, or effort for quota; Gifts where quota is swapped for nothing in return; and quota swapped for money.

Member States now have to use quota swaps to trade bycatch quotas for which there are low or no TACs rather than exchanging quotas for target species in order to address issues associated with the landing obligation, choke species and stock range expansions and shifts. Lado (2016) suggests this change in "currency" may put unwanted upward pressure on TACs against scientific advice. Furthermore, the complex nature of quota swapping practices and the absence of transparency in the quota swapping at the Member State and EU level means fishers are unable to easily internalize the costs of the landing obligation and range shifts and fishers attempting to use existing mechanisms can face high transaction costs (Hoefnagel et al., 2015). Sobrino and Sobrido (2017) find that quota swapping between member states has been carried out inefficiently in the past and changes to the CFP in 2013 including the landing obligation obligation in combination with the presence of choke species will only worsen the situation.

Quota uplift

"Quota uplift" provisions, introduced to the CFP to address the TAC implications of the landing obligation are still untested but could be used to adjust the relative stability keys in circumstances where need can be demonstrated (Rihan et al. 2019). For example, Article 16(2) could be potentially used to change a relative stability key where an adjustment of fishing opportunities is needed to ensure relative stability of landings after accounting for what fleets can and cannot catch with the national quota. Article 16(3) addresses the situation where new scientific evidence shows that there is a significant disparity between the fishing opportunities that have been fixed for a specific stock and the actual state of that stock and permits a Member State having a direct management interest to submit a reasoned request to the Commission for it to submit a proposal to alleviate that disparity. The ICES (2016) report on species ranges shifts

could provide sufficient evidence for Member States to request a remedy for disparities in TACs allocations and catches. It is unclear though how the Commission would respond to such a request and how a final determination would be made.

Flexibility mechanisms

Other options that could be used to alter allocations under relative stability are the flexibility mechanisms under Article 15 including: (a) interspecies flexibility (substituting catch of one species for catch of another), (b) year-to-year flexibility (for example allowing unused quota from one period to be used in the next fishing period) and (c) *de minimis* exemption (exempting small amounts of catch, generally less than five percent, from the landing obligation).

De minimis exemptions are increasingly used in discard plans as a short-term response to the landing obligation (Karp et al. 2019). However, if used too liberally they will be no longer *de minimis* (Borges and Lado 2019). The economic consequence *de minimis* exemptions also questionable. For example, Hoff et al. (2019) found that for the fisheries they analysed in the Bay of Biscay that *de minimis* reduced profits because increased fishing effort lead to higher mortality and reduced stocks and thus reduced fishing possibilities.

There are examples of interspecies flexibility and year-to-year flexibility outside of the EU (Karp et al., 2019; McIlwain, 2015). that can be referenced for inspiration. For example, New Zealand and Iceland have similar landing obligations to the new EU regulation and use systematic catch balancing mechanisms for stocks managed using TACs (Karp et al., 2019; Mace et al., 2013; Woods et al., 2015). Catch balancing refers to the way, after the act of fishing, that fishing

vessels, companies or individual fishers acquire the necessary entitlements to 'cover' the catch they have taken if they do not already hold an entitlement to that catch. Catch balancing requires two things: A trading platform (regulatory or non-regulatory) to allow ex-post acquisition of appropriate fishing entitlements to cover catches; and a currency or de-facto currency to allow trading to occur no matter the species/stock caught. Ex-post catch balancing recognizes that fishers always run the risk of catching fish from a stock that they may not have an entitlement for. The relative effectiveness (or absence) of a catch balancing mechanism becomes critical when there: (1) is a restriction on discarding and/or (2) are severe penalties/consequences for discarding/or retaining species that the fisher does not have an entitlement to take.

Similarly, interspecies flexibility or "cod equivalence" schemes, as used in Iceland, allow fishers to trade off quota of more valuable stocks against the catch of less valuable species for which not enough quota is held. The trade-off ratio is usually based on the relative value (port price) of the fish species (Woods et al., 2015). "Deemed values", used in New Zealand, are a fee paid for any over-catch above the ITQ holdings of the fisher (Borges et al., 2016; Karp et al., 2019; Mace et al., 2013). Both bycatch trade-offs and deemed values (or combination thereof) act as the currency for a catch balancing system set up as a trading platform. Quota carry forwards (allowing unused quota from one period, to be used in the next period), carry backs (allowing fishers with catches over quota to borrow against the next periods quota) and quota pools (where quota can be "banked" by a group of fishermen, and any member of the bank can draw on the pool to cover catches above their quota) can help keep the catch balancing "submarket" liquid (McIlwain, 2015). Article 15 provides regulatory avenues for some of these mechanisms should Member States wish to pursue them.

Continued discussion within the CFP is needed to explore the benefits of the EU wide mechanisms (regulatory and non-regulatory) that allow for fishers to acquire fishing entitlements for catch for which they do not hold entitlements. This will be challenging. Quota management and enforcement are Member State competencies while TAC setting is an EU competency. There are only weak CFP obligations in relation to adjustment mechanisms. Article 29 Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013, Art 29 states:

> *Member States should consider adjustments through quota swaps with other Member States, including on a permanent basis. Member States should also consider facilitating the pooling by vessel owners of individual quotas, for example at the level of producer organisations or groups of vessel owners. Ultimately, Member States should consider counting by-catch species against the quota of the target species, depending on the conservation status of the by-catch species.*

The European Commission has no mandate to establish a CFP wide catch balancing mechanism or exchange system. It can only set the TACs and allocate according to the relative stability keys. Mandatory EU-wide fleet-based quota trading was roundly rejected in the 2013 CFP reforms, suggesting discussions about market and rights-based mechanisms will need to be carefully nuanced. At the same time, growing tensions created by the landing obligation and rebuilding stocks may create the policy and political impetus to trial fleet level catch balancing mechanisms under Article 15 in the first instance and if scientifically justified such as by the recent ICES (2016) report into species range shifts, changes to relative stability keys under Article

16. National systems will need to be adopted that create specific adjustment mechanisms within a national TAC (for example by strengthening Article 29). These mechanisms in turn must be consistent with EU system wide adjustment mechanisms and then consistent with international mechanisms. This requires not just policy reforms but legal ones. Relative stability key reform can only address intra-EU adjustments not national level adjustment.

Conclusion

EU fisheries are at a critical juncture. The confluence of political change and environmental change, along with the challenge of the landing obligation, creates a once in a generation opportunity for a paradigm shift in fisheries management in the region. At stake is confidence in, and support for the management of the regions shared fisheries, the economic viability of fisheries and sustainability of stocks. Brexit is an incentive to unlock the potential of existing, but underutilised mechanisms within the CFP to reform and allow the reimagining of fisheries management and governance in the Northeast Atlantic region, a region with fish landings worth some US$ 12billion per annum.

The next round of CFP reforms is envisaged after 2020, and a new, comprehensive and adaptable fishery governance regime for Northeast Atlantic might be within reach within that time frame. This change will not occur by itself. Decision makers by necessity should heed the results of existing and emerging science-based bioeconomic modelling tools that enable us to identify the biological and economic dynamics that different management approaches can harness to help ensure climate resilient fisheries. A more rigorous evidenced-policy discourse where there is a collaboration with thought leaders in the region could help design and form the basis for a

comprehensive theory of change that addresses the challenges, and potential opportunities, related to the new realities of Northeast Atlantic fisheries management. National, EU and International forums are substantively different from legal and policy perspectives and will likely require very different solutions. 'Paper' solutions and short-term political fixes are not enough. Solutions need to be implementable and be effective on the water.

Will this ensure resilience for EU fisheries and fishing communities despite climate change leading to a poleward shift of fish stocks, and the UK's exit from the EU? What are the strategies available to the EU when it negotiates quotas for its member states? Given that the EU has not handled changes so far that effectively, with its underlying relative stability keys not having changed for three decades, Brexit may well be what pushes the system towards more flexibility and dynamism. Options for addressing these challenges are available including quota swapping, quota uplift provisions and flexibility mechanisms. These instruments are being adopted to varying degrees by individual Member States and the European Commission. None of these can bring more fish to the waters of the EU and are likely insufficient by themselves to overcome the fundamental limitations of existing relative stability keys especially if Brexit becomes a reality.

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