NEW ECONOMICS FOUNDATION

FISH DEPENDENCE 2018 UPDATE

THE RELIANCE OF THE EU ON FISH FROM ELSEWHERE

CONTENTS

EXECUTIVE SUMMARY **2**

1. INTRODUCTION **5**

2. BACKGROUND **7**
2.1 CHANGES IN FISH STOCKS 7
2.2 HIGH LEVELS OF CONSUMPTION 8
2.3 SOURCING FROM ABROAD 9
2.4 AQUACULTURE PRODUCTION **9**

3. METHODOLOGY **13**
3.1 CAVEATS WITH DATA AND METHODOLOGY 16

4. RESULTS **19**

5. DISCUSSION AND IMPLICATIONS **25**
5.1 INTERPRETATION OF RESULTS 25
5.2 IMPLICATIONS OF THE EU'S FISH DEPENDENCE 27
5.3 THE WAY FORWARD AND OPPORTUNITIES FOR CHANGE 28

6. CONCLUSIONS **30**

APPENDIX 32

ENDNOTES 35

EXECUTIVE SUMMARY

Despite recent progress to rebuild fish stocks in European waters, approximately 40% of European Union (EU) stocks remain overfished. This overexploitation means that fish stocks are less productive than if they were allowed to grow in size and harvested at their maximum sustainable yield (MSY). The result is that while the EU produces 11kg of fish per capita annually (2016), this domestic supply falls short of the 23kg of fish consumption per capita in the EU. The EU has been able to maintain this high level of consumption by sourcing seafood from other regions of the world through imports and the catches of its distant-water fleet. This report, the ninth edition of an annual series, highlights Europe's reliance on fish products originating from external waters for its consumption and provides recommendations for a sustainable seafood system.

In this report,we estimate the degree of self-sufficiency in fish consumption achieved by the EU as a whole and for each of its member states. Self-sufficiency is defined as the capacity of EU member states to meet demand for seafood from their own waters. We express the degree of self-sufficiency in the form of a 'fish dependence day'. Based on a member state or region's total annual fish consumption, the fish dependence day is the date on the calendar when it will begin relying on fish from elsewhere because its domestic supplies have been depleted.

The EU's fish dependence day is now 9 July, indicating that the EU relies on non-EU waters for almost half of the fish it consumes. Last year, the fish dependence day was 22 July and the year before it was 7 July. The EU has therefore maintained a high degree of reliance on fish from non-

EU waters, with its fish dependence day consistently falling in July. The EU's fish dependence day is roughly three and a half weeks earlier than in 2000 and has only moved later in the calendar by seven days since 2007. The fact that the level of dependence on non-EU seafood is not increasing while many European fish stocks are recovering is a hopeful sign that the EU seafood system is becoming more sustainable. All else being equal, this should manifest itself as improving self-sufficiency over time. Currently however, the level of EU self-sufficiency is still too low and the level of fishing pressure in EU waters is still too high.

It is no surprise that member states with little or no access to EU waters, such as Austria, Slovakia, and Slovenia,become fish dependent early in the year. More surprising, however, is that many member states with significant coastlines are also fish dependent early in the year. These include Portugal, Italy, Germany, France, and Spain – the latter a country that sources more than half of its seafood from non-EU waters.

Our calculations of domestic production include aquaculture (fish farming) in EU countries, a growing global enterprise that has served to offset the overexploitation of EU fish stocks but has not itself reduced the overall level of fish dependence recorded. If we discount domestic aquaculture, the EU's fish dependence day moves earlier in the calendar to 25 May. For large aquaculture producers such as the UK, Spain, and Greece, their respective national fish dependence days occur months earlier. Restoring EU fish stocks to MSY levels is another factor that would see significant gains in the seafood self-sufficiency of many EU member states.

Restoring fish stocks in the northeast Atlantic to their MSY would increase the EU's self-sufficiency levels by nearly three months (85 days), moving its fish dependence day to from 9 July to 2 October. If directed only to human food consumption, this could provide for the annual consumption of 57 million EU citizens. A lack of data in the Mediterranean and the Black Sea means that MSY estimates are not available, but these fish stocks are overexploited to a greater degree, and thus the benefits of recovery are potentially even greater.

Our bio-economic modelling has revealed the economic benefits in terms of revenues, profits, jobs, wages – and of course food itself – that can come from restoring fish stocks to MSY levels. How these different economic benefits are prioritised depends on industry structure and national policy, for example how quota is allocated to the fleet.

The EU Common Fisheries Policy (CFP) was reformed in 2013. This represents a significant step in the right direction as it lays the legal foundations to bring about the sustainable management of all fish stocks in Europe by 2020.The reformed CFP also includes a discard ban and requires member states to be transparent and take social and environmental criteria into account when allocating fishing opportunities. The CFP is supported by the European Maritime and Fisheries Fund (EMFF), which contains some positive measures, such as more funding to enhance data collection and to improve control and enforcement.

It is now up to EU member states to choose how ambitious they want to be in implementing the reformed CFP and how quickly they can deliver on the commitments of the CFP to bring fish stocks to their MSY by 2020. Healthy fish stocks mean more food, jobs, and profits, so the sooner we get there, the better for everyone. EU member states need to look beyond the short-term costs of fish stock restoration and turn the potential long-term benefits that healthy marine resources can provide into a reality.

The UK's proposed exit from the EU adds a new dimension to EU fish dependency. Trading patterns are likely to change if the UK leaves the single market and seeks to form new trade relations outside of the EU. UK fisher organisations and campaigners for leaving the EU are also hoping that Brexit will give UK fishers exclusive national access to fish stocks that have historically been shared between EU countries – potentially allowing the UK to expand production at the cost of other member states. At this point, however, it appears that current arrangements will be maintained until at least the end of 2020. Whatever the outcome of Brexit, it is clear that sustainability is key. A situation where each side exploits a shared fish stock to the level it feels is 'fair' will result in a worse outcome for all – the tragedy of the commons.

In the context of finite resources and growing populations, the EU model of fish dependence has proven unsustainable. The EU's high level of fish dependence has implications for the sustainability of fish stocks globally, also at risk of overexploitation, and for the communities that depend on them. Action on the part of governments, the fishing industry, and campaigners to improve the sustainability of EU waters is beginning to yield results, but this is only a partial victory. Rebuilding European fish stocks to their full potential – currently off track for the 2020 deadline in the CFP – will help, but we must also work to improve the environmental aspects of EU consumption and trade, and their impact on global fish stocks to create a truly sustainable seafood system.

To restore fish stocks to MSY and reduce levels of fish dependence, EU member states must develop long-term, ambitious fisheries management. Positive environmental outcomes can be encouraged by setting fishing opportunities in accordance with scientific advice and allocating these opportunities to segments of the fishing fleet with the lowest environmental impact. States must also promote ecologically responsible consumption levels and use public funds to support both fish stock restoration and fishing communities.

1. INTRODUCTION

Fisheries play a pivotal role in human health and wellbeing: fish are crucial to the global food supply, providing about one-fifth of animal protein consumption worldwide.[1] Indeed, fisheries are likely to become even more important as populations continue to increase and the pressures on scarce land for agriculture continue to grow, pushing more people towards fisheries as a 'last-resort' activity. But there is only so much fishing that our oceans can sustain. For fisheries policies to be sustainable, they need to acknowledge and respect the ecological limits of the marine ecosystems on which they depend. Ultimately, what drives fisheries is fish consumption and that consumption needs to be commensurate with the biocapacity of the oceans.

EU waters are potentially rich and productive seas capable of delivering a long-term and stable supply of fish, together with jobs and other benefits for coastal communities. But years of overcapacity, poor compliance, and failing fisheries management have contributed to the reduced seafood supply from EU waters. The EU currently consumes much more than its waters produce and depends on fish from other countries to satisfy its demand.

In a context of finite resources and a growing population, this EU model has proven to be neither sustainable nor replicable on a global scale. Unsustainable levels of fish consumption are putting pressure on the waters around the EU and abroad. Having overfished its own stocks, the EU is now highly dependent on non-EU fish to meet demand (i.e., its fish dependence). This results in higher fishing intensity in other parts of the world where fisheries may be more poorly regulated. This 'exporting' of overfishing can also undermine the potential of poorer regions to meet their domestic demand.

The main goal of this report is to illustrate the extent to which the EU – despite its potentially abundant and productive seas – has become increasingly dependent on fish from elsewhere. We highlight the implications of this trend for the EU and its member states and make the case for the EU to increase its self-sufficiency (i.e., when domestic supply matches domestic demand). This decrease in fish dependence can be achieved through the restoration of the EU's fish stocks and more responsible consumption. While fish dependence is not in itself a measure of sustainable fishing, the reduction of fish dependence over the long term is likely to indicate a move towards more sustainable fisheries management.

In the following section we contextualise fish dependency by summarising the latest trends with respect to the state of fish stocks, levels of fish consumption, and EU strategies to source fish from abroad. We look at how self-sufficiency would be affected if fish stocks were restored (to MSY). We also assess the contribution that aquaculture makes to national self-sufficiency.

Later in the report, we describe our methodology for estimating the degree of fish self-sufficiency in EU member states and share the results of our calculations. We then discuss the implications of our findings and end with a series of conclusions and recommendations.

2. BACKGROUND

2.1 CHANGES IN FISH STOCKS

From 1993 to 2013, EU catches steadily declined at an average rate of 2% annually, coinciding with the decrease in abundance for almost all demersal stocks. However, significant progress has been made in recent years in the northeast Atlantic. While over 90% of fish stocks in the Mediterranean are subject to overfishing,[2] 41% are in the northeast Atlantic – down from 73% a decade ago.[3]

Notwithstanding this aggregate progress, this trend is representative only of assessed stocks (which is only about 60% of total actual stocks[4]). In the Mediterranean, for example, very few fish stocks are assessed. Many EU fish stocks are still unhealthy, producing far less than they could if they were managed in a sustainable way. On a global level, the United Nations Food and Agriculture Organization (FAO) reports that 31% of stocks are overexploited or depleted, with another 58% fully exploited.[5] Only 11% of stocks monitored by the FAO are considered able to produce more than the current level of catches.

Overexploitation of natural resources generally implies lost 'rents', i.e., the economic benefits that could be derived from fisheries compared to current gains.[6] The World Bank has estimated the annual cost of global overfishing at US$50 billion, totalling US$2 trillion over the past three decades.[7] The costs of overfishing in the northeast Atlantic have been estimated at 1,150,069 tonnes of additional fish per year, enough to meet the annual demand of 57 million EU citizens – therefore reducing the need to source fish from other countries.

2.2 HIGH LEVELS OF CONSUMPTION

Although the number of fish stocks which are fished at MSY in the EU has been increasing (from 22 in 2003, to 25 in 2009, and up to 31 in 2014),[8] fish consumption remains at levels beyond that which EU waters are able to support. In 2016, the total catch in EU waters amounted to over 4 million tonnes,[9] which is about 40% of the EU's total fish consumption (approximately 10 million tonnes).[10] On average, each European citizen consumes 22.7 kg of seafood products per year (as of 2014),[11] which is 16% above the annual global average of 19 kg per capita. Portugal (55.3 kg per capita), Spain (46.2 kg per capita), Lithuania (44.7 kg per capita), France (34.4 kg per capita), and Sweden (33.2 kg per capita) have the highest per capita consumption rates in the EU (see Table 1).[12] Together, these five countries alone account for about half of EU fish consumption.[13] The FAO predicts that per capita fish consumption for EU15 countries will continue to increase by 17% from 1989 to 2030, while for EU28 + Norway, the FAO predicts it will rise by 9% over the same period.[14]

Portugal has maintained its position as the biggest per capita fish consumer in the EU, steadily increasing its consumption from 29 kg per capita in 1980 to 60 kg per capita in 2009, before declining slightly.[15] Most other countries have increased their per capita consumption levels as well. For example, France, Germany, Spain, Finland, Italy, and the Netherlands, among others, increased their consumption by between 50% and 120% between 1961 and 2011. Others increased their consumption even faster, for example Ireland (201%), Malta (218%), and Cyprus (348%). Not all of these increases are direct human consumption, but the fish may be used in aquaculture (where inputs tend to outweigh fish production outputs, particularly for carnivorous species).

TABLE 1: FISH CONSUMPTION PER CAPITA FOR EU28 MEMBER STATES, 2014

Country	(kg/capita/year)
Portugal	55.3
Spain	46.2
Lithuania	44.7
France	34.4
Sweden	33.2
Luxembourg	33.1
Malta	32.0
Italy	28.9
Latvia	25.5
Cyprus	25.0
Belgium	24.9
United Kingdom	24.9
Finland	23.9
Ireland	23.0
European Union (average)	22.7
Netherlands	22.6
Denmark	22.1
Croatia	18.4
Estonia	18.1
Greece	17.3
Austria	13.4
Germany	13.3
Poland	13.0
Slovenia	10.8
Slovakia	7.8
Czech Republic	7.5
Romania	6.3
Bulgaria	6.0
Hungary	3.6

Source: European Market Observatory for Fisheries and Aquaculture Products (January 2017).

At the global level, fish consumption has grown at a rate of 3.6% per year since 1961, rising from 9 kg per capita per year half a century ago to a record high of 20 kg in 2015.[16] Projections suggest a global population growth of 2.4 billion, to over 9.7 billion, by 2050. Food demand is expected to rise faster than population growth, as a larger proportion of the middle-class (with greater spending power) increase their animal protein consumption.[17] It can be expected that pressures on fish stocks are likely to increase as the global population continues to grow.[18]

Governments and industry also have a role to play in promoting responsible consumption. For example, the current official recommendation by NHS Choices is to consume two servings (280g) of fish per capita per week.[19]

2.3 SOURCING FROM ABROAD

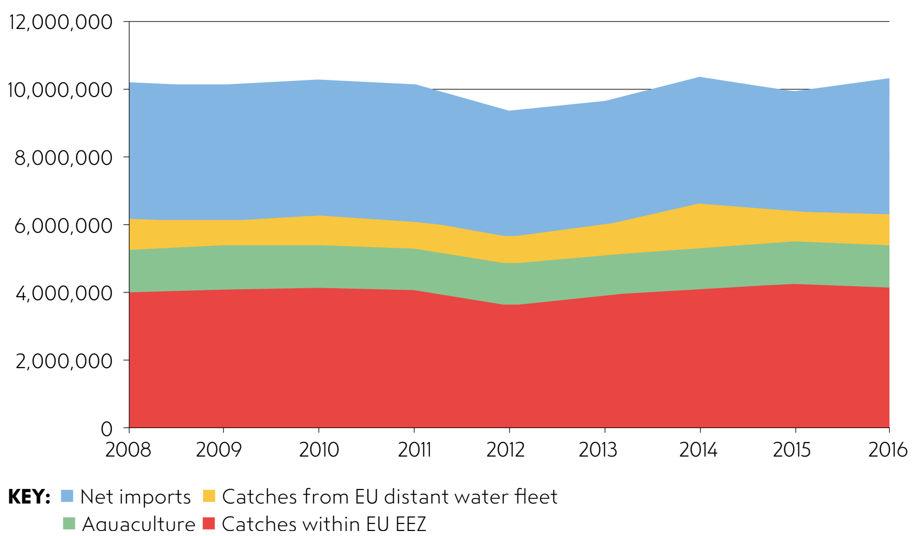
Over the years, to make up for the shortfall in production, the EU has increased its fish consumption by sourcing more fish from abroad. Fish is also caught by the EU's distant-water fleet, which operates in other (third) countries and international waters. The distant-water fleet is relatively small compared to the EU's total number of vessels. In 2015, the EU had a total of 85,154 vessels[20] with around 700 of these fishing in non-EU waters,[21] yet this small number makes up almost one-quarter of the EU fishing capacity in tonnage. Spain accounted for over one-half of these vessels; most of the others are from France, Portugal, Italy, Latvia, Lithuania, and the Netherlands, which owns some of the largest freezer-trawlers.[23, 24] Current European Commission estimates put the total catch by the EU distant-water fleet at around 28% of total EU catches.[25] These vessels predominantly operate in third countries' exclusive economic zones (EEZs) under fisheries partnership agreements, and in international waters, yet their catch is classed as EU produce.

The EU is the world's largest market for fish and has become increasingly reliant on imports to meet its needs.[26] Between 2000 and 2016, it has, on average, imported 3.8 million tonnes more fisheries products than it has exported (Appendix: Table A3).[27] These imports help meet its demand for human consumption and processing, as well as animal feed and aquaculture. Data from the EU indicates that imports in tonnes accounted for between 55% in 2006 and 39% in 2016[28] of the EU's apparent consumption.[29] The trends in catches and imports are illustrated in Figure 1.

2.4 AQUACULTURE PRODUCTION

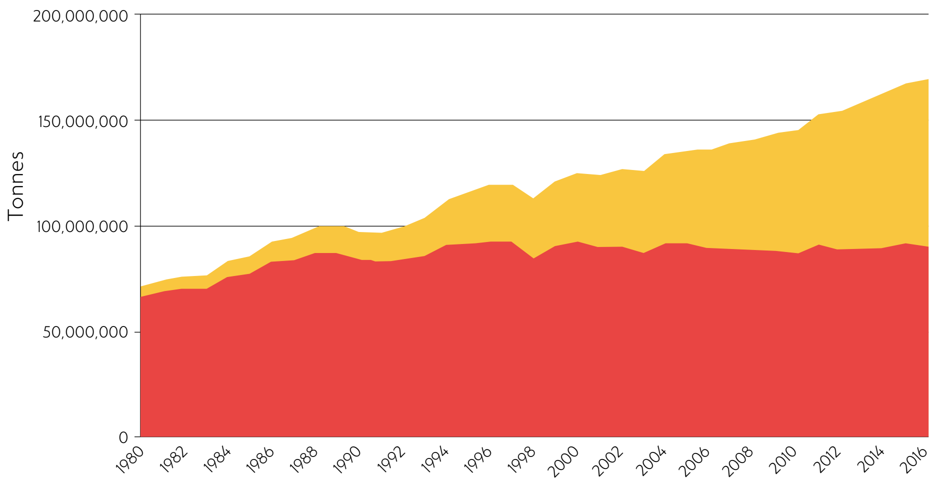
Aquaculture is often presented as a solution to overfishing – a means of increasing production in a way that is decoupled from wild stocks.

FIGURE 1: COMPOSITION OF EU28 FISH CONSUMPTION, 2000–2016



Source: Eurostat database[22], and European Market Observatory for Fisheries and Aquaculture Products database.

FIGURE 2: GLOBAL CATCHES AND AQUACULTURE, 1980–2016



KEY: Global aquaculture production ■ Global capture production

Source: FAO Fishery Statistical Collections[30]

As global fish stocks have declined, aquaculture production has risen; it is now the world's fastest growing animal food sector.[31] In 2016, global total catch was 90 million tonnes; aquaculture production (not including plants and miscellaneous aquatic animals) totalled 79 million tonnes, with a value of US$ 225 billion. Aquaculture's global contribution to human consumption of fish products was 52%[32] in 2016 compared with only 9% in 1980.[33] Average annual per capita consumption of aquaculture products has increased more than tenfold since 1970 – to 10.42kg in 2015, a 2.8% increase from 2014.[34] In 2013, for the first time in human history, aquaculture accounted for more global fish consumption than capture fisheries. Figure 2 illustrates the growth of the aquaculture sector globally and highlights the trend of the industry in becoming the most important global source of fish and seafood.[35]

In the EU, aquaculture production increased up to 1997 as wild catches declined; since then, however, domestic aquaculture production has remained stable at around 1.16–1.43 million tonnes.[36] Domestic EU aquaculture supplies less than 13% of fish consumed in the EU.[37]

Almost 90% of EU28 production takes place in EU15 countries, with five nations (Spain, France, the UK, Italy, and Greece) supplying 77% of production.[38] Table 2 shows the EU's aquaculture production in 2016.

TABLE 2: EU DOMESTIC AQUACULTURE PRODUCTION (2016) IN QUANTITY AND AS EU SHARE

	2016 aquaculture production	
	Total production (tonnes)	**% of EU28 production**
EU28	1,279,179.04	100.00%
Spain	293,509.95	22.95%
United Kingdom	194,275.32	15.19%
France	163,303.60	12.77%
Italy	148,138.80	11.58%
Greece	123,323.50	9.64%
Netherlands	61,763.44	4.83%

Source: Eurostat Statistics Database[39]

The aquaculture industry and some policymakers hope that increases in aquaculture production will compensate for the decline in wild fish catches.[40] But, while there is likely to be an increasingly important role for aquaculture, there are a few reasons why its potential is limited. First and foremost, among these is that some forms of aquaculture perform a dual role of producers and consumers of fish, putting extra pressure on already overfished stocks; they are dependent on fresh fish or fish meal and oil produced by wild fish catches to feed many of their farmed species, most notably carnivorous fish such as salmon or sea bass.

In 2014, about 9% (16 million tonnes) of global fish production was used to make fish meal and fish oil, primarily for aquaculture.[41] Although fish meal and fish oil global production from marine capture fisheries decreased between 1980 and 2015, the share of this market going to the aquaculture sector has increased considerably from 10% in 1980 to 76% in 2015.[42]

More than 46% of the global aquaculture production in 2008 depended on the supply of external feed inputs.[43] The percentage of species non-reliant on external feed has declined gradually from more than 50% in 1980 to 30.8% in 2014,[44] reflecting increasing consumer demand for species of fish that are higher up the food chain, such as salmon and tuna.[45]

Asia accounted for 88% of global aquaculture production by volume in 2013.[46] But, as the world's largest market for fish, the EU is an important player in ensuring the sustainable management of the aquaculture industry. FAO statistics on the international trade in fish products do not distinguish between fisheries and aquaculture; therefore, it is difficult to determine aquaculture's share of global trade. However, estimates for China suggest that the average annual growth rate in fishery and aquaculture exports was around 12.2% between 2004 and 2014.[47] Therefore, while the EU's domestic aquaculture sector may not be growing significantly, domestic consumption is clearly dependent on high levels of aquaculture from other nations.

Furthermore, in the EU aquaculture sector, species dependent on external feed input still make up 43% of the production volume and 62% of its value. The Rainbow trout (21%), the Atlantic salmon (16%), and the Gilthead seabream (12%) alone make up nearly half of EU's aquaculture production by value.[48]

With current practices, production of such species puts great pressure on wild fish stocks. Indeed, the Department of Environment, Food and Rural Affairs (Defra), the UK government's agricultural and environmental ministry, has stated that an increased reliance on these groups of species is unviable and instead points to species that are lower in the food chain, such as molluscs.[49]

If consumption behaviour determines the direction of aquaculture, with a preference for carnivorous and resource-intensive fish, then aquaculture will drive the depletion of fish stocks even further. Consequently, the only viable means of offsetting depleted fish stocks and maintaining the same quantity of supply is to increase the production of seafood, such as molluscs and crustaceans, effectively replacing wild fish with farmed molluscs. EU aquaculture appears to be following this scenario. With EU waters providing fewer fish, half of the EU's aquaculture production is now of shellfish (molluscs and crustaceans).[50]

At the same time, up to 75% of the fish meal in the feed for predator species could easily be replaced.[51] Over the last 30 years, there have been successes in the substitution of the proteins in fish meal with vegetable proteins or with proteins from micro-organisms.[52] Fish waste from the processing industry is also increasingly being used in the production of feed, making up between 25 and 35% of the world's production of fishmeal in 2014,[53] yet bycatch is the primary source of fresh aquaculture feed in Asia.[54] However, these alternative sources for fish meal and oil still raise a number of concerns, including the effects of a vegetarian diet on fish health[55] and the use of bycatch potentially leading to a softening of regulations on reducing bycatch.[56] The use of discards and bycatch for aquaculture feeds and the development of markets around them could create a barrier to preventing unwanted catches in the first place.

Another reason why fish aquaculture's potential may be limited is its links to a wide range of environmental impacts.[57, 58] These include the introduction of alien species,[59] environmental impacts from genetically modified and escaped fish,[60,61,62] habitat modification and pollution,[63] antibiotic use and other problems with intensive farming practices,[64] and an unsustainable use of resources.[65,66,67,68]

Finally, the EU's aquaculture prioritisation for more resource-efficient groups, such as molluscs, will do little to satisfy the diversity of fish products often demanded by consumers.

In conclusion, aquaculture, if undertaken responsibly, can add to the global supply of fish and can therefore reduce pressure on wild fish stocks. However, the industry is still significantly adding to consumption levels, as is the case with carnivorous species. Without an improvement in the abundance of wild fish stocks, aquaculture's potential for growth is predominantly in resource-efficient, non-carnivorous species. This business-as-usual approach will see the continued depletion of wild fish stocks and – as is already being seen – the eventual replacement of wild fish with farmed molluscs and crustaceans for consumption purposes.

3. METHODOLOGY

To reveal the EU's dependence on fish from non-EU waters, we have estimated self-sufficiency levels for all EU countries. We express these in terms of fish dependence days.

Self-sufficiency levels are calculated as a ratio of domestic supply (production) over domestic demand (consumption):

> self-sufficiency = domestic supply / domestic demand.

A country that is able to produce as much as it consumes will have a ratio of 1.00 or more. A ratio of less than 1.00 means that some consumption depends on non-EU resources, which can be interpreted as an indicator of dependence on the resources of other countries. Taken over several years, such ratios allow us to identify trends in the EU's dependence on other nations' resources. Therefore, both the degree of self-sufficiency and the changes in the ratio over time are important. A decreasing ratio means that more consumption is being supplied from outside the EU; an increasing ratio means that the EU is becoming more self-sufficient.

The self-sufficiency of a country increases if domestic production increases, net imports decrease, and/or if consumption decreases (decreasing consumption would be observed through lower production and/or lower net imports). Increases in production can come from higher catches in national and EU waters and/or from higher aquaculture production.

The degree of self-sufficiency can be represented as a fraction of a year and then converted into a fish dependence day: the day in a year when a country will have consumed its entire annual supply of fish resources, if it uses only production from its own waters from the beginning of the year. After this date, the nation becomes dependent on sourcing its products from elsewhere, hence the date is termed the 'fish dependence day'.

For example, a degree of self-sufficiency of 0.4 means that a member state's fish resources provide the equivalent of 146 days of consumption (365 days x 0.4). Counting 146 days from 1 January, we can say that a country with a self-sufficiency ratio of 0.4 depends on other countries' resources from 26 May onward for the rest of the year. Therefore, the earlier the date, the more dependent the member state.

To obtain fish dependence days for all EU member states, we took the following steps.

i) Domestic supply: We calculated domestic supply by gathering data on total catch per nation in EU waters and trade balances.

ii) Domestic demand: We calculated domestic demand by gathering data on total catch in all regions and trade balances, i.e., exports minus imports.

iii) Self-sufficiency: We calculated the degree of self-sufficiency as the ratio of domestic supply over domestic demand.

iv) Fish dependence days: We converted the degree of self-sufficiency into calendar days by multiplying by 365 and finding the corresponding fish dependence day in the calendar year.

i) Domestic supply

Domestic supply is defined as catches in EU waters plus aquaculture production. At national level, this includes catches by the national fleet in its own national waters and the waters of other EU member states, plus all domestic aquaculture production (mariculture, freshwater aquaculture, and any other form). Catches by EU vessels in non-EU waters are excluded, since these depend on non-EU resources.

In equation form, domestic supply is calculated as:

domestic supply = catches in national and EU waters[69] + aquaculture production.

Data for catches[70] from the EU and member states were available through Eurostat[71] (Table A1). Where there was no catch data available for 2016, we assumed that the 2016 catch was equal to the 2015 catch.

In the absence of data on non-EU catches by member states, this catch was estimated for each member state using the following method. All EU member state catches in FAO sub areas that overlapped with the EEZ of an EU member state were extracted from the Eurostat database. Where there was not a perfect overlap between the EU's EEZ and an FAO sub-division, we conservatively assumed all catches were made in the EU EEZ (conservative, because a lower external catch means higher self-sufficiency). This approach provided the total catches per member state within FAO areas at least partially overlapping with EU EEZ. All other recorded catches are therefore happening outside the EU EEZ and therefore do not count towards EU domestic supply. It is possible to calculate catches outside EU waters by subtracting catches from within EU waters from the total catches per member state provided by Eurostat.

catches in non-EU waters by MS fleet = total catches that year by MS - catches in EU waters by MS.

This method was used to provide a measure of EU and non-EU catches per member state between 2008 and 2016.

ii) Domestic demand

Domestic demand is defined by apparent consumption within a country. It encompasses all demand for fish products by a country, whether these are used for human consumption or animal feed or are wasted. Apparent consumption is measured as total production (catches and aquaculture), plus imports, minus exports. In equation form that is:

> apparent consumption[72] = total production (total catches in EU and non-EU waters + aquaculture) + Trade balance (imports – exports).

Data for catches for the EU and member states – the same as was used for domestic production – were taken from Eurostat statistics[73] (Table A1). Our trade data were taken from the European Market Observatory for Fisheries and Aquaculture Products database[74] (Table A3). These trade data cover trade in all fish and aquaculture products.

iii) Self-sufficiency

The degree of self-sufficiency was calculated by dividing domestic supply by domestic demand. As noted earlier, this represents the proportion of consumption in a region (the EU) or nation (EU member state) that is supplied by its own resources. In equation form, this is calculated as:

> self-sufficiency = domestic supply / domestic demand.

This is equivalent to:

> self-sufficiency = catches in EU waters + aquaculture production / apparent consumption.

Net trade (imports minus exports) is included in the domestic demand denominator and not in domestic supply because trade is not production. A positive trade balance (i.e., exports greater than imports) increases the degree of self-sufficiency by reducing the proportion of production that is consumed domestically, and therefore should be included in domestic demand.

iv) Fish dependence days

The final step of the methodology was to convert self-sufficiency ratios into days. This was done simply by multiplying the self-sufficiency fraction by 365 and deriving the corresponding date in the year.

iv) Fish dependence day without aquaculture

We calculate the date at which member states would become fish dependent if they could not rely on aquaculture to sustain consumption. We subtract aquaculture from domestic production and divide this by apparent consumption (which is assumed not to change); this implies that aquaculture would have to be replaced by imports in order to sustain the same level of consumption.

This is slightly different to the way we have calculated the measure in previous versions of this report. Previously we subtracted aquaculture from both domestic production and consumption, thereby assuming that consumption adjusts so that no additional imports are necessary.

We have made this change in order to demonstrate the maximum impact of aquaculture on fish dependence.

iv) Fish dependence day without overfishing
We calculate the fish dependence day without overfishing by adding estimates of catch lost due to overfishing for each member state to the estimates of production. More detail on this can be found in the Results section.

3.1 CAVEATS WITH DATA AND METHODOLOGY

While all data used in our estimates were taken from official sources such as the FAO, Eurostat, and the European Commission, the datasets used have several limitations that could affect our results. A key point to highlight is that our calculations were restricted at times by the limited quality and availability of data. Additional information on the share of national catches derived from national, EU, international, and other non-EU waters, would help strengthen our results, but this information is either unavailable or difficult to access. This is partly due to poor reporting of fisheries data and a lack of transparency among EU member states. While our results are not perfect, they are based on the best available information. As explained in the following sections, our estimates are conservative, which means that real levels of self-sufficiency are likely to be lower than the results show.

Sustainability
Care must be taken when interpreting changes in fish dependence days from one year to another. In particular, an increase in self-sufficiency in one year (and therefore a later fish dependence day) does not necessarily indicate an increase in stock size or greater sustainability. Self-sufficiency may increase in a single year if a large but unsustainable catch is harvested since it increases domestic production temporarily. Equally, a decreasing self-sufficiency (an earlier fish dependence day) may indicate a harvest that has been restrained in order to restore fish stocks to more sustainable levels. For these reasons, longer-term trends may be more indicative of genuine changes in sustainability.

International waters
Some fishing grounds are not located in the EEZs of any nation. Thus, the total sum of fishing grounds within EEZs is less than the total global fishing resources. Since these resources do not belong to any nation, they cannot be counted as a component of the self-sufficiency of any nation. Therefore, we do not take these into account, although some portion of international fishing grounds might arguably be considered to pertain to the EU.

Member state catches in EU waters
The Rule of Origin[75] criterion dictates that fish caught by an EU vessel outside EU waters are classified as EU produce, unlike produce caught in the same location under another vessel's flag. This means that all EU catches by the EU fleet in non-EU waters are classified as EU production, even if they come from other countries' waters. This makes it difficult to distinguish between what is caught in a country's territorial waters (defined as a country's EEZ) and catches in other member states' EEZs or EU waters.

The absence of official data that divides catches between national waters, EU waters, international waters, and non-EU waters led us to make several assumptions that could affect the results at member state level.

EU catches in non-EU waters
Catches by the EU's external fishing fleet in our estimates should be considered the minimum amount of fish caught by EU vessels in non-EU waters.

The total non-EU catch by the EU

external fleet is based catches in FAO fishing areas that have no overlap with the EEZ of EU member states. However, there are many areas that overlap with EU EEZ only slightly and in these cases the assumption is that all EU fishing is taking place in the area of overlap. For example, in the Mediterranean, the EEZ only extends to 12 nautical miles from the coast, which means that vessels fishing beyond this limit are fishing in international waters. This suggests that the total amount of non-EU catches is much larger than the figures on which we have based our results.

Lack of data on catches within the EEZs of member states

Under the CFP, EU waters are regarded as a common resource that can be exploited by any member state. Without data on catches within a member state's waters, we cannot comment on how self-sufficient a member state is within its own EEZ. This means that fishing by member states in other countries' waters will increase their self-sufficiency as long as these waters are inside the EU. Spain is clearly a significant beneficiary of this, since a large part of its fleet operates in waters outside Spanish jurisdiction but still within EU waters. This does not, however, affect the self-sufficiency of the EU as a whole.

Illegal, unreported, and unregulated (IUU) fishing and bycatch

Our results do not take into account IUU fishing, discards, and bycatch. Estimates of the scale of IUU fishing are only available for specific stocks or fleets, making it impossible to include it in this analysis. However, high levels of discards and bycatch should have little impact on the analysis, as all discards and most bycatch do not enter the market. Yet, it is worth noting that official data sources on total catches are estimated from recorded landings and, given that landings do not include bycatch or discards, the catch data used in our analysis underestimate the true catch that takes place, further supporting our assertion that our results are conservative.

Trade data

Data on trade are readily available from the Eurostat pocketbook on fisheries statistics 1990–2006,[76] but unfortunately this information is no longer published. Instead all trade data have been extracted from the European Market Observatory for Fisheries and Aquaculture Products (EUMOFA).[77] Trade includes all commodity groups.

Aquaculture trade

When constructing the self-sufficiency dates that exclude aquaculture from the catch data, we were unable to remove trade in aquaculture products. This was because of a lack of trade data sufficiently detailed to distinguish at the 10-digit-code specificity required at EU level. This is something that could be further explored in future editions of this report, but it would require updating dates for all previous years, if we wanted to make them comparable.

Aquaculture

The formula used to estimate self-sufficiency levels includes aquaculture as a measure of domestic production. Higher levels of aquaculture production will increase self-sufficiency if it contributes to a net gain in seafood produced. This is limited, however, if aquaculture is dependent on more fish than it produces.

The dependence of aquaculture on wild fish stocks is already captured in the wild catches and trade components of the formula. However, our methodology does not capture the fact that half of the EU's domestic aquaculture production is now shellfish (molluscs and crustaceans)[78] and that the current trend is one in which we are replacing wild fish with farmed molluscs. Neither does it capture the diminished choices available to the consumer.

In other words, if we depleted all wild fish stocks and replaced them with the equivalent quantity of farmed molluscs, self-sufficiency levels would remain the same. Similarly, if we replaced 200 species of wild fish with just one species of farmed mollusc, as long as the aggregate quantities of fish – seafood – produced remained the same, the self-sufficiency level would not change.

Consequently, we present the results with and without aquaculture production. Removing aquaculture production from the equation results in a decrease in self-sufficiency (i.e., fish dependence will come earlier in the year) as shown in Table 6. That said, due to the way in which trade data are collected, aquaculture could not be removed from trade data, which means that each tonne of traded fish product is equivalent, regardless of whether it is wild or farmed.

Apparent consumption
We calculate the consumption levels of EU economies by a 'disappearance model'. In other words, we assume that the amount of fish consumed is equal to the total weight of fish entering the economy (catches and imports), less any fish that exits the economy (exports). This does not give human consumption, since fish could be wasted or used for some other purpose (e.g. animal feed). The FAO also calculates consumption according to a disappearance model. However, they calculate a measure that is considered closer to actual human consumption. Therefore, in addition to catches and trade, they also take into account changes in inventories of fish products, direct feed uses and other non-food uses. While this trend is also revealing, for the purpose of total fish dependence we argue that total fish consumption, rather than human consumption, is the relevant measure.

4. RESULTS

When analysing the ratio of domestic supply over domestic demand, we arrived at estimates of the degree of self-sufficiency of the EU and its member states (Table 3) and their corresponding fish dependence days (Table 4).

Table 3 shows that the EU's degree of self-sufficiency is around 52% in 2016 – a decline on the previous year.

Fish dependence in the EU, as a whole, shows that its fish stocks still support just over one-half of its consumption.

TABLE 3: DEGREE OF SELF-SUFFICIENCY FOR THE EU AND ITS MEMBER STATES

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU28*	-	0.87	0.59	0.56	0.52	0.50	0.52	0.52	0.52	0.52	0.52	0.53	0.51	0.55	0.52
Austria	0.06	0.06	0.06	0.04	0.04	0.04	0.04	0.03	0.03	0.04	0.04	0.04	0.04	0.05	0.04
Belgium	-	-	0.16	0.22	0.29	0.21	0.10	0.11	0.11	0.11	0.12	0.12	0.13	0.13	0.14
Bulgaria	-	-	0.40	0.23	0.27	0.40	0.32	0.34	0.41	0.39	0.40	0.41	0.41	0.41	0.42
Croatia*	-	-	-	-	-	-	1.00	1.00	1.00	1.00	1.00	1.10	1.29	1.36	1.32
Cyprus	-	-	0.82	0.14	0.26	0.23	0.23	0.24	0.28	0.30	0.30	0.38	0.33	0.37	0.41
Czech Republic	-	-	0.31	0.31	0.35	0.33	0.35	0.30	0.36	0.40	0.52	0.52	0.49	0.37	0.39
Denmark	1.13	1.20	1.00	0.85	0.79	0.62	0.69	0.70	0.73	0.70	0.65	0.77	0.67	0.72	0.62
Estonia	-	-	1.11	#	#	2.51	3.05	#	#	#	#	4.42	3.66	3.59	4.26
Finland	0.60	0.64	0.70	0.67	0.68	0.75	0.76	0.77	0.75	0.72	0.73	0.74	0.76	0.78	0.86
France	0.68	0.57	0.56	0.47	0.47	0.45	0.43	0.39	0.38	0.39	0.41	0.42	0.40	0.37	0.39
Germany	0.33	0.30	0.28	0.42	0.34	0.32	0.36	0.28	0.29	0.29	0.29	0.35	0.33	0.39	0.34
Greece	0.64	0.68	0.66	0.60	0.66	0.60	0.62	0.64	0.72	0.73	0.72	0.74	0.66	0.69	0.71
Hungary	–	-	0.33	0.38	0.48	0.51	0.42	0.46	0.45	0.49	0.48	0.48	0.58	0.61	0.63
Ireland	2.43	2.20	1.88	1.92	1.78	1.54	1.79	1.44	1.51	1.82	3.90	3.65	2.79	3.14	2.18
Italy	0.49	0.47	0.39	0.34	0.34	0.33	0.31	0.32	0.31	0.30	0.29	0.27	0.27	0.27	0.26
Latvia	-	-	1.09	1.44	1.44	1.34	1.55	1.35	1.45	1.33	2.40	1.70	1.03	1.60	0.81
Lithuania	-	-	-0.44	0.24	0.23	0.45	0.50	0.58	0.21	0.23	0.24	0.16	0.32	0.46	0.33
Malta	–	-	-	-	-	-	0.29	0.18	0.30	0.32	0.32	0.30	0.33	0.38	0.25
Netherlands	1.60	0.89	1.02	1.72	1.68	1.21	1.22	0.62	0.68	0.81	0.86	0.91	1.04	2.16	2.15
Poland	–	-	0.53	0.49	0.47	0.55	0.47	0.63	0.52	0.63	0.55	0.58	0.43	0.57	0.54
Portugal	0.52	0.38	0.21	0.11	0.32	0.32	0.43	0.35	0.42	0.43	0.43	0.43	0.42	0.43	0.34
Romania	–	-	0.24	0.12	0.14	0.16	0.11	0.12	0.09	0.12	0.13	0.14	0.13	0.15	0.16
Slovakia	–	-	0.07	0.10	0.10	0.12	0.06	0.06	0.03	0.03	0.03	0.05	0.06	0.06	0.13
Slovenia	–	-	0.21	0.18	0.16	0.16	0.13	0.13	0.10	0.09	0.11	0.10	0.11	0.12	0.13
Spain	0.46	0.40	0.40	0.34	0.36	0.35	0.42	0.47	0.45	0.48	0.42	0.39	0.38	0.42	0.40
Sweden	0.86	1.05	1.40	1.10	1.35	1.00	0.88	0.95	1.06	0.87	0.69	0.79	0.71	0.86	0.98
United Kingdom	0.58	0.67	0.64	0.64	0.59	0.54	0.54	0.58	0.63	0.63	0.65	0.67	0.75	0.73	0.69

Notes: *Before 2014, figures exclude Croatia. # Self-sufficiency values were assumed to be unreliable if higher or lower than 5. This was only seen for Estonia.

For the past ten years, the EU's fish dependence day has occurred in July. Based on 2016 data, it currently falls on 9 July, 13 days earlier than in 2015. Member states differ in their levels of self-sufficiency and the majority of EU countries have decreased their fish dependence in 2016. Unsurprisingly, inland countries or those with little access to the sea (i.e., Austria, Slovenia, Slovakia, Romania, and the Czech Republic) become fish dependent much earlier in the year, relative to the EU average.

Estonia, Ireland, the Netherlands, and Croatia have remained self-sufficient – continuing to produce surpluses. Latvia, on the other hand, shifted from self-sufficient in 2015 to fish dependent in 2016.

While the degree of self-sufficiency is important because it reflects the current state of affairs, trends are also important because they reflect the longer-term implications. We see that most countries, and the EU as a whole, remain highly dependent on resources from outside EU waters. Since 2000, the EU28 member states have reduced their degree of self-sufficiency by 7% – a significant decline.

In the UK and Poland, fish dependence day comes 16 and 14 days earlier than the previous year, respectively. For Lithuania, Malta, and Portugal, these figures are even higher with fish dependence day coming 49 and 31 and 30 days earlier in 2016, respectively. In Latvia, the increase in dependence is even more striking with its date of dependence falling 10 months earlier than the year before.

Sweden saw the greatest shift towards fish independence with its dependence day falling 43 days earlier in 2016. Estonia, which was already self-sufficient, had the greatest jump in its dependence date, with enough domestic supply to last more than four years into the future (April 2020) from 2016. In 2015, its dependence day was August 2018. It is worth noting, however, that the wide-ranging figures for Estonia over the timeframe of this report are likely to relate to the quality of the data or to changes in records of imports and exports figures, rather than to changes in consumption or fishing patterns.

Some countries have access to a long coastline, yet their dependence does not seem to reflect this, due mostly to the state of their fisheries and their levels of consumption. In fact, many become fish dependent in the first half of the year: Portugal becomes dependent on 5 May; Spain on 26 May; France on 21 May; Italy on 6 April; others like the UK come a bit later in the year on 7 September.

In 16 years, the EU28 fish dependence day has moved earlier in the year by almost a month – from 4 August in 2000 to 9 July in 2016. At current levels of consumption, if EU citizens were to rely solely on fish caught in EU waters, the EU would consume its domestic supply by 9 July – in just over half a year. This is 13 days earlier than in 2015; however, the fish dependence day has remained steadily in July, later than 7th of the month since 2008. This follows a mostly positive trend since 2007 but indicates that the EUis still not on track to remove its fish dependence. There are a few signs of increasing self-sufficiency at national level. As noted earlier, Sweden has reduced its fish dependence substantially, by 96 days, between 2014 and 2016. Estonia's dependence day has moved later by around a year, due to increased production and lower exports. Slovakia and Finland have also improved slightly; by 28 and 29 days, respectively, due to increases in production and a decreasing trade deficit.

TABLE 4: FISH DEPENDENCE DAYS FOR THE EU AND ITS MEMBER STATES

	1990	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU28*	-	04-Aug	25-Jul	09-Jul	02-Jul	09-Jul	08-Jul	10-Jul	11-Jul	07-Jul	13-Jul	07-Jul	22-Jul	09-Jul
Austria	21-Jan	23-Jan	15-Jan	15-Jan	15-Jan	14-Jan	12-Jan	13-Jan	16-Jan	16-Jan	16-Jan	17-Jan	17-Jan	17-Jan
Belgium**	-	28-Feb	20-Mar	15-Apr	17-Mar	06-Feb	10-Feb	13-Jan	08-Feb	13-Feb	15-Feb	16-Feb	17-Feb	22-Feb
Bulgaria	-	27-May	27-Mar	08-Apr	27-May	28-Apr	04-May	13-Jan	24-May	25-May	29-May	30-May	29-May	01-Jun
Croatia*	-	-	-	-	-	31-Dec	>1 year	13-Jan	>1 year	31-Dec	>1 year	>1 year	>1 year	>1 year
Cyprus	-	27-Oct	19-Feb	07-Apr	25-Mar	23-Mar	28-Mar	13-Jan	18-Apr	19-Apr	20-May	01-May	15-May	29-May
Czech Republic	-	25-Apr	25-Apr	09-May	30-Apr	08-May	19-Apr	13-Jan	26-May	09-Jul	10-Jul	30-Jun	16-May	20-May
Denmark	> year	31-Dec	07-Nov	15-Oct	14-Aug	10-Sep	14-Sep	13-Jan	12-Sep	26-Aug	10-Oct	01-Sep	22-Sep	15-Aug
Estonia	-	> year	> year	> year	> year	>1 year	>1 year	13-Jan	>1 year	>1 year	>1 year	>1 year	>1 year	>1 year
Finland	09-Aug	13-Sep	02-Sep	05-Sep	29-Sep	03-Oct	10-Oct	13-Jan	22-Sep	22-Sep	26-Sep	05-Oct	12-Oct	10-Nov
France	06-Sep	25-Jul	20-Jun	20-Jun	13-Jun	07-Jun	24-May	13-Jan	23-May	30-May	04-Jun	26-May	17-May	21-May
Germany	30-Apr	13-Apr	03-Jun	05-May	27-Apr	10-May	12-Apr	13-Jan	16-Apr	16-Apr	09-May	29-Apr	24-May	04-May
Greece	20-Aug	29-Aug	06-Aug	28-Aug	07-Aug	13-Aug	21-Aug	13-Jan	25-Sep	20-Sep	27-Sep	31-Aug	09-Sep	14-Sep
Hungary	-	02-May	19-May	26-Jun	07-Jul	02-Jun	19-Jun	13-Jan	27-Jun	23-Jun	26-Jun	30-Jul	12-Aug	17-Aug
Ireland	> year	> year	> year	> year	> year	>1 year	>1 year	13-Jan	>1 year	>1 year	>1 year	>1 year	>1 year	>1 year
Italy	29-Jun	24-May	05-May	06-May	30-Apr	24-Apr	28-Apr	13-Jan	21-Apr	15-Apr	10-Apr	10-Apr	09-Apr	06-Apr
Latvia	-	> year	> year	> year	> year	>1 year	>1 year	13-Jan	>1 year	>1 year	>1 year	>1 year	>1 year	23-Oct
Lithuania	-	01-Jan	30-Mar	27-Mar	12-Jun	01-Jul	31-Jul	13-Jan	26-Mar	28-Mar	01-Mar	29-Apr	18-Jun	30-Apr
Malta	-	-	-	-	-	17-Apr	07-Mar	13-Jan	28-Apr	26-Apr	21-Apr	01-May	18-May	31-Mar
Netherlands	> year	> year	> year	> year	> year	>1 year	14-Aug	13-Jan	25-Oct	09-Nov	29-Nov	>1 year	>1 year	>1 year
Poland	-	13-Jul	30-Jun	20-Jul	19-Jul	21-Jun	18-Aug	13-Jan	19-Aug	18-Jul	01-Aug	05-Jun	28-Jul	14-Jul
Portugal	08-Jul	16-Mar	11-Feb	02-Apr	26-Apr	05-Jun	07-May	13-Jan	06-Jun	06-Jun	06-Jun	02-Jun	06-Jun	05-May
Romania	-	28-Mar	14-Feb	20-Feb	28-Feb	11-Feb	13-Feb	13-Jan	13-Feb	16-Feb	20-Feb	17-Feb	23-Feb	29-Feb
Slovakia	-	27-Jan	04-Feb	07-Feb	14-Feb	22-Jan	23-Jan	13-Jan	11-Jan	10-Jan	20-Jan	21-Jan	22-Jan	18-Feb
Slovenia	-	17-Mar	06-Mar	26-Feb	27-Feb	16-Feb	18-Feb	13-Jan	04-Feb	10-Feb	05-Feb	10-Feb	12-Feb	15-Feb
Spain	18-Jun	28-May	06-May	10-May	08-May	03-Jun	20-Jun	13-Jan	24-Jun	02-Jun	22-May	18-May	02-Jun	26-May
Sweden	11-Nov	> year	> year	> year	30-Dec	18-Nov	13-Dec	13-Jan	15-Nov	09-Sep	16-Oct	18-Sep	10-Nov	23-Dec
United Kingdom	30-Jul	21-Aug	23-Aug	04-Aug	16-Jul	15-Jul	02-Aug	13-Jan	17-Aug	24-Aug	01-Sep	30-Sep	23-Sep	07-Sep

Notes: *Before 2014, figures exclude Croatia. **Includes Luxembourg. # Self-sufficiency values were assumed to be unreliable if higher or lower than 5 and by extension the fish dependence date that is created using this value. This was only seen for Estonia.

Excluding aquaculture from domestic production further reduces the degree of self-sufficiency, as seen in Table 5. Removing aquaculture from production makes the state of low self-sufficiency more apparent, moving the EU fish dependence day earlier in the year by more than a month, in the period 2008–2016, and between 1 and 5.5 months for the main EU aquaculture producers such as Spain (2 months), Italy (1.5 months), France (1.5 months), and Greece (5.5).

TABLE 5: FISH DEPENDENCE DAYS FOR THE EU AND ITS MEMBER STATES, EXCLUDING AQUACULTURE FROM DOMESTIC SUPPLY

	1990	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU28*	-	14-Jul	03-Jul	14-Jun	07-Jun	24-May	23-May	26-May	26-May	20-May	29-May	24-May	06-Jun	25-May
Austria	04-Jan	04-Jan	02-Jan	02-Jan	02-Jan	>1 year	>1 year	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan
Belgium**	-	25-Feb	19-Mar	15-Apr	16-Mar	01-Mar	18-Feb	08-Feb	08-Feb	13-Feb	14-Feb	16-Feb	17-Feb	22-Feb
Bulgaria	-	22-Apr	01-Mar	16-Mar	23-Apr	29-Mar	31-Mar	24-Mar	22-Mar	19-Mar	31-Mar	24-Mar	08-Mar	03-Mar
Croatia*	-	-	-	-	-	-	-	08-Oct	21-Oct	26-Oct	07-Dec	>1 year	>1 year	>1 year
Cyprus	-	25-Oct	24-Jan	12-Feb	10-Feb	28-Jan	25-Jan	27-Jan	22-Jan	26-Jan	25-Jan	25-Jan	29-Jan	28-Jan
Czech Republic	-	30-Jan	27-Jan	03-Feb	30-Jan	26-Jan	26-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan
Denmark	> year	31-Dec	13-Nov	13-Oct	10-Aug	26-Sep	30-Oct	13-Sep	30-Aug	09-Aug	25-Sep	21-Aug	11-Sep	04-Aug
Estonia	-	> year	#	#	> year	> year	#	#	#	#	>1 year	>1 year	>1 year	>1 year
Finland	11-Jul	06-Sep	24-Aug	29-Aug	24-Sep	08-Oct	16-Oct	07-Sep	30-Aug	29-Aug	03-Sep	13-Sep	17-Sep	15-Oct
France	22-Jun	21-Jun	14-May	15-May	07-May	28-Apr	08-Apr	29-Mar	07-Apr	07-Apr	16-Apr	13-Apr	06-Apr	11-Apr
Germany	09-Apr	24-Mar	21-May	25-Apr	13-Apr	04-Apr	04-Apr	27-Mar	25-Mar	28-Mar	19-Apr	15-Apr	09-May	18-Apr
Greece	03-Aug	27-Jun	23-May	15-Jun	22-May	11-May	12-May	05-Apr	06-Apr	03-Apr	09-Apr	30-Mar	05-Apr	28-Mar
Hungary	-	24-Feb	07-Mar	29-Mar	31-Mar	01-Apr	28-Mar	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan
Ireland	> year	> year	> year	> year	> year	> year	> year	>1 year	>1 year	>1 year	>1 year	>1 year	>1 year	>1 year
Italy	03-May	06-Apr	27-Mar	30-Mar	23-Mar	09-Mar	14-Mar	10-Mar	03-Mar	03-Mar	25-Feb	23-Feb	25-Feb	23-Feb
Latvia	-	> year	> year	> year	> year	> year	> year	>1 year	>1 year	>1 year	>1 year	>1 year	>1 year	20-Oct
Lithuania	-	01-Jan	27-Mar	23-Mar	09-Jun	17-May	19-May	13-Mar	19-Mar	15-Mar	15-Feb	22-Apr	02-Jun	19-Apr
Malta	-	-	-	-	-	19-Jan	02-Jan	24-Jan	07-Feb	27-Jan	23-Jan	27-Jan	26-Jan	15-Jan
Netherlands	>1 year	>1 year	>1 year	>1 year	>1 year	29-Jan	10-Jul	17-Jul	20-Sep	03-Oct	17-Oct	06-Nov	>1 year	>1 year
Poland	-	30-Jun	07-Jun	27-May	27-Jun	13-May	03-Jul	29-May	11-Jul	12-Jun	01-Jul	29-Apr	16-Jun	06-Jun
Portugal	04-Jul	22-Mar	09-Feb	10-Apr	23-Apr	17-Apr	27-Mar	28-May	29-May	28-May	28-May	23-May	28-May	27-Apr
Romania	-	13-Feb	22-Jan	24-Jan	25-Jan	19-Jan	15-Jan	01-Jan	03-Jan	04-Jan	07-Jan	09-Jan	17-Jan	24-Jan
Slovakia	-	17-Jan	23-Jan	23-Jan	29-Jan	23-Jan	28-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01-Jan	01 -Jan
Slovenia	-	20-Feb	04-Feb	29-Jan	29-Jan	23-Jan	28-Jan	18-Jan	17-Jan	08-Jan	06-Jan	06-Jan	05-Jan	04-Jan
Spain	01-May	18-Apr	30-Mar	25-Mar	24-Mar	08-Apr	10-Apr	17-Apr	23-Apr	29-Mar	01-Apr	23-Mar	01-Apr	26-Mar
Sweden	31-Oct	>1 year	>1 year	>1 year	30-Dec	>year	> year	>1 year	22-Oct	15-Aug	22-Sep	27-Aug	21-Oct	27-Nov
United Kingdom	17-Sep	05-Aug	03-Aug	13-Jul	22-Jun	11-Jul	26-Jul	17-Jun	18-Jun	23-Jun	01-Jul	29-Jul	21-Jul	12-Jul

Source: Data used were Eurostat data or national data, where available. Aquaculture was excluded from production but included in the trade data.

Notes: *Before 2014, figures exclude Croatia. **Includes Luxembourg. # Self-sufficiency values were assumed to be unreliable if higher or lower than 5 and by extension the fish dependence date that is created using this value. This was only seen for Estonia.

The impacts of overfishing are highly significant in diminishing the long-term catches that can be sustained by European fleets. The New Economics Foundation's (NEF's) Bio-Economic Model of European Fleets found that recovering stocks to MSY would deliver 2 million tonnes of additional fish per year, enough to meet the annual demand of 89 million EU citizens; €1.6 billion additional gross revenues per year; and €800 million additional net profits per year which could support up to 20,000 new jobs.[79] Importantly, the model does not look at Mediterranean stocks or non-quota species in the northeast Atlantic, meaning that the estimated costs of overfishing are likely to be much higher.

Overfishing these stocks imposes a severe constraint on how self-sufficient the EU and its member states can hope to be, given current levels of consumption. By imputing the potential that rebuilding stocks has to meet current consumption, and trading this off against the fish that are currently caught outside of EU waters (either imports or external catches) because domestic production is too low, we find striking results. The EU loses around 2 million tonnes per year from overfishing just these stocks, which, if rebuilt, could increase the EU's self-sufficiency in 2016 from 0.52 to 0.75. This would delay the EU's fish dependence day by over two months, from 9 July to 2 October.

However, the picture for member states is more varied. Rebuilding these stocks to MSY levels would make Denmark, the UK, Sweden, and Latvia entirely self-sufficient. Ireland, Germany, and the Netherlands would also stand to gain substantially. Some member states that specialise in forage fish may well be negatively affected in terms of the volume of fish they land, causing a reduction in their fish dependence as an increasing abundance of predator

TABLE 6: COMPARISON OF FISH DEPENDENCE DAYS FOR SELECTED EU MEMBER STATES WITH AND WITHOUT OVERFISHING.

	With overfishing (2016)	Without overfishing (2016)	Difference (days)
EU	9-Jul-16	2-Oct-16	85
Belgium	22-Feb-16	5-Mar-16	12
Germany	4-May-16	18-Jun-16	45
Denmark	15-Aug-16	12-Jun-17	301
Spain	26-May-16	26-Jun-16	31
Estonia	5-Apr-20	26-Dec-19	-101
Finland	10-Nov-16	24-Sep-16	-47
France	21-May-16	8-Jul-16	48
United Kingdom	7-Sep-16	4-Feb-17	150
Ireland	7-Mar-18	27-Jul-19	507
Lithuania	30-Apr-16	12-Dec-16	226
Latvia	23-Oct-16	28-Apr-17	187
Netherlands	25-Feb-18	23-Sep-18	210
Poland	14-Jul-16	19-Jul-16	5
Portugal	5-May-16	19-May-16	14
Sweden	23-Dec-16	1-Aug-17	221

Source: Data used were Eurostat data, or national data (where available), and aquaculture was excluded from production but included in the trade data. Difference days have been rounded. Data for MSY potential came from NEF models.

species, as stocks return to MSY, raises predation pressure on stocks lower in the food chain. These results can be seen in Table 6. It is important to bear in mind that these results are not complete estimates of the costs of overfishing. For example, while stocks and catches in the Mediterranean have declined substantially in the last few decades, the costs of overfishing to Greece and Italy are zero and relatively small for Spain because MSY potential is difficult to assess for the Mediterranean and the Black Sea given the lack of data.

5. DISCUSSION AND IMPLICATIONS

Fish dependence is a powerful concept that illustrates how far overconsumption outstrips domestic resources. As we have shown, one way to demonstrate this trend is to represent a country's degree of self-sufficiency as a calendar day – the day in the year when a country has consumed its own supply and must begin sourcing its products elsewhere, hence the term 'fish dependence day'. For the EU, this date is currently 9 July, after which the EU depends on foreign resources (or 25 May, if we do not include domestic aquaculture in our calculations).

5.1 INTERPRETATION OF RESULTS

Many factors affect a country's degree of self-sufficiency. These include the size of the fleet, fish catch, external catch relative to total catch, area and productivity of national waters, fish consumption per capita, the scale of imports and exports, and domestic aquaculture production.

Naturally, landlocked countries or those with small fleets (relative to consumption demand) will have a lower degree of self-sufficiency. Those nations with high levels of fish consumption and substantial external fishing, such as Germany, Spain, and Portugal, reach their fish dependence days earlier in the year. Others with a higher proportion of catches in EU waters and lower levels of consumption, such as Latvia, have a dependence date later in the year while countries such as Ireland, Estonia, the Netherlands, and Croatia are self-sufficient.

Aquaculture increases fish production and therefore improves self-sufficiency levels. But this is only the case when it results in a net gain in production; for example, if fish outputs are bigger than fish inputs (i.e., fishmeal). This is not always the case, as we have seen with carnivorous species. Our results show that the inclusion of aquaculture delays the date of fish dependence by almost 1.5 months. But overall, aquaculture production has not altered the trend of increasing EU fish dependence.

Calculating self-sufficiency is often misrepresented as an argument against trade but that is not the aim of this report. As consumer tastes vary by country and region – for seafood especially – trade has beneficial impacts in matching production with consumption. However, a deficit in trade (net imports) means that the EU is dependent on waters outside its own to meet its seafood demand. The fact that fish is a highly traded product and that EU consumers tend to consume different fish products than what is produced in the EU does not in itself lead to fish dependence; only when this swapping of fish becomes unbalanced will dependency begin.

Of course, we would expect a high level of dependence in the EU for some products. The EU's coffee or banana dependence day would fall on 1 January as these products are not grown within the EU. In the case of fisheries, however, the continued reliance of the EU on imports is not due to a lack of natural endowment, but rather the result of mismanagement and overcapacity of EU fishing fleets which have contributed to the decline of fish stocks in EU waters. This trajectory is now turning for an increasing number of stocks, particular in the northeast Atlantic, the Baltic Sea, and widely migratory stocks. For stocks in the northeast Atlantic with MSY assessments, overfishing decreased from 73% in 2007 to 41% in 2015.[80]

The EU is naturally endowed with potentially rich and productive seas and it has the capacity to significantly increase its self-sufficiency levels both by managing its marine ecosystems in a sustainable way and by changing its consumption patterns. It is therefore important to emphasise that the trends found here are not an unavoidable problem, rather the consequence of previous overcapacity in EU fishing fleets, poor management of EU fish resources, and unsustainable consumption patterns. As the trend in the declining health of Europe's fish stocks begins to turn around, so too can our dependence on fish from elsewhere.

Fish dependence and sustainability
It is worth highlighting that the degree of self-sufficiency we have calculated is not a direct commentary on the sustainability of fisheries. For example, according to our results, the Netherlands was a self-sufficient country until 2009 and then again in 2012 and from 2014 onwards, but this does not mean that it fished sustainably in its own waters until 2009. Indeed, our estimates[81] for the costs of overfishing show that the Netherlands stands to benefit from an extra 163 days of self-sufficiency from rebuilding these stocks. The sustainability of a country's fisheries is not directly investigated in this report. A direct commentary on sustainability requires detailed knowledge of the carrying capacities of all species and stocks, while our estimates[82] concern only quota species in the northeast Atlantic.

Despite this, we believe there is substantial evidence to suggest that increasing dependence on other countries over the long term is a powerful indicator of unsustainable fisheries and the overexploitation of EU resources. Our self-sufficiency ratios are an easy-to-understand way of highlighting the impact that the EU's increasing fish dependence is having on other countries. Ultimately, our results are consistent with other evidence[83] on the effects of unsustainable trends in global fisheries.

5.2 IMPLICATIONS OF THE EU'S FISH DEPENDENCE

Food security in developing countries

The interdependence of countries is becoming increasingly complex, not least in the food market.[84,85] A significant proportion of EU fish imports come from developing countries. At a global level, $80 billion of the US$148 billion worth of fish products exported in 2014 came from developing countries.[86] The fish-product trade is more valuable to developing countries than those of meat, tobacco, rice, and sugar combined.[87] It is clear, therefore, that notions of self-sufficiency directly impact the interdependence and patterns of global trade.

But while there are potentially large economic benefits from trade, the status quo is not necessarily working for poorer countries. It is challenging for developing countries to receive higher returns on their resources. Trade fuels economic development in the exporting countries, and revenues from fish exports may, potentially, help combat hunger in these countries.[88] But trade can lead to problems of food insecurity in developing countries where, as is often the case, fish is a major source of protein.[89]

The emergent picture is non-uniform across and within countries. In at least some cases, the net effects of the fish trade are completely unclear, showing neither decreased food security nor economic development. That said, there are other cases where the outcomes of trade are clearer. While fish for export are generally different, higher-value species than those consumed locally, there is evidence that in some cases fish supply is being diverted away from vulnerable people in developing countries. For example, in the decade from 1978/1980 to 1988/1990, per capita fish consumption in developed regions increased (by 27.7% in North and Central America and 23% in Europe and Asia), while in developing regions it fell (by 2.9% in Africa, 7.9% in South America, and more than 25% in at least 24 countries, including Burundi, Libya, Mali, Costa Rica, and Colombia).[90] Moreover, there is worrying evidence that this decline is not being offset by other forms of animal protein,[91] despite the region potentially benefiting economically from trade. How this diversion occurs is not straightforward; it may be due to a combination of local people and exporters targeting the same species, or the knock-on effect of the exploitation of particular but exclusive stocks.

In summary, in order to combat cases of unsustainable trade that unfairly disadvantage developing countries, trade regimes need to be more environmentally and socially aware.[92,93,94] The positive macroeconomic impact of exporting fish products and natural resources must be used to drive development, yet also weighed against the potential negative consequences for those who depend on those resources in poor communities. Consumption within sustainable limits is an important component of any positive trade. The EU, for the sake of its own food security, employment, and ecological health, must replenish its own fish stocks, with any excess demand being satisfied by well-regulated and mutually beneficial trade with developing countries.

Vulnerability of the EU fishing industry

There is still a large gap between fish supply and demand within Europe as a consequence of overfished stocks. This is putting jobs in the domestic fishing industry at risk and also undermining the processing industry that depends on fisheries. The prospect of increasing fuel prices can only exacerbate this trend. Fuel is currently subsidised in many countries, and this is often essential if fishing operations are to be economically viable. Such subsidies will be more difficult to justify and maintain, however, as climate change and rising oil prices begin to have an impact and the pressure to cut carbon emissions intensifies. For example, the increasing dependence of the EU processing industry on imports is pushing up societal and environmental costs such as climate change impacts and environmental damage.

In order to maintain competitiveness with non-EU producers and processors, the EU fishing industry must use its resources more efficiently.

Undersupply for the growing European market is not likely to be a problem in the immediate future. The average fish price in European markets is higher than anywhere else in the world except Japan, which makes Europe a lucrative and attractive market for exporters. In the longterm, however, unless we start improving the productivity of EU waters, the prospects for the EU fishing industry look bleak.

Some companies, such as the Spanish-based companies Pescanova and Calvo, responded to shortages in EU fish stocks by sourcing fish directly through their own fleet or through joint ventures in developing countries. While this is a natural response to a challenging economic environment from a business strategy point of view, it only serves to increase our dependence on fish from elsewhere.

5.3 THE WAY FORWARD AND OPPORTUNITIES FOR CHANGE

There are many benefits associated with replenishing fish stocks. A high degree of self-sufficiency helps to deliver increased food security, improved resource management, a healthier environment, and long-term employment and social stability for fishing communities. A decrease in the degree of self-sufficiency means the opposite, which is why the EU's fish resources and fisheries sector are both in such a parlous state.

This situation is reversible, however. The current state of EU fisheries must be set against a backdrop of once rich and productive EU waters of considerable economic and cultural significance.[95,96,97] We need to moderate current levels of fish consumption and restore EU fish stocks, both of which would reverse our increasing levels of fish dependence.

The reformed EU Common Fisheries Policy

Before the reform of the EU CFP in 2013, it was widely recognised that the CFP had failed to deliver on its central objective – the sustainable exploitation of living aquatic resources.[98] However, the reform of the CFP, involving negotiations between the European institutions (European Parliament, the European Commission, and all EU member states) and campaigning by a diverse group of stakeholders, has led to commitments to sustainable fishing and has addressed the majority of the previous shortcomings.

In December 2013, a new CFP was approved, which represents a huge step forward for fish stocks and the communities dependent on them.The new policy, which applies throughout EU waters and to the EU fleet globally (as of 1 January 2014), has laid the foundation for sustainable fisheries management in the EU and if properly implemented will lead to all EU fish stocks being fished at MSY by 2020 and to discard-free fisheries.

The policy also requires member states to be transparent and take social and environmental criteria into account when allocating fishing opportunities, rather than just allocating based on historic track record. This point opens up the possibility for the development and implementation of new criteria that ensure fishing opportunities and funding are targeted to those segments of the fleet that deliver the highest value to society. NEF's work has described how this could be delivered.[99]

The new CFP is supported by the EMFF with a total of €6.5 billion available up to 2020. The new EMFF contains some positive measures, such as more funding to enhance data collection and improve control and enforcement and also to support fishing communities in the transition to sustainable fisheries. The need for better data collection is particularly relevant, especially in the Mediterranean and the Black Sea where around 80% of landings come from stocks which are data deficient.[100]However, for the EU overall, the trend is positive. The number of stocks with fishing limits in accordance with MSY advice has increased from 34 in 2005 to 75 in 2017. At the same time, the number of stocks with fishing limits in accordance with scientific advice has increased from 2 in 2005 to 44 in 2017 (6% to 59%).[101]

Yet, the new EMFF still includes funding for measures which could lead to overfishing, such as subsidies for fishing vessel engine replacement, which may contribute to overcapacity.

An ambitious and effective implementation of the new CFP, with a good use of EMFF opportunities, can deliver sustainable management of fish stocks in Europe. Now it is up to member states, EU institutions, and the fishing industry to make the most of it and translate the potential of more food, more jobs, and more profits into a reality. EU citizens, meanwhile, need to exercise their consumer power to move towards patterns of consumption that match what our oceans are able to produce.

6. CONCLUSIONS

The EU and many of its largest member states remain highly dependent on fish resources from other countries. This is down to two main driving factors: many EU fish stocks are in poor health – below their maximum potential – and the EU demand for fish remains high as EU citizens eat more fish than their waters can produce. The EU's fish dependence day is now 9 July, meaning that the EU relies on foreign resources for almost half of its fish consumption. This dependence – while showing signs of stabilisation – has increased since 2000 and the impact of aquaculture in reducing this trend is limited. Certain member states, such as Spain, France, Italy, Portugal, and Germany, reach their fish dependence days much earlier than this, despite their significant access to EU waters.

As a consequence, to meet EU demand, many of the costs of EU fisheries mismanagement and historical overfishing are being exported, with direct impact on the fish stocks of non-EU countries. Change is desperately needed if we are to break this pattern – the EU needs to focus efforts on restoring its own marine ecosystems and to ensure that its consumption is not at the expense of fish stocks in other parts of the globe.

We have also seen that a high dependence of aquaculture on wild-fish catches for fish meals and oils is not only making the industry less productive (as inputs tend to outweigh fish production outputs, particularly for carnivorous species), but also, as an increasingly important consumer of fish, aquaculture is putting extra pressure on fish stocks.

The reformed EU CFP is an opportunity to rebuild fish stocks and to reduce our levels of fish dependence. We recommend that EU member states:

- Develop and implement ambitious long-term fisheries management plans (LTFMPs), including catch limits which lead to the restoration of EU fish stocks to their MSY by 2020 at the latest.
- Allocate fishing opportunities to those segments of the fleet that deliver best value to society with the lowest environmental impact.
- Promote responsible consumption levels that respect the ecological limits of the marine ecosystems.
- Use public funds responsibly, to support fish stock restoration and support fishing communities in the transition to discard-free sustainable fishing.

These measures will help to reverse the EU's dependence on other countries' resources.

Action on the part of governments, the fishing industry, and campaigners to improve the sustainability of EU waters is beginning to yield results, but this is only a partial victory. Rebuilding European fish stocks to their full potential – currently off track for the 2020 deadline in the CFP– will help, but we must also work to improve the environmental aspects of EU consumption and trade, and their impact on global fish stocks to create a truly sustainable seafood system.

APPENDIX

This section includes supporting tables and data that were used in the text or in calculations.

TABLE A1: TOTAL FISHERIES PRODUCTION IN THE EU (CATCH + AQUACULTURE) IN KILO-TONNES LIVE WEIGHT (1995–2016)

Member State	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU28*	9,253.90	8,187.80	6,902.60	6,733.70	6,486.70	6,181.88	6,122.41	6,270.81	6,090.72	5,650.31	6,012.06	6,631.88	6,404.05	6,279.48
Austria	3.3	3.3	2.8	2.9	2.9	2.1	2.1	2.2	2.9	3.1	3.2	3.4	3.5	3.5
Belgium	36.5	31.7	25	23.1	24.7	22.2	21.8	22.5	22.4	24.6	25.6	26.7	24.5	26.9
Bulgaria	12.6	10.7	8.6	10.8	13.3	14.9	15.3	17.6	16.0	15.1	15.8	15.4	19.4	21.1
Croatia	-	-	34.7	37.8	48.6	65.4	71.7	68.1	87.7	77.5	89.0	92.7	89.1	89.1
Cyprus	9.8	69.4	4.3	5.7	5.4	5.8	4.7	5.5	5.8	5.6	6.5	6.1	6.9	8.1
Czech Republic	22.6	24.1	24.7	25.1	24.7	20.4	20.1	20.4	21.0	20.8	19.4	20.2	20.2	21.0
Denmark	2,043.60	1,577.70	949.6	895.8	684.2	727.8	811.8	860.3	748.6	536.2	700.1	778.6	904.9	705.0
Estonia	132.3	113.4	100.1	87.6	100.2	98.7	95.2	93.0	79.1	64.0	67.4	67.0	71.6	73.2
Finland	171.8	170.9	145.6	162.3	177.7	132.8	138.9	139.0	136.6	151.6	157.9	166.8	168.3	177.0
France	956.4	969.1	840	831.1	795.8	728.0	666.0	643.0	680.5	666.3	729.1	723.9	660.7	688.1
Germany	302.9	271.6	330.4	335.5	340.8	251.4	235.0	255.6	258.4	240.4	254.0	242.4	278.1	272.9
Greece	184.4	194.8	198.5	211.3	208.3	198.7	203.8	191.1	174.1	169.6	172.5	164.8	170.4	187.8
Hungary	16.7	20	21.3	22.2	22.9	15.0	14.2	13.6	15.5	14.6	14.4	15.4	17.3	17.3
Ireland	419.1	329.2	327.7	265	267.5	250.0	316.2	365.0	250.1	310.1	278.9	306.2	272.4	271.5
Italy	611.5	518.7	479	489.5	467.6	390.1	410.3	383.6	376.9	333.0	313.8	325.7	339.8	340.7
Latvia	149.7	136.7	151.2	141	156	158.2	163.4	165.0	156.7	90.1	116.4	120.0	82.2	115.4
Lithuania	59.1	81	141.7	156.8	190.9	160.1	153.5	141.3	140.0	73.4	78.6	152.2	76.5	109.8
Malta	5.5	2.8	2.1	8.5	9.8	8.0	7.2	8.7	6.0	9.6	11.4	11.0	13.2	14.8
Netherlands	502.6	571	620.6	512.1	467	422.2	396.4	442.8	408.7	391.2	371.0	438.5	427.2	430.1
Poland	454.5	253.5	193.2	181.3	186.7	152.3	211.5	166.9	209.9	212.9	226.7	205.9	220.6	232.4
Portugal	274.5	196.7	226	237	260.6	231.2	205.4	230.8	223.1	206.4	204.7	188.0	194.8	190.5
Romania	69.1	17.1	13.3	15.8	16.5	12.9	13.5	9.0	8.9	10.8	11.8	12.9	15.9	18.2
Slovakia	3.6	2.3	2.6	3	3.2	1.1	0.8	0.8	0.9	1.3	1.1	1.2	1.2	2.0
Slovenia	3	3	2.6	2.5	2.5	2.0	2.2	1.5	1.5	1.7	1.5	1.7	1.8	2.0
Spain	1,392.90	1,375.70	988	1,038.60	1,023.00	1,105.6	954.0	995.5	1,072.8	1,024.4	1,130.3	1,393.8	1,195.0	1,153.3
Sweden	412.1	343.4	262.2	276.8	243.6	237.3	210.4	221.3	193.3	163.9	190.2	184.8	215.2	213.7
United Kingdom	1,003.80	900.1	841.6	792.5	790.7	767.7	777.0	806.7	793.6	832.1	820.9	966.6	913.3	894.1

* EU27 until 2016.

Source: Eurostat, European Commission. Eurostat database (http://ec.europa.eu/eurostat/data/database). Eurostat Pocketbook – Agriculture, forestry, and fishery statistics.

TABLE A2: EU EXTERNAL CATCHES IN KILO-TONNES PRODUCT WEIGHT (2000–2016)

Member State	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU28	1,425.70	1,184.70	1,144.50	1,087.70	906.49	715.46	885.82	801.98	797	891	1,300.19	878	889.07
Denmark	231.5	102.1	76.5	91.3	111.7	95.5	90.0	83.6	68.9	77.1	82.4	62.6	16.8
Estonia	20.8	35.5	34.3	32.6	14.6	10.9	12.8	14.6	10.9	12.0	10.9	11.1	11.6
Finland	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
France	116.8	116.8	116.8	116.8	108.0	92.8	91.4	89.8	80.4	89.1	111.7	109.8	104.8
Germany	29.5	35.9	35.7	82	41.7	40.6	43.9	64.5	42.7	21.8	27.2	25.0	27.7
Greece	0	11.8	11.4	10.9	2.0	1.8	1.3	1.1	1.1	0.9	0.7	0.7	0.7
Ireland	9.3	15.9	5.1	6.9	0.2	0.3	7.6	0.1	8.2	5.2	4.6	1.8	1.7
Italy	2	35.5	34.3	32.6	8.2	5.9	0.4	2.0	0.0	0.0	0.0	2.7	4.3
Latvia	3.4	47.4	45.8	43.5	15.7	15.5	12.0	10.6	6.4	9.1	42.8	17.5	41.9
Lithuania	15.2	118.5	114.5	108.8	72.4	63.2	107.7	105.2	51.3	62.1	94.0	33.2	66.4
Netherlands	16.9	44.2	59.3	73.7	21.9	6.2	103.3	31.2	7.0	5.9	97.9	12.6	38.7
Poland	58.2	23.7	22.9	21.8	3.5	2.9	3.5	4.7	29.6	17.2	52.0	51.0	52.6
Portugal	27.2	94.8	91.6	87	28.7	31.4	33.8	36.6	31.3	31.7	28.6	27.6	38.8
Spain	576	414.7	401.6	398.5	368.4	266.9	278.8	299.9	393.8	505.5	687.6	472.9	452.1
Sweden	31.3	51.4	54.3	7.8	31.6	25.6	27.8	19.0	24.9	26.4	26.7	23.8	0.7
United Kingdom	31.9	23.7	28.7	30.7	78.2	55.9	71.4	39.0	40.6	26.8	33.2	25.8	30.1

Source: Eurostat, European Commission. Eurostat database (http://ec.europa.eu/eurostat/data/database). Eurostat Pocketbook – Agriculture, forestry, and fishery statistics.

TABLE A3: TRADE BALANCE (EXPORTS MINUS IMPORTS) IN KILO-TONNES PRODUCT WEIGHT (1995–2014)

Member State	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU28*	-3,473.40	-3,512.60	-3,496.40	-3,863.10	-3,450.10	-3,714.60	-4,103.40	-4,276.00	-3,927.25	-4,367.45	-4,024.7	-4,015.5	-3,739.0	-3,643.9	-3,733.8	-3,553.4	-4,027.5
Austria	-50.9	-53.5	-50.3	-53.7	-61.4	-68.6	-67.3	-72.1	-55.2	-64.4	-63.6	-67.0	-69.2	-72.9	-73.6	-73.2	-74.7
Belgium	-164.9	-135.4	-134.7	-140.9	-146.9	-91.4	-55.4	-95.1	-198.8	-176.0	-63.6	-187.7	-181.1	-180.9	-181.1	-164.8	-161.5
Bulgaria	-15.9	-17.9	-17.8	-22.9	-23.3	-27.9	-29.5	-19.8	-31.2	-30.1	-63.6	-24.6	-22.8	-23.1	-22.4	-28.4	-29.2
Croatia	-	-	-	-	-	-	-	-	0.0	0.0	-63.6	0.0	0.0	8.2	20.6	23.7	21.7
Cyprus	-15.3	-17.5	-16.2	-16.9	-20.3	-26.9	-16	-18.4	-19.7	-15.3	-63.6	-13.9	-13.1	-10.6	-12.3	-11.9	-11.7
Czech Republic	-52.7	-54.7	-49.5	-48.3	-52.9	-54.1	-45.9	-51	-37.4	-47.5	-63.6	-31.7	-19.0	-17.7	-20.6	-34.2	-33.5
Denmark	-1.2	16.4	-180	-419.5	-158.6	-167.7	-219.9	-385.3	-158.8	-208.6	-63.6	-206.6	-179.9	-106.3	-263.4	-258.2	-397.2
Estonia	47.8	98.1	86.1	7.5	63.5	90.8	84	73.1	71.1	81.3	-63.6	78.8	63.5	54.9	51.6	54.7	58.8
Finland	-73.7	-90.1	-84.3	-82.7	-83.5	-72.4	-77	-60.9	-42.7	-40.4	-63.6	-52.2	-57.1	-56.5	-52.8	-47.6	-28.7
France	-543.3	-618.7	-623	-593.8	-648.2	-712.9	-698.7	-715.7	-700.7	-788.7	-63.6	-828.0	-754.9	-786.8	-813.1	-813.6	-815.4
Germany	-601.5	-525	-558.2	-526.1	-463	-400.1	-429.8	-510.2	-335.9	-466.7	-63.6	-411.4	-434.7	-406.8	-418.1	-364.5	-443.9
Greece	-79.8	-110.2	-122.8	-95.2	-78	-117.5	-91	-121.9	-120.1	-113.8	-63.6	-62.2	-63.9	-59.5	-81.9	-76.0	-77.2
Hungary	-41.7	-48.8	-46.8	-39.4	-30.2	-35.2	-25.1	-21.8	-20.8	-16.4	-63.6	-16.4	-15.9	-15.4	-11.3	-10.9	-10.3
Ireland	153	212.4	223.4	197.1	208.1	154.2	118.3	96.7	110.8	96.9	-63.6	112.6	232.8	204.0	198.0	186.2	147.9
Italy	-696.8	-762.2	-747.9	-792.4	-805	-833.7	-841.1	-856.9	-825.5	-849.1	-63.6	-866.0	-818.8	-832.1	-872.3	-908.7	-932.6
Latvia	61.5	85.3	81.5	73.6	65.1	75.9	76.3	71.7	66.4	53.9	-63.6	46.9	55.2	53.4	44.8	41.8	25.0
Lithuania	-43.2	-45.3	-21	-5.7	-10.1	-2.9	-1.7	4.6	-15.1	-2.6	-63.6	-9.9	-19.1	-23.7	-27.7	-17.5	-21.5
Malta	-15	-20.3	-14.2	-27.6	-18.6	-15.6	-25.2	-35.5	-19.2	-32.9	-63.6	-12.6	-20.6	-26.4	-22.4	-21.8	-45.0
Netherlands	12.4	30.1	42.7	120.8	313	260	194.6	103.1	93.6	-234.9	-63.6	-54.9	-55.6	-30.3	110.7	235.6	248.4
Poland	-182.6	-168	-135.2	-142.6	-150.8	-154	-145.7	-116.2	-161.8	-119.7	-63.6	-115.1	-122.4	-132.6	-155.6	-76.9	-103.0
Portugal	-239.9	-249.9	-237.9	-254.3	-231.6	-968.8	-276	-290	-242.2	-296.4	-63.6	-211.7	-198.5	-198.2	-193.2	-196.1	-250.8
Romania	-55.1	-64.6	-77.1	-73.4	-84.5	-96.3	-98.8	-86.3	-101.9	-98.4	-63.6	-66.2	-73.4	-73.6	-86.1	-92.3	-93.8
Slovakia	-21	-21.6	-21.2	-20.1	-26.3	-25.4	-23.8	-23.2	-17.4	-12.8	-63.6	-30.3	-46.4	-19.6	-20.4	-19.9	-12.7
Slovenia	-11.6	-13.3	-12.2	-11.4	-12	-11.8	-13.6	-13.1	-14.0	-14.0	-63.6	-14.3	-13.4	-13.5	-13.6	-13.3	-13.7
Spain	-602.5	-651.9	-666.6	-772.5	-723.2	-680.9	-759.3	-764.4	-633.2	-515.7	-63.6	-542.6	-471.0	-480.9	-483.2	-537.8	-590.3
Sweden	98.5	73.8	42.2	22.2	23.2	23.3	67.8	1.9	4.4	15.7	-63.6	-6.4	-37.1	-17.0	-37.1	-7.5	-3.7
United Kingdom	-472	-533.2	-471.3	-396.8	-414.9	-433.8	-506.7	-405.3	-510.6	-457.2	-63.6	-411.6	-391.7	-368.6	-285.6	-308.4	-366.5

Source: European Market Observatory for Fisheries and Aquaculture Products database.

Retrieved from: http://www.eumofa.eu/ad-hoc-queries3

ENDNOTES

1 FAO. (2014). The State of World Fisheries and Aquaculture. Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations, Rome. (2014). Retrieved from http://www.fao.org/3/a-i3720e.pdf

2 European Commission. (2015). Communication from the Commission to the Council concerning a consultation Fishing Opportunities for 2016. Brussels, Belgium. Retrieved from http://ec.europa.eu/dgs/maritimeaffairs_fisheries/consultations/fishing-opportunities-2016/doc/com_2015_239_en.pdf

3 Scientific, Technical and Economic Committee for Fisheries (STECF) - Monitoring the performance of the Common Fisheries Policy (STECF-17-04). Publications Office of the European Union, Luxembourg; EUR 28359 EN; doi:10.2760/491411. Retrieved from: https://stecf.jrc.ec.europa.eu/documents/43805/55543/STECF+17-04+-+Monitoring+the+CFP.pdf

4 European Environment Agency. (2015). Status of marine fish stocks. Retrieved from https://www.eea.europa.eu/downloads/ff1a173f76ea4b8ead5081a95659a728/1507798802/assessment.pdf

5 FAO. (2016). The State of World Fisheries and Aquaculture. Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations, Rome. Retrieved from http://www.fao.org/3/a-i5555e.pdf

6 FAO. (2009). The State of World Fisheries and Aquaculture. Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations, Rome. Retrieved from www.fao.org/docrep/011/i0250e/i0250e00.htm

7 World Bank. (2008). Sunken Billions: The Economic Justification for Fisheries Reform. Retrieved from web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTARD/0,,contentMDK:21930578~pagePK:148956~piPK:216618~theSitePK:336682,00.html

8 European Commission. (2015). Scientific, Technical and Economic Committee for Fisheries (STECF-16-05). Monitoring the performance of the Common Fisheries Policy. Retrieved from https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/scientific-technical-and-economic-committee-fisheries-stecf-monitoring-performance-common-1

9 NEF estimates derived from Eurostat fisheries statistic database. (Landings of all member states in fishing areas that overlap with EU member state EEZ).

10 Ibid.

11 European Market Observatory for Fisheries and Aquaculture Products. (2017). EU Consumer Habits Regarding Fishery and Aquaculture Products. Retrieved from https://www.eumofa.eu/documents/20178/84590/EU+consumer+habits_final+report+.pdf/5c61348d-a69c-449e-a606-f5615a3a7e4c

12 Ibid.

13 NEF calculations using catch and trade data from Eurostat database. Retrieved from epp.eurostat.ec.europa.eu/portal/page/portal/fisheries/data/database

14 FAO. (2007). Future Prospects for Fish and Fishery Products. 4. Fish consumption in the European Union in 2015 and 2030. Retrieved from ftp.fao.org/docrep/fao/010/ah947e/ah947e.pdf

15 FAO Statistics Division. (updated: 29 June 2013). Food supply: Livestock and fish primary equivalent. Retrieved from http://faostat.fao.org/site/610/default.aspx#ancor

16 World Health Organization. (2013). Global and regional food consumption patterns and trends: Availability and consumption of fish. Retrieved from www.who.int/nutrition/topics/3_foodconsumption/en/index5.html

17 Jennings, S., Stentiford, G.D., Leocadio A.M., et al. (2016). Aquatic food security: insights into challenges and solutions from an analysis of interactions between fisheries, aquaculture, food safety, human health, fish and human welfare, economy and environment. *Fish and Fisheries, 17, 893-938*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/faf.12152/epdf

18 UN Secretariat – Department of Economic and Social Affairs. (2009). 2008 Revision of World Population Prospects. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat. Retrieved from esa.un.org/unpp/

19 NHS Choices. (2015). Fish and shellfish. National Health Service. Retrieved from https://www.nhs.uk/Livewell/Goodfood/Pages/fish-shellfish.aspx

20 Common Fisheries Policy. (2016). CFP facts and figures. 85,154 vessels in 2015.

21 European Parliament. (2017). New rules for managing the EU external fishing fleet (2017) Retrieved from http://www.europarl.europa.eu/RegData/etudes/BRIE/2017/608651/EPRS_BRI(2017)608651_EN.pdf

22 Eurostat, European Commission. (2016). Eurostat Pocketbook – Agriculture, forestry and fishery statistics. 2016 Edition. Eurostat database. Retrieved from epp.eurostat.ec.europa.eu/portal/page/portal/fisheries/data/database

23 Marine Traffic. (2018). Annelies Ilena, the world's largest freezing trawler, is currently Dutch owned. Retrieved from http://www.marinetraffic.com/ais/shipdetails.aspx?mmsi=244563000

24 European Commission. (2008). Study on the European External Fleet. Contract FISH/2006/02 final report. Retrieved from ec.europa.eu/fisheries/publications/studies/external_fleet_2008_en.pdf

25 European Commission. (n.d.) 20% taken on the high seas with a further 8% taken under fishing agreements. Retrieved from https://ec.europa.eu/fisheries/cfp/international_en (11 April 2018).

26 European Commission. (2013). Scientific, Technical and Economic Committee for Fisheries (STECF) – The Economic Performance of the EU Aquaculture Sector - 2013 exercise (STECF-13-03). 2013. Publications Office of the European Union, Luxembourg, EUR 25975 EN, JRC 81620, 237 pp. Retrieved from http://stecf.jrc.ec.europa.eu/documents/43805/410684/2013-04_STECF+13-03+-+EU+Aquaculture+sector_JRC81620.pdf

27 NEF's estimates derived from Eurostat latest fisheries statistic database (data for 2016).

28 EMOFA. (n.d.). European Market Observatory for Fisheries and Aquaculture Products database. Retrieved from http://www.eumofa.eu/ad-hoc-queries3 (11 April 2018).

29 Apparent consumption = catches + imports – exports.

30 FAO. (n.d.). Both global capture production and global aquaculture production exclude aquatic plants and miscellaneous aquatic animals (subgroup under species). Retrieved from http://www.fao.org/figis/servlet/TabSelector (11 April 2018).

31 FAO. (2016). The State of World Fisheries and Aquaculture. Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations, Rome. Retrieved from http://www.fao.org/3/a-i5555e.pdf

32 NEF estimate. Aquaculture as a percentage of total fishery (78.8% of landings) & aquaculture (not including plants and miscellaneous aquatic animals) production for human consumption.

33 Ibid.

34 FAO. (2017). The Global Aquaculture Summit 2017. Retrieved from http://www.fao.org/in-action/globefish/news-events/details-news/en/c/897130/

35 FAO. (2011). Fisheries and Aquaculture Technical Paper. Demand and Supply of Feed Ingredients for Farmed Fish and Crustaceans. Retrieved from http://www.fao.org/docrep/015/ba0002e/ba0002e.pdf

36 Eurostat statistics, European Communities. (1990–2016). Aquaculture production in tonnes and value. Retrieved from epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tag00075&plugin=1

37 NEF estimate based on Eurostat data.

38 Eurostat. (n.d.). Production from aquaculture excluding hatcheries and nurseries (form 2008 onwards) (fish_aq2a). Retrieved from http://ec.europa.eu/eurostat/data/database (11 April 2018).

39 Ibid

40 This can be concluded from: James, M.A. & Slaski, R. J. (2009). A strategic review of the potential for aquaculture to contribute to the future security of food and non-food products and services in the UK and specifically England. Report commissioned by the Department for the Environment and Rural Affairs, 121pp.; and Scientific, Technical and Economic Committee for Fisheries (STECF) – Summary of the 2013 Economic Performance Report on the EU Aquaculture sector (STECF-13-30). 2013. Publications Office of the European Union, Luxembourg, EUR XXXX EN, JRC XXX, 56 pp.

41 FAO. (2016). The State of World Fisheries and Aquaculture, FAO Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations, Rome. Retrieved from http://www.fao.org/3/a-i5555e.pdf

42 Seafish.org. (2016). Seafish - Fishmeal and fish oil facts and figures. December 2016. Retrieved from http://www.seafish.org/media/publications/SeafishFishmealandFishOilFactsandFigures_201612.pdf

43 FAO. (2011). Fisheries and Aquaculture Technical Paper. Demand and Supply of Feed Ingredients for Farmed Fish and Crustaceans. FAO, Rome. Retrieved from http://www.fao.org/docrep/015/ba0002e/ba0002e.pdf

44 FAO. (2016). The State of the Worlds Fisheries and Aquaculture (2016). Retrieved from http://www.fao.org/3/a-i5555e.pdf

45 FAO. (2013). The State of World Fisheries and Aquaculture 2013, FAO Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations, Rome. Retrieved from http://www.fao.org/docrep/016/i2727e/i2727e.pdf

46 Ibid.

47 FAO. (2016). The State of the Worlds Fisheries and Aquaculture. Retrieved from http://www.fao.org/3/a-i5555e.pdf

48 European Commission. (n.d.). Facts, figures, and farming: Aquaculture. Retrieved from http://ec.europa.eu/fisheries/cfp/aquaculture/facts/index_en.htm (11 April 2018).

49 James, M.A. & Slaski, R.J. (2009). *A Strategic Review of the Potential for Aquaculture to Contribute to the Future Security of Food and Non-food Products and Services in the UK and Specifically England*. Report commissioned by Department for Environment, Food and Rural Affairs, UK.

50 European Commission. (n.d.). Facts, figures, and farming: Aquaculture. Retrieved from http://ec.europa.eu/fisheries/cfp/aquaculture/facts/index_en.htm (11 April 2018).

51 Bell, J. & Waagbo, R. (2008). Safe and nutritious aquaculture produce: benefits and risks of alternative sustainable aquafeeds. In: *Aquaculture in the Ecosystem*. Springer, Dordrecht, 2008. 185-225.

52 German Advisory Council on Global Change [WBGU]. (2013). *World in Transition – Governing the Marine Heritage*. Berlin: WBGU.

53 Seafish. (2016). Fishmeal and fish oil facts and figures. December 2016. Retrieved from http://www.seafish.org/media/publications/SeafishFishmealandFishOilFactsandFigures_201612.pdf

54 Wijkström, U.N. (2009). The use of wild fish as aquaculture feed and its effects on income and food for the poor and the undernourished. In M.R. Hasan and M. Halwart (eds). *Fish as Feed Inputs for Aquaculture: Practices, Sustainability and Implications*. Fisheries and Aquaculture Technical Paper. No. 518. Rome: FAO. pp. 371–407.

55 Keijzer, N. (2011). European Centre for Development Policy Management. Discussion Paper No. 120. Fishing in troubled waters? Retrieved from http://www.ecdpm.org/Web_ECDPM/Web/Content/Download.nsf/0/56F5D1AF9CF3F223C125790C00532733/$FILE/11-120_final%20jd.pdf

56 Naylor, R. L., Hardy, R. W., Bureau, D. P., et al. (2009). Feeding aquaculture in an era of finite resources. *Proceedings of the National Academy of Sciences 106 (36)*. Retrieved from http://www.pnas.org/content/106/36/15103.full

57 Goldberg, R.J., Elliot, M.S. & Naylor, R.L. (2001). *Marine Aquaculture in the United States: Environmental Impacts and Policy Options*. Arlington, Virginia: Pew Oceans Commission.

58 Scottish Executive Central Research Unit. (2002). *Review and Synthesis of the Environmental Impacts of Aquaculture*. The Scottish Association for Marine Science and Napier University. Scottish Executive Central Research Unit. Edinburgh: The Stationery Office.

59 Pérez, J.E., Alfonsi, C., Nirchio, M., et al. (2003). The introduction of exotic species in aquaculture: A solution or part of the problem? *Interciencia,28(4): 234–238*.

60 Anderson, L. & Greenpeace Genetic Engineering Campaign. (2005). *Genetically Engineered Fish – New Threats to the Environment*. Amsterdam: Greenpeace. Retrieved from www.greenpeace.org/usa/press-center/reports4/genetically-engineered-fish

61 Naylor, R., Hindar, K., Fleming, I.A., et al. (2005). Fugitive salmon: Assessing the risks of escaped fish from net-pen aquaculture. *BioScience,55(5): 427*.

62 Greenpeace and Gene Watch UK. (2007). *GM Contamination Register*. Retrieved from www.gmcontaminationregister.org

63 Marine Biological Association. (2008). Species and Habitats: Sensitivity assessment rationale. Marine Life Information Network (MarLIN) website. Plymouth: Marine Biological Association of the UK.

64 Tetreault, I. (2006). *Seafood Watch Seafood Report: Farmed Tilapia*. Monterey: Monterey Bay Aquarium. Retrieved from www.montereybayaquarium.org

65 Brown, P.B. & Smith, K. (2007). Soybean use – aquaculture (fact sheet) Urbandale: Soybean Meal Information Centre. Retrieved from www.soymeal.org/pdf/aqua.pdf

66 Deutsch, L., Gräslund, S., Folke, C., et al. (2007). Feeding aquaculture growth through globalization: Exploitation of marine ecosystems for fishmeal. *Global Environmental Change* 17: 238–49.

67 Huntington, T.C. (2004). *Feeding the Fish: Sustainable fish feed and Scottish aquaculture*. Report to the Joint Marine Programme (Scottish Wildlife Trust and WWF Scotland) and RSPB Scotland. Hampshire: Poseiden Aquatic Resource Management.

68 Ng, W.K. (2003). The potential use of palm kernel meal in aquaculture feeds *Aquaculture Asia,8(1): 38–39*.

69 This relates only to EU waters, but is not distinguished by member state EEZs. Ideally, we would have liked to restrict domestic production to fish catches by a country within its own EEZ but under the Common Fisheries Policy, fleets are allowed to fish in other EU States' waters without registering the origin of the catch. The consequences of this will be discussed in Section 3.1 Caveats with data and methodology.

70 Official data sources on catches represent recorded landings. Since landings do not include discards, bycatch, illegal, unreported or unregulated (IUU) fishing, official catch data is in effect a large underestimation of the 'real catch' that takes place.

71 Eurostat statistics. European Communities. (n.d.) Catches - north-east Atlantic (from 2000 onwards (fish_ca_alt21) Retrieved from http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=fish_ca_atl27&lang=en

72 'Total catches' includes aquaculture production and wild catches by the EU and all member states, available through Eurostat. From this figure, for each country, the estimated external catch (derived in (i) is subtracted. Trade data includes aquaculture trade as well as wild catch, and is in all fishery products, regardless of processing method.

73 Ibid.

74 European Market Observatory for Fisheries and Aquaculture Products database. *Retrieved from: http://www.eumofa.eu/ad-hoc-queries3*

75 World Trade Organisation on Rule of Trade: technical information. Retrieved from: www.wto.org/english/tratop_e/roi_e/roi_info_e.htm

76 European Commission. (2007). Eurostat Pocketbook 2007, Fisheries Statistics data 1990–2006. Eurostat statistics © European Communities. Cat. No. KS-DW-07-001-EN-N. Retrieved from ec.europa.eu/fisheries/publications/fishyearbook2007.pdf

77 EMOFA. (n.d.). European Market Observatory for Fisheries and Aquaculture Products trade database (ad-hoc queries). Retrieved from http://www.eumofa.eu/ad-hoc-queries1

78 European Commission. (n.d.). Facts, figures, and farming: Aquaculture. Retrieved from http://ec.europa.eu/fisheries/cfp/aquaculture/facts/index_en.htm (11 April 2018).

(11 April 2018).

79 Carpenter, G. & Esteban, A. (2015). *Managing EU fisheries in the public interest*. London: New Economics Foundation. Retrieved from http://www.neweconomics.org/publications/entry/managing-eu-fisheries-in-the-public-interest

80 European Commission. (2017). Scientific, Technical and Economic Committee for Fisheries (STECF) - Monitoring the performance of the Common Fisheries Policy (STECF-17-04). Retrieved from http://publications.jrc.ec.europa.eu/repository/bitstream/JRC106498/lb-ax-17-004-en-n.pdf

81 Ibid.

82 Ibid.

83 FAO. (2016). The State of World Fisheries and Aquaculture 2016. Contributing to food security and nutrition for all. Rome. 200 pp

84 Simms, A., Moran, D. & Chowla, P. (2007). *The UK Interdependence Report* London: NEF. Retrieved from www.neweconomics.org/publications/uk-interdependence-report

85 FAO. (2003). *Report of the Expert Consultation on International Fish Trade and Fish Security*. FAO Fisheries Report No. 708. Rome: Food and Agriculture Organization of the United Nations. Retrieved from ftp.fao.org/docrep/fao/006/y4961e/Y4961E00.pdf

86 FAO Newsroom. (2016). Global per capita fish consumption rises above 20 kilograms a year. Retrieved from http://www.fao.org/news/story/en/item/421871/icode/

87 Ibid.

88 FAO Newsroom. (2006). Fish exports by developing countries help combat hunger, but better management needed. Retrieved from www.fao.org/newsroom/en/news/2006/1000301/index.html

89 FAO. (2009). The State of Food and Aquaculture 2002. Food and Agriculture Organization of the United Nations, Rome. Retrieved from www.fao.org/DOCREP/004/y6000e/y6000e05.htm#P121_21299

90 World Resources Institute. (1994). *World Resources 1994–95*. New York: Oxford University Press, pp. 352–353.

91 Kent, G. (1997). Fisheries, food security and the poor. *Food Policy, 22(5), 393–404*. Retrieved from www.fao.org/newsroom/en/news/2006/1000301/index.html

92 Schorr, D. (2004). *Healthy Fisheries, Sustainable Trade: Crafting New Rules on Fishing Subsidies in the World Trade Organisation*. Godalming: WWF. Retrieved from www.wto.org/english/forums_e/ngo_e/posp43_wwf_e.pdf

93 Bradshaw, C.J.A., Giam, X. & Sodhi, N.S. (2010). Evaluating the relative environmental impact of countries *PLoS ONE,5(5): e10440*. doi:10.1371/journal.pone.0010440.

94 Holland, D.S. (2007). Managing environmental impacts of fishing: Input controls versus outcome-oriented approaches. *International Journal of Global Environmental Issues, 7(2-3), 255–272*.

95 Starkey, D.J., Holm, P. & Barnard, M. (2008).*Oceans Past: Management Insights from the History of Marine Animal Populations*. Sterling, USA: Earthscan.

96 Barrett, J., Beukens, R., Simpson, I., et al. (2000). What was the Viking Age and when did it happen? A View from Orkney. *Norwegian Archaeological Review,33(1)*.

97 Thurstan, R.H., Brockington, S. & Roberts, C.M. (2010). The effects of 118 years of industrial fishing on UK bottom trawl fisheries. *Nature Communications, 1(2):15*.

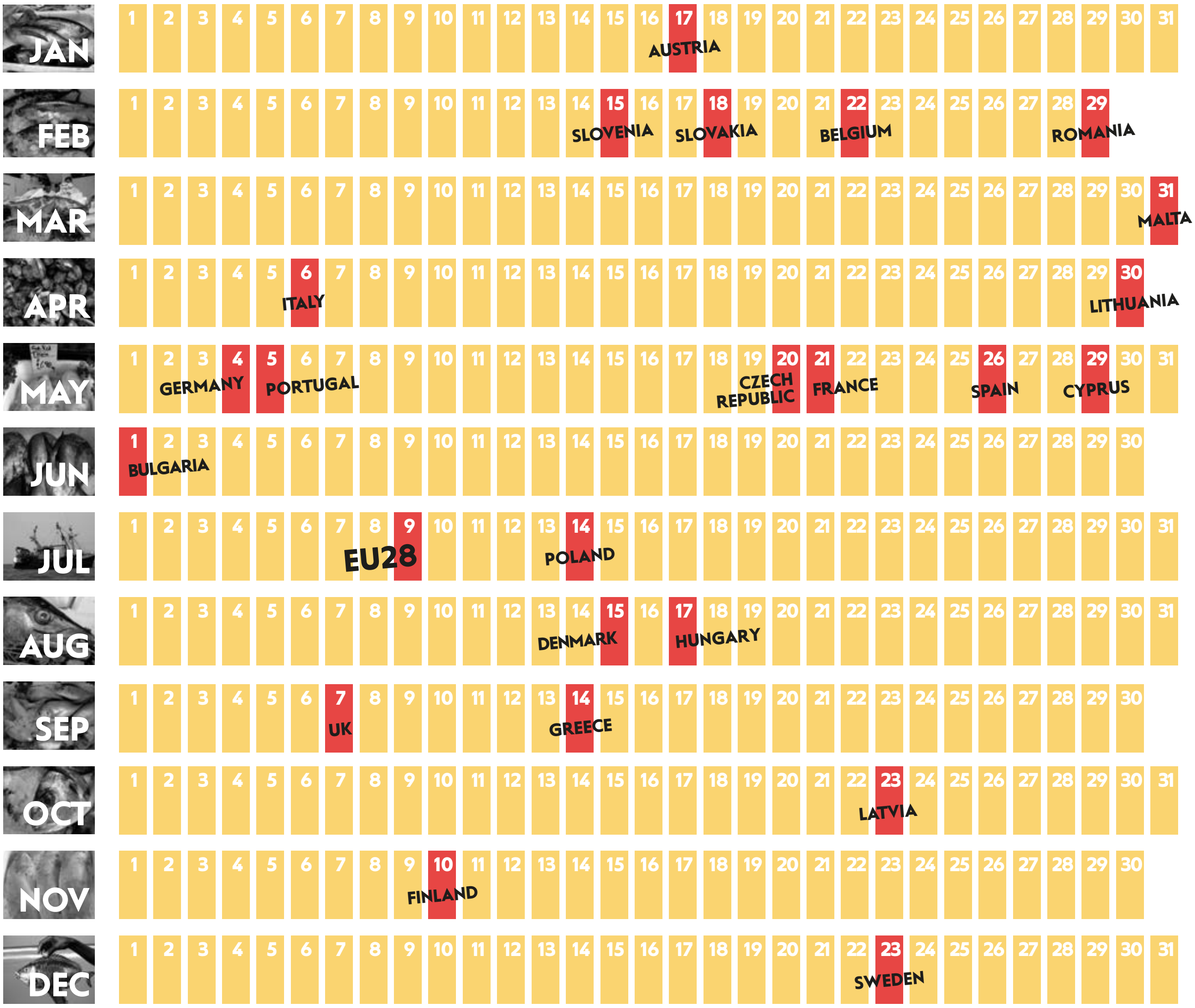
98 Council Regulation (EC) No. 2371/2002 of 20 December 2002 on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy [see amending act(s)]

99 Carpenter, G. & Kleinjans, R. (2017). Who gets to fish? The allocation of fishing opportunities in EU Member States. London: New Economics Foundation. Retrieved from http://neweconomics.org/2017/03/who-gets-to-fish/

100 European Parliament. (2013). Directorate-General for Internal Policies Policy Department B: Structural and Cohesion Policies Fisheries - Data-Deficient Fisheries in Eu Waters (2013). Retrieved from http://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/495865/IPOL-PECH_ET(2013)495865_EN.pdf

101 European Commission. (2017). Communication from the Commission on the State of Play of the Common Fisheries Policy and Consultation on the Fishing Opportunities for 2018. COM (2017) 368. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD:2017:256:FIN

FISH DEPENDENCE DAY CALENDAR 2016



WWW.NEWECONOMICS.ORG
info@neweconomics.org
+44 (0)20 7820 6300 @NEF
Registered charity number 1055254

WRITTEN BY:

2018 update written by:
Harry Owen and Griffin Carpenter

Original version written by:
Aniol Esteban and Rupert Crilly

COVER IMAGE:

iStock.com/epicurean