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European Fisheries

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Fish Dependence – 2012 Update

The increasing reliance of the EU on fish from elsewhere

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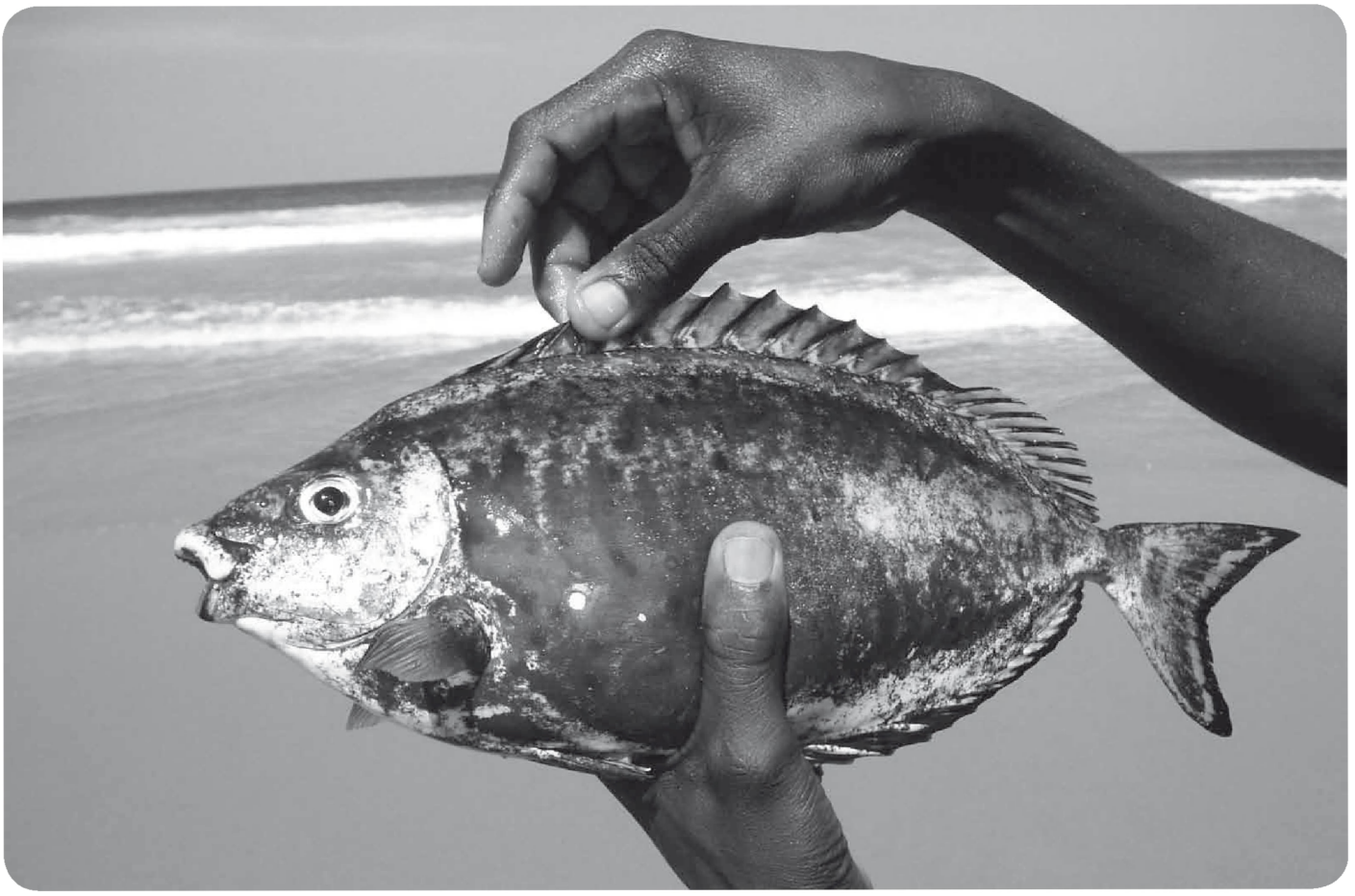
OCEAN2012 is an alliance of organisations dedicated to transforming European Fisheries Policy to stop overfishing, end destructive fishing practices and deliver fair and equitable use of healthy fish stocks.

OCEAN2012 was initiated, and is co-ordinated, by the Pew Environment Group, the conservation arm of The Pew Charitable Trusts, a non-governmental organisation working to end overfishing in the world´s oceans.

The steering group of OCEAN2012 consists of the Coalition for Fair Fisheries Arrangements, Ecologistas en Acción, The Fisheries Secretariat, **nef** (new economics foundation), the Pew Environment Group and Seas At Risk.



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Preface

This is an update of the *Fish Dependence* report published in 2010 and updated in 2011. It includes figures for self-sufficiency levels and fish dependence days in 2012 for all EU27 member states.

This updated report includes:

- a comparison between the 2012, 2011, and 2010 results, illustrating the extent to which the EU is dependent on fish from other regions;
- new data on catches made in non-EU waters by Denmark and Sweden; and
- estimates of how levels of self-sufficiency would vary if 43 European stocks were restored to their maximum sustainable yield (MSY).

Due to the lag in data reporting, the 2010 and 2011 reports were based on 2006 and 2007 data. However, a shortening of this lag has allowed this year's report to use 2009 data instead of 2008 data. This applies to all countries except Germany.

The updated information is explained in the relevant sections. The most significant updated information in this report concerns the methods we used to address the limited availability of information on catches in non-EU waters by EU member states.

In the coming years, it is our intention to provide an annual update and so we would welcome suggestions on how to improve the content and look of this work.

Executive summary

European Union (EU) fish stocks are in an unprecedentedly poor state yet fish consumption throughout Europe remains high. The EU has been able to maintain and even expand its levels of consumption by sourcing fish from other regions of the world, both through the catches of its distant-water fleet and imports. This report highlights Europe's reliance on fish products originating from external waters for its fish supplies, and provides pointers towards a more sustainable future for dwindling global fish stocks.

nef (the new economics foundation) has estimated 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 fish from their own waters. We have expressed the degree of self-sufficiency in the form of a 'fish dependence day'. Based on a member state's or a region's total annual fish consumption, the fish dependence day is the date in the calendar when it will start to depend on fish from elsewhere because its own supplies have been depleted.

For the EU as a whole, fish dependence day is now 6 July, indicating that almost one-half of fish consumed in the EU is sourced from non-EU waters. Last year, it was 2 July; the year before, it was 9 July. Compared to 2011, this is positive news as the EU marginally reduces its reliance on fish from non-EU waters by four days. Whilst it is still too early to say, we hope that the results mark a change in the trend and a sign that overfishing is diminishing in EU waters. All else being equal, this would manifest itself as improving self-sufficiency. Currently, however, the level of EU self-sufficiency is too low and the degree of overexploitation in EU waters too high. From 2000 to last year's assessment, the EU's fish dependence day had fallen earlier and earlier in the year, and is still three weeks earlier than in 2000.

Restoring 43 fish stocks (out of more than 150 EU stocks) to their maximum sustainable yield would increase the EU's self-sufficiency levels by more than two months (69 days), moving its fish dependence day to 14 September. If directed only to human food consumption, rebuilding stocks could provide for the annual consumption of 90 million EU27 citizens.

Member states with little or no access to EU waters, such as Austria, Slovakia, and Slovenia, evidently become fish dependent early in the year. More surprising, however, is that many member states with greater access to EU waters are also fish dependent early in the year. These include Spain, Portugal, Italy, Germany, and France – all of whom source more than one-half of their fish from non-EU waters.

Our calculations include domestic aquaculture (fish farming) in EU countries, a growing enterprise that has served to marginally offset the overexploitation of EU fish stocks but has not itself been responsible for reversing the trend of increasing fish dependence that has taken place over the past decade. Nonetheless, without aquaculture, the EU's fish dependence would be 11 June; for big aquaculture producers such as Spain, France, Italy, and Greece, their respective national fish dependence day would occur more than one month earlier. Similarly, restoring EU fish stocks would result in significant gains in self-sufficiency levels.

In a context of finite resources and growing populations, the current EU model is unsustainable. The EU's increasing fish dependence has implications for the sustainability of fish stocks globally, which are also overfished, and for the communities that depend on them.

The main message of this report is that rising fish consumption in a context of overexploited stocks is environmentally unviable and socially unfair. The EU has highly productive waters that have the potential to sustain a long-term and stable supply of fish, jobs, and related social and economic benefits, but only if its fish resources are managed responsibly.

The reform of the EU's Common Fisheries Policy (CFP) offers a perfect opportunity to put the structures in place to turn this situation around. To transform the management of the EU's marine resources, the new CFP needs to provide a policy framework that will restore marine ecosystems to healthy levels and deliver a fair allocation of resources. At a minimum this will require the following actions.

- Set a clear target to restore EU fish stocks to MSY levels.
- Reduce capacity in line with the available resources; improve data collection, transparency, and reporting; and prioritise scientific advice in determining catch quotas.
- Create a context in which being profitable is aligned with doing the right thing, by making access to resources conditional on social and environmental criteria.
- Promote responsible consumption among all EU consumers, and implement measures that are conducive to more responsible fishing outside EU waters.
- Use public funds to deliver social and environmental goods by investing in environmentally constructive measures, research, and stakeholder involvement, as well as enforcing sustainable quotas and practices.

In order for this to happen, policymakers need to look beyond the short-term costs that could result from reform and prioritise the long-term benefits that healthy marine resources will provide.

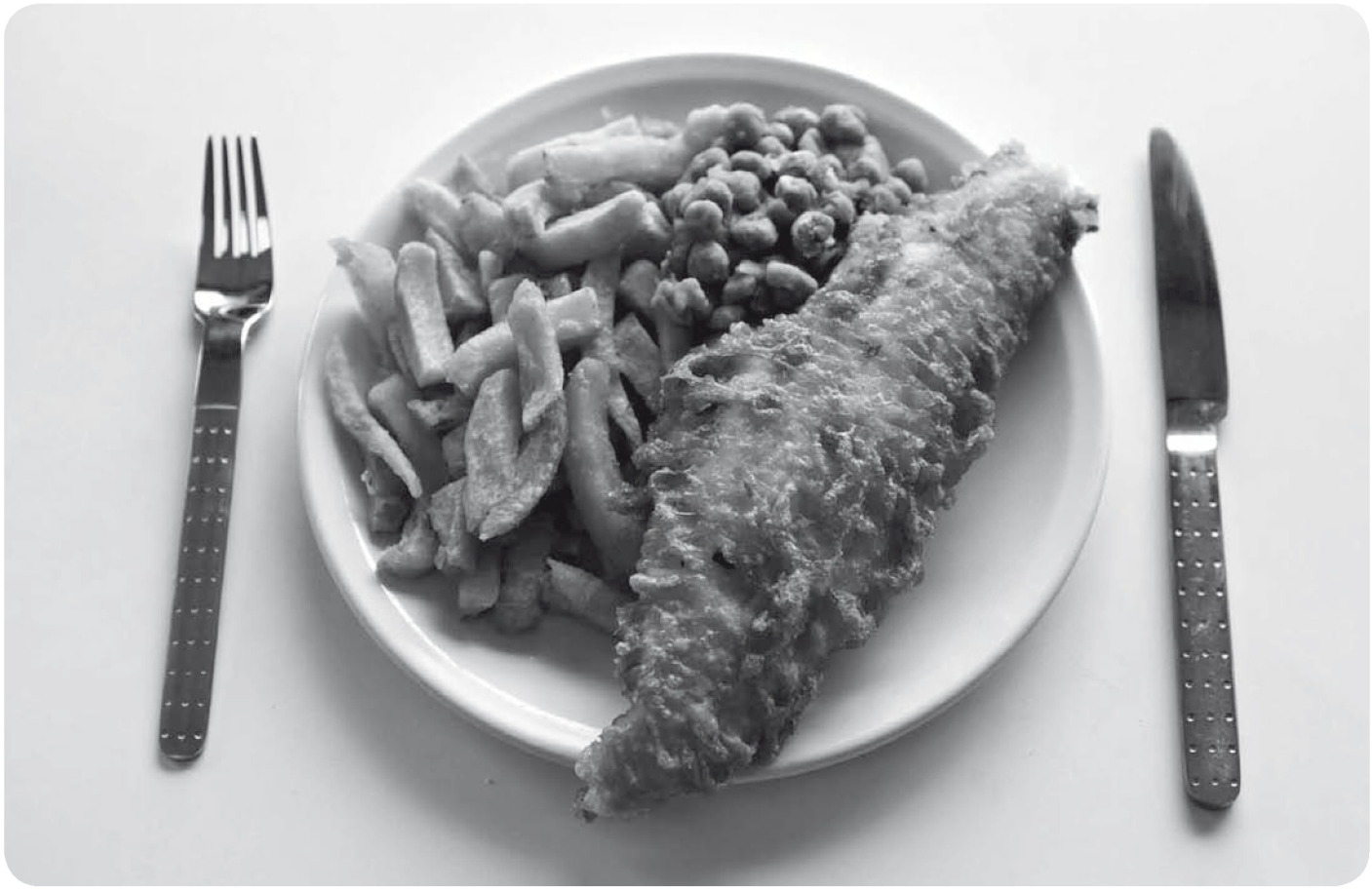


Photo: Corey Arnold

Introduction

Fisheries play a pivotal role in human health and wellbeing: fish are crucial to the global food supply, providing one-fifth of animal protein consumption worldwide. 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.

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 poor fisheries management and overexploitation have reduced the size of fish stocks and the biocapacity of its waters. The EU currently consumes much more than its waters produce and depends enormously on fish from other countries to satisfy its demand.

In a context of finite resources and a growing population, the EU model is neither sustainable nor replicable on a global scale. Unsustainable levels of fish consumption are putting pressure on EU waters and beyond. Having overfished its own stocks, the EU is now increasing its dependence on non-EU fish to meet demand (i.e. its fish dependence). This is reducing the long-term productivity of marine ecosystems elsewhere and is also undermining the potential of poorer regions to meet their own 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 approaches domestic demand) and decrease its fish dependence through the restoration of its own fish stocks and more responsible consumption. While fish dependence is not in itself a measure of sustainable fishing, the reduction of fish dependence implicitly requires moving towards more sustainable fisheries management.

Arguments in favour of self-sufficiency are often misrepresented as arguments against trade and the needs of industry and the market, but that is not the aim of this report. International trade is extremely beneficial and has massive potential to improve people's lives across the world. However, it needs to take place in a fair way and within the limits of the ecosystem. The continuing reliance of the EU on fish imports is not due to a lack of natural endowment but rather the result of gross mismanagement of its own fish resources.

In the following section we give context to our research. We summarise current trends with respect to the state of fish stocks, levels of fish consumption, and EU strategies to source fish from abroad. If fish stocks were restored (to MSY), we look at how this would affect self-sufficiency. 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.

Background

EU fish stocks are unhealthy, producing far less than they could if they were managed in a sustainable way. Indeed, 72 per cent of EU-assessed stocks are estimated to be overexploited and more than 20 per cent beyond safe biological limits.[1]

Declining fish stocks

EU catches have steadily declined since 1993 at an average rate of 2 per cent per year; almost all demersal stocks have declined in recent years.[2] The total landings from EU fisheries in the northeast Atlantic Ocean and the Mediterranean Sea have decreased by 30 per cent over the past decade.[3]

On a global level, the United Nations Food and Agriculture Organization (FAO) reports that 32 per cent of stocks are overexploited or depleted, with another 53 per cent fully exploited.[4] Only 15 per cent of stocks monitored by FAO are considered able to produce more than the current level of catches; the lowest level since 1970.[5] Around the world, 27 per cent of fisheries were judged to have collapsed by 2003, meaning that their annual harvests had fallen to less than 90 per cent of their historical maximum yields.[6] If the current trend continues, some scientists have predicted that 100 per cent of commercial stocks could collapse by 2048.[7]

Overexploitation of natural resources is synonymous with lost 'rents', the maximum economic yield that could be derived from fisheries compared to current revenues.[8] The World Bank has estimated the annual cost of global overfishing at US$50 billion, totalling US$2 trillion over the past three decades.[9] The costs of overfishing in 43 European fish stocks across the North Atlantic have recently been estimated at €3.2 billion per year (in 2010 terms);[10] restoring these stocks would supply enough fish to meet the current annual demand for 155 million EU citizens,[11] therefore reducing the need to source fish from other countries.

Rising levels of consumption

While the productivity of EU fish stocks has decreased, fish consumption in the EU continues to increase and remains at levels beyond what EU waters are able to produce. In 2008, the total catch in EU waters amounted to more than 4 million tonnes,[12] which is about 38 per cent of the EU's total fish consumption (over 10.7 million tonnes).[13] On average, each European citizen consumes 22.1 kg of seafood products per year (as of 2007),[14] which is 29.2 per cent above the annual global average of 17.1 kg per capita. Portugal (with 61.6 kg per capita), Spain (44.8 kg), Lithuania (37.6 kg), France (34.2 kg), and Finland (31.70 kg) have the highest consumption rates in the EU.[15] Together, these five countries alone account for 37 per cent of EU fish consumption.[16] The FAO predicts that per capita fish consumption for EU15 countries will continue to increase by 17 per cent from 1989 to 2030, while for EU27 + Norway the FAO predicts it will rise by 9 per cent over the same period.[17]

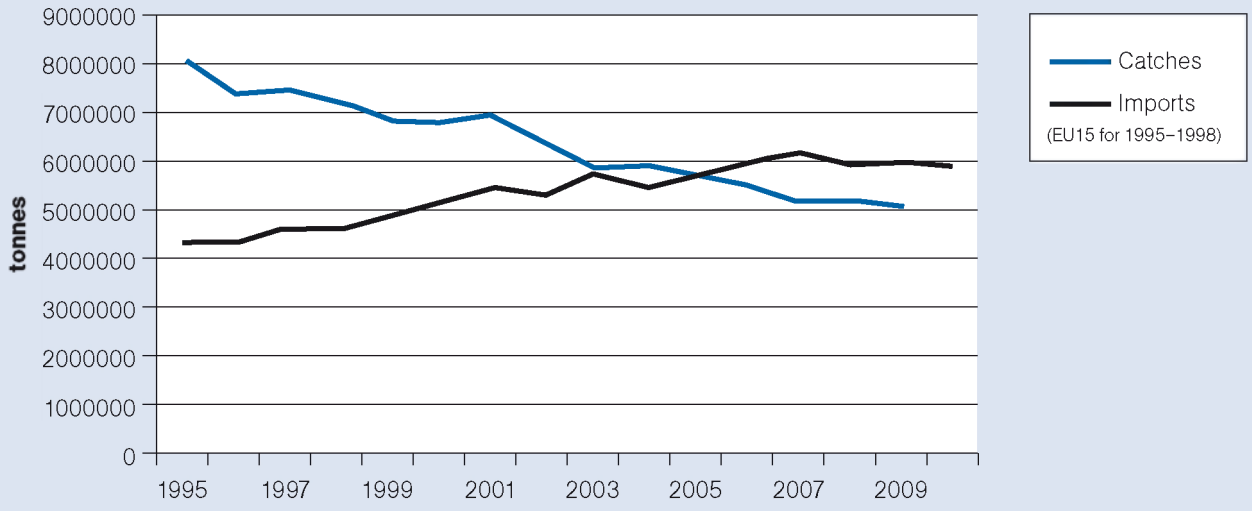
In the EU only two countries maintained their levels of fish consumption from 1961 to 2005: Portugal, which has continued to consume the most fish per capita in the EU27; and the United Kingdom (UK), which ranked 10th in the EU27 in 2005.[18] All other countries increased their consumption. For example, France, Germany, Spain, Finland, and the Netherlands, among others, increased their consumption by between 50 and 100 per cent. Others increased their consumption even faster, for example Italy (up to 108 per cent), Ireland (217 per cent) and Cyprus (304 per cent). Not all of these increases are direct human consumption but may be used in aquaculture (where inputs tend to outweigh fish production outputs, particularly for carnivorous species, such as salmon).

Table 1: Fish consumption per capita for EU member states

(kg/capita/year)	*2007*
Portugal	61.6
Spain	44.8
Lithuania	37.6
France	34.2
Finland	31.7
Malta	31.7
Sweden	28.5
Luxembourg	28.0
Cyprus	27.3
Italy	25.4
Belgium	24.2
Denmark	22.3
Ireland	21.4
Greece	20.9
United Kingdom	20.3
Netherlands	19.0
Estonia	16.4
Austria	15.4
Germany (including former GDR)	15.3
Latvia	12.6
Poland	10.9
Slovenia	10.2
Czech Republic	9.9
Slovakia	8.1
Romania	5.3
Hungary	5.1
Bulgaria	4.2
Europe	**22.1**
World	**17.1**

Source: Fishery and Aquaculture statistics. FAO yearbook 2008
http://www.fao.org/docrep/013/i1890t/i1890t.pdf

Figure 1: EU27 catches (landings) and imports, 1995–2009



Source: Eurostat [34]

At the global level, fish consumption has grown at a rate of 3.6 per cent per year since 1961, rising from 9 kg per capita per year half a century ago to 16 kg in 1997.[19] Since 1997, this global growth has slowed;[20] however, in 2008, fish consumption reached a record high with 17.1 kg per capita, according to FAO estimates.[21] It can be expected that pressures on fish stocks are only likely to increase as the global population continues to grow, reaching a projected nine billion people between 2040 and 2050.[22]

Sourcing from abroad

Due to its heavily overexploited fish stocks, the EU has increased its fish consumption by sourcing more fish from abroad. Fish is caught by the EU's distant-water fleet, which operates in other countries' and international waters; it is also, increasingly, imported.

The distant-water fleet is relatively small compared to the EU's total number of vessels. In 2006, the EU had 718 vessels fishing in non-EU waters, out of a total of 88 000 vessels;[23] 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 freezing trawlers.[24, 25] Over the 2001–2005 period, estimates of the catch size of the EU distant-water fleet ranged from 1.06 million to 1.2 million tonnes,[26] equivalent to 19–21 per cent of total EU catches.[27] These vessels predominantly operate in third countries' exclusive economic zones (EEZs), under fisheries 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. In 2006, it imported 4.1 million tonnes more fisheries products than it exported,[28] a deficit that grew to 4.3 million tonnes in 2007 and dropped back to 4 million tonnes in 2009. These imports help meet its demand for human consumption and processing, as well as animal feed and aquaculture. In terms of value, the EU imported US$23 billion worth of fish and fisheries products from non-EU suppliers in 2007, an increase of 11 per cent on 2006.[29] Data from the EU indicate that imports in tonnes accounted for between 59 per cent in 2006 and 57.5 per cent in 2008[30] of the EU's apparent consumption[31] (including domestic aquaculture), while if domestic aquaculture is excluded, this figure rises to 67 percent in 2006 and 65 per cent the following year.[32]

Comparing 2009 to 2007 figures, EU imports have actually fallen by 170 000 tonnes; export levels have risen by around 100 000 tonnes. Fish production continues to fall (now 7 per cent lower than 2006 and 2.5 per cent lower than 2007), mostly due to lower EU catches. This is on top of a 28 per cent drop in production in the 12 years from 1995 to 2006 (Appendix: Table 1).[33] The *declining catches/rising imports* trend is illustrated in Figure 1.

Table 2: EU aquaculture production (2009) in quantity and as EU share.

2009 aquaculture production		
	Total production (tonnes)	% of EU27 production
EU27	1,300,000	100.00
EU15	1,190,000	91.54
Spain	269,000	20.69
France	234,000	18.00
UK	197,000	15.15
Italy	162,000	12.46
Greece	122,000	9.38
Ireland	47,000	3.62

Source: Eurostat Statistics Database.[36] NB. Figures rounded.

Aquaculture production

Aquaculture is often presented as a sustainable solution to overfishing: production can be increased because it is decoupled from the shrinking wild stocks. As global fish stocks have declined, aquaculture production has risen. Table 2 shows the EU's aquaculture production in 2009. Aquaculture production increased in the EU up to 1997 as wild catches declined; since then, however, aquaculture production has remained stable at around 1.25–1.43 million tonnes.[35] EU aquaculture supplies less than 13 per cent of fish consumed in the EU. More than 90 per cent of EU27 production takes place in EU15 countries, with five nations (Spain, France, Italy, the UK, and Greece) supplying 76 per cent of production.

It is hoped by the industry and some policymakers that increases in aquaculture production will compensate for the decline in wild fish catches. But while there is likely to be a constructive role for aquaculture, there are three main reasons why its potential is limited. First and foremost among these is that most marine fish aquaculture is not usually decoupled from wild stocks, and is typically highly dependent on them for fish feed. The precise conversion of wild fish to aquaculture in tonne-for-tonne terms depends on the composition of fishmeal and the species being produced. The production of certain species requires large quantities of wild catch as feed, at a conversion rate greater than 1.00.[37,38] Examples include salmon (conversion rate: 3.15); marine finfish (5.16) (species include flounder, halibut, sole, cod, hake, haddock, redfish, sea bass, congers, tuna, bonito and billfish); marine shrimp (2.81); trout (2.46); and tilapia (1.41).[39,40,41]

With current practices, production of these groups puts significant pressure on wild fish stocks. Indeed, the Department of Environment, Food and Rural Affairs (Defra[42]), the UK government's agricultural and environmental body, has stated that an increased reliance on these groups of species is unviable and instead points to lower-trophic-level species, such as molluscs.[43]

Table 3: Aquaculture production by the four main EU producers.

Quantity of production ('000 tonnes)	Spain	France	Italy	UK
Mariculture	29.1	7.4	29.8	134.1
Freshwater	26.0	38.4	42.4	16.8
Molluscs and crustaceans	208.0	189.2	175.0	30.5
Hatcheries/nurseries (million juveniles)	84,380	58.0	0.0	215.9

Source: Review of the EU Aquaculture Sector and Results of Costs and Earnings Survey (2009). Definition of data collection needs for aquaculture. Reference no. FISH/2006/15-Lot 6.

If the direction of aquaculture is determined by consumption behaviour, 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, EU aquaculture mainly produces molluscs and crustaceans. The EU produces 152 983 tonnes of marine fish but 4.5 times that amount of shellfish (682 292 tonnes of crustaceans and molluscs). This disparity can be seen clearly in Table 3, which details EU aquaculture production categorised as mariculture, freshwater, shellfish production and nurseries. Globally, marine fish contribute less than 2.5 per cent of total aquaculture production versus 45 per cent freshwater fish (e.g. tilapia), and 24 per cent molluscs.[44]

The second reason why aquaculture's potential may be limited is its links to a wide range of environmental impacts.[45,46] These include the introduction of alien species;[47] environmental impacts from escaped genetically modified fish;[48,49,50] habitat modification and pollution;[51] antibiotic use and other problems with intensive farming practices;[52] and an unsustainable use of resources.[53]

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

In conclusion, aquaculture, on balance, adds to the global supply of fish but comes at a price which under current trends are unsustainable without rebuilding wild stocks. Without an improvement in the abundance of wild fish stocks, aquaculture's potential for growth is predominantly in resource-efficient, non-carnivorous species. Otherwise, the business-as-usual approach will see the continued depletion of wild fish stocks and – as is already being seen – the eventual replacement for consumption purposes of wild fish with farmed molluscs and crustaceans.

The trend for fish dependence, with its reliance on fish stocks from external sources, cannot be replicated outside of the EU and should not continue.

Methodology

In order 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):

$$\text{Self-sufficiency} = \frac{\text{domestic supply}}{\text{domestic demand}}$$

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 (or the EU) increases if production increases and/or if consumption decreases. 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. 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 in quantitative terms (365 days x 0.4). Counting 146 days from 1 January, we can say that a country with a self-sufficiency rating of 0.4 depends on other countries' resources from 27 May (or 26 May in a leap year) onward for the rest of the year. Therefore, the earlier the date, the more dependent the member state.

In order 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 those 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[54] + aquaculture production

Data for catches[55] from the EU and member states were available through Eurostat[56] (see Appendix: Table 1 for sample statistics). However, it was not possible to obtain data on catches by member states disaggregated by the source location, i.e. whether the fish were sourced from national and EU waters or non-EU fishing grounds. We therefore used an alternative estimate of domestic supply as:

domestic supply = fish production (total catches in all waters + aquaculture) − catches in non-EU waters

In the absence of data on non-EU catches by member states, the catch by a member state was estimated using a number of methods. Any data provided by a member state's fisheries ministry were taken as the default, most robust estimate. In one form or another (either as a proportion of total catches, a static point estimate, or a time series of values) this applied to Spain, France, Sweden, and Denmark. The second best estimate was that obtained from catches in FAO areas around the world by each country, with the exclusion criteria of any overlap with EU waters. Thirdly, the non-EU catch was estimated using fleet tonnage capacity as a proxy for the share that a country had in total EU27 external fishing, both of which were provided in a European Commission report.[57] A combination of the latter two was applied to all countries, with the condition that the maximum of either was used.

The third approach used a share of gross tonnage that each nation has in the total EU external fleet[58] and the assumption that the gross tonnage for all member states translates into proportional shares of catches (Appendix: Table 2 presents data on the tonnage of member states' external fleets and the EU as a whole). For example, our estimates show that the EU caught 1.2 million tonnes in external waters, so if a member state had 10 per cent of the EU's external fleet capacity in terms of gross tonnage, we assumed that it was responsible for 10 per cent of the 1.2 million tonnes caught in non-EU waters (120 000 tonnes). Using this final method, catches in non-EU waters for each member state (MS) were calculated as:

catches in non-EU waters by MS fleet = catches in non-EU waters by EU fleet × MS share of EU tonnage capacity

Our estimate of 2006 non-EU catch was derived from a simple average of the previous five years' external catch: 1 198 847 tonnes (varying from 1.06–1.30 million tonnes).

Our estimate for the 2007 non-EU catches (and for 2008) was also a fixed 21 per cent of the total EU catch in that year, derived from a conservative estimate from a European Commission report.[59,60] This equals approximately 1.08 million tonnes.

Our estimate for this year's[61] non-EU catches was also a fixed 21 per cent of the total EU catch, derived as above. This equals approximately 1.06 million tonnes.

This year, for almost all countries (though not for the EU27 as a whole), we used the second method, based on catches by FAO fishing area[62] obtained from Eurostat. This involved extracting data on catches by the EU and its member states for FAO fishing areas throughout the globe, then looking at which of these areas were outside the EU's EEZ. 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 exercise revealed some estimates of external catches that were higher than those derived based on the European Commission reports.[63,64] These higher values are more directly linked to fishing activity (i.e. they are reported catches in a specific area, rather than a fleet-based estimate calculated using tonnage capacity and total fleet catches in all non-EU areas) but can still be considered conservative as we did not include any catches from regions that even partially overlap EU waters. We used estimates derived from this approach most notably for Germany, the Netherlands, and the UK.

The above two methods were applied to all countries except four. For Sweden and Denmark we used national data obtained from their respective fisheries ministries. For Spain and France we used different estimates from their fisheries ministries, described in the *Caveats with data and methodology* section.

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 this is:

apparent consumption[65] = total production (total catches in EU and non-EU waters + aquaculture) + imports − exports

Data for catches for the EU and member states – the same as was used for domestic production – were taken from Eurostat statistics[66] (see Appendix: Table 1 for sample data). Our trade data were taken from Eurostat pocketbooks[67] and external database[68] (see Appendix: Table 3 for sample data). These trade data cover trade in all fish and aquaculture products.

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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:

$$\text{Self-sufficiency} = \frac{\text{domestic supply}}{\text{domestic demand}}$$

This is equivalent to:

$$\text{Self-sufficiency} = \frac{\text{catches in EU waters + aquaculture production}}{\text{apparent consumption}}$$

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.

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 had several limitations that could have affected our results. A key point to highlight is that while all results have derived from official data sources, our calculations have been 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 prohibitively 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 far from perfect, it is worth pointing out that they are based on the best available information and can be considered as providing the best picture currently available. 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.

i) Member state catches in EU waters

The Rule of Origin[69] criteria dictates that fish caught by an EU vessel outside EU waters be 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 own 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.

ii) EU catches in non-EU waters

Our estimates using the second and third methods for estimating the EU's external fishing fleet should be considered a minimum amount caught by EU vessels in non-EU waters.

The total non-EU catch by the EU external fleet and its gross tonnage is based on the 718 vessels of the EU external fleet that conduct at least 90 per cent of their activity outside EU waters. 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. But it is unlikely that the 718 vessels composing the external fleet include those vessels operating in the Mediterranean, particularly since these 718 vessels must spend at least 90

per cent of their activity outside the EU. Where vessels from Mediterranean EU countries operate beyond their EEZ for less than 90 per cent of their activity, their catch is counted as national catch when it should be regarded as sourced from non-EU waters.

This suggests that the total amount of non-EU catches is much larger than the figures on which we have based our results.

iii) Share of national catch sourced from non-EU waters

As already described, estimating non-EU catch involved a number of methods. The third one was based on the assumption that every country's share of EU external fleet capacity (in gross tonnage) is a reflection of its share of non-EU catches. A country that makes up 2 per cent of the EU external fishing fleet tonnage capacity would, we assume, be responsible for 2 per cent of total catches by the EU external fishing fleet (equivalent to 21 293 tonnes). This quantity was then subtracted from the total catches by that country to obtain its catches in EU waters.

Using capacity as a proxy for catch-size appropriation is equivalent to assuming that all vessels catch the same amount relative to their tonnage. This could result in underestimated attribution of the share of external catches commanded by countries with low-capacity vessels, relative to the average, as well as overestimates for those countries with above-average capacity vessels. Also, it does not take any transhipment (i.e. shipping to intermediate destinations) into consideration.

Using this method implied, in the case of Malta alone, that non-EU catches were larger than total catches; this is clearly impossible. We therefore used our second method, using catches by Malta in FAO areas, which in all years is zero. Note that this approach of using the minimum external catch is the opposite to that used for most countries, where the results derived from FAO areas (the second method) was prioritized over the third method because it was considered the minimum.

In order to validate our estimates of share of national catches coming from non-EU waters, we tried to obtain information at national level for each member state, but we could only obtain national data for Sweden, Denmark, Spain and France. Data from the Spanish Ministry for Fisheries[70] suggests that 54 per cent of Spanish catches are made in non-EU waters, matching the estimates

derived using our methodology (when including aquaculture production in Spanish catches). The fraction of Spanish catches sourced from outside the EU in 2005 was 54 per cent,[71] which is equivalent to 0.55 million tonnes when the entire Spanish fleet caught 0.99 million tonnes. Using our method, where 52 per cent of the external fleet's capacity is Spanish and there were 1.06 million tonnes of EU external catches in total, we also arrived at 0.55 million tonnes (for 2005). Likewise, for France, the official statistics[72] and our own were similar.[73] For both countries we used the figures from national sources rather than our estimates, although we view the findings as supporting our methodology.

iv) 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 own 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 nations' 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.

v) 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.

vi) Trade data

Data on trade are readily available from the Eurostat pocketbook on fisheries statistics 1990–2006,[74] but unfortunately this information is no longer published. Instead, all trade data for 2007-2009 have been extracted from the Eurostat external trade database.[75] Trade codes include all seafood products, including live fish, frozen fish, fishmeal, fish oils, and processed fish, and are exactly the same as those used by Eurostat in previous editions of the fisheries statistics pocketbook.

vii) Contemporary data

Finally, it is worth noting that there is a delay of around three to four years for data reporting. However, a shortening of this delay has allowed us, for this 2012 update, to use data from 2009. Previously we used 2006 data for the 2010 report, and 2007 data for the 2011 report. Therefore, the 2008 data has been skipped in between these reports for the sake of publishing the most recent data on fish dependence. As in other years, we make the assumption in this report that similar conditions hold for 2012 as they did in the data years (i.e. 2009).

viii) 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.

ix) 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 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 EU aquaculture production is dominated by molluscs 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.

Results

The EU is now 51 per cent self-sufficient, becoming fish dependent on 6 July.

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 4) and their corresponding fish dependence days (Table 5).

Table 4 shows that the EU's degree of self-sufficiency is now 51 per cent, and that this ratio has been decreasing almost since its formation. The 2008 and 2009 results show a slight improvement on 2007, but are otherwise below all previous years. The EU15 has also shown declining self-sufficiency, from just over 67 per cent in 1995 to 50 per cent in 2009, a 25 per cent drop in 14 years.

Table 4: Degree of self-sufficiency for the EU and its member states.

	1990	1995	2000	2005	2006	2007	2008	2009
EU27		0.871	0.59	0.563	0.518	0.5	0.512	0.511
EU15	0.671	0.67	0.588	0.56	0.519	0.501	0.504	0.5
Belgium*			0.161	0.215	0.287	0.206	0.165	0.137
Bulgaria			0.401	0.234	0.267	0.402	0.337	0.378
Czech Republic			0.314	0.313	0.353	0.326	0.308	0.306
Denmark	1.125	1.197	0.999	0.85	0.787	0.618	0.75	0.835
Germany	0.328	0.295	0.28	0.421	0.341	0.32	0.302	0.271
Estonia			1.106	7.072	30.835	2.505	2.417	4.214
Ireland	2.431	2.197	1.876	1.916	1.776	1.536	1.813	1.453
Greece	0.635	0.676	0.66	0.597	0.657	0.598	0.583	0.602
Spain	0.461	0.397	0.404	0.343	0.356	0.349	0.37	0.397
France	0.679	0.565	0.564	0.466	0.468	0.449	0.439	0.386
Italy	0.491	0.472	0.393	0.34	0.343	0.329	0.291	0.302
Cyprus			0.819	0.137	0.264	0.228	0.19	0.198
Latvia			1.094	1.442	1.437	1.339	1.285	1.128
Lithuania			-0.444	0.244	0.233	0.446	0.385	0.392
Hungary			0.332	0.379	0.482	0.513	0.502	0.499
Malta			0.158	0.117	0.252	0.217	0.253	0.022
Netherlands	1.602	0.887	1.022	1.716	1.681	1.213	1.071	0.562
Austria	0.057	0.057	0.061	0.039	0.041	0.039	0.035	0.036
Poland			0.529	0.494	0.467	0.545	0.429	0.545
Portugal	0.516	0.383	0.205	0.112	0.318	0.317	0.303	0.244
Romania			0.237	0.122	0.138	0.16	0.148	0.146
Slovenia			0.207	0.177	0.155	0.159	0.142	0.177
Slovakia			0.072	0.095	0.102	0.121	0.1	0.106
Finland	0.603	0.643	0.7	0.669	0.679	0.745	0.785	0.804
Sweden	0.862	1.053	1.402	1.096	1.35	0.995	1.02	1.096
UK	0.577	0.674	0.636	0.643	0.592	0.639	0.595	0.638

* Includes Luxembourg.

Table 5: Fish dependence days for the EU and its member states

	1990	1995	2000	2005	2006	2007	2008	2009
EU27	-	-	04-Aug	25-Jul	09-Jul	02-Jul	05-Jul	06-Jul
EU15	02-Sep	02-Sep	03-Aug	24-Jul	09-Jul	03-Jul	03-Jul	02-Jul
Belgium#	-	-	28-Feb	20-Mar	15-Apr	17-Mar	01-Mar	19-Feb
Bulgaria	-	-	27-May	27-Mar	08-Apr	27-May	02-May	18-May
Czech Republic	-	-	25-Apr	25-Apr	09-May	30-Apr	22-Apr	22-Apr
Denmark	>1 year	>1 year	31-Dec	07-Nov	15-Oct	14-Aug	30-Sep	01-Nov
Germany	30-Apr	18-Apr	13-Apr	03-Jun	05-May	27-Apr	20-Apr	20-Apr
Estonia	-	-	>1 year	>1 year	>1 year	>1 year	01-Jun	18-Mar
Ireland	>1 year	>1 year	>1 year	>1 year	>1 year	>1 year	23-Oct	15-Jun
Greece	20-Aug	04-Sep	29-Aug	06-Aug	28-Aug	07-Aug	31-Jul	08-Aug
Spain	18-Jun	26-May	28-May	06-May	10-May	08-May	15-May	25-May
France	06-Sep	26-Jul	25-Jul	20-Jun	20-Jun	13-Jun	09-Jun	21-May
Italy	29-Jun	22-Jun	24-May	05-May	06-May	30-Apr	16-Apr	21-Apr
Cyprus	-	-	27-Oct	19-Feb	07-Apr	25-Mar	10-Mar	14-Mar
Latvia	-	-	>1 year	>1 year	>1 year	>1 year	13-Apr	16-Feb
Lithuania	-	-	01-Jan	30-Mar	27-Mar	12-Jun	20-May	24-May
Hungary	-	-	02-May	19-May	26-Jun	07-Jul	02-Jul	02-Jul
Malta	-	-	>1 year	Undefined*	Undefined*	19-Mar	02-Apr	08-Jan
Netherlands	>1 year	20-Nov	>1 year	>1 year	>1 year	>1 year	25-Jan	25-Jul
Austria	21-Jan	21-Jan	23-Jan	15-Jan	15-Jan	15-Jan	13-Jan	14-Jan
Poland	-	-	13-Jul	30-Jun	20-Jul	19-Jul	05-Jun	18-Jul
Portugal	08-Jul	20-May	16-Mar	11-Feb	25-Apr	26-Apr	20-Apr	30-Mar
Romania	-	-	28-Mar	14-Feb	20-Feb	28-Feb	23-Feb	23-Feb
Slovenia	-	-	17-Mar	06-Mar	26-Feb	27-Feb	21-Feb	06-Mar
Slovakia	-	-	27-Jan	04-Feb	07-Feb	14-Feb	06-Feb	08-Feb
Finland	09-Aug	23-Aug	13-Sep	02-Sep	05-Sep	29-Sep	13-Oct	21-Oct
Sweden	11-Nov	>1 year	>1 year	>1 year	>1 year	30-Dec	07-Jan	05-Feb
UK	30-Jul	04-Sep	21-Aug	23-Aug	04-Aug	22-Aug	05-Aug	21-Aug

Notes:

- indicates that estimates could not be made, typically due to lack of data, particularly trade balances.

* indicates that estimates were unrealistic due to consumption being greater than catches minus external catches, aquaculture production and imports (data limitation). Aquaculture included in the catch data.

includes Luxembourg.

Dates not available for some countries prior to joining the EU.

Fish dependence in the EU as a whole shows that its fish stocks support just over one-half of its consumption; its fish dependence day falls on 6 July, four days later than in 2007, but three days earlier than in 2006. Member states differ in their levels of self-sufficiency. 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. On the other hand, Estonia, Latvia, Ireland, and Sweden appear to be self-sufficient and are able to produce more fish than they consume.

Others, however, have access to potentially enormously productive waters, 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 strikingly early in the year: Portugal becomes dependent on 30 March; Spain on 25 May; France on 21 May; Italy on 21 April; others like Greece and UK come a bit later on 8 and 21 August respectively. This year the Netherlands becomes self-sufficient for the first time since the 1990s; and worryingly to such a degree as to be almost half-dependent on non-EU fish.

Table 6: Fish dependence days for the EU and its member states, excluding aquaculture from domestic supply.

	1990	1995	2000	2005	2006	2007	2008	2009
EU27	-	-	14-Jul	03-Jul	14-Jun	07-Jun	11-Jun	11-Jun
Belgium#	-	-	25-Feb	19-Mar	15-Apr	16-Mar	01-Mar	18-Feb
Bulgaria	-	-	22-Apr	01-Mar	16-Mar	23-Apr	29-Mar	31-Mar
Czech Republic	-	-	30-Jan	27-Jan	03-Feb	30-Jan	26-Jan	26-Jan
Denmark	>1 year	>1 year	31-Dec	13-Nov	13-Oct	10-Aug	26-Sep	30-Oct
Germany	09-Apr	31-Mar	24-Mar	21-May	25-Apr	13-Apr	04-Apr	04-Apr
Estonia	-	-	>1 year	>1 year	>1 year	>1 year	10-Jun	08-May
Ireland	>1 year	>1 year	>1 year	>1 year	>1 year	>1 year	22-Mar	01-Aug
Greece	03-Aug	18-Jul	27-Jun	23-May	15-Jun	22-May	11-May	12-May
Spain	01-May	27-Apr	18-Apr	30-Mar	25-Mar	24-Mar	08-Apr	10-Apr
France	22-Jun	19-Jun	21-Jun	14-May	15-May	07-May	28-Apr	08-Apr
Italy	03-May	12-May	06-Apr	27-Mar	30-Mar	23-Mar	09-Mar	14-Mar
Cyprus	-	-	25-Oct	24-Jan	12-Feb	10-Feb	28-Jan	25-Jan
Latvia	-	-	>1 year	>1 year	>1 year	>1 year	14-Apr	17-Feb
Lithuania	-	-	01-Jan	27-Mar	23-Mar	09-Jun	17-May	19-May
Hungary	-	-	24-Feb	07-Mar	29-Mar	31-Mar	01-Apr	28-Mar
Malta*	-	-	>1 year	Undefined*	Undefined*	14-Jan	19-Jan	02-Jan
Netherlands	>1 year	13-Nov	>1 year	>1 year	>1 year	>1 year	29-Jan	10-Jul
Austria	04-Jan	03-Jan	04-Jan	02-Jan	02-Jan	02-Jan	02-Jan	02-Jan
Poland	-	-	30-Jun	07-Jun	27-May	27-Jun	13-May	03-Jul
Portugal	04-Jul	18-May	22-Mar	09-Feb	22-Apr	23-Apr	17-Apr	27-Mar
Romania	-	-	13-Feb	22-Jan	24-Jan	25-Jan	19-Jan	15-Jan
Slovenia	-	-	20-Feb	04-Feb	29-Jan	29-Jan	23-Jan	28-Jan
Slovakia	-	-	17-Jan	23-Jan	23-Jan	29-Jan	23-Jan	28-Jan
Finland	11-Jul	14-Aug	06-Sep	24-Aug	29-Aug	24-Sep	08-Oct	16-Oct
Sweden	31-Oct	>1 year	>1 year	>1 year	>1 year	30-Dec	07-Jan	06-Feb
UK	17-Sep	26-Aug	05-Aug	03-Aug	13-Jul	30-Jul	11-Jul	26-Jul

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

Notes:

- indicates that estimates could not be made, typically due to lack of data, particularly trade balances.

* estimates for Malta were made for this year, and re-made for last year, by excluding any potential Maltese non-EU catch.

includes Luxembourg

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 show a general decline in self-sufficiency from 1990 to 2009; that is, the EU and its leading member states are shown to be increasingly dependent on resources from outside EU waters. The EU15 member states have reduced their degree of self-sufficiency by 25 per cent compared to 1995, while the EU27 has reduced its self-sufficiency by 41 per cent compared to the same year.

In just nine years the EU27 fish dependence day has moved forward in the calendar by almost one month – from 4 August in 2000 to 6 July in 2009 (this year's estimates, due to data reporting delays). 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 6 July. This means that the EU depends on fish from other parts of the world for almost half of the year.

Spain is now able to provide for 17 more days of fish consumption than in 2007, becoming dependent on 25 May, from 8 May in 2007. The UK is now dependent one day later than in 2007. Sweden regains full self-sufficiency. Denmark has also improved markedly by 102 days since 2007. Its fish dependence day now falls on 1 November, from 22 July in 2007.

There are worrying signs of increasing dependence for several countries. The Netherlands' self-sufficiency, which fell by 27.8 per cent last year, has fallen to almost half, as it becomes fish dependent on 25 July. This is 189 days more dependent than in 2007. Germany's self-sufficiency levels remains very similar to previous years. France and Belgium increased their dependence by 23 and 25 days, respectively, between 2007 and 2009. Italy's dependence comes 9 days earlier, 30 April in 2007 to 21 April in 2009. And, Portugal is now fish dependent more than three weeks earlier in the year than it was in 2007.

Excluding aquaculture from domestic production further reduces the degree of self-sufficiency, as can be seen in Table 6. Removing aquaculture from production makes the trend of declining self-sufficiency more apparent, moving the EU fish dependence day forward by a little more than a month in the 2000–2009 period (though a 4-day improvement on 2007), and by more than one month for the main EU aquaculture producers such as Spain, Italy, France, and Greece (more than two months).

The impacts of overfishing are highly significant in diminishing the long-term catches that can be sustained by European fleets. A recent paper by **nef**[76] found that overfishing in 43 North East Atlantic stocks amounted to an annual loss of 3.5 million tonnes of fish in 2010 for all countries (mostly the EU27, Norway, and Iceland), equivalent to €3.2 billion. Importantly, the study does not look at Mediterranean stocks or any of the more than 100 other stocks in European waters, meaning that the estimated costs of overfishing are not exhaustive and are likely to be much higher.

The 3.5 million tonnes lost were calculated using a static comparison of the MSY that could be taken from each of these stocks compared to their current, overfishing-reduced landings in 2010. Applying the same method to the landings used in this updated report for 2009, shows an annual loss of 3.67 million tonnes due to overfishing.

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 have 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 EU27 loses around 2 million tonnes per year from overfishing just these stocks, which if rebuilt could increase the EU27's self-sufficiency in 2009 from 0.511 to 0.702. This would delay the EU27's fish dependence day by over two months, from 6 July to 14 September.

However, the picture for member states is more varied. Rebuilding these 43 stocks would make the UK, Denmark, and Finland entirely self-sufficient, and in strong exporter positions. Those countries that are already self-sufficient (Sweden, Ireland, Latvia) would become even more self-sufficient. Other countries stand to gain substantially, too: Germany could potentially become fish dependent two months later (21 June versus 20 April), France two months later (22 July versus 21 May), the Netherlands 83 days later (16 October versus 25 July), Poland 46 days later (3 September versus 18 July), and Spain 39 days later (from 25 May to 3 July). These results can be seen in Table 7. It is important to bear in mind that these results are not exhaustive 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 none of the 43 stocks studied are in the Mediterranean.

Discussion and implications

Fish dependence is a powerful concept that illustrates how far overconsumption outstrips domestic resources. As we have shown, one way to illustrate 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 6 July, after which the EU depends on foreign resources (or 11 June if we do not include domestic aquaculture in our calculations).

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 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 Denmark, have a dependence date later in the year. Some EU countries, namely Ireland, Sweden, Latvia, and Estonia, are actually 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 slightly more than three weeks. But overall, aquaculture production has not altered the trend of increasing fish dependence.

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 poor management of EU fish resources and consumption patterns.

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 this year, but this does not mean that it has fished sustainably in its own waters until now. Indeed, our estimates[77] for the costs of overfishing show that the Netherlands stands to benefit from an extra 83 days of self-sufficiency from rebuilding these stocks. However, 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[78] concern only 43 of more than 150 European stocks, and none in the Mediterranean.

Despite this, we believe there is substantial evidence to suggest that increasing dependence on other countries is a powerful indicator of unsustainable fisheries and 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 on the effects of unsustainable trends in global fisheries. The EU model is not replicable at a global scale and is therefore unsustainable.

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.[79,80] A significant proportion of EU fish imports come from developing countries. At a global level, more than half of the US$57.7 billion worth of fish products traded in 2004 came from developing countries.[81] The fish-product trade is more valuable to developing countries than those of tea, rice, cocoa, and coffee combined.[82] 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 current rules of the game are not necessarily working for poorer countries. It is challenging for developing countries to get good 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.[83] But trade can lead to problems of food insecurity, largely because fish is a major source of protein in developing countries.[84]

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 1978/80 to 1988/90, per capita fish consumption in developed regions increased (by 27.7 per cent in North and Central America and 23 per cent in Europe and Asia), while in developing regions it fell (by 2.9 per cent in Africa, 7.9 per cent in South America, and more than 25 per cent in at least 24 countries, including Burundi, Libya, Mali, Costa Rica, and Colombia).[85] Moreover, there is worrying evidence that this decline is not being offset by other forms of animal protein,[86] 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 damage developing countries, trade regimes need to be more environmentally and socially aware.[87,88,89] 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

As EU fish stocks dwindle, the gap between supply and demand within Europe continues to widen. This is putting jobs in the fishing industry at risk and also undermining the processing industry that depends on fisheries. The lower productivity of EU stocks in recent years means that fishing is becoming an increasingly costly enterprise. The amount of effort and fuel needed to land one tonne of fish is higher than it needs to be, and higher than it would be if stocks were at a sustainable level. It is estimated that UK trawlers invest 17 times more effort than they did 118 years ago to land an equivalent catch.[90]

The prospect of further increases in fuel price 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 make 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. Contrary to the current position, this requires a large reduction in fishing capacity and for the EU to set levels of fish stocks beyond the MSY for as long as it takes them to recover.

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 long-term, 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, have responded to shortages in EU fish stocks by sourcing fish directly through their own fleet or through joint ventures in developing countries.[91] 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.

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.[92,93,94] 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 current reform of the CFP offers a unique opportunity to do just that.

To transform the management of our marine resources, we need the new CFP to provide a policy framework that will restore marine ecosystems to healthy levels and deliver a fair allocation of resources within the EU and internationally. As a minimum this will require the following actions.

- Set a clear target to restore EU stocks to their MSY level and beyond.
- Reduce capacity to reconcile it with available resources; improve data collection, transparency, and reporting; and prioritise scientific advice in determining catch quotas.
- Create a context in which being profitable is aligned with doing the right thing, by making access to resources conditional on social and environmental criteria.
- Promote responsible consumption among all EU consumers, and implement measures that are conducive to more responsible fishing outside EU waters.
- Use public funds to deliver social and environmental goods by investing in environmental measures, research, stakeholder involvement, and control and enforcement, rather than the current situation of funding the overcapacity of the fishing fleet through modernising vessels and failing to control overfishing i.e. access to fisheries stocks.

In order for this to happen, policymakers need to look beyond the short-term costs that could result from reform and instead give priority to the medium- and long-term benefits that healthy marine resources will provide. But action will also be required at other levels. Businesses need to respond to the current challenges by adopting business models that secure their viability in the future and protect the scarce resources on which they depend. EU citizens, meanwhile, need to exercise their consumer power to move towards patterns of consumption that match what our oceans are able to produce.

Conclusions

The EU and many of its leading member states are heavily dependent on fish resources from other countries. This is down to two main driving factors: EU stocks being in poor health and EU demand for fish continues to increase as EU citizens eat more fish than their waters can produce.

We have seen that the EU now relies on foreign resources for almost half of its fish consumption, that this dependence has been increasing relative to all years except 2007, and that the impact of aquaculture in reducing this trend is limited. The EU's fish dependence day is 6 July. Certain member states, such as Spain, France, Italy, and Portugal, reach their fish dependence days much earlier than this, despite their access to productive EU waters.

In the context of a steadily growing population, the trend towards the fishing of stocks to depletion before moving on to another resource (either through targeting distant-water fishing grounds or importing produce) is unsustainable, environmentally ruinous, and potentially damaging for poorer countries and their development. Many of the costs of EU fish mismanagement are being exported, with direct consequences on the fish stocks of non-EU countries, simply to meet EU demand. In addition, this is being done without sustainable benefits to EU consumers. 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 move towards consumption levels that are commensurate with ecosystem capacity.

The imminent CFP reform is an ideal opportunity to create a robust policy framework that restores the EU's marine resources and protects them for future generations. To this end, **nef** is an active member of the OCEAN2012 coalition, which is dedicated to transforming European fisheries policy, to stop overfishing, to end destructive fishing practices, and to deliver fair and equitable use of healthy fish stocks.

If we are to get this reform of the CFP right, the EU needs to champion the goals of sustainable fishing inside and outside the EU, end destructive fishing practices, and deliver fair and equitable use of healthy fish stocks. All of these policies are consistent with reversing the EU's trend towards increased dependence on other countries' resources.

Appendix

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

Table A1: Total fisheries production in the EU (catch + aquaculture) in tonnes live weight

Member state	1995	2000	2005	2006	2007	2008	2009
EU27	9,275,222	8,192,623	6,895,356	6,689,494	6,443,127	6,428,211	6,360,739
Austria	3,322	3,286	2,790	2,863	2,889	2,440	2,492
Belgium	36,477	31,678	24,983	23,143	24,667	22,735	22,295
Bulgaria	12,627	10,652	8,578	10,803	13,307	14,022	16,891
Cyprus	9,772	69,360	4,267	5,725	5,425	5,788	4,767
Czech Republic	22,608	24,129	24,697	25,077	24,723	24,559	24,183
Denmark	2,043,638	1,577,683	949,648	895,752	684,181	727,837	811,877
Estonia	132,345	113,585	100,136	87,584	100,225	101,519	98,076
Finland	171,874	171,822	146,092	162,334	177,404	164,596	168,223
France	955,920	970,241	840,349	830,597	795,313	737,743	668,623
Germany	302,925	271,585	330,352	335,521	293,758	324,087	289,254
Greece	184,361	194,762	198,461	211,286	208,266	203,769	204,735
Hungary	16,674	19,987	21,270	22,229	22,946	22,394	20,537
Ireland	417,012	327,484	322,547	264,235	279,650	250,217	316,292
Italy	611,522	518,680	479,000	489,540	467,631	393,623	415,326
Latvia	149,719	136,728	151,160	140,955	156,001	158,518	163,728
Lithuania	59,082	80,985	141,726	156,775	190,874	185,766	176,117
Malta	5,539	2,820	2,072	8,513	9,834	8,009	6,776
Netherlands	522,048	571,005	622,636	478,327	467,011	463,369	437,655
Poland	454,483	253,481	193,166	174,933	180,271	179,328	260,397
Portugal	268,852	198,656	218,463	236,990	260,504	230,648	205,554
Romania	69,105	17,099	13,352	15,773	16,497	17,906	17,151
Slovakia	3,567	2,255	2,648	2,980	4,071	2,733	2,584
Slovenia	2,956	3,037	2,573	2,500	2,465	2,190	2,716
Spain	1,402,906	1,378,193	990,579	1,035,762	1,020,908	1,171,061	1,029,290
Sweden	412,145	343,374	262,236	276,804	243,619	238,935	211,953
UK	1,003,742	900,055	841,574	792,492	790,687	774,420	783,248

Source: Eurostat, European Commission. Fishery Statistics 1995-2008. Eurostat Pocketbooks. 2009 Edition Eurostat database (epp.eurostat.ec.europa.eu/portal/page/portal/fisheries/data/database)".

Table A2: EU external catches in tonnes product weight (1999-2009)

Member state	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
EU27	1442487.06	1425746.91	1453102.14	1327485.39	1237279.89	1233663.69	1184674.47	1144538.64	1087730.07	1086919.89	1064257.11
Denmark	177705	231538	171737	146103	137995	122656	102112	76461	91261	69722	59150
Germany	31767	29468	28555	27547	26514	24848	35912	35698	82042	96539	70942
Estonia	16068	20788	16355	16597	16000	17374	35540.2341	34336.1592	32631.9021	32607.5967	31927.7133
Ireland	3049	9288	44094	20707	13118	10355	15868	5149	6874	8096	9950
Greece	0	0	0	0	0	0	11846.7447	11445.3864	10877.3007	10869.1989	10642.5711
Spain	628524.36	576010.98	591759	459886.68	462753.54	417120.3	414689.76	401585.04	398542.14	496138.5	410791.5
France	116819	116819	116819	116819	116819	116819	116819	116819	116819	116819	116819
Italy	10410	1980	4579	4029	5141	4494	35540.2341	34336.1592	32631.9021	32607.5967	31927.7133
Latvia	3080	3397	3330	2742	29189	26507	47386.9788	45781.5456	43509.2028	43476.7956	42570.2844
Lithuania	14639	15176	102734	30524	18010	14193	118467.447	114453.864	108773.007	108691.989	106425.711
Malta*	0	0	0	0	0	0	23693.4894	22890.7728	21754.6014	21738.3978	21285.1422
Netherlands	14561	16922	49568	15487	35536	59324	44204	59262	73714	84147	66226
Poland	92279	58195	36326	26864	16117	19323	23693.4894	22890.7728	21754.6014	21738.3978	33061
Portugal	28600	27166	28496	31822	33828	27351	94773.9576	91563.0912	87018.4056	86953.5912	85140.5688
Finland	0	0	0	0	81	0	0	0	0	0	0
Sweden	14097	31337.094	24633.959	39756.646	76474.092	34813.556	51418.477	54333.24	7816.027	6837.909	5970.741
UK	38746	31907	30713	23866	26796	23886	23693.4894	28738	30737	36110	38675

Source: Study on the European External Fleet (2008) (Contract FISH/2006/02) © European Communities.

Table A3: Trade balance (exports minus imports) in tonnes product weight (1990–2009)

Member state	1990	1995	2000	2005	2006	2007	2008	2009
EU27*	–	–	-3,395,321	-3,455,598	-3,907,940	-4,275,958	-4,012,273	-4,007,893
Austria	-68,450	-55,048	-50,896	-68,639	-67,318	-72,135	-68,280	-65,813
Belgium	–	–	-164,870	-91,389	-57,525	-95,076	-114,694	-140,590
Bulgaria	-209,856	-227,867	–	–	–	-19,821	-27,611	-27,828
Cyprus	–	–	-15,309	-26,934	-15,965	-18,364	-24,631	-19,,285
Czech Republic	–	–	-52,691	-54,098	-45,032	-51,020	-55,061	-54905
Denmark	126,568	336,026	-1,178	-167,686	-241,938	-385,273	-150,145	-89,608
Estonia	–	–	47,779	90,493	85,910	73,120	73,007	82,378
Finland	-111,706	-95,418	-73,669	-72,295	-76,910	-60,918	-45,049	-40,951
France	-531,132	-528,131	-543,131	-711,651	-694,961	-715,732	-677,611	-769,758
Germany	-790,976	-642,276	-601,522	-403,100	-578,925	-510,195	-430,004	-521,188
Greece	-72,220	-70,757	-79,850	-116,066	-92,090	-121,799	-127,089	-117,750
Hungary	–	–	-40,137	-34,859	-23,864	-21,768	-22,256	-20,580
Ireland	115,887	227,208	152,964	154,195	115,425	96,702	116,633	105,389
Italy	-625,928	-607,538	-696,826	-834,104	-834,603	-856,909	-845,278	-855,954
Latvia	–	–	61,472	75,854	76,244	71,708	68,957	56,354
Lithuania	–	–	-43.215	-2,953	-1,581	4,553	-14,269	-1,710
Malta	–	–	-15,029	-15,363	-19,276	-35,484	-23,594	-303,874
Netherlands	89,166	-66,446	12,427	259,871	193,745	103,116	109,289	-222,667
Poland	–	–	-174,198	-154,792	-148,081	-116,188	-188,313	-156,670
Portugal	-128,622	-182,805	-239,920	-966,388	-260,984	-289,964	-242,871	-289,394
Romania	–	–	-55,123	-96,241	-98,565	-86,334	-103,387	-100,104
Slovakia	–	–	-29,283	-25,359	-26,297	-23,184	-24,612	-21,721
Slovenia	–	–	-11,603	-11,931	-13,634	-13,073	-13,226	-12,644
Spain	-439,092	-525,095	-602,475	-683,718	-751,947	-764,351	-653,336	-528,691
Sweden	-50,821	20,870	98,479	23,004	71,798	1,879	11,364	24,011
UK	-607,411	-448,919	-472,032	-433,771	-506,180	-629,868	-465,686	-384,133

Source: Eurostat, European Commission. Fishery Statistics 1990-2006. Eurostat Pocketbooks. 2007 Edition. 2007 figures extracted from Eurostat external trade database. Eurostat database (epp.eurostat.ec.europa.eu/portal/page/portal/fisheries/data/database)*.

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54 Figure for total catches in all fishing regions is measured in tonnes, includes aquaculture, and covers the period of one year. It 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 under 'Caveats with data and methodology'.

55 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.

56 Eurostat statistics © European Communities. (1990–2006). Retrieved from: epp.eurostat.ec.europa.eu/portal/page/portal/fisheries/data/database

57 European Commission, Contract FISH/2006/02. (2008). Study on the European external fleet. Final report.

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59 European Commission. (2009). A diagnosis of the EU fisheries sector: Sector development and CFP instruments. Commission Staff Working Document.

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61 'This year' corresponds to data from 2009 because of a minimum three year delay in data reporting. Previous reports have had a four year delay, such that the first Fish Dependence report released in 2010 corresponded to data from 2006, and the updated 2011 report corresponded to data from 2007. Shortening the data reporting delay has meant, in order to publish the most recent levels of fish dependence, that we refer to this year as 2009, effectively skipped 2008 results (although these are also found in the tables).

62 Eurostat statistics © European Communities. (1990–2006). Retrieved from: epp.eurostat.ec.europa.eu/portal/page/portal/fisheries/data/database

63 European Commission. (2009). A diagnosis of the EU fisheries sector: Sector development and CFP instruments. Commission Staff Working Document.

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65 '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 as above, in section i) is subtracted. Trade data includes aquaculture trade as well as wild catch, and is in all fishery products, regardless of processing method.

66 *Ibid.*

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

68 Trade statistics: Eurostat external trade database. Retrieved from: http://epp.eurostat.ec.europa.eu/portal/page/portal/external_trade/data/database

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

70 Retrieved from: www.mma.es/secciones/calidad_contaminacion/indicadores_ambientales/banco_publico_ia/pdf/PESCapturas.pdf

71 This figure of 54 per cent was used time-independently in order to follow Spanish national data as closely as possible.

72 Ministere de l'Alimentation de l'Agriculture et de la Peche. État du secteur des pêches français. Document préparatoire aux Assises de la pêche établie par Ifremer/IRD/Muséum d'histoire naturelle/FranceAgriMer.

73 We calculated France's figure by summing its national catch using data from the referenced report (from p. 23 onwards: 'État du secteur des pêches français') on catches in different areas, which came to 116 819 tonnes in 2008. Just as in the case for Spain, we used this figure time-independently to represent France's external catch in all years of our analysis.

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

75 Retrieved from: epp.eurostat.ec.europa.eu/portal/page/portal/external_trade/data/database

76 While re-estimated for 2009 landings used in this report, the methods are identical to those in: Crilly, R. and Esteban, A. (2012). *Jobs lost at sea: Overfishing and the jobs that never were.* London: **nef**.

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

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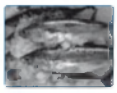
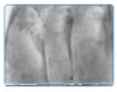
Fish dependence day calendar 2012

JAN		1	2	3	4	5	6	**7** MALTA	8	9	10	11	12	13	**14** AUSTRIA	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
FEB		1	2	3	4	5	6	7	**8** SLOVAKIA	9	10	11	12	13	14	15	16	17	18	**19** BELGIUM	20	21	22	**23** ROMANIA	24	25	26	27	28			
MAR		1	2	3	4	5	**6** SLOVENIA	7	8	9	10	11	12	13	**14** CYPRUS	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	**30** PORTUGAL	31
APR		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	**20** GERMANY	**21** ITALY	**22** CZECH REPUBLIC	23	24	25	26	27	28	29	30	
MAY		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	**18** BULGARIA	19	20	**21** FRANCE	22	23	**24** LITHUANIA	**25** SPAIN	26	27	28	29	30	31
JUN		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
JUL		1	**2** HUNGARY	3	4	5	**6** EU27	7	8	9	10	11	12	13	14	15	16	17	**18** POLAND	19	20	21	22	23	24	**25** NETHERLANDS	26	27	28	29	30	31
AUG		1	2	3	4	5	6	7	**8** GREECE	9	10	11	12	13	14	15	16	17	18	19	20	**21** UK	22	23	24	25	26	27	28	29	30	31
SEP		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
OCT		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**21** FINLAND	22	23	24	25	26	27	28	29	30	31
NOV		**1** DENMARK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
DEC		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

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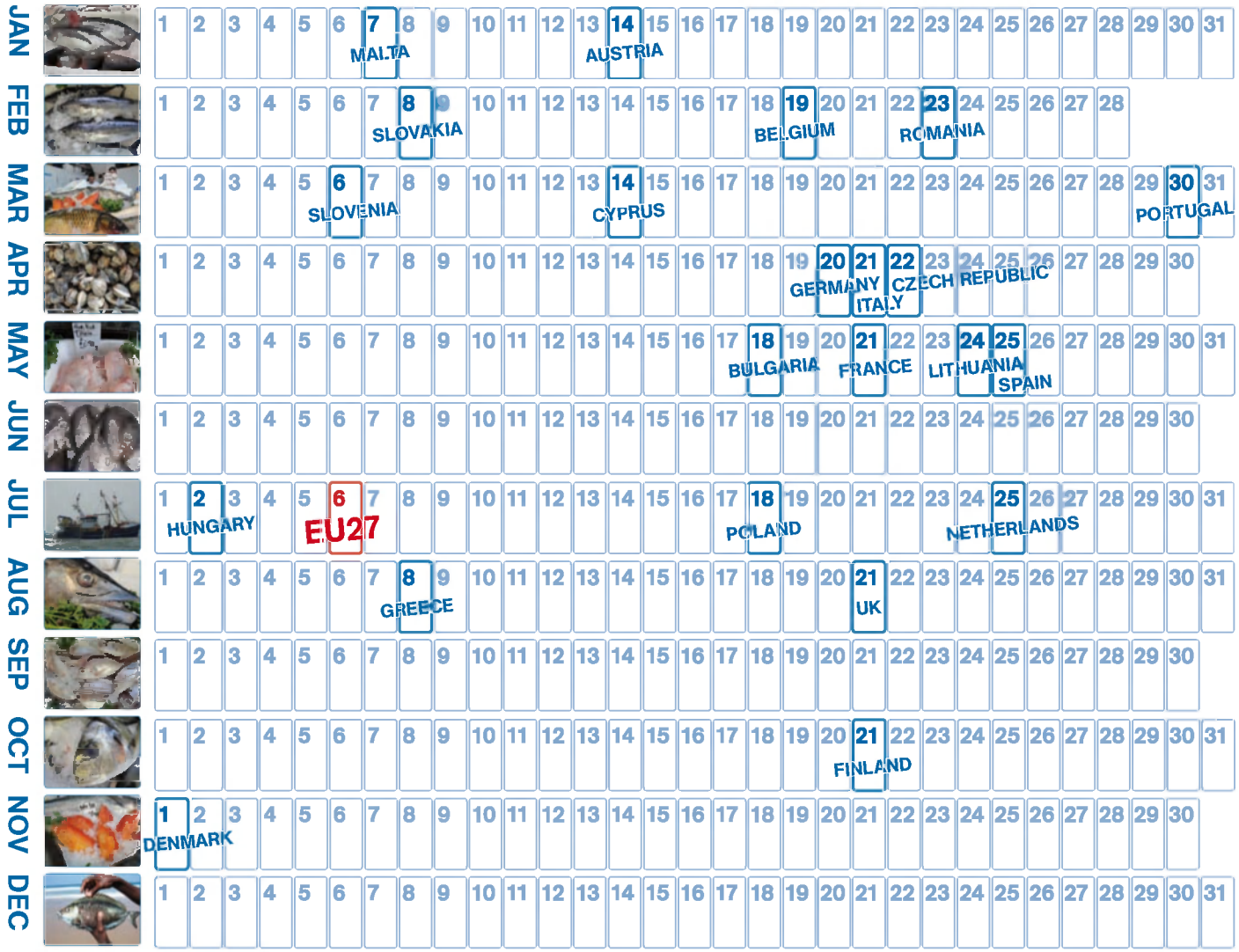

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