

# Research for PECH Committee - Landing Obligation and Choke Species in Multispecies and Mixed Fisheries - The South Western Waters



**Fisheries**





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## **Abstract**

This study presents an identification of the likely stocks that could act as choke stocks under the landing obligation to be fully implemented in 2019 for South Western Atlantic Waters. The study provides an estimation of the likely surplus/deficit quota by stock, Member State and EU level. It also analyses the likely solutions to it and if the likely management possibilities have been used or not. It finally provides a list of stocks of high risk of being choke after the application of the existing tool box for alleviating the choke problem in the near future.

This document was requested by the European Parliament's Committee on Fisheries.

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## LIST OF ABBREVIATIONS

<b>Btrigger</b>	Spawning stock biomass that triggers a specific management action
<b>BMGT</b>	Spawning stock biomass that triggers a specific management plan
<b>BOB</b>	Bay of Biscay
<b>CFP</b>	Common Fisheries Policy
<b>DCF</b>	Data Collection Framework
<b>EEZ</b>	Economic Exclusive Zone
<b>EU</b>	European Union
<b>FIDES</b>	Fishery Data Exchange System
<b>FMSY</b>	Fishing mortality consistent with MSY
<b>ICCAT</b>	International Commission for the Conservation of Atlantic Tunas
<b>ICES</b>	International Council for the Exploration of the Sea
<b>IQF</b>	Inter-species quota flexibility
<b>MCRS</b>	Minimum Conservation reference Size
<b>MMS</b>	Minimum Mesh Size
<b>MS</b>	EU Member State
<b>MSY</b>	Maximum Sustainable Yield
<b>NEAC</b>	North-East Atlantic Commission
<b>NGO</b>	Non-governmental Organizations
<b>NSAC</b>	Noth Sea Advisory Council
<b>RFMO</b>	Regional Fisheries Management Organisation
<b>SSB</b>	Spawning Stock Biomass
<b>STECF</b>	Scientific, Technical and Economic Committee for Fisheries
<b>SWW</b>	South Western Waters

**TAC** Total Allowable Catches

**UN** United Nations

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## EXECUTIVE SUMMARY

### Background

The common fisheries policy (CFP) basic Regulation (EU, 2013) establishes a phased introduction of a landing obligation (also known as the discard ban). It has become a central element on the CFP. In the article 15 of this regulation it is explained under which circumstances landing obligation becomes applicable. A summary will be that **by the year 2019 all the species that are subject to total allowable catches (TACs) and quotas and or minimum conservation reference size (MCRS) in the Mediterranean, must be retained and landed.**

There is a general feeling that landing obligation is a positive forward step in the rationalization of the fisheries in the European Union (EU). More “green” fisheries are necessary to conduct a sectorial policy that has been accused from being “dirty” and furthermore besmirched by public money spent on it. Nevertheless, **the landing obligation has a difficulty in terms of how it should be implemented.**

The landing obligation generates the so-called **choke effect** (the smallest quota species in a multi-species fishery: when the quota of such choke species is exhausted, the whole fishing activity must stop). This is one important landing obligation implementation difficulty. When landing obligation is combined with rules used for determining annual fish catch quotas seeking a single-point estimate of maximum sustainable yield (i.e.  $F_{MSY}^1$ ), the final fishing mortalities will be below the  $F_{MSY}$ . According to the maximum sustainable yield (MSY) criteria, this constitutes **a loss of fishing opportunities, and therefore it may compromise the economic performance of some fishing fleets.** Therefore, identification of the likely choke species becomes a relevant issue to be studied.

### Aim

The study addresses three key aspects of the **landing obligation implementation** in the Atlantic South Western Waters (SWW) fisheries.

- **Identify**, using publicly available data sources, stocks that can be considered **choke** under the implementation of the landing obligation;
- **Investigate** fleets, tools and management actions appropriate for each stock/fishery to **reduce the deficit between catch and quota**, considering also **external factors** such as climate change and the withdrawal of the United Kingdom from the EU (“Brexit”).
- **Determine** stocks of high-risk of being choke species after using (or exploring their use) all the **alleviating tools (flexibilities and exemptions) already anticipated** in the article 15 of the CFP or any other different management action.

The methodology comprised a twofold approach as displayed in Figure 1 of the main report. Across the relevant Member States with fisheries in SWW, the first stage was to provide **an indication of the likely surplus or deficit between catches and adapted quota of SWW stocks.** Based on this, potential choke situations were identified and categorised following a three categories division system.

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<sup>1</sup> Fishing mortality consistent with achieving Maximum Sustainable Yield.

This preliminary list of stocks was used as basis to identify the adequate mitigation tools, coming from the CFP provisions and to propose other solutions outside of it. On this basis, stocks were classified as high, moderate and low choke risk stocks. On top of this classification, external elements such as climate change and Brexit were evaluated to determine if this classification could potentially change in the future.

## RESULTS

Results show that from the 51 stocks regulated using a total allowable catch (TAC) system in the SWW region, **23 were identified as potentially problematic** (Table 11 in the main report). For 14 of them there is insufficient quota at EU level (red cells in the *Overall* column of Table 11 in the main report).

For France and Spain 14 stocks were identified for which their individual adapted quota seemed insufficient. **For France 8 of these stocks there was insufficient quota at EU level, the same number as in Spain**, even for different stocks.

**All the 3 stocks for which Portugal has insufficient quota faced this problem at EU level.** Finally, for Belgium 7 stocks with insufficient quota were identified. For 4 of them there was insufficient quota at EU level, in 2016.

After evaluating each mitigation tool, coming from the CFP provisions and the external pressures coming from climate change and Brexit, the risk of being a choke stock was assessed. Results are displayed in Table 14 in the main report.

It was found that there are **3 potential stocks with high risk of causing choke difficulties, considering the mitigation tools coming from the CFP provisions and the external factors: whiting (WHG/08) in the Bay of Biscay, horse mackerel (JAX/2A-14) as widely distributed and alfonosinos (ALF/3X14) as a deep-sea stock.** When analysed **by Member State, France and Spain are those most likely to be affected.**

In **Atlantic Iberian waters** there is moderate risk for **megrims** (LEX/8C3411), **hake** (HKE/8CD3411) and **anchovy** (ANE/9/3411), affecting specially Spain and Portuguese fisheries. For the first two, choke risk is heavily dependent on how the quota uplift is shared among Member States. For anchovy the existing high survivability exemption was considered as key for lowering the risk.

In the **Bay of Biscay**, **megrims** (LEZ/8ABDE), **nephrops** (NEP/8ABDE), **skates and rays** (SRX/89-C) and **pollack** (POL/8ABDE) can also be considered as **moderate risk** stocks. The risk of megrim can be lowered given that the special condition of the use of a 5 % of the quota of LEZ/07 in ICES Divisions 8abde, is likely to change (allowing up to a 25% use of the quota of LEZ/07). For nephrops, this risk will be reduced if the high survivability exemption is confirmed. Finally, for skates and rays, evidences on high survivability can also lower this risk. The case of pollack is related on how recreational catches are treated.

In terms of **widely distributed stocks**, **Boarfish** (BOR/678) is a moderate risk stock, especially because IQF is unlikely to be applied to this stock. France and Spain can be affected by their boarfish zero-quota condition. Finally, for **cod** (COD/7XAD34) and **haddock** (HAD/7XAD34), overall catches in SWW are low compared to the total distribution, although the zero-quota condition of several Member States implies that choke risk can also be considered as moderate.

## CONCLUSIONS

**Not all the likely choke stock problems can be solved through the existing mitigation toolbox, although they can be alleviated for most of the stocks in SWW fisheries.** Those stocks for which insufficient available quota exists or for which relevant Member States have zero quota, are those more likely to be affected by the landing obligation from the choke issue point of view.

The existing toolbox requires a flexible application, furthermore, those tools outside the provisions of the article 15 of the CFP are likely to be explored. **Swaps have been demonstrated as powerful mechanism to quota-fishing possibilities adaptation at Member State level and they should be further used in the context of the landing obligation.** However, the complexity of defining a unique exchange currency, especially in the context of multi-species fisheries of SWW, could complicate their use. Other flexibility mechanisms such as inter species quota flexibility have not been used in SWW yet. This is probably due to the flexibility they are providing is not worth for the problems faced by SWW fisheries and the Member States involved. Other tools outside the “box” are further to be explored. Target ranges (within the MSY objective), combined *de minimis* for non-directed stocks, or more technological elements such as real time information sharing are also promising.

Finally, **the discrepancies found on the data from diverse sources was the main limitation of the study.**



# 1. DESCRIBE MULTISPECIES / MIXED FISHERIES: THE BIOLOGY AND ECOLOGY OF THE SPECIES CONCERNED AND THE FISHERY ITSELF

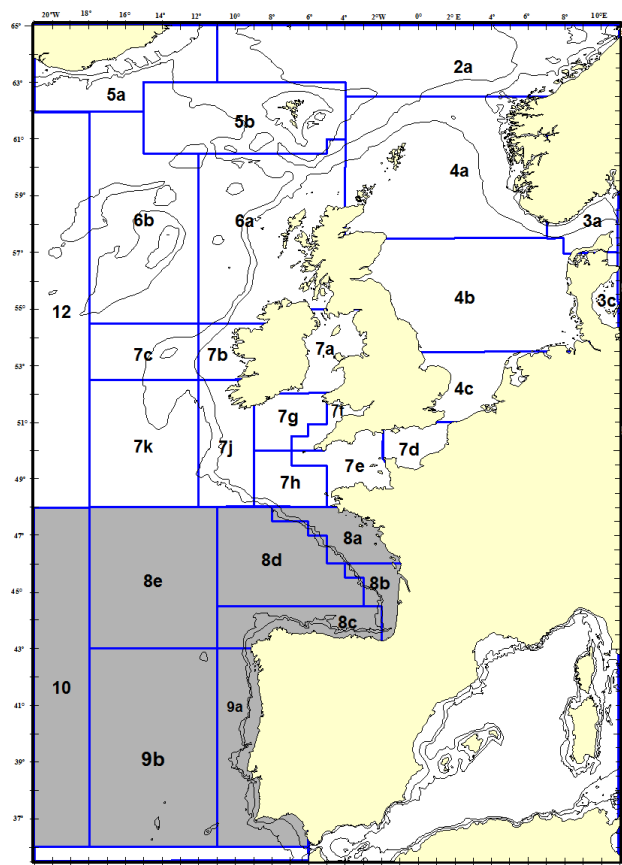
## KEY FINDINGS

- **Belgium, Spain, France, the Netherlands and Portugal have a direct fisheries management interest in South Western waters.**
- A mayor number of **SWW fisheries are multi-species and mixed fisheries**. In many cases **with several target species**.
- **Multi-species fisheries** are likely to be affected by the landing obligation.
- It is relevant and necessary to identify **those stocks acting as choke**, and provide, if any, relevant management actions at all levels, that could prevent or at least reduce choke problems.

## 1.1. General overview of the South Western Atlantic Waters

A large number of commercial and non-commercial fish species are caught for human consumption in this eco-region (Map 1). The fisheries in the Bay of Biscay and Atlantic Iberian Peninsula waters exploit demersal and pelagic fish species, crustaceans, and cephalopods. French, Spanish and Portuguese fleets operate in this area, and occasionally also fleets from other countries (Belgium, The Netherlands, United Kingdom and Ireland).

**Map 1: South Western Atlantic Waters and their corresponding ICES areas.**



**Source:** Authors

**Note:** Grey areas are those studied in this report (SWW).

From the stocks side, it is complicate to define which are those specifically of SWW. The reason is that some stocks are clearly beyond the boundaries of the SWW region, including other ICES fishing areas. Furthermore, some fisheries are to be considered widely distributed, including some small pelagics and tuna like species.

The main pelagic species at the Iberian Peninsula are sardine (*Sardina pilchardus*), anchovy (*Engraulis encrasicolus*), mackerel (*Scomber scombrus*) and horse mackerel (*Trachurus trachurus*). These species form the basis of important fisheries of the Iberian Peninsula and in the Bay of Biscay, representing an important source of income for local economies. Also, characteristic are other species more common to temperate and subtropical waters, such as Spanish mackerel (*Scomber colias*), Mediterranean horse mackerel (*Trachurus mediterraneus*), and blue jack mackerel (*Trachurus picturatus*). Small pelagic fishes are generally caught by purse-seiners, while a wider variety of gears are used to catch middle-sized pelagic fishes, e.g. handlines and bottom trawl gears. The demersal fisheries mainly target hake (*Merluccius merluccius*), megrim (*Lepidorhombus whiffiagonis*), four-spot megrim (*Lepidorhombus boschii*), anglerfishes (*Lophius piscatorius* and *L. budegassa*), and Norway lobster (*Nephrops norvegicus*) with other secondary demersal species.

Tunas are also fished in this area, mainly albacore (*Thunnus alalunga*) and bluefin tuna (*Thunnus thynnus*) using pole and lines and pelagic trawls.

The Spanish and Portuguese fleets operating in the Atlantic Iberian Peninsula shelf were segmented into métiers under the EU project IBERMIX (DG FISH/2004/03-33), and the results were described in ICES (2007).

The most important fisheries operating in the Bay of Biscay, both in number of vessels and in landings, are the French fishery and the Spanish fisheries followed by the Dutch, the United Kingdom and Belgium. Those countries mainly operate pair trawl (mainly targeting hake and blue whiting), bottom otter trawl (targeting both demersal –hake, megrim, monkfish and Norway lobster– and mixed –mainly cephalopods and red mullet– species). Purse seiners for small pelagic species and pelagic trawls for small and big pelagic species are also found.

An important characteristic of these fisheries is that they are mixed<sup>2</sup> and multi-species fisheries and in many cases with several target species. Therefore, SWW fisheries can be considered as '**double-mixed**' fisheries, where both stocks and Member States are mixed together.

## 1.2. Fleets and fisheries by Member State

### 1.2.1. Portugal (PT)

In Portugal four administrative vessel segments have been defined for the continental coast ICES (2007). Firstly, there is the small-scale regional fleet. Small vessels with reduced autonomy and with a high diversity of fishing gears (beam trawl, gill- and trammel-nets, hooks and longline, traps and pots) target mainly coastal and estuarine species. Gears and fishing activity may be very typical on a regional scale. Secondly, can be found the purse-seine fleet. Vessels with high engine power and autonomy. This fleet uses mainly seine nets and targets small pelagic species. Thirdly, the trawl fleet. They use mainly bottom trawl nets. Target a great variety of benthic and demersal species including fish, cephalopods, and crustaceans.

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<sup>2</sup> Mixed fisheries are understood as several different fishing gears exploiting one (or several stocks).

Finally, the artisanal/multi-gear (polyvalent) fleet. They use a great variety of fishing gears (gill- and trammel-nets, hooks and longline, traps and pots). This fleet targets a great diversity of benthic, demersal, and pelagic species (fish, shellfish, cephalopods, and crustaceans) and it contributes to an important part of the total annual landings of the demersal fish species, in particular, for hake and anglerfish.

### **1.2.2. Spain (SP)**

The Spanish fleets operating on the Atlantic Iberian Peninsula shelf catch a variety of species in several multispecies fisheries including a great diversity of trawl, gill net, longline, purse seine and small-scale fleets. In northern Iberian area operate a three métier trawl fleet including otter bottom trawls and pair trawls targeting hake, white and black anglerfish, megrim and four-spot megrim, Norway lobster, blue whiting, mackerel, and horse mackerel. In the Gulf of Cadiz, the south-eastern border of the Atlantic Iberian region, two groups of trawlers can be distinguished: the most numerous group normally operates in shallow waters (30–50 m), for which the target species are a mixture of sparids, cephalopods, sole, hake, and horse mackerel, and the other group which operates between 90 and 500 m and mainly targets blue whiting, shrimp, horse mackerel, hake, and Norway lobster. The latter group consists of smaller trawlers fishing for hake as well as crustaceans, molluscs, and cephalopods (octopus, etc.).

In the Bay of Biscay two groups of vessels operate. Demersal species focused trawlers, longliners and netters, as well as purse seiners, targeting small (anchovy, sardine) and large pelagics (tunas).

### **1.2.3. France (FR)**

For France a very diverse of fleets can be found. Bottom trawls, pelagic trawls, purse seine and gillnets. The main species caught in this area are nephrops (bottom trawl), sole (gillnet), and anchovy (pelagic trawl and purse seine). Anglerfish and hake are mostly caught by French-flagged vessels based in Spain (Basque Country). These vessels use gillnets. The French fisheries take the largest proportion of elasmobranchs of any fleets in this region. Traditionally, the French fishery was limited to the continental shelf of the Celtic Sea, the Channel, and the Bay of Biscay.

### **1.2.4. Belgium (BG)**

Belgium has a flatfish-directed fishery mainly targeting sole in ICES Divisions 8ab. Vessels taking part in these fisheries are mostly large beam trawlers with engine powers exceeding 900 HP. Vessels often shift between these areas (and the Celtic and Irish Seas), even during the same trip, depending on quota availability and catch opportunities.

### **1.2.5. Other (Oth)**

Even if at lower scale some fleets from the Netherlands, Ireland and UK are also fishing in SWW, although they cannot be considered as a major component of the SWW fisheries.



## 2. IDENTIFY THE SPECIES ACTING AS CHOKE, DESCRIBING AND ASSESSING WHETHER TRADITIONAL SWAPS HELP TO REDUCE ANY DEFICITS BETWEEN CATCHES AND QUOTAS.

### KEY FINDINGS

- **A choke stock was defined as any species for which the available quota is exhausted before the quotas are exhausted of (some of) the other stocks that are caught together in a (multi-species) fishery.**
- The main objective was to **identify stocks that can be considered choke** under the implementation of the landing obligation and **investigate tools and management actions appropriate** for each stock/fishery to reduce the deficit between catch and quota.
- **51 different stocks were analysed.** Those, with catches in the SWW region and a TAC regulation for the year 2016.
- In terms of the data used, some **inconsistencies were found among the different databases.**
- **Potential 'choke situations' were identified** and categorised following the definitions developed at the MS workshop on 'Access to Quota'.
- According to 2016 data, in SWW there were **23 stocks with a potential of causing choke problems.** The variability of some of these TACs can make this number increase or decrease.
- 6 of these stocks are of fisheries of the Bay of Biscay, 3 of Iberians waters, 4 widely distributed and 1 deep sea stock.
- **14** of them were of category 3, that is **insufficient quota existed at EU level.**
- **9** of them of category 2, that is sufficient quota is available at EU level, but **insufficient quota exists at individual Member State level.**
- **France and Spain face a problem for 14 of these stocks, while the number is lower for Belgium (7) and Portugal (3).**

**The relative stability principle provided a method to handle the question of how to divide fishing opportunities up into national quotas** by setting up a distributional-key (Box 1) and was first applied in practice with the adoption of the CFP in 1983. Under this system, TAC for each fish stock have been shared out between the Member States according to a **fixed allocation key** based on their historic catches. The purpose of relative stability is, as the term suggests, preventing repeated arguments over how quotas should be allocated.

### Box 1: Relative stability

First laid down in 1983 CFP Basic Regulation and operationalised in 1983 TACs and Quota Regulation, it fixes a distributional key of the TAC by Member State based on the allocation principles of: Historical catches (1973-1978); Dependency as enshrined in 1976 Hague Preferences; and jurisdictional losses (1973-1976).

**Source:** Authors.

Discards are the portion of a catch of fish which is not retained on board during commercial fishing operations and is returned to the sea. **Without landing obligation**, as it has been from the beginning of the previous CFP releases, **the distributional key used was not accounting for discards**. Therefore, discards have been used by fishers as the way of avoiding the over quota problem<sup>3</sup>, that is if the quota is exceeded, discarding was the way to comply with the regulation. In such a framework when relative stability principle was agreed, the focus of the negotiators was on the commercially valuable species of their fishing vessels, that is **on the landings and not on the catches (landings and discards)**.

### Box 2: Landing obligation

Art 15(1): All catches of species which are subject to catch limits and, in the Mediterranean, also catches of species which are subject to minimum sizes [...], caught during fishing activities in Union waters or by Union fishing vessels outside Union waters in waters not subject to third countries' sovereignty or jurisdiction, in the fisheries and geographical areas listed below shall be brought and retained on board the fishing vessels, recorded, landed and counted against the quotas where applicable, except when used as live bait [..]

**Source:** CFP basic Regulation, Art. 15(1).

Without landing obligation (Box 2), there was not a quota implementation issue<sup>4</sup> in a multispecies context since the excess catch could be discarded, however, after 2019 when all catches (under TAC or MCRS) are to be landed, it may create a difficulty<sup>1</sup>.

**This difficulty is exacerbated in the context of multi-species fisheries.** These fisheries are defined by the harvesting of **multiple types of fish by vessels at the same time**. In these fisheries is difficult to target species individually as several species are caught together in each haul. Multi-species and mixed fishery problems have been addressed in fisheries literature (Ulrich et al., 2011), and the conclusion has been that there is always a choke species that can potentially limit the fishing effort. The term choke species was first introduced by Schrope (2010) and stands for the idea that the lowest quota in a mixed fishery constraints the opportunities of catching other for which quota has not been exhausted, given a certain fishing effort (Box 3).

### Box 3: Choke stock

A choke stock is a stock for which the available quota is exhausted before the quotas are exhausted of (some of) the other stock that are caught together in a (mixed) fishery.

**Source:** IP/B/PECH/IC/2015-124

The issue of **choke stocks has been highlighted as the biggest single difficulty in implementing the landing obligation**. The source of this problem comes from the **necessity that all catches count against the quota**. In the most extreme case, the lack of quota could **shut down fishing operations before the end of the season with potentially economic implications**.

This implementation problem arises in, fundamentally, two cases:

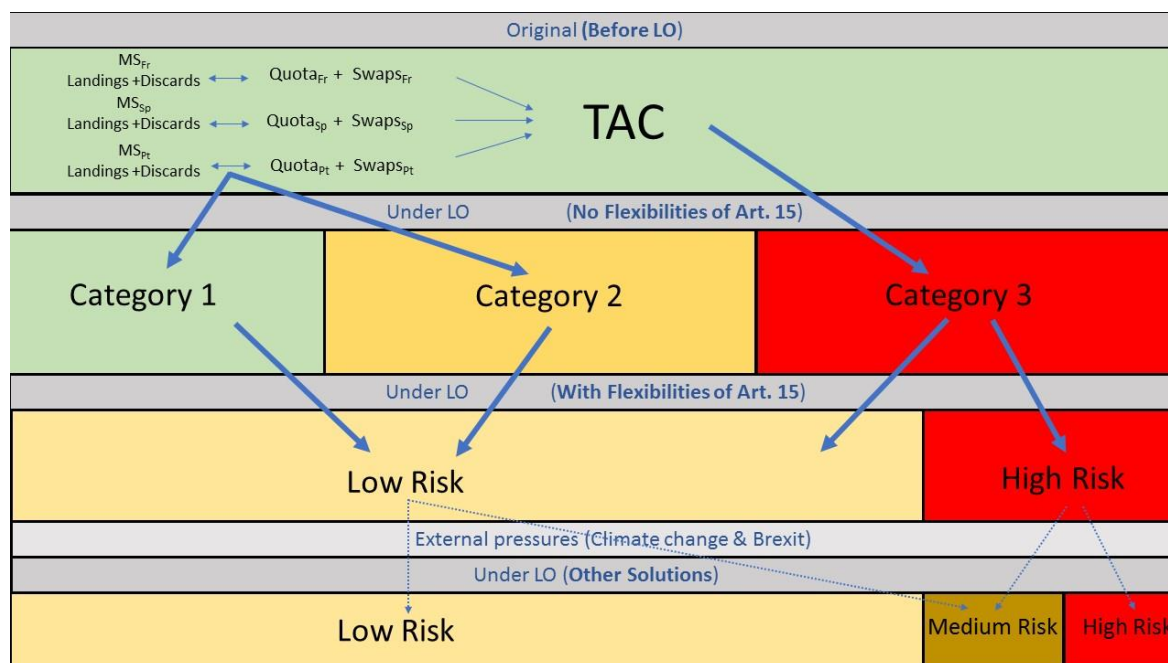
<sup>3</sup> Quota constraint is not the only reason for discarding. MCRS as biological references for sustainability of the species and or high-grading, that is to retain the most valuable fish and discard the low or null valuable fish to save storing space and/or unrewarded crew effort, are also two powerful reasons for discarding. Furthermore, they are powerful from the economic rationality side.

<sup>4</sup> There are other difficulties related to the implementation of the regulations beyond the TACs and quotas.

- **Bycatches in a targeted fishery.** Where the choke is the bycatch stock. Effort is reduced due to the bycatch and the target fishing possibilities are not fully utilized.
- **Target stocks in a multi-species fishery.** Where the choke is (are) the target(s) stocks. Effort is reduced due to one target stock and the remaining target stocks fishing possibilities are unmet.

In other words, in a clean and single species fishery, choke effects are not possible, although other implementation issues may arise from the impossibility of discarding individuals under MCRS.

**Figure 1: Process followed for the identification of choke stocks risks**



**Source:** Authors

Currently, a **toolbox to alleviate the choke stocks problems exist**. This toolbox can be interpreted from its regulatory source. Existing tools prior to the landing obligation (i.e., swaps, special conditions and quota borrowing and banking), tools created with the landing obligation (i.e., high survivability and *de minimis* exemptions and inter-species quota flexibility) and other tools that may arise from the identification of the problems and solutions, (bycatch quotas, combined TACs,...).

With the aim of identifying choke risks in SWW fisheries considering these alleviating tools, this study has the triple objective of:

- **Identify**, using publicly available data sources, stocks that can be considered **choke** under the implementation of the landing obligation;
- **Investigate** fleets, tools and management actions appropriate for each stock/fishery to **reduce the deficit between catch and quota**, considering also **external factors** such as climate change and withdrawal of the United Kingdom from the EU ("Brexit").
- **Determine** stock of high-risk of being choke species after using (or exploring their use) all the **alleviating (flexibilities and exemptions) tools already anticipated** in the article 15 of the CFP or any other different management action.

To do so, the process described in Figure 1 was followed. Section 2 of this report is devoted to numerically establish the main problems that the landing obligation can create at Member State level and at SWW overall stock level (first two rows of Figure 1). Section 3 describes

and considers stock by stock the existing mitigation tools and external pressures that may affect the final choke risk assessment (last two rows of Figure 1). The overall aim is to provide a final **overview of the situation using 2016 as a reference year**.

## 2.1. Data used

The case study analysed was the stocks and fisheries of the South Western Atlantic Waters (SWW) region (Map 1). **The analysis started from an individual management stock basis.**

Stocks analysed in SWW were selected using the COUNCIL REGULATION (EU) 2016/72 of 22 January 2016 fixing for 2016 the fishing opportunities for certain fish stocks and groups of fish stocks, applicable in Union waters and, for Union fishing vessels, in certain non-Union waters, and amending Regulation (EU) 2015/104, and the COUNCIL REGULATION (EU) No 1367/2014 of 15 December 2014 fixing for 2015 and 2016 the fishing opportunities for Union fishing vessels for certain deep-sea fish stocks. Using these two regulations, ICES subareas 8, 9, 10 and 34.1.1 (Map 1) were filtered to identify the relevant TAC regulated stocks of this sea region.

Therefore, this report **is only reflecting the potential choke situations of the stocks selected (stocks in SWW area)**, and not all the potential choke stocks of the Member States involved in SWW (i.e., Belgium, France, Ireland, Portugal, Spain, The Netherlands and United Kingdom).

**The reference year was 2016**, the latest year for which complete catch data was available at the time of producing this study.

On this selection, the relevant Member States with a positive quota of the stocks selected were identified. **Landings and discards (catch data)** by Member State were obtained from the STECF database coming from the 2017 DCF data call to support fishing effort regime evaluations.

Several exceptions were considered to this general data source rule. For the case of the stocks of megrims (LEZ/8C3411 and LEZ/8ABD) and anchovy (ANE/9/3411), the STECF data show several inconsistencies. In these cases, ICES data (from the relevant stock assessment groups reports of ICES -[www.ices.dk](http://www.ices.dk)-) were used. For some deep-sea stocks (R. grenadiers - RNG/8X14- and RHG/8X14- and G. forkbeard - GFB/89-) the data submitted to the Fishery Data Exchange System (FIDES) was used. In this last case it was not clear to the authors if the catch data reflected landings or landings and discards. This is the reason why Tables 8 and 9 present a merged column reflecting the value submitted to this database. For the two stocks of deep sea sharks (DWS/56789- and DWS/10-) and for orange roughy (ORY/1CX14), it was impossible to obtain any catch data.

The data sources used for each stock for Tables 2 to 9 was identified under the column "Stock" (source).

Initial quota and real final quota by Member State and stock could differ. However, it is extremely difficult to identify changes in the available final quota by Member State and stock coming from swaps, year flexibilities, fines,... Therefore, the approach taken considered the concept of **adapted quota**. This last is defined as the quota that the Member State has at the end of the year coming from the original quota and after international swaps, allowed flexibilities and fines. The adapted quota which is the final quota includes, in some cases, revisions concerning transfers from non-utilized quota in the previous year or deductions for excessive catches in the previous year (borrowing and banking). **Tables 2 to 10 reflect this quota adaptation by Member State** under the general column "swaps" as a positive value (when quota is increased) or as a negative value when is decreased.

Adapted quotas were obtained from the *Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente* for Spain, the *Ministère de l'Agriculture et de l'Alimentation* for France, the *Afdeling Kennis Kwaliteit en Visserij* for Belgium and the *Direcção Geral de Recursos Naturais, Segurança e Serviços Marítimos* of Portugal. **All of them provided us the necessary data to obtain the adapted quota by stock.**

## 2.2. Methodology

Across the relevant Member States, to provide an indication of the likely surplus or deficit between catches and adapted quota, the percentage of consumed quota was calculated by stock. Additionally, the TAC consumption was calculated by stock. This **consumption represents the sum of landings and discards of the stocks**. Based on this data, potential choke situations were identified and categorised following the definitions developed at the MS workshop on 'Access to Quota' (14 -15 April 2016, Edinburgh)<sup>5</sup>:

- **Category 1: Sufficient quota is available at Member State level.** The choke stock is due to the distribution of quota within the Member State, such that a region or fleet segment does not have enough quota to cover catches. This situation may be resolved by the Member State itself and species falling into this category are not considered further in this report.
- **Category 2: Sufficient quota is available at EU level, but insufficient quota exists at Member State level.** The choke stock is due to the distribution of quota between Member States and may be resolved between Member States in a regional context.
- **Category 3: Insufficient quota exists at EU level.** The choke stock candidate is due to insufficient quota within the relevant sea basin to cover current catches, resulting in the total cessation of fishing of the flag vessels of a Member State or Member States.

## 2.3. Stocks considered

In total 51 different stocks were analysed in five different blocks (Table 1):

- 17 Stocks in Iberian Waters (ICES Divisions 8c, 9a and subareas 10 and CECAF 34.1.1);
- 8 stocks in the Bay of Biscay (ICES Divisions 8abd);
- 8 widely distributed stocks;
- 6 widely distributed large pelagic;
- 12 deep sea stocks.

**Table 1: Stocks considered in the analysis**

Common name	Stock	Area
Anchovy	ANE/9/3411	Iberian waters
Anglerfish	ANF/8C3411	
Blue whiting	WHB/8C3411	
Mackerel	MAC/8C341	

<sup>5</sup> In this workshop a choke mitigation tool has been designed for North Western Waters to develop contingency plans before the full implementation of the landing obligation in 2019.

Megrim	LEZ/8C341	
Hake	HKE/8C341	
Horse mackerel	JAX/08C	
Horse mackerel	JAX/09	
Norway Lobster	NEP/08C	
Norway Lobster	NEP/9/3411	
Pollack	POL/08C	
Pollack	POL/9/3411	
Sole	SOO/8CDE34	
Skates and Rays	SRX/89-C.	
Undulate Rays	RJU/8-C.	
Undulate Rays	RJU/9-C	
Anchovy	ANE/08	
Anglerfish	ANF/8ABDE	Bay of Biscay
Megrim	LEZ/8ABDE	
Hake	HKE/8ABDE	
Pollack	POL/8ABDE	
Norway Lobster	NEP/8ABDE	
Sole	SOL/8AB	
Plaice	PLE/8/3411	
Whiting	WHG/08	Widely distributed
Blue whiting	WHB/1X14	
Mackerel	MAC/2CX14-	
Horse mackerel	JAX/2A-14	
Boarfish	BOR/678-	
Cod	COD/7XAD34	
Haddock	HAD/7X7A34	
Ling	LIN/6X14	Deep sea
Saithe	POK/7/3411	
Deep Sea sharks	DWS/56789-	
Deep Sea sharks	DWS/10-	
Black scabbardfish	BSF/8910-	
Black scabbardfish	BSF/C3412-	
Alfonsinos	ALF/3X14-	
R. Grenadiers	RNG/8X14-/RHG/8X14-	
Orange roughy	ORY/1CX14	
Red seabream	SBR/678-	
Red seabream	SBR/09-	Large Pelagics
Red seabream	SBR/10-	
Greater forkbeard	GFB/89-	
Greater forkbeard	GFB/1012-	
Bluefin tuna	BFT/AE45WM	
Northern Albacore	ALB/AN05N	
Swordfish	SWO/AN05N	
Bigeeye tuna	BET/ATLANT	
Blue Marlin	BUM/ATLANT	
White Marlin	WHM/ATLANT	

**Source:** EU Regulations 2016/72 and 1367/2014.

## 2.4. Analysis

The analysis was made through quantitative data, divided in blocks using the regional distribution of the stock and/or the type of fishery. Each block provides a summary table where the variables presented are:

- Stock: Species common name in English and the management stock definition;
- Source: Data source for landings and discards;
- Management Status: Last known biological/target status of the stock according to the corresponding advisory body (ICES or ICCAT);
- MCRS: Minimum Conservation reference size if exists. If not, "-" is displayed;
- Member State: Expresses the total EU TAC and the name of the Member State;
- Quota: Expresses the original quota in tonnes by Member State;
- Swaps: Expresses the adapted quota change (positive or negative) in tonnes by Member State;
- Landings: Landings in tonnes as recorded from the data source reflected in "Source";
- Discards: Discards in tonnes as recorded from the data source reflected in "Source";
- Catch/quota: Percentage of total catch (landings and discards) respect to the adapted quota. In red if it is above 100;
- Choke risk category (1,2,3) as explained above. Green implies Category 1, orange Category 2 and red Category 3.

## 2.5. Stocks in Iberian Waters (ICES Divisions 8c, 9a and subareas 10 and CECAF 34.1.1)

Tables 2 and 3 present the likely quantitative choke risk stocks in Iberian waters.

**Table 2: Stocks in Iberian waters. Category according to catch and quota.**

Species Stock	Management status	MCRS	MS	Quota	Swaps	Landings	Discards	Catch/ quota	Choke risk Category
				Tonnes					
<b>Anchovy</b> ANE/9/3411 Source: ICES	Undefined	9 cm	TAC	10622		13584	0	128%	3
			Spain	5080	1089	6647	0	108%	
			Portugal	5542	1875	6937	0	94%	
<b>Anglerfish</b> ANF/8C3411 Source: STECF	Sustainable	-	TAC	2569		2384	0	93%	1
			France	2	50	37	0	72%	
			Spain	2141	-57	1652	29	81%	
			Portugal	426	224	393	2	61%	
<b>Blue whiting</b> WHB/8C3411 Source: STECF	Above FMSY	-	TAC	29914		25241	3351	96%	2
			France	0	0	0	0	>100%	
			Spain	23931	16158	23309	2280	64%	
			Portugal	5983	707	1932	1071	45%	
<b>Mackerel</b> MAC/8C341 Source: STECF	Above FMSY	20cm	TAC	40918		26210	3565	73%	1
			France	224	0	95	0	42%	
			Spain	33723	-3337	25322	3256	94%	
			Portugal	6971	-657	1499	308	29%	
<b>Megrim</b> LEZ/8C341 Source: ICES	Above FMSY	20cm	TAC	1363		974	397	101%	3
			France	63	0	3	0	5%	
			Spain	1258	93	851	397	92%	
			Portugal	42	63	120	0	114%	
<b>Hake</b> HKE/8C341 Source: STECF	Above FMSY	27cm	TAC	10674		8854	2460	106%	3
			France	656	96	191	2	26%	
			Spain	6830	999	6983	2182	117%	
			Portugal	3188	466	1680	276	54%	
<b>Horse Mackerel</b> JAX/08C Source: STECF	Below Btrigger	15cm	TAC	17235		15405	526	92%	1
			France	268	0	2	0	1%	
			Spain	15441	1367	14323	304	87%	
			Portugal	1526	20	1080	222	84%	
<b>Horse Mackerel</b> JAX/09 Source: STECF	Sustainable	15cm	TAC	68583		28307	632	42%	1
			Spain	17444	1574	15710	627	86%	
			Portugal	50839	-4653	12597	5	27%	
<b>Norway Lobster</b> NEP/08C Source: STECF	Below Btrigger	85mm	TAC	48		17	0	35%	1
			France	2	0	1	0	41%	
			Spain	46	-3	16	0	37%	

**Source:** Authors using STECF and ICES data. TACs and quota from Regulation (EU) 2016/72. Adapted quota from the information provided by the relevant Member States. Reference year, 2016.

**Notes:** “-” Stands for not evaluated. “>100%” stands for either positive quota or no catches but evidences of positive catches.

**Table 3: Stocks in Iberian waters. Category according to catch and quota. (cont)**

Species Stock	Biological status	MCRS	MS	Quota	Swaps	Landings	Discards	Catch/ quota	Choke Category
				Tonnes					
Norway Lobster NEP/9/3411 Source: STECF	Below  Btrigger	85mm	TAC Portugal Spain	320 240 80	 13 5	219 173 46	0,06 0 0,06	68% 68% 54%	1
Pollack POL/9/3411 Source: STECF	Undefined	30cm	TAC Portugal Spain	282 9 273	 0 -50	85 5 80	0 0 0	30% 56% 36%	1
Pollack POL/08C Source: STECF	Undefined	30cm	TAC Portugal Spain	231 23 208	 0 0	153 0 153	0 0 0	66% 0% 74%	1
Sole SOO/8CDE34  Source: STECF	Undefined	24cm	TAC France Spain Portugal	1072 0 403 669	 0 0 0	250 1 96 153	0 0 0 0	23% <b>&gt;100%</b> 24% 23%	2
Skates and Rays SRX/89-C.   Source: ICES	Undefined	-	TAC Belgium France Spain Portugal UK	3420 7 1298 1057 1051 7	 0 -65 -132 0 4	1396 2 480 438 433 43	- - - - - -	41% 29% 39% 47% 41% <b>391%</b>	2
Undulate Rays RJU/8-C.   Source: ICES	Undefined	-	TAC Belgium France Portugal Spain UK	25 0 9 8 8 0	 0 7 -7 0 -	21 0 14 0 7 0	- - - - - -	84% 0% 88% 0% 88% 0%	1
Undulate Rays RJU/9-C   Source: ICES	Undefined	-	TAC Belgium France Portugal Spain UK	40 0 16 12 12 0	 0 -12 12 0 -	31 0 0 23 8 0	- - - - - -	78% 0% 0% 96% 67% 0%	1

**Source:** Authors using STECF and ICES data. TACs and quota from Regulation (EU) 2016/72. Adapted quota from the information provided by the relevant Member States. Reference year, 2016.

**Notes:** “-” Stands for not evaluated. “>100%” stands for either positive quota or no catches but evidences of positive catches.

## 2.6. Stocks in the Bay of Biscay (ICES Divisions 8abd)

Tables 4 and 5 present the likely quantitative choke risk stocks of the Bay of Biscay relevant for fisheries in SWW.

**Table 4: Stocks in the Bay of Biscay. Category according to catch and quota.**

Species Stock	Biological status	MCRS	MS	Quota	Swaps	Landings	Discards	Catch/ quota	Choke risk Category
				Tonnes					
<b>Anglerfish</b> ANF/8ABDE  Source: STECF	Undefined	-	TAC	8980		8172	951	102%	3
			Belgium	0	310	219	55	89%	
			France	7612	100	6678	638	95%	
			Spain	1368	50	1184	167	95%	
			Portugal	0	0	0	85	>100%	
			UK	0	-	91	6	-	
<b>Megrims</b> LEZ/8ABDE  Source: ICES	Above FMSY	20cm	TAC	1802		2163	522	149%	3
			Belgium	0	15	14	10	160%	
			France	1334	90	1476	391	131%	
			Spain	997	-428	673	121	140%	
<b>Hake</b> HKE/8ABDE  Source: STECF	Sustainable	27cm	TAC	40393		25155	3846	72%	1
			Belgium	18	1653	7	31	2%	
			France	27910	724	16786	2332	67%	
			Ireland	0	0	0	0	0%	
			Spain	13974	-1545	8362	1483	79%	
			UK	0	-	1	0	-	
<b>Norway Lobster</b> NEP/8ABDE  Source: STECF	Below Btrigger	85mm	TAC	3899		4149	1793	152%	3
			Belgium	0	6	0	0	3%	
			France	3665	5	4148	1793	162%	
			Spain	234	-220	1	0	9%	
<b>Common Sole</b> SOL/8AB  Source: STECF	Above FMSY	24cm	TAC	3420		3393	139	103%	3
			Belgium	42	4873	288	5	6%	
			France	3135	0	3100	134	103%	
			Spain	8	-3	5	0	93%	
			Netherlands	235	-	0	0	0%	
<b>Pollack</b> POL/8ABDE  Source: STECF	Undefined	30cm	TAC	1482		1323	131	98%	2
			Belgium	0	0	0	0	>100%	
			France	1230	0	1293	130	116%	
			Spain	252	-242	5	0	50%	
			UK	0	-	25	0	>100%	

**Source:** Authors using STECF and ICES data. TACs and quota from Regulation (EU) 2016/72. Adapted quota from the information provided by the relevant Member States. Reference year, 2016.

**Notes:** “-” stands for not evaluated. “>100%” stands for either positive quota or no catches but evidences of positive catches.

**Table 5: Stocks in the Bay of Biscay. Category according to catch and quota (cont.).**

Species Stock	Biological status	MCRS	MS	Quota	Swaps	Landings	Discards	Catch/ quota	Choke risk
				Tonnes					Category
Anchovy ANE/08 Source: STECF	Above BMGT	9cm	TAC	33000		20278	15686	109%	3
			France	3300	1750	2110	5795	157%	
			Spain	29700	-6591	18168	9891	121%	
Whiting WHG/08  Source: STECF	Undefined	27cm	TAC	2540		2499	782	129%	3
			Belgium	0	10	1		10%	
			France	1524	882	2452	773	134%	
			Spain	1016	-883	42	9	38%	
			Portugal	0	0	4	0	>100%	
Plaice PLE/8/3411  Source: STECF	Undefined	22cm	TAC	395		173	2	44%	1
			Belgium	0	5	1		20%	
			France	263	50	121	2	39%	
			Spain	66	-55	4	0	36%	
			Portugal	66	0	47		71%	
Skates and Rays SRX/89-C.  Source: ICES	Undefined	-	TAC	3420		1396	-	41%	2
			Belgium	7	0	2	-	29%	
			France	1298	-65	480	-	39%	
			Spain	1057	-132	438	-	47%	
			Portugal	1051	0	433	-	41%	
			UK	7	4	43	-	391%	

**Source:** Authors using STECF and ICES data. TACs and quota from Regulation (EU) 2016/72. Adapted quota from the information provided by the relevant Member States. Reference year, 2016.

**Notes:** “-” stands for not evaluated. “>100%” stands for either positive quota or no catches but evidences of positive catches.

## 2.7. Widely distributed

Tables 6 and 7 present the likely quantitative choke risk for widely distributed stocks relevant for fisheries in SWW.

**Table 6: Widely distributed stocks with catches in SWW. Category according to catch and quota.**

Species Stock	Biological status	MCRS	MS	Quota	Swaps	Landings	Discards	Catch/ quota	Choke risk
				Tonnes					Category
Blue Whiting WHB/1X14  Source: STECF	Above FMSY	-	TAC	207657		208121	9710	105%	3
			Denmark	31704	6920	38884	1809	105%	
			Germany	12327	-	14622	2264	137%	
			Spain	26878	-26757	16	2	15%	
			France	22063	-7995	10157	230	74%	
			Ireland	24550	3209	27656	3009	110%	
			Netherlands	38659	19629	78498	14	135%	
			Portugal	2497	0	0	0	0%	
			Sweden	7842	-7704	42	248	210%	
			UK	41137	731	38247	2135	96%	
Mackerel MAC/2CX14-  Source: STECF	Above FMSY	20cm	TAC	357587		227397	26346	71%	2
			Germany	27751	-	9777	695	38%	
			Denmark	0	-	19025	367	-	
			Estonia	189	-	0	0	0%	
			Latvia	140	-	0	0	0%	
			Netherlands	33178	-	15268	249	47%	
			Poland	1602	-	0	0	0%	
			Lithuania	140	-	13	0	9%	
			France	15169	6983	16636	12836	134%	
			Ireland	75837	-	53081	3220	74%	
			Belgium	0	45	44	3	104%	
			Spain	24	1290	1588	6680	629%	
			UK	208557	-	111965	2296	55%	
Horse mackerel JAX/2A-14  Source: STECF	Below Btrigger	15cm	TAC	106721		71647	110252	170%	3
			Belgium	0	11	28	0	255%	
			Denmark	10415	-2063	0	158	2%	
			Germany	8126	7765	11402	12	72%	
			Spain	11084	342	1104	88931	788%	
			France	4183	4285	2862	20333	274%	
			Ireland	27064	3782	29066	223	95%	
			Netherlands	32606	8043	24958	0	61%	
			Portugal	1068	0	0	0	0%	
			Sweden	675	-639	0	0	0%	
			UK	9800	-1723	2227	594	35%	

**Source:** Authors using STECF and ICES data. TACs and quota from Regulation (EU) 2016/72. Adapted quota from the information provided by the relevant Member States. Reference year, 2016.

**Notes:** “-” stands for not evaluated. “>100%” stands for either positive quota or no catches but evidences of positive catches.

**Table 7: Widely distributed stocks with catches in SWW. Category according to catch and quota (cont.)**

Species  Stock	Biological status	MCRS	MS	Quota	Swaps	Landings	Discards	Catch/ quota	Choke risk
				Tonnes					Category
<b>Boarfish</b> BOR/678-  Source: STECF	Undefined	-	TAC	42637		17883	0	42%	2
			Germany	0	5	4	0	80%	
			France	0	0	>0	>100	>100%	
			Denmark	10463	-	389	0	4%	
			Ireland	29464	-	17491	0	59%	
			Spain	0	0	0	>100	>100%	
			UK	2710	-	0	0	0%	
<b>Cod</b> COD/7XAD34  Source: STECF	Above FMSY  Below Btrigger	35cm	TAC	4372		3902	910	110%	3
			France	3166	-169	2353	509	96%	
			Ireland	864	-	979	175	134%	
			Spain	0	0	0	>0	>100%	
			Netherlands	1	199	37	3	20%	
			Belgium	0	41	137	16	375%	
			UK	341	-	395	207	177%	
<b>Haddock</b> HAD/7X7A34  Source: STECF	Above FMSY	30cm	TAC	8912		8850	10666	219%	3
			Belgium	107	20	93	896	778%	
			France	4958	3	4787	5400	205%	
			Ireland	2329		2445	2898	229%	
			Netherlands	0	0	14	0	>100%	
			Spain	0	0	0	0	>100%	
			UK	1518		1510	1473	197%	
<b>Ling</b> LIN/6X14  Source: STECF	Sustainable	63cm	TAC	10297		6841	449	71%	2
			Belgium	39	40	37	5	53%	
			Denmark	7	-	0	0	0%	
			Germany	140	-	1	0	1%	
			Spain	2837	-283	1431	28	57%	
			France	3025	-	1876	107	66%	
			Ireland	758	-	755	127	116%	
			Portugal	7	-	0	0	0%	
			UK	3484	-	2741	182	84%	
<b>Saithe</b> POK/7/3411  Source: STECF	Undefined	35cm	TAC	5948		938	142	18%	2
			France	2341	0	88	19,61	5%	
			Belgium	0	0	1	0,39	>100%	
			Ireland	384	-	731,74	74,7	210%	
			Spain	0	9	1	34,22	389%	
			UK	2987	-	118	13,33	4%	

**Source:** Authors using STECF and ICES data. TACs and quota from Regulation (EU) 2016/72. Adapted quota from the information provided by the relevant Member States. Reference year, 2016.

**Notes:** “-” stands for not evaluated. “>100%” stands for either positive quota or no catches but evidences of positive catches.

## 2.8. Widely distributed large pelagics

Table 8 presents the likely quantitative choke risk for widely distributed large pelagic stocks relevant for fisheries in SWW.

**Table 8: Widely distributed large pelagic stocks with catches in SWW. Category according to catch and quota.**

Species Stock	Biological status	MCRS	MS	Quota	Swaps	Landings	Discards	Catch/ quota	Choke risk
				Tonnes					
Bluefin tuna BFT/AE45WM  Source: STECF	Sustainable	115cm	TAC	11204		1195	114	12%	1
			Greece	182	-	0	0	0%	
			Spain	3534	-60	841	0	24%	
			France	3488	-	354	114	13%	
			Croatia	551	-	0	0	0%	
			Italy	2753	-	0	0	0%	
			Malta	226	-	0	0	0%	
			Portugal	332	0	0	0	0%	
			Other	39	-	0	0	0%	
N. Albacore ALB/AN05N  Source: STECF	Sustainable	-	TAC	24542		21985	295	91%	2
			Ireland	2585	-	2287	89	92%	
			Spain	14917	163	15519	12	103%	
			France	4512	0	4179	193	97%	
			Uk	394	-	0	0	0%	
			Portugal	2179	0	0	0	0%	
Swordfish SWO/AN05N  Source: STECF	Not Overfished	-	TAC	7686		2891	0	38%	1
			Spain	6393	-1089	2884	0	54%	
			Portugal	1162	0	7	0	1%	
			Other	131	-			0%	
Bigeye tuna BET/ATLANT  Source: STECF	Overfished	-	TAC	23789		3545	0	15%	1
			Spain	13397	-3	3297	0	25%	
			Portugal	4515	0	0	0	0%	
			France	5878	0	247	0	4%	
Blue Marlin BUM/ATLANT  Source: STECF	Ovefished	-	TAC	408		11	0	3%	2
			Spain	0	0	11	0	>100%	
			Portugal	50	0	0	0	0%	
			France	358	0	0	0	0%	
White Marlin WHM/ATLANT  Source: STECF	Overfished	-	TAC	24		10	0	42%	2
			Spain	2	0	9		379%	
			Portugal	21	0	0	0	0%	
			France	0	0	1		>100%	

**Source:** Authors using STECF and ICCAT data. TACs and quota from Regulation (EU) 2016/72. Adapted quota from the information provided by the relevant Member States. Reference year, 2016.

**Notes:** “-” stands for not evaluated. “>100%” stands for either positive quota or no catches but evidences of positive catches.

## 2.9. Deep-sea stocks

Tables 9 and 10 present the likely quantitative choke risk for deep sea stocks relevant for fisheries in SWW.

**Table 9: Deep Sea stocks with catches in SWW. Category according to catch and quota.**

Species Stock	Biological status	MCRS	MS	Quota	Swaps	Landings	Discards	Catch/ quota	Choke risk
				Tonnes					Category
Deep Sea sharks DWS/56789-  Source: No data	Overexploited	-	TAC	0		0	0	-	
			Germany	0		0	0	-	
			Estonia	0		0	0	-	
			ireland	0		0	0	-	
			Spain	0	0	0	0	-	
			France	0		0	0	-	
			Lithuania	0		0	0	-	
			Poland	0		0	0	-	
			Portugal	0	0	0	0	-	
			UK	0		0	0	-	
Deep Sea sharks DWS/10- Source: No data	Overexploited	20cm	TAC	0		0	0	-	
Portugal	0		0			-			
Black scabbardfish BSF/8910- Source: STECF	Unknown	-	TAC	3700		2441	0	66%	1
Spain			12	12	16		65%		
France			29		3		11%		
Portugal			3659	394	2422		60%		
Black scabbardfish BSF/C3412- Source: STECF	Unknown	-	TAC	2827		1914	0	68%	1
Portugal			2827	0	1914	0	68%		
Alfonsinos ALF/3X14-  Source: STECF	Unknown	-	TAC	296		198	1415	545%	3
Ireland			9		0	0	0%		
Spain			67	19	146	5	175%		
France			18	2	9	1409	7090%		
Portugal			193	20	43	0	20%		
UK			9		1	0	16%		
R. grenadiers RNG/8X14- RHG/8X14-  Source: FIDES	Unknown		TAC	3279		1010		31%	1
Germany			21		0		0%		
Ireland			5		0		0%		
Spain			2354	434	1009		36%		
France			109		1		0%		
Latvia			38		0		0%		
Lithuania			5		0		0%		
Poland			737		0		0%		
UK			10		0		0%		

**Source:** Authors using STECF and FIDES data. TACs and quota from Regulation (EU) 1367/2014. Adapted quota from the information provided by the relevant Member States. Reference year, 2016.

**Notes:** “-” stands for not evaluated. “>100%” stands for either positive quota or no catches but evidences of positive catches.

**Table 10: Deep Sea stocks with catches in SWW. Category according to catch and quota (cont.)**

Species Stock	Biological status	MCRS	MS	Quota	Swaps	Landings	Discards	Catch/ quota	Choke Category
				Tonnes					
Orange roughy 1-5,8-10,12,14  Source: No data	Overexploited		TAC	0		0	0	-	
			Ireland	0	0	0	0	-	
			Spain	0	0	0	0	-	
			France	0	0	0	0	-	
			Portugal	0	0	0	0	-	
			UK	0	0	0	0	-	
Red Seabream 6,7,8  Source: STECF	Overexploited		TAC	160		113	8	76%	1
			Ireland	5	-	0	0	0%	
			Spain	128	12	106	8	81%	
			France	6	20	7	1	32%	
			UK	16	-	0	0	0%	
			Others	5	-	0	0	0%	
Red Seabream 9  Source: STECF	Unknown		TAC	183		65	0	35%	1
			Spain	144	8	21	0	14%	
			Portugal	39	37	44	0	57%	
Red Seabream 10  Source: STECF	Unknown		TAC	517		515	0	100%	1
			Spain	5	1	0	0	5%	
			Portugal	507	78	515	0	88%	
			UK	5		0	0	0%	
Greater forkbeard 8,9  Source: FIDES	Unknown		TAC	320		283		88%	1
			Spain	290	24	241		77%	
			France	18	39	29		51%	
			Portugal	12	1	13		99%	
Greater forkbeard 10,12  Source: STECF	Unknown		TAC	65		10	0	16%	1
			France	10	0	0	0	0%	
			Portugal	45	5	10	0	21%	
			UK	10	-	0	0	0%	

**Source:** Authors using STECF and FIDES data. TACs and quota from Regulation (EU) 1367/2014. Adapted quota from the information provided by the relevant Member States. Reference year, 2016.

**Notes:** “-” stands for not evaluated.

## 2.10. Summary of the choke quantification when no flexibilities are considered

**Table 11 presents a summary of the stocks that could potential act as choke.** In green, those Member State-Stock pairs with no potential risk; in red, member state-stock pairs with potential risk. For the “Overall” column and additional orange colour was used to identify stocks with a risk at member state level but not at EU level. From the 51 stocks with TAC in SWW, 23 were identified as potentially problematic. 14 of them are of category 3, that is there is insufficient quota at EU level.

France and Spain had in 2016, 14 stocks for which their individual adapted quota seemed insufficient. The situation is even worse for those stocks of category 3. For France 8 of these stocks were of category 3, the same number as Spain, even for different stocks.

**Table 11: Potential Choke stocks risk in SWW by Member State and Overall (EU)**

Species	Stock	Member State (SWW)				Overall
		Belgium	France	Portugal	Spain	
Anglerfishes	ANF/8ABDE					
Megrim	LEZ/8ABDE					
N. Lobster	NEP/8ABDE					
Sole	SOL/8AB					
Anchovy	ANE/08					
Whiting	WHG/08					
Pollack	POL/8ABDE					
Anchovy	ANE/9/3411					
B. Whiting	WHB/8C3411					
Megrim	LEZ/8C3411					
Hake	HKE/8C3411					
Sole	SOO/8CDE34					
Albacore	ALB/AN05N					
B. Marlin	BUM/ATLANT					
W. Marlin	WHM/ATLANT					
B. Whiting	WHB/1X14					
Mackerel	MAC/2CX14					
H. Mackerel	JAX/2A-14					
Boarfish	BOR/678					
Cod	COD/7XAD34					
Haddock	HAD/7X7A34					
Saithe	POK/7/3411					
Alfonsinos	ALF/3X14					

**Source:** Authors.

**Notes:** In green, those stock/MS combinations that are not problematic. In red those stock/Member State combinations that are problematic. In yellow those for which there is sufficient quota at EU level.

The three stocks for which Portugal had insufficient quota were of category 3, that is there was insufficient quota at EU level. Finally, Belgium had 7 stocks with insufficient quota, and 4 of them were of category 3.

This initial analysis was made considering the **adapted quota** of each Member State. Even without the landing obligation quota swaps played a key role on adapting quotas to fishing possibilities. **Under landing obligation, quota swaps are likely to play a further prominent role in dealing with choke situations** (Penas-Lado, 2016). Their success will depend on the quota currency required to pay for the swaps and the incentives to make quota available.

However, the analysis only shows that surplus quota is potentially available. It is up to the relevant Member State to brake the deal. **Some apparent surpluses could in fact be already used for swaps of other stocks and therefore wouldn't necessarily be available to reduce the risk for the identified stocks.**

Nevertheless, **in SWW fisheries there are 14 stocks with insufficient quota at EU level, at least without considering the mitigation tools proposed by the art. 15 of the CFP.**

Next section aims to provide a risk assessment of potential choke situation considering the mitigation tools.



### 3. ASSESS WHETHER THE TOOLS IN THE CFP ARE TECHNICALLY ADEQUATE AND SUFFICIENT TO IMPLEMENT THE LANDING OBLIGATION AND THE REASONS WHY SOME ARE BEING CURRENTLY UNDERUTILISED

#### KEY FINDINGS

- Actions that can be taken to reduce the choke issue, are divided into those based on the art. 15 of the CFP, avoidance actions, and those TAC based.
- It is relevant and necessary to identify **those stocks acting as choke**, and provide, if any, relevant **management actions at all levels**, that could prevent or at least reduce this choke issue.
- **There is not a general rule to alleviate choke problems**, and actions are to be taken considering each stock-fleet combination, individually.
- Future changes in distribution are likely but given the complexity of the mechanisms affecting the spatial distribution of fish stocks, predicting those changes with precision and accuracy was not possible.
- Albacore, anchovy, cod, hake, herring, mackerel, plaice, horse mackerel, and common sole have shifted their distribution in relation to TAC management areas since 1985.
- It is reasonable to assume that these changes will challenge some assumptions underlying the current management of SWW fisheries.

#### 3.1. Summary of the mitigation actions

The different actions that can be taken to reduce the choke issue can be categorized in three groups:

##### Actions based on art 15 of the CFP

- **Quota uplifts:** A one-off addition to quota to reflect all the catches being landed. They are calculated on the basis of how much **the fleets that come under the landing obligation contribute to total catches and discards**. When calculating the TAC top-ups this will also take into account the *de minimis* percentages of discards.
- **Interspecies quota flexibility (IQF):** It regulates a **limited transfer between stock-specific TAC**. It is applicable when the non-target stock (which in this case would be a choke) is within safe biological limits. Its use is limited to a 9% transfer.
- **High survivability exemptions:** These are possible solutions, **providing scientific evidences can support the exemptions**. However, providing such evidence for each case is challenging. In the case of SWW this is true for anchovy in the slipping operations and Norway lobster, although some other cases are under study, such as some ray stocks.
- **De minimis exemptions:** These are relevant where **discards are relatively low** and scientific evidence indicates that further selectivity is very difficult to achieve or to avoid disproportionate costs of handling unwanted catches. In some fisheries it may

be possible to **combine the *de minimis* across a number of stocks** to increase flexibility.

### Avoidance of unwanted catches

- **Selectivity improvements:** Selectivity devices are divided into two categories: size and species selectivity measures. The former can be achieved by **increasing the cod-end mesh size and/or installing escape panels. The latter refers to sorting devices, and trawl modifications.** Knowledge of species specific behavioural or physiological responses can be used to increase gear selectivity for certain species.
- **Closures of specific areas or depth range:** They can be spatial, temporal or restricted to certain fleets.
- **Real-time closures:** Measures to avoid certain hotspot areas of unwanted catch.
- **Information sharing:** Real time catch information shared among vessels to promote voluntary avoidance of certain hotspot areas.

### Smart use of quota, based actions

- **Special conditions:** Special conditions imply the possibility of using one stock as donor of other stock. This system is prior to the landing obligation, however, nowadays this is **closely related to IQFs**, given that they always refer to the conditions of art.15(8) (i.e., IQF).
- **Others quota:** The **grouping of low volume choke stocks within an “others” stock quota**. Member States without quota could account for their unavoidable bycatch, as a percentage of the total TAC.
- **A set-aside quota system:** The idea is that a Member State reserves a proportion of its original quota, to be used for alleviating difficulties caused by choke stocks.
- **Remove TAC:** Review the number and type of TACs, especially for multi-species fisheries. Remove bycatch stocks from the TAC regime, **when TAC is not acting as a conservation mechanism**. It has to be taken into account that defining what constitutes a bycatch species is difficult as it may be a bycatch for one Member State but a target species for another.

A list of clearly identified prohibited species is provided under Article 12 of **Regulation (EU) No 43/2014 and does not require any further reflection. For a number of stocks, the TAC has been set to 0 and must therefore not be landed.**

- **Merging TAC regions.** Implicitly, this occurs in stocks of the Bay of Biscay where the total TAC is then divided in smaller areas, **defining sub stocks of a unique managed stock.**
- **Use of  $F_{MSY}$  ranges.** These are defined by ICES as the range of fishing mortalities compatible with an MSY approach to fishing were defined as the **range of fishing mortalities** leading to no less than 95% of MSY and which were precautionary in the sense that the probability of SSB falling below  $B_{lim}$  in a year in long-term simulations with fixed  $F$  was  $\leq 5\%$ .

**The application of these tools is specific to each stock.** No general rule can be established. Therefore, in the next sections, stocks previously categorized as category 2 and 3 are analysed individually. In this analysis, sources of the choke problem and potential solutions are assessed.

## 3.2. Analysis by potential choke stocks: Iberian waters (Tables 2 and 3)

### 3.2.1. Megrims (LEZ/8C341)

Southern stock of megrim is composed of two species, *Lepidorhombus whiffiagonis* and *L. boscii*, not separated in the landings. A single TAC covers both. Megrims are caught by bottom trawlers from Spain and Portugal targeting demersal species which carry out a multi-species fishery targeting megrims (mainly four spotted megrim) together with European hake, monkfish, blue whiting, mackerel and horse mackerel. Spain trawling fleet showed the highest landings with around 87 % of total stock landings in the last five years.

Although theoretically **categorised as 3** (not enough EU TAC and Portugal without sufficient individual quota), this categorization is based on zero discards from Portugal and 1% excess on TAC consumption. Therefore, it can be considered as **low risk stock** of being choke.

### 3.2.2. Hake (HKE/8C341)

Southern stock of hake is caught by gill nets, bottom longlines and three trawl métiers at Iberian waters. Vessels from bottom trawler métier targeting demersal species and bottom trawlers targeting pelagic and demersal species carry out a multi-species fishery targeting hake and other species like four spotted megrim, monkfish, blue whiting, mackerel and horse mackerel all around the year. These métiers are reported to have largely and variable hake discards of an annual rate of 37% (up to 89%). The main reason for discarding hake is the undersized individuals (< 27 cm) and quota restrictions in all trawl fisheries. Vessels from métier 'Pair bottom trawl targeting pelagic and demersal species in north Spanish Iberian waters, carry out a multi-species fishery targeting blue whiting (*Micromesistius poutassou*) and hake (*Merluccius merluccius*) all around the year and mackerel (*Scomber scombrus*) - seasonally-. This métier is reported to have largely and variable hake discards of an annual rate of 23.5% (up to 76.5%). Main reason for discarding hake is the high catch rate of undersized individuals (< 27 cm).

Spain and Portugal together contribute about 98% of total stock landings. Spain fleets show the highest landings with around 79% of total landings and Portugal the 19% of landings in the last five years.

Hake in Atlantic Iberian waters is under landing obligation from the 1<sup>st</sup> of January 2016 for all gill nets, with minimum mesh size between 80 to 99 mm wide, longlines and all bottom trawls and seines using mesh size larger or equal to 70 mm. Currently, a *de minimis* exemption for hake, up to a maximum of 6 % in 2018 of the total annual catches of this species by trawlers targeting this species is in place (EU Regulation 2016/2374). However, this *de minimis* is to be revised through new evidences confirming or not that that selectivity is very difficult to achieve for the métiers involved.

Southern stock of hake has been **categorised as 3**. It should be noted that data on this stock presents some discrepancies in terms of the STECF and ICES sources. According to STECF data, hake landings consume around the 80% of the TAC while according to ICES this consumption is above the 91%. The use of this last dataset makes that the excess of quota would be 116% instead of the 106% displayed in Table 2.

Given the multi-species nature of the fisheries in were hake is target, and the different fleets, including artisanal and industrial fleets involved, southern stock of hake can be considered as **moderate risk** stock of being choke.

### 3.2.3. Blue whiting (WHB/8C3411)

Blue whiting is caught by bottom trawlers targeting demersal species and pair bottom trawlers targeting pelagic and demersal species in north Spanish Iberian waters, that carry out a multi-species fishery targeting blue whiting all around the year. Spain and Portugal together catch the total stock TAC. Spain fleets showed the highest landings with around 92 % of total landings and Portugal the 8% of landings in the last five years.

This stock is of **category 2**, due to level of catches of France with quota zero. This can be corrected using swaps, given that the TAC consumption is below 100%. It can be considered as a **low risk stock** of being choke, although in years of low TAC it could potentially create some problems.

### 3.2.4. Sole (SOO/8CDE34)

Sole is caught by gill nets at Iberian waters. Portugal fleets show the highest landings with around 61 % of total landings and Spain the 38% of landings in the last five years of the time series.

This stock is of **category 2**, due to level of catches of France with quota zero. This can be corrected using swaps, given that the TAC consumption is below 25%. It can be considered as a **low risk stock** of being choke.

### 3.2.5. Anchovy (ANE/9/3411)

Anchovy is caught by purse seines in Iberian waters. Portugal fleets show the highest landings with around 51 % of total landings and Spain the 49% of landings in the last five years of the time series.

**Category 3** using ICES data. No relevant discards. In general, a clean single, seasonal fishery in where problems are related to individuals under MCRS. Not fully evaluated given the discrepancies among ICES and STECF data. It can be considered as a **low risk stock** of being choke. Currently there are several alleviating measures in place, including a *de minimis* and a high survival exemption for the case of slipping<sup>6</sup>.

## 3.3. Analysis by potential choke stocks: Bay of Biscay B (Tables 4 and 5)

### 3.3.1. Anglerfishes (ANF/8ABDE)

Anglerfish is composed of two species, *Lophius piscatorius* and *L. budegassa*. Both are caught on the same grounds and by the same fleets and are usually not separated by species in the landings. Anglerfish is a component of mixed fisheries taking hake, megrim, sole, cod, plaice and nephrops. Spain and France together contribute about 80% of total stock landings. French fleets show the highest landings with around 87% of total landings in the last five years.

Considering both species together, the percentage of landings of ICES Divisions 8abd (Bay of Biscay) in relation to total stock (ICES subarea 7 and Divisions 8abd) in the last 5 years has been around 25%.

In relation to the fleets involved, in France the nephrops and the bottom trawlers and in Spain bottom trawlers are the most important fleets catching this stock.

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<sup>6</sup> The full catch can be returned at sea without being brought onto the deck of the vessel.

Anglerfishes are under landing obligation since 1st of January 2017 for all gill nets with minimum mesh size larger or equal to 200 mm wide (170 mm in 2018). No exemptions are considered for anglerfishes in the Bay of Biscay. It can be considered as a **low risk stock** of being choke.

### 3.3.2. Megrims (LEZ/8ABDE)

Megrims (*Lepidorhombus spp.*) in ICES divisions 7b-k and 8abd are caught in a mixed demersal fishery catching anglerfish, hake and nephrops, both as a targeted species and as valuable bycatch. The two species are landed and recorded together in ports' statistics.

Megrims in the Celtic Sea, west of Ireland, and in the Bay of Biscay are caught in a mixed fishery predominantly by French, Spanish, UK and Irish demersal vessels. In 2016, the four Member States together have reported around 96% of the total landings.

France and Spain are the two main Member States fishing megrim in ICES Divisions 8abd. The percentage of catches in ICES Divisions 8abd in relation to total stock (ICES subarea 7 and Divisions 8abd) has been around 18% in the year 2016.

Megrims in the Bay of Biscay will **not** enter under **landing obligation until 2019**.

If the total distribution of the stock is considered (ICES subarea 7 and Divisions 8abde) megrim is unlikely to be a choke species because in 2016 TAC was higher than catches. However, if only ICES Divisions 8abde are analysed, TAC is lower than catches and it would be considered as a choke stock. On that sense there is a special condition on this stock allowing the use of a 5 % of the quota of LEZ/07 in ICES Divisions 8abde, for France and Spain. Additionally, this percentage is likely to be increased to a 25% in 2018. This implies that the only Member State for which this stock can cause choke difficulties is Belgium. All these characteristics together make megrims in the Bay of Biscay to be considered as a stock with **moderate risk** of being choke.

### 3.3.3. Common sole (SOL/8AB)

The sole fishery has two main components: one is a French gillnet fishery directed to sole (about two thirds of the total catch) and the other one a trawl fishery (French otter or twin trawlers and Belgian beam trawlers).

A special condition applies to this stock. 5% of the quota of LEZ/07 may be used in ICES Divisions 8abde, (LEZ/8ABDE) for by-catches in directed fisheries for sole.

Landing obligation applies to this stock for bottom and beam trawls (70-100 MMS) and gillnets and trammel nets (>100mm). There is a *de minimis* exemption for common sole (EU, 2016), up to a maximum of 5 % of the total annual catches of this species by vessels targeting this species in with beam trawls and bottom trawls targeting this species. There is also a *de minimis* exemption for common sole, up to a maximum of 3% of the total annual catches of this species by vessels targeting it using gillnets and trammel nets. These existing *de minimis* exemptions are to solve the problem that France could potentially have. Therefore, it can be considered as a **low risk stock** of being choke.

### 3.3.4. Anchovy (ANE/08)

The anchovy fishery in the Bay of Biscay has two main components: Purse seiners for France and Spain and pelagic trawl fishery for France. Discards represent approximately 50% of fishing possibilities. However, it should be noted that discards in many cases should occur under slipping conditions<sup>7</sup> for which there is a high survivability exemption (EU, 2014). An

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<sup>7</sup> The full catch can be returned at sea without being brought onto the deck of the vessel.

evaluation of the discards quantity due to slipping would be relevant for this fishery. It can be considered as a **low risk stock** of being choke.

### 3.3.5. Whiting (WHG/08)

Whiting (*Merlangius merlangus*) is caught in mixed demersal fisheries primarily by France and Spain. Whiting has never been recorded in Spanish discards and is negligible in Portuguese discards. However, according to the data used, France is presenting high discards levels which represent around 50% of the adapted quotas.

Whiting in the Bay of Biscay will not enter under landing obligation until 2019.

Given the high level of discards for France, it can be considered as a **high risk** stock of being choke in multiple French fisheries.

### 3.3.6. Norway lobster (NEP/8ABDE)

Norway lobster (*Nephrops norvegicus*) is caught in mixed demersal fisheries primarily by France and Spain.

According to the data used, France is presenting high discards levels which represent around 40% of the adapted quotas.

Norway lobster in Atlantic Iberian waters is under landing obligation from the 1<sup>st</sup> of January 2016. However, an exemption to it is currently in place for trawlers based on the high survivability of discards (EU Regulation 2016/2374). This exemption is to be revised through new scientific evidences confirming or not this high survivability of the discards. As pointed out by Méhault et al (2016) survivability of *Nephrops* will depend on crew sorting practices and the layout of the deck. *Nephrops* may be more or less trampled and damaged during the sorting process. The same authors suggest that to optimize their chances of survival, the use of a sorting table and evacuation gutter on board would be a suitable option to minimize the duration of air exposure and physical damage.

Given the high level of discards for France, it can be considered as a **moderate risk** stock of being choke in trawl French fisheries, unless the high survivability exemption is confirmed.

### 3.3.7. Skates and Rays (SRX/89-C.)

Skates and rays are caught by gill nets, bottom longlines and bottom trawlers targeting demersal species. France fleets show the highest landings with around 34% of total landings followed by Spain and Portugal, both with around 31% of total landings, in the last five years of the time series.

**Category 2** using ICES data. Not fully evaluated given the discrepancies among ICES and STECF data. Existing low TACs can create problems. In SWW, studies on the survivability of these species after discarding are on the way, however, not concise results on this side, yet. There is a **moderate risk** of being choke unless high survivability exemption is confirmed.

### 3.3.8. Pollack (POL/8ABDE)

Category 2 using STECF data, pollack, (*Pollachius pollachius*) is mainly exploited by France and Spain, with minor contribution to landings from UK.

Most fleets did not report pollack discards. For Spanish netters discards are considered negligible and French netters discarded 11% of their catches in 2016. If reported discards are considered, TAC consumption is around 98%. Considering also that recreational catches may be considerable, there is a **moderate risk** stock of being choke.

### 3.4. Analysis by potential choke stock: Widely distributed (Tables 6 and 7)

#### 3.4.1. Blue whiting (WHB/1X14)

This is a large TAC covering a very wide management area with multiple swaps between Member States. Although categorized as 3, none of the main SWW Member States face problems with their quota consumptions, once discards are accounted for.

In a 2018 a 6% *de minimis* for 2018 for industrial pelagic trawlers processing that species onboard to obtain surimi base is allowed. A *de minimis* exemption for demersal fisheries would potentially remove any risk of this stock choking multiple fisheries. It can be considered as a **low risk** stock in SWW fisheries.

#### 3.4.2. Horse mackerel (JAX/2A-14)

According to the data used, France Spain are presenting discards levels 7 and 2 times higher than their adapted quotas. This effect is pushing up the overall catches making this stock to be considered a **highly risky choke stock**. Belgium also presents insufficient adapted quota, but this is due to zero original quota of this Member State. There is also a high discrepancy among ICES and STECF catch data, specially related to discards levels. The discard estimates (STECF estimates) used in this report for these Member States maybe over estimates. While in the STECF data total discard estimates for this stock have been around 110,000 tonnes, ICES estimates show values around 4,500 tonnes.

In 2018 a 4% *de minimis* for purse seiners and pelagic trawls is in place. However, the *de minimis* has limited benefits as registered discards for France and Spain are high. Additionally, horse mackerel TAC regulation presents several special conditions to allow for IQF. However, horse mackerel acting as a donor stock could exacerbate the problems.

Overall, given the data used, it can be considered as **high-risk stock** of causing choke difficulties in multiple fisheries, especially to those demersal fisheries with high discards levels. A combined *de minimis* exemption with other small pelagics could alleviate choke issues in demersal fisheries. Information sharing among these fleets could also help on avoiding hotspot areas.

#### 3.4.3. Haddock (HAD/7X7A34)

According to the data studied only 1% of the catches are made in SWW (ICES subareas 8,9 and 10). However, this stock is a relevant example of choke species, even if its distribution exceeds beyond the limits of what can be considered SWW fisheries. All Member States involved in the fishery face a choke problem. There are several reasons for that. France, Ireland and UK which have targeted fleets to this stock have big levels of discards. On the contrary the Netherlands and Spain have quota zero.

Discards are high and consist of significant amounts of fish above MCRS as well as undersized fish. There are no clear mitigation actions on this fishery. There is no evidence of high survivability and the *de minimis* has limited benefits as discards are high.

Real time closures could reduce catches of juveniles for some although they are only applicable to fisheries where large concentrations of juvenile haddock are frequently encountered. Increased selectivity (both size and species selectivity measures) will likely lead to losses of catches of haddock and other marketable species (whiting, cod, nephrops). It can be considered as a **moderate risk** stock in SWW fisheries, especially for France and Belgium (high catches) and the Netherlands and Spain (zero quota), even considering the low level of catches in this region.

#### 3.4.4. Cod (COD/7XAD34)

According to the data studied only 10% of the catches are made on SWW (ICES subareas 8 9 and 10). Deficit in quota compared to catches for Ireland and UK. On the contrary, Belgium, The Netherlands, and Spain have quota zero.

TAC variability of this stock is high, which makes difficult to predict which Member State will be impacted in the future.

There is no evidence of high survivability and the *de minimis* has limited benefits as discards are high. Size and species selectivity improvements are possible in certain fisheries by using escape panels to reduce catches of juvenile cod. Improvements in size selectivity are difficult to achieve in all fisheries where cod is caught without significant economic losses from catch opportunities foregone.

It can be considered as a **moderate risk** stock in SWW fisheries especially for Belgium the Netherlands and Spain (zero quota), even considering the low level of catches in this region.

#### 3.4.5. Mackerel (MAC/2CX14-)

A fishery where France and Spain could potentially face choke issues coming from the bycatch of demersal fisheries. In these fisheries the existing *de minimis* has limited benefits as discards are high. Belgium can also face a choke problem due to zero quota (although a positive adapted quota).

In 2018 a 4% *de minimis* for purse seiners and pelagic trawls is in place. High survivability evidences exist only for purse seiner in slipping. Nevertheless, the bulk of discards comes from demersal fisheries. These mixed fisheries include artisanal and industrial fleets. Overall, TAC seems enough to potentially solve choke issues at EU level. Currently, demersal fleets in the Bay of Biscay are avoiding areas of high abundance of this species. There is, likely, an informal mechanism for information sharing among them. It cannot be evaluated if this will be enough to solve all choke issues therefore, a combined *de minimis* for pelagic species for non-directed fisheries would help on alleviating choke problems.

This stock can be considered as a **moderate risk** choke stock, although this consideration is only for Spain and France, given their low initial quota in relation to their total catches. It should be further noted that Spain is to pay back a total of 65,429 tonnes of mackerel over 11 years, i.e. by 2023 (EU, 2013b), which is likely to create further choke difficulties.

#### 3.4.6. Boarfish (BOR/678-)

A fishery where no discards are noted. Quota zero issues identified for France and Spain in where it is a bycatch of industrial demersal and artisanal fisheries. There is a special condition in the horse mackerel TAC covering ICES subareas 6 to 8 that allows the offsetting of boarfish catches against the horse mackerel quota, with a limit of 5% of this quota. However, boarfish does not seem to be under biological safe limits to be allowed for IQF.

Given that the TAC is unmet, choke problems can be potentially solved using quota swapping or through a *de minimis* in demersal fisheries. However, when all catches of boarfish are subject to the landing obligation in 2019 then there will be a **moderate risk** of boarfish choking demersal fisheries for Member States with initial zero quota.

#### 3.4.7. Saithe (POK/7/3411)

In SWW fisheries saithe is caught as bycatch. The TAC for this stock is unmet due to low abundance of it. Only 18% of the TAC was caught (including landings and discards) in 2016. The main problem comes from Spanish fleet's discards with an initial zero quota (although a positive adapted quota). Although additional swaps could potentially solve the problem for

this Member State, it could also be considered removing the TAC for this stock, given that the TAC is not having a clear conservation effect. It can be considered as a **low risk** stock

### 3.5. Analysis by potential choke stock: Large pelagic stocks (Table 8)

For large pelagics, the landing obligation applies originally, since 1st of January 2015, to the following species/stocks; swordfish in North and South Atlantic (but not in the Mediterranean), albacore in the North and South Atlantic, bigeye tuna, yellowfin, blue and white marlin in the Atlantic (but not in the Mediterranean), bluefin tuna in East Atlantic and Mediterranean. However, some tuna RFMOs (ICCAT) rules include obligations to discard, which is in contradiction with the EU landing obligation.

To avoid this discrepancy between ICCAT recommendations and EU law, a Delegated Act (Delegated Regulation (EU) 2015/98) was approved by the EU Commission, and the landing obligation should not apply to EU vessels participating in the fisheries covered by those ICCAT recommendations (bigeye tuna, bluefin tuna, and swordfish).

### 3.6. Analysis by potential choke stock: Deep sea stocks (Tables 9 and 10)

There are 12 deep-sea stocks relevant to SWW where the risk of choking fisheries is unclear. In recent years fisheries for deep sea species have declined and there are now only a few directed fisheries for these stocks. For most Member States they are caught only as a bycatch. In all these cases STECF data is incomplete or unreliable, the level of fishery is very low, or Member States do not catch their quota and traditionally swap it out.

For **black scabbardfish** (BSF/8910- and BSF/C3412-) caught by deep-water set-longlines and an **exemption from landing obligation** is currently in place. This is due to the fact that discards have been assumed to be null or negligible for most ICES assessment purposes as the black scabbardfish discard mortality is mainly caused by shark and cetacean predation on hooked black scabbardfish and is relatively low when compared to landings.

Some works are currently in place studying **high survivability of red seabream** (SBR/09-). These studies still must provide evidences on this.

Generally, for these stocks, discards, where reported, are low and the TACs tend to match the actual catches indicating a **low choke risk**. This is not to say that there are no choke issues, however, **with the available data the only stock identified as category 3 is alfonsoinos (ALF/3X14-)**. This choke issue is especially relevant for France where discards of this stock account for almost the 90% of the total catches of this stock by all Member States.

### 3.7. Future scenarios after 2019: Climate change and EU27

#### 3.7.1. Climate change

Anthropogenic stressors such as climate change are increasingly threatening the living resources that depend upon the coastal-marine habitats. Essentially, climate change can produce effect **on the productivity of a single stock, on the community and on the relative spatial distribution of stocks**.

EU TACs are scientifically advised to reach MSY as soon as possible or at the latest by the year 2020. There are scientific **evidences that climate change could alter the productivity**. Recruitment in fish populations has long been known to be a key process that

is strongly influenced by climate variability and hence could alter reference points based on fish productivity such as  $F_{MSY}$ . This implies that the **currently observed fish stocks productivities can change**.

The assemblages of species in ecological communities reflect interactions among organisms as well as between organisms and the abiotic environment, therefore, **climate change can alter community composition**.

There are also **evidences on how climate change could alter the spatial distribution of the stocks**, often through species specific physiological thresholds of temperature and precipitation tolerance (Walther et al 2002). Migratory species (like albacore in SWW) are among the best documented but often exhibit large fluctuations from year to year in their breeding sites, making it difficult to discern long-term range shifts. In more sedentary species follow from the slow processes of population extinctions and colonisations, distributional shifts are more likely to be detected.

Given that stocks are defined as a species and geographical distribution level, all the considerations above **can produce effects on the anticipated choke situations**.

A summary on the main findings in the literature of changes in the distributional behaviour of the specific stocks in SWW (mainly based on ICES 2017b) is presented in Table 12.

**Table 12: SWW stocks and likely spatial distribution shifts due to climate change**

Species (stocks)	Comments on changes in the distribution
Albacore (ALB/AN05N)	Goikoetxea et al. (2017) have detected a northward shift in the observations of albacore during the period 1981-2006. This shift could be partly associated to the warming of the sea in the Bay of Biscay.
Anchovy (ANE/9/3411) (ANE/08)	According to Chust et al. (2014) changes in abundance and phenology are expected to occur on this population under climate change scenarios that project higher temperature and lower primary production in the continental shelf.
Anglerfish (ANF/8C3411) (ANF/8ABDE)	No large geographic shifts in the species distribution are reported for this stock. <i>Lophius. budegassa</i> is likely to have a progressive displacement towards northeast. TAC unit beyond boundaries are not likely to change.
Blue whiting (WHB/8C3411) (WHB/1X14)	A noticeable north-eastern shift in the abundance's centre of gravity was observed on the north coast of Spain while a contrasting south-western shift was observed in west Scotland. However, the reason for these shifts is not clear. Given the changes in the past and current stability on the TAC areas no expected changes that can influence current TAC units are expected.
Cod (COD/7XAD34)	It is likely a northward shift in the geographic range of cod and a shift in the geographic centre of mass of its biomass. Most biomass will remain on continental shelves and the productivity of southern stocks will decline. These changes will affect fishery yields and management decisions.
Haddock (HAD/7X7A34)	According to the available data occurrence has increased on the western shelf in the Bay of Biscay, however longer-term trends may well show different patterns. The only significant relative changes in abundance between adjacent ICES areas have been found in the Celtic Sea and Bay of Biscay which fall within the same TAC management area. A mismatch between haddock regional abundances and TAC allocation seems unlikely in the near future.

Hake (HKE/8C341) (HKE/8ABDE)	Changes in distributions are related to an expansion of the population towards the north and not to a shift in the overall distribution of the two stocks of hake. Population has increased at a faster rate in the North Sea than in other areas, creating a potential mismatch between the TAC allocated by area and the regional stock abundance.
Horse mackerel (JAX/8C341) (JAX/2A-14)	A potential rebuilding of the Western stock in combination with increasing temperatures, would result in increasing migration north into the Norwegian sea.
Mackerel (MAC/8C341) (MAC/2CX14-)	Spawning distribution has shifted northward in the last three decades. Yet, the understanding of the drivers remains too poor to make accurate predictions of the future distribution (Bruge et al., 2016)
Megrim (LEZ/8C341) (LEZ/8ABDE)	Large geographic shifts in the species distribution have not been observed. There was not differential contribution across TAC units.
Plaice (PLE/8/3411)	A large reduction in survey catches of plaice from the Bay of Biscay serves as a good example of extirpation due to warming on the species (Hermant et al., 2010). Temperature as the main driver of the unsuitability and eventual loss of effective juvenile habitat is also well illustrated (Désaunay et al., 2006). The retraction of this species southern extent may continue under a scenario of continued warming.
Pollack (POL/9/3411) (POL/08C) (POL/8ABDE)	No information is available on the factors controlling the distribution of pollack, and therefore nothing can be said about future changes.
Saithe (POK/7/3411)	No evidences of distributional shifts are found in SWW. Neither an overall directional shift in distribution nor a significant relative change in abundance between adjacent ICES areas have been observed.
Sole (SOL/8AB) (SOO/8CDE34)	No evidences of distributional shifts are found in SWW, although increased growth of sole can be expected in northern areas of its extent.
Whiting (WHG/08)	Slight change in the overall distribution in SWW. A north-western shift in centre of gravity observed in the Bay of Biscay is consistent with a potential climate-driven northward shift. No mismatch between whiting regional abundances and TAC allocation can be anticipated.

**Source:** Authors, using ICES (2017b) and references cited in the text.

**In SWW, albacore, anchovy, cod, hake, herring, mackerel, plaice and horse mackerel**, have shifted their distribution in relation to TAC management areas since 1985 (Table 12).

**Results need to be taken with caution.** Some of the trawl surveys in the Bay of Biscay and Iberian waters analysed by ICES (2017b) only capture a demographic component of the population, the juvenile component, since larger individuals are distributed deeper. Furthermore, it is still not clear **which is the relative contribution of climate change, density-dependence and seasonal migration for each species and within TAC area**. Climate change can be a driver for distribution changes, however, others such as stock size, geographic attachment, importance of oceanographic characteristics species interactions or fishing effort distribution, can act in synergy to explain the changes observed.

### 3.7.2. Withdrawal of the United Kingdom from the EU

Fish do not respect national boundaries, and for them, 'Brexit' or 'Bremain' makes no difference. For stocks that are shared between United Kingdom (UK) and EU waters (e.g. cod,

haddock, saithe, plaice), ICES will still issue management advice on levels of fishing mortality and quotas.

Access to fishing grounds pre-dates the United Nations Convention on the Law of the Sea, under which countries established their Exclusive Economic Zones (EEZs). The current allocation of fishing possibilities to the EU Member States is based on the Relative Stability Principle as laid down in The Hague Compromise (Box 1).

CFP is committed towards achieving MSY. EU Member States will still be bound by these commitments and shared stocks will need to be managed with this objective in mind. On this basis some evidences are presented below:

- **UK and EU will need to agree on TACs through negotiations.** These would be bilateral in the case of stocks that are shared only between the EU and UK, or through NEAFC for stocks shared with other countries (as is currently the case with mackerel, which is negotiated between the EU, Norway, Iceland and the Faroe Islands).
- **This “new” negotiation offers an opportunity for establishing a new basis on which to divide TACs for shared stocks between the EU and the UK,** re-evaluating the distribution of stocks and therefore the basis on which they are shared. However, this new sharing can cause elements on increasing pressure on the shared stocks, compromising the MSY objective.
- UK vessels have historically fished (and continue to do so) in waters of the North Sea and Irish Sea beyond what would be established as “UK waters”. Other EU Member States, reciprocally, fish in UK waters (Table 13).

**Table 13: Percentage of landings by Member State in UK waters**

Member State	% of landings in UK waters (2011-2015)
UK	45%
France	8%
Belgium	1%
Spain	0.5%
Others	45.5%

**Source:** Authors, using data from Le Gallic et al (2017).

- French fleet are those that potentially could be more affected by an EU of 27 Member States. However, there are several UK-flagged, but foreign-owned vessels, owned through UK-registered companies, that are part of the UK fleet and which access UK quota. These vessels are likely to continue to be part of the UK fleet, with associated access rights to UK waters, although this may depend on whether the Economic Link criteria are revised, or any other decision is taken by the UK.
- The Economic Link stipulates that every vessel fishing UK quota-controlled stocks must comply with certain conditions, which have the greatest impact on UK registered, foreign-owned vessels. Vessels must meet any of the following conditions to demonstrate an economic link with the UK:
  - Land at least 50% of the weight of their landings of EC quota stocks in UK ports;
  - At least 50% of the crew must be normally resident in UK coastal areas;
  - At least 50% of operating expenditure (net of crew wages) must be spent on the purchase of goods and services in UK coastal areas;

- Demonstrate sufficient benefit to populations dependent on fisheries and related industries by other means.
- This Economic link is more likely to affect the so-called Anglo-Spanish fleets.
- EU is an important market for UK fish and fish products, with over 70% of exports for the sector (including aquaculture products) going to EU countries.
- Changes in the spatial distribution can be exacerbated by the EU27 if UK decides not to abide by the CFP and discard or even land over quota.

Whilst the details of Brexit are still far from clear, the overall conclusion from the evidences presented above, is that the result will depend on the **outcome of the negotiations among EU27 and UK**. MSY can be expected to be the guiding principle of both parties, although quota sharing could increase pressure on shared stocks, especially if the share (quota) is perceived as unfair by one of the parties. For the stocks analysed here, the highly migratory stocks and Bay of Biscay stocks (which present a northern distribution) are those more likely to be affected. Additionally, **if EU27 fleets are expelled from UK waters, the resulting fishing effort and therefore, fishing pressure, will be likely transferred to the adjacent areas**. Fleets fishing stocks from ICES Divisions 8abde (Bay of Biscay) are likely to increase the number of trips, and hence, the risks of higher fishing pressure, if so.

**SWW fisheries are less likely to be affected by the Brexit than other EU Atlantic areas although they are not completely immune.**

### **3.8. Summary of the choke risk assessment, when flexibilities, exemptions and global warming are considered.**

The initial pre-screening of the stocks, and their categorisation under 2 and 3 categories, was contrasted against the mitigation tools anticipated by the CFP. The excess of catches, a full top up, the use of the *de minimis*, if high survivability of discards has been demonstrated, if IQF can be applied and if distributional shifting evidences have been found due to global warming, are presented in **Table 14, to provide a qualitative risk assessment of a particular stock to be considered as choke stock in SWW fisheries**. In this table the following elements are included:

- Area: Area as described in Section 2;
- Species: Species common name in English;
- Stock: Management stock definition;
- Exploitation status: Last known biological/target status of the stock according to the corresponding advisory body (ICES or ICCAT);
- Choke category: as identified in Section 2 (potential choke situation);
- Excess: Over catches in relation to the total TAC of the stock;
- Full top up: Discards/catches ratio. Coloured in red if the full top up is lower than the Excess, in green if the contrary;
- LO: The year in when the stock entered landing obligation;
- H Surv: High survivability exemption. Y stands for currently in place, N for not allowed, PSS for purse seiner slipping, "unlikely" or likely given the current evidences when the stocks enter landing obligation;
- *De minimis*: Y, currently allowed. N is not currently allowed. IPT allowed only for industrial pelagic trawlers, and "-" the stock will enter landing obligation in 2019;

- IQF: Inter-species quota flexibility (IQF). It is marked if the stock can be considered for IQF in 2018 (Y) or not (N);
- Distribution shifts: If evidences of distributional shifts are available in the literature (Section 3.7.1).
- Choke risk in SWW: A qualitative assessment made by the authors based on the elements of the table and on the characteristics of the fisheries. Low, moderate and high-risk stocks are, therefore, identified.

There are 3 potential stocks with **high risk** of causing choke difficulties to certain Member States, considering the mitigation tools coming from the CFP provisions and the external pressures analysed. These high-risk stocks are, **whiting** (WHG/08) in the Bay of Biscay, **horse mackerel** (JAX/2A-14) as widely distributed and **alfonsinos** (ALF/SEAFO) as a deep-sea stock. If considered by Member State, France and Spain are those most likely to be affected.

In **Atlantic Iberian waters** there is **moderate risk for megrims** (LEX/8C3411), **hake** (HKE/8CD3411) and **anchovy** (ANE/9/3411), affecting specially Spain and Portuguese fisheries. For the first two, risk of being a choke stock is heavily dependent on how the quota uplift is shared among Member States. For anchovy the existing high survivability exemption was considered as key for lowering the risk.

In the **Bay of Biscay**, **megrims** (LEZ/8ABDE), **nephrops** (NEP/8ABDE), **skates and rays** (SRX/89-C) and **pollack** (POL/8ABDE) can be considered as **moderate risk** stocks. The risk of megrim can be lowered given that the special condition of the use of a 5 % of the quota of LEZ/07 in ICES Divisions 8abde, is likely to change (allowing up to a 25% use of the quota of LEZ/07). For Nephrops, this risk will be reduced if the high survivability exemption is confirmed. Finally, for skates and rays, evidences on high survivability can also lower this risk. The case of pollack is related on how recreational catches are treated.

In terms of **widely distributed stocks**, **boarfish** (BOR/678) can be considered as a **moderate risk** stock, especially because IQF is unlikely to be applied to this stock. France and Spain can be affected by their boarfish zero-quota condition. Finally, for **cod** (COD/7XAD34) and **haddock** (HAD/7XAD34), overall catches in SWW are low compared to the total distribution of the stocks, although the zero-quota condition of several Member States implies that choke risks can be considered as moderate.

**Table 14: Risk assessment by stock in SWW fisheries.**

Area	Species	Stock	Exploitation Status	Initial Choke Category	Excess	Full Top Up	LO Since	High Surv.	De Minimis	IQF	Evidences Distribut. Shift	Risk in SWW
Bay of Biscay	Anglerfishes	ANF/8ABDE	Undefined	3	2%	10%	2017	N	N	Y	N	Low
	Megrim	LEZ/8ABDE	Above FMSY	3	49%	19%	2019	Unlikely	-	Y	N	Moderate
	N. Lobster	NEP/8ABDE	Below FMSY	3	52%	30%	2016	Y	N	N	N	Moderate
	Common Sole	SOL/8AB	Above FMSY	3	3%	4%	2016	N	Y	N	N	Low
	Anchovy	ANE/08	Above BMGT	3	9%	44%	2015	PSS	Y	N	Y	Moderate
	Whiting	WHG/08	Undefined	3	29%	24%	2019	Unlikely	-	N	Y	High
	Skates & Rays	SRX/89-C.	Undefined	2	0%	0%	2019	Likely	-	N	N	Moderate
	Pollack	POL/8ABDE	Undefined	2	0%	9%	2019	Unlikely	-	N	N	Moderate
Iberian waters	Anchovy	ANE/9/3411	Undefined	3	28%	0%	2015	PSS	Y	N	Y	Moderate
	B. Whiting	WHB/8C3411	Above FMSY	2	0%	12%	2017	N	IPT	Y	Y	Low
	Megrim	LEZ/8C3411	Above FMSY	3	1%	29%	2019	N	-	Y	N	Moderate
	Hake	HKE/8C3411	Above FMSY	3	6%	22%	2016	N	Y	Y	Y	Moderate
	Sole	SOO/8CDE34	Undefined	2	0%	0%	2016	N	Y	N	N	Low
Tuna	Albacore	ALB/AN05N	Sustainable	2	0%	1%	2015	N	Y	N	Y	Low
	B. Marlin	BUM/ATLANT	Overfished	2	0%	0%	2015	N	N	N	N	Low
	W. Marlin	WHM/ATLANT	Overfished	2	0%	0%	2015	N	N	N	N	Low
Widely distributed	B. Whiting	WHB/1X14	Above FMSY	3	5%	4%	2017	N	N	Y	Y	Low
	Mackerel	MAC/2CX14	Above FMSY	2	0%	10%	2015	PSS	Y	Y	Y	Moderate
	H. Mackerel	JAX/2A-14	Above FMSY	3	70%	60%	2015	PSS	Y	N	N	High
	Boarfish	BOR/678	Undefined	2	0%	20%	2019	Unlikely	-	N	N	Moderate
	Cod	COD/7XAD34	Above FMSY	3	10%	20%	2016	N	N	N	Y	Moderate
	Haddock	HAD/7X7A34	Above FMSY	3	119%	54%	2016	N	N	Y	Y	Moderate
	Saithe	POK/7/3411	Undefined	2	0%	13%	2016	N	N	N	N	Low
Deep	Alfonsinos	ALF/3X14	Undefined	3	445%	88%	2019	Unlikely	-	N	N	High

**Source:** Authors**Notes:** PSS: purse sein slipping; IPT: Industrial Pelagic trawlers; Y: Yes; N: No; LO: Landing obligation.



## 4. CONCLUSIONS AND RECOMMENDATIONS

### KEY FINDINGS

- Belgium, Spain, France, the Netherlands and Portugal have a direct fisheries management interest in South Western waters. A mayor number of SWW fisheries are multi-species and mixed. In many cases with several target species.
- Multi-species fisheries are likely to be affected by the landing obligation.
- The analysis carried out was meant as illustrative and to identify stocks where choke difficulties may be an issue.
- According to 2016 data, in SWW there were 23 stocks with a potential of causing choke problems. The variability of some of these TACs can make this number increase or decrease.
- There is not a general rule to alleviate choke problems, and actions are to be taken considering each stock-fleet combination, individually.
- Swaps are playing and will further play a key role while redistributing fishing companies' or producer organisations' quotas in a way that a reasonable balance between fishing opportunities and usual catch composition is achieved. However, some limits to swaps can be predicted. Furthermore, swaps are likely to alter welfare metrics.
- Inter-species quota flexibility should be related not only to precautionary limits but also to the management target. Their speculatively should be avoided.
- De minimis is effective when the discards are low in comparison to the total catches.
- Quota uplifts should be neutrally distributed.
- Choke stocks are to be relaxed with a good practice of this flexibility. FMSY ranges are a good example of it, if wisely used.
- "Other" tools such as, removing TACs if their conservation effect is not confirmed, real time closures or set aside quotas (including a "deemed" value system), are worth of exploration.
- Discrepancies on data used should be further analysed. Furthermore, this report may contain not forecasted choke situations or on the contrary choke situations that only occurred in the analysed year.

The analysis carried out was meant as **illustrative and to identify stocks where choke difficulties may be an issue**. To do so, following a sequential logic, adapted quota catches by Member State, total catches by stock and TAC were mutually confronted to obtain an initial pre-screening of the situation in SWW fisheries. Following a three-category system, those stocks that potentially could act as choke in SWW were identified.

On this selection, an analysis of the tools already available to mitigate or rendering more flexible choke situations was performed and the likely risks identified under a qualitative scheme.

## 4.1. The CFP mitigation “toolbox”

### 4.1.1. Quota swaps

It was shown how swaps are playing and will further play a key role while redistributing fishing companies’ or producer organisations’ quotas in a way that a reasonable balance between fishing opportunities and usual catch composition is achieved. The stocks in SWW identified as category 2, i.e. those likely to be solve choke issues with a swap are presented in Table 15.

**Table 15: Stocks for which swaps can alleviate choke situations in SWW**

Common name	Stock
Pollack	POL/8ABDE
Blue whiting	WHB/8C3411
Sole	SOO/8CDE34
Northern Albacore	ALB/AN05N
Blue Marlin	BUM/ATLANT
White Marlin	WHM/ATLANT
Mackerel	MAC/2CX14-
Boarfish	BOR/678-
Saithe	POK/7/3411

Source: Authors

In all these cases **some limits to swaps can be predicted**. National or regional law as of distribution of quotas, including individual fishing quota or individual transferable quotas. Quota swapping can be impaired as stakeholders and Member States hold onto quota till late in the year, to ensure that all catches can be accounted for. Some apparent surpluses could in fact be already used for swaps of other stocks and therefore would not necessarily be available to reduce the risk for the identified stocks. This imply that **the numerical exercise like the one presented here, does not consider the Member State internal quota sharing process, nor its yearly internal strategy as national quota holder**.

Member State quotas reflect the initial theoretical fishing possibilities distribution while swaps are the movement to reconcile the initial quota allocation with the current fishing possibilities. Landing obligation, and in particular choke effects, are likely to speed up this swapping process. Relative stability (Box 1) ensures that quota distribution reverts each year to the same starting point.

It should be further noted that **fisheries and markets for fish do not always coincide**. This is important because swapping unmet quotas imply likely changes in market prices. This, essentially, reduces the producers (fishing firms) surplus<sup>8</sup> and increase the consumers surplus<sup>9</sup>. These two, together with the resource rent are the three components of welfare as defined in economic theory. Therefore, **swaps are likely to alter welfare in size and distribution**, while the direction of this change will critically depend on the fish demand and supply structures.

**Choke difficulties are likely to change fishing effort constraints** and therefore the **currency to be used for exchanging quotas**. On this issue, the concept of shadow value becomes relevant.

<sup>8</sup> The amount the producer is willing to supply goods for and the actual amount received when trading.

<sup>9</sup> The difference between what consumers are willing to pay for a fish relative to its market price.

**Shadow values refers to the value associated with a constraint.** In fact, shadow value will reflect the (marginal) value of relaxing the constraint. The shadow value is zero when the constraint does not bind. The main idea behind it is that technology binds the fishing firm; the shadow value of a superior technology is the increase in profit associated with it. Under landing obligation, it implies that a better technology (for example higher selectivity) will reduce choke effects and hence profits associated to the activity.

Market clearing prices for quota reflect the overall degree of scarcity within the market and this information shows changing trends in behaviour. There is a common industry perception, for example, that **prices for choke species quotas will be inflated to capture the marginal value of the entire choked harvest.** However, this will highly depend on the realities of discard, and indeed quota, regulation and enforcement.

Knowledge of **shadow values** would allow predictions on the types of transactions that might take place in a quota market, and **if monitored, could be the main source of information to detect choke issues within the year.**

#### 4.1.2. Inter-species quota flexibility

On top the initial choke stocks identification alleviating measures could be applied. One of this is the inter-species quota flexibility (IQF) as set in the CFP regulation in Art15 (8).

##### Box 4: Inter-species quota flexibility

Art 15(8): By way of derogation from the obligation to count catches against the relevant quotas in accordance with paragraph 1, catches of species that are subject to the landing obligation and that are caught in excess of quotas of the stocks in question, or catches of species in respect of which the Member State has no quota, may be deducted from the quota of the target species provided that they do not exceed 9 % of the quota of the target species. This provision shall only apply where the stock of the non-target species is within safe biological limits."

**Source:** CFP basic Regulation, Art. 15(8)

In TAC and quota regulation 2016/72 of 22 January 2016 fixing for 2016 the fishing opportunities for certain fish stocks and groups of fish stocks, applicable in Union waters and, for Union fishing vessels, in certain non-Union waters, and amending Regulation (EU) 2015/104, in Article 7.2 regarding to conditions for landing catches and by-catches, we can find the following:

##### Box 5: List of stocks identified for IQF

Art 7(2): The stocks of non-target species within safe biological limits referred to in Article 15(8) of Regulation (EU) No 1380/2013 are identified in Annex I of this Regulation for the purposes of the derogation from the obligation to count catches against the relevant quotas provided for in that Article".

**Source:** TAC and quota regulation 2016/72

**One recommendation** is that **IQF could negatively affect and contribute to worsen the situation of some fish stocks.** It is necessary to agree with the precaution set in the CFP regulation to constrain the use of IQF **just if the stock of the non-target species is within safe biological limits.** At the same time, if it is within a safe biological limit, it has to make sure that **the use of IQF is not going to lead us to lose this good condition of the stock.** A recommendation is to **set in advance which stocks are going to be used under IQF, and to assess this flexibility in the scientific group(s) providing advice**

**for TACs** (i.e. ICES). The reason for this is that it is important to relate this flexibility not only to precautionary limits but also to the management target ( $F_{MSY}$ ) itself.

**A second recommendation is to monitor that IQFs are not used speculatively**, that is transferring quota from a low value stock to a high value stock, given that fishing mortality of the recipient stock can increase significantly. An exchange currency is likely to be set (shadow values are clearly reflecting this element better than the market values). Being a choke bycatch stock implies giving it the consideration **of an input and not an output of the system. Therefore, is not correct to evaluate it as the former and therefore to use market values as exchange rates.**

**Up to the knowledge of the authors IQFs have not been used for stocks in SWWs.** It should be further noted that the use of IQF is complex in SWW fisheries. The main reason is that **many of the fisheries are mixed and multi-species, with several target species.** Furthermore, the confluence of different fleets implies that what is considered as a target stock for one fleet can be bycatch for another one. IQFs can introduce flexibility in the context of unmet fishing possibilities of a target stock. However, variability of fishing possibilities may **preclude any anticipation of the Member State in their use, even within the year in which IQF can potentially be applied.**

**Horse mackerel and boarfish are stocks in which the complexity (and the contradictions) emerge.** Boarfish can be the recipient under the special condition of the TAC regulation, although biological safeguards are not met (IQF) for this bycatch. However, both (the donor and the recipient stocks) are choke for two SWW Member States (France and Spain). Therefore, the exchange currency to be considered in this IQF is neither the market value of boarfish nor horse mackerel, but the market price of the target species (i.e. hake). However, these are two stocks with a wider distribution in where other Member States can interpret other exchange currencies, which can be boarfish, horse mackerel (if target) or any other (if bycatch).

#### 4.1.3. De minimis

*De minimis* exemption (Box 6) is probably the most successful tool used yet to avoid choke situations. However, it should be noted that any ***de minimis* is effective when the discards are low in comparison to the total catches.** For example, for the case of Alfonsinos (ALF/3X14-), and according to the data source used, discards are 40 times higher than the TAC. Examples like this, have to be corrected through technical measures, if possible, given that exemptions or flexibilities are not useful.

#### Box 6: *De minimis*

Art 15(2): Landing obligation does not apply to up to 5 % of total annual catches of all species subject to the landing obligation when scientific evidence indicates that increases in selectivity are very difficult to achieve; or to avoid disproportionate costs of handling unwanted catches, for those fishing gears where unwanted catches per fishing gear do not represent more than a certain percentage, to be established in a plan, of total annual catch of that gear. Catches under *de minimis* shall not be counted against the relevant quotas; however, all such catches shall be fully recorded.

**Source:** CFP basic Regulation, Art. 15(2)

**Combined *de minimis*** is another approach that has been suggested for SWW fisheries, for the specific **small pelagic discards** (mainly, mackerel and horse mackerel) of demersal fleets. This combined *de minimis* should help on the implementation of landing obligation. However, it should be noted that this type of combined *de minimis* should be accompanied of **safeguards**, that is, limits on the discards levels of each individual species. The

implementation should follow the principle of defining the discard profile of a fleet and allow a maximum percentage of each species beyond the individual historic discards percentage and with the overall limit of the combined *de minimis*. Furthermore, it should be accompanied by real-time catch monitoring and reporting. If not, and in line with CFP objectives, the maximum safeguard amount should be deducted from each individual TACs, resulting in a loss of fishing opportunities. Whether this loss of fishing opportunities is higher or not than the costs of handling the combined catch, will be fleet specific, although this TAC reduction will be required to be neutrally distributed, that is, the fishing opportunities reduction have to be imposed on those fleets effectively using the combined *de minimis*.

#### 4.1.4. Quota uplift

Quota uplifts are defined as a one-off addition to quota to reflect all the catches being landed (Box 7).

##### Box 7: Quota uplift (top-up)

Art 16(2): When the landing obligation in respect of a fish stock is introduced, fishing opportunities shall be fixed taking into account the change from fixing fishing opportunities that reflect landings to fixing fishing opportunities that reflect catches, on the basis of the fact that, for the first and subsequent years, discarding of that stock will no longer be allowed.

**Source:** CFP basic Regulation, Art. 16(2)

These quota uplifts should be calculated based on historic discard rates. However, **the big differences observed among STECF and ICES data in terms of overall catches** (in particular, on discards data), prevents us for providing robust recommendations, given that the conclusions obtained could be misleading. In Table 14 the full top up was calculated and contrasted against the catch excess. Those full top-ups unable to cover the catch excess have been highlighted in red.

On a more general perspective, the main recommendations is that **quota uplifts should be neutrally distributed**. Three elements support this statement:

- Top-ups have the theoretical property that if the stock is at MSY levels, i.e. if no reduction in fishing mortality coming from the regulation is expected, they should be able to solve any choke difficulties, at least if the uplift is shared neutrally among the fishing fleets "causing" this uplift. However, those stocks identified as potentially problematic in SWW are not still at MSY levels (Table 14), which complicates, even further choke problem identifications.
- Top-ups that fully contribute to the landings of one fleet (due to their high selectivity) can make these fleets to be better off under a landing obligation scheme than outside it (Prellezo et al, 2016). This is good in the sense that creates positive incentives to increase the selectivity however, **they do not resolve the choke risk**, because those fleets with high discards, have to use this increment to cover, and only partially, their discards. A differential treatment of these uplifts, based on the identification of their quantity is recommendable, considering that **incentives for avoiding discards have to be kept to reach the final objective of the landing obligation** of "greener" fisheries.
- The principle of relative stability implies that a top-up does not solve the choke risk to those Member States with **zero quota** of a particular stock.

#### 4.1.5. High survivability

##### Box 8: High survivability

Art 15(4): The landing obligation shall not apply to species for which scientific evidence demonstrates high survival rates, taking into account the characteristics of the gear, of the fishing practices and of the ecosystem.

**Source:** CFP basic Regulation, Art. 15(4)

Research has shown that not all discards die. Any surviving discarded fish contributes positively to the stock and landing those individuals therefore removes that benefit. In SWW fisheries, evidences exist on high survivability for some small pelagic under slipping conditions for purse seiners. There are also high survivability evidences on Nephrops in the Bay of Biscay. Furthermore, there are evidences on how this survivability rate will depend on crew sorting practices and the layout of the deck. Additionally, studies on rays and skates and on red seabream are in place. If all these evidences are confirmed, high survivability exemption will be a powerful tool to mitigate choke risk on these stocks.

It should be noted the poorly specified term “high” coming from art 15(4) of the CFP. Therefore, when interpreting, it should be done **considering the share** (i.e. the percentage of the discards that survive), but also **the size** (the quantity discarded). If this last is high, although with a high percentage of survivability, the total “deaths” will also be high. This interpretation is valid to recommend, that for all these exemptions, when granted, **the discards levels have to be closely monitored**.

#### 4.2. “Other” tools

It was not the intention to suggest alternative measures to alleviate the risk that would make substantive changes to existing EU regulations, including the CFP. However, there are “other” tools that merit the attention as candidates to reduce difficulties potentially caused by choke stocks.

##### 4.2.1. Flexibility in management

**Flexibility is important**, as highlighted by Schindler and Hilborn (2015): “The ability to adapt to ecosystem changes revealed by monitoring and assessment is likely to be a far more powerful strategy than assuming that what has worked in the past will work in the future”. Adaptability can deal with the undesirable states but can also accommodate or even boost the unexpected opportunities. Potential difficulties caused by **choke stocks are to be relaxed with a good practice of this flexibility**.

$F_{MSY}$  ranges are defined as the range of fishing mortalities compatible with an MSY approach. **Ranges introduced a desired**, and sometimes necessary, **flexibility in the system**. There are many discussions whether  $F_{upper}$  is truly an acceptable MSY reference point, however this is a policy decision not a scientific one.

Ranges in SWW have been calculated by ICES for the stocks displayed in Table 16.

**Table 16: FMSY point estimate and range for SWW stocks**

Stock	FMSY lower	FMSY	FMSY upper
W. Anglerfish 8c9a	0.18	0.31	0.41
Hake 8c9a	0.166	0.245	0.362
Four-spot megrim 8c9a	0.12	0.19	0.29
Megrim 8c9a	0.12	0.19	0.29
Sole 8ab	0.18	0.33	0.49
Hake 8abd	0.18	0.28	0.45

Source: ICES (2017).

F<sub>MSY</sub> ranges can alleviate potential effort constraints coming from choke stocks. However, they should be “wisely” applied to **avoid a chronic increase of fishing mortality**, derived for fishing always, and for all the stocks, at the F<sub>MSY</sub> upper level. Therefore, ranges should be used to set TACs using the highest possible fishing mortalities within the ranges, considering always that individual biomasses are always above their reference levels. It should be further noted that while this scheme could potentially alleviate choke risks, does not necessarily imply higher fishing firm profits, especially when time is included in the discussion (Froese et al, 2018).

#### 4.2.2. Real time management

**Real time closures** are an additional route to be explored. **They could reduce catches of juveniles for some fisheries.** They will reduce catches of individuals under MCRS or even low value sizes of commercial stocks.

In general, **real time monitoring (and reporting) is likely to provide a management flexibility that could alleviate almost all the undesired (by managers) choke situations.** However, the main problem deriving from their use is that they are **difficult to implement and specially administer.**

#### 4.2.3. Smart use of the TAC and quota system

An additional recommendation will be to evaluate the conservation effect of low TAC stocks, especially when this TAC is not fully used. **Remove TACs if their conservation effect is not confirmed** and apply other conservation measures, while monitoring catch closely, could alleviate these “artificial” choke difficulties.

**A set-aside quota system** is another choke mitigation strategy to be explored. The idea is that a Member State reserves a proportion of its original quota. The use of this set-aside quota can be determined under different mechanisms:

- The use of a **"deemed" value system**. The deemed value is defined as the value realized in excess of the cost of landing. If a species for which no quota is available (exhausted or zero quota) is landed a pre-agreed fee (deemed value) to the management authority should be paid. The main difficulty is the definition of this fee, given the value of the set aside quota is not the same for fleets with different discards profiles, and/or if it is a bycatch or a target for different fleets within the same Member State. However, this system in combination with the shadow value calculation and the IQF flexibility included in the art 15 of the CFP could provide the right incentives at a minimum cost.
- Use the set-aside quota as an **incentive system** allocating them individually (by vessel or fishing firm) after demonstrating best practices fishing behaviour to reduce

discards, including, among others, selectivity improvements, or an onboard technology that ensures a fully documented system.

Note that this set-aside quota can be clearly in **conflict with the relative stability principle** (Box 1). However, it can also be considered as powerful choke mitigation tool, particularly for Member States with zero quota of choke risk stocks.

#### 4.2.4. Analysis of limitations

**It was not the intent to provide an analysis that offered a future prognosis of the exact nature of choke difficulties.** It is important to remark that **choke identifications presented in this report are based on 2016 data and therefore do not necessarily reflect the exact nature of choke issues in the future.** This will depend on future stock and TAC developments, distributional shifts, changes in the fishing effort spatial distribution and on the future development of the EU composition and oncoming negotiations. Therefore, this report may contain **not forecasted choke situations or on the contrary choke situations that only occurred in the analysed year.**

An additional important element for discussion regarding SWW fisheries, is on the data discrepancies identified throughout the report. On this side **two recommendations** are given:

- **Check the reasons for the discrepancies among the different data sources;**
- **Analyse the reasons why, if any other potential choke stocks arise or are identified by any other party (which is likely), they were not identified with the data used.**

These discrepancies among STECF and ICES data has been already highlighted by the STECF (STECF, 2013). This discrepancy is evident for the case of horse mackerel. It is not the intent of this report to resolve the issue, however one consideration is to be given:

Discard estimates are derived from relative small samples when compared to the overall fleet effort. This means that for many stocks, **discard estimates are derived using high raising factors.** This will inevitably lead to rather uncertain catch estimates and advice. This uncertainty has two undesired effects:

- **If the discard rate is seriously underestimated** setting TACs could result in creating an unintended choke species;
- **If the discard rate is seriously overestimated** such an approach could lead to an unintended overexploitation.

#### 4.2.5. Who is responsible for what?

One **final recommendation** to will be to clarify **who, in this process, is responsible for what.** The NSAC has produced a representation of responsibility for preventing “chokes” in their 2017 advice on implementing the landing obligation (NSAC, 2017). Three levels have been identified:

- **EU level:** Is of the responsibility of the EU to propose new legislations to ensure the landing obligation implementation in accordance with overarching objectives of the CFP and other relevant legislations. The regulations have to clearly provide the right incentives to meet the objectives defined. Science should support on providing impact assessments and/or ex-post evaluations of these measures.
- **National level:** Apply all the flexibilities and measures currently in the table to implement landing obligation, with the support and coordination of POs, NGOS and

science in general. In many cases, some potential surpluses have been identified. In these cases, it is up to the relevant member state to break the deal. This is relevant for those stocks identified in Table 15. At this level providing the right incentives is also relevant.

- **Local level:** Producer organisations should promote compliance and present voluntary measures. They can be incentivised for doing so. Nevertheless, as an economic activity, in many cases they are obtaining profits from fishing, therefore, they can develop actions to collectively share the risks inherent to fishing in general and to the choke stocks difficulties. The fishing sector is to implement selectivity and avoidance measures, with the scientific support to consolidate and check the robustness of the results. This is relevant to implement all the selectivity and avoidance measures defined in this report.

**Science can (should) be consulted at an early stage of the process**, although is the obligation of the EU, Member States, producer organisations and fishers, to promote the most implementable landing obligation scheme in coherence with the CFP objectives. **Science should focus on balancing inputs and outcomes of the process.** This should include the predictions based on the best available knowledge and avoidance of prescriptions. The scientific investigation should be linked to the societal debate on management objectives, trade-offs and tools for analysis. The risk of each possible outcome has to be evaluated by the society using their political processes.

There are many reasons to decide on a discard action and the mitigation actions can differ. The study of Sigurðardóttir et al. (2015) has concluded that, given this diversity, the full management system needs to create an **incentive framework that motivates fishers to avoid unwanted catches**. This framework should be understood from the economic/financial performance of the fleets but also from their compliance with the rules in place boosting the participation and the overall governance of the industry in the creation of the incentives scheme. **It is only in this setting that the discard mitigation methods might be effective and therefore choke stocks difficulties reduced.** We are dealing with a **shifting, dynamic, and warming ecosystem**, that requires a governance and management system flexible enough to ensure that landing obligation does not lead to **chronic misalignment** between Member States quota allocations and the portfolio of fish available to catch.



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This study presents an identification of the likely stocks that could act as choke stocks under the landing obligation to be fully implemented in 2019 for South Western Atlantic Waters. The study provides an estimation of the likely surplus/deficit quota by stock, Member State and EU level. It also analyses the likely solutions to it and if the likely management possibilities have been used or not. It finally provides a list of stocks of high risk of being choke after the application of the existing tool box for alleviating the choke problem in the near future.

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