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The TAC Dependency Tool

EU fishing fleet's economic dependency on stocks subjected to fishing TACs. Online tool v2, including Species_GSA units for the Mediterranean & Black Sea fleet

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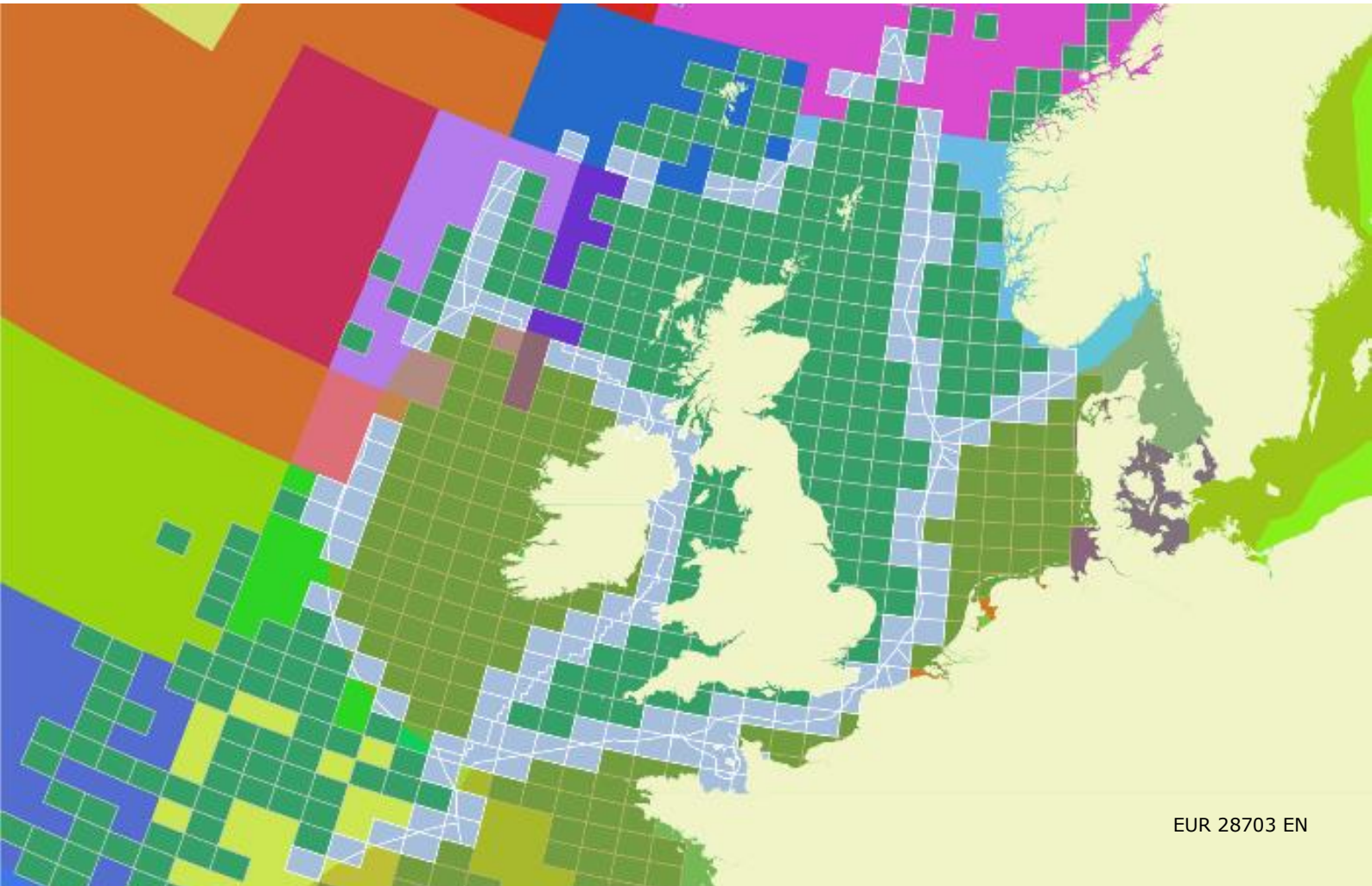

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Contents

Abstract

The present report develops a TAC Dependency Indicator (TDI) for stocks regulated by a Total Allowable Catch as listed in the Council Regulations fixing fishing opportunities for certain fish stocks and groups of fish stocks applicable in Union waters and, for Union fishing vessels, in certain non-Union waters, in line with Regulation No 1380/2013 on the Common Fisheries Policy. The main objective of the exercise is to provide policy makers with reference economic data collected under the Data Collection Framework and analysed within the scope of the Annual Economic Report (AER) on the EU fishing fleet in a format that can be easily linked to TACs and TAC proposals. Thus, the TDI focuses on providing an estimate of the economic relevance that each stock subjected to a Total Allowable Catch (TAC) has on EU fishing fleets from a regulatory perspective. The TDI is calculated as the proportion between the value of landings associated to a given regulated stock and the total value of landings of a fleet segment. Employment and GVA associated to each TAC unit are also estimated proportionally. Additionally, in the absence of TAC and quotas for most fisheries in the Mediterranean & Black Sea, this report and online tool provides dependency ratios on species-units (species by GSA) for EU fishing fleets operating in FAO fishing area 37.

1 - Introduction

1.1 Policy Context

The main instrument regulating fishing mortality in European marine fisheries management is in the context of the Council Regulations fixing fishing opportunities for certain fish stocks and groups of fish stocks applicable in Union waters and, for Union fishing vessels, in certain non-Union waters, in line with Regulation No 1380/2013 on the Common Fisheries Policy (CFP).

Fishing opportunities or Total Allowable Catches (TACs) are used to manage EU fisheries at a macro-level. TACs are set annually for most stocks (or biennial for deep-sea stocks) by the Council of Ministers following the publication of the European Commission's TAC proposals ([1]). For stocks that are shared and jointly managed with non-EU countries, the TACs are agreed with those non-EU countries.

Council Regulation (EU) 2017/72 sets the TACs for the year 2017. For 2018, the new TAC proposals by the Commission will be discussed during the EU Council of Fisheries Ministers in December 2017.

Within the limit of the TACs, quotas are allocated to EU Member States or Third Countries using a different allocation percentage by Member State becoming national quotas. This fixed percentage is known as the relative stability key but EU countries can exchange quotas with other EU countries. After the TAC allocation has been agreed among Member States, it is the responsibility of each MS to monitor its quota uptake and to close the fisheries when quotas have been taken up. Member States must keep the Commission regularly informed about their quota uptake. This is provided through the Commission's online Catch Reporting System (Master Data Register).

TAC proposals are based on scientific advice from advisory bodies such as the International Council for the Exploration of the Sea (ICES), the Scientific, Technical and Economic Committee for Fisheries (STECF) and the General Fisheries Commission for the Mediterranean (GFCM), and should take into account biological and socio-economic aspects ([2]).

The main biological criteria adopted when fixing TACs is to bring fishing mortality to the levels required to allow stocks to rebuild to biomass levels that can produce maximum sustainable yield (MSY). In cases where no MSY assessment is available, the Commission applies a precautionary approach.

With the explicit introduction of economic objectives in the CFP ([3]), there is a growing need to integrate socio-economic analyses into the scientific advice process, which continues to be based almost entirely on biological assessments. Assessing the social and economic impacts of TAC and quota proposals needs to be integrated into the process.

The economic advice for supporting DG MARE in the TACs negotiation process requires robust estimates of the potential economic impacts of different TAC scenarios on EU fleets, for example, in terms of Gross Value Added (GVA), profit margins and employment. Yet,

([1]) For example, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL Consultation on the fishing opportunities for 2017 under the Common Fisheries Policy- COM/2016/396.

([2]) In accordance with Article 16(1) of Regulation (EU) No 1380/2013, fishing opportunities should be allocated to Member States in such a way as to ensure relative stability of fishing activities of each Member State for each fish stock or fishery. The total allowable catch (TACs) should therefore be established, in line with Regulation (EU) No 1380/2013, on the basis of available scientific advice, taking into account biological and socio-economic aspects whilst ensuring fair treatment between fishing sectors, as well as in the light of the opinions expressed during the consultation of stakeholders, in particular at the meetings of the Advisory Councils.

([3]) Art. 2.1 "The CFP shall ensure that fishing and aquaculture activities are environmentally sustainable in the long-term and are managed in a way that is consistent with the objectives of achieving economic, social and employment benefits, and of contributing to the availability of food supplies")

at present there is no single bio-economic model able to assess the social and economic impacts of TAC and quota proposals at EU wide level. Several integrated models have been developed and are currently used to assess biologic and socio-economic impacts, in the short and longer-term. However, these models are generally very complex and specific, i.e. they have been designed with particular stocks (usually from a biological perspective) or fleets in mind, and hence are not easily or readily conditioned ([4]).

The Bio-Economic Model of European Fleets (BEMEF) model, constructed around the DCF fleet economic data, was identified by STECF ([4]) as the only available model which covers almost all TACs within the EU in the Northeast Atlantic region. However, current limitations of the model may induce misleading results on the economic assessments of TAC proposals, as such assessments would lack the long-term effects of the TAC proposals (driving the fisheries to FMSY).

Currently, the assessment of the socio-economic impacts of TACs on EU national fleets relies on economic data collected through the EU Data Collection Framework (DCF). This data is analysed and presented in the *Annual Economic Report on the performance of the EU fishing fleets* (AER) produced by STECF with a two-year time lag. The main socio-economic performance indicators analysed in the AER include Gross Value Added (GVA), gross profit and net profit, as well as other indicators such as, labour productivity (GVA per FTE), return on fixed tangible assets, average wage, etc.

However, the performance indicators provided in the AER relate to fleet segments and hence, not directly to fish stocks or TAC units. An indirect link between economic data (such as costs and income) and the TAC units could ideally be established through the so called '*transversal or fishing activity data*', which include data on landings by species, gear-type and FAO fishing sub-region. Yet, the relatively high level of spatial aggregation of these data submitted by MS under the DCF fleet economic data call does not allow for a straightforward relation in many cases.

Taking into account the need for readily available and reliable socio-economic data on the relevance of stocks subjected to a TAC on fleet performance, this report presents the development of the TAC Dependency Indicator (TDI).

The analysis follows the regulatory perspective and maps stocks according to the TAC units as indicated in the Council Regulations fixing fishing opportunities for certain fish stocks and groups of fish stocks in line with Regulation No 1380/2013 on the Common Fisheries Policy (CFP) and taking into account catch data as reported by Member States in the EU Catch Reporting system (FIDES) ([5]).

Hence, this approach was taken so as to provide policy makers with reference economic data collected under the DCF and analysed within the scope of the AER in a format that can be easily linked to TACs and TAC proposals.

While the North East Atlantic and the Mediterranean Sea EU fisheries are governed by the CFP, fisheries in the latter region are mostly managed by input controls (fishing effort). Only a few TACs are set for species in FAO fishing area 37. These include turbot and sprat in the Black Sea and several highly migratory fish species, such as bluefin tuna, bigeye tuna, swordfish, Atlantic blue and white marlin, etc..

For a more comprehensive coverage, dependency ratios for fleet segments operating in the Mediterranean & Black Sea are also provided. In the absence of defined regulatory TAC unis, dependency ratios, and proportional FTE and GVA, were calculated for fleet segments in area 37, by species and GSA (Geographical Sub-Areas).

([4]) STECF 17-05 - Bio-economic modelling_JRC106583.pdf

([5]) This exercise may not fully cover some stocks, such as those that are ambiguously defined, for example, other species (OTH) for which there may be no clear correspondence with landings data by species (FAO code) provided under the DCF and analysed in the AER.

1.2 TAC Dependency Indicator (TDI)

The TAC Dependency indicator (TDI) provides an estimate of the economic relevance that each stock subjected to a TAC has on EU fishing fleet segments from a regulatory perspective.

The TDI is calculated as the proportion between the value of landings associated to a given TAC unit and the total value of landings of a fleet segment.

The dependency ratio, based on historical data and always with a two-year time lag, does not provide any measure of the effects from setting the TACs at a certain level. In fact, the TDI being a simple proportion does not require modelling.

The TAC dependency indicator and online tool are intended to serve as a first step in the TAC proposal and impact assessment processes, by identifying potential fleet segments and TAC units for further scrutiny, using more sophisticated bio-economic modelling approaches.

The TAC Dependency Indicator is intended to serve as a first step in the TAC proposal and impact assessment processes by identifying fleet segments that could potentially be impacted by the setting of TACs and quotas. Further scrutiny into these fleet segment and the possible socio-economic impacts would require the use of more sophisticated tools, such as bio-economic modelling.

The TDI can also be seen to complement two other suites of indicators, which are also produced based on the scientific data collected by Member States through the DCF and intended to contribute to the reporting requirements on the CFP by the Commission ([6]):

(1) the CFP monitoring indicators ([7]) - report on the progress in achieving maximum sustainable yield (MSY) objectives and the status of fish stocks.

(2) the 'balance' indicators - a suite of biological, technical and economic indicators calculated and interpreted according to the European Commission Guidelines (COM (2014) 545 final) ([8]), to assess Member States efforts in achieving a balance between their fleet capacity and their fishing opportunities.

Both these analyses and reports use stock assessment data from ICES (for the North Atlantic) and STECF / GFCM (for the Mediterranean & Black Sea region) and hence, follow the biological stock perspective as opposed to the regulatory approach taken in this exercise.

This report set outs to provide an overview of the methodology and data sources used to calculate the TDI, as well as their current limitations. The report also provides an outline

([6]) Article 50 of the Common Fisheries Policy (CFP; Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013) stipulates: "The Commission shall report annually to the European Parliament and to the Council on the progress on achieving maximum sustainable yield and on the situation of fish stocks, as early as possible following the adoption of the yearly Council Regulation fixing the fishing opportunities available in Union waters and, in certain non-Union waters, to Union vessels."

([7]) In accordance with STECF (2016b), a new set of indicators were included in this year's analyses (see STECF 17-04 - Monitoring the performance of the CFP).

([8]) Communication from the Commission to the European Parliament and the Council. Guidelines for the analysis of the balance between fishing capacity and fishing opportunities according to Art 22 of Regulation (EU) No 1380/2013 of the European Parliament and the Council on the Common Fisheries Policy.

of the dedicated online tool, highlighting some functionalities and outputs that are currently available ([9]).

The indicator is calculated by TAC unit as defined in the Council Regulation (EU) 2016/72 and by DCF fleet segment, over the period 2008-2015.

The same data is presented according to two complementary perspectives that address the following two questions:

- which fleet segments are more dependent on a given regulated stock or TAC unit?
- which TAC units are mostly targeted by a given fleet segment?

In addition, the overall dependency on regulated stocks is provided by fleet segment and Member State.

The report and online tool presents a static situation with no attempt of forecasting. To appreciate impacts from quota changes and forecast dependencies consequent to a change of the TACs, a more complex modelling exercise would need to be undertaken using bio-economic models such as BEMEF.

Nonetheless, consistency in dependency ratios over the time series may be indicative of a consolidated and stable relation between stocks and fleets. Under such circumstances it is possible to foresee what will be the level of dependency in the short term and draw more robust conclusions in respect of the current year TACs proposal.

Box 1. The TAC Dependency Indicator: what it can and cannot do

— The TAC Dependency indicator (TDI) provides estimates of the economic relevance that each stock subjected to a TAC has on EU fishing fleet segments from a regulatory perspective.

— The TDI is calculated as the proportion between the value of landings associated to a given TAC unit and the total value of landings of a fleet segment.

— The tool is intended to serve as a first step in the TAC proposal and impact assessment processes by identifying fleet segments that could potentially be impacted.

— Historical time series data may be indicative of the dependency level of fleet segments on certain stocks and their ability to adapt to changes.

— Results are constrained by data limitations, in particular those related to spatial aggregations.

— The dedicated online tool serves as a visual aid to analyse and extract data in a user-friendly environment.

1.3 Fleet dependency on species in the Mediterranean & Black Sea

Fleet dependency on species by GSA for EU fleet segments operating in FAO area 37 were estimated in the same way as for the regulatory TAC units. That is, the dependency is calculated as the proportion between the value of landings associated to a given species in a GSA and the total value of landings of a fleet segment.

([9])https://visualise.jrc.ec.europa.eu/t/dcf/views/TAC_dependency_dgmare_MAPS/TotalAllowableCatchIndicator?:embed=y&:showShareOptions=true&:display_count=no&:showVizHome=no#20

2 - Data, definitions and methodology

The TAC dependency indicator is calculated by fleet segment for each TAC unit as defined in the Council Regulation (EU) 2016/72, using DCF data on landings in value and weight submitted by Member States under the 2017 call for economic data on the EU fishing fleet. Additional information by TAC unit is also provided at the EU and Member State levels.

2.1 Data sources

Information from several data sources are used to estimate the dependency of fleet segments on TAC units from a regulatory perspective. These include: (i) the fishing activity and socio-economic data provided by Member States under the Data Collection Framework, (ii) TAC and quota regulations (fishing opportunities), (iii) catch data provided by Member States under the EU catch reporting system (FIDES) and, (iv) spatial data from the FMZ map book.

2.1.1 EU Data Collection Framework (DCF)

Fishing activity and socio-economic data on the EU fishing fleet are collected and submitted annually by Member States under the data collection framework (DCF), cf. Council regulation (European Commission (EC) No 199/2008 of 25 February 2008).

This current version uses data collected under the 2017 DCF call for fleet economic data, which requested economic and fishing activity data for the years 2008 to 2015 from all 23 coastal Member States ([10]). The data analysed cover the fishing fleet (capacity), fishing activity (landings and effort) and economic data (income, costs, employment, enterprises, capital value and investment). It should be noted that the completeness and reliability of the data collected under the DCF remains the responsibility of the Member State.

For this analyses, DCF data on landings, employment, income and costs for the period 2008 to 2015 were used. While fishing activity data is provided aggregated by fleet segment, supra-region, sub-region and gear type, the economic data is provided aggregated by fleet segment and supra-region only (see definition of fleet segment below).

Landings, in weight and value, are provided by fleet segment, supra-region (areas 27, 37 and OFR – other fishing regions), sub-region (FAO division for the North Atlantic and other regions and by sub-division for the Baltic, Mediterranean & Black seas), species and gear-type.

Employment data (total employed and Full Time Equivalent) and data on variable costs (energy, repair, labour, etc.) and fixed costs by fleet segment were also retrieved from the DCF economic data to estimate employment and GVA associated to TAC units.

2.1.2 Fishing Opportunities and the Catch reporting system (FIDES3)

Each year, TACs and quotas by Member State are set in the EU Council Regulations fixing Fishing Opportunities (FO) for certain fish stocks and groups of fish stocks applicable in Union waters and, for Union fishing vessels, in certain non-Union waters, in line with Regulation No 1380/2013 on the Common Fisheries Policy (CFP).

The current FO regulation sets the TACs for the year 2017 in the Council Regulation (EU) 2017/72. For 2018 the new proposals by the Commission will be discussed during the EU Council of Fisheries Ministers in December 2017.

The TACs are published in different official documents by main type or groups, namely:

- fishing opportunities for certain fish stocks and groups of fish stocks, applicable **in Union waters and, for Union fishing vessels, in certain non-Union waters**
- fishing opportunities for Union fishing vessels for certain **deep-sea fish stocks**

([10]) Ref. Ares(2017)380592 - 24/01/2017

- fixing for 2017 the fishing opportunities for certain fish stocks and groups of fish stocks in the **Black Sea**
- fixing for 2017 the fishing opportunities for certain fish stocks and groups of fish stocks applicable in the **Baltic Sea**

Member States are required to systematically report catches through the Catch Reporting System, managed by DG MARE and accessible through Fishery Data Exchange System (FIDES3) ([11]). Countries send data gathered from their fishing vessels and only validated data are stored. The Catch reporting user interface shows data on catches by regulated stocks (TAC units), the adapted quota for each TAC and the consumption by Member State and year. Catch data on non-regulated stocks are also available.

2.1.3 Fisheries Management Zones (FMZ Mapbook and Geodata)

The Fisheries Management Zones (FMZ) used in this analyses are the version 3.4 and contains areas and allocated management stocks for the period 2013-2015. The FMZ version 3.4 file was released on August 2015. The latest available version of the FMZ is v 4.1 released on the 28th April 2017). Version 4.1 contains the FMZ polygons and related stocks update for the period 2015-2017 (incl. first amendment), as well as the multiannual plans. The 2016 fishing stocks are not yet included.

The FMZ (Fisheries Management Zones) geodataset contains all unique polygons used for describing fishing stocks or other fisheries management areas. It has a one-to-many relationship with the thematic datasets (tables). Currently the FMZ Geodata are distributed as shapefile.

The Stocks dataset is also available, containing all stocks defined in the yearly EU fishing opportunities legislation. It holds one record per stock, containing the stock ID and stock area name as defined in the regulations, and a link to the geographic FMZ dataset using FMZ ID.

A zip file containing the Stocks table and linked FMZ shapefile can be found on the Master Data Register (MDR at: https://ec.europa.eu/fisheries/cfp/control/codes_en).

More information available: https://ec.europa.eu/fisheries/cfp/control/codes_en

2.2 Concepts and Definitions

2.2.1 DCF Fleet segmentation

In the context of the DCF ([12]), a fleet segment is defined as a group of vessels with the same length class (length overall, LOA) and predominant fishing gear during the year.

Individual vessels are attributed to a given fishing technique (or main gear group) based on a dominance criterion, usually determined by the level of fishing effort, e.g. number of fishing days of the main gear used during the year ([13]). Vessels classified according to a certain fishing technique may also operate with other different gear types and in different supra-regions.

Each fleet segment is also allocated to the FAO major fishing area in which it mostly operates. These main areas or supra-regions comprise: (i) North Atlantic, including the Eastern Arctic, North and Baltic seas (FAO area 21+27), (ii) Mediterranean and Black seas (FAO area 37) and (iii) all other fishing regions (collectively termed 'OFR'). Vessels allocated to a given supra-region may also operate in other supra-regions.

([11]) http://s-antares.fish.cec.eu.int/cr/index.cfm?event=datawarehouse.quotas

([12]) Commission Decision 2010/93/EU, Annex, Chapter 1, definition d.

([13]) If a fishing gear is used by more than the sum of all the others (i.e. a vessel spends more than 50% of its fishing time using that gear), the vessel shall be allocated to that segment.

Hence, a fleet segment is a combination of the fishing technique and vessel length group operating predominately in a major fishing region, for example, ”A27 FRA HOK VL1824“ comprises French vessels between 18 and 24 m LOA, operating predominately in the Northeast Atlantic using hook and line gears (area 27) ([14])

Given that some national fleets may include the same type of fleet segment operating in the same fishing region but for management purposes need to be distinguished, such as, fleets operating in EU outermost regions or fleets fishing exclusively in international waters, an additional dimension – the *geographical indicator,* is added to the fleet segment name. This enables distinguishing between, for example, Portuguese hook and line vessels operating in the Northeast Atlantic (area 27), i.e. *A27 PRT HOK VL1824 P1* (Portuguese mainland Hook and line fleet 18-24 m) and *A27 PRT HOK VL1824 P3* (Azorean Hook and line fleet 18-24 m).

While the DCF fishing activity variables, such as fishing effort and landings (weight and value) contain a gear specification, the same is not true for the economic data on employment, costs and income, which are only provided by fleet segment and supra-region. It is therefore not possible to directly calculate GVA or any of the economic performance indicators by gear type from the DCF data. This make sense when assessing the economic performance of fishing fleets as it is not possible to allocate costs, in particular, fixed costs to the various gear types used by a fishing vessel or fishing firm over a reference year.

Therefore, the dependency ratios on TAC units are calculated by fleet segment, which is currently the only way to establish a direct link to the economic variables on costs without the need to adopt a model based disaggregation approach.

Moreover, if a fleet segment is composed of few vessels, usually less than 10 vessels, the economic data provided by fleet segment may be clustered with other fleet segments to preserve confidentiality requirements. Thus, when interpreting data for clustered fleet segments it should be taken into account that these may not represent uniform aggregates of vessels with the same fishing technique and that the composition of the cluster may change from one year to the other, generating some inconsistency in the time series.

For more information: https://datacollection.jrc.ec.europa.eu/dc/fleet

2.2.2 TAC unit

TAC units are defined in the TAC and quota regulations by a species or group of species and Fisheries Management Zones (FMZ). These management units for which the TACs are set do not always correspond to the stock units for which ICES, STECF and GFCM provide their scientific advice.

Furthermore, in many cases, ‘special conditions’ apply for TAC units and are reported in the TAC and quota regulations.

In general, the terminology applied is as follows:

1) 'Parent' stock is a ”normal stock“ defined in the TAC and Quota regulations. Parent stocks may or may not have a 'child' stock.
2) 'Child' usually means that the stock is linked to a 'parent' stocks and it is a special condition (SC) type. The relation or special condition can be in terms of area, period, species, quantity, etc. A 'child' stock usually has an asterisk '*' in its name.

([14]) Jardim, E., A. Urtizberea, A. Motova, C. Osio, C. Ulrich, C. Millar, I. Mosqueira J.J. Poos, J. Virtanen, K. Hamon, N. Carvalho, R. Prellezo & S. Holmes (2013). Bio-economic Modelling Applied to Fisheries with R/FLR/FLBEIA. JRC Scientific and Policy Report EUR25823. http://www.azti.es/mailings/flbeia/Jardim2013FLBEIA.pdf

There are four special condition (SC) types:

3) SS - sub-species
4) SA - sub-area
5) EL - extra limitation and
6) SC - special condition generic.

Child stocks of the type SS, SA and EL have an area which is equal to or included in the parent stock area.

Child stocks of the type SC allow catching a certain share of the main stock elsewhere. SC stocks refer to an area outside the parent stock area, while they may (or not) be included in or overlap with the area of another stock. However, there are exceptions to these 'rules':

- not all child stocks have an * in the area, e.g. this occurs in most sub-species and sub-areas stocks in the Baltic.
- some children have double parents - and grandparents,
- etc.

There are a few cases where the child is the stock mentioned in the Regulation and a 'virtual' parent has to be created in order to monitor a common quantity. An example, WHB/*NZJM, which is parent to both WHB/*NZJM1 and WHB/*NZJM2, but both these children also have other parents.

Child stocks of the type SC refer to an area outside the parent stock area, and if excluded, the full list of stocks / areas is not considered.

In the case of the Baltic Sea stocks, all the SA children can be removed. In fact, these stocks have been simplified in the draft regulation for 2017, maintaining only the code of the 'parent'.

In the context of the TAC dependency exercise, all special conditions of the type, SS, SA and EL, were excluded when estimating total fleet dependencies.

In the Catch Reporting System, 'child stocks' are linked to a 'special condition' (SC), i.e. special condition stocks. Catches are reported either under 'catches' or 'special condition catches'.

For the correct calculation of the total reported amounts only the 'Catches' column figures should be used because 'SC Catches' column is a double of what is reported under 'child' stocks, or stocks starting with '*'.

2.2.3 FMZ mapbook

Fisheries Management Zones (FMZ) are geographical areas delineated with a regulatory perspective in mind. They incorporate a series of specifications such as the exclusion of external territorial waters. In some cases, these specifications result in different boundaries with respect to areas identifying stocks according to a biological perspective and/or with respect to fishing areas defined by FAO, ICES and other RFMOs.

In view of the main objective - provide policy makers with reference economic data from the AER in a format that can be linked to TACs and TAC proposals - this exercise follows the regulatory perspective approach and maps stocks according to the FMZ definitions.

The FMZ geodataset is a set of polygons with a unique numeric identifier (FMZ ID) and a description. The FMZ ID can be used to link information from other datasets to a geographic object. The FMZ polygons are unique (there are no duplicate geographic objects in the geodataset) but can overlap. The ID and definition of an FMZ is stable and will never be changed in future releases; if a new area definition is needed a new FMZ polygon will be added to the geodataset.

While each FMZ has a unique ID code, one or more stocks may be associated to a particular FMZ. The map-book shows the Stock Codes and Regulation Area Definitions for a total of 459 number of stocks (TAC units).

This document does not provide the TAC or quota amounts (in tonnes) as set out in the TAC & quota regulations.

Box 2. Definitions

- **DCF fleet segment** - a group of vessels with the same length class (length overall, LOA) and predominant fishing gear during a given year.
- A fleet segment is defined by a combination of a fishing technique and vessel length group, operating predominately in a major fishing region.
- The geographical indicator adds another dimension to allow distinguishing same fleet segments operating in different regions.
- **TAC unit** - species or group of species within a Fisheries Management Zone (FMZ).
- Each TAC unit is associated to one FMZ, while each FMZ may have several TAC units associated to it.
- Each year a TAC unit is assigned a Total Allowable catch (TAC). Each respective Member State is allocated a quota of the TAC, according to a fixed percentage, also known as the relativity key.

2.3 Methodology

2.3.1 Linking data sources

The link between the four data sources used to estimate the economic relevance of TACs and quotas on EU Member State fishing fleets is established taking into account the definition of a TAC unit and FMZ, i.e. species (or species group) + FMZ (spatial area), which all data sources used share to a certain extent.

All four data sources used in this exercise have a species or species group and/or a defined geographical area, although not necessarily at the same aggregation levels (Figure 1).

- **DCF fleet economic data** – landings by Member State, fleet segment, species, FAO division or sub-division, gear type and year, and socio-economic data (employment, income, costs, investment, etc.) by Member State, fleet segment and year.
- **Fishing Opportunities (FO) or TAC and quota regulations** – TAC and quotas (in tonnes) fixed by Member State in a given year (as adopted by the Ministers of the Member States at the Fisheries Council in December). These amounts may be amended throughout the year (referred to as adapted quota in the Catch reporting). The information from this document can be obtained digitally from complementary data sources provided with the FMZ map book (MDR) and from the Catch reporting system (FIDES3).
- **Catch reporting system** - catches by TAC unit and Member State. Catches by special condition and the adapted quota are also available.
- **FMZ geodataset** - contains unique polygons used for the management and allocation of an individual or group of special conditions fish stocks a. FMZ boundaries may or may not coincide with FAO fishing areas or ICES areas. Each

FMZ has a unique ID and can be associated to one or several TAC and quota codes, for example: FMZ ID: 27000304

Description: ICES VII (= Union and international waters of)
TAC & Quota Stock Codes for this FMZ include:

- ANF/07.
- LEZ/07.
- NEP/07.
- POL/07.

DCF landings by species and FAO fishing area were matched to the TAC units as defined in the TAC & Quota regulations by year, available from the Stock table (MDR) and as provided by Member States in the Catch Reporting System.

The data submitted to the catch reporting system on catches by TAC unit are at the Member State level and hence, not available by fleet segment as provided through the DCF data.

Catches reported in the Catch Reporting System were linked to the DCF data and used to assess the coverage and reliability of the results. That is, catches by TAC unit reported by Member States should equate to the DCF landings, give or take, considering that the DCF fleets covered may differ somewhat (active as of 1 January as opposed to all active throughout the year). Additionally, limitations may apply as regards the spatial aggregations and missing or confidential data. This validation is only possible at the Member State level.

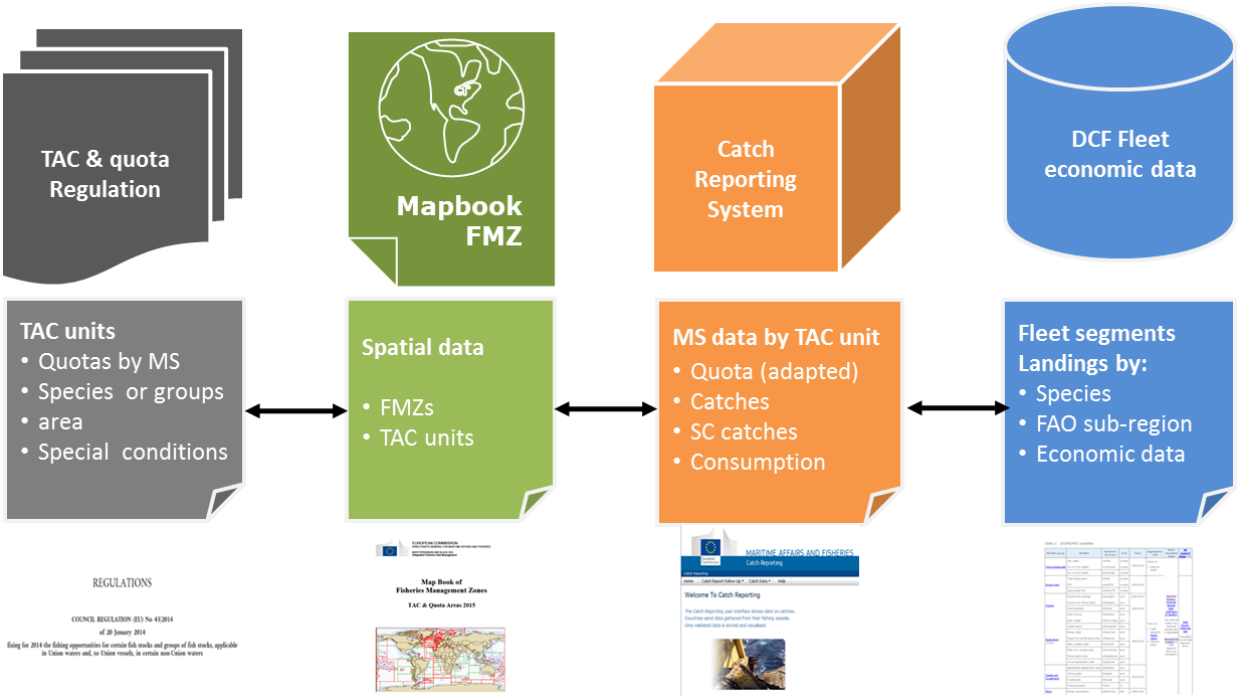


Figure 1. Simplified diagram of the various data sources used and the links between them.

2.3.2 Indicators on fleet dependency on TAC units

TAC Dependency Indicator

Once the mapping between FMZ and FAO is established the TDI is calculated as the ratio between the value of landings of the selected TAC unit and the total value of landings of the fleet segment, according to the following formula:

$$TDI_{TACunit,fleet} = \frac{Turnover_{TACunit,fleet}}{Turnover_{fleet}}$$

TAC unit - GVA dependency indicator

Estimates of GVA require a deduction from income of variable and fixed costs. Also in this case, costs are proportionally attributed to TAC units based on the basis of a proportionality criteria using the following formula:

$$GVA_{TACunit,fleet} = Turnover_{TACunit,fleet} - \frac{Variablecosts_{fleet} * Turnover_{TACunit,fleet}}{Turnover_{fleet}} - \frac{costs_{fleet} * Turnover_{TACunit,fleet}}{Turnover_{fleet}}$$

Where variable costs are energy, repair and other variable costs and fixed costs are non-variable costs (DCF variables).

TAC unit - employment (FTE) dependency indicator

Similarly, employment (in total employed and FTE) for fleet segments were estimated for TAC units using the following equation:

$$Employment_{TACunit,fleet} = Employment\frac{fleet * Valueoflandings_{TACunit,fleet}}{Valueoflandings_{fleet}}$$

Where the employment variable used is Full-Time Equivalent (FTE).

2.3.3 Indicators on fleet dependency in the Mediterranean & Black Sea

DCF landings by species and GSA area were matched by fleet segment and year. This is a direct relationship and no further data processing is required. Fleet dependency ratios on the landed value, and proportional estimates of FTE and GVA associated to each species-GSA, were estimated as describe above.

2.4 Time series

The latest available economic data reports to 2015. DCF data for the years 2008 to 2015 were used to calculate time series results. The TDI is calculated for the period 2008-2015 using the TAC units and FMZs as defined for 2015.

There is no guarantee that the dependency ratio calculated for 2015 are maintained in 2016 and 2017 and that they will remain unchanged after the establishment of the TACs. In fact, fleets may have an adaptive behaviour and react to changes in the level of the TACs by reallocating their share of income from one stock to another.

This report presents a static situation with no attempt of forecasting. To evaluate impacts from quota changes and forecast dependencies consequent to a change of the TACs more complex modelling exercise would need to be undertaken using bio-economic model such as the Bio-Economic Model of European Fleets (BEMEF), which is already constructed around the DCF and AER data/analyses.

In some cases, the regularity in the time series of dependency ratios may be indicative of a consolidated and stable relation between stocks and fleets. Under such circumstances it is possible to foresee what will be the dependency level in the short term and draw more robust conclusions in respect of the current year TACs proposal. To appreciate the level of stability of the indicators the values reported for the year 2015 are accompanied by a representation of the time series for the period 2008-2015.

2.5 Data and methodological limitations

Management units are defined in the TAC and quota regulations as a combination of species (or species groups) and Fisheries Management Zones (FMZ).

The main limitations encountered in this exercise are due to the differences in the spatial aggregation used as well as and derive essentially from the resolution of the data available and inconsistencies between the different sources of information. Other limitations include missing data or data provided at incorrect aggregation levels (in the case of the DCF data).

Moreover, many TACs and TAC units are linked to special conditions, notably related to inter-species quota flexibility, catch composition rules, obligations to release (discard) certain species with high survivability, etc. Special conditions are also in a number of cases connected to fishing in non-EU waters (in particular Norwegian waters).

2.5.1 DCF scientific economic data on the EU fishing fleet

Economic data under the DCF is provided by Member State fleet segment. Yet, in some cases, generally in order to ensure confidentiality, fleet segments are often grouped with other fleet segments to form clusters. On the other hand, transversal or fishing activity data (effort and landings) are provided by fleet segment, gear type and FAO fishing area (by division in the North Atlantic or sub-division in the Baltic and Mediterranean & Black sea regions). Currently, data is not provided by metier (e.g. also by mesh size).

The DCF fishing activity data are not always provided at the correct aggregation levels, for example, at the appropriate geographic stratification such as FAO fishing areas level 3 (division) or 4 (sub-division) and FAO 3-alpha species codes, which are sometimes but not always provided by more generic codes that include several species, for example: ANF (see annex for a more detailed list).

TAC unit	FAO 3A_code	Scientific_name	English_name
ANF	ANF	Lophiidae	Anglerfishes nei
ANF	ANG	Lophius americanus	American angler
ANF	MON	Lophius piscatorius	Angler(=Monk)
ANF	MNZ	Lophius spp	Monkfishes nei
ANF	ANK	Lophius budegassa	Blackbellied angler

2.5.2 Spatial resolution of the data/regulation/advice

Management units are defined in the TAC and quota regulations as a combination of species (or species groups) and Fisheries Management Zones (FMZ). As FMZ are geographical areas delineated with a regulatory perspective in mind, they represent ad hoc groupings of entire or parts of FAO fishing areas.

When the FMZ cover only a portion of the FAO areas, merging with the DCF transversal data, which is reported by FAO fishing areas level 3 or 4, can be problematic. See Annex 2 for more details.

Figure 2 shows the main fishing grounds in the North Atlantic and Mediterranean Sea. The diagram highlights fishing areas at FAO division (or DCF level 3) in the North Atlantic region and sub-division (or DCF level 4) in the Baltic Sea. Landings data reported under the DCF for the Mediterranean and Black seas, are also provided at level 4, i.e. by GFCM GSA areas (Geographical Sub-Area, GFCM).

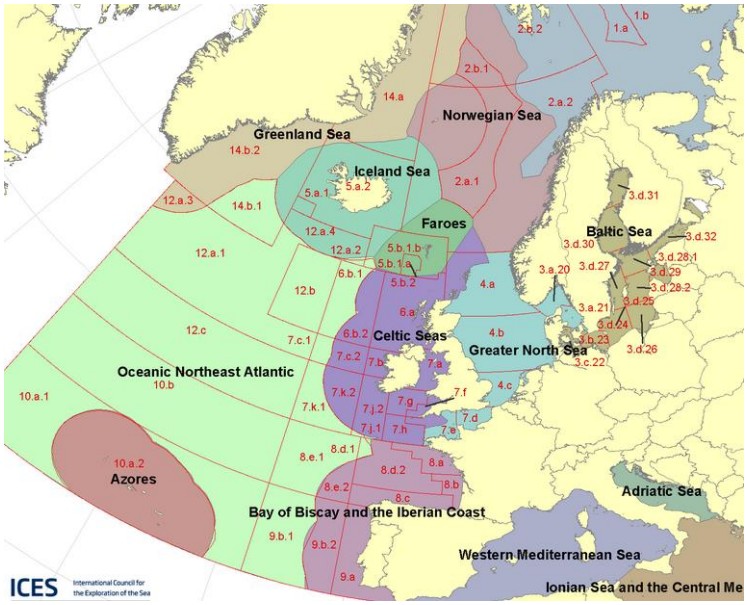


Figure 2**.** Main EU fishing regions, highlighting areas by FAO division in the North Atlantic and sub-division in the Baltic Sea (source: ICES)

Furthermore, FMZ areas and ICES areas do not always match. In some cases, ICES areas partially coincide with an FMZ while an ICES area may therefore appear in multiple FMZs if it lies on the border of the FMZs. Each ICES area is made up of smaller ICES rectangles. Again, the matching of rectangles to areas is not exact meaning that a rectangle can feature in multiple areas. Hence, TAC units do not necessarily coincide with biological stocks, for which stock assessments are generally produced.

Ideally, for this exercise, the area of the stock subjected to a TAC should coincide with FAO fishing areas division or sub-division, as this is the level of aggregation for which fishing activity data (effort and landings) is provided under the DCF fleet economic data call (see Figures xxx). Furthermore, it would be useful if the TAC area (the FMZ associated to a stock) also coincided with the ICES areas for which biological advice is given.

TAC area (FMZ) = FAO area (division or sub-division) = biological advice area (ICES rectangle).

If biological information on the TAC is also needed, then both the area and the species covered by the TAC should be exactly the same as the area and species combination for which the ICES advice is given. For example, this is the case for common sole in the Irish Sea, sol-iris (advice) vs. SOL/07A (TAC). Both the advice and the TAC (proposal) refer to sole in VIIa. However, this does not always apply. In some cases, the FMZ covers more or less area than the FAO fishing area or advice area.

TAC area (FMZ) > or < FAO fishing area (division or sub-division) or advice area (ICES rectangle)

Typical cases are when the TAC refers to only Union waters, for example ”Union waters of IVb, IVc and VIId“, i.e. excludes Norwegian waters of IVb. However, DCF landings data are provided by FAO fishing area division or sub-division and in these cases, the Norwegian waters fall within division areas in the North Atlantic. The current spatial resolution of the DCF landings data cannot specify whether activity is in Union waters or Norwegian waters (see Figures xxx).

Due to these inconsistencies and to the coarse spatial resolution of the landings data it is not always possible to accurately allocate landings to the TAC units.

In some cases, landings data may not be matched at all and in other cases it may be that the same landings data are allocated more than once to different TAC units (over-counting).

Unless the spatial aggregations match or landings data is available at a higher resolution, these data issues, that may lead to under or overestimating TAC unit dependency ratios, cannot be overcome/corrected.

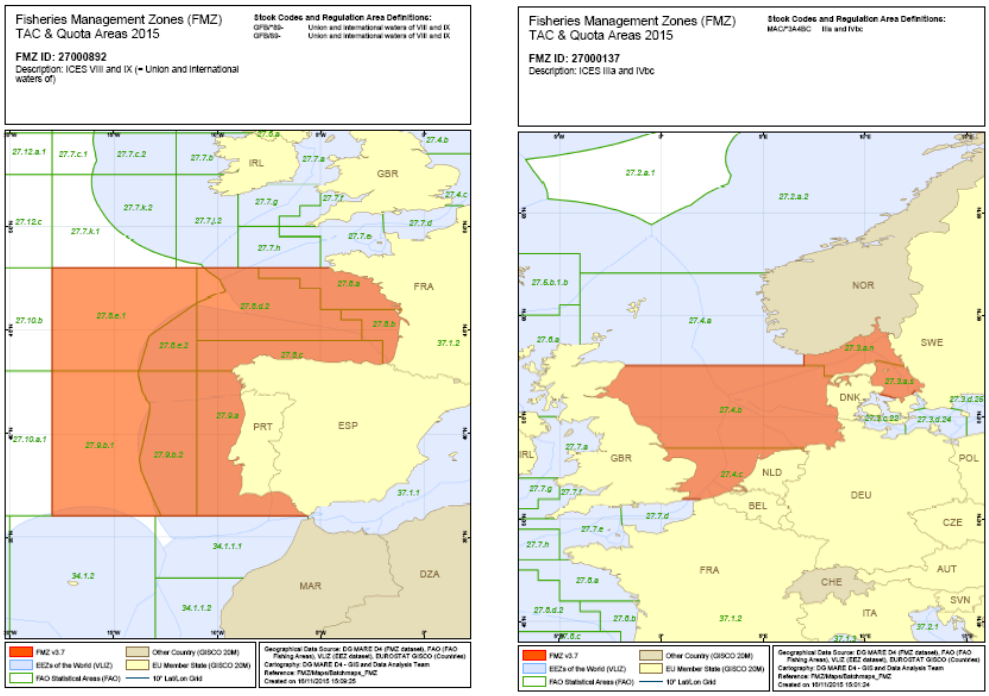


Figure 3. Examples of ideal cases where FMZ = FAO fishing areas

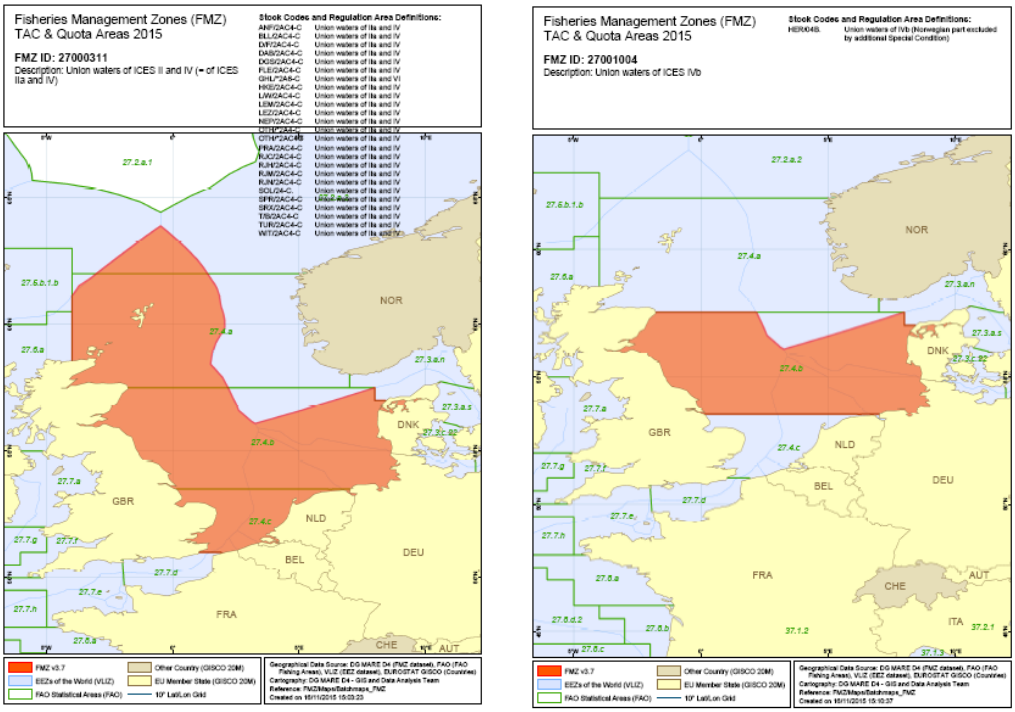


Figure 4. Examples of cases where the FMZ ≠ FAO fishing division areas, i.e. when the FMZ excludes Norwegian waters of 27.4.a and/or 27.4.b

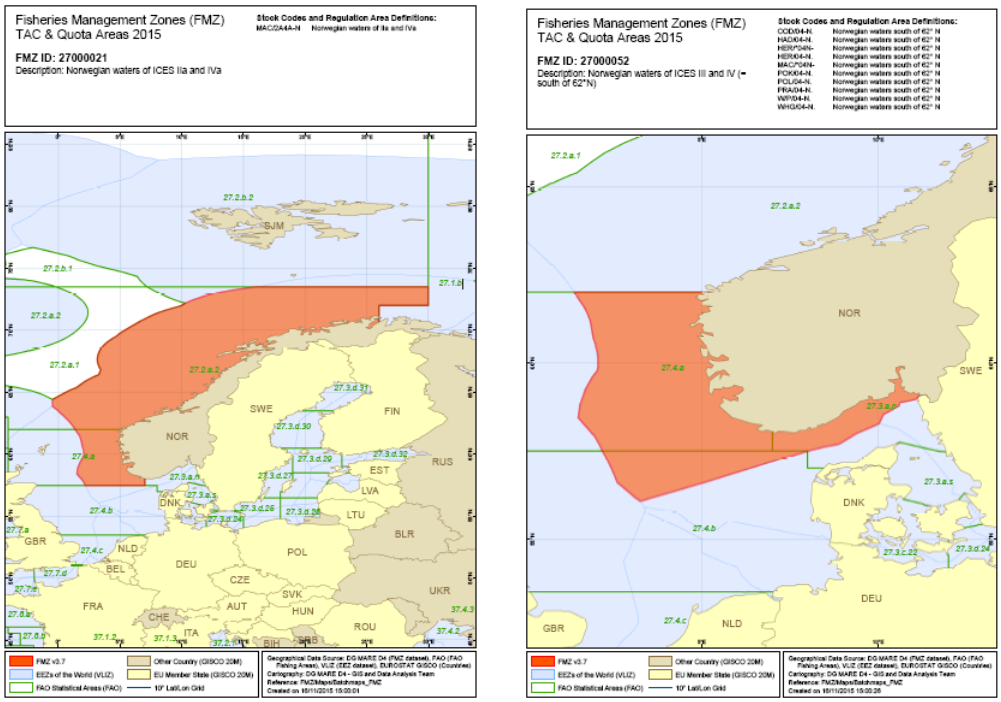


Figure 5. Examples of cases where the FMZ ≠ FAO fishing division areas, i.e. when the FMZ includes only Norwegian waters of 27.2 and 27.4.

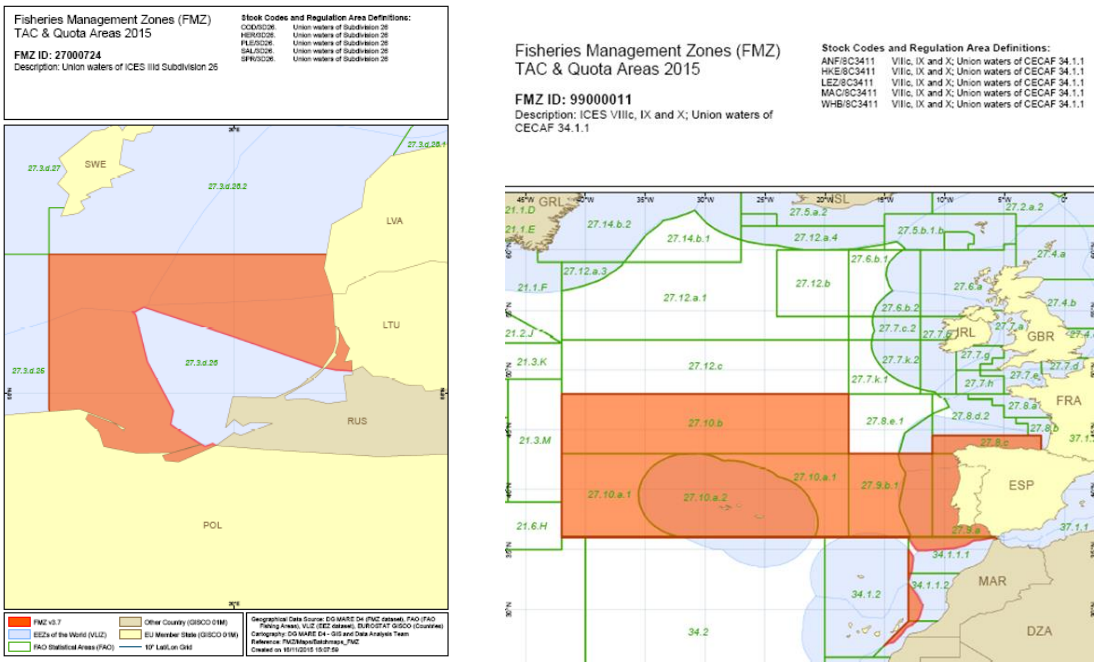


Figure 6. Other examples of cases where the FMZ ≠ FAO fishing division or sub-division areas.

2.5.3 TAC units

As mentioned above, there is often a spatial mismatch between the TAC regulation and ICES advice on stocks, and hence, the TAC units do not always correspond to the biological stock areas. In addition, some TAC units are set for several species or stocks combined whereas the biological advice is generally given for individual stocks.

It may also be the case that 'associated by-catches' can be included as part of the TAC. For example: sprat in the Skagerrak and Kattegat, spr-kask (advice) vs. SPR/03A. Both advice and TAC refer to the same area (IIIa) but the TAC includes both sprat and 'associated by-catches', whereas the advice refers to this species alone. Even though there is no area mismatch, the landings data cannot be matched since the stock or species that these 'associated by-catch' apply to, are not defined (FAO 3-alpha code).

Additionally, some of the species codes in the FMZ data refer to genus rather than species (megrim, anglerfish, redfish) while the corresponding code in the landings data may refer to the species. For this analysis, this does not pose a big problem as all species codes for the genus can be included in the TAC unit. For example, ANF – Lophiidae, which includes several species (ANG, MON, MNZ, ANK). This type of issue can generally be addressed by simply incorporating the set of species within the species group defined in the regulation and merged to provide data by TAC unit.

However, there are several stock/species in the TAC regulation for which FAO 3-alpha code are not applied. For example: W/P/04-N (whiting and pollack), I/F/04-N (industrial fish), D/F/2AC4-C (dab and flounder), T/B/2AC4-C (turbot and brill), L/W/2AC4-C (lemon sole and witch flounder), B/L/05B-F (ling and blue ling), C/H/05B-F (cod and haddock). For all cases, apart from I/F/ and RED, the inconsistent FAO code can be fixed. More recently, these joint species codes now exist as separate single species codes in the regulations (for example TUR/2A C4-C for turbot and BLL/2A C4-C for brill) as well as in the FMZ geodataset.

Yet, there remain cases where the DCF data cannot be associated to a TAC unit as the stock/species 'code' are not identified. These cases include TAC units defined as 'OTH' (Other), 'I/F' (industrial fish) and 'RED' (red fish). As these are not FAO 3-alpha codes, nor are they defined as any species or species group, the DCF landings data submitted by MS

cannot be matched. These TAC units cannot be identified unless Member States report them as such under the DCF. Currently this occurs only for RED but it is not evident to what extent this is being reported.

2.5.4 Biological stocks differ to Regulated stocks (TAC units)

This is not an issue for the present study, which focuses on the regulatory stock definition but may constitute an additional challenge if MSY is brought into the equation.

Stock assessment data is provided by species and ICES area. A stock is denoted by the ICES assessment stock name, the ICES areas that are covered by the assessment and the species code. Each ICES area contains ICES rectangles. Due to the way ICES areas are defined the rectangles may exist in more than one area, for example if the rectangles are on the borders of multiple areas.

Box 3. Data Limitations

- Spatial resolution of the data
- Cases where FMZ ≠ FAO fishing areas ≠ ICES Rectangles
- Special conditions (e.g. mesh size, industrial fleets, child stocks, grandparents, grandchild, sister stock, etc.)
- Inconsistent information from ≠ data sources
- DCF data: Fleet segment level data (clusters), data gaps, data provided at incorrect aggregation levels
- TAC units ≠ biological stocks

3 - Results

The TDI was calculated for combination of all stocks and fleet segments with available data. In addition to the TDI indicator, the report provides figures on the total value of landings that can be attributed only to the stock, the total value of landings of the fleet segments and estimates of the FTE and GVA for the stock.

The data is presented at TAC unit and a fleet segment level. The data included in these two sections refers to the year 2015 and dependency ratios for the time series covering 2008-2016 (2016 preliminary).

The TDI can be updated whenever more recent DCF data becomes available. However, the DCF data carries a one to two-year time lag and hence, does not coincide with the TAC regulation in force. Yet, while the values of TACs and quotas for each TAC unit may vary year to year, the TAC units (species + FMZ) themselves remain fairly constant. Therefore, if the TDI is provided according to the 2015 TAC regulation for all years analysed.

The following section describes the various components of the TDI online tool. The data limitations, mentioned in the above section, warrant careful consideration when using the TDI and web tool.

Complete tables of dependencies are provided and can be downloaded from the online dashboards at: https://visualise.jrc.ec.europa.eu/t/dcf/views/TAC_dependency_dgmare_MAPS/TotalAllowableCatchIndicator?:embed=y&:showShareOptions=true&:display_count=no&:showVizHome=no#20

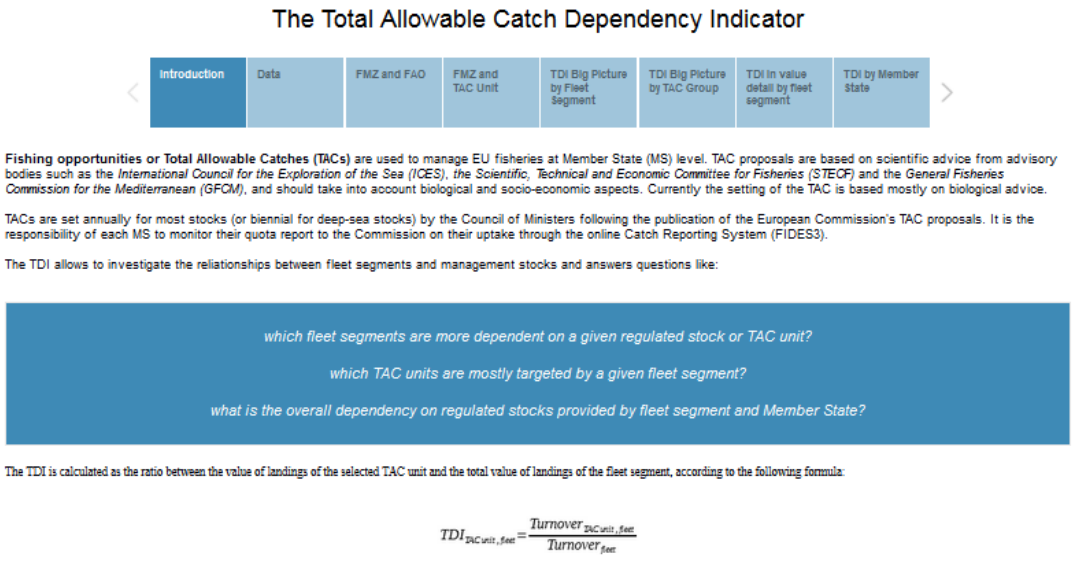
3.1 TDI Online Tool v.2

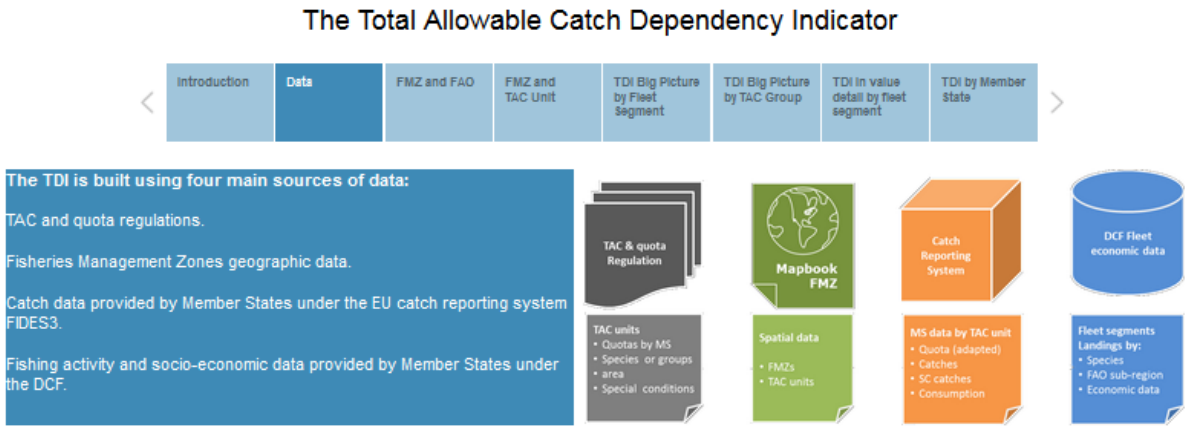
The user-friendly online tool, outlined below, provides information and results from this exercise in several interactive dashboards in Tableau, and include aggregations at the Member State, fleet segment and TAC unit levels.

The online tool is password accessible at this (provisional) link:

https://visualise.jrc.ec.europa.eu/t/dcf/views/TAC_dependency_dgmare_MAPS/TotalAllowableCatchIndicator?:embed=y&:showShareOptions=true&:display_count=no&:showVizHome=no#20

Introduction and data page – metadata and general information on the TDI





FMZ and FAO - spatial information and link between FMZs and FAO fishing areas.

This dashboard displays the level of spatial overlap between the stock area (FMZ) and FAO fishing areas. As mentioned in the previous paragraphs, FMZs are arbitrary management areas for TAC stocks. An FMZ might contain one or more TAC stocks and one or more FAO areas. FAO division and subdivision levels are used in the DCF economic database to store volume and value data needed to compute the TDI. Consequently, one important step of the TDI exercise was to allocate FAO areas to the corresponding FMZ. Through geographical intersection it was possible to disaggregate every FMZ into its constituent FAO parts and, for each constituent FAO part, it was possible to calculate the proportion of the FAO area within the FMZ.

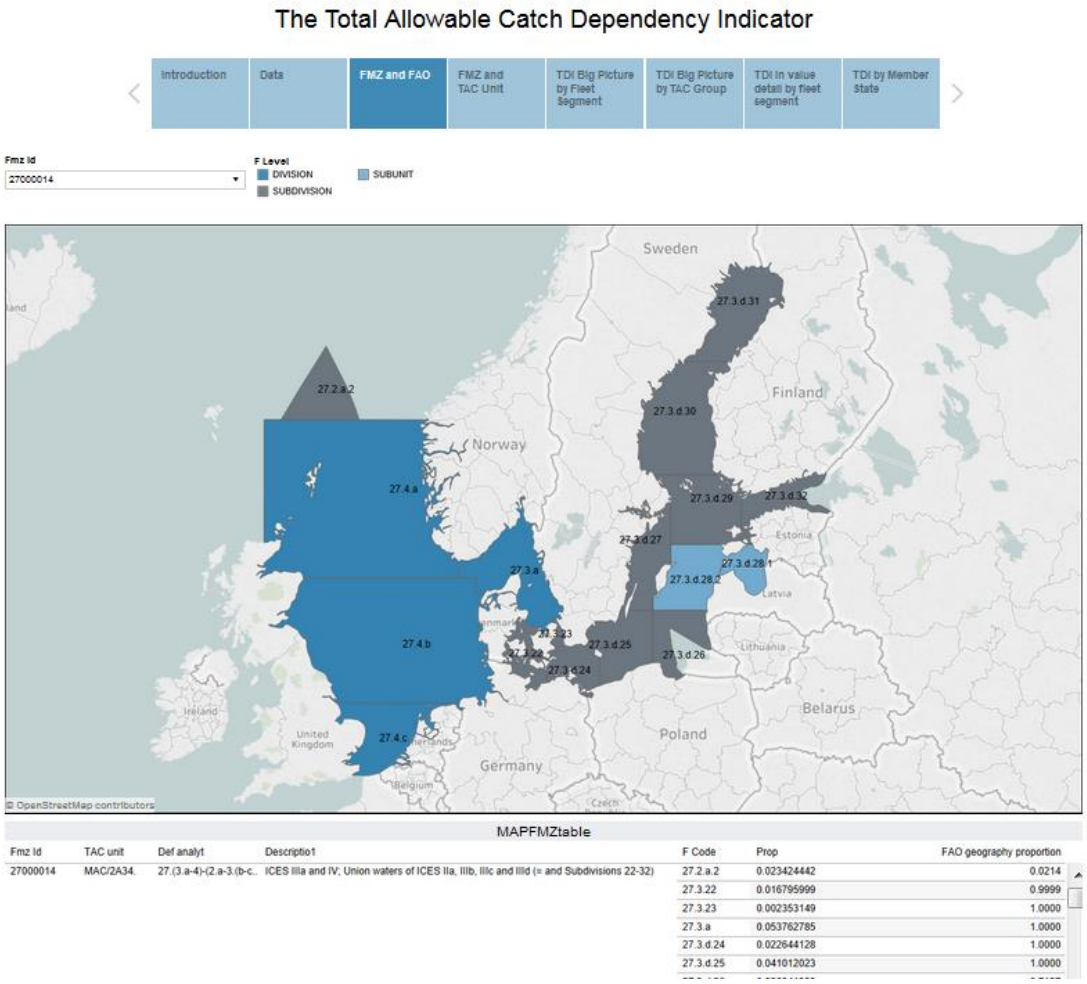
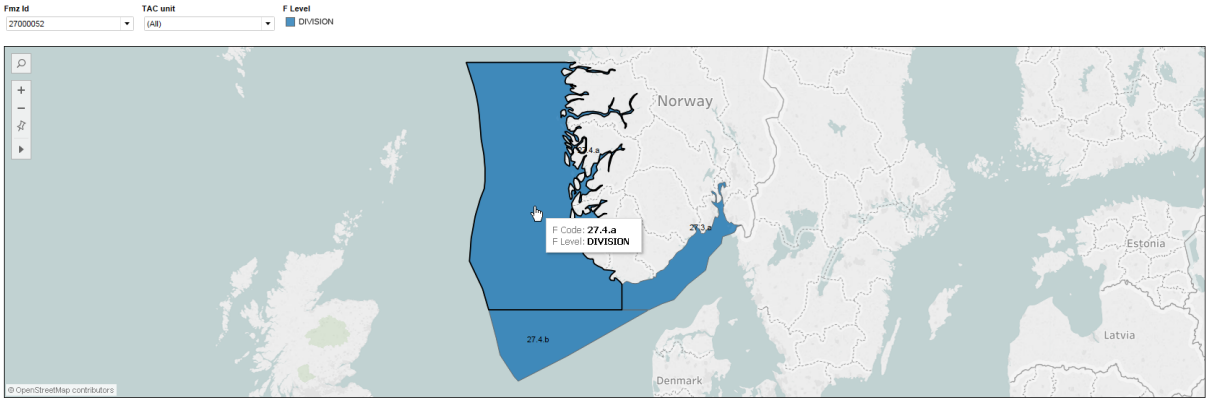


Fig. 18 shows the FMZ, TAC and FAO geographies all together. FMZ 27000052 contains seven TAC units and it is comprised of three FAO divisions: 27.3.a, 27.4.a and 27.4.b. None of these FAO areas is completely inside the FMZ. In Fig. 18, the table below the map contains two additional fields named *proportion* and *FAO geography proportion*. The first reports the share of the FAO constituent part on the total FMZ area. The field named *FAO geography proportion* contains indication on the share of the Total FAO area overlapping with the FMZ. If the values of *FAO geography proportion* is 100% it means that the FAO area is completely contained inside the FMZ.



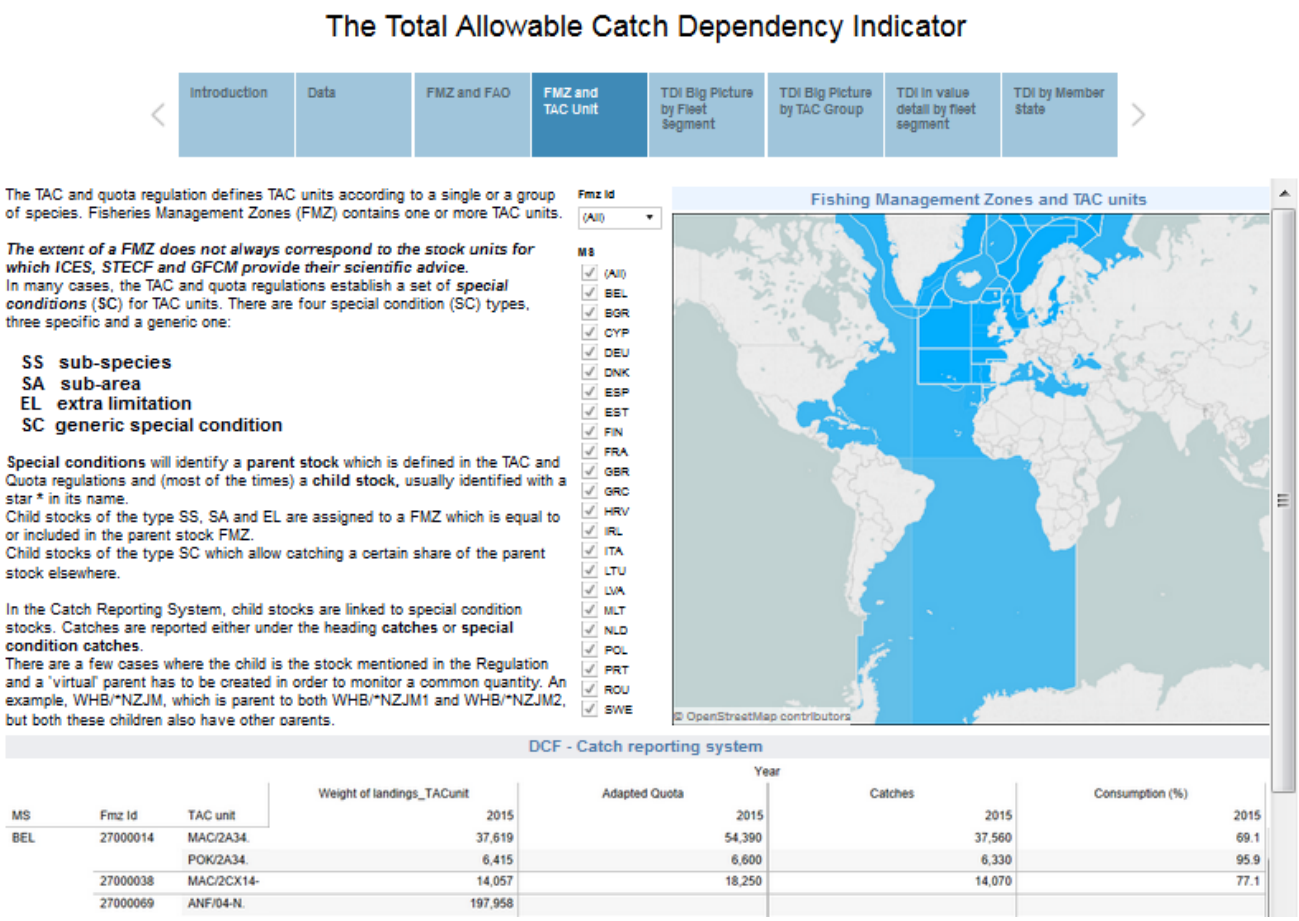
Fmz Id	TAC unit	Def analyt	Description	F Code	Prop	FAO geography proportion
27000052	COD/04-N.	27.(3-4).NOR	Norwegian waters of ICES III and IV (= south of 62N)	27.3.a	0.109414856	0.2989
				27.4.a	0.702997641	0.4147
				27.4.b	0.187568324	0.1050
	HAD/04-N.	27.(3-4).NOR	Norwegian waters of ICES III and IV (= south of 62N)	27.3.a	0.109414856	0.2989
				27.4.a	0.702997641	0.4147
				27.4.b	0.187568324	0.1050
	HER/04-N.	27.(3-4).NOR	Norwegian waters of ICES III and IV (= south of 62N)	27.3.a	0.109414856	0.2989
				27.4.a	0.702997641	0.4147
				27.4.b	0.187568324	0.1050
	POK/04-N.	27.(3-4).NOR	Norwegian waters of ICES III and IV (= south of 62N)	27.3.a	0.109414856	0.2989
				27.4.a	0.702997641	0.4147
				27.4.b	0.187568324	0.1050
	POL/04-N.	27.(3-4).NOR	Norwegian waters of ICES III and IV (= south of 62N)	27.3.a	0.109414856	0.2989
				27.4.a	0.702997641	0.4147
				27.4.b	0.187568324	0.1050
	PRA/04-N.	27.(3-4).NOR	Norwegian waters of ICES III and IV (= south of 62N)	27.3.a	0.109414856	0.2989
				27.4.a	0.702997641	0.4147
				27.4.b	0.187568324	0.1050
	WHG/04-N.	27.(3-4).NOR	Norwegian waters of ICES III and IV (= south of 62N)	27.3.a	0.109414856	0.2989
				27.4.a	0.702997641	0.4147
				27.4.b	0.187568324	0.1050

Figure 7. Example view of the FMZ, TAC and FAO geographies together

FMZ and TAC unit - link between FMZs and TAC units, including data provided by MS in the Catch reporting system (FIDES3).

Once obtained the FAO constituent parts it was possible to query the DCF database using a combination of species and FAO areas and obtain catch data for the selected species and FAO division level (subdivision for the Baltic). The case of FMZ 2700052 is a difficult one because it presents an FMZ that is shared with Norway. The FMZ's description is Norwegian waters of ICES III and IV (=south of 62 N) and it is comprised of three FAO division parts contained in the territorial waters of Norway. The FAO geography proportion column is not one hundred percent; hence we are not able to precisely allocate landings to the part of the FAO division that is Norwegian territorial waters.

For the purpose of the TDI exercise here presented, if an FMZ contained a part of FAO division we did not use the FAO geography proportion to weight the data from the DCF database. In other scientific domains, when facing similar problems, researchers adopt the assumption that the fish stock is uniformly distributed inside an FAO area and then multiply the landings at FAO division obtained from the DCF economic database by the FAO geography proportion.



TDI Big Picture by Fleet segment - *Provides a general picture of the importance of each TAC unit by fleet segment*

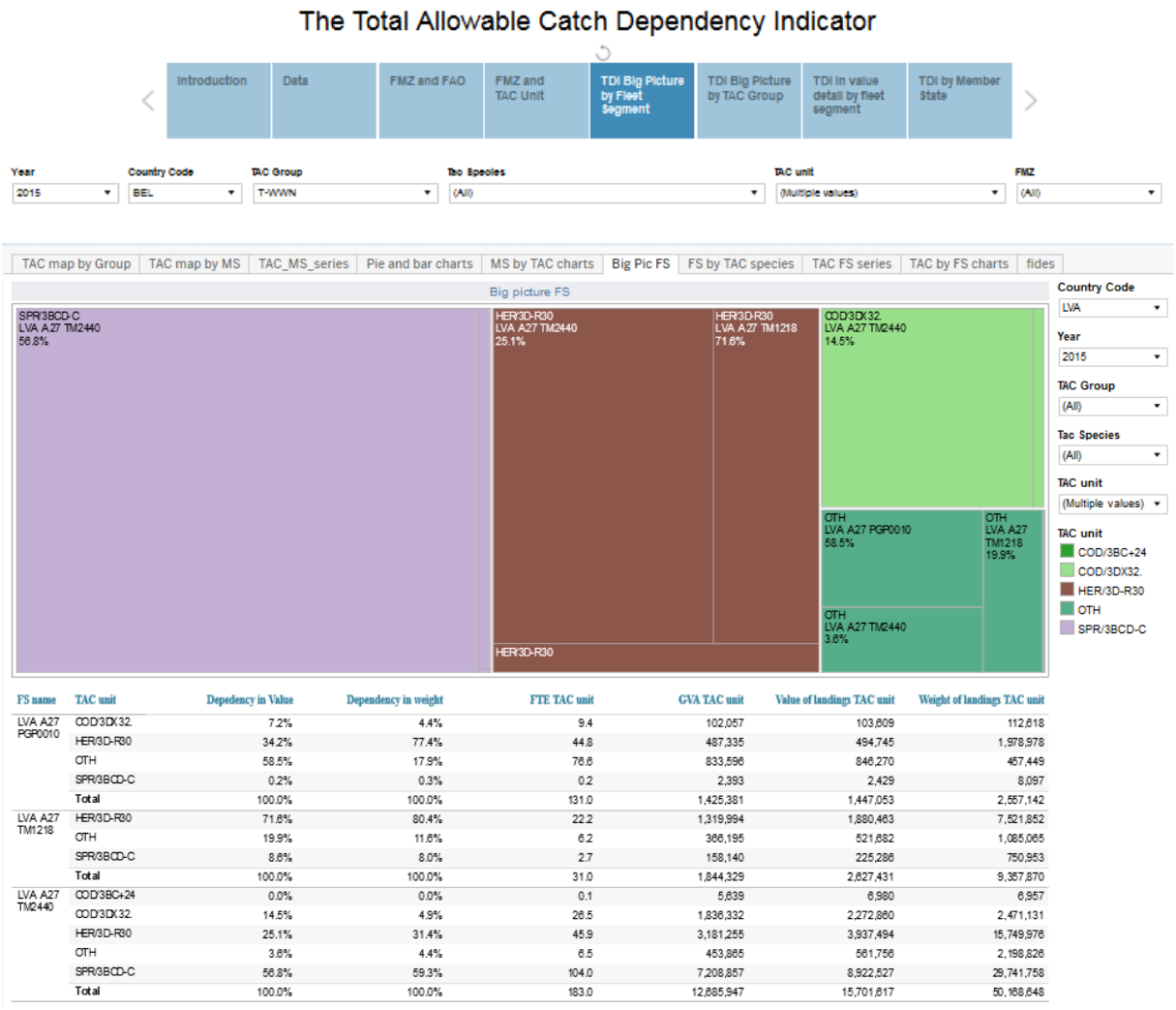
This dashboard helps to identify which fleet segments target which TAC units and how dependent they are on each TAC unit.

The dashboard displays the dependency ratios (in terms of landed value) by Member State fleet segment and TAC unit in map format.

The size of the map rectangles is proportional to the value of landings. The different TAC units are differentiated by colour.

Additional information provided in the table includes: value and weight of landings by TAC unit and associated FTE and GVA, estimated using the DCF data.

The Tooltip provides details on the TAC area (FMZ) as defined in the regulation, the total landed value of the TAC unit and the total value of landings the EU fleet.



FS name	TAC unit	Depedency in Value	Dependency in weight	FTE TAC unit	GVA TAC unit	Value of landings TAC unit	Weight of landings TAC unit
LVA A27 PGP0010	COD/3DX32.	7.2%	4.4%	9.4	102,057	103,609	112,618
	HER/3D-R30	34.2%	77.4%	44.8	487,335	494,745	1,978,978
	OTH	58.5%	17.9%	76.6	833,596	846,270	457,449
	SPR/3BCD-C	0.2%	0.3%	0.2	2,393	2,429	8,097
	Total	100.0%	100.0%	131.0	1,425,381	1,447,053	2,557,142
LVA A27 TM1218	HER/3D-R30	71.6%	80.4%	22.2	1,319,994	1,880,463	7,521,852
	OTH	19.9%	11.6%	6.2	366,195	521,682	1,085,065
	SPR/3BCD-C	8.6%	8.0%	2.7	158,140	225,286	750,953
	Total	100.0%	100.0%	31.0	1,844,329	2,627,431	9,357,870
LVA A27 TM2440	COD/3BC+24	0.0%	0.0%	0.1	5,839	6,980	6,957
	COD/3DX32.	14.5%	4.9%	26.5	1,836,332	2,272,860	2,471,131
	HER/3D-R30	25.1%	31.4%	45.9	3,181,255	3,937,494	15,749,976
	OTH	3.6%	4.4%	6.5	453,865	561,756	2,198,826
	SPR/3BCD-C	56.8%	59.3%	104.0	7,208,857	8,922,527	29,741,758
	Total	100.0%	100.0%	183.0	12,685,947	15,701,617	50,168,648

Figure 8. Example view of the TDI online tool: Big Picture by Fleet Segment dashboard (TAC units by fleet segment)

Filter options

Country code: one or more MS may be selected from the drop down box

Year: selection of one year from the drop down box; time-series available 2008 to 2016 (2016 preliminary).

TAC group: one or multiple TAC groups may be selected from the drop down box

TAC species: one or more species may be selected from the drop down box

TAC units: one or more TAC units may be selected drop-down box

DASHBOARD: TACunit by fleet segment (FS) time-series – *Provides information on fleet segment dependency on TAC units over the period 2008-2015.*

The dashboard displays in table format the dependency ratios (in terms of landed value) by TAC unit over the period 2008 to 2015. Results are also provided for OTH (non-TAC stocks). See example provided for the Irish fleet segment DTS VL 1824 in Figure.

Totals are provided for all years, and include TAC and non-TAC stocks. Ideally, dependency ratio totals should equate to 100% but may not be the case due to one or more of the issues mentioned above in Data/methodological limitations.

The bar chart provides the dependency ratio (in terms of landed value) by year and TAC unit, differentiated by colour.

The 'Non-TAC' group, indicating 'OTH' provides results for non-regulated stocks.

The Tooltip provides more details on the TAC area (FMZ) as defined in the regulation, the FAO areas covered by the DCF landings data, the landed value of the TAC unit and the total value of landings the MS fleet.

Filter options

Country code: one or more MS may be selected from the drop down box

FS name: one or more DCF fleet segments may be selected from the drop down box

Year: one or multiple years may be selected from the drop down box; time-series available 2008 to 2015.

TAC species: one or more species may be selected from the drop down box

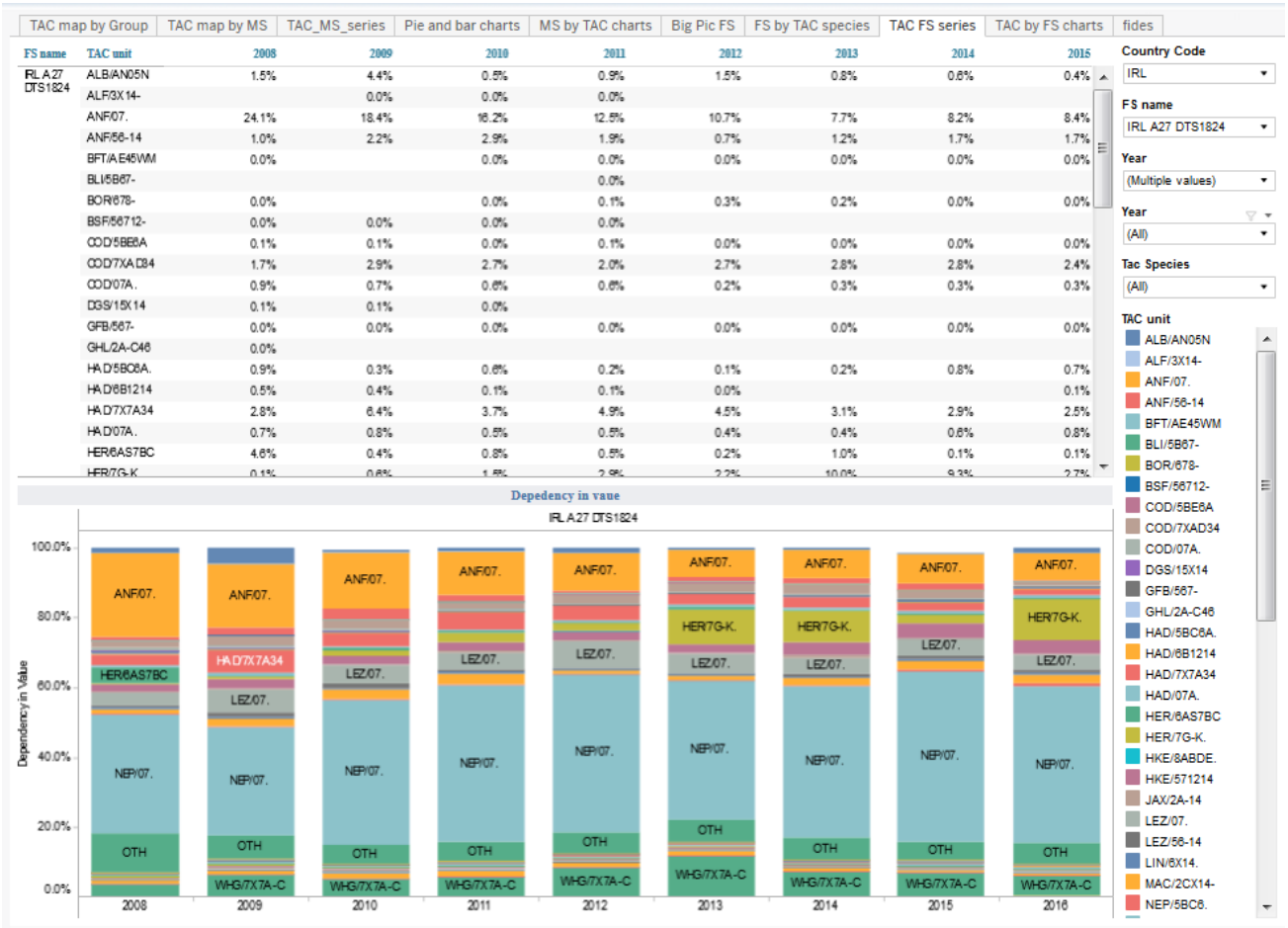


Figure 9. Example view of the TDI online tool: TAC Fleet Segment time-series dashboard

DASHBOARD: TAC units by Fleet Segment, charts - *Displays information on the dependency of MS fleets on TAC units in pie and bar charts.*

This dashboard provides the dependency in terms of value and weight of landings for each TAC unit targeted by a MS fleet segment in pie chart format. Time series data on the value and weight of landings by fleet segment for each TAC unit over the years 2008 to 2015 is provided in the bar charts. Results are also provided for OTH (non-TAC stocks).

The Tooltip provides details on the TAC area (FMZ) as defined in the regulation, the FAO areas from which the DCF landings data were taken, the landed value of the TAC unit and the total value of landings the MS fleet.

Filter options

Year: one year may be selected from the drop down box for the pie charts; bar charts provide the available time-series data (2008 to 2015).

FS name: one fleet segment may be selected from the list

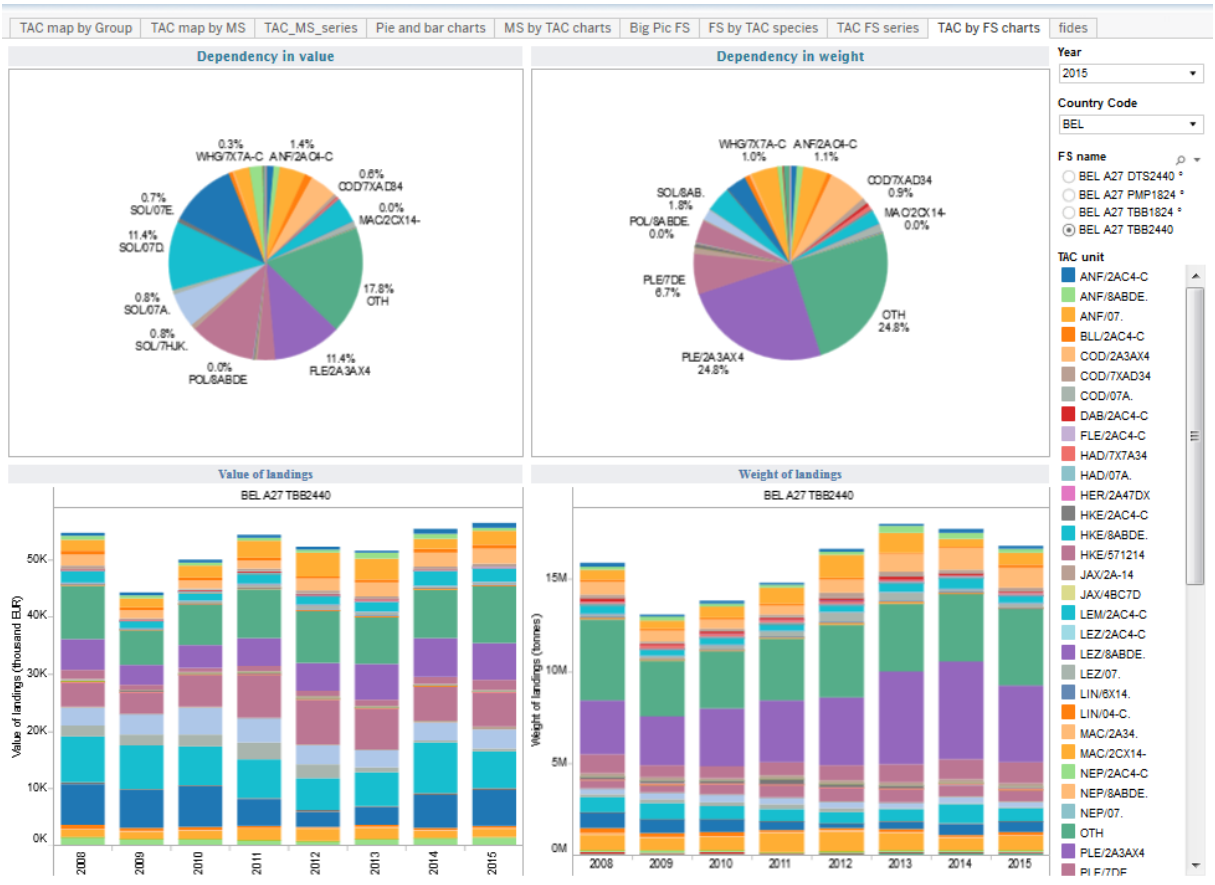


Figure 10**.** Example view of the TDI online tool: TAC by FS charts dashboard

DASHBOARD: TAC unit, map by MS - *Provides a general picture of the importance of each TAC unit by Member State*

The dashboard displays the dependency ratios (in terms of landed value and landed weight) by Member State and TAC unit, ordered by TAC group.

The size of the map tree rectangles is proportional to the value of landings. The different TAC units targeted by the MS fleet are differentiated by colour.

The 'Non-TAC' group, indicating 'OTH' provides results on non-regulated stocks.

Totals are provided for all variables, and include TAC and non-TAC stocks. Ideally, Dependency ratio totals should equate to 100% but may not be the case due to one or more of the issues mentioned above in Data/methodological limitations.

Sub-totals are provided by TAC Group.

Additional information in the table includes: the value and weight of landings by TAC unit and associated FTE and GVA, estimated using the DCF data. The adapted quota, catches, special condition catches and consumption (%) taken from the Commission's Catch reporting system (FIDES) are also provided.

The Tooltip provides details on the TAC area (FMZ) as defined in the regulation, the FAO areas from which the DCF landings data were taken, the landed value of the TAC unit and the total value of landings the MS fleet.

TAC groups defined as available for 2015 in the Catch reporting system (FIDES):

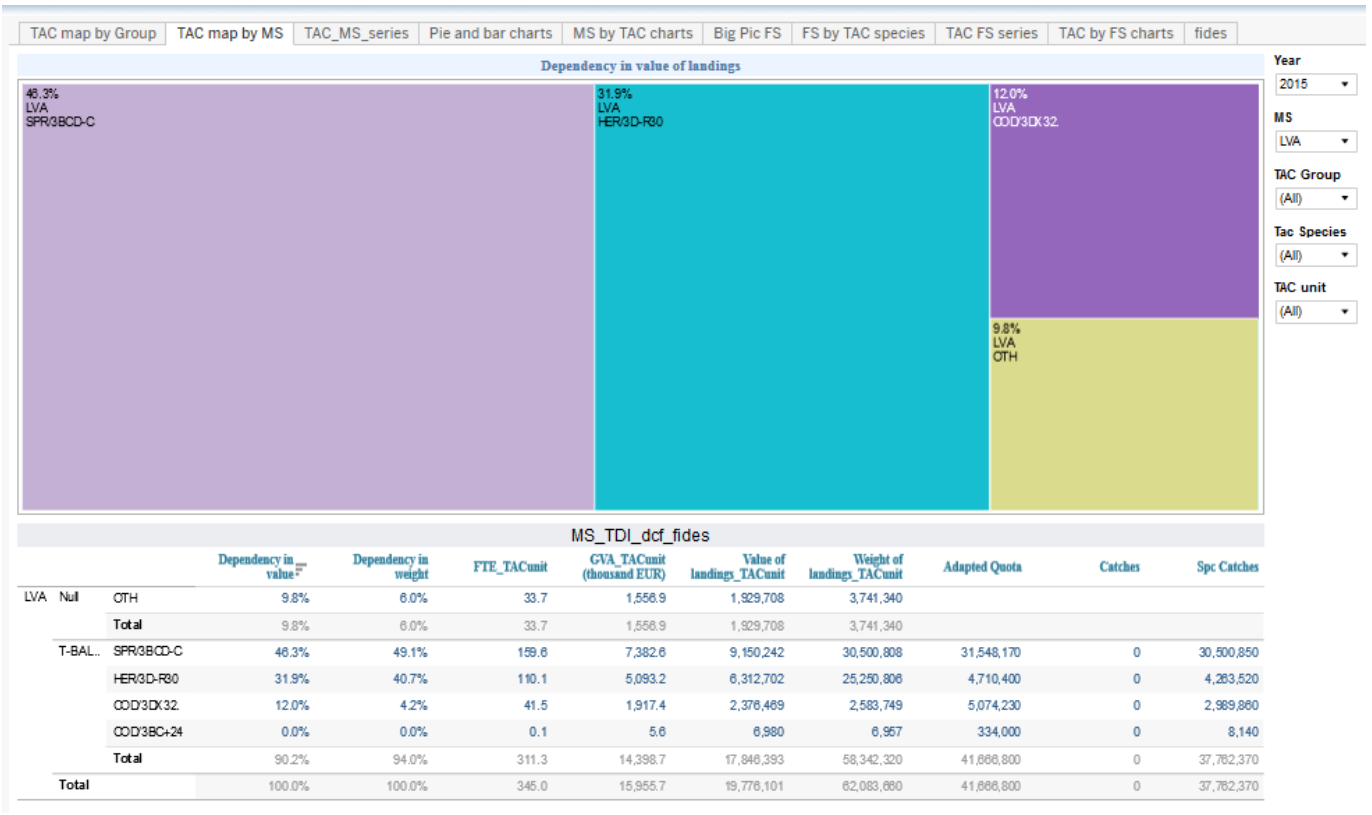
Filter options

Year: selection of one year from the drop down box; time-series available 2008 to 2016 (2016 preliminary).

TAC group: one or multiple TAC groups may be selected from the drop down box. The 'null' option provides dependency on non-regulated stocks.

TAC species: one or more species may be selected from the drop down box

TAC units: one or more TAC units may be selected drop-down box



			Dependency in value	Dependency in weight	FTE_TACunit	GVA_TACunit (thousand EUR)	Value of landings_TACunit	Weight of landings_TACunit	Adapted Quota	Catches	Spc Catches
LVA	Null	OTH	9.8%	6.0%	33.7	1,556.9	1,929,708	3,741,340			
		Total	9.8%	6.0%	33.7	1,556.9	1,929,708	3,741,340			
	T-BAL...	SPR/3BCD-C	46.3%	49.1%	159.6	7,382.6	9,150,242	30,500,808	31,548,170	0	30,500,850
		HER/3D-R30	31.9%	40.7%	110.1	5,093.2	6,312,702	25,250,806	4,710,400	0	4,263,520
		COD/3DX32.	12.0%	4.2%	41.5	1,917.4	2,376,469	2,583,749	5,074,230	0	2,989,860
		COD/3BC+24	0.0%	0.0%	0.1	5.6	6,980	6,957	334,000	0	8,140
		Total	90.2%	94.0%	311.3	14,398.7	17,846,393	58,342,320	41,666,800	0	37,762,370
	Total		100.0%	100.0%	345.0	15,955.7	19,776,101	62,083,660	41,666,800	0	37,762,370

Figure 11**.** Example view of the TDI online tool: TAC map by MS dashboard

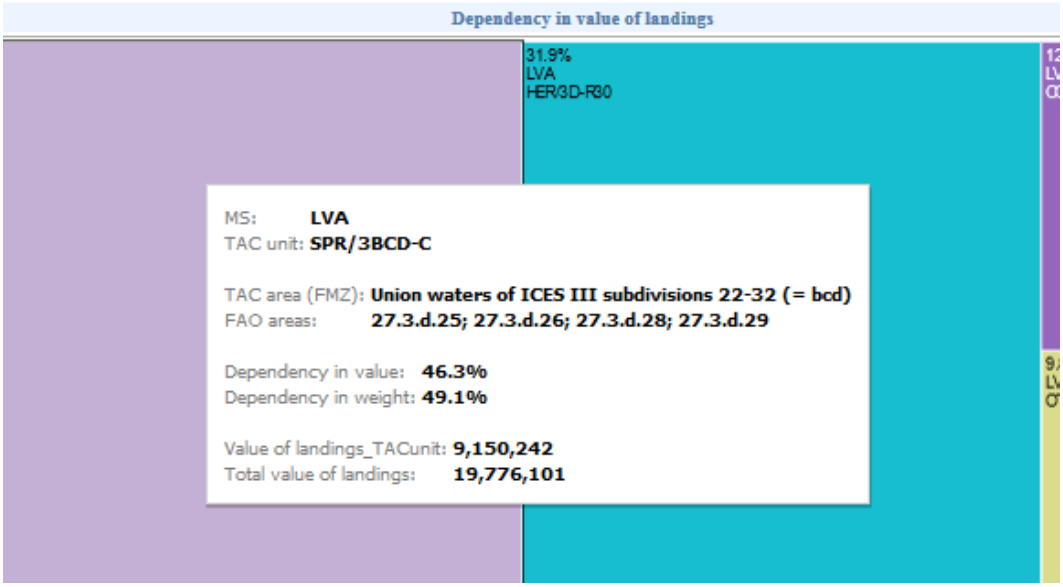
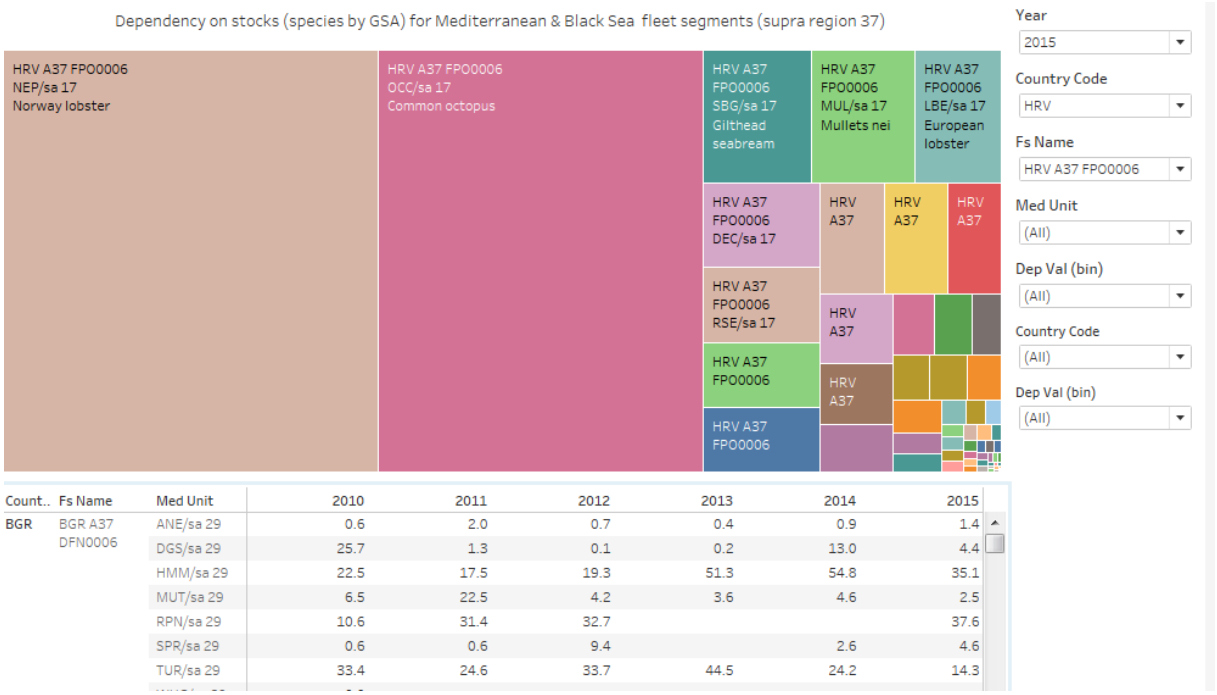


Figure 12**.** Information provided in the Tooltip the TDI online tool view: TAC map by MS dashboard

Fleet segment dependency on species by GSA in the Mediterranean & Black Sea region

This dashboard helps identify the most important species_GSA units by Member State fleet segment (MAP) as well as providing dependency ratios by fleet segments (Table).

Time-series data is also available, as dependency ratios and in absolute values (landings in value and weight).



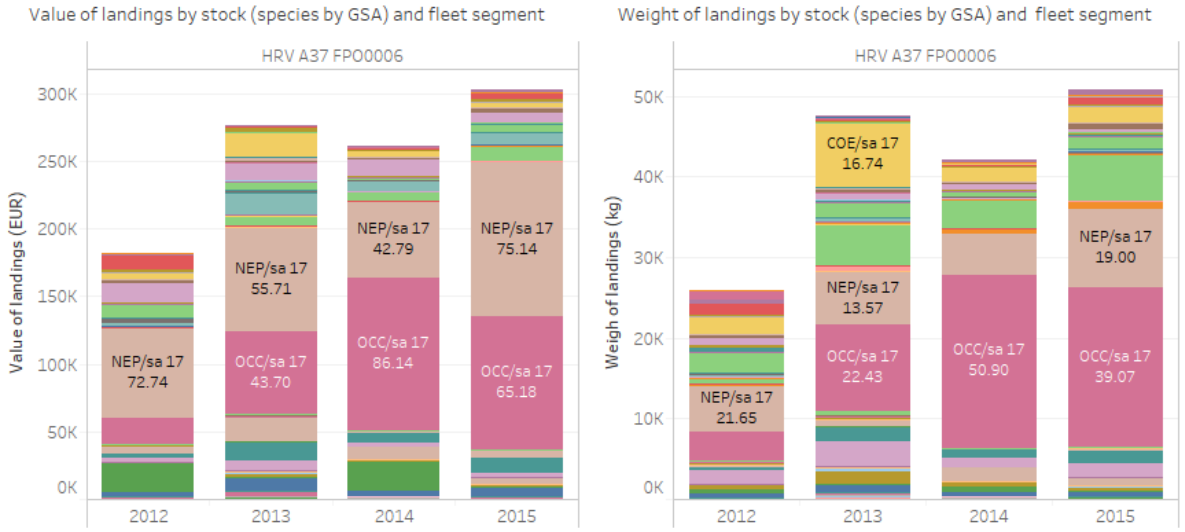


Figure 13**.** Example view for the Mediterranean & Black Sea region – fleet dependency on species by GSA.

Additional Views

DASHBOARD: TAC unit by Member State, time-series – *Provides information on the dependency of MS fleets in terms of value of landings on TAC units and the associated FTE and GVA generated from these TAC unit landings, for the period 2008-2015.*

The dashboard displays in table format the dependency ratios (in terms of landed value) by TAC unit, the associated FTE and GVA estimated using the DCF data for the MS fleet over the period 2008 to 2016 (where available). Results are also provided for OTH (non-TAC stocks) and ordered by TAC group.

Totals are provided for all variables, and include TAC and non-TAC stocks. Ideally, dependency ratio totals should equate to 100% but may not be the case due to one or more of the issues mentioned above in Data/methodological limitations.

Sub-totals are provided by TAC Group.

The bar chart below provides the dependency ratio (in terms of landed value) by year and TAC unit, which are differentiated by colour.

The 'Non-TAC' group, indicating 'OTH' provides results on non-regulated stocks.

Additional information in the table includes: the value and weight of landings by TAC unit and associated FTE and GVA, estimated using the DCF data. The adapted quota, catches, special condition catches and consumption (%) taken from the Commission's Catch reporting system (FIDES) are also provided.

The Tooltip provides details on the TAC area (FMZ) as defined in the regulation, the FAO areas from which the DCF landings data were taken, the landed value of the TAC unit and the total value of landings the MS fleet.

TAC groups defined as available for 2015 in the Catch reporting system (FIDES)

TAC Group	
T-BALTIC	TAC - Baltic Sea area
T-BLACK	TAC - Black Sea area
T-DSS	TAC - Deep sea species
T-HMF	TAC - Highly migratory fish
T-NEAFC	TAC - NEAFC Convention Area
T-WWN	TAC – North Western Waters

Filter options

Year: one or multiple years may be selected from the drop down box; time-series available 2008 to 2016 (2016 preliminary).

TAC group: one or multiple TAC groups may be selected from the drop down box. The 'null' option provides dependency on non-regulated stocks.

TAC species: one or more species may be selected from the drop down box

TAC units: one or more TAC units may be selected drop-down box

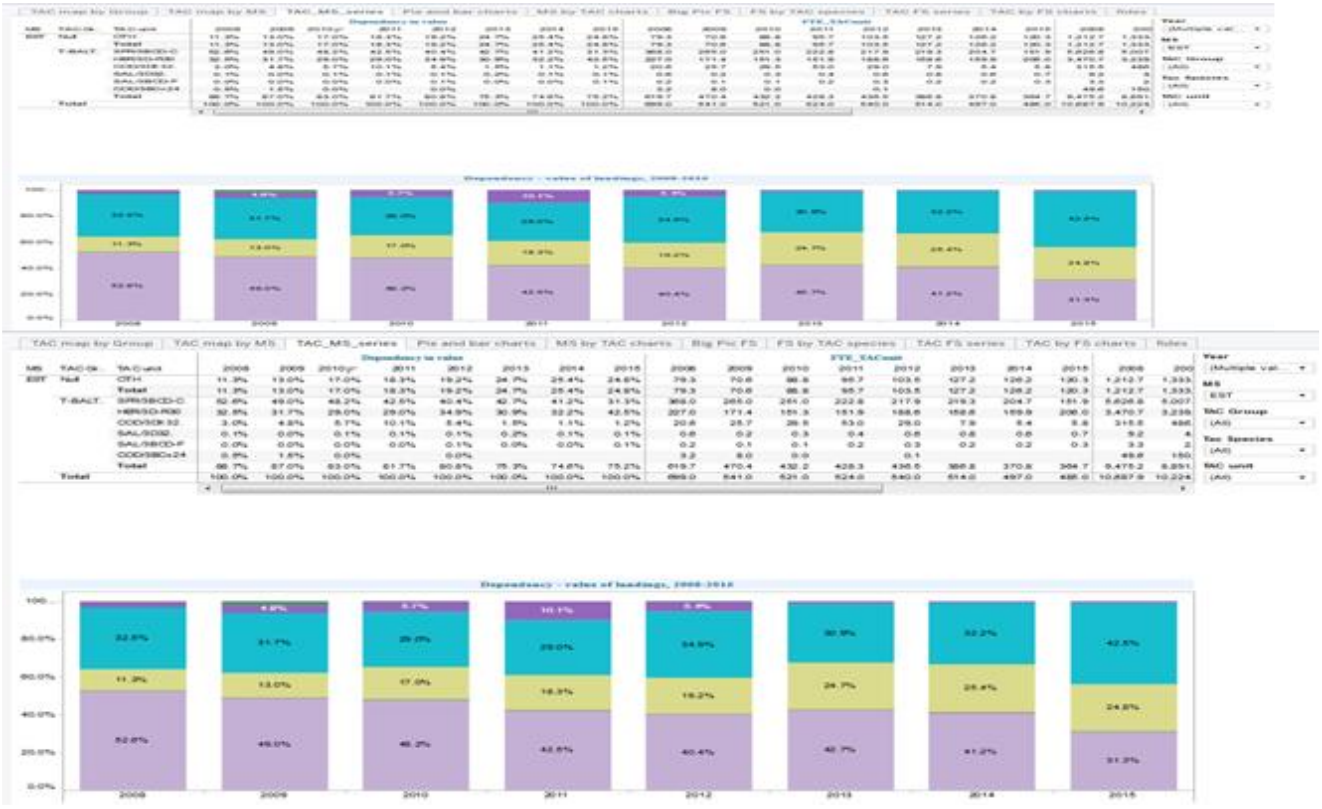


Figure 14**.** Example view of the TDI online tool: TAC MS series dashboard

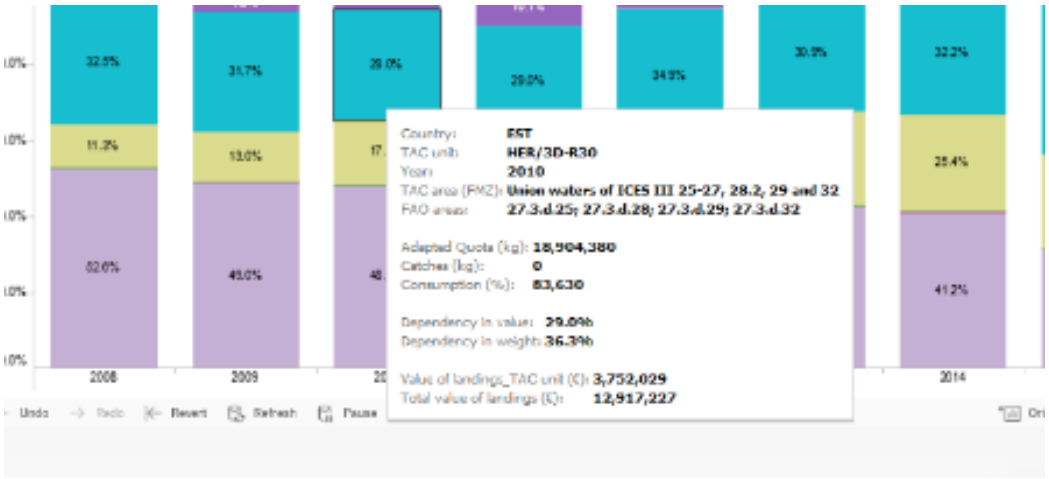


Figure 15**.** Information provided in the Tooltip the TDI online tool view: TAC MS Series dashboard

DASHBOARD: Charts by MS - *Provides information on the dependency of MS fleets on TAC units over time.*

This dashboard provides the dependency ratios in terms of value and weight of landings for each TAC unit targeted by a MS fleet in pie chart format. Time series data on the value and weight of landings by the MS fleet for each TAC unit over the years 2008 to 2015 is provided in the bar charts. Results are also provided for OTH (non-TAC stocks).

The Tooltip provides details on the TAC area (FMZ) as defined in the regulation, the FAO areas from which the DCF landings data were taken, the landed value of the TAC unit and the total value of landings the MS fleet.

Filter options

Year: one year may be selected from the drop down box for the pie charts; bar charts provide the available time-series data (2008 to 2015).

MS: one MS may be selected from the drop down box

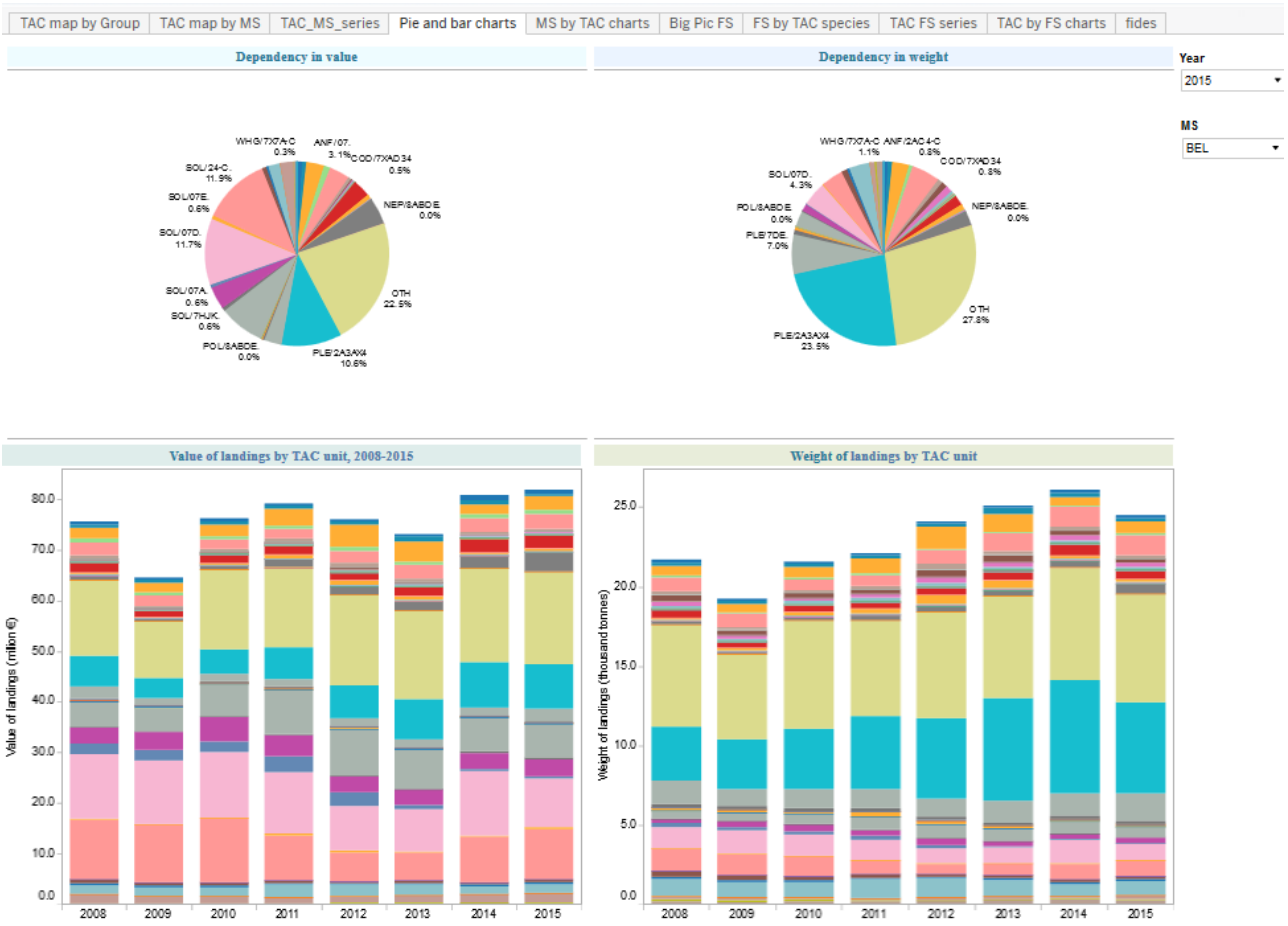


Figure 16**.** Example view of the TDI online tool: Pie and bar charts dashboard

DASHBOARD: MS by TAC unit – *Provides information on MS fleets targeting specific TAC units.*

This dashboard provides the dependency ratios in terms of value and weight of landings of MS fleets in pie chart format for a particular TAC unit and year. Time series data on the value and weight of landings by MS fleet of the TAC unit in provided in bar chart format. Results are also provided for OTH (non-TAC stocks).

The Tooltip provides details on the TAC area (FMZ) as defined in the regulation, the FAO areas from which the DCF landings data were taken, the landed value of the TAC unit and the total value of landings the MS fleet.

Filter options

Year: one year may be selected from the drop down box for the pie charts; bar charts provide the available time-series data (2008 to 2015).

MS: one MS may be selected from the drop down box

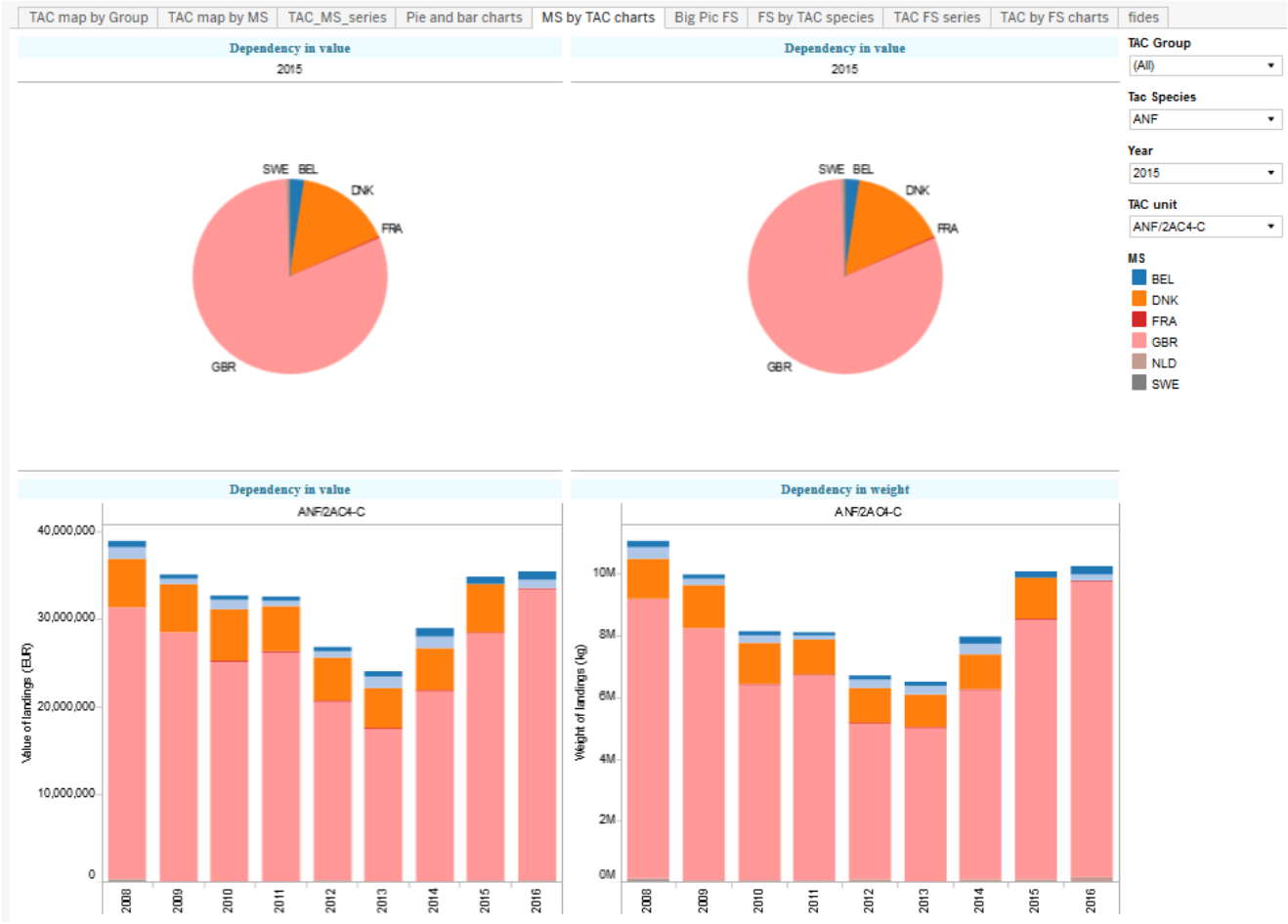


Figure 17**.** Example view of the TDI online tool: MS by TAC unit dashboard – TAC unit ANF/2AC4-C

DASHBOARD: TAC unit map by TAC Group, EU fleet - *Provides a general picture of the importance of each TAC group and TAC unit at the EU level.*

The dashboard displays the dependency ratios (in terms of landed value and landed weight) by Member State and TAC unit grouped by TAC group in map and table format.

The size of the tree map rectangles is proportional to the value of landings. The different TAC groups are displayed using different colours.

Additional information provided in the table includes: value and weight of landings by TAC unit calculated using the DCF data as well as, the adapted quota, catches, special condition catches and consumption (%) taken from the Commission's Catch reporting system (FIDES).

The Tooltip provides details on the TAC area (FMZ) as defined in the regulation, the total landed value of the TAC unit and the total value of landings the EU fleet.

TAC groups defined as available for 2015 in the Catch reporting system (FIDES) (see below).

TAC Group	
T-BALTIC	TAC - Baltic Sea area
T-BLACK	TAC - Black Sea area
T-DSS	TAC - Deep sea species
T-HMF	TAC - Highly migratory fish
T-NEAFC	TAC - NEAFC Convention Area
T-WWN	TAC – North Western Waters

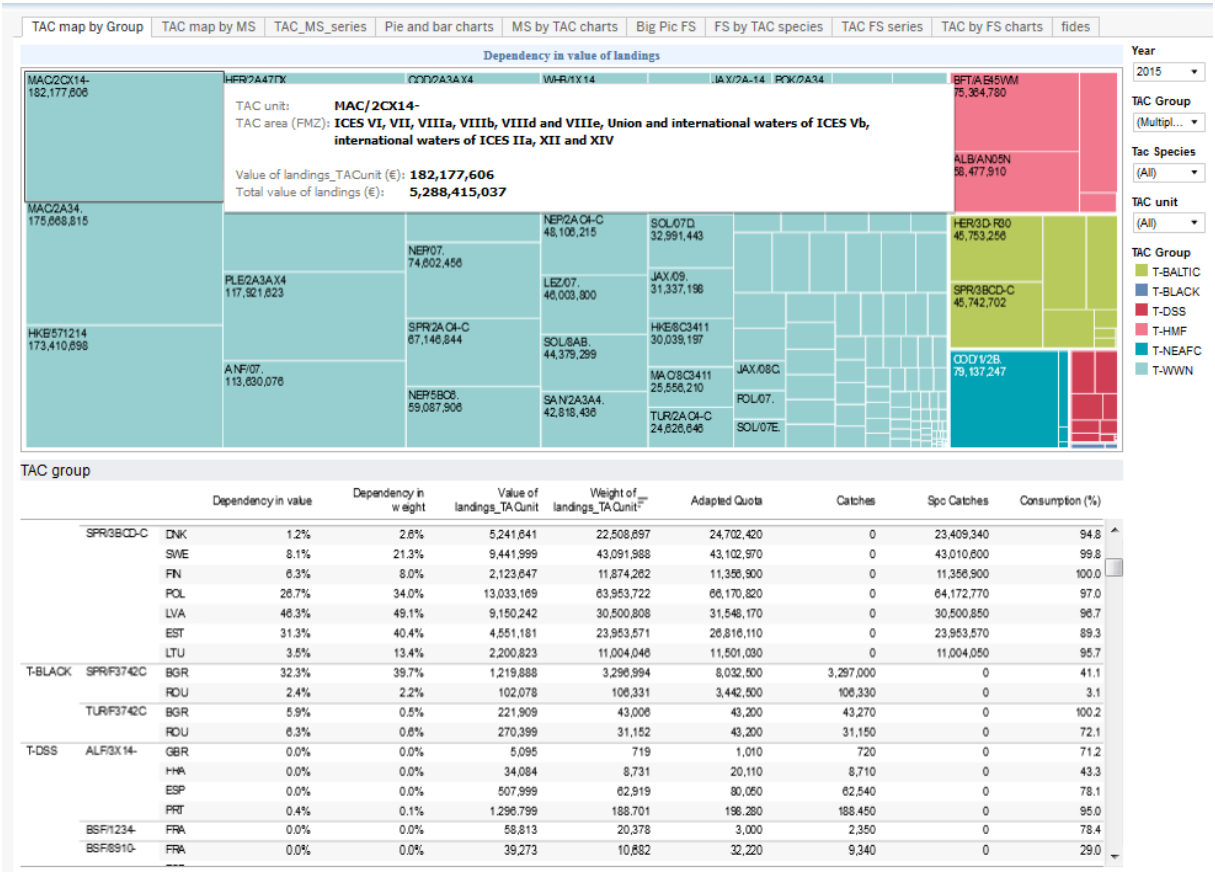
Filter options

Year: selection of one year from the drop down box; time-series available 2008 to 2016 (2016 preliminary).

TAC group: one or multiple TAC groups may be selected from the drop down box

TAC species: one or more species may be selected from the drop down box

TAC units: one or more TAC units may be selected drop-down box



			Dependency in value	Dependency in weight	Value of landings_TACunit	Weight of landings_TACunit	Adapted Quota	Catches	Spc Catches	Consumption (%)
	SPR/3BCD-C	DNK	1.2%	2.6%	5,241,641	22,508,697	24,702,420	0	23,409,340	94.8
		SWE	8.1%	21.3%	9,441,999	43,091,988	43,102,970	0	43,010,600	99.8
		FIN	6.3%	8.0%	2,123,647	11,874,262	11,356,900	0	11,356,900	100.0
		POL	26.7%	34.0%	13,033,169	63,953,722	66,170,820	0	64,172,770	97.0
		LVA	46.3%	49.1%	9,150,242	30,500,808	31,548,170	0	30,500,850	96.7
		EST	31.3%	40.4%	4,551,181	23,953,571	26,816,110	0	23,953,570	89.3
		LTU	3.5%	13.4%	2,200,823	11,004,046	11,501,030	0	11,004,050	95.7
T-BLACK	SPR/F3742C	BGR	32.3%	39.7%	1,219,888	3,296,994	8,032,500	3,297,000	0	41.1
		ROU	2.4%	2.2%	102,078	106,331	3,442,500	106,330	0	3.1
	TUR/F3742C	BGR	5.9%	0.5%	221,909	43,006	43,200	43,270	0	100.2
		ROU	6.3%	0.6%	270,399	31,152	43,200	31,150	0	72.1
T-DSS	ALF/3X14-	GBR	0.0%	0.0%	5,095	719	1,010	720	0	71.2
		FRA	0.0%	0.0%	34,084	8,731	20,110	8,710	0	43.3
		ESP	0.0%	0.0%	507,999	62,919	80,050	62,540	0	78.1
		PRT	0.4%	0.1%	1,296,799	188,701	198,280	188,450	0	95.0
	BSF/1234-	FRA	0.0%	0.0%	58,813	20,378	3,000	2,350	0	78.4
	BSF/8910-	FRA	0.0%	0.0%	39,273	10,882	32,220	9,340	0	29.0

Figure 18**.** Example view of the TDI online tool: EU level by TAC group dashboard

DASHBOARD: Fleet segment by TAC species - *Provides information on MS fleet segments targeting TAC units of a specific species or species group*

The dashboard displays the dependency ratios (in terms of landed value and landed weight) by Member State and TAC unit, ordered by TAC group.

The size of the map rectangles is proportional to the value of landings. The different TAC units targeted by the MS fleet are differentiated by colour.

The 'Non-TAC' group, indicating 'OTH' provides results on non-regulated stocks.

Totals are provided for all variables, and include TAC and non-TAC stocks. Ideally, Dependency ratio totals should equate to 100% but may not be the case due to one or more of the issues mentioned above in Data/methodological limitations.

Sub-totals are provided by TAC Group.

Additional information in the table includes: the value and weight of landings by TAC unit and associated FTE and GVA, estimated using the DCF data. The adapted quota, catches, special condition catches and consumption (%) taken from the Commission's Catch reporting system (FIDES) are also provided.

The Tooltip provides details on the TAC area (FMZ) as defined in the regulation, the FAO areas from which the DCF landings data were taken, the landed value of the TAC unit and the total value of landings the MS fleet.

TAC groups defined as available for 2015 in the Catch reporting system (FIDES)

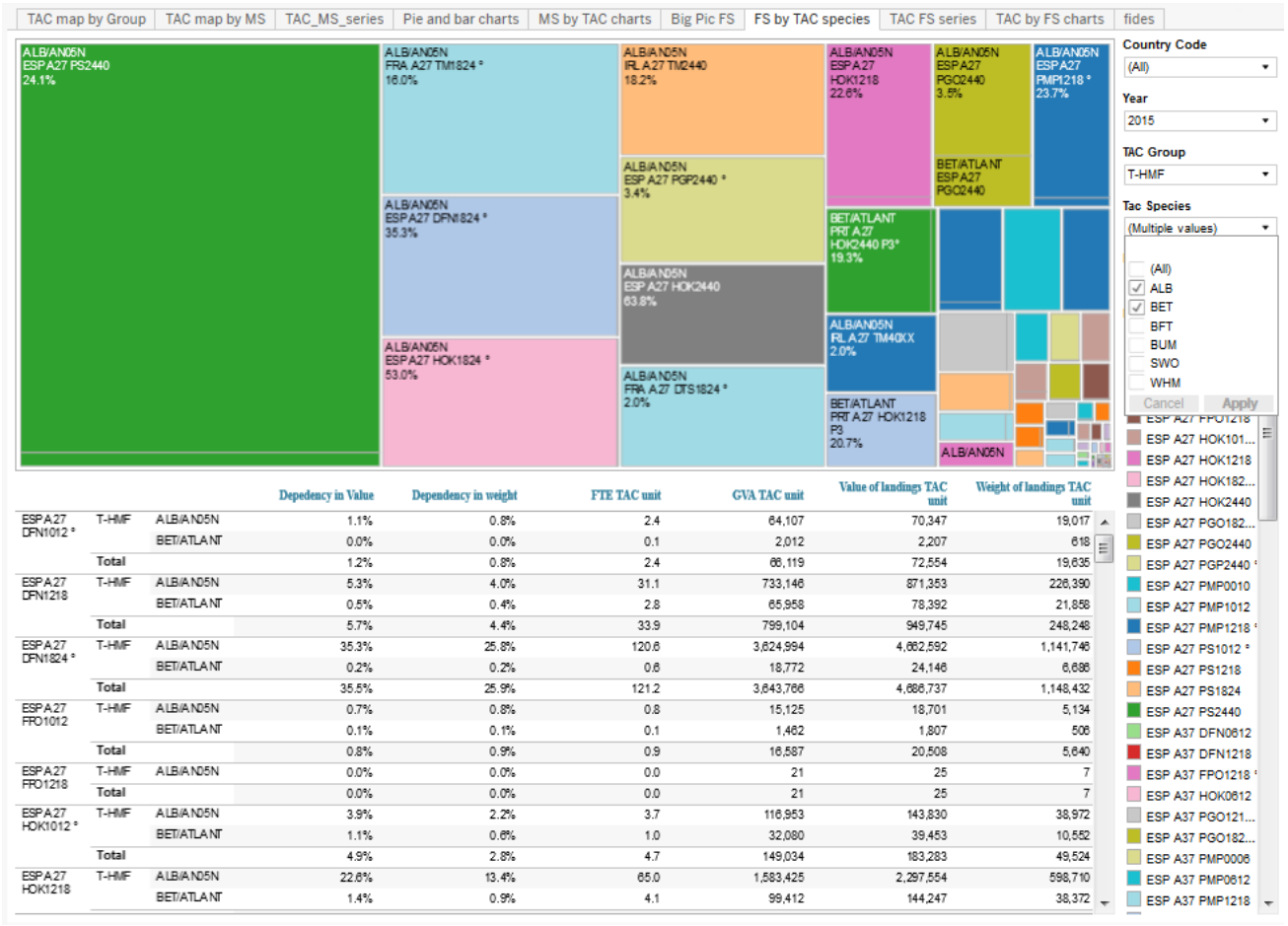
Filter options

Year: selection of one year from the drop down box; time-series available 2008 to 2016 (2016 preliminary).

TAC group: one or multiple TAC groups may be selected from the drop down box. The 'null' option provides dependency on non-regulated stocks.

TAC species: one or more species may be selected from the drop down box

TAC units: one or more TAC units may be selected drop-down box



			Depedency in Value	Dependency in weight	FTE TAC unit	GVA TAC unit	Value of landings TAC unit	Weight of landings TAC unit
ESP A27 DFN1012 °	T-HMF	ALB/AND5N	1.1%	0.8%	2.4	64,107	70,347	19,017
		BET/ATLANT	0.0%	0.0%	0.1	2,012	2,207	618
	Total		1.2%	0.8%	2.4	66,119	72,554	19,635
ESP A27 DFN1218	T-HMF	ALB/AND5N	5.3%	4.0%	31.1	733,146	871,353	226,390
		BET/ATLANT	0.5%	0.4%	2.8	65,958	78,392	21,858
	Total		5.7%	4.4%	33.9	799,104	949,745	248,248
ESP A27 DFN1824 °	T-HMF	ALB/AND5N	35.3%	25.8%	120.6	3,624,994	4,662,592	1,141,746
		BET/ATLANT	0.2%	0.2%	0.6	18,772	24,146	6,686
	Total		35.5%	25.9%	121.2	3,643,766	4,686,737	1,148,432
ESP A27 FPO1012	T-HMF	ALB/AND5N	0.7%	0.8%	0.8	15,125	18,701	5,134
		BET/ATLANT	0.1%	0.1%	0.1	1,462	1,807	506
	Total		0.8%	0.9%	0.9	16,587	20,508	5,640
ESP A27 FPO1218	T-HMF	ALB/AND5N	0.0%	0.0%	0.0	21	25	7
	Total		0.0%	0.0%	0.0	21	25	7
ESP A27 HOK1012 °	T-HMF	ALB/AND5N	3.9%	2.2%	3.7	116,953	143,830	38,972
		BET/ATLANT	1.1%	0.6%	1.0	32,080	39,453	10,552
	Total		4.9%	2.8%	4.7	149,034	183,283	49,524
ESP A27 HOK1218	T-HMF	ALB/AND5N	22.6%	13.4%	65.0	1,583,425	2,297,554	598,710
		BET/ATLANT	1.4%	0.9%	4.1	99,412	144,247	38,372

Figure 19**.** Example view of the TDI online tool: FS by TAC species dashboard

4 - Concluding remarks

This report and the online tool address the limitations posed by the aggregation of DCF transversal data and builds a bridge between the economic data, which is collected at EU level by fleet segment, and TAC units. The link is established through spatial methods ([15]).

The calculation of the TDI can be considered as a first step in combining the economic and the biologic perspectives towards the establishment of more complex forecasting and bio-economic modelling modules on top of the DCF data and AER analyses.

Fishing opportunities or Total allowable catches (TACs) are catch limits (normally expressed in tonnes) that are set for most commercial fish stocks. The EU Commission prepares a proposal based on scientific advice on the stock status from advisory bodies such as ICES and STECF.

In the setting of TACs, not only biological factors need to be taken into account. Managers need to also take into consideration economic, social and political objectives and the trade-offs between them.

TACs are set annually for most stocks by the Council of fisheries ministers. Fishing opportunities are shared amongst MSs using a formula that reflects the countries historical participation in fisheries. The formula is based on what is known as the principle of 'relative stability', which ensures each MS a fixed percentage out of a given TAC. This principle is based on historical distribution of catches of each species between MSs, which supposedly reflects the socio-economic importance that those countries place on a particular resource.

Typically, TACs are set before the fishing seasons begins, based on information about the fishery in the past, harvest levels and estimates of stock size, and may also consider biological and economic modelling outputs. For the present analysis, dependency ratios on TAC units are calculated by fleet segment and gear-type but the socio-economic indicators remain at the level of main fishing technique (fleet segment), which is the only way to establish a direct link to the economic variables on costs without the need to adopt a model based disaggregation approach.

The report and online tool present a static situation with no attempt of forecasting. To appreciate impacts from quota changes and forecast dependencies consequent to a change of the TACs, a more complex modelling exercise would need to be undertaken using bio-economic models, such as the Bio-Economic Model of European Fleets (BEMEF), which is already constructed around the DCF and AER data/analyses.

Nonetheless, consistency in dependency ratios over the time series may be indicative of a consolidated and stable relation between stocks and fleets. Under such circumstances, it is possible to foresee what will be the level of dependency in the short term and draw more robust conclusions in respect of the current year TACs proposal.

Management units are defined in the TAC and quota regulations as a combination of species (or species groups) and Fisheries Management Zones (FMZ)[16].

Fisheries Management Zones (FMZ) are geographical areas delineated with a regulatory perspective in mind. They incorporate a series of specifications such as the exclusion of external territorial waters. In some cases, these specifications result in different boundaries with respect to fishing areas defined by FAO and ICES, and therefore, areas identifying

([15]) GIBIN M., Integrating fisheries management zones with FAO and ICES statistical areas by data fusion. JRC Technical Report. JRC105881.

([16]) The TAC and Quotas Areas 2015 detailed in the 'Map Book of Fisheries Management Zone TAC & Quota Areas 2015'

https://circabc.europa.eu/webdav/CircaBC/MARE/MDR/Library/GeoData/TACQuota_2015_FMZ_v3_7.pdf

stocks according to a biological perspective. Hence, TAC units do not necessarily coincide with biological stocks, for which stock assessments are generally produced.

Moreover, many TACs and TAC units are linked to special conditions, notably related to inter-species quota flexibility, catch composition rules, obligations to release (discard) certain species with high survivability, etc. Special conditions are also in a number of cases connected to fishing in non-EU waters (in particular Norwegian waters).

The TDI stems from an earlier work produced by the JRC in collaboration with the Swedish Agency for Marine and Water Management (SwAM). The purpose of the Swedish case study was to develop a policy support tool ([17]) to assess the economic dependency on regulated stocks for fishing coastal communities in Sweden. Access to logbook data for the fleet allowed disaggregating economic analyses at the level of vessels and hence, fishing ports and fishing communities. Hence, the dependency indicator was calculated for single ports (home and landing ports) for the national fleet. The tool allowed identifying coastal communities more likely to be affected in socio-economic terms from the setting of TACs and quotas. By availing detailed transversal data from logbooks, it is possible zoom-in the level of geographical analysis from countries to regions, provinces and single fishing coastal communities. Yet, it is highly unlikely that such disaggregated data will be made available at the EU wide scale.

Given the non-availability of more detailed and disaggregated landings data (such as logbook data) in this current study, data limitations impede a precise conform to the regulation and vice-versa. As such, the TDI and the results presented in the online tool should be consulted and considered with some degree of caution.

([17]) https://fishreg.jrc.ec.europa.eu/web/stockdependency/data

Annex 1 – List of FAO species codes for generic TAC units

TAC unit	FAO 3A_code	Scientific_name	English_name
ANF	ANF	Lophiidae	Anglerfishes nei
ANF	ANG	Lophius americanus	American angler
ANF	MON	Lophius piscatorius	Angler(=Monk)
ANF	MNZ	Lophius spp	Monkfishes nei
ANF	ANK	Lophius budegassa	Blackbellied angler
SAN	SAN	Ammodytes spp	Sandeels(=Sandlances) nei
SAN	AVM	Ammodytes americanus	American sand lance
SAN	BKG	Ammodytes gilli	Gill's sand lance
SAN	QLH	Ammodytes marinus	Lesser sand-eel
SAN	PAS	Ammodytes personatus	Pacific sandlance
SAN	SAN	Ammodytes spp	Sandeels(=Sandlances) nei
SAN	ABZ	Ammodytes tobianus	Small sandeel
ALF	ALF	Beryx spp	Alfonsinos nei
ALF	BXD	Beryx decadactylus	Alfonsino
ALF	BYS	Beryx splendens	Splendid alfonsino
BOR	BOR	Caproidae	Boarfishes nei
BOR	BOC	Capros aper	Boarfish
GER	KEF	Chaceon affinis	Deep-sea red crab
GER	HOQ	Chaceon australis	Austral golden crab
GER	HBJ	Chaceon bicolor	Pacific golden crab
GER	ELQ	Chaceon eldorado	El Dorado shrimp
GER	HFB	Chaceon fenneri	Golden deepsea crab
GER	HNX	Chaceon granulatus	Japanese golden crab
GER	HKH	Chaceon karubar	Indonesian golden crab
GER	HNQ	Chaceon macphersoni	Pink geryon
GER	CGE	Chaceon maritae	West African geryon
GER	HBN	Chaceon notialis	Southwest Atlantic red crab
GER	HQP	Chaceon poupini	Polynesian golden crab
GER	CRR	Chaceon quinquedens	Red crab
GER	GER	Chaceon spp	Chaceon geryons nei
PCR	CVB	Chionoecetes bairdi	Tanner crab
PCR	CWJ	Chionoecetes japonicus	Red snow crab
PCR	CRQ	Chionoecetes opilio	Queen crab
PCR	PCR	Chionoecetes spp	Tanner crabs nei
TOT	TOP	Dissostichus eleginoides	Patagonian toothfish
TOT	TOA	Dissostichus mawsoni	Antarctic toothfish
TOT	TOT	Dissostichus spp	Antarctic toothfishes nei
LEZ	LDB	Lepidorhombus boscii	Four-spot megrim
LEZ	LEZ	Lepidorhombus spp	Megrims nei
LEZ	MEG	Lepidorhombus whiffiagonis	Megrim
GRV	RHG	Macrourus berglax	Roughhead grenadier
GRV	QMC	Macrourus caml	Caml grenadier
GRV	MCC	Macrourus carinatus	Ridge scaled rattail
GRV	MCH	Macrourus holotrachys	Bigeye grenadier
GRV	GRV	Macrourus spp	Grenadiers nei
GRV	WGR	Macrourus whitsoni	Whitson's grenadier
PAI	KCU	Paralomis aculeata	Red stone crab
PAI	KDD	Paralomis anamerae	
PAI	KCF	Paralomis formosa	Globose king crab
PAI	PAG	Paralomis granulosa	Softshell red crab
PAI	KLV	Paralomis longipes	
PAI	KCV	Paralomis spinosissima	Antarctic stone crab
PAI	PAI	Paralomis spp	
PAI	KVV	Paralomis verrilli	Red vermillion crab
PEN	ABS	Penaeus aztecus	Northern brown shrimp

PEN	PNB	Penaeus brasiliensis	Redspotted shrimp
PEN	CSP	Penaeus brevirostris	Crystal shrimp
PEN	YPS	Penaeus californiensis	Yellowleg shrimp
PEN	EKU	Penaeus canaliculatus	Witch prawn
PEN	FLP	Penaeus chinensis	Fleshy prawn
PEN	APS	Penaeus duorarum	Northern pink shrimp
PEN	PRB	Penaeus esculentus	Brown tiger prawn
PEN	PNI	Penaeus indicus	Indian white prawn
PEN	KUP	Penaeus japonicus	Kuruma prawn
PEN	TGS	Penaeus kerathurus	Caramote prawn
PEN	WKP	Penaeus latisulcatus	Western king prawn
PEN	ELY	Penaeus longistylus	Red-spot king prawn
PEN	PNJ	Penaeus marginatus	Aloha prawn
PEN	PBA	Penaeus merguiensis	Banana prawn
PEN	GIT	Penaeus monodon	Giant tiger prawn
PEN	SOP	Penaeus notialis	Southern pink shrimp
PEN	WWP	Penaeus occidentalis	Western white shrimp
PEN	PPS	Penaeus paulensis	Sao Paulo shrimp
PEN	REP	Penaeus penicillatus	Redtail prawn
PEN	PNP	Penaeus plebejus	Eastern king prawn
PEN	PNT	Penaeus schmitti	Southern white shrimp
PEN	TIP	Penaeus semisulcatus	Green tiger prawn
PEN	PST	Penaeus setiferus	Northern white shrimp
PEN	ESS	Penaeus silasi	False white prawn
PEN	PEN	Penaeus spp	Penaeus shrimps nei
PEN	PNS	Penaeus stylirostris	Blue shrimp
PEN	PNU	Penaeus subtilis	Southern brown shrimp
PEN	PNV	Penaeus vannamei	Whiteleg shrimp
FLX	FLX	Pleuronectiformes	Flatfishes nei
FLX	HAL	Hippoglossus hippoglossus	Atlantic halibut
FLX	GHL	Reinhardtius hippoglossoides	Greenland halibut
FLX	PLE	Pleuronectes platessa	
FLX	LEM	Microstomus kitt	Lemon sole
FLX	TUR	Psetta maxima	Turbot
FLX	BLL	Scophthalmus rhombus	Brill
FLX	FLE	Platichthys flesus	European flounder
FLX	LEZ	Lepidorhombus spp	Megrims nei
FLX	MEG	Lepidorhombus whiffiagonis	Megrim
FLX	LDB	Lepidorhombus boscii	Four-spot megrim
EDW	EDQ	Pseudopentaceros pectoralis	Longfin armorhead
EDW	EDR	Pseudopentaceros richardsoni	Pelagic armourhead
EDW	EDW	Pseudopentaceros spp	Pelagic armourheads nei
EDW	EDJ	Pseudopentaceros wheeleri	Slender armorhead
SRX	SRX	Rajiformes	Rays, stingrays, mantas nei
SRX	JRK	Raja ackleyi	Ocellate skate
SRX	JRA	Raja acutispina	
SRX	JRF	Raja africana	African ray
SRX	RJA	Raja alba	White skate
SRX	JRN	Raja annandalei	
SRX	JRS	Raja asterias	Mediterranean starry ray
SRX	JRU	Raja australis	Sydney skate
SRX	JRB	Raja badia	Broad skate
SRX	JRH	Raja bathyphila	Deep-water ray
SRX	RJB	Raja batis	Blue skate
SRX	JRW	Raja bigelowi	Bigelow's ray
SRX	JRI	Raja binoculata	Big skate
SRX	JRO	Raja boesemani	

SRX	RJH	Raja brachyura	Blonde ray
SRX	JRL	Raja bullisi	Bullis skate
SRX	JRM	Raja campbelli	Blackspot skate
SRX	JRT	Raja castelnaui	Spotback skate
SRX	JRD	Raja caudaspinosa	Munchskin skate
SRX	JRV	Raja cerva	White-spotted skate
SRX	JRG	Raja cervigoni	Finspot ray
SRX	RJI	Raja circularis	Sandy ray
SRX	JRR	Raja clarkii	
SRX	RJC	Raja clavata	Thornback ray
SRX	JRJ	Raja compagnoi	
SRX	JRZ	Raja cortezensis	Cortez' ray
SRX	JRY	Raja cyclophora	Eyespot skate
SRX	JRX	Raja dageti	
SRX	JRQ	Raja dissimilis	Ghost skate
SRX	JFD	Raja doutrei	Violet skate
SRX	JFE	Raja eglanteria	Clearnose skate
SRX	JFQ	Raja equatorialis	Ecuatorial ray
SRX	RJD	Raja erinacea	Little skate
SRX	JFF	Raja fuliginea	
SRX	RJF	Raja fullonica	Shagreen ray
SRX	RJY	Raja fyllae	Round ray
SRX	JFG	Raja garmani	Freckled skate
SRX	SRR	Raja georgiana	Antarctic starry skate
SRX	JFI	Raja gigas	
SRX	JFU	Raja gudgeri	Greenback skate
SRX	JFH	Raja heemstrai	
SRX	JFW	Raja herwigi	
SRX	JFO	Raja hollandi	
SRX	RJG	Raja hyperborea	Arctic skate
SRX	JFN	Raja innominata	
SRX	JFR	Raja inornata	California ray
SRX	RJJ	Raja jenseni	Shorttail skate
SRX	JFJ	Raja johannisdavisi	
SRX	JFK	Raja kenojei	
SRX	RJL	Raja laevis	Barndoor skate
SRX	JFA	Raja lanceorostrata	Rattail skate
SRX	JFM	Raja lemprieri	Thornback skate
SRX	JFS	Raja lentiginosa	
SRX	JFV	Raja leopardus	Leopard skate
SRX	JFX	Raja leucosticta	
SRX	RJK	Raja lintea	Sailray
SRX	JRC	Raja macrocauda	
SRX	JFY	Raja maderensis	Madeiran ray
SRX	JFZ	Raja meerdervoortii	
SRX	JAM	Raja melitensis	Maltese ray
SRX	RJE	Raja microocellata	Small-eyed ray
SRX	JAI	Raja miraletus	Brown ray
SRX	RJM	Raja montagui	Spotted ray
SRX	RJN	Raja naevus	Cuckoo ray
SRX	JAT	Raja nasuta	Rough skate
SRX	JAD	Raja nidarosiensis	Norwegian skate
SRX	RJT	Raja ocellata	Winter skate
SRX	JAO	Raja olseni	Spreadfin skate
SRX	RJO	Raja oxyrinchus	Longnosed skate
SRX	JRP	Raja pita	
SRX	JFP	Raja polyommata	Argus skate
SRX	JAY	Raja polystigma	Speckled ray

SRX	JAW	Raja powelli	
SRX	JAU	Raja pulchra	
SRX	JAL	Raja pullopunctata	Slime skate
SRX	JAV	Raja purpuriventralis	
SRX	RJR	Raja radiata	Starry ray
SRX	JAR	Raja radula	Rough ray
SRX	RFV	Raja ravidula	Smoothback skate
SRX	JAH	Raja rhina	Longnose skate
SRX	JFB	Raja robertsi	Bigmouth skate
SRX	RFO	Raja rondeleti	Rondelet's ray
SRX	RFX	Raja rouxi	
SRX	JFC	Raja schmidti	
SRX	SKA	Raja spp	Raja rays nei
SRX	RFS	Raja springeri	Roughbelly skate
SRX	RFT	Raja stellulata	Starry skate
SRX	RFY	Raja stenorhynchus	Prow-nose skate
SRX	RFL	Raja straeleni	Spotted skate
SRX	RFA	Raja taaf	Whiteleg skate
SRX	JAB	Raja teevani	Prickly brown ray
SRX	JAE	Raja tengu	
SRX	JAF	Raja texana	Roundel skate
SRX	RJU	Raja undulata	Undulate ray
SRX	JAG	Raja velezi	Velez ray
SRX	JAK	Raja wallacei	Yellowspotted skate
SRX	JAZ	Raja whitleyi	Wedgenose skate
SRX	JRE	Rajella barnardi	Bigthorn skate
SRX	RJV	Rajella kukujevi	
SRX	RAJ	Rajidae	Rays and skates nei
SRX	MRA	Rhinoptera adspersa	Rough cownose ray
SRX	MRB	Rhinoptera bonasus	Cownose ray
SRX	MRR	Rhinoptera brasiliensis	Ticon cownose ray
SRX	MRJ	Rhinoptera javanica	Flapnose ray
SRX	MRY	Rhinoptera jayakari	Oman cownose ray
SRX	MRM	Rhinoptera marginata	Lusitanian cownose ray
SRX	MRN	Rhinoptera neglecta	Australian cownose ray
SRX	NZX	Rhinoptera spp	
SRX	MRS	Rhinoptera steindachneri	Pacific cownose ray
SRX	RHK	Rhinoraja kujiensis	Dapple-bellied softnose skate
SRX	RHJ	Rhinoraja longicauda	
SRX	RHE	Rhinoraja odai	
RED	SFT	Sebastes aleutianus	Rougheye rockfish
RED	OPP	Sebastes alutus	Pacific ocean perch
RED	RVR	Sebastes aurora	Aurora rockfish
RED	RVB	Sebastes babcocki	Redbanded rockfish
RED	SFB	Sebastes borealis	Shortraker rockfish
RED	SBY	Sebastes brevispinis	Silvergray rockfish
RED	REC	Sebastes capensis	Cape redfish
RED	QYS	Sebastes carnatus	Gopher rockfish
RED	SFJ	Sebastes caurinus	Copper rockfish
RED	QYR	Sebastes chlorostictus	Greenspotted rockfish
RED	RVC	Sebastes ciliatus	Dusky rockfish
RED	SFO	Sebastes constellatus	Starry rockfish
RED	RFC	Sebastes crameri	Darkblotched rockfish
RED	SFD	Sebastes diploproa	Splitnose rockfish
RED	SFE	Sebastes elongatus	Greenstriped rockfish
RED	WRO	Sebastes entomelas	Widow rockfish
RED	REN	Sebastes fasciatus	Acadian redfish
RED	YRO	Sebastes flavidus	Yellowtail rockfish

RED	SGO	Sebastes goodei	Chilipepper rockfish
RED	RVH	Sebastes helvomaculatus	Rosethorn rockfish
RED	SFQ	Sebastes inermis	
RED	SFK	Sebastes jordani	Shortbelly rockfish
RED	QYT	Sebastes levis	Cowcod
RED	SFG	Sebastes maliger	Quillback rockfish
RED	REG	Sebastes marinus	Golden redfish
RED	RMG	Sebastes melanops	Black rockfish
RED	RVM	Sebastes melanostomus	Blackgill rockfish
RED	REB	Sebastes mentella	Beaked redfish
RED	SFW	Sebastes miniatus	Vermilion rockfish
RED	SEJ	Sebastes minor	
RED	SFY	Sebastes mystinus	Blue rockfish
RED	RVN	Sebastes nebulosus	China rockfish
RED	RNV	Sebastes nigrocinctus	Tiger rockfish
RED	REQ	Sebastes oculatus	Patagonian redfish
RED	SBC	Sebastes paucispinis	Bocaccio rockfish
RED	SPG	Sebastes pinniger	Canary rockfish
RED	RVP	Sebastes polyspinis	Northern rockfish
RED	RPJ	Sebastes proriger	Redstripe rockfish
RED	SWD	Sebastes reedi	Yellowmouth rockfish
RED	SEQ	Sebastes rosaceus	Rosy rockfish
RED	RRV	Sebastes ruberrimus	Yelloweye rockfish
RED	QYV	Sebastes rufus	Bank rockfish
RED	RVT	Sebastes saxicola	Stripetail rockfish
RED	SFL	Sebastes schlegeli	Korean rockfish
RED	SED	Sebastes serranoides	Olive rockfish
RED	SFP	Sebastes serriceps	Treefish
RED	RED	Sebastes spp	Atlantic redfishes nei
RED	SFZ	Sebastes taczanowskii	
RED	RVU	Sebastes variegatus	Harlequin rockfish
RED	SFV	Sebastes viviparus	Norway redfish
RED	RVW	Sebastes wilsoni	Pygmy rockfish
RED	RVZ	Sebastes zacentrus	Sharpchin rockfish
SOO	EGY	Solea aegyptiaca	Egyptian sole
SOO	OLK	Solea bleekeri	Blackhand sole
SOO	SZI	Solea elongata	Elongate sole
SOO	OLJ	Solea humilis	
SOO	OAM	Solea impar	Adriatic sole
SOO	SOS	Solea lascaris	Sand sole
SOO	OAS	Solea nasuta	Snouted sole
SOO	OAO	Solea ovata	Ovate sole
SOO	OAL	Solea senegalensis	Senegalese sole
SOO	SOO	Solea spp	
SOO	QFQ	Solea stanalandi	Stanaland's sole
JAX	HMC	Trachurus capensis	Cape horse mackerel
JAX	HMG	Trachurus declivis	Greenback horse mackerel
JAX	TUD	Trachurus delagoa	African scad
JAX	TUJ	Trachurus indicus	Arabian scad
JAX	JJM	Trachurus japonicus	Japanese jack mackerel
JAX	RSC	Trachurus lathami	Rough scad
JAX	HMM	Trachurus mediterraneus	Mediterranean horse mackerel
JAX	TUZ	Trachurus novaezelandiae	Yellowtail horse mackerel
JAX	JAA	Trachurus picturatus	Blue jack mackerel
JAX	JAX	Trachurus spp	Jack and horse mackerels nei
JAX	PJM	Trachurus symmetricus	Pacific jack mackerel
JAX	HOM	Trachurus trachurus	Atlantic horse mackerel
JAX	HMZ	Trachurus trecae	Cunene horse mackerel

List of abbreviations and definitions

AER	Annual Economic Report on the performance of the EU fishing fleets
BEMEF	Bio-Economic Model of European Fleets
CFP	Common Fisheries Policy
DCF	Data Collection Framework
EL	extra limitation
F	Fishing mortality
FAO	Food and Agriculture Organisation
FIDES	Catch reporting system
FMZ	Fisheries Management Zone
FO	Fishing opportunities
FS	Fleet segment
FTE	Full-Time Equivalent
FTE	Full-Time Equivalent
GFCM	General Fisheries Commission for the Mediterranean
GVA	Gross Value Added
HOK	Hook and line
ICES	International Council for the Exploration of the Seas
LOA	length over all
MDR	FMZ map book
MS	Member State
MSY	Maximum Sustainable Yield
P3	Geo-indicator indicating from the Azores Islands.
PRT	Portugal
SA	sub-area
SC	Special Condition
SS	sub-species
STECF	Scientific, Technical and Economic Committee for Fisheries
TAC	Total Allowable Catch
TDI	TAC Dependency Indicator
VL	vessel length

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