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**Brexit and the Consequences for Fisheries Management
in the North Sea**

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Abbreviations

- EEA = European Economic Area
- EEZ = Exclusive Economic Zone
- EFTA = European Free Trade Area
- EU27 = EU with 27 member states after Brexit
- CFP = Common Fisheries Policy
- TAC = Total allowable catch quota
- UNCLOS = UN Convention on the Law of Sea

0. INTRODUCTION

The North Sea is a very productive fishing area of great importance to surrounding coastal states - Norway, the UK, Sweden, the Netherlands, France, Germany, Denmark and Belgium, with an average total harvest in recent years of slightly more than 1.8 million tonnes¹. Pelagic, demersal and shellfish fisheries are all important, although the importance of the various fisheries varies by country.

Since the introduction of the 200 nautical mile Exclusive Economic Zone (EEZ) regime, the North Sea coastal states have cooperated in the management of shared stocks. Norway and the EU reached a cooperative management agreement for five such stocks - cod, haddock, saithe, whiting and plaice - as early as 1977, however, the Agreement on Fisheries between the EEC and the Kingdom of Norway² (hereinafter the 1980 Agreement) was not signed until February 1980 due to an internal dispute in the EU. Norway and the EU also agreed on joint management for North Sea herring in 1986, formally as part of the 1980 Agreement.

All coastal states in the area except Norway are members of the EU. As such they are subject to the Common Fisheries Policy (CFP) so that their fisheries are managed jointly with quota shares according to the principle of relative stability, as we shall discuss later. Every year, within the confines of the 1980 Agreement, there are fisheries consultations between Norway and the EU to agree on total allowable catch quotas (TAC) for shared stocks, exchange of quotas, and other regulations. The Norway-EU cooperative agreement has proven to be remarkably successful with quota shares that have remained unchanged. There is also cooperation about management of other fisheries, as part of the 1980 Agreement, as we shall also discuss.

The United Kingdom has now withdrawn from the EU, and thus the CFP, which for decades has been the most dominant instrument in British fisheries policy. This may have important repercussions for fisheries management in the North Sea. With Brexit, there will be three parties to the management of North Sea fisheries: either a new agreement must be negotiated³, or the current Norway-EU Agreement must be amended to include the United Kingdom. The United Kingdom is an important player in the North Sea, both because it has large quotas, but also because EU27 fishermen currently have the right to fish in UK waters

¹ Norwegian and EU catches, plus the Faroe Islands and Russia, annual average for 2014-15, ICES areas 4a, b and c, ICES catch data set, see Part II for more details..

² Official Journal of the European Union 1980 L226/48.

³ Bilateral «discussions» between Norway and the EU, and between Norway and the UK about a future trilateral agreement are already taking place (NFD, 2020).

due to the CFP. Moreover, access agreements permit fishermen from third countries such as Norway and the Faroe Islands to harvest in the EU EEZ and thereby the UK EEZ as well.

Negotiations between the UK and the EU for a new, comprehensive agreement for their future relationship have already commenced. Similarly, Norway/EFTA and the UK will also negotiate a new trade agreement. When it comes to fish, the UK is a very large fish market, and access to this market by exporters of Norwegian seafood is important. On the other hand, the EU is an important market for British fishermen. Trade agreements may have an impact on the negotiations for the sharing of quotas and other issues related to fisheries management, although it has always been the position of Norway that there should be no direct link between quotas and trade (Melchior, 2020b).

The purposes of this study are twofold. The first is to attempt to explain why the cooperative management of the six shared North Sea fish stocks has been so stable to date, and to ask what lessons this success holds for the world at large. The second is to analyse, to speculate upon the post Brexit management of these resources. The lessons learned from cooperative management over 40 years may well have an impact also on future cooperation between Norway, the UK and the EU27. The crucial question is whether Brexit risks disrupting this successful cooperative management regime and, if so, how. Obtaining an answer to this question requires that we examine, *inter alia*, the consequences of Brexit for prospective fishery relations between the UK and the EU27.

In addressing these issues, the theory of strategic interaction, more popularly referred to as game theory, will be drawn upon to provide a broad overarching framework, for the basic reason that strategic interaction between and among the coastal states involved lies at the heart of the resource management issues to be examined.

This article consists of three main parts. Part I will be one in which we set the stage. The legal framework will be briefly reviewed, to be followed by a discussion of the rudiments of the theory of strategic interaction as applied to fisheries. Part II, which will address the first purpose of this study, is devoted to the pre-Brexit situation. We start by explaining quota sharing and fisheries management in the North Sea, and how this has evolved over time. Moreover, we will provide overviews over Norwegian and UK fisheries. Part III will then focus on the second purpose of the study, post Brexit management of these resources, in particular, consequences for the sharing of catch quotas and future scenarios for Norway-UK-EU27 cooperation. The difficult UK-EU 27 fisheries relationships is certain to have a major impact upon the overall management of the six North Sea shared fish stocks. Part IV will be a brief summary, as well as a call for future research.

Additional data are given in Appendix A, while in Appendix B we give an overview over Norway-UK trade relations, with an emphasis on Norwegian fish exports.

I. BACKGROUND

I.1 The legal framework

Of the major fishing areas in the North-East Atlantic, the following are of greatest relevance to this study: the Barents Sea, where the main species include cod, haddock, saithe, capelin and shrimp, the Norwegian Sea, where the main species include blue whiting, mackerel and Norwegian spring spawning herring, and the North Sea, where a number of demersal, pelagic and shellfish species are harvested. The cod stock in the Barents Sea is shared by Norway and Russia, with a quota given to third countries. The main parties in the Norwegian Sea are Norway, EU until now including the UK, Faroe Islands, Iceland, Greenland and Russia; with Brexit, the UK will become a coastal state. As this sea also includes high seas areas and straddling fish stocks, the Northeast Atlantic Fisheries Commission (NEAFC) plays a role in management (Bjørndal, 2009)⁴. North Sea stocks are harvested by fishermen from a number of European countries.

Prior to the end of the Second World War, international law recognised two broad types of marine areas, the coastal state territorial sea and the high seas. Traditionally the territorial sea extended to no more than three nautical miles. Today, it is 12 miles from shore or the baselines.

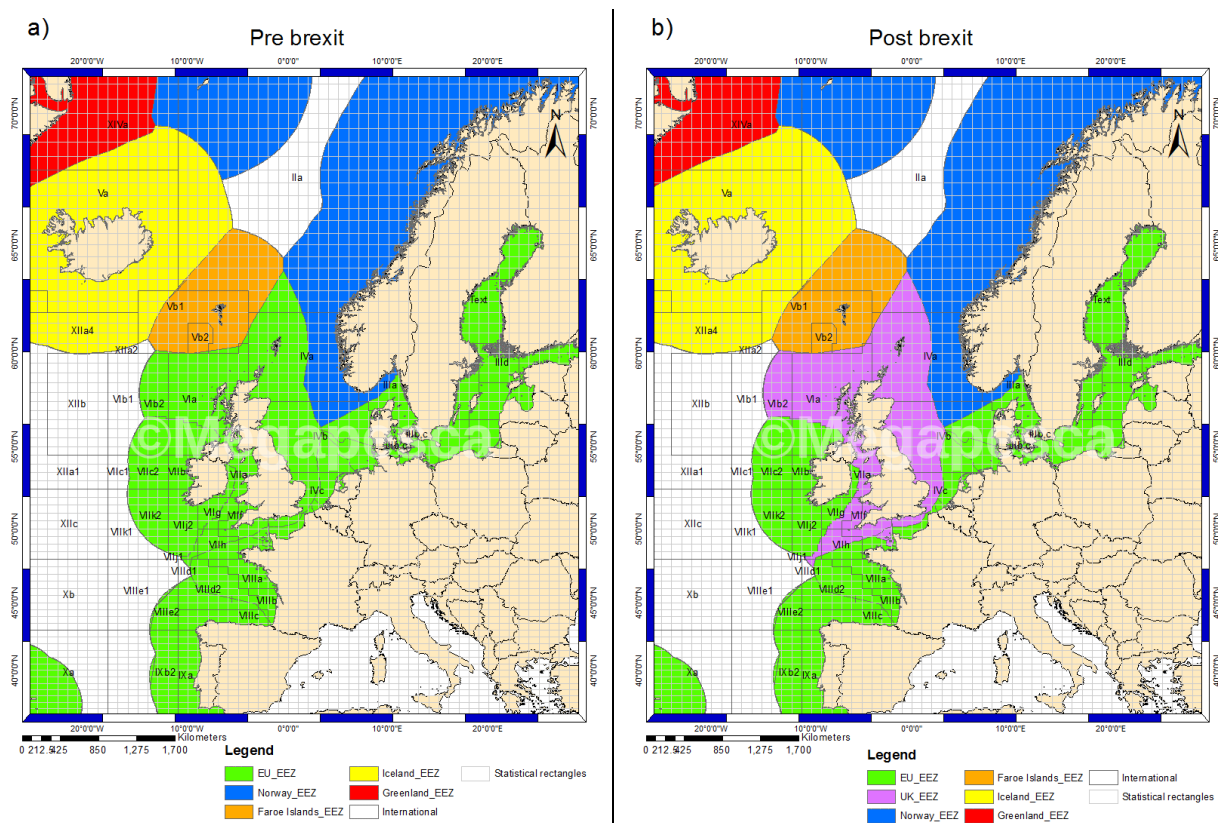
The legal framework is the 1982 UN Convention on the Law of Sea (UNCLOS) (UN 1982). That convention establishes the regime of 200 nautical mile Exclusive Economic Zones (EEZs) for coastal states (UN 1982, Part V). Within the EEZ, the coastal state has “sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living ----“ (UN 1982, Article 56 (1.a)).

Although the UNCLOS was approved in 1982, and legally went into force as international law on 16th November, 1994, many coastal states including European ones introduced EEZs in 1977, by which time it was evident that EEZs would be part of the Law of the Sea. Figure 1 illustrates EEZs in the North-East Atlantic pre- (a) and post-Brexit (b). As can be seen, the UK EEZ includes parts of the North Sea, the English Channel, the Norwegian Sea, the Irish Sea and the Western Approaches.

Although EEZs are national, in many policy areas coastal states in the EU have transferred authority to the EU so that Pre-Brexit, the EEZs of the EU coastal states could have been considered as one zone, known as Union waters. Moreover, fishermen from any EU

⁴ Brexit will also have consequences for management in the Norwegian Sea. For example, for Norwegian spring spawning herring, the UK will become a new coastal state, while the EU will no longer be a coastal state.

country could harvest in the EEZ of any member state outside its territorial waters. Post-Brexit, the UK will gain control of the management of fisheries in its EEZ, while that of the EU will be limited to that of the remaining coastal states. The implication of this is that there will be a new coastal state managing its fisheries in the area, the consequences of which will be analysed in detail in this article.



Source: Goulding and Szalaj (2017)

Figure 1. EEZs in the North-East Atlantic: a) Pre-Brexit and b) Post-Brexit

The 1982 UN Convention recognises that, because of the mobility of capture fishery resources, a coastal state will find that some of the fishery resources within its EEZ may cross the EEZ boundary into neighbouring EEZs and/or into adjacent high seas (UN 1982, Article 63; Article 64). Adopting FAO terminology, it can be said that this gives rise to the following classes of internationally shared fish stocks⁵:

⁵ There is a third type of transboundary stock, namely highly migratory stocks defined in a special annex to the Convention, mainly tunas. These stocks are not relevant to this study. For sake of completeness, mention is made also of a fourth class, discrete high seas stocks living only in the high seas, a class, which is also irrelevant to the discussion at hand (Munro et al., 2004).

(a) EEZ to EEZ stocks – shared stocks crossing the EEZ boundary into the EEZs of one or more coastal states;

(b) Straddling fish stocks – stocks crossing the EEZ boundary into the adjacent high seas.

In addition, there are exclusive fish stocks existing in the EEZ of only one coastal state.

The six shared stocks in the North Sea that are the focus of this analysis all belong to Class a). Nevertheless, in the North East Atlantic there is also substantial harvesting of straddling fish stocks, which can have an impact on the management of these six shared stocks.

As for the management of straddling fish stocks, the more recent 1995 UN Fish Stocks Agreement (1995 UNFSA) is meant to supplement and buttress the fisheries provisions of the 1982 UN Convention. Under the 1995 UNFSA, coastal states and distant water fishing states (DWFSs) exploiting straddling fish stocks and highly migratory fish stocks are to manage these resources through Regional Fisheries Management Organisations (RFMOs). As noted above, several stocks in the Norwegian Sea, including Norwegian spring spawning herring, mackerel and blue whiting, are straddling, and NEAFC is an RFMO in the sense of the 1995 UNFSA (Bjørndal, 2009) with a mandate to regulate fisheries in the high seas in the North East Atlantic. Its members are Norway, Russia, Iceland, the EU and Denmark in respect of the Faroe Islands and Greenland. As the UK has traditionally played an important role in NEAFC, it is to be expected that she will join the organisation in her own right.

The management of shared stocks (Class a) is dealt with in the 1982 UN Convention in Article 63(1). The article calls upon the relevant coastal states to come together “—to seek ---- to agree upon the measures necessary to co-ordinate and ensure the conservation and development of such stocks ----“ (UN 1982, Article 63(1)). A corresponding obligation regarding straddling fish stocks is established in Article 63(2).

It⁶ can be pointed out that International Tribunal for the Law of the Sea (2015) in its 2015 Fisheries Advisory Opinion noted that the obligation in Article 63(1) to seek to agree on necessary conservation and development measures was a ‘due diligence’ obligation, which required “the States concerned to consult with one another in good faith”. These consultations should be meaningful in the sense that substantial effort should be made by all States concerned, with a view to adopting effective measures necessary to ensure the conservation and development of shared stocks (para. 210). Such measures should be ‘aimed at preventing over-exploitation of such stocks that could undermine their sustainable exploitation’ (para. 211). Measures should be based on the best scientific evidence available, but when such evidence is

⁶ We are grateful to Professor Robin Churchill for drawing this to our attention.

insufficient, the States concerned must apply the precautionary approach (para. 208). They must also comply with the obligations in articles 61(3) (on maximum sustainable yield), 61(4) (on taking into consideration associated and dependent species) and 61(5) (on exchanging scientific information) of UNCLOS, as well as have due regard for the rights and duties of other States as required by articles 56(2), 58(3) and 192 of UNCLOS.

Importantly, however, the 1982 UN Convention does not require the relevant coastal states to reach an agreement or to submit to a dispute settlement. If the relevant coastal states undertake a good faith attempt to achieve a cooperative agreement, but do not succeed, then each state is to undertake to manage its share of the stock as best it can, in accordance with other provisions of the 1982 UN Convention (Munro *et al.*, 2004). We might refer to this as the default position.

I.2 Elements of the theory of strategic interaction (game theory) applied to fisheries

A game theoretic situation is deemed to arise when the actions of one “individual” have a perceptible impact upon one or more other “individuals”, leading to a strategic interaction between or among the “individuals” – a commonplace situation (Grønþæk *et al.*, 2020). In the case of transboundary fishery resources, the strategic interaction is clear enough. Think of two “individuals”, two coastal states, A and B, sharing such a resource. The exploitation of the stock of the A fleet will, except under very unusual circumstances, have a perceptible impact upon the exploitation opportunities of the B fleet, and vice-versa – hence the strategic interaction. In the case under consideration, we can think in the pre-Brexit world of A and B as being Norway and the EU respectively⁷.

A bit of game theory jargon in passing. The “individuals” engaged in the game are referred to as players or agents. The players have possible courses of action open to them, referred to as strategies. The implementation of the strategies by the players, recognising the impact of the strategies upon other players, is the game. The economic returns to the players from adopting different possible strategies are referred to as payoffs.

A stable outcome to the game is referred to as the solution to the game, with their being no guarantee that a solution will in fact exist. Finally, games may be “static” or dynamic in nature, and if dynamic may be repeated.

⁷ As Grønþæk *et al.* (2020) point out, game theory was all but ignored by fisheries economists, until the late 1970s. It was the coming of the EEZ regime, and the accompanying internationally shared fish stock problem, that compelled fisheries economists to incorporate game theory into their box of analytical tools (Grønþæk, 2020, ch. 1).

Game theory is divided into two broad categories, non-cooperative, or competitive games and cooperative games. In a cooperative game, we talk about the players forming coalitions; in a non-cooperative game, the players are, by definition, playing alone – playing as “singletons”, to bring in yet another bit of game theory jargon⁸.

If we return to the legal framework, we are reminded that, under Article 63(1 and 2) of the 1982 UN Convention, coastal states sharing a transboundary fish stock are required to come together to attempt to establish a cooperative resource management agreement, but are not required to actually reach an agreement (UN 1982, Article 63(1 and 2)). This then raises two questions: (1) what are the consequences of the coastal states being unsuccessful in establishing a cooperative resource management agreement, what we termed the default position? The coastal states would then manage their shares of the resource as best they could under the other provisions of the 1982 UN Convention. (2) what conditions must be met for a cooperative resource management regime to be stable over time? If the answer to (1) is that the negative consequences of non-cooperative resource management are inconsequential, then obviously (2) is of no interest.

In attempting to answer the first question, we bring to bear the theory of non-cooperative games. What the theory predicts is that, under non-cooperation, the players will be compelled to adopt strategies, which they know to be harmful. This is popularly known as the “Prisoner’s Dilemma”, after a story designed to illustrate this point. Consider the following simple example from fisheries.

Suppose that there are two coastal states, A and B, sharing a fishery resource. Both recognise that, due to inadequate management in the past, the resource has been overexploited. A resource rebuilding, i.e., resource investment, programme is in order. Coastal state A considers engaging in a resource rebuilding program, by restricting the harvests of the A fleet. There is, however, no cooperation between A and B. What assurance does A have that B will also restrict the harvests of the B fleet, in order to rebuild the resource? Answer: none.

A has two strategies: (i) restrict the harvests of the A fleet; or (ii) do nothing. If A implements strategy (i), there is the risk that B will do nothing and simply free ride off of the sacrifices undertaken by A. If A implements strategy (ii), it will incur no costs and will possibly free ride off of the resource rebuilding efforts of B, if B is foolish enough to restrict the harvests

⁸ As a first complication, the two categories are not mutually exclusive. It is a straightforward matter to construct a non-cooperative game in which there is no element of cooperation. In a cooperative game, on the other hand, there is no such exclusivity. As will be pointed out, in any cooperative game there lurks in the background a non-cooperative game.

of the B fleet. The dominant strategy for A is strategy (ii). What holds true for A holds true for B. The resource rebuilding programme will not be undertaken. If A and B were able to cooperate effectively, the resource rebuilding programme would be undertaken, to the benefit of both.

There is ample evidence that this theory has high predictive power in the world of marine capture fisheries. In 2002, the FAO, in cooperation with the government of Norway, mounted an Expert Consultation on the Management of Shared Fish Stocks (FAO, 2002, iv). The Consultation report puts forth as its first conclusion that, with few exceptions, non-cooperative management of shared fish stocks carries with it the threat of overexploitation. Cooperation in the management of these resources is an essential pre-requisite, if the management is to be effective (FAO, 2002). Cooperation does matter.

A spectacular example of the “Prisoner’s Dilemma”⁹ at work, is provided by North Sea herring. Prior to the advent of the EEZ regime the North Sea herring fishery game was decidedly non-cooperative. Non-cooperative management did more than carry the threat of overexploitation: the stock was driven to next extinction in 1977 under open access conditions (Bjørndal & Conrad, 1987).

In returning to our two fundamental questions, question (2) - what conditions must met for a cooperative resource management regime to be stable over time? - is of interest after all. To address this question, we turn to the theory of cooperative games, which is first and foremost a theory of bargaining. The version that we shall consider rests upon the foundation provided by John Nash (Nash, 1953).

A stable solution to a cooperative game exists, only if the players are able to enter into a binding agreement¹⁰. In the Nash world, it is assumed that the players will cooperate, will enter into a binding agreement, if, and only if, it is in their best interests so to do. Altruism plays no role¹¹. What then are the basic conditions that must be met, if the solution to a cooperative game is to be stable over time?

The very first condition to be met is that the players are able to communicate with one another effectively. If they cannot communicate effectively with one another, then all is lost. Non-cooperation will prevail, with all that entails.

⁹ Which Grønbaek *et al.* (2020) re-name the “Fisher’s Dilemma”.

¹⁰ Binding may mean legally binding, however, there are also many examples of agreements that are not legally binding, but nevertheless operate as if they were.

¹¹ This is not meant to disparage altruism. If it exists, so much the better. What Nash is endeavouring to do is to demonstrate that, even if the players are motivated by self-interest alone, there will be circumstances in which it is in their self-interests to cooperate, rather than compete.

The second condition is that each and every player at each and every moment through time must anticipate a “payoff” at least as great as would receive under non-cooperation, where the latter is seen as the payoff resulting from the solution to a non-cooperative game¹². In game theory terminology, this is referred to as the “individual rationality” constraint or condition.

To cite the FAO-Norway Expert Consultation report once again, no attempt to achieve cooperative management of shared fish stocks can hope to succeed “---unless each and every participant anticipates receiving long term benefits at least equal to the long term benefits it would expect to receive in the absence of collaboration”. The Consultation goes on to state that this fact, while obvious, is often ignored (FAO, 2002, iv).

The third condition, equally obvious, is that the solution to the cooperative game must be collectively rational in that there cannot exist an alternative solution, which would make one or more players better off, without harming the others – the “collective rationality” constraint¹³. The fourth condition, which is less obvious, is that the cooperative management agreement must be resilient, in that it must be able to withstand unpredictable shocks, be they environmental, economic, or political (e.g. Brexit).

Examples of lack of time consistency, or resiliency, can be found in the Norwegian Sea, where changing migration patterns for two straddling stocks, Norwegian spring spawning herring and mackerel, led to a breakdown in sharing agreements (Bjørndal, 2009). As a consequence of warming water temperatures in the oceans, migration patterns for many stocks are expected to change and an increase in the number of straddling fish stocks appears likely (Barange *et al.*, 2018). This may put strain on numerous international management agreements (Ellefsen *et al.*, 2017) and is also relevant for the North Sea as we will comment on in part III.

In order to enhance the likelihood that conditions two, three and four will be satisfied, it is important that the scope for negotiations or bargaining between the parties involved be made wide as possible. This brings up what those involved in game theory refer to as “side payments” – an unfortunate term. “Side payments” are usually thought of as transfers, monetary or non-monetary. We shall add to “side payment” like arrangements.

Following Grønæk *et al.* (2020), we shall define a cooperative fish resource management regime *without* side payments or side payment like arrangements as follows. Consider coastal states A and B once again, this time managing cooperatively a shared fish stock. If the cooperative resource management arrangement is without side payments, or side

¹² This goes back to our earlier comment that cooperative games are not separate and distinct from non-cooperative games. Behind every cooperative game there lurks a non-cooperative game.

¹³ Economists would express this condition by saying that the solution must be Pareto Optimal.

payment like arrangements, the payoffs to A(B) over time will be determined solely by the harvest of the A(B) fleet within the A(B) EEZ (Grønbaek *et al.*, 2020).

The euphemism “negotiation facilitators” has also been used over side payments¹⁴. “Negotiation facilitators” would “---broaden the scope for bargaining over allocations, assist in achieving compromises where there are differences in management goals of cooperating states/entities, and enhance the flexibility and resilience of the cooperative arrangement over time” (FAO, 2002, iv). In the case of fisheries, “negotiation facilitators” could refer to trade, an issue we will return to on several occasions, or even security arrangements.

There is, finally, a complication, which does not afflict non-cooperative games. In non-cooperative games the number of players does not matter all that much. If one starts with a simple two player non-cooperative game and then moves on to a non-cooperative game with three or more players, the latter is seen as no more than a generalisation of the former. In cooperative games, the number of players matters and matters a great deal. We first run into the problem of coalitions.

In a two player cooperative game, life is simple. Then there is only one coalition that counts – the two players. Do they, or do they not, cooperate? Once the number of players exceeds two, we run into the possibility of sub-coalitions. Return to our shared fish stock, a transboundary fish stock, but this time suppose that the stock is shared by three coastal states, A, B and C.

All three cooperating together would be referred to as the Grand Coalition. In the case of the North Sea post-Brexit, this would refer to cooperation between Norway, the UK and the EU27. There is also the possibility, however, of sub-coalitions, three to be exact¹⁵. One might have A and B cooperating and then playing competitively against C; A and C cooperating and then playing competitively against B; B and C cooperating and then playing competitively against A. Life now becomes much more complicated, in that while we may have full cooperation, we may also have partial cooperation.

In addition to all of this, there is the problem of free riding, of a player defecting and enjoying the benefits of the cooperation of the others, while incurring none of the costs of cooperation. If free riding is rampant, condition number two, the “individual rationality” constraint, will not be satisfied, for reasons that should be obvious, and attempts at cooperation will be stillborn. The difficulty in suppressing free riding increases exponentially with the number of players.

¹⁴ “Side payments” have, unfortunately, been misinterpreted as a bribe, “kick backs”, all in all quite unsavoury.

¹⁵ The number of possible coalitions increases exponentially with the number of players.

When it comes to straddling stocks, still another issue is what is called the new member problem, i.e., the situation that arises when a new player wants to join the game, which may lead to strain or even the breakdown of a cooperative agreement (Bjørndal & Munro, 2012). Usually this is considered in the context of straddling stocks where “new” distant water fishing states may commence fishing on the high seas¹⁶. With Brexit, when it comes to shared stocks, the situation is different. Hitherto, Norway and the EU have made joint management decisions when it comes to shared stocks in the North Sea; henceforth, there will be three players, Norway, the UK and the EU27, where the UK enters the game as a new coastal state with corresponding rights and responsibilities according to UNCLOS, as discussed above.

As a final comment, we need to point out that the vast majority of games are not “one shot” simultaneous games. First, players may play sequentially, giving rise to multi-stage games. One example might be the UK and the EU27 agreeing on a trade and fisheries deal before entering into negotiations with Norway. The sequencing of negotiations may have an impact on the final outcome. Secondly, the games, single stage or multi-stage, are commonly repeated over time. One consequence of repeated games, if they are non-cooperative, is that, if the games are repeated over an extensive period of time, the games may evolve into cooperative ones. An example of that is Norwegian spring spawning herring, where non-cooperation over several years was followed by a cooperative agreement (Bjørndal, 2009). The one caveat, in the case of fisheries, is that non-cooperation may endanger the sustainability of the fish stocks.

The stage has now been set. We can now turn to the pre-Brexit of the North Sea transboundary fishery resources and the reasons for the stability of the cooperative management regimes

¹⁶ This may or may not be relevant for management in the Norwegian Sea, an interesting topic, which is beyond the scope of this article.

II. THE PRE-BREXIT SITUATION

Let us start by considering North Sea fisheries. Table 1 gives aggregate catches by all countries for 2015-17 for four different species groups. In this period, the average annual catch was 1.827 mill tonnes. The most important group is the first, consisting of six shared stocks jointly managed by Norway and EU under the 1980 Agreement. The second group consists of five other stocks are considered joint but are not jointly managed. In the annual fisheries consultations between Norway and the EU, the two parties jointly determine TACs for the six shared stocks, while for the non-jointly managed stocks each party sets its own TAC. Nevertheless, the two parties may cooperate in different ways. The third group consists of the two straddling stocks mackerel and blue whiting. The coastal state agreements for these stocks cover the management in the entire North East Atlantic, however, there are substantial catches also in the North Sea. The last category is “others”, consisting of stocks that are not shared and/or for which there is no management cooperation. A number of them will have been EU stocks, now becoming shared UK-EU27 stocks. The substantial variation in catches of the five non-jointly managed stocks is due to great variability in stock size and TAC over time for sandeel. Harvest by species is given in Appendix A, Table A10.

Table 1. Aggregate harvests in the North Sea 2015-17. Tonnes.^{a)}

Species group	2015	2016	2017
Six shared stocks under joint management: cod, haddock, saithe, whiting, plaice and North Sea herring	671,354	737,777	686,947
Five shared stocks not under joint management: sandeel, hake, anglerfish (monkfish), horse mackerel and Norway pout	403,054	175,387	564,745
Straddling stocks: mackerel and blue whiting	337,711	297,713	309,757
Others	498,952	450,984	328,121
Total	1,911,071	1,661,861	1,889,570

a) ICES area IV.

Source: The Directorate of Fisheries.

The focus of this study is the six shared stocks that are jointly managed under the 1980 Agreement. This is not only because these stocks represent the most important part of the fisheries cooperation between Norway and the EU, but also because other kinds of cooperation including non-jointly managed stocks, access and exchange arrangements including in the Barents Sea to a very large degree are undertaken as part of the 1980 Agreement.

II.1 Quota sharing and management in the North Sea

The North Sea is an important and productive fishing area. Although some small stocks are confined to the EEZ of one particular country, many stocks are shared between two or more countries. As inspection of Figure 1 will illustrate, the introduction of 200 mile EEZs caused major changes in fisheries management in the North Sea: a sea that was previously a “free for all” for fishermen from surrounding countries, was partitioned into EEZs of relevant states.

Norway and all countries in the EU¹⁷ established 200 mile EEZs as of 1st January, 1977. In anticipation of this, Norway and the EU started negotiations about a fisheries agreement as early as November, 1976. When doing so, there was an important assumption that traditional fishing patterns and mutual fishing opportunities should be maintained as far as possible, although these would need to be “balanced” over time. Moreover, each party would allow fishing vessels from the other party to fish in its zone (Foss, 1991).

An agreement for five jointly managed shared stocks - cod, haddock, saithe, whiting and plaice - was reached in April 1977 (Norway, 1981) and the sharing of quotas commenced the same year, however, the 1980 Agreement was not signed until February 1980 (Norway, 1981). The reason it took so long to sign the agreement was internal disputes among EU countries as some countries came out worse than others (Melchior, 2020b). Moreover, there was disagreement about the time period for the EU to reduce harvesting in the Norwegian EEZ in the Barents Sea. Eventually Norway agreed to a transition period until the end of 1982 (Foss, 1991). In other words, access to catch quotas was a controversial issue. The issue of catch quotas in the Barents Sea was contentious also in later negotiations between Norway and the EU, such as on the European Economic Area (EEA) Agreement in 1989-91 and about EU-membership starting in November 1992 (Melchior, 2020b). It has always been the position of Norway that there should be no direct link between quotas and trade, as Norway did not want to give quotas in exchange for improved market access. Nevertheless, this has happened to some degree.

The Norway-EU Agreement (Anon., 1979a) was based on a scientific report from an expert group with members from Norway and the EEC (Anon., 1979b). The factors that were taken into account in determining catch shares included the distribution of eggs and larvae, the distribution of juvenile fish, the distribution of the adult stock based on survey data, the distribution of commercial landings, spawning areas and the exploitation rate and management measures (Anon., 1979b). As pointed out by Gullestad *et al.* (2019), the report did not suggest how these factors should be weighted so as to arrive at an allocation key. According to Gullestad

¹⁷ At the time, this was the European Economic Community (EEC). Nevertheless, we will use the term EU throughout.

(*op. cit.*), taking this report as the point of departure, a working group of EU and Norwegian scientists and managers analysed the situation and proposed that, due to the lack of comprehensive and reliable data for several of these problems and problems of how to weight them, negotiations could be based on the distribution of the fishable part of the stock in the Norwegian and EU coastal states' EEZs, including the zonal distribution of catches. With this as a starting point, the EU and Norway in 1979 in Nantes agreed on catch shares for cod, haddock, saithe, whiting and plaice (Anon., 1979a; Churchill & Owen, 2010, p. 336).

According to the 1980 Agreement, Norway and EU will enter into annual quota agreements for shared stocks in the North Sea, jointly as well as non-jointly managed, Norwegian fishing west of the British Isles and at Greenland, as well as EU fishing in the Norwegian EEZ in the Barents Sea (Foss, 1981). Moreover, there will also be negotiations about annual quota exchanges, including in areas other than the North Sea. It is the intention that there should be a “mutually satisfactory balance in their reciprocal fisheries regulations”¹⁸ where the balance is to be achieved in terms of value, not catch (Churchill and Owen, 2010).

A major institutional change having a profound impact on fisheries management in the North Sea and elsewhere was the evolving Common Fisheries Policy (CFP) of the EU. The 1970s and 1980s was also a time of enlargement for the EU. On the eve of the UK, Norway, Ireland and Denmark opening negotiations in 1970 to join the EU, the then EU6 adopted the equal access principle, which was presented as a *fait accompli* and part of the *acquis communautaire* to the candidate countries, which they had to accept. Between then and 1977, when the EEZs were introduced, the EU made no attempt to set TACs, let alone quotas. Opposition to the equal access principle was one of the major reasons why Norway decided against joining the EU in 1973.

The CFP has four main elements – fisheries management, relations with third states, structural adjustment and organisation of the market – of which the first two have relevance for this study. According to the first element, fisheries management such as setting TACs in “Community waters” is the competence of the EU, which also negotiates fisheries agreements with third states (Churchill and Owen, 2010). Moreover, TACs are to be distributed among member states according to the concept of “relative stability”, which was adopted by the EU member states in 1983 – until then there had been no agreement on quotas. Apart from relatively minor changes, each member state's quota, as percentage share of the TAC for each of the relevant stocks, has remained more or less unchanged ever since. Relative stability was

¹⁸ Agreement on Fisheries between the EEC and the Kingdom of Norway, Art 2(1)(b) and Annex, as cited in Churchill and Owen (2010).

determined by combining three factors – historical catches, preferential treatment for regions particularly dependent on fishing, and losses of catch resulting from the exclusion of Community vessels from third states following the introduction of 200 nm EEZs (Churchill and Owen, 2010). This means that for the EU, quota shares in the North Sea (and elsewhere) are allocated permanently between the countries according to a relative stability formula, a topic that will be further discussed below.

Portugal and Spain, becoming EU members in 1986, necessitated new negotiations between Norway and the EU (Melchior, 2020b). Portugal and Spain are both coastal states with substantial fisheries interests. As a consequence of the CFP, the total EU quotas in the North Sea were shared before Portugal and Spain joined the Union. Moreover, Spain in particular had lost access to distant water fishery resources world wide as a consequence of the new EEZs. This caused bitterness on the Spanish side that was evident in negotiations with Norway, not only in 1986, but for a long time to come.

The European Economic Area (EEA) Agreement is very comprehensive, covering many sectors of the economy (Fossum & Graver, 2017). When it comes to trade, for Norway the EEA agreement replaced the 1972 Free Trade Agreement with the EU, which Norway negotiated after the decision not to join the EU. In parallel with the EEA negotiations, there were separate discussions about fisheries cooperation between Norway and the EU. These lead to further development of the bilateral cooperation based on the 1980 Agreement, which resulted in a new agreement, based on the exchange of letters, dated 2nd May, 1992. Formally, this is not part of the EEA Agreement (Foss, 1991).

In terms of trade, Norway was given permanent duty free quotas of 30,000 tonnes for products that previously had (temporary) duty free exemptions. Catch quotas in the Barents Sea were an important matter in the EEA negotiations – an issue that is politically sensitive in Norway and controversial in the EU: Spain was ready to block an agreement if there was no solution to the question of catch quotas (Melchior, 2020b). Norway gave a declaration to consider additional EU access to groundfish north of 62°N and agreed to make available permanently a quota of 1,500 tonnes redfish that it introduced for EU vessels on the accession of Portugal and Spain to the EU in 1986. This is outside of the balanced exchange of the 1980 Agreement (Churchill and Owen, 2010).

Furthermore, the EU cod quota north of 62°N, where the EU had a quota since the introduction of EEZs, was finalised at 2.9%, to be balanced with quota exchanges in the North Sea. In addition, there was an additional quota to increase over time to 11,000 tonnes per year; from 1997 onwards this was set at 1.24% of the TAC, which represents the actual average EU

quota for 1993-97 (Foss, 1991). Norway is to be compensated with quota exchanges for the additional quota, as far as possible, but in areas other than the North Sea. Formally, these exchanges are made under the 1980 Agreement. It is important to bear in mind that “balanced exchanges” are measured in value terms, not in quantities.

On top of this, the EU has a cod quota of 3.77% of the TAC in the “Svalbard Fisheries Protection Zone”. After the introduction of EEZs, Norway gradually reduced the cod quota for third countries in this area. This caused conflicts between the Norwegian Coast Guard and trawlers from several countries, including Spain. To ease the political pressure, Norway offered an autonomous quota to the EU, not subject to any compensation¹⁹. The size of the quota is supposed to represent average harvest in the area by third countries in the 10 year period up to 1977. Thus, in total, the EU has 9.71% of the cod quota in the Barents Sea²⁰.

In 1977, when Norway and the EU agreed on the joint management of five shared stocks, the North Sea herring stock was at a very low level. A fishing moratorium was introduced in 1977 to save the stock from being driven to extinction, and the fishery was not reopened until 1984. When the fishery was reopened, the EU offered Norway a quota of only 2%, later increased to 4% of the TAC. This was turned down by Norway, which started a “demonstration” fishery to show that a larger share of the stock was to be found in the Norwegian EEZ. As a consequence, in 1986 the parties reached an agreement about variable sharing of the stock: for a spawning stock biomass (SSB) less than 1.5 mill tonnes, Norway’s share was 25%, for an SSB between 1.5 and 2 million tonnes, Norway’ share was 29%, which increased to 32% if the SSB exceeded 2 million tonnes. As of 1998, the two parties agreed on a 29-71 sharing between Norway and the EU regardless of the size of the SSB.

Bjørndal & Lindroos (2004) analyse the sharing of the North Sea herring fishery between Norway and the EU. They calculate the cooperative and non-cooperative equilibria under various assumptions regarding costs and discount rates. The question that arises is how the cooperative benefit should be shared. A common and intuitive solution is to give an equal share of the cooperative benefit to each country (see Kaitala & Munro, 1997). This means that the countries should receive their non-cooperative payoff plus an equal share of the cooperative benefit.²¹

¹⁹ Goulding & Szalaj (2017) state that fishing rights in the “Svalbard Fisheries Protection Zone” are claimed by Norway, but disputed by others. In the absence of a legal resolution, the EU and Norway have agreed that the fishery in the zone will be managed by Norway. See also Foss (1991).

²⁰ A few other third countries also have cod quotas in the Barents Sea. Moreover, the EU has (small) quotas also for some other species, but cod is by far most important (see NFD, 2020).

²¹ See Kaitala & Munro (1997) for other sharing rules.

As noted above, the current sharing rule between Norway and the EU is 29 – 71. It is found that this sharing rule favours the EU in the sense that it receives more than half of the cooperative benefit. Bjørndal & Lindroos (2004) go further to find a share that satisfies the equal sharing arrangement. According to their analysis, Norway should receive at least 32% of the TAC, whereas the current allocation is 29%. Thus, the actual management scheme does not conform with the equal benefit sharing rule.

The six shared stocks currently under joint Norway-EU management, based on the 1980 Agreement, are harvested by eight countries: Norway, the UK, Sweden, the Netherlands, France, Germany, Denmark and Belgium. In addition, as will be highlighted below, there are important fisheries for other species including joint Norway-EU stocks that are not jointly managed, quota exchanges and more.

TACs for the six shared stocks are determined annually in negotiations between Norway and the EU. The International Council for the Exploration of the Sea (ICES) has established statistical rectangles that provide a grid covering the area between 36°N and 85°30'N and 44°W and 68°30'E. The rectangles are one degree of longitude by half a degree of latitude. The North Sea represents area 4 as illustrated in Figure 2. Quota setting for stocks in this area and in the Norwegian Sea, is based on advice from ICES.²²

National quotas are derived from the TACs, and these are supported by various technical measures (closed areas and seasons, minimum mesh sizes and landing sizes, etc.). Moreover, each party shall, within its EEZ, grant access to fishing vessels of the other party to fish, in accordance with provisions that have been agreed upon in the annual negotiations. Numerous monitoring, control and surveillance measures are also in place to ensure enforcement of the regulations.

²² There is a separate agreement for Skagerak and Kattegat. For details, see Agreed Record (2020).



Figure 2. ICES Areas in and around the North Sea

Table 2 gives quota shares for Norway and the EU for the six jointly managed shared stocks in the North Sea. Although in principle the sharing is *ad hoc* from year to year, in reality the quota shares are fixed. As noted, Norway and the EU will every year agree on a TAC for the different stocks. Once TACs are set, national quotas follow from that. Although TACs will vary from year to year, 2020 TACs are also given in Table 2 so as to illustrate the importance of the various stocks. In terms of quantity, North Sea herring is by far most important, followed by plaice, saithe, cod, haddock and whiting. For Norway, herring and saithe are most important.

Table 2 also illustrates two other important variables when it comes to quota management in the North Sea. The first is quota exchanges. *Quota exchange* involves fishing vessels from one country being allocated a quota of various species in another country's EEZ. In 2020, Norway transferred some quantities of haddock and whiting to the EU, while the EU transferred saithe to Norway. These exchanges are limited; as will be shown below, quota exchanges are more important for some other species. The other is *access*. As discussed above, access means that fishing vessels from one country will be permitted to harvest all or part of their own quotas in a different country's EEZ. Norway is permitted to harvest her entire quotas of cod, haddock, saithe, whiting and plaice and up to 60,000 tonnes of herring in EU waters, while the EU can harvest large shares of most of their quotas in Norwegian waters. We will return to the issue of access later.

It is important to consider not only quantities, but also values, as what matters is the sharing of economic benefits. To do so, prices for the different species are required. For this purpose, we have used average UK landings prices. These prices are at the same level in the

value chain and although there may be some differences from market to market, there is every reason to believe they are representative for landings by fishermen from all relevant countries.

Cod is seen to be the most valuable fish at £2.08/kg, followed by plaice. Herring fetches the lowest price - £0.44/kg. If we assume the 2018 prices are representative also for 2020, we can find the quota values for this year. Under these assumptions, plaice becomes the most valuable stock with a quota value of £279 million, followed by herring. Ideally, we would like to have net values, i.e., revenues minus costs. This would, however, involve an exercise that is beyond the scope of this paper.

Table 2. TACs, Quota Shares (%) for Norway and the EU, Quota Transfers (Tonnes), Norwegian and EU Quotas (Tonnes), Average Price per Species and Quota Values for Shared Stocks in the North Sea

Species (ICES area)	TAC	Norway % share	EU % share	Transfer from Norway to EU	Transfer from EU to Norway	Nor. quota total ^{a)}	In EU zone ^{b)}	EU quota total ^{b)}	In Norwegian Zone ^{b)}	Average UK 2018 price £/kg	Gross value of 2020 TAC £ million
Cod (4)	14,718	17	83	-	-	2,502	2,502	12,216	10,618	2.09	30.76
Haddock (4)	35,653	23	77	300	-	7,900	7,900	27,752	20,644	1.45	51.70
Saithe (4, 3a)	79,813	52	48	-	200	41,703	41,703	38,110	38,110	0.81	64.65
Whiting (4)	17,158	10	90	500	-	1,216	1,216	15,942	10,801	1.25	21.45
Plaice (4)	146,852	7	93	-	-	10,280	10,280	136,572	56,041	1.90	279.02
Herring (4, 7d)	385,008	29	71	-	-	111,652	50,000 ^{c)}	273,356	50,000 ^{c)}	0.44	169.40

Sources:

Agreed Record (2020) with regard to quota shares and all quantities.

Prices: Table 3.8a Landings into the UK and abroad by UK vessels by area of capture. 2018. In https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/833883/Chapter_3_Landings.xls

- These numbers are after quota transfers.
- These numbers represent quantities that can be harvested in the other contracting party's waters.
- An additional quantity of maximum 10,000 tonnes will be granted if such an increase is called for.

As the EU quota is shared according to the principle of “relative stability”, the percentage quota shares of the different countries remain constant over time. As can be seen (Appendix A, Table A1), the United Kingdom is dominant in the fisheries for cod, whiting and haddock. For plaice, the UK has the second largest quota after the Netherlands, for herring the second largest after Denmark, while for saithe France and Germany have larger quotas than the UK.

Based on the sharing agreement between Norway and the EU, and the EU's principle of relative stability, we can find the quota shares of Norway, the UK and EU27 for the different species (Table 3). It can be noted that the UK is dominant for haddock and whiting, and in reality also for cod, while Norway is dominant for saithe. The EU27 is dominant for plaice and

herring, although for the latter, Norway has the largest national quota followed by Denmark and the UK.

A key issue is to what degree Brexit will lead to changes in quota shares. It is important to note that the UK has already signalled she will continue to abide by ICES advice. We will return to these questions in Section III.

Table 3. Quota Shares (%) for Norway, the UK and EU-27 out of total TACs

Species (ICES area)	Norway % share	UK % share	EU27 %
Cod (4)	17	38.9	44.0
Haddock (4)	23	65.0	12.0
Saithe (4, 3a)	52	8.0	40.0
Whiting (4)	10	60.2	29.8
Plaice (4)	7	27.0	66.0
Herring (4, 7d)	29	16.1	54.5

As noted above, quota exchanges and access rights are important elements of fisheries management in the North Sea. There are several reasons why this is so. One reason for an exchange could be that the quotas are based on historical catch patterns and not necessarily adjusted to account for the actual situation for the individual countries today. Thus, it regularly happens that a country ends up in a situation, in which some quotas are constraining and others are not. Therefore, in order to continue fishing, exchanges are made with countries, where this situation is not a problem (Andersen *et al.*, 2017). Another reason for exchanges could be better use of the various countries' fleet technology and activity distribution.

Access arrangements may be advantageous partly for the same reasons, but also for others. Norwegian fishermen harvest herring in the EU zone because of better availability (higher stock density), which may be particularly important when stock levels are low. This will imply lower harvesting costs per unit. Another reason may be greater proximity to landing ports. Whatever the reasons, the implication is that access rights will make the quota more valuable.

II.2 Norwegian fisheries in the North Sea

Norwegian fishermen harvest about 70% of their total catches in areas under Norwegian jurisdiction. The rest is harvested in international waters and the EEZs of other countries, including 14% in the EU zone where the North Sea is most important.

Norwegian harvesting in the North Sea of all species is given in Table 4. Total harvest increased from 608,000 tonnes in 2015 to a peak of 901,000 tonnes in 2018, down to 858,000

tonnes in 2019, with an average annual harvest of 752,000 tonnes. On average, 40.4% was harvested in the Norwegian EEZ, 41.2% in the UK EEZ and 18.4% in the EU27 zone. In 2018, harvest in the UK EEZ far exceeded that in the Norwegian EEZ²³, while in 2017 and 2019 harvest in the UK zone was slightly less than in the Norwegian zone. This clearly illustrates the importance of the UK EEZ to Norwegian fishermen. As for the EU27 zone, catches are dominated by blue whiting although that is not in the North Sea.

Table 4. Norwegian Harvesting in the North Sea by Area^{a)}: the Norwegian EEZ, the UK EEZ and the EU-27 EEZ, 2015-19. Tonnes

Area	2015	2016	2017	2018	2019	Average
Norwegian EEZ	306,060	280,235	307,445	281,154	345,649	304,109
UK EEZ	247,720	212,949	297,019	461,264	329,554	309,701
EU27 EEZ	54,406	142,315	151,512	158,953	182,951	138,027
Total	608,186	635,499	755,976	901,371	858,154	751,837

a) This corresponds to ICEA areas IV a, b and c – Skagerak is not included. A species breakdown is provided in Appendix A.

Source: Derived from Appendix A, Tables A2-A4.

Norwegian harvest of the six jointly managed shared stocks for the period 2015-19 is given in Table 5. The table gives harvest in the Norwegian, UK and EU27 zones (see Tables A2-A4 for more details on Norwegian harvesting in the North Sea). In this period, the total annual catch varied in the range 180,000 – 211,000 tonnes, with an average of 191,000 tonnes. When compared to the figures in Table 5, one can infer that the six shared stocks represent only 25% of total Norwegian harvest in the North Sea. On average, 58.3%, 41.5% and 0.2% come from the Norwegian, UK and EU27 zones, respectively. In terms of quantity, of the six jointly managed stocks, herring is by far most important, followed by saithe. For herring, on average 38.4% is harvested in the UK zone, while 48.7% of saithe come from the UK zone. For cod, about 51% come from the UK zone. Catches of whiting and plaice are negligible. All in all, these statistics clearly show the importance of the UK zone to Norwegian fishermen, while that of the EU27 is negligible.

As shown in Table 2, for five of the six stocks Norway can harvest its entire quota in EU waters; for North Sea herring, Norway may harvest up to 60,000 tonnes annually in the EU zone. Several years herring catches in the UK zone are close to this limit. According to industry

²³ This was due to large harvests of blue whiting in the Irish and UK zones and large harvest of mackerel in the UK zone, see Appendix, Tables A3 and A4.

sources, it might be profitable for Norwegian fishermen to harvest even more of the herring quota in UK waters, if this were permitted.

Table 5. Norwegian Harvest of Jointly Managed Shared Stocks in the North Sea

Species	Year					
	2015	2016	2017	2018	2019	Average
Cod – total	5,139	5,710	5,592	5,553	4,582	5,315
-In Norwegian EEZ	2,257	2,372	2,464	2,952	2,440	2,497
-In UK EEZ	2,865	3,220	2,984	2,389	2,085	2,708
-In EU-27 EEZ	17	118	144	212	57	110
Haddock – total	1,885	1,489	2,080	1,440	1,416	1,662
-In Norwegian EEZ	860	754	969	864	1,023	894
-In UK EEZ	1,024	714	1,083	539	384	749
-In EU-27 EEZ	1	21	28	37	9	19
Saithe – total	35,203	31,121	48,915	39,441	49,913	40,919
-In Norwegian EEZ	16,266	16,404	16,644	22,877	32,770	20,992
-In UK EEZ	18,922	14,710	32,267	16,555	17,141	19,919
-In EU-27 EEZ	15	7	4	9	2	7
Whiting – total	1,046	1,079	895	977	1,106	1,021
-In Norwegian EEZ	209	179	297	190	560	287
-In UK EEZ	837	879	595	784	541	727
-In EU-27 EEZ	0	21	3	3	5	6
Plaice – total	148	87	65	64	49	83
-In Norwegian EEZ	42	75	50	58	46	54
-In UK EEZ	68	11	15	6	3	21
-In EU-27 EEZ	38	1	0	0	0	8
North Sea herring – total	136,213	150,154	132,943	163,907	127,739	142,191
-In Norwegian EEZ	77,478	90,432	85,415	107,659	72,723	86,741
-In UK EEZ	58,718	59,541	47,450	55,878	54,620	55,241
-In EU-27 EEZ	17	181	78	370	396	208
Grand total	179,634	189,640	190,490	211,382	184,805	191,190
-In Norwegian EEZ	97,112	110,216	105,839	134,600	109,562	111,465
-In UK EEZ	82,434	79,075	84,694	76,151	74,774	79,365
-In EU-27 EEZ	88	349	257	631	469	355

It is also important to have information about catches by UK and EU27 fishermen in the Norwegian EEZ of the six jointly managed shared stocks²⁴ (Table 6). UK catches are seen to be modest compared to EU27. EU27 catches are larger than those of the UK for all species except haddock. If we compare to Table 5, it is obvious that the UK EEZ is far more important to Norwegian fishermen than the Norwegian zone to EU27 fishermen, let alone British.

Table 6. UK and EU27 Catches of Jointly Managed Shared Stocks in the Norwegian EEZ South of 62°N (exl. Skagerrak). Tonnes

	2015	2016	2017	2018	2019
Cod UK	2,862	2,617	2,695	1,736	1,248
Cod EU27	5,798	5,122	5,484	7,071	3,695
Cod total	8,661	7,739	8,179	8,808	4,943
Haddock UK	5,895	5,762	5,021	3,345	2,657
Haddock EU27	1,853	1,409	1,526	1,324	1,181
Haddock total	7,748	7,171	6,547	4,669	3,838
Saithe UK	1,764	1,406	1,232	1,568	1,434
Saithe EU27	12,050	7,826	10,936	11,889	10,831
Saithe total	13,815	9,232	12,168	13,458	12,265
Whiting UK	761	704	686	404	513
Whiting EU27	92	109	110	112	111
Whiting total	854	814	796	516	624
Plaice UK	819	946	981	236	482
Plaice EU27	7,983	9,117	9,972	7,962	6,448
Plaice total	8,803	10,063	10,953	8,198	6,930
Herring UK	460	2,456	1,058	0	0
Herring EU27	18,272	20,208	5,186	1,885	873
Herring total	18,732	22,664	6,244	1,885	873
UK total	12,561	13,891	11,673	7,289	6,334
EU total	46,048	43,791	33,214	30,243	23,139
Grand total	58,613	57,682	44,887	37,532	29,473

In Appendix A (Table A7), Norwegian harvests in English as well as Scottish waters are also given. Scotland is dominant in this regard: for herring, slightly less than 10% is taken in the English zone; virtually all other harvests are in the Scottish zone. This is a matter we will return to in Section IV.

²⁴ Total catches by UK and EU-27 fishermen in the Norwegian zone are given in the Appendix, Tables A5 and A6.

II.3 UK Fisheries and the UK EEZ

As stated before, after the UK joined the EU, over time the Common Fisheries Policy (CFP) became the dominant instrument for managing UK fisheries. TACs for stocks managed by the EU are set at the EU level from which national quotas follow according to relative stability, including for third countries, as well as fisheries regulations that are common for all member states. As part of the CFP, any EU vessel can in general fish anywhere in the EU EEZ zone outside of the 12 mile territorial sea subject to having quota on given fish stocks and other regulations that are common in EU waters.

Much of the following is based on Napier (2017a) who provides a detailed analysis of landings from the UK EEZ and UK landings from the EU EEZ for the period 2011-15. In the following, Napier (2017a) is the reference to all factual information, unless otherwise stated. The study is based on landings by EU fishing vessels, as data on landings by non-EU fishermen were not available for this study.

Over the five years 2011-15, UK fishing vessels on average landed a total of just over 650,000 tonnes of fish and shellfish per year. Ninetyeight percent were caught in the Northeast Atlantic, the remainder in other areas of the world's oceans. In the Northeast Atlantic, 81% (82% by value) were harvested in the UK EEZ, 14% in the EU27 EEZ and the remainder elsewhere in the Northeast Atlantic. This clearly illustrates the importance of the UK EEZ for British fishermen.

However, the UK EEZ is very important, not only for British fishermen, but also for fishermen from several other countries. Table 7 gives UK and EU27 catches of the 20 main fish and shellfish species – average landings and value per year for the period 2011-15. The listing is according to total weight. It must be noted that non EU harvesting, for all practical purposes Faroese and Norwegian catches, are not included.

Landings statistics are based on ICES statistical rectangles. Where only a part of a rectangle is inside the UK EEZ, the proportion of landings from this rectangle caught within the UK EEZ is assumed to be equal to the proportion of the area of the rectangle that lies within the EEZ²⁵.

Average annual landings from the UK EEZ are 1,223,000 tonnes. However, it is important to keep in mind that the UK EEZ includes areas in the Norwegian Sea and parts of the English Channel, Irish Sea and Western Approaches, i.e., areas outside the North Sea (see Figure 1). It is noteworthy that EU catches of 697,000 tonnes (57% of the total) are higher than

²⁵ According to Andersen *et al.* (2017), on average about 13% of total landings value comes from the divided rectangles.

the UK catches, which amount to 527,000 tonnes or 43% of the total. The total average annual value of catches is £1,171 million, with the value of UK catches (55%) higher than that of EU catches (45%). This is due to the composition of catches, in particular higher UK catches of shellfish.

By weight, mackerel²⁶ and herring represent almost 50% for both the EU and the UK. For the EU, more than 70% of landings are pelagic – sandeel, blue whiting and horse mackerel are also important, while these fisheries are negligible for the UK.

By value, UK landings were almost equally divided between pelagic, demersal and shellfish species, while EU landings were almost equally divided between demersal and pelagic fish, with shellfish and industrial fish accounting for only small proportions.

Mackerel and herring also dominated the landings of EU boats by value, together accounting for 40% of the total, but were followed in value by common sole and hake. For the UK, mackerel is most important in terms of value, followed by scallops, monks, crab, haddock and herring.

²⁶ Much of the mackerel is harvested in ICES area IVa, areas around Shetland, and between Shetland and Norway, in other words, not in the North Sea.

Table 7. Weights and Values of the Top 20 Fish and Shellfish Species landed from the UK EEZ by UK and EEZ Fishing Vessels. Annual averages for 2011-15. Weights in '000 Tonnes, Values in £ millions

Species	Weight UK Vessels	Weight EU Vessels	Total Weight	Value UK Vessels	Value EU Vessels ^{a)}	Total Value
Mackerel	174.0 (33%)	126.0 (18%)	299.0 (24%)	164.0 (25%)	118 (22%)	282.0 (24%)
Herring	77.1 (15%)	216 (31%)	293.0 (24%)	32.6 (5%)	91.5 (17%)	124.0 (11%)
Sandeel	2.0 (0%)	88.5 (13%)	90.5 (7%)	0.6 (0%)	27.6 (5%)	28.2 (2%)
Blue whiting	3.3 (1%)	48.7 (7%)	52.1 (4%)	0.9 (0%)	13.1 (2%)	14.0 (1%)
Horse mackerel	7.7 (1%)	34.4 (5%)	41.1 (3%)	3.0 (0%)	13.4 (3%)	16.4 (1%)
Haddock	28.4 (5%)	6.9 (1%)	35.3 (3%)	33.9 (5%)	8.3 (2%)	42.2 (4%)
Nephrops	28.8 (5%)	4.7 (1%)	33.6 (3%)	93.0 (14%)	15.2 (3%)	108.2 (9%)
Saithe	12.1 (2%)	21.0 (3%)	33.1 (3%)	11.9 (2%)	20.6 (4%)	32.5 (3%)
Scallops	26.9 (5%)	4.8 (1%)	31.7 (3%)	48.2 (7%)	8.7 (2%)	56.9 (5%)
Edible crab	26.9 (5%)	1.7 (0%)	28.6 (2%)	34.0 (5%)	2.2 (0%)	36.2 (3%)
Monks	13.0 (2%)	8.9 (1%)	21.8 (2%)	39.2 (6%)	26.7 (5%)	65.9 (6%)
Hake	6.9 (1%)	14.2 (2%)	21.1 (2%)	15.1 (2%)	31.2 (6%)	46.3 (4%)
Whiting	10.3 (2%)	10.6 (2%)	21.0 (2%)	10.7 (2%)	11.0 (2%)	21.7 (2%)
Plaice	7.3 (1%)	11.6 (2%)	18.9 (2%)	7.8 (1%)	12.3 (2%)	20.1 (2%)
Whelks	17.7 (3%)	1.0 (0%)	18.6 (2%)	12.6 (-)	0.7 (-)	13.3 (-)
Others ^{b)}	12.9 (2%)	5.6 (1%)	18.4 (2%)			
Boarfish	1.8 (0%)	13.9 (2%)	15.7 (1%)	0.2 (0%)	1.3 (0%)	1.5 (0%)
Cod	11.4 (2%)	4.2 (1%)	15.6 (1%)	22.3 (3%)	8.2 (2%)	30.5 (3%)
Norway pout	0.0 (0%)	15.4 (2%)	15.4 (1%)	0.0 (0%)	1.3 (0%)	1.3 (0%)
Sprat	5.3 (1%)	8.5 (1%)	13.9 (1%)	1.1 (0%)	1.7 (0%)	2.8 (0%)
Common sole	1.8 (0%)	5.4 (1%)	7.2 (1%)	13.7 (2%)	40.2 (8%)	53.8 (5%)
Megrim	3.5 (1%)	3.9 (1%)	7.5 (1%)	9.1 (1%)	10.1 (2%)	19.2 (2%)
Lobsters	2.5 (0%)	0.0 (0%)	2.5 (0%)	24.6 (4%)	0.3 (0%)	24.9 (2%)
Bass	0.8 (0%)	0.9 (0%)	1.7 (0%)	5.7 (1%)	6.6 (1%)	12.3 (1%)
Other species	44.6 (8%)	40.1 (6%)	84.6 (7%)	61.3 (10%)	56.1 (11%)	117.4 (10%)
TOTAL	527 (100%)	697 (100%)	1,223 (100%)	645 (100%)	526 (100%)	1,171 (100%)

a) Estimated on the assumption that EU prices are the same as UK prices.

b) These are species the names of which have not been recored – as different from other species, where species name are known. For this reason it does not make sense to estimate values.

Source: Napier (2017a).

Amongst the principal species landed from the UK EEZ, EU boats' shares of the total landings varied widely between species, from as high as 100% for Norway pout and argentinines to only 20% for haddock. Other principal species for which EU boats accounted for a large share of the total landings included blue whiting (94% by weight), boarfish (89%), horse mackerel (82%), herring (74%), hake (67%), saithe (63%) and plaice (61%). EU boats also accounted for high proportions of the landings of some other species that were landed in smaller quantities, such as black scabbardfish (96%).

Amongst the principal species landed from the UK EEZ by value, EU boats' shares of total landings were highest for sandeel (98% by value), common sole (75%), herring (74%), hake (67%) and saithe (73%). Again, EU boats also accounted for high proportions of some other species whose total values were smaller, such as black scabbardfish (96%), blue whiting (84%) and horse mackerel (82%).

When it comes to management, blue whiting and mackerel are part of the Norwegian Sea management regime (Bjørndal, 2009), which will not be considered any further in this analysis. As already noted, six shared stocks are under joint Norway-EU management. For other stocks, the annual TACs (and regulations in general) are set by the EU with quotas for Norway and other third countries, if relevant²⁷. Moreover, Norwegian vessels will have access rights to the EU EEZ to harvest these quotas. In terms of catch, sandeel, horse mackerel, nephrops and crab are the five most important. Here the EU dominates when it comes to the two pelagics, while the UK dominates for nephrops, scallops and crab. In terms of value, scallops, monks, sole, hake and crab are the five most important species. The UK has the highest value shares for scallops, monks and crabs, while the EU has the highest value shares for sole and hake.

Table 8 summarises information for the six jointly managed North Sea shared stock when it comes to harvesting in the UK EEZ by British, EU27 and Norwegian vessels. When we compare this to total landings and value in the UK EEZ (Table 7), for UK vessels landings of shared stocks represent 27.8% of catch and 18.5% of value, while for EU27 vessels, shared stocks represent 38.8% of catch and 28.3% of value from the UK EEZ.

Table 8. UK and EU vessels landings from UK EEZ, annual averages for 2011-15, weight and value. Norwegian vessel landings from UK EEZ, annual averages for 2011-16. Weight '000 tonnes, value £ million

Species	UK vessels weight	EU27 vessels weight	Norw. vessels weight	Total weight	Value UK boats £ mill	Value EU27 boats £ mill	Value Norw boats £ mill	Value total UK and EU27 £ mill
Cod	11.4	4.2	2.1	17.1	22.3	8.2	4.1	34.6
Haddock	28.4	6.9	0.7	36.0	33.9	8.3	0.8	43.0
Saithe	12.1	21.0	16.0	49.1	11.9	20.6	15.7	48.2
Whiting	10.3	10.6	0.5	21.5	10.7	11.0	0.5	22.2
Plaice	7.3	11.6	0.1	19.0	7.8	12.3	0.1	20.2
North Sea herring	77.1	216.0	56.2	349.5	32.6	91.5	23.8	147.9
Total	146.6	270.3	75.6	492.5	119.2	151.7	45.0	315.2

Source: For UK and EU taken from Napier (2017a), Tables 4 and 6. For Norway, averages for the 2011-16 period. See Appendix A, Table A3 for more information on Norwegian harvesting.

²⁷ Council Regulation (EU) 2019/124 set the TACs and other regulations for 2019, see <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32019R0124>

Overall landings from the UK EEZ

To find overall landings fishermen from the UK EEZ, we must also include non-EU vessels, primarily from the Faroe Islands and Norway. The results are summarised in Table 9 with more information provided in Appendix A (Table A8). Once more it is important to bear in mind that the UK EEZ also includes areas outside the North Sea.

Faroese landings are mainly of pelagic species managed as part of Norwegian Sea fisheries. For Norway, blue whiting and mackerel are also most important in terms of quantity, however, harvests of North Sea herring and demersal fisheries are also important. Catches of blue whiting and mackerel are likely to be in the Norwegian Sea rather than the North Sea.²⁸ Total catches of the five demersal shared stocks represent 73% of the total catch of demersal species (Appendix A, Table A3)²⁹.

When we look at the overall picture in the UK EEZ, non-UK vessels represent 68% of landings and 54% of value (Table 9). British fishermen represent only 32% of the landings but 46% of the value. In this regard it should also be mentioned that a part of UK quotas are owned by nationals from other countries, which is known as “quota-hopping”³⁰.

Table 9. Estimated weights and values of all fish and shellfish landed from the UK EEZ by UK, EU, Faroese and Norwegian fishermen for 2014

	Weight '000 tonnes	Value £ million
UK vessels	526.8 (32%)	644.9 (46%)
EU vessels	696.7 (43%)	526.4 (37%)
Faroese vessels	74.3 (5%)	51.7 (4%)
Norwegian vessels	336.2 (21%)	190.3 (13%)
Total	1,633.9 (100%)	1,413.2 (100%)
Of which all non-UK vessels	1,107.1 (68%)	768.4 (54%)

Source: Napier (2017a), Figure 25.

Note: For UK and EU, numbers are averages for 2011-15; for the Faroese Islands and Norway, numbers are for 2014.

Comparison

Over the five years from 2011 to 2015 it is estimated that EU fishing vessels on average landed just under 700,000 tonnes of fish and shellfish annually, with an estimated value of almost £530

²⁸ There may also be EU27 catches of Norwegian spring spawning herring in the Norwegian Sea part of the UK EEZ, but information about this is not available.

²⁹ Figures for Norway in Table 9 are for 2014. See Appendix A, Table A3, for data for 2015-19.

³⁰ According to research by the BBC and the New Economics Foundation, in 2019, 55% of the fishing quota's annual value in England was owned by foreigners, while in Scotland, only 4% of the annual value was in foreign hands. Current UK rules say even if vessels are 100% foreign-owned, they must have an "economic link" to the UK. That means they must meet one of five conditions, which include landing more than half their catch at UK ports or having majority British crews. See <https://www.bbc.com/news/52420116>.

million, from the UK EEZ each year (Table 9). Over the same period it is estimated that UK fishing boats landed just over 90,000 tonnes of fish and shellfish annually, with a value of about £110 million, caught elsewhere in the EU EEZ each year, on average. That is, EU boats landed over seven times more fish and shellfish by weight, and almost five times more by value from the UK EEZ than UK boats did from the EU EEZ.

Napier (2017b) is an update of Napier (2017a) with figures for 2016. As the averages have not been updated, we will here give a brief summary of some of the 2016-results:

-EU27 fishing boats landed more fish and shellfish from the UK EEZ in 2016 than UK boats did (58% of the total by weight).

-About one quarter of the fish and shellfish landed by EU27 fishing boats from the North East Atlantic in 2016 (23% by weight) was caught in the UK EEZ.

-Only a small proportion of the fish and shellfish landed by UK fishing boats in 2016 (12% by weight) was caught elsewhere in the EU EEZ.

Some additional information is provided in Appendix A.

Combined, these results illustrate the importance of the UK EEZ also for other countries. According to Andersen *et al.* (2017), in the period 2012-16, annual Danish landings in the UK zone varied between 200,000-300,000 tonnes with a landings value between DKK 0.7-1.0 billion, corresponding to 27-34% of total Danish landings value and 31-45% of landings quantity. If we compare these landings figures to those in Table 7 above, they suggest that Denmark represents 33-43% of total EU27 catches in the UK EEZ. Overall, Denmark is the most important of the EU27 fishing states active in the UK EEZ.

According to Andersen *et al.* (2017), if the accessibility to the UK EEZ is reduced, or even eliminated, it will negatively impact the economic performance of a number of Danish vessels to an extent that cannot be compensated via increased activity in other areas.

II.4 Quota Exchanges

As noted above, there are also quota exchanges between countries, for shared as well as for other stocks. Norwegian harvests of quota exchanges in the North Sea in total and with the UK in particular are given in Table 10. We notice that just over 50% of quota exchanges are harvested in the UK zone. The most important species in this regard is blue whiting, where although the UK is important, most of the harvesting is in the Irish EEZ³¹, which is not in the North Sea. Sprat is harvested in the Dutch EEZ. More information about quota exchanges of

³¹ Mackerel and blue whiting are part of the management regime for the Norwegian Sea (Bjørndal, 2009).

what is considered joint stocks, but not jointly managed, is given in the Appendix A (Table A9).

Table 10. Norwegian Harvests of Quota Exchanges – Total and in the UK Zone – Averages for 2011-16. Tonnes

Species	Average 2011-2016 North Sea total	Average 2011-2016 UK zone
Blue whiting ^{a)}	126 529	59 928
Norway pout	10 066	10 057
Sprat	9 695	0
Ling	5 332	5 247
Tusk	2 142	2 138
Others ^{b)}	2 168	2 123
Total EU-zone	155 932	79 493

a) This includes areas outside of the North Sea.

b) These include Greenland halibut, horse mackerel, saithe, blue lung, monkfish and sole.

For Denmark, for the 2012-16 period, on average 9% of the transfers from Denmark have been to the UK, while the transfers from the UK to Denmark on average amount to 15% (Andersen *et al.*, 2017). Thus, overall, Denmark receives much more quota from the UK than vice versa, measured in live weight. Not being able to undertake such quota exchanges in the future can have an economic impact, especially for the vessels most dependent on the UK EEZ, because the most exchanged species are also the most important species for their fishery. However, the primary part of the exchanges is undertaken for species, which are also primarily caught in the UK EEZ. Thus, the future importance of exchanges for these species will to a high degree depend on the possibility for Danish vessels to fish in the UK EEZ at all (Andersen *et al.*, 2017).

III. POST-BREXIT FISHERIES MANAGEMENT IN THE NORTH SEA

As noted in Section I, game theory is commonly used to analyse fisheries management, in particular where two or more countries are involved. In the case of the North Sea, cooperation has prevailed for several decades, and we will analyse how this cooperation might be affected by Brexit. As a consequence of Brexit, institutional arrangements will have to be changed and there will now be three rather than two players trying to reach an agreement.

III.1 Brexit: Consequences for the sharing of catch quotas

Having exited the EU, the UK has become an independent coastal state subject to UNCLOS and numerous other international treaties that it is signatory to. The major difference is, however, that the UK is no longer part of the Common Fisheries Policy. The UK will become party to the management of shared stocks with Norway and the EU and will have to negotiate coastal state agreements with both these parties or a three-party agreement.³² Furthermore, the UK will control access to its EEZ, be a party to exchange agreements and more.

As noted in Section I, although the UK left the EU on 31st January, 2020, the transitional agreement implies that, for most practical purposes, the UK will largely adhere to the EU *aqui* until the end of 2020. This means that the UK will be an independent party to negotiations with Norway and the EU for the setting of TACs and determining other management instruments, including the sharing of quotas, for 2021.

When considering future UK fisheries management, we can distinguish between the following type of fisheries:

1. Norwegian Sea fisheries
2. Barents Sea fisheries
3. EU-UK stocks
4. Norway-UK-EU27 shared stocks, jointly or non-jointly managed

We will briefly review all fisheries of relevance for UK fisheries management.

Norwegian Sea and Barents Sea fisheries

The Norwegian Sea has three important pelagic fisheries – Norwegian spring spawning herring, blue whiting and mackerel. The first two are of limited importance to British fishermen, although there are large catches of blue whiting in the UK EEZ (e.g. Appendix A, Table A3). Fishing for mackerel, on the other hand – a straddling stock found both in coastal state EEZs

³² There will also need to be a coastal state agreement with the Faroe Islands, but we will not consider that any further in this study.

and on the high seas – is the most valuable UK fishery (Table 7). There is currently no comprehensive management agreement for this stock: on the one hand, Iceland sets its own TAC, on the other hand, the EU, Norway, the Faroe Islands and Russia set a joint TAC as well as a share for other countries and for NEAFC (Jensen *et al.*, 2015). In the long run, this situation is unstable and may endanger the stock. In the future, the UK, as one of the largest harvesters of mackerel, will become an independent and important coastal state in this fishery.

In the Barents Sea, as outlined above, the EU has quotas of Norway – Russia shared stocks (in the case of saithe, exclusively Norwegian). For 2020 these quotas represent 21,518 tonnes cod, 1,100 tonnes haddock, 2,550 tonnes saithe and 400 tonnes by-catches. The UK holds 46.9% of these quotas, however, there are internal quota exchanges among EU countries, and the UK has in recent years not fully fished its quota³³. For the additional quota (1.24%, see discussion above), exchanges include quotas to Norway from EU exclusive stocks and from EU quotas in Greenland waters³⁴. As the EU was not able to offer Norway a full exchange for 2020, this year Norway held back 8,429 tonnes of the EU cod quota (NFD, 2020).

For 2020, the cod quota to the EU in the Svalbard zone is 28,960 tonnes. Main harvesting countries are Spain (39.8%), Germany (19.8%) and the UK (13.2%). It is outside the scope of this article to consider these fisheries and exchanges, although it must be acknowledged that they may also impact the North Sea situation and vice versa.

UK-EU27 Stocks

A number of stocks in UK waters have until now been managed as EU stocks. Considering Table 7, this includes a number of shellfish species (nephrops, scallops, crab, whelks and lobsters) as well as fish species including boarfish, sole, megrim and bass. It is notable that for shellfish, the harvest shares of the UK greatly exceed those of the EU27, while for the fish species, the EU-27 is dominant. Although we have little information about these fisheries, it is likely that some will become jointly managed shared stocks³⁵. Other species are likely to become EU27 stocks while some will become UK stocks, depending on their location. The latter are likely to include a number of shellfish species: as Heath & Cook (2020) notes, the fisheries for stocks such as scallop, crabs and lobster, which are valuable to the UK, are carried out almost exclusively in UK waters (see Table 7).

³³ Norway has also held back a few thousand tonnes as the EU has not been able to offer a balanced quantity in the North Sea.

³⁴ For 2020, this includes 10,000 tonnes sprat in the North Sea and 10,000 tonnes capelin in ICES areas 14 and 5a.

³⁵ Some special issues may arise in the Irish Sea. See O'Higgins & O'Hagan (2019).

Negotiations between the UK and the EU27 about their future partnership, including the management of these stocks, have already commenced³⁶.

Shared Stocks under Norway-EU-UK Management

In a sense, the 1980 Agreement can be considered the outcome of a two-stage game (see Part I.2). This is because the EU acts on behalf of relevant member countries. Thus, the member countries must first agree on its strategy (stage one). As we shall see below, this is also the case for the UK.³⁷ Subsequently, there will be negotiations between the three parties (stage two). Nevertheless, we will here consider negotiations for an agreement as a one stage game. Moreover, we must distinguish between a new framework agreement, to replace or extend the 1980 Agreement to include three parties, and annual negotiations about the setting of TACs, fisheries regulations and more undertaken in the context of the new framework agreement.

The crucial question is, how will Brexit upset the North Sea sharing agreement? Table 3 gives current quota shares for Norway, the UK and the EU-27 for the six shared stocks currently under joint management. The question is what adjustments there will be in quota shares as a consequence of Brexit as well as changes to other parts of the management agreement such as access to the UK EEZ by Norwegian and EU27 fishermen. Moreover, it is also an important matter that quota setting also in the future will be based on ICES advice.

In addition, according to fisheries consultations between Norway and the EU for 2020 (Agreed Record, 2020), the following are considered joint stocks but not jointly managed:

- sandeel,
- hake,
- anglerfish (monkfish),
- horse mackerel and
- Norway pout.

Of these, Norway pout, anglerfish and horse mackerel are considered shared stocks. Although formally not jointly managed, Norway and the EU cooperate in their management, again based on ICES advice. When consulting Table 7, it is seen that UK fishermen do not harvest Norway

³⁶ The UK published a draft fisheries agreement on 19 May 2020, see https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/886009/DRAFT_Fisheries_Framework_Agreement.pdf, while the EU published its negotiating directives in February 2020, see <https://www.consilium.europa.eu/media/42736/st05870-ad01re03-en20.pdf>

³⁷ In principle, one might say that also Norway (and any other country) first needs to agree on their negotiating position, which will happen in consultations between the government and important stakeholders in the fishery. Grønbaek & Lindroos (2006) analyse coalition formation among authorities and fishermen. Aanesen, & Armstrong (2016) consider a situation with a “hierarchy” of regulations, e.g. EU as well as national regulations.

pout, while harvest of horse mackerel is small and that of sandeel is limited. The UK EEZ is, however, important for EU fishermen harvesting these species as well as for Norwegian (see Appendix A, Table A8). There are also substantial quota exchanges of these species (Appendix A, Table A9). When it comes to hake and anglerfish (monkfish), about two thirds of the total are harvested by EU fishermen and one third by UK fishermen. In the future, it is expected that Norway, the EU-27 and the UK will cooperate on the management of these stocks.

III.2 Analysis

As noted, there has been cooperative management of shared stocks in the North Sea for more than 40 years under the 1980 framework agreement. Moreover, the main principles underlying the agreement have remained unchanged. This means that the cooperative management agreement has been very stable. This raises three questions: Why has this agreement been so successful? How have the parties to the agreement benefitted? And what will the future bring? We will now address these questions.

The success of the management of North Sea shared fish stocks

We can now address the first purpose we set out to analyse, namely, the stability of the cooperative agreement. Overall, the management of the North Sea shared stocks presents us with examples of cooperative resource management games, which have proven to be stable for over 40 years – no small achievement. Nevertheless, it must be conceded that the cooperative management of the six North Sea stocks has not been an unalloyed success. Churchill and Owen (2010) point out that the practical results of the 1980 Agreement have been mixed, as during the 1980s and 1990s, there was considerable overfishing for many stocks. Currently, overall the situation appears to be better. Nevertheless, cod, in particular, has been a disappointment. The cod spawning stock biomass (SSB) is below B_{lim} , and recruitment has been low since 1998. Several variables such as recruitment failure and temperature change are likely to have influenced the development in SSB, and there are limited prospects for the situation to improve (ICES, 2019; NFD, 2020). The TAC for 2020 was reduced by 50% compared to 2019 and numerous measures are in place with the intention of controlling harvest (Agreed Record, 2020). By way of contrast, however, the North Sea herring and saithe SSBs have well above the MSY levels, let alone minimum levels, since the mid-1990s; the plaice SSB has been comfortably above the MSY level since 2008 (ICES, 2019)).

In terms of the economic returns from the fisheries, it is fair to say that they have improved over time. There has been a reduction in over-capacity in many of the fleets, which has also been helped by a move towards rights-based fishing with a positive impact on profitability (Thøgersen *et al.*, 2013). Although the net economic surplus from cooperation may not have been maximised, it is safe to say that it is positive.

While discarding has been prohibited in Norway, this has not been the case in the EU. This was an issue for demersal fisheries rather than pelagic, due also to the mixed nature of these fisheries. Thøgersen *et al.* (2013) point to the fact that while demersal fisheries are mixed, TACs are set on a single species basis which gives rise to choke species, and consequently high grading and discarding. According to Diamond & Beukers-Steward (2011), in the North Sea, discard rates for EU countries are among the highest in the world. To end this practice, the EU has introduced a landing obligation, which was meant to be fully operational in 2019, although this objective appears not to have been met (Client Earth, 2019).

We are now in a position to suggest reasons for the stability that has been observed when it comes to North Sea fisheries management. They prove to be few and are very straightforward.

The first is that these games have been two player games. The smaller the number of players, the greater the chances of success. The second is that the “individual rationality” constraint is clearly met. With just two players, free riding is a negligible problem although some may claim that e.g. high grading is a type of free riding. At the governing levels there is no sign that either of the players deems sharing as being inherently “unfair” although the UK fishing sector advocates higher catch shares for the UK, and there have also been claims for higher Norwegian quota shares, as we will return to below. As to the payoffs from non-cooperation, it is safe to assume that both players recognise that they would be far below those arising from cooperation. This is most clearly seen in the case of North Sea herring. Non-cooperative management of this resource holds with it the promise of overexploitation of the stock, a matter we will return to.

The third is that the players have undertaken to expand the scope for bargaining, to maximise the size of the economic pie, having done this through the implementation of a set of what we have termed side payment like arrangements. This is most easily seen in the two players allowing one another to take substantial shares of their quotas in one another’s zones as illustrated in Table 2. Moreover, there is cooperation about the management of joint stocks that are not jointly managed. Furthermore, there are substantial quota exchanges for other species

in the North Sea as well as in the Barents Sea and elsewhere. These exchanges are very important for agreement on quota sharing for North Sea stocks.

The cooperative agreement involves several stocks, rather than one, which enhances the prospects for cooperation, given that side payments plus side payment arrangements are employed. The guiding principles for the determination of catch shares were the distribution of the fishable part of the stock, including the zonal distribution of the catches, in addition to historical catches, principles that were accepted by all parties to the negotiations.

The countries have benefitted from stability. While TACs change from year to year, the relative national quotas remain constant. Thus, there is no need for divisive bargaining about how to share the TAC. Moreover, even if TACs change over time, for sustainably managed stocks this will be within certain limits, which allows for a degree of certainty with regard to the future. This is very important for the fishing industry.

It is also important to note that management is based on ICES advice where researchers from all relevant countries participate. Moreover, there has been agreement about management plans and harvesting rules as well as about how these are to be implemented. Furthermore, enforcement of regulations has become stricter over time. The EU has now introduced a discard ban, a measure that was implemented in Norway long ago.

Finally, until 2020, the cooperative resource management agreements had been spared major shocks. In 2020, they are confronting a shock of possibly monumental proportions - Brexit.

The future

We now turn to the second purpose of this article, the speculative part of the discussion, namely the management of North Sea fisheries following the post-Brexit transition stage. It is important to note that all fisheries need to be considered, not only the six shared stocks under joint management, but also other North Sea stocks. Moreover, as pointed out, Norwegian Sea and Barents Sea quotas are also relevant for the North Sea and vice versa. Other relevant variables include *access*, in particular future access to the UK EEZ³⁸, quota exchanges, including the fact that the EU27/the UK are unable to come up with a balanced exchange for quotas in the Barents Sea³⁹, and, in particular trade, which also includes the right to land fish in third countries. All

³⁸ According to industry sources, Norwegian fishermen might wish to have permission to harvest even more North Sea herring in the UK zone.

³⁹ In principle, the UK could challenge Norway's right to manage fisheries in the Svalbard Protection Zone. Although the UK is signatory to the 1920 Svalbard Treaty, the UK is not bound by the understanding between Norway and the UK when it comes to the Svalbard zone.

these variables have proved important, to lesser or greater degrees, for pre-Brexit fisheries management.

When it comes to the allocation of quotas, the principles applied will be very important. These include zonal attachment and historical catches. If historical catches should be the main principle, it would indicate only limited changes. If, on the other hand, zonal attachment is used, there will likely be changes in quota shares for a number of species even if this principle is not as clear cut as it might appear to be, a question we shall return to later.

From Section II.3, it is seen that the UK EEZ is very important for Norwegian harvesting of shared stocks in the North Sea, representing almost 50% of the saithe harvest and almost 40% of the herring harvest in recent years. Moreover, the UK zone is important also for fishermen from other EU countries. It is also notable that virtually all Norwegian harvest in EU waters is taken in the UK zone. British fishermen on their part harvest most of their quotas in UK waters including in the Norwegian Sea.

All in all, this suggests that Norwegian and EU27 fishermen to a large degree depend on the UK EEZ for their fisheries, while the dependence of UK fishermen on the EEZs of Norway and EU27 is quite limited. The consequences of being excluded from the UK zone may be inability to harvest full quotas and/or increased cost of harvesting, possibly also lower prices if e.g. smaller fish are harvested. This may have strategic implications for the sharing of quotas.

At least three scenarios may be considered:

I) Status quo. Continuation of the current management agreement including the joint setting of TACs, current quota sharing, EEZ access and more. Essentially this would leave the current status quo intact.

II) Agreement between the three parties. This might involve increased quotas for UK fishermen, for some species, and greater British control of the UK EEZ, which might have an impact on the access of non-UK fishermen to the UK EEZ. As it is expected that Norwegian and EU27 fishermen would not be able to compensate for this by harvesting elsewhere in the North Sea, this could bring substantial losses for non-UK fishermen – and increased landings and profits for the UK fisheries sector.

III) No agreement. In case no agreement is reached, each party may set its own quota for its own waters. Although coastal states are admonished under UNCLOS to cooperate in the management of shared stocks, as noted in Section II.1, if they do not succeed in doing so, each state is to manage its share of the stock in accordance with other provisions of the 1982 UN Convention (Munro *et al.*, 2004).

Scenario I) status quo would imply no changes to the current situation, in other words, the UK would have to abide by the 1980 Norway-EU fisheries agreement. This is neither realistic nor likely. Nevertheless, it serves as an important point of reference for other outcomes.

As for scenario II), it is assumed that this will involve cooperation between Norway, the UK and the EU27 with some changes in quota shares and access rights. This would be what we call the Grand Coalition, consisting of all three parties. As already noted, talks are under way to reach a fisheries agreement.

Scenario III) no agreement may be envisaged in different ways⁴⁰. The outcome may be the three parties playing competitively against each other as singletons. It is, however, perhaps more realistic that there will be a situation where a sub-coalition consisting of two of the three parties – in principle, Norway-UK, Norway-EU27 or UK-EU27 – which plays competitively against the third. Whatever the case might be, it will involve three parties, if they are playing as singletons, or two parties for the case of a sub-coalition and a singleton, each setting quotas. Although the quotas are likely to be set as shares of recommended TACs by ICES, the sum of quotas may exceed ICES advice. This is the kind of situation that has been witnessed in the past in the Norwegian Sea for Norwegian spring spawning herring and currently for mackerel (Bjørndal, 2009, Jensen *et al.*, 2015).

Of the three feasible sub-coalitions, the UK-EU27 is most critical. Regarding Norway-EU27, there is every reason to expect that current arrangements will continue into the future. The two entities have very close cooperation through the EEA arrangement although fisheries are not part of this agreement (Fossum & Graver, 2017). Even if the balance in quota exchanges would shift, with the UK leaving the EU, there is no reason to expect major changes. There is, however, uncertainty regarding the two other sub-coalitions, in particular UK-EU27.

In a numerical exercise, Goulding & Szalaj (2017) consider post-Brexit catch under a set of assumptions, including UK fishermen harvesting the quantities currently harvested by the EU27 in UK waters, while being excluded from the EU27 zone, but disregarding changes in other areas such as the Barents Sea. Based on data for 2014, UK catch quantity is found to increase by 86% and value by 80%, while EU harvest and value will decline. This might imply an extreme case of scenario III). Losses to the EU27 would be substantial; those to Norway much more modest.

⁴⁰ Other scenarios may also be envisaged. In an earlier study, Carpenter (2017) considered six scenarios, from no Brexit to a hard Brexit.

The UK-EU27

We now turn to the very difficult question of UK-EU27 post-Brexit fisheries relations. It can be said from the outset that, if these relations turn out badly, the consequences could be most unfortunate for North Sea fisheries management.

To begin, in the evolving UK-EU27 fisheries game, the UK is not, as Phillipson & Symes (2019) stress, to be seen as a single player. In essence, this is the same point as we have made above regarding two stage games, which is relevant for both Norway and the EU. As is the case with these players, the UK should also be seen as a coalition, consisting of the harvesting sector, the processing sector and the government. The interests of the harvesting and processing sectors are not identical. The government will, of course, be influenced by both, as well as by the interests of the devolved nations, in particular Scotland, which has the largest fishing sector, a point we will return to later. The UK must also be concerned with her reputation in terms of sustainable development and conservation of natural resources, very much including fishery resources and the environment.

With respect to the harvesting sector, let it be recalled that, in the discussion of the rudiments of game theory, emphasis was given to the importance in cooperative games of achieving an outcome in which the allocation of the benefits of cooperation were perceived by all players to be “fair” through time. For this to be the case, it is essential that the cooperative management agreement must be flexible and resilient.

As Phillipson & Symes (2019) point out, the negotiations over the UK’s accession to the EU in the 1970s, as they pertained to fisheries “---left a deep sense of grievance within the UK’s catching sector over their small share of the Total Allowable Catches---“ (Phillipson & Symes, 2019, p.169). The problem of “unfairness”, as seen from the perspective of that sector, was then exacerbated by the freezing of quota allocations through time by the implementation of the principle of “relative stability” as part of the CFP41. Goulding & Szalaj (2017) point out that for the UK, the critical issue is the differential between relative stability shares and the zonal attachment to the UK EEZ for fish stocks. They state that UK fishermen believe there is a massive difference, and that they expect that under Brexit they will have access to more quota than under the CFP and relative stability. Nevertheless, it must be kept in mind that the UK

⁴¹ If a time invariant allocation rule is to be applied, then the rule had better be consistent through time. Zonal attachment is reasonably consistent through time, but not always as the histories of the Norwegian spring spawning herring and mackerel fisheries reveal (Bjørndal, 2009). The EU allocation rule was, let us be reminded, historical catches, which meets the consistency through time requirement particularly badly. With the rule, one becomes, over time, a prisoner of ancient history. In the following, examples will be provided that even zonal attachment may not be time invariant.

joined the EU in 1973, before the introduction of 200 nm EEZs, and quota negotiations and determining relative stability were based on the Hague Agreement of November 1976 and not finalised until 1983 with the UK a party to the negotiations.

During the 2016 referendum campaign, there were groups within the UK harvesting sector that campaigned actively for the Leave side, e.g. Fishing for Leave⁴². The moderate members of the sector would see the allocations re-negotiated, with much more emphasis put on zonal attachment, in the belief that the greater preponderance of fishery resources in the UK EEZ, over those in the EU27 EEZ, would right the “injustices” of the past (Phillipson & Symes 2019). The less moderate advocate a policy of “unilateralism”, of eliminating all foreign fishing within the UK EEZ, of building up UK harvesting capacity over time, with the UK managing its share of the fishery resources on its own – what we referred to earlier as the 1982 UN Convention Article 63(1) default position (Phillipson & Symes, 2019, *ibid.*). This corresponds to scenario III) no agreement⁴³.

Let us focus on the scenario III) no agreement. What would work in its favour is the EU27 becoming intransigent and saying no to concessions on quotas and demanding continued full access to UK waters; in response, the UK may offer no concessions on access to its EEZ. The UK could then possibly “walk away” from the negotiations (Phillipson & Symes, 2019, *ibid.*). It is, however, also possible that the EU-27 will “walk away” from the negotiations if they find the UK to be intransigent when it comes to quotas and access. Nevertheless, this would imply that the EU27 would need to stop fishing in the UK EEZ, which would come at great expense to their fishermen. This represents a strong bargaining card for the UK government. Positions are, of course, likely to change as bargaining continues.

It is worthwhile to digress for a moment on the question of access to the UK EEZ. Under the CFP, harvests of EU27 vessels in UK waters far exceed the harvests of UK vessels in EU27 waters. In value terms, the value of the EU27 vessels’ harvest in the UK zone is five times greater than that of UK vessel harvests in EU27 waters (see Section II.1 and Appendix A (box 1). Similarly, Norway harvests 41.2% of its total North Sea catch in UK waters (Table 5), while the UK harvests fairly small quantities in the Norwegian EEZ. How unfair! And yet.

⁴² It has been claimed that 100% of Scottish fishermen were in favour of leaving (Goulding & Szalaj, 2017), however, this claim is rather difficult to verify.

⁴³ For some species and fleets, there are historical rights to fish in the territorial sea of the UK between 6-12 n.m.. For the Channel Islands, the UK and France have concluded three treaties relating to fishing by French vessels in Channel Island waters (Churchill and Owen, 2010). According to press reports, fishing conflicts have erupted in this area. These are issues that will be coming up in the forthcoming negotiations, but will not be considered in this analysis.

In the discussion of the pre-Brexit management of the six shared stocks, much was made of the fact that the two players to a large degree are able to harvest their quotas throughout the two zones. This enabled the vessels to catch the fish when they were most valuable and to avoid spawning grounds. This had the effect of maximising the global economic returns. Nevertheless, it is important to bear in mind the importance of the UK zone.

The principle of “zonal attachment” has been invoked to justify larger quotas for the UK. However, Shepherd & Horwood (2019) point out that this ignores several complicating factors. Fish migrate all the time, and sometimes there are shifts in their distributions in response to climate change and other environmental factors⁴⁴. The scientific reality is that one does not know where the fish are with any accuracy most of the time. Fundamentally, there is no obvious basis for deciding how to weight and combine whatever information is available. Goulding & Szalaj (2017) point out that the definitive attachment of stocks to EEZ is simply not known. Shepherd & Horwood (*op. cit.*) go on to point out that any “objectively” determined percentages would inevitably fail to match historic shares, and thus generate conflict. Finally, it must be borne in mind that the migration and distribution of fish stocks may vary over time, so that zonal attachment – if it could be measured – may not be time invariant. To this must be added that in a well functioning fishery cooperative game, the stocks under consideration would, on both economic and biological grounds, be harvested in the UK EEZ. In terms of “fairness”, what counts is the allocation of the economic benefits from the harvests of these fishery resources, not where the harvests are taken.

What will work against the no agreement scenario, from a fisheries perspective, is first of all trade in goods and services. Roughly speaking, the UK exports most of the fish that it harvests, and imports most of what it consumes and processes. The UK exports (by volume) about 80% of what it catches with 66% going to the EU27 (Goulding & Szalaj, 2017). In the case of no agreement, it would invite retaliatory tariffs and other trade restrictions from the EU.

Nevertheless, although trade in goods matter, the services sector is vastly more important to the UK economy. This includes financial services and, in particular, the future role of the City of London, the premier hub for finance in the world. It is of utmost importance for the UK that the financial sector can operate as unfettered as possible in the EU market. This also tells us that the “scope” of the negotiations matter (see Part II.2). While the UK wants a

⁴⁴ Hake, a joint North Sea stock not jointly managed, represents one example: increasing stock size has expanded its distribution so that a substantial proportion of hake in the North Sea is now distributed in the Norwegian zone (source: Agreed Record (2020)). Earlier we also made reference to North Sea herring, where a larger share of the stock is to be found in the Norwegian zone when stock size is at a high level.

separate fishing treaty, the EU is demanding that all the different elements of the post-Brexit agreement — trade, fisheries, aviation and energy — should be covered by an overarching legal structure.⁴⁵

Shepherd & Horwood (2019) point out that any attempt to adjust catch shares is guaranteed to lead to disputes. This has happened periodically, for example when additional fishing states like Spain have joined the EU, and when there have been major shifts in the geographical distributions of some stocks. Norwegian spring spawning herring and mackerel in the Norwegian Sea are cases in point (Bjørndal, 2009; Bjørndal & Ekerhovd, 2014). According to Shepherd & Horwood (2019), “...*the required shares are hammered out by negotiation among the interested parties, a process that is certainly influenced by any relevant scientific information, but certainly not decided by it*”. Furthermore, they state that it would be inconceivable that market access is not considered as part of the negotiations as British fishermen are dependent on the EU market for their products.

Shepherd & Horwood (2019) note that the UK Fisheries White Paper provides some indications of what the UK government thinks the effect of applying zonal attachment might be, compared with using relative stability, for a range of stocks. As examples (Defra, 2018), for North Sea sole zonal ‘attachment’ is over 30% in contrast to the 4% derived using relative stability, while for North Sea saithe, zonal attachment is 33-54% as compared to 8% under relative stability. The complexity of this methodology is also witnessed by the fact that the White Paper estimates zonal “attachment” according to three different principles.

The no agreement scenario involves all three parties, acting as independent coastal states, setting quotas based on ICES advice, although in principle there could be a sub-coalition of two parties playing against the third. As the sum of quotas may exceed 100% of the ICES advice, this may over time be detrimental to the sustainability of fish stocks. This case has been analysed by Heath & Cook (2020), who have carried out an extensive modelling exercise to analyse this scenario. Their conclusions are that no agreement could prove to be destructive for North Sea fishery resources, with North Sea cod and herring being at greatest risk: cod, because stock size at the outset is at a very low level; herring, because it is a schooling species, which in the worst case might be driven to (near) extinction.

We do, however, consider this an unlikely outcome in the long run. Norway, the UK and the EU are all responsible coastal states or entities operating according to the provisions of

⁴⁵ See “Starmer rejects Brexit extension as talks get off to a slow start”, *The Times*, 12th May, 2020.

UNCLOS. Mismanagement will damage the reputation of all three parties. Although the sustainability of stocks may be endangered for a period of time⁴⁶, sooner or later one would expect the parties to agree on joint management. In Section II.2 it was noted that, if non-cooperative games are repeated over an extensive period of time, the game may evolve into a cooperative one. The science based approach to fisheries management in the North Sea, where ICES plays a prominent role, is another reason for expecting that cooperation will prevail in the long run.

It is, however, pertinent to consider what damage could be made to the sustainability of stocks if there is a period with non-cooperative management. In general, this depends on several factors. One issue is the extent to which the parties' joint quotas exceed the ICES recommended TAC. Another is the initial state of the stock, e.g. cod, which is currently at a low level as compared to herring, which is at a sustainable level. A third is how long the overharvesting will take place. And finally, once an agreement is reached, how long it will take for the stock to recover, which very much depends on the ecosystem in question. Another factor that is pertinent to the North Sea situation is that, as argued above, the EU27 and Norway may not be able to harvest their entire quotas for some species if their vessels are denied access to the UK EEZ. It is also fair to point out that consumer response to unsustainable harvesting is becoming increasingly important in world fish markets and will help counteract unsustainable harvesting (Kurien, 2005; Bjørndal *et al.*, 2014). For these and other reasons it is impossible to know, however, the Norwegian spring spawning herring and mackerel cases in the Norwegian Sea give reason for optimism.

At the outset, we suggested three alternative scenarios for future North Sea fisheries management, I) status quo, II) agreement between all three parties, and III) no agreement. We have argued that while there is certainly a possibility that negotiations about a fisheries agreement may break down, as an agreement must be seen in a larger game theoretic perspective including trade in goods and services, a breakdown is likely to be of a temporary nature. The question is then, what we will end up with. We believe there will be changes in current arrangements and that, for some species, the UK may end up with higher quotas than at present. There is also reason to believe that the UK will demand greater control of fisheries in its EEZ,

⁴⁶ Phillipson & Symes (2019, p. 171) quote from both the UK Brexit White Paper of 2017 and the House of Lords Brexit Inquiry report, also of 2017. From the Brexit White Paper, we have: “-----following EU exit, we will want to ensure a *sustainable* and profitable seafood sector and deliver a cleaner, healthier and more productive marine environment”, while from the House of Lords Brexit Inquiry report, we have: “--- walking away [“unilateralism” approach] would, by leading to unilateral management of shared fish stocks, risk undermining the *sustainability* of fish stocks---“. These concerns will be shared by both Norway and the EU27.

a right it has according to UNCLOS. Nevertheless, changes in quotas and access agreements with the EU27 are likely to be gradual.

Norway-UK

It is difficult to assess the future of the Norway-UK relationship. The UK is Norway's most important export market and cannot easily be replaced. In fisheries, however, it has been clearly demonstrated that parts of the Norwegian fishing fleet to a large degree depends on the UK EEZ and that exclusion from this zone would lead to losses for the industry, while UK fishing has little dependence on the Norwegian zone. A consequence may be that the UK demands larger quotas for some species at the expense of Norway and changes in the access rights of Norwegian fishermen to the UK zone. Overall, it is difficult to say what Norway could offer in order to maintain current quotas and access rights. Nevertheless, EU quotas in the Barents Sea might give Norway some leverage, as the UK has almost half the EU quota albeit a much smaller share of the quota in the Svalbard protection zone. As the UK in recent years has not fully harvested her cod quota⁴⁷, it is an interesting question how important it is to keep this quota. What matters is whether the EU27 would like to keep the cod quota, including the UK part, and whether or how Norway will accommodate an EU request. It is also an issue that Norway in recent year has held back cod quotas as the EU has not provided a full exchange. It may thus be an option for Norway to keep some of these quotas

We have stipulated three possible future scenarios: I) status quo, II) agreement, which is likely to involve that the UK harvesting sector prevails and UK harvest quotas are increased in UK waters, with the quid pro quo being that Norwegian and EU27 vessels are granted a more limited but still "acceptable" access to quotas in the UK EEZ, and III) no agreement, where the EU or the UK "walks away" from the negotiations.

It is assumed, quite reasonably we would argue, that the Norway-EU27 trade relations will remain unchanged. The importance of the UK market for Norway's exports of fish products would appear to place Norway in a vulnerable position in its forthcoming post-Brexit negotiations with the UK. Norwegian fish exports to the UK are, by and large, not in direct competition with UK harvested fish. In fact, important export products such as cod and haddock are very popular in the UK market and imports come in addition to domestic supply of these species. UK harvesting in the Norwegian EEZ is very limited.

⁴⁷ In 2015 and 2016, the UK harvested 30% and 25%, respectively, of the EU cod harvest – remaining quantities were offered for exchange.

Furthermore, UK fish processors have a high degree of dependence upon supplies of frozen fish blocks and fillets from Norway, along with Iceland and Canada (Phillipson & Symes 2019, p. 170). One could anticipate vehement objections from UK fish processors, if there were moves to impose increased trade barriers against Norwegian fish exports to the UK.

Where does all of this leave Norway, with respect to the management of North Sea fish stocks? All rests upon the UK-EU27 fisheries negotiations, although in principle one could also envisage a separate Norway-UK agreement. This may also depend somewhat on how negotiations are organised and their sequence. There will first be negotiations between the UK and the EU27 about trade. These will also include fish. An important issue is to what degree this will set the “stage” for UK-Norway negotiations that are likely to come later. Nevertheless, there have for several years been talks about future fisheries cooperation (NFD, 2020), and many of these issues will need to be addressed at the Norway-UK-EU27 fisheries consultations in December 2020 for the setting of TACs and other regulatory instruments for 2021.

Under scenario III), the UK manages its shares of the shared stocks and bars all foreign vessels from its EEZ. The consequences could, from a Norwegian perspective, be unfortunate. There would be an immediate loss, followed by a longer term, and more serious loss, unless an agreement on quotas and access is reached. With regard to the immediate loss, we have illustrated that extensive amounts of the Norwegian quotas not only of the six shared stocks, but also of several other stocks are taken in the current EU zone. All but trivial amounts taken in the current EU zone are taken in the UK zone.

With respect to the longer term loss, under scenario III), the UK ceases to play a cooperative fishery game, and reverts to a non-cooperative fishery game with both the EU27 and Norway. We had talked earlier about the possibility of partial cooperation in a three-player game, but it is difficult to see a sub-coalition between Norway and the EU amounting to much. The Grand Coalition would be everything. The Grand Coalition would disintegrate and non-cooperation would rule the day.

As now has been repeated over and over, non-cooperative fishery games can be, and almost invariably are, damaging. Think of the success of the cooperative management of North Sea herring. This could be reversed, with several stocks being threatened with mismanagement. Should this situation arise, one would nevertheless anticipate that, over time, the three parties would be able to agree on cooperation, as we have argued above.

Under scenario I), all would apparently be well for Norway – the status quo is maintained. However, as we have argued, this is not a feasible scenario for the future. Moreover, this would hold long term risks. One important player, the UK harvesting sector, would be

bitterly dissatisfied, convinced that its share of the benefits of cooperation is grossly “unfair”. This would hold with it the prospects of future instability.

Scenario II) would see UK harvest quotas increased at the expense of Norway and EU27. To what extent would these increases come at the expense of Norway? At this point, it is impossible to say. It must, however, also be kept in mind that the Norwegian harvesting sector believes Norway is entitled to larger quotas for a number of stocks in the North Sea.⁴⁸ These demands are justified because of changes in the distribution of certain stocks so that the zonal attachment to the Norwegian EEZ has increased over time at the expense of the British zone. Accordingly, it is likely that British demands for larger quotas at least to a degree may be met by Norwegian counterdemands.

Overall, we put forward the proposition that not only is scenario II) most likely, but this scenario might best serve Norway’s long term interests. It is most likely, because of the lopsided relationship between the UK and the EU27/Norway when it comes to fisheries, in terms of quotas and access. Moreover, the UK market is important for Norwegian fish products, while the reverse is not true. It is also difficult to see what Norway could offer, e.g. in terms of reduced tariffs on imports that would be sufficient for the UK to permit Norway to keep high quotas and full access to the UK EEZ. In principle, in negotiations with the EU over several decades, it has also been the policy of Norway and EFTA not to mix access to fish and trade, although this principle has not been fully adhered to, as explained in Part II.1. It may also be in the long term interest of Norway, as this scenario implies that the UK harvesting sector is likely to be satisfied, which would make it less likely that there would be reasons for renegotiating the agreement in the future. In other words, this would allow for time resiliency of the agreement, an issue we will return to in the conclusions.

In short, it is likely Norway may have to accept reduced quotas for some species as well as changes in access rights to the UK EEZ. A new agreement will obviously need to involve compromises for all parties. Moreover, changes may take place over a period of time.

⁴⁸ See e.g. *Fiskeribladet*, 20th May, 2017.

IV. SUMMARY AND CONCLUSIONS

Based on an agreement signed in 1980, Norway and the EU have jointly managed six shared stocks in the North Sea and in addition cooperated in several other areas. The two parties agree on annual TACs, based on advice from ICES, where quota sharing has remained unchanged over time. There are several reasons why this cooperation has been successful, including the fact that only two parties are involved with both benefitting from the cooperation. The agreement includes several stocks, which makes it more flexible, and this makes it easier to arrive at an agreement. Access to the other party's EEZ and quota exchanges are also important.

With Brexit, future cooperation between Norway, the UK and the EU27 – the Grand Coalition – must be in the form of a new agreement. The UK EEZ is very important for fishermen from Norway and the EU27, who would suffer if they were excluded from this zone.

In this study three future scenarios have been considered: I) status quo, II) agreement between all three parties, and III) no agreement. Negotiations between the UK and the EU27 about their future relationship have already commenced; as mentioned, talks between all three parties about a future fisheries agreement have been ongoing for several years. This includes fisheries, an area where it may be challenging to arrive at an agreement. There is a possibility that no agreement will be reached, at least in the first instance, an outcome that might have unfortunate consequences for sustainable harvesting of North Sea stocks if it persists. This would be undesirable, from the point of view of all three parties. Therefore, it may seem reasonable that the eventual outcome will be a variant of scenario II), which will give the UK somewhat larger quotas for some stocks and greater control over her EEZ. The service sector is of crucial importance to the UK economy and, among other things, to ensure access for this sector to the EU market, one might anticipate some flexibility in the fisheries sector.

The UK is the largest export market for Norway and an important market for fish. In negotiations between Norway and the UK it is difficult to see what Norway can offer to get greater flexibility when it comes to fish, even if Norway might have a basis for demanding larger quotas for some stocks. In sum, it appears that Norway might expect smaller quotas for some stocks.

In this report, we have focussed on the North Sea, even if what happens there also depends on what happens in other seas. This relates to the Norwegian Sea, where several important straddling stocks are harvested, and where institutional arrangements will change. In future research it would be interesting to analyse the consequences of Brexit for fisheries management in the Norwegian Sea.

As illustrated in the Appendix A (Table A7), giving an overview over Norwegian harvest in the UK zone, about 93% was harvested in Scottish waters in the 2011-16 period. If we consider catches by fishermen from other EU countries, more or less the same picture emerges. Moreover, the Scottish zone is dominant also for catches by British fishermen. Thus, in the fisheries sector, Scotland is by far the most important country in the Union. For this reason, it has also been suggested that Holyrood should have a special say on the future of fisheries.⁴⁹

In the 2014 Scottish Independence Referendum, 55.4% voted against independence while 44.7% voted for. Despite this result, independence for Scotland is still on the political agenda. The Scottish Nationalist Party (SNP) is dominant in the Scottish Legislature and took 48 out of 59 Scottish seats in Westminster in the December 2019 general election. Moreover, the SNP considers their performance in the 2019 election as a mandate for pursuing a second independence referendum.

We do not want to go into this matter in any detail but simply point out that there are numerous hurdles that may prevent Scotland from becoming independent. Moreover, should a second referendum be held and result in a yes vote, joining the EU would also present its challenges as Scotland could not simply “assume” the UK’s place in Brussels. One point worth noting is that also some other EU countries have independence movements and might be opposed to Scottish membership as this might spur on independence movements in their own countries.

Nevertheless, the information presented in this report clearly shows that an independent Scotland would be an important fishing state for Norway and the EU, which would open for new negotiations about the sharing of catch quotas, in particular if the Scottish harvesting sector is not satisfied with the agreement that is currently being negotiated. As mentioned, this was possibly the sector that most decisively voted for Leave in 2016.

⁴⁹ See “Holyrood deserves a say on the future of our fisheries” by Professor David Bell, *The Times*, 14th February, 2020.

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APPENDIX A. DATA**Box 1. Harvesting in 2016**

It is estimated that UK and EU fishing boats landed 1.4 million tonnes of fish and shellfish, with a total value of £1,502 million, caught within the UK EEZ in 2016. (This does not include landings from the UK EEZ by Norwegian, Faroese, or other non-EU boats.) Of that, 810,000 tonnes (58%), worth almost £690 million (46%), were landed by EU fishing boats. UK fishing boats thus accounted for less than half (42% by weight) of the fish and shellfish landed from the UK EEZ in 2016, although just over half by value (54%). It is estimated that UK fishing boats landed almost 700,000 tonnes of fish and shellfish, with a value of £966 million, from the North-East Atlantic in 2016. Of that, only 81,000 tonnes (12%), worth about £108 million (11%), was caught elsewhere in the EU EEZ. Most of the fish and shellfish landed by UK boats (84% by weight and value) was caught in the UK EEZ. It is estimated, therefore, that EU fishing boats landed 10 times more fish and shellfish (by weight) from the UK EEZ than UK boats did from other areas of the EU EEZ in 2016, or six times more by value. One quarter of all the fish and shellfish landed by EU fishing boats from the North-East Atlantic in 2016 (23% by weight, 25% by value) was caught in the UK EEZ.

There are two main findings from this analysis:

Firstly, it is estimated that EU fishing boats caught well over half of the fish and shellfish from the UK EEZ by EU and UK boats in 2016 (58% of the total by weight). That does not take account of landings from the UK EEZ by Norwegian, Faroese or other non-EU fishing boats (for which data are available), which would to reduce UK boats' share. Overall, it is estimated that almost one-quarter (23% by weight) of the fish and shellfish landed by EU fishing boats from the North-East Atlantic in 2016 was caught in the UK EEZ.

Secondly, in contrast, it is estimated that only a small proportion of the fish and shellfish landed by UK fishing boats in 2016 (12% by weight) was caught in other areas of the EU EEZ.

Source: Napier (2017b)

Table A1. Relative stability in the EU - North Sea and surrounding areas^{a)}

Species	Belgium	Denmark	Germany	France	Netherlands	Sweden	UK
Cod	3,6%	20,5%	13,0%	4,4%	11,6%	0,1%	46,9%
Haddock	0,7%	5,1%	3,2%	5,7%	0,6%	0,5%	84,2%
Saithe	0,1%	8,6%	21,8%	51,3%	0,2%	1,2%	16,7%
Whiting	2,1%	9,3%	2,4%	13,9%	5,4%	0,0%	66,9%
Plaice	6,2%	20,0%	5,8%	1,2%	38,5%	0,0%	28,5%
Herring	0,0%	29,5%	17,8%	7,9%	20,4%	1,7%	22,6%

a) The table also includes ICES areas 3a and 7d, cf. Figure 2.

Source: <https://eur-lex.europa.eu/legal-content/DA/TXT/PDF/?uri=CELEX:32020R0123&qid=-1396448139289&from=DA>

Note:

The following tables have been prepared by the Directorate of Fisheries, Norway. The sorting of catches is based on the 10 species that are most harvested by Norwegian vessels in the UK EEZ. This needs not correspond to the species that are most harvested in the EEZs of Norway or the EU27. There is no distinction between stocks so that “herring” might include both North Sea and Norwegian spring spawning herring.

Table A2. Norwegian Harvesting in the Norwegian EEZ South of 62°N

	2015	2016	2017	2018	2019
Blue whiting	31,037	26,284	24,207	21,360	21,277
Mackerel	18,187	44,420	7,874	6,814	7,411
Herring	79,145	92,199	87,467	109,113	73,651
Saithe	16,721	16,791	16,960	23,169	33,012
Norwegian Pout	28,558	21,046	13,815	12,841	44,935
Ling	1,165	1,366	1,761	2,071	2,224
Cod	2,720	2,851	2,851	3,192	2,587
Hake	1,714	2,929	1,685	2,067	2,057
Tusk	316	325	319	523	493
Greenland halibut	13	0	0	0	1
Others	126,484	72,024	150,506	100,004	158,001
Total	306,060	280,235	307,445	281,154	345,649

Source: Directorate of Fisheries, Norway

Table A3. Norwegian Harvests in the UK EEZ 2015-19. Tonnes

	2015	2016	2017	2018	2019
Blue whiting	115,161	90,838	140,267	201,253	98,131
Mackerel	19,437	12,328	46,921	157,585	128,201
Herring	58,718	59,541	47,450	55,878	54,620
Saithe	18,922	14,710	32,267	16,555	17,141
Sandeel	15,937	14,866	7,318	12,404	15,044
Ling	6,358	6,729	8,067	6,807	6,307
Cod	2,865	3,220	2,984	2,389	2,085
Hake	2,229	2,772	2,251	1,060	1,304
Tusk	2,200	1,792	1,712	1,681	1,804
Greenland halibut	2,060	1,991	1,648	1,368	1,132
Others	3,832	4,162	6,135	4,284	3,786
Total	247,720	212,949	297,019	461,264	329,554

Source: Directorate of Fisheries, Norway

Table A4. Norwegian Harvesting in the EU27 EEZ

	2015	2016	2017	2018	2019
Blue whiting	43,045	122,850	144,721	149,591	173,295
Mackerel	0	17	7	6	8
Herring	17	181	78	370	396
Saithe	15	7	4	9	2
Norwegian Pout		1			
Ling	14	84	102	63	1
Cod	17	118	144	212	57
Hake	1				
Tusk		1	1	2	
Greenland halibut					
Others	8,297	19,056	6,455	8,700	9,192
Total	51,406	142,315	151,512	158,953	182,951

Source: Directorate of Fisheries, Norway

Table A5. Harvest by UK Vessels in Norwegian EEZ UK south of 62°N (ex. Skagerak). Tonnes

	2015	2016	2017	2018	2019
Blue whiting					
Mackerel	4,052	422	1	4	10
Herring	460	2,456	1,058		0
Saithe	1,764	1,406	1,232	1,568	1,434
Norwegian Pout					
Ling	113	114	110	144	96
Cod	2,862	2,617	2,695	1,736	1,248
Hake	2,063	2,009	2,143	2,118	1,267
Tusk	1	1	1	2	1
Greenland halibut		0	0	0	
Haddock	5,895	5,762	5,021	3,345	2,657
Whiting	761	704	686	404	513
Plaice	819	946	981	236	482
Others	631	600	541	489	638
Total	19,421	17,037	14,469	10,046	8,346

Source: Directorate of Fisheries, Norway

Table A6. Harvest by EU27 Vessels in Norwegian EEZ UK south of 62°N (ex. Skagerak). Tonnes

	2015	2016	2017	2018	2019
Blue whiting		3	1		0
Mackerel	1,515	3,376	30	377	292
Herring	18,272	20,208	5,186	1,885	873
Saithe	12,050	7,826	10,936	11,889	10,831
Norwegian Pout	4	27	15	0	10
Ling	418	586	829	907	768
Cod	5,798	5,122	5,484	7,071	3,695
Hake	2,726	2,242	2,554	4,186	2,124
Tusk	24	30	35	37	44
Greenland halibut	0	0	0	2	2
Haddock	1,853	1,409	1,526	1,324	1,181
Whiting	92	109	110	112	111
Plaice	7,983	9,117	9,972	7,962	6,448
Others	4,161	4,609	4,887	4,863	4,877
Total	54,896	54,664	41,565	40,615	31,256

Source: Directorate of Fisheries, Norway

Table A7. Norwegian Harvests in England, Scotland and UK EEZ by Species – Sum 2011-16. Tonnes

Species	England	Scotland	UK total
Cod		12 483	12 483
Haddock	2	4 367	4 369
Saithe		96 103	96 103
Whiting	1	2 893	2 894
Plaice	344	67	411
Herring	32 215	305 088	337 303
Sum	32 562	420 948	453 510

Source: Directorate of Fisheries, Norway.

Table A8. Estimated Faroese and Norwegian Catches in the UK EEZ in 2014. Tonnes

	Faroe tonnes	Norway total EU EEZ tonnes	Norway UK EEZ (75% of total) tonnes
Pelagic species	66,627	342,078	256,559
-Blue whiting	18,363	212,604	159,453
-Mackerel	48,264	75,924	56,943
-Herring		50,000	37,500
-Horse mackerel		3,550	2,663
Demersal species	669	82,146	61,610
-Cod		4,726	3,545
-Haddock		6,205	4,654
-Saithe		41,119	30,464
-Whiting		859	644
-Plaice		7,514	5,636
-Blue ling	150	150	113
-Ling	200	5,500	4,125
-Tusk	9	2,923	2,192
-Deepwater species		140	105
-Other species	200	4,000	3,000
-Sole		10	8
-Greenland halibut	110	9,000	6,750
Industrial species	7,000	24,000	18,000
-Norway pout	7,000	15,000	11,250
-Sprat		9,000	6,750
TOTAL all species	74,296	448,224	336,168

Source: Napier (2017a)

Note: For Norway, allocated quotas for the EU EEZ are given, assuming 75% is harvested in the UK EEZ. For mackerel actual landings are reported.

Table A9. 2020 Joint Stock Quotas (not jointly managed)^{a)}

	Quota to Norway in the EU zone	Quota to EU in the Norwegian zone
Norway pout	14,500	-
Blue ling	250	-
Ling	8,000	-
Tusk	2,923	-
Combined quota ^{b)}	280	
Shrimps	-	200
Horse mackerel	2,550	-
Others ^{c)}	6,750	11,000
Sole	10	
Anglerfish		1,700
Norway lobster	-	600
Ling	-	1,350
Tusk	-	170
Saithe	940	-
Blue whiting	99,900	

a) Ling and tusk both appear twice in the table; this refers to different fishing areas.

b) Fishing with long lines for grenadiers, rat tails, mora mora and greater forkbeard.

c) Including fisheries not specifically mentioned; exceptions may be introduced after consultations as appropriate.

Source: Agreed Record (2020)

Table A.10. Aggregate harvests in the North Sea 2015-17. Species and species groups.
Tonnes. ^{a)}

Species and species group	2015	2016	2017
Cod	32,011	34,260	34,599
Haddock	30,276	30,162	30,051
North Sea herring	451,619	516,255	459,258
Saithe	68,112	60,864	81,215
Whiting	15,333	17,354	14,967
Plaice	74,003	78,883	66,857
Sum shared stocks	671,354	737,777	686,947
Anglerfish (monkfish)	8,812	10,023	11,086
Hake	14,615	19,719	19,654
Horse mackerel	9,882	10,969	11,923
Norway pout	61,172	61,780	33,660
Sandeel	308,573	72,895	488,422
Sum joint stocks not jointly managed	403,054	175,387	564,745
Mackerel	298,692	249,184	271,228
Blue whiting	39,019	48,529	38,529
Sum straddling stocks	337,711	297,713	309,757
Others	498,952	450,984	328,121
Grand total	1,911,071	1,661,861	1,889,570

a) ICES area IV.

Source: Directorate of Fisheries.

APPENDIX B. NORWAY-UK ISSUES

The UK is Norway's largest single export market. In 2018, UK imports of goods and services amounted to GBP 21.98 billion of which crude oil represented GBP 9.1 billion and gas GBP 8 billion⁵⁰. Norwegian oil and gas have very large shares of the UK market.

After the UK left the EU on January 31st, 2020, there will be an 11 month transitional period, essentially with trade on EU membership terms, and in which a permanent agreement with the EU is to be negotiated. The EU has exclusive competence in commercial policy, including trade agreements with other countries or trading blocks (Fossum & Graver, 2017). For this reason, the UK was unable to negotiate trade agreements with third countries prior to Brexit.

Norway, like numerous other countries, has a transitional “back-up” agreement with the UK that was invoked on the day the UK left the EU at which point negotiations for a free trade agreement could commence⁵¹. In the meantime, trade will be based on the transition agreement, which essentially is the EFTA-EU Agreement that will be in place until the UK and Norway/EFTA negotiate a permanent free trade agreement⁵². In this period, exports to the UK will essentially be on the same terms as exports to the EU; “it is the United Kingdom’s intention to treat imports from Norway and Iceland no less favourably than imports from the European Union...” (Anon., 2019). In other words, in the short run there will be no changes when it comes to terms for Norwegian exports to the UK.

Thus, for the time being trade will be business as usual. However, there is still great uncertainty as to the permanent agreement to be negotiated by the UK and the EU, and when this will be implemented. This may have consequences also for Norway-UK relations, but at present it is very difficult to speculate on possible outcomes. Moreover, the UK will need to negotiate trade agreements with numerous trading partners and Norway is not likely to be on top of this list.

Fish exports

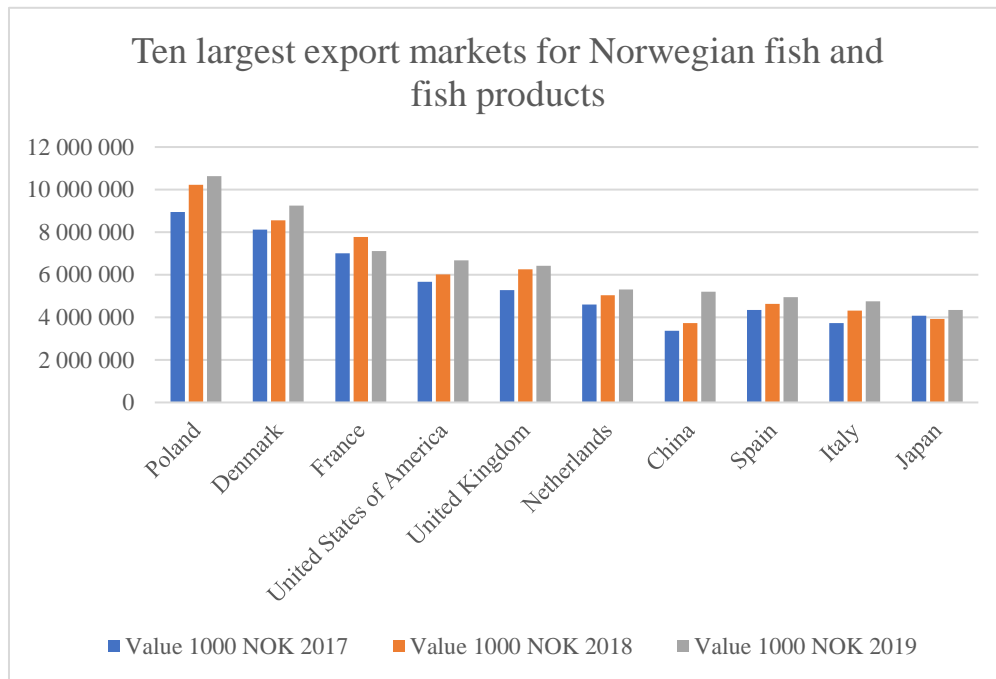
In 2019, the UK was the 5th largest export market for Norwegian seafood after Poland, Denmark, France and the United States (4th largest in 2018, see Figure B.1) with exports of almost NOK 6.42 billion in 2019. Moreover, exports have been increasing in recent years. Exports to some countries are largely for further processing (e.g. Poland and Denmark), which

⁵⁰ Source: Office for National Statistics – UK trade: February 2020.

⁵¹ The agreement is between Iceland, the Kingdom of Norway and the United Kingdom (Anon., 2019).

⁵² Export duties will remain unchanged; as for duty free quotas for some products, there may be some adjustments.

is then partly re-exported, while some export is to “HUB” countries (e.g. the Netherlands and Sweden), which is partly transhipped to other countries.



Source: Norwegian Seafood Council

Figure B.1. Ten largest export markets for fish 2017-19

Exports of main fish products for 2015-19 are given in Table B.1. Salmon is by far the most important product with exports of NOK 3.98 billion in 2019, or 62% of total exports, of which 91% was fresh/chilled whole. In other words, the degree of processing is very small. Other important products are haddock and cod, followed by mackerel and shrimps. The UK is Norway’s largest export market for cod and haddock, and the fifth largest for salmon.

Table B.1. Fish Exports to the UK 2015-19. '000 NOK

	2015	2016	2017	2018	2019
Salmon	3 445 036	3 821 307	3 546 238	4 302 727	3,977,901
Fresh/chilled fillet	242 113	169 481	118 182	225 176	278,242
Fresh/chilled whole	3 114 350	3 573 106	3 392 399	4 024 436	3,621,916
Frozen fillet	80 569	69 515	32 831	52 825	71,331
Haddock	447 465	492 587	519 444	585 613	578,162
Fresh/chilled whole	127 533	92 061	108 557	83 816	69,481
Frozen fillet	109 050	104 166	110 940	104 600	113,002
Frozen whole	202 822	285 812	296 565	396 997	394,265
Cod	645 301	661 244	546 085	526 399	698,289
Fresh/chilled fillet	7 840	19 732	2 566	3 031	7,887
Fresh/chilled whole	101 599	82 873	68 815	44 333	41,713
Frozen fillet	241 724	194 490	215 117	247 337	239,390
Frozen whole	277 627	348 988	243 539	217 741	388,991
Mackerel	10 504	5 405	51 756	126 956	106,622
Fresh/chilled whole	1 048	306	42 954	123 282	104,294
Shrimps	52 883	93 707	103 089	123 770	212,480
Peeled shrimps	50 179	92 253	102 408	123 395	212,059
Grand Total	5 077 726	5 656 206	5 272 695	6 252 362	6,420,213

Source: Norwegian Seafood Council

According to a study of trade flows in 2018, direct exports of cod from Norway to the UK amounted to 24,600 tonnes with exports via HUB 34,800 tonnes; for salmon, 77,600 tonnes were exported directly and 9,100 tonnes via HUB, while for haddock, 30,700 tonnes were exported directly and 15,600 tonnes via HUB⁵³. Even when allowing for re-exports, these figures clearly show that Norway has larger market shares in the UK than what would be indicated by figures on direct exports as presented in Table B.1 and Figure B.1.

As Norway is member of EFTA, there is free trade in fish with the other EFTA countries Iceland, Lichtenstein and Switzerland. When it comes to exports to the EU, conditions have changed over time, e.g. as former EFTA countries and Spain and Portugal have joined the Union. Melchior (2020a) gives an overview over the trade relationship with the EU, historical as well as current. It must also be pointed out that Norway is part of the EU's veterinary regime (Fossum & Graver, 2017; Elvestad & Veggeland, 2020), and as a consequence, there is

⁵³ Source: Norwegian Seafood Council – Kontali AS.

simplified border crossing control for food exports from Norway to the EU (Mathisen & Solvoll, 2020).

Since 1973, Norway has attempted to achieve free market access to the EU for fish and fish products, but without having succeeded in full. While many seafood products face duties when exported to the EU, there are duty free quotas for many of them so that on the whole, about 2/3 of the products are duty-free (Melchior, 2020a).

As noted above, the EU import duty regime will also apply to exports to the UK until a new free trade agreement is negotiated between the UK and Norway/EFTA. In addition to duties, an important issue will also be whether the UK will remain part of the EU's veterinary and sanitary regime, which is essential for trade in seafood.

Export duties for selected seafood products are given in Table B.2⁵⁴. Most favoured nation (MFN) rates, which are according to the WTO Agreement, are given as well as Norwegian preferential rates due to trade agreements with the EU; while Norway has preferential rates for some products, this is not the case for all.

⁵⁴ For full overview over export duties, duty free quotas and more as of 2018, see <https://seafood.no/markedsadgang/Toll-opprinnelse-og-frihandelsavtaler/toll/tolltariff-til-eu-2018/>

Table B.2. Export duties for important seafood export to the EU and the UK – percentage

Product	Norwegian preferential rate^{a)}	MFN rate
Salmon – fresh or chilled	X	2.0
Salmon fillets – fresh or chilled, also frozen fillet	X	2.0
Salmon – salted	X	15.0
Salmon – smoked	X	13.0
Haddock – fresh or chilled; also frozen	0	7.5
Haddock – frozen fillet	0.9	7.5
Cod - fresh, including fillets	0	12.0
Cod – frozen, including fillets	0.9	7.5
Shrimps – boiled and peeled, for processing	X	20.0

a) An X indicates that the Norwegian rate is equal to the most favoured nation (MFN) rate.

One defining feature of the Common Fisheries Policy is higher duties on processed products so as to protect the EU processing industry (Bjørndal *et al.*, 2016). This is reflected in the duties on e.g. salted salmon, smoked salmon and boiled and peeled shrimps. Some observers have expressed a hope that the new free trade deal with the UK will allow duty free access also for processed products, which might be beneficial to the Norwegian fish processing industry (Fossum & Graver, 2017). While this may be hoped for, labour costs are higher in Norway than in virtually any other European country, which of course is a very substantial competitive disadvantage for Norwegian producers.