The unintended impact of the European discard ban

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Abstract: The European Union (EU) discard ban, called the Landing Obligation (LO), was initiated in 2015 to reduce unwanted catches by EU fisheries. To ease the transition to a system where Total Allowable Catches (TACs) refer to catches rather than landings only, the majority of EU TACs were increased to account for the part of the catch that was previously discarded and would now be landed. The analysis shows an average annual upward adjustment of 36% in TACs since 2015, but these percentages were considerably higher in 2019 and 2020 (reaching 43% and 50%, respectively), when the LO was fully applicable to all fisheries, and particularly for TACs of demersal species (reaching 51% and 60%). These results demonstrate the significant impact that the discard ban has had on the quantities of EU fishing opportunities. Since discarding has not declined in EU fisheries at any significant level, the magnitude of these increases may likely have resulted in a substantial widespread increase in fishing mortality being exerted on European stocks, and thus likely lead to an implosion of the EU TAC system, the Common Fisheries Policy central instrument to manage fisheries in the EU.

1. Introduction

Fisheries in the European Union (EU) are managed through the Common Fisheries Policy (CFP; EU, 2013). The CFP's central instrument for achieving stock conservation objectives in the North-East Atlantic are Total Allowable Catches (TACs). The EU CFP also includes a discard ban, called the Landing Obligation (LO, Article 15 of Regulation (EU) No 1380/2013), introduced progressively by fisheries and species from 1 January 2015 until 2019. The LO is only applicable to TAC-regulated species in the Atlantic and to species that have a

Minimum Conservation Reference Size (MCRS) in the Mediterranean Sea, caught in European waters or by European fishing vessels. Before 2015, TACs limited only the amount of fish landed and not the entire catch. Since 2015 more and more TACs refer to catches through the phased introduction of the LO, whereby all catches of TAC-regulated species in the North-East Atlantic need to be brought to shore, landed and accounted for by 2019. Catches below MCRS have limited use and are not allowed to be sold for human consumption to avoid creating markets for undersized fish.

The landing obligation, however, includes four specific exemptions to the obligation to land:

i) species for which fishing is prohibited. Prohibited species, mainly relating to Protected, Endangered or Threatened species (PET), if caught, have to be released immediately.

ii) individuals that have been damaged by predators. Predator-damaged fish exemption was considered initially for the Baltic Sea salmon fisheries due to the occurrence of seal predation (Borges & Penas Lado, 2019), but is applicable to any European fishery.

iii) species that have "high" survival rates after being discarded. The high survival exemption is applicable to any fishery and species for which scientific evidence has shown a high survival rate, but where "high" although originally discussed to be possibly "above 50%" (STECF, 2013), is in practice anything above 17% (EC, 2018a).

iv) catches which fall under the *de minimis* exemption. As the Latin term indicates, this exemption refers to minimal accepted discard percentages, namely up to 5% of total annual catches (up to 7% and 6% during the first two consecutive transitional two year period). It is applicable under two conditions: if there is scientific evidence that increases in selectivity are "very difficult" to achieve, or to avoid "disproportionate costs" of handling unwanted catches, but only where the bycatch by the gear in question does not represent more than a certain percentage of the catch.

For fisheries under exemptions, discarding can continue and the amounts of catch discarded are not counted against their respective fishing quota, but quantities over 50 kg have to be recorded in logbooks (EU, 2015).

Details of the specific fisheries under the LO, and their respective applicable exemptions, are established in discard plans by sea regions and are valid for three year periods. No at-sea monitoring is required for fisheries under the European discard ban and its exemptions, although *de minimis* exemption quantities discarded need to be fully recorded, but no prerequisite as to how to "fully record" is specified in law.

A key condition for EU Member States (MSs) in agreeing to the LO at the time of the CFP negotiations was the possibility for TAC adjustments contained in Article 16(2) of the CFP (Savina, 2019). To accommodate the predicted increase in landed catch from fisheries under the LO, since 2015 the relevant TACs were adjusted, supposedly, in accordance with the estimated catch that formerly would have been discarded, based on the contribution of each of the fleets under the discard ban to total catches and discards of the concerned stocks. Between 2015 and 2018, TACs were adjusted upwards (called top-ups), where the calculated amount of unwanted catch (former discards) that would now be landed was added to the maximum wanted catch (former landings) advised by scientific institutions. Under the full applicability of the LO, i.e. from 2019, the start point for the TAC calculations was, on the other hand, the scientific maximum total catch advice minus any deduction for fish discarded under exemptions (called top-downs). However, the methodology used by the EC for calculating TAC adjustments is unclear and has been the subject of extensive discussion by stakeholders, particularly regarding fisheries where available discard data is incomplete, or when historic landings (and not discards) were used to determine which vessels were under the progressive implementation of the LO until 2018, and for which top-ups were calculated (Savina, 2019).

In brief, TACs adjustments have contributed since 2015 to greater fishing opportunities based on the argument that this will support the implementation of the landing obligation (e.g. EC, 2020). At the same time, the number of granted exemptions to the European discard ban has increased considerably by fisheries, species and sea basins, while their justifications have become less clear (STECF, 2020). Fisheries can be under several different exemptions depending on the species caught and gear used, resulting in TACs that have several exemptions applied. And yet, discarding practices continue with minimal change, due to a combination of policy changes and insufficient monitoring and control (Borges & Penas Lado, 2019; Savina,

2019). Despite continuing discarding practices, there are no signs that the EU TAC system will revert to account for only commercial landings again (EC, 2020); it would likely be seen by stakeholders as a sign that the LO will not continue to be implemented and also as a widespread decrease of fishing opportunities which will have opposition from EU MSs and the fishing industry.

In summary, the phased introduction of the European discard ban and its exemptions have introduced a significant level of complexity to the setting of fishing opportunities, in an already complex system. In turn, it added difficulty to evaluate the LO implementation and its impact in one of the CFP's central instruments to manage European fisheries. It may have led to increases in fishing opportunities to adjust for landed discards, and while discards are hardly being landed, it could have significant impacts on the sustainability of European fisheries because TACs may not be effective anymore in limiting fishing mortality. This study attempts to estimate the extent of the top-ups and top-downs applied to the EU TACs since 2015. Specifically, this study aims to analyse the TAC adjustment set in the context of the LO and its exemptions, by comparing the TACs with their respective scientific advice on fishing opportunities, following the methodology described in Borges (2018). In doing so, the analysis presented should contribute to the ongoing discussion related to positive incentives and at-sea monitoring needed for the implementation of the European discard ban, in particular the uncertainty associated with short-term catch forecasts provided by scientific institutions but also the effectiveness of harvest control rules embedded in sea basin Multiannual Management Plans (MAPs, ex. Western Waters MAP - Regulation (EU) 2019/472).

2. Methods

2.1. Data used

The TACs, defined as catch limits set for one or more stocks in particular geographical areas per year, agreed by the Council of the EU and available at www.eur-lex.europa.eu, and the corresponding fishing opportunities advised by the International Council for the Exploration of the Sea (ICES) stock summary advice sheets available at www.ices.dk were compiled and compared for the years 2015–2020. This

temporal window was chosen to coincide with the introduction of the LO. The analysis was restricted to TACs for stocks in European Union waters where the LO applies: to the west of Scotland, around Ireland and the Celtic Sea, hereinafter referred to as Northern Western Waters; the Bay of Biscay and Iberian waters, hereinafter referred to as Southern Western Waters; the North Sea and the Baltic Sea. Skates and rays and deep-water sharks TACs were excluded from the analysis due to the inability to align the advised catch for the various species and stocks to the seven TACs. Four additional TACs have no scientific advice available on fishing opportunities Thus, in total, eleven TACs were excluded from the analysis..

2.2. Assumptions

Several assumptions were made to allow for the comparison between TACs and associated ICES advice[1]. As ICES gives catch advice per stock, which in many cases does not match the TAC geographical area, the comparison between TAC and associated advice required some level of calculation: dividing stock advice in proportion to the TAC area, removing non-EU TAC shares or combining advice for several stocks in one TAC. The corresponding ICES maximum total catch advice for each stock was considered to be at F_{MSY} according to the EU CFP MSY objectives, or at MSY F_{upper} if the TAC was set accordingly to the respective EU multi-annual plan (MAP) rules. TACs that were the combination of one or more stocks for which one of the stocks lacked quantitative advice were excluded from further analysis. Finally, when ICES advised a zero catch but a non-zero TAC was nevertheless set, the TAC was deemed to have exceeded the advised catch by a symbolic 100%.

2.3. Analysis

Following Borges (2018), TACs set between 2015 and 2020 were compared to maximum advised catch levels in order to determine the impact of the LO on TAC level setting. For each TAC and year, the relative differences between the agreed TAC and the ICES advised total catch and between the agreed TAC and the ICES advised wanted catch were calculated as a percentage of the ICES advised maximum total and wanted catch respectively. The result is highly variable and shows positive skewness (Figure 1). Consequently, the

median would be a more applicable measure for central tendency than the arithmetic mean, as the mean is influenced by extreme points. However, the skewed distribution reflects the actual nature of TAC setting decisions: TACs are more likely to be adjusted upwards and by larger magnitudes by MSs than adjusted downwards. The data also reflects the issue with bycatch stocks, particularly if in poor state, where the scientific catch advice is low but not zero, and a (large) TAC was nevertheless set. This is the case with whiting in the Skagerrak and Kattegat, which accounts for six extreme data points, that has low commercial value but is caught in mixed demersal fisheries. Since the objective of the analysis is to demonstrate the overall magnitude of (upward) adjustments in TACs due to the LO, the arithmetic mean is more revealing than the median. Therefore, I report the arithmetic means in the text of the results section, while both mean and median values are presented in Figure 1 and Tables 2 and 3. For completeness, the data presented in Figures 4 and 5 as means are presented in the online supplementary material as box-and-whisker plot figures.

The comparison between the agreed TAC and ICES advice was made in light of the following assumptions regarding the expected impact of all LO exemptions on TAC levels, presumably considered by the European Commission (EC) when proposing TAC adjustments, and assuming full introduction and implementation of the LO (all fisheries are under the LO and are landing unwanted catch, Table 1). If the discard ban's high survival exemption applies to all fisheries under a TAC and the survival rate is 100%, then that TAC should be set equal to the wanted catch advice (i.e. commercial landings) as no unwanted quantities are landed. If, on the other hand, the high survival exemption is only applicable to part of the fisheries under that TAC and/or the survival rate is less than 100%, then the catch corresponding to alive discards would be removed from the TAC corresponding to total catch advice. Nevertheless, I assume (and discuss below) that a TAC that is under a high survival exemption has a high percentage of survival (i.e. low percentage of dead discards) and thus should be set considerably closer to the wanted catch advice. The *de minimis* exemption, on the other hand, is limited to a reduced fixed percentage of unwanted catch that can still be discarded (from a maximum of 7% to 5% of a species' total annual catch) and thus should not necessarily account for the total

[1] Database available as additional online supporting information.

unwanted catch of all the fisheries under that TAC, and any amount of unwanted catch could be removed from the TAC. The combination of both high survival and *de minimis* exemptions would naturally allow for more unwanted catch to continue to be discarded and less need for TAC adjustments above the wanted catch (previously landed catch), while if the TAC is under no exemption then it would be equal to the total catch advised as all unwanted catch would need to be landed. Predator-damaged fish can be discarded without being counted against the TAC or recorded, but has had limited application (Borges & Penas Lado, 2019). Species prohibited from being caught do not have a TAC set and should be immediately returned to sea (with the exception of picked dogfish, which is prohibited to be caught in all areas except in the North Sea where it is under a TAC). Finally, generic *de minimis* and high survival exemptions, that were introduced extensively since 2019 (ex. EC, 2018a), i.e. where a group of species and/or gears are combined in one type of exemption, were not considered further in this study due to the difficulty of assigning specific TACs (possibly applicable to a maximum of 51 TACs in 2019 and 32 in 2020, as illustrated by points in Figure 2 below).

3. Results

In total, this study made comparisons of 129 TACs with the corresponding ICES scientific advice for fishing opportunities (total and wanted catch) per year, for each of the years 2015 until 2020. The implementation of the LO started in 2015 with TAC regulated species caught by pelagic fisheries and fisheries in the Baltic Sea, and thus only two demersal Baltic Sea TACs but all the pelagic TACs with scientific advice were used in the analysis. Between 2016 and 2018 additional demersal TACs came in to the LO, accompanying the respective fisheries phased introduction, and from 2019 onwards, all TACs were under the LO (129 TACs). There has been an incremental increase in exemptions adopted for the different fisheries, following the increase in demersal TACs coming into the LO. Half of all demersal TACs have a specific LO exemption since 2019, but most have a combination of a specific and a “generic” exemption (Figure 2 and 3). However, only two types of exemptions have been agreed: *de minimis* and survival, while the list of species for which fishing is prohibited has also increased but these species do not have TACs. *De minimis* has been the

preferred exemption adopted for fisheries under demersal TACs, and has increased considerably since 2019. Adoption of the high survival exemption has also steadily increased, while the combination of both exemptions peaked in 2018 (Figure 3).

Since 2015, TACs under the LO have been adjusted upwards by an average of 36% annually to account for the predicted landed unwanted (previously discarded) catch (TAC under LO-wanted catch, Table 2), an adjustment that surpassed the ICES total catch advised by 19% (TAC under LO-total catches, Table 2), translating in an adjustment solely due to account for unwanted catch of 17%. However, for TACs not yet under the LO, until 2018, the TAC departure from scientific advice was higher, 41% and 31%, for wanted and total catch, respectively. When all TACs were set within the LO, i.e. from 2019 onwards, the departure from scientific advice continued to increase reaching 50% for wanted catch (LO-wanted catch, Figure 4) but stabilizing for total catches at around 30% (LO-total catches, left panel, Figure 4). However, the departure from wanted catch advice is higher for demersal TACs than the departure from total catches or for both pelagic TACs comparisons (Table 2, right panel, Figure 4).

Regarding each LO exemption and their impact, there was an inversion of strategies by MSs regarding exemptions in 2018: TACs with *de minimis* and high survival exemptions had smaller differences compared to wanted catch and total catch advice (*de minimis* and high survival lines, Figure 5) in 2018; while TACs with a combination of both *de minimis* and survival exemptions peaked in 2018/2017 (*de minimis* + high survival line). It is interesting to note also that TACs with the combination of *de minimis* and high survival exemptions have been set closer to total catch advice (6%), while TACs with only *de minimis* or high survival exemptions show a higher departure from total catch advice (19% and 23% respectively, Table 3, right panel, Figure 5).

4. Discussion

The results show that to accommodate the predicted increase in landed catch from fisheries under the European discard ban, since 2015 the relevant TACs were adjusted by an average of 36% annually to account for the catch that formerly would have been discarded, and disregarding the level of implementation of the

LO, i.e. the extent unwanted catch has been landed or not. The H2020 DiscardLess project (Grant Agreement No. 633680) noted that progress towards achieving the objectives of the LO of reducing unwanted catch and changing fishing practices has been imperceptible due to a combination of policy changes and insufficient monitoring and control (Savina, 2019). In fact, enforcement of the LO was postponed to 2017 in order to give fishers time to adjust their operations (EU, 2015). The EC has also concluded that there is a general lack of compliance with the LO (EC, 2019, 2020) and that illegal and unrecorded discarding is widespread (EC, 2018b, 2020). Furthermore, while TAC adjustments are part of the overall package of measures to implement the LO and are considered by the EC to be legally binding, i.e. the EC fishing opportunities proposal has to start with total catch advised by scientific institutions minus catch discarded through exemptions, they should nevertheless not jeopardise the CFP F_{MSY} objective or increase fishing mortality (EC, 2017). Considering that TACs have been adjusted upwards by 36% to accommodate the predicted increase in landed catch, but that no significant quantities of unwanted catch have been landed, it is very likely that a substantial widespread increase in fishing mortality is being exerted on European stocks. An example is the case of cod in the west of Scotland, where ICES advice is 0 catches but a non-zero TAC has been set since 2019 to allow for the demersal fishery to operate, and where cod is a bycatch. While unwanted catch above MCRS started to be landed in 2019, individuals below MCRS were not. ICES estimates cod catches below MCRS to be much higher than reported, while fishing mortality continues to increase (ICES, 2020). The EC Scientific, Technical and Economic Committee for Fisheries (STECF) in its CFP monitoring report (STECF, 2020a) already observed a change in the trend of fishing mortality (F/F_{MSY}) of Northeast Atlantic EU stocks, steadily decreasing until 2013 but somewhat stabilising after at around 1, meaning that the fraction of overexploited stocks ($F>F_{MSY}$) is no longer diminishing. The reason behind this stabilisation is likely to be a combination of factors and not solely due to the upward adjustments made to TACs since 2015, but the adjustments have likely contributed. However, the expected changes in fishing patterns through the effective implementation and adoption of LO exemptions will likely change the values of MSY reference points as these depend on the selectivity of the fisheries (ex. ICES, 2018). If there is limited and/or biased

knowledge regarding catches, one may not be able to determine if, or by how much, fishing mortality has increased, and ultimately the status of stocks and their exploitation.

The EU discard ban has the overall goal of reducing unwanted catch of European fisheries, and if complied with could therefore represent the biggest push for more selective fishing in the history of the EU CFP (Borges et al., 2016). That potential incentive would be at a minimum level if the TAC would be equal to total advised catches while assuming status quo fishing, as only the reduction of space on board for commercial catch would push for an avoidance of unwanted catch, to maximize the use of the space on board and quota available for high price species and sizes. At a maximum, the TAC should be set less than total advised catch so as to, in combination with reduction of storage space, incentivise avoidance of unwanted catch and change fishing practices. Instead, the upward adjustments in TACs discussed in this analysis, without complementary at-sea monitoring systems, can only lead to an increase in fishing activity to use the available TAC in commercial species and sizes, and with it an increase of unwanted catch and discards, precisely in opposition to the LO objectives.

It is important to note that the values reported here are underestimations of the real upward adjustments of TACs due to the LO, since TACs were considered a symbolic 100% above fishing opportunities advice when the advice was for 0 catches, and while generic *de minimis* and high survival exemptions were not considered in depth in this study. That said, it is difficult to determine the level of catch adjustment due solely to the LO when a TAC is set above total catch advice. There are doubts how TAC adjustments are calculated firstly by the EC when proposing fishing opportunities, and secondly when they are finally agreed by the Council of the EU. In 2019, the EC released to MSs a working document with the calculation for several 2020 TAC adjustments (CEU, 2019a), but this document does not include all TACs and it was only made public through an access to information request made by an NGO. In addition, the calculations are only applicable to the EC proposal and not to the final TACs agreed by Council which, in many cases, differ. There may be cases where a TAC was set above total catch advice due to other considerations than LO upward adjustments. In fact, Borges (2018) demonstrated that this is not a new feature of the EU TAC

decision system, and that TACs have been frequently set above advice even before the LO was discussed in the public arena or set in legislation. Thus, the reasons behind TAC adjustments cannot be solely attributed to the LO, and economic and/or social arguments may have been involved. This indeed may be the case for the TACs that were set above catch advice, even though they were not yet under the LO. Nevertheless, one of the main arguments used by MSs since 2015 to set TACs above scientific advice is to mitigate discards, cope with the LO and avoid fisheries chokes, i.e. the risk for early closures of fisheries when the quota of one species is exhausted before others (ex. CEU, 2019b). Furthermore, although the departure of TACs not yet under the LO from total catch advice is higher than the departure of TACs under the LO, their net increase (i.e. the difference between the TAC and wanted catch advice value) is smaller, indicating that issues other than discards were perhaps used to justify that departure. Finally, and in addition to the arguments just detailed, it is important to note that the EC in its TAC calculations assumes the "worst case scenario" and deducts the highest amounts of unwanted catches allowed to be discarded through exemptions in cases of unclear or missing data or data mismatch (CEU, 2019a).

Regarding the exemptions to the European discard ban, it is clear that the landing obligation is being circumvented by the significant increase in exemptions adopted, not only by the high level of permitted discards but also to the added complexity to control and enforce regulations. This is exacerbated by the appearance of combined and "generic" exemptions predominantly since 2019, with most TACs presently falling under such exemptions and likely adjusted accordingly, but without clear justifications or requiring effective monitoring and control. STECF (2019, 2020) has already acknowledged the increase in exemptions and the lack of selectivity measures submitted by MSs to be added to regional discard plans. This lack of selectivity measures and increase in exemptions, associated with the fact that exemptions are becoming more generic, with species, gears and areas combined, justified by qualitative and/or incomplete quantitative data, and with no review of their use and applicability, also undermines the purpose of the LO of reducing unwanted catch.

Regarding the high survival exemption specifically, the percentage of survival of each species is accounted for in the TAC such that, while a fishery is allowed to continue to discard without a limit, the percentage of dead discards were added by the EC to the TAC until 2018 and discounted from the TAC since 2019. It is unclear why the percentage of dead, and not alive, discards where discounted from the TAC by the EC since 2019, as TACs should reflect fishing mortality and not survivability. In any case, the TAC for species with high discard rates, even with low survivability (such as plaice at around 17%), can depart considerably from the respective wanted catch advised, as observed in this study (average 35% annually), while discarding continues. This is why STECF has indicated higher risk for overexploitation for fisheries under high survival exemption than under *de minimis* exemption (STECF, 2019). It is also seems illogical that since 2019 *alive* discards are in practice added to wanted catch advised to obtain a total TAC level, but that these are still being legally discarded under a high survival exemption. The *de minimis*, on the other hand, is not supposed to be counted against the TAC, but needs to be fully reported, and is still bound to specific fisheries and corresponds to a small percentage of discards. This is in accordance with the results that show a higher departure of TACs with *de minimis* exemptions from wanted catch advice (42%) than TACs with high survival exemptions (35%). However, in many fisheries, the discard percentage granted is above the fishery's unwanted catch so the exemption will cover the totality of discards and more (e.g. boarfish in North Western Waters), while in other cases it only covers a small percentage of discards and thus its need and relevance is unclear (STECF, 2020b).

Another issue associated with TACs adjustment that has not been considered or discussed at any level relates to the standard implementation error assumed in Management Strategies Evaluations (MSEs). MSEs are used to assess harvest control rules (HCRs), management plans' precautionary assumptions, and their effectiveness in fulfilling pre-established management objectives. In most evaluations carried out by ICES and STECF, a 15% implementation error in management measures is usually assumed. As TACs have been adjusted upwards by an average of 36%, many of the HCRs and EU MAPs considered to be precautionary by ICES to provide advice on fishing opportunities may no longer be so. The results of this analysis should therefore be factored into the ICES advisory system, and considered in the periodic EU MAPs reviews.

Finally, there is an increased awareness by fisheries control institutions in MSs and by the EC European Fisheries Control Agency (EFCA) that the LO has not been monitored or controlled at any significant level, and that the discard ban is not being complied with by fishers. One can argue that the positive incentive of TAC adjustments should therefore be removed as they are not being used to account for unwanted catch, and TACs should go back to follow the wanted catch (commercial landings) advice or that the adjustment should be reserved for when unwanted catch starts to be landed. However, it is probably unlikely that the EC will propose, and MSs agree, to go back to landings TACs, due to the predictable strong backlash from the fishing industry as TACs would be seen to be cut by at least 30%. Reserving the added fishing opportunity to account for unwanted catch when it is in fact landed is associated to national quota management systems and is thus under the sole responsibility of MSs, but only a few MSs have considered adding provisions to account for this, while it is unclear how many have actually reserved it. Therefore, I argue that with the introduction of a radical management measure such as a discard ban, and with significant positive incentives already given without any conditions in return, the only remaining possibility for its effective implementation is to establish large scale at-sea monitoring programmes. In this context, there is an opportunity for the fishing industry to be proactive in dictating some of the conditions of effective at-sea monitoring programmes that are bound to be compulsory in European waters sooner or later.

5. Conclusions

This is the first study that estimates the extent of adjustments applied to the EU TAC system since the introduction of a discard ban in 2015. The results show that TACs have been adjusted upwards by 36% annually, and in recent years more than doubled to account for unwanted catches that were supposed to be landed but are not. These are noteworthy results, demonstrating the major impact that the landing obligation has had on fishing opportunities in Europe. The magnitude of these values, combined with the fact that discards have not been landed to any significant level, may lead to an implosion of the EU TAC system and to negative impacts on fish stocks and fisheries sustainability within a few years. In the meantime, it is crucial that all stakeholders realize and acknowledge that a major impact of the European

discard ban was to compromise the effectiveness of the EU TAC system, the Common Fisheries Policy's central instrument to manage fisheries in the EU, and try to mitigate it, e.g. through at-sea monitoring.

The data underlying this article are available in the article and in its online supplementary material.

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