



European  
Commission

## JRC TECHNICAL REPORTS

# The Mediterranean and Black Sea STECF Stock Assessment Database

Osio G.C., Gibin M., Mannini A.,  
Villamor A., Orio A.

2018



This publication is a Technical report by the Joint Research Centre (JRC), the European Commission's science and knowledge service. It aims to provide evidence-based scientific support to the European policy making process. The scientific output expressed does not imply a policy position of the European Commission. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of this publication.

**Contact information**

Name: Alessandro Mannini  
Address: Via Enrico Fermi 2749, Ispra (Varese) Italy  
Email: [alessandro.mannini@ec.europa.eu](mailto:alessandro.mannini@ec.europa.eu)  
Tel.: +39 0332 78 5784

**JRC Science Hub**

<https://ec.europa.eu/jrc>

JRC 112485

EUR 29294 EN

---

ISBN 978-92-79-88954-7      ISSN 1831-9424      doi:10.2760/559579

Luxembourg: Publications Office of the European Union, 2018

© European Union, 2018

Reuse is authorised provided the source is acknowledged. The reuse policy of European Commission documents is regulated by Decision 2011/833/EU (OJ L 330, 14.12.2011, p. 39).

For any use or reproduction of photos or other material that is not under the EU copyright, permission must be sought directly from the copyright holders.

How to cite this report: Osio G.C., Gibin, M., Mannini A., Villamor A., Orio A. The Mediterranean and Black Sea STECF Stock Assessment Database. EUR 29294 EN, Publications Office of the European Union, Luxembourg, 2018 ISBN 978-92-79-88954-7, doi:10.2760/559579

All images © European Union 2018

# The Mediterranean and Black Sea STECF Stock Assessment Database

*Osio Giacomo Chato, Gibin Maurizio, Mannini Alessandro,  
Villamor Adriana, Orio Alessandro*

# Table of Contents

<a href="#">1 Introduction.....</a>	<a href="#">4</a>
<a href="#">2 STECF Stock Assessment.....</a>	<a href="#">5</a>
<a href="#">2.1 Brief description of STECF stock assessment workflow.....</a>	<a href="#">5</a>
<a href="#">2.2 Data sources.....</a>	<a href="#">6</a>
<a href="#">2.3 Methods: stock assessment models.....</a>	<a href="#">6</a>
<a href="#">2.4 Version Control and construction of the STECF DB.....</a>	<a href="#">7</a>
<a href="#">2.5 Outputs: Stock objects and reference points.....</a>	<a href="#">8</a>
<a href="#">2.6 STECF stock assessments by GSAs and species, temporal coverage and methods.</a>	<a href="#">8</a>
<a href="#">2.7 Stock status.....</a>	<a href="#">14</a>
<a href="#">2.8 The Mediterranean &amp; Black Sea stock assessments database dashboard.....</a>	<a href="#">17</a>
<a href="#">3. Ram legacy fish stock assessments database.....</a>	<a href="#">18</a>
<a href="#">3.1 General description of RAM.....</a>	<a href="#">18</a>
<a href="#">4 Conclusions.....</a>	<a href="#">19</a>
<a href="#">5 References.....</a>	<a href="#">20</a>
<a href="#">6 List of abbreviations and definitions.....</a>	<a href="#">21</a>
<a href="#">7 List of figures.....</a>	<a href="#">22</a>
<a href="#">8 List of tables.....</a>	<a href="#">23</a>

## Acknowledgements

Abella Alvaro, Accadia Paolo, Ak Orhan, Anastopoulou Ioanna, Angelini Silvia, Aydin Ilhan, Bartolino Valerio, Basilone Gualtiero, Beare Douglas, Bellido Jose M., Bigot Jean-Luis, Bitetto Isabella, Bonhommeau Sylvain, Bonanno Angelo, Cardinale Massimiliano, Carpi Piera, Charilaou Charis, Chashchyn Oleksandr, Cheliari Anna, Cikes Kec Vanja, Colloca Francesco, Costantini Ilaria, Dagtekin Murat, Damalas Dimitrios, Daskalov Georgi, De Felice Andrea, Demirel Nazli, Di Natale Antonio, Dimech Mark, Duzgunes Ertug, Facchini Maria Teresa, Farrugio Henri, Fiorentino Fabio, Garcia Rodriguez Mariano, Genc Yasar, Georgieva Ioana, Giannoulaki Marianna, Gil De Sola Luis, Gucu Ali Cemal, Guijarro Beatriz, Guillen Garcia Jordi, Gumus Aysun, Isajlovic Igor, Jadaud Angélique, Jenko Klavdija, Josephides Marios, Karlou-Riga Constantina, Katsanevakis Stelios, Kavadas Stefanos, Kirkegaard Eskild, Knittweis Leyla, Kokkalis Alexandros, Leonchuk Yevhen, Leoni Simone, Ligas Alessandro, Lleonart Jordi, Lloret Josep, Lucchetti Alessandro, Mannini Alessandro, Mantopoulou Palouka Danai, Mantzoyini Eirini, Maravelias Christos, Martin Paloma, Massutí Enric, Maximov Valodia, Maynou Francesc, Mikeladze Ramaz, Mikhaylyuk Alexander, Minto Coilin, Molla Gazi Karolina, Morello Elisabetta, Murenu Matteo, Mustac Bosiljka, Musumeci Claudia, Nicolaev Simion, Ordinas Francesc, Orio Alessandro, Osio Giacomo Chato, Panayotova Marina, Patti Bernardo, Pengal Polona, Pereira João, Perez Gil Jose Luis, Pesci Paola, Pesic Ana, Petrakis George, Pilling Graham, Quetglas Antoni, Quintanilla Luis Francisco, Radu Gheorghe, Raetz Hans-Joachim, Ramirez John, Raykov Violin, Recasens Laura, Rouyer Tristan, Russo Tommaso, Sabatella Evelina Carmen, Sala Antonello, Sampson David, Santojanni Alberto, Saraux Claire, Sartor Paolo, Sbrana Mario, Scarcella Giuseppe, Scott Finlay, Shlyakhov Vladyslav, Simmonds Edmund John, Sgardeli Vasiliki, Spedicato Maria Teresa, Ticina Vjekoslav, Torres Pedro, Tserpes George, Tsikliras Athanassios, Tsitsika Effie, Ungaro Nicola, Ustundag Erdal, Vasilakopoulos Paris, Vasiliades Lavrentios, Vidoris Pavlos, Vrgoc Nedo, Yankova Maria, Zengin Mustafa, Zorica Barbara.

## Abstract

Since 2007, the Scientific Technical Economic Committee for Fisheries (STECF), for which Joint Research Centre (JRC) runs the Secretariat and all the data collection process, started collecting and organizing information on Mediterranean and Black Sea fisheries, and since 2009 performing standardized stock assessments on these fisheries during STECF expert working groups (EWGs).

The stock assessment results have been documented in more than 30 reports STECF EWGs (<https://stecf.jrc.ec.europa.eu/reports/medbs>).

Stock assessments performed during the STECF EWGs employ different approaches and tools, however, models implemented in the Fisheries Libraries in R (FLR, <http://www.flr-project.org>) were the most used.

After almost 10 years of stock assessments in the Mediterranean and Black Sea, JRC extracted available stock assessment data from digital repositories of EWGs and compiled a STECF reference database.

From each assessment contained in the STECF reports yearly time series of stock variables such as: Total Catch (total weight of all fish in the stock), Recruitment (total number of individuals entering yearly in the population), Spawning Stock Biomass (total weight of all sexually mature fish in the stock) and Fishing Mortality were extracted.

The assessments data are made available through an online interactive dashboard under the STECF Data dissemination web page (<https://stecf.jrc.ec.europa.eu/dd/medbs/ram>) that allow readers to compare and contrast several stock assessments variables. Each stock assessment is linked via an URL to the original source of the stock assessment.

According to EU CFP - Common Fisheries Policy (Reg. EU 1380/2013 and Reg. EU 812/2015) all EU commercial fish stocks should be fished at a maximum sustainable yield (Fmsy). Biological reference points, Fref (Fmsy or a proxy as  $F_{0.1}$ ) and were subsequently used to assess if the level of exploitation ( $F/F_{msy}$ ) is in line with the CFP objectives ( $F/F_{msy} \leq 1$ ) or not ( $F/F_{msy} > 1$ ).

The STECF database is the reference database for the computation of the Common Fisheries Policy monitoring indicators for the Mediterranean and Black Sea (<https://stecf.jrc.ec.europa.eu/documents/43805/2092142/STECF+18-01+adhoc+-+CFP+Monitoring+2018.pdf>)

To ensure traceability and foster reproducible scientific research, all the data, code and references part of the compilation process are hosted on GitHub, a well-known version control software platform.

The target audience of the dashboard ranges from governments, fisheries institutes, stakeholders, NGO's and common citizens that want to check the status of marine fisheries resources evaluated.

A copy of the Mediterranean and Black Sea STECF stock assessment results will be included, for the first time, in the next release of the RAM legacy database: a voluntary contributed worldwide stock assessments database, RAM legacy, (<http://ramlegacy.org/>). The RAM Legacy database includes fish stock assessments from all around the world's oceans, and provides a unique source of information to make comparisons between fisheries and to perform global analysis of stock status.

# 1 Introduction

According to FAO-GFCM the Mediterranean and Black Seas are, for fisheries purposes, divided in 30 geographical subareas (GSAs hereafter) (Figure 1). Of these, 19 GSAs are in EU waters.

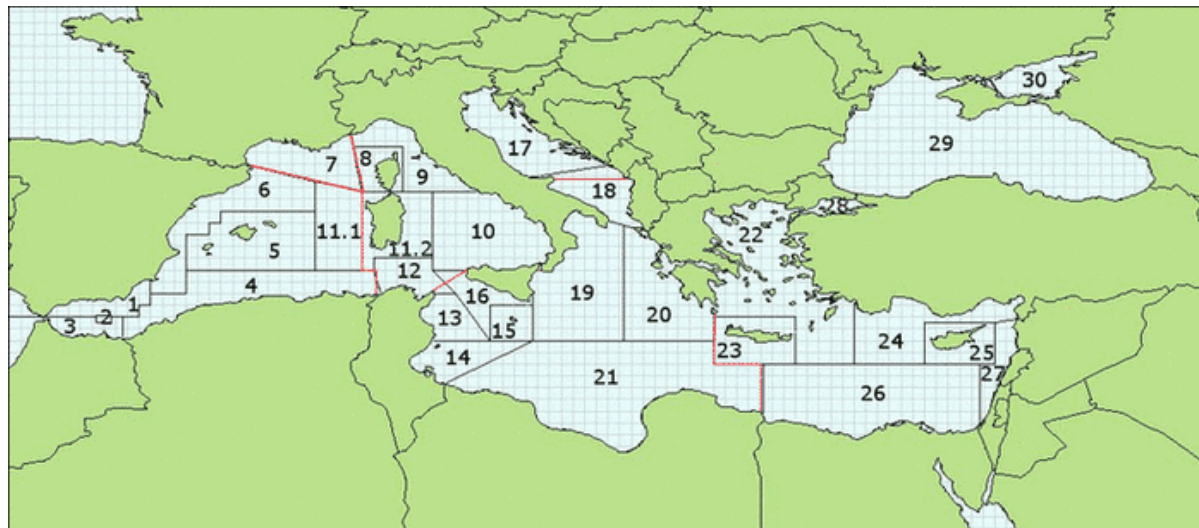


Figure 1: FAO GFCM Geographical Sub areas (<http://www.fao.org/gfcm/data/map-geographical-subareas>).

Since 2007, STECF started collecting and organizing the information on all these fisheries, and since 2009 performing standardized stock assessments ([https://stecf.jrc.ec.europa.eu/documents/43805/44856/09-03\\_SG-ECA-MED-RST+09-01+-+Mediterranean+Stock+Assessment+Standardization](https://stecf.jrc.ec.europa.eu/documents/43805/44856/09-03_SG-ECA-MED-RST+09-01+-+Mediterranean+Stock+Assessment+Standardization)).

After almost 10 years of stock assessments in the Mediterranean and Black Sea, a revision of the available data was performed and the most updated assessments organized and made available in an online tool. This updated data base of Mediterranean and Black Sea stock assessments is freely available and will also be included in a worldwide assessments database, RAM legacy (<http://ramlegacy.org/>), in its next release. RAM legacy is a worldwide data base which includes fish stock assessments from all around the world's oceans, and provides a good source to make comparisons between fisheries status, but also between the assessment process performed in different fishing areas.

In the present report we will describe the stock assessment process performed in the Mediterranean and Black Sea under STECF framework, the revised and updated resulting database, as well as the online visualization tool.

## 2 STECF Stock Assessment

### 2.1 Brief description of STECF stock assessment workflow

The stock assessment process starts with the specific request of Directorate-General for Maritime Affairs and Fisheries (DG MARE) ([https://ec.europa.eu/info/departments/maritime-affairs-and-fisheries\\_en](https://ec.europa.eu/info/departments/maritime-affairs-and-fisheries_en)) through a list of Terms of Reference (ToR's) given to STECF. TORs can indicate the priorities of assessment or can make specific questions of explorative or methodological nature. According to these needs, a group of independent experts are invited to attend a so called Expert Working Group (EWG). Since 2007 more than 30 working groups have been celebrated, between 2 and 3 per year.

During an EWG exclusively dedicated to perform stock assessments, between 15 and 20 assessments are performed. Each stock assessment typically covers one species in one GSA, which is the most used definition of stock. However, for some species, based on biological evidence, one stock covers several GSAs for which, assessments are performed across all GSAs.

The results of all the assessments performed are presented to STECF plenary meetings, where difficulties, limitations and problems on data and/or assessments are described and discussed. According to this, some of the assessments might be not accepted, whereas those accepted will serve as basis of advice and published as so in the final report.

Table 1: Commercial species assessed in STECF assessments working groups. Scientific name, 3Alpha code English name, Family and Order refer to ASFIS 2017 (<http://www.fao.org/fishery/collection/asfis/en>).

Scientific name	3Alpha Code	English name	Family	Order
<i>Aristaeomorpha foliacea</i>	ARS	Giant red shrimp	Aristaeidae	NATANTIA
<i>Aristeus antennatus</i>	ARA	Blue and red shrimp	Aristaeidae	NATANTIA
<i>Dicentrarchus labrax</i>	BSS	European seabass	Moronidae	PERCOIDEI
<i>Engraulis encrasicolus</i>	ANE	European anchovy	Engraulidae	CLUPEIFORMES
<i>Lophius budegassa</i>	ANK	Blackbellied angler	Lophiidae	LOPHIIFORMES
<i>Lophius piscatorius</i>	MON	Angler(=Monk)	Lophiidae	LOPHIIFORMES
<i>Merlangius merlangus</i>	WHG	Whiting	Gadidae	GADIFORMES
<i>Merluccius merluccius</i>	HKE	European hake	Merlucciidae	GADIFORMES
<i>Micromesistius poutassou</i>	WHB	Blue whiting(=Poutassou)	Gadidae	GADIFORMES
<i>Mullus barbatus</i>	MUT	Red mullet	Mullidae	PERCOIDEI
<i>Mullus surmuletus</i>	MUR	Surmullet	Mullidae	PERCOIDEI
<i>Nephrops norvegicus</i>	NEP	Norway lobster	Nephropidae	REPTANTIA
<i>Pagellus erythrinus</i>	PAC	Common pandora	Sparidae	PERCOIDEI
<i>Parapenaeus longirostris</i>	DPS	Deep-water rose shrimp	Penaeidae	NATANTIA
<i>Phycis blennoides</i>	GFB	Greater forkbeard	Gadidae	GADIFORMES
<i>Psetta maxima</i>	TUR	Turbot	Scophthalmidae	PLEURONECTIFORMES
<i>Raja clavata</i>	RJC	Thornback ray	Rajidae	RAJIFORMES
<i>Rapana venosa</i>	RPW	Thomas' rapa whelk	Muricidae	GASTROPODA
<i>Sardina pilchardus</i>	PIL	European pilchard(=Sardine)	Clupeidae	CLUPEIFORMES
<i>Solea solea</i>	SOL	Common sole	Soleidae	PLEURONECTIFORMES
<i>Sparus aurata</i>	SBG	Gilthead seabream	Sparidae	PERCOIDEI
<i>Spicara smaris</i>	SPC	Picarel	Centracanthidae	PERCOIDEI
<i>Sprattus sprattus</i>	SPR	European sprat	Clupeidae	CLUPEIFORMES
<i>Squalus acanthias</i>	DGS	Picked dogfish	Squalidae	SQUALIFORMES
<i>Squilla mantis</i>	MTS	Spottail mantis squillid	Squillidae	STOMATOPODA
<i>Trachurus mediterraneus</i>	HMM	Mediterranean horse mackerel	Carangidae	PERCOIDEI
<i>Trachurus trachurus</i>	HOM	Atlantic horse mackerel	Carangidae	PERCOIDEI
<i>Trisopterus minutus</i>	POD	Poor cod	Gadidae	GADIFORMES



## 2.2 Data sources

Assessments are usually performed based on two types of data: fishery dependent (fishery data) and fishery independent data (survey data)

Since 2000, an EU framework for the collection and management of fisheries dependent data has been in place and it is linked to the STECF advisory process (Doerner et al.2018). This framework was reformed in 2008 (EC 665/2008) resulting in the EU Data Collection Framework (DCF). Under this framework, EU Member States (hereafter MSs) collect a wide range of fisheries data needed for scientific advice. Data are collected on a National Program basis in which each MS indicates data that have to be collected, resources allocated for the collection, and how data are collected (<https://datacollection.jrc.ec.europa.eu/>).

The Mediterranean and Black Sea data call, launched by EC DG MARE and managed by EC JRC, provides crucial information on the catches and/or landings by size/age group for each species and GSA, from which important stock parameters can be estimated for management purpose..

The scientific surveys from which most biological data come are: MEDITS (International bottom trawl surveys in the Mediterranean), focused in bottom trawl gears and hence benthic species, established since 1994 (<http://www.sibm.it/SITO%20MEDITS/principalemedits.htm>) and Medias (MEDiterranean International Acoustic Survey), acoustic surveys mainly targeting pelagic species (<http://www.medias-project.eu/medias/website/>). From these surveys, target species data on size/age structure and abundance for each species and GSA are inferred. These two surveys are listed as a DCF mandatory surveys, and they are conducted annually by EU Mediterranean Member States.

Details on Black Sea surveys are available in the Bulgaria and Romania Work Plans (<https://datacollection.jrc.ec.europa.eu/wp/2017>)

## 2.3 Methods: stock assessment models

There are a variety of stock assessment evaluation methods regularly used in the Mediterranean and Black Sea. They differ on the requirements on a priori information on the stock, both biological and fisheries dependent data, and the time range of this data needed to run it with confidence. The criteria supporting the choice of one or another method are well described in (<https://stecf.jrc.ec.europa.eu/documents/43805/1446742/STECF+16-14+-+Methods+for+Med+stock+assessments.pdf>), but briefly as an overview the used assessment models in the Mediterranean and Black Sea STECF evaluations are listed in the table below:

Table 2: Summary of the main assessment methods and of the data required (STECF 16-14)

Table 3.2.1 – Summary of the main assessment methods and of the data required.

Catch	Effort	Abundance indexes from scientific surveys (biomass and density indexes)	Catch number at age or length	Age/length structured tuning indexes	Natural mortality	Biological parameters (proportion of mature, LW parameters, ect)	Example models	Comments
Yes							Catch MSY, DCAC, SRA	Enough long time series, and enough contrast are needed In some cases series must include pristine situation
Yes		Yes					AIM (time series models)	Enough long time series, enough contrast is needed
Yes	Yes	Yes					Biomass dynamic model e.g. ASPIC, SPICT, state-space Schaefer	Production models can be fitted with catch and index of biomass that can not necessarily be CPUE
Yes			Yes		Yes		SepVPA	Useful for trends and not for absolute values
				Yes	Yes	Yes	Fishery independent assessment models (e.g. SURBA)	Strong assumptions on selectivity at age
Yes		Yes	Yes	Yes	Yes	Yes	VPA models (XSA, ADAPT, ecc)	Time series of biomass and fishing mortality and if a spawners recruitment function is fitted to model outputs, complete advice on status determination and forecasts of limit and target catch levels can be provided
Yes		Yes	Yes	Yes	Yes	Yes	SCAA models (A4A, ICA ecc)	Generally complete advice on status determinations and forecasts of limit and target catch levels are attainable if spawner-recruitment dynamics are embedded. Otherwise, advice is limited to estimates of biomass and fishing mortality time series
Yes		Yes	Yes	Yes	Yes	Yes	IA models (SS3)	Generally complete advice on status determinations and forecasts of limit and target catch levels are attainable if spawner-recruitment dynamics are embedded. Otherwise, advice is limited to estimates of biomass and fishing mortality time series. Can also provide advice on size and spatial stock structure.

SAM (State-space Assessment Model– Nielsen & Berg 2014 ), XSA (Extended Survivor Analysis - Shepherd 1999, Darby and Flatman 1994) and a4a (Assessment for All – Jardim et al., 2015)) are available in FLR, the Fisheries Library in R, a platform of development of analytical tools and methods for quantitative fisheries science, developed and maintained by members of the Fisheries and Aquaculture group of the JRC (<http://www.flr-project.org/>). The advantages of this platform are its transparency and availability, as all scripts and materials are freely available and continuously updated (<https://github.com/flr>).

## 2.4 Version Control and construction of the STECF DB

EC JRC STECF Secretariat has built a Github repository for the following purposes:

1. To back up in an organized way the repositories of each STECF MED EWGs performed over the period 2012-2017
2. To store pre 2012 assessments results
3. To rerun and verify each stock assessments performed in STECF EWGs.
4. To compile a database of stock assessment results for Mediterranean and Black Sea
5. To convert the STECF DB in a DB compatible with RAM LEGACY database format.

The repository is structured in folders by EWG where all the assessments raw data and scripts are stored. The input data folder contains the stock assessments R objects (for FLR and SPICT bases assessments), pre 2012 assessment results and reference points for each assessment. Finally a folder contains R scripts that perform a number of tasks needed to compile a final stock assessment database:

- Extract the stock objects from the EWG Folders
- Extract parameters of interest from the stock objects
- Merge result of various stock assessments from stock objects, .csv files with older assessment data and reference points
- generic files for names and coding conventions

The compilation of the stock assessment database yields a complete version containing all the stock assessments performed over the period 2008-2017, which contains assessments of the same stocks performed in different years. Since evaluation of stock status or management advice is performed only on the most updated assessment, filtering is applied to retain the last updated assessment of each stocks. Such filtering generates a yearly DB version, with the current release being identified as V4 and containing stock assessment data up to STECF EWG 17-15 which was performed in December 2017. Finally, to export the stock assessment database to a format compatible with the DB structure of RAM Legacy, another R script reshapes the data so that these can be imported in RAM through an .RData file.

## **2.5 Outputs: Stock objects and reference points**

Most assessments performed during STECF working groups were done using models and scripts available in FLR or in R Core. The FLR stock object (FLStock) stored in Github contain all the assessment input data as well as estimated parameters, thus it is possible retrieve all estimates of management interest. In the case of the currently documented DB V4 these parameters are: yearly Total catch, Recruitment, Spawning Stock Biomass and Fishing mortality. However having all the stock objects available gives the opportunity to extract easily additional information or input data for other purposes or for running different models.

Since, the main outputs of interest of an assessment are the estimates of the thresholds of the biological reference points both Fref (Fmsy or F0.1) and, whether available, Bref (Bmsy) were extracted too.

The status of the stock is inferred from the relationship between current fishing mortality (F) or biomass (B) and the corresponding reference point. In the Mediterranean Sea there is almost no data on the biomass of the stocks and the most common indication of stock status is F/Fref (Level of Exploitation). If this ratio is lower than 1 means that the current fishing mortality is higher than the threshold for Maximum sustainable yield, and hence that stock is in overfishing.

## **2.6 STECF stock assessments by GSAs and species, temporal coverage and methods**

In the final database V4, in addition to filtering out outdated stock assessments, when there are available stocks assessed in single GSAs and in merged GSAs, only the merged areas assessments were kept. As a result, a total of 88 assessments are included in the Mediterranean and Black Sea database.

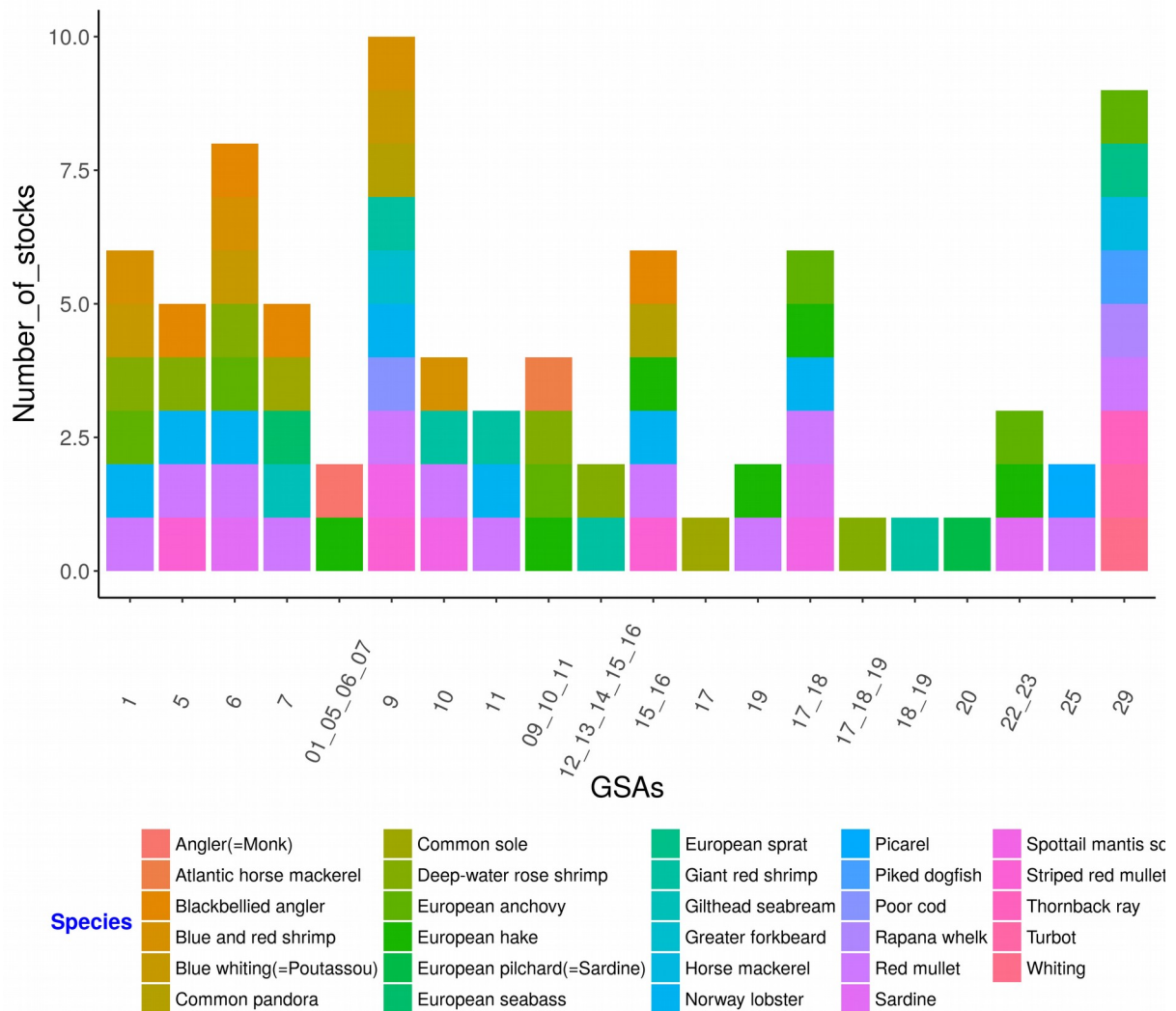


Figure 2: Assessments performed in each GSA or in merged GSAs.

Figure 2 summarized stock assessment carried out by GSA (or merged GSAs). Among GSAs, the highest number of assessments have been carried out in GSA 9 (Ligurian and Northern Tyrrhenian seas), after in GSA 29 (Black Sea) and GSA 6 (Northern Spain).

The total stock assessment covered geographic stocks of 28 different target species. These species are selected according to their economic value and importance in the whole basin or in certain GSAs. Among demersal species assessed, Red mullet has updated 12 assessments, followed by Norway lobster (NEP) and Deep-water rose shrimp (DPS) have been assessed in 7 and 6 GSAs (or merged GSAs). The main small pelagic



Table 3: Stock reference point values and assessment time coverage

3Alpha Code	Species	Area	F reference point	Min assessed year	Max assessed year
ANE	European anchovy	09_10_11	0.220	2009	2016
ANE	European anchovy	1	0.452	2002	2009
ANE	European anchovy	17_18	0.570	1975	2016
ANE	European anchovy	22_23	0.470	2000	2016
ANE	European anchovy	29	0.490	1988	2016
ANE	European anchovy	6	0.704	1945	2016
ANK	Blackbellied angler	15_16	0.160	2009	2010
ANK	Blackbellied angler	5	0.080	2003	2013
ANK	Blackbellied angler	6	0.140	2004	2013
ANK	Blackbellied angler	7	0.290	2009	2011
ARA	Blue and red shrimp	1	0.410	2002	2014
ARA	Blue and red shrimp	10	0.310	2009	2011
ARA	Blue and red shrimp	6	0.360	2002	2014
ARA	Blue and red shrimp	9	0.320	2006	2010
ARS	Giant red shrimp	10	0.650	2006	2014
ARS	Giant red shrimp	11	0.310	2006	2014
ARS	Giant red shrimp	12_13_14_15_16	0.300	2006	2011
ARS	Giant red shrimp	18_19	0.420	2008	2014
ARS	Giant red shrimp	9	0.510	2006	2014
BSS	European seabass	7	0.136	2013	2015
DGS	Piked dogfish	29	0.080	1989	2016
DPS	Deep-water rose shrimp	09_10_11	0.910	2006	2015
DPS	Deep-water rose shrimp	1	0.870	2003	2015
DPS	Deep-water rose shrimp	12_13_14_15_16	0.900	2007	2009
DPS	Deep-water rose shrimp	17_18_19	0.700	2007	2016
DPS	Deep-water rose shrimp	5	0.620	2002	2012
DPS	Deep-water rose shrimp	6	0.270	2001	2012
GFB	Greater forkbeard	9	0.320	2011	2011
HKE	European hake	01_05_06_07	0.390	2003	2014
HKE	European hake	09_10_11	0.200	2006	2014
HKE	European hake	15_16	0.150	2006	2009
HKE	European hake	17_18	0.160	2008	2014
HKE	European hake	19	0.140	2003	2016
HKE	European hake	22_23	0.240	2004	2006
HMM	Horse mackerel	29	0.267	2005	2016
HOM	Atlantic horse mackerel	09_10_11	0.230	2009	2016
MON	Angler(Monk)	01_05_06_07	0.220	2013	2015
MTS	Spottail mantis squillid	10	0.410	2011	2011
MTS	Spottail mantis squillid	17_18	0.375	2008	2016
MTS	Spottail mantis squillid	9	0.540	2009	2010
MUR	Striped red mullet	15_16	0.190	2002	2012
MUR	Striped red mullet	5	0.181	2000	2012
MUR	Striped red mullet	9	0.520	2006	2015
MUT	Red mullet	1	0.270	2003	2013
MUT	Red mullet	10	0.410	2006	2010
MUT	Red mullet	11	0.110	2005	2012
MUT	Red mullet	15_16	0.450	2006	2011
MUT	Red mullet	17_18	0.410	2008	2014
MUT	Red mullet	19	0.360	2006	2016
MUT	Red mullet	25	0.220	2008	2008
MUT	Red mullet	29	0.640	1990	2016
MUT	Red mullet	5	0.150	2000	2012
MUT	Red mullet	6	0.570	2002	2013
MUT	Red mullet	7	0.140	2004	2013
MUT	Red mullet	9	0.596	2006	2013
NEP	Norway lobster	1	0.200	2009	2011
NEP	Norway lobster	11	0.190	2005	2015
NEP	Norway lobster	15_16	0.200	2002	2012
NEP	Norway lobster	17_18	0.370	1960	2016
NEP	Norway lobster	5	0.170	2002	2013
NEP	Norway lobster	6	0.175	2009	2015
NEP	Norway lobster	9	0.190	2005	2015
PAC	Common pandora	15_16	0.300	2006	2011
PAC	Common pandora	9	0.480	2010	2010
PIL	Sardine	17_18	0.440	1975	2016
PIL	Sardine	20	0.400	2000	2008
PIL	Sardine	22_23	0.503	2000	2016
PIL	Sardine	6	0.526	2002	2016
POD	Poor cod	9	0.740	2011	2011
RJC	Thornback ray	29	0.160	2008	2016
RPW	Rapana whelk	29	0.280	2000	2016
SBG	Gilthead seabream	7	0.190	2013	2015
SOL	Common sole	17	0.260	2006	2014
SOL	Common sole	7	0.085	2011	2015
SPC	Picarel	25	0.310	2010	2010
SPR	European sprat	29	0.640	1997	2016
TUR	Turbot	29	0.260	1950	2016
WHB	Blue whiting	1	0.400	2009	2011
WHB	Blue whiting	6	0.159	2009	2013
WHB	Blue whiting	9	0.328	2009	2013
WHG	Whiting	29	0.630	1994	2016

Among the 81 assessments, 25 of them have been performed in merged GSAs. Aegean Sea areas, 22 and 23, are merged for most assessments. Also around the Siculo-Tunisian strait most assessments are performed on stocks covering several GSAs, either from 12 to 16 or only 15 and 16, depending on the species considered. Adriatic Sea, GSAs 17 and 18, and Ionian Sea, GSA 19, are also merged for assessment of most stocks.

European hake in the western Mediterranean is also assessed in two big stocks, one covering Gulf of Lions and Eastern coast of Spain and another covering Ligurian and Tyrrhenian Seas.

Time coverage of the updated assessments ranges between 1 year to more than 71 years, however most assessments cover a time frame of 9-12 years (Figure 4).

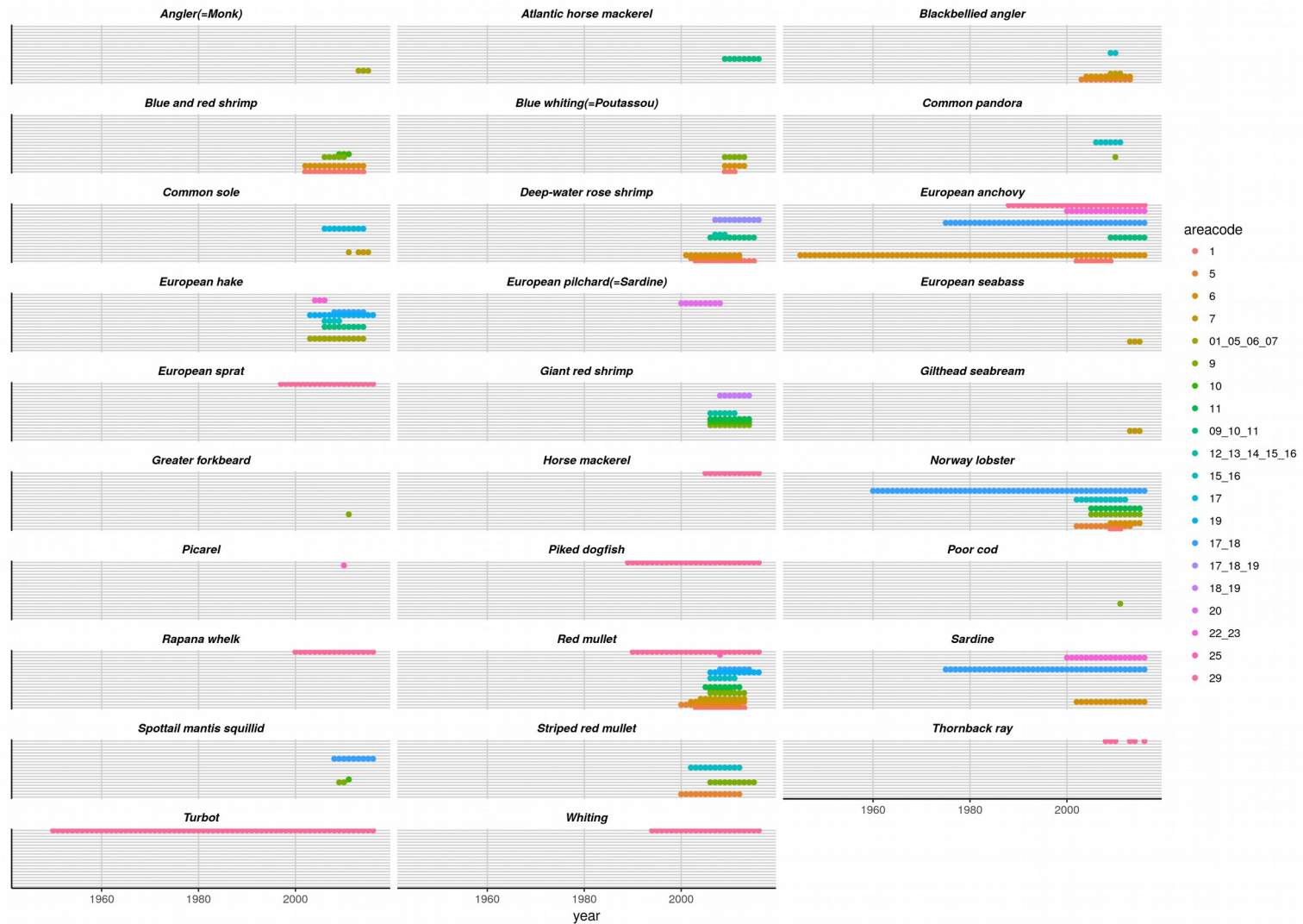


Figure 4: Stock assessment time coverage



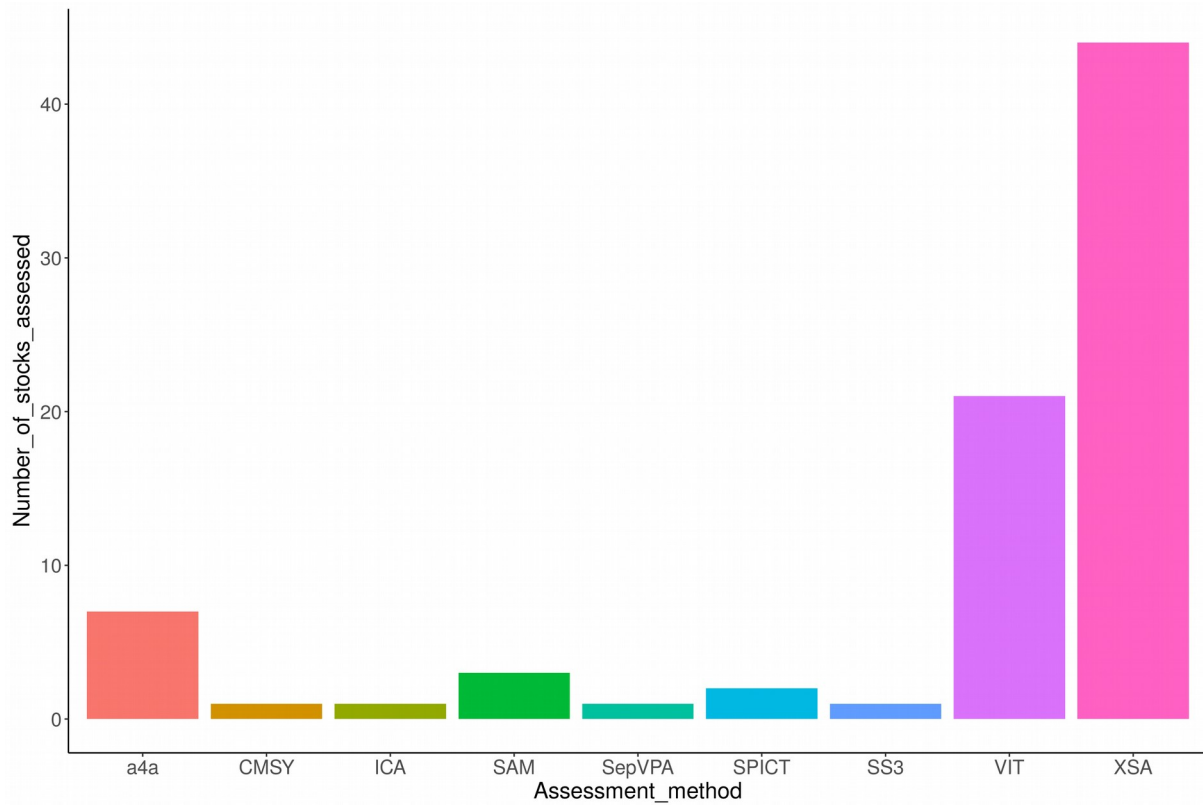


Figure 5: Stock assessment methods used to evaluate stock status.

More than 50% of the assessments have been performed with XSA evaluation method. VIT method has been used in 22 assessments, whereas the other evaluation methods have been used from 1 to 7 times. (Figure 4).

## 2.7 Stock status

Only 7 out of 81 assessed stocks for which was possible computed a final stock status evaluation were considered not in overfishing (i.e.  $F/F_{ref}$  is lower or equal than one) (Figure 6).

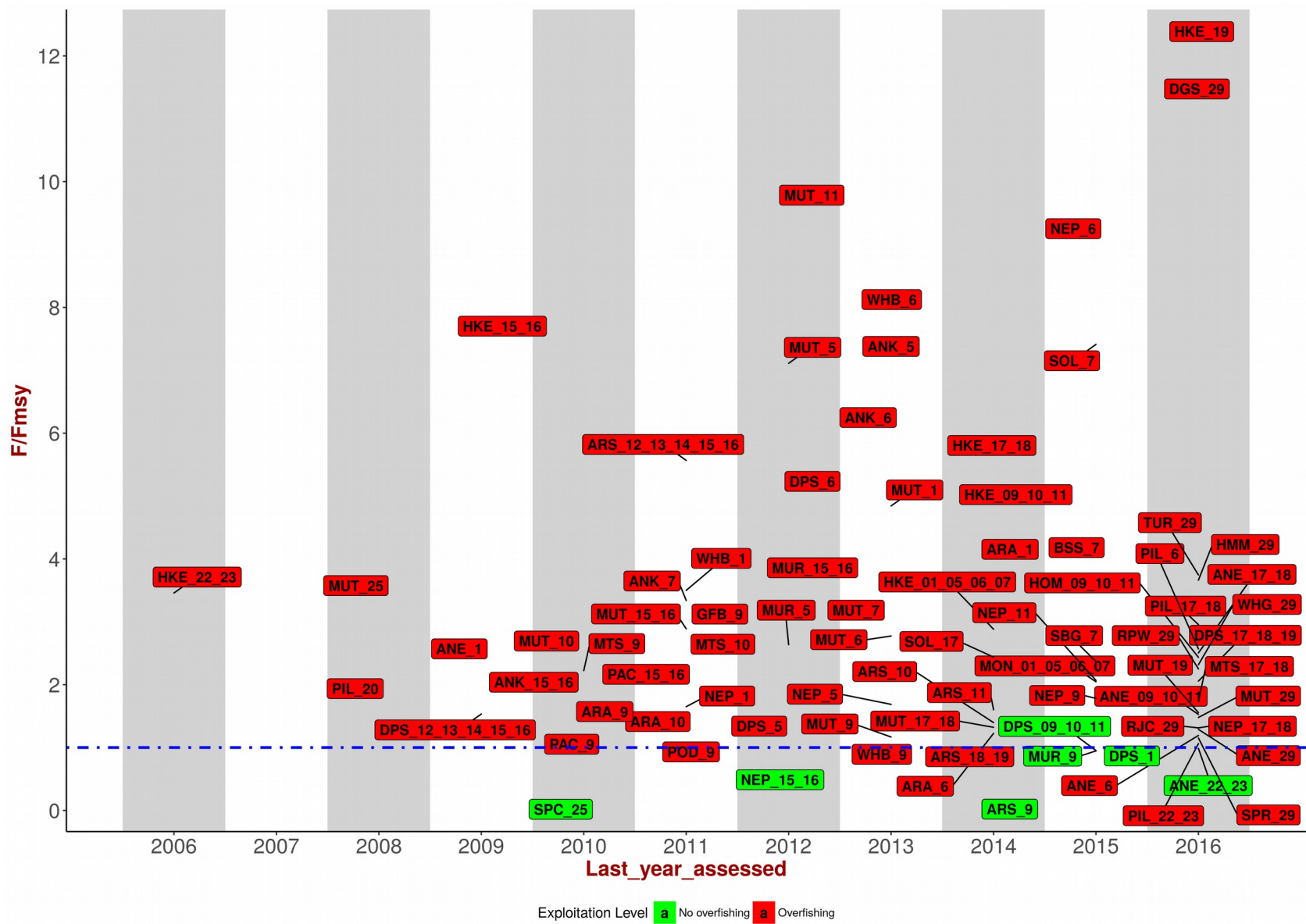


Figure 6: Stock status of 71 assessed stock in the Mediterranean and Black Sea

## STECF STOCK ASSESSMENT DATABASE IN THE MEDITERRANEAN AND BLACK SEA

Citation: GIBIN M., OSIO G.C., MANNINI A., VILLAMOR MARTIN PRAT A. (2017), *The STECF MED&BS Database Visualisation Dashboard*, Scientific Information system and database, JRC104195.

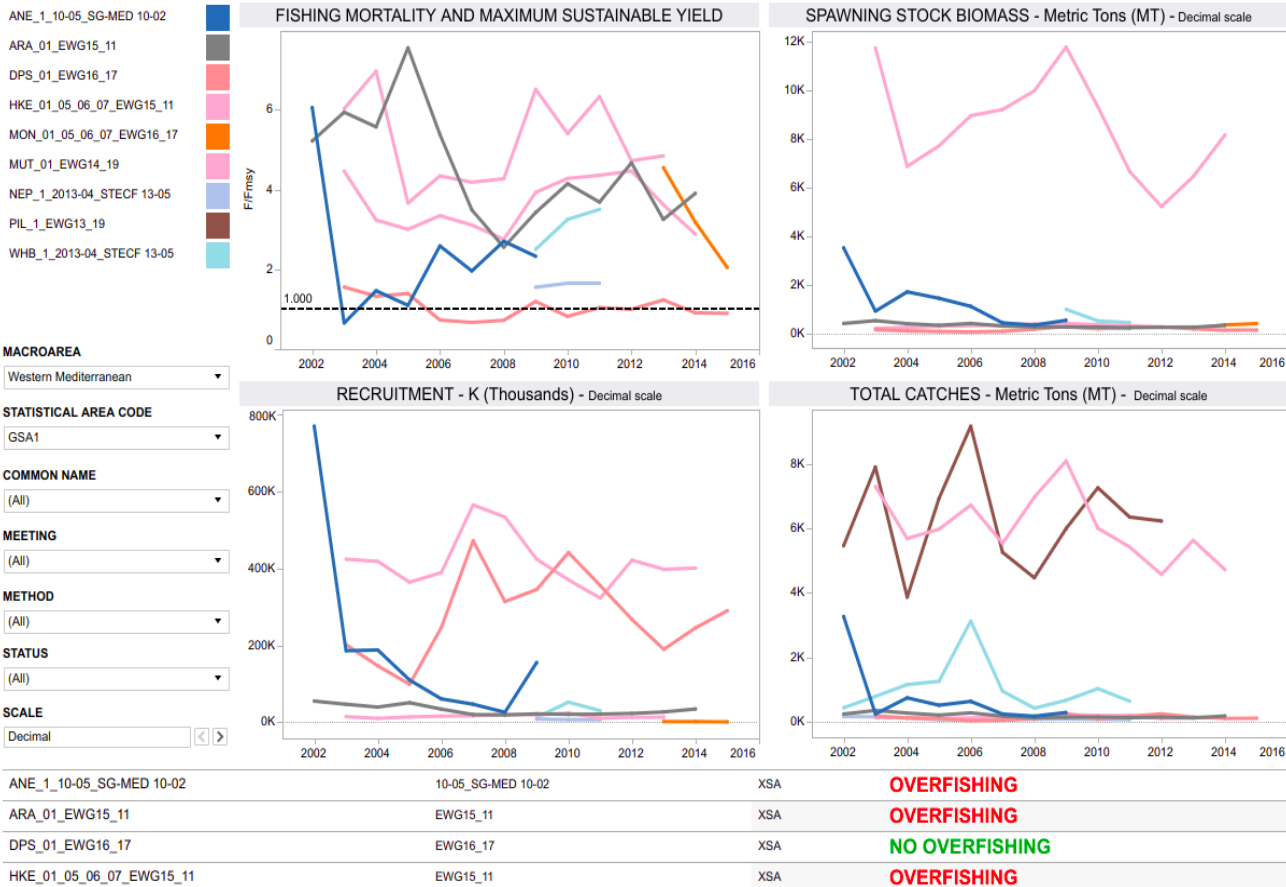


Figure 7: The STECF Mediterranean and Black Sea stock assessment dashboard

## 2.8 The Mediterranean & Black Sea stock assessments database dashboard

The software Tableau was used to create a tool to visualize and download all the relevant information of the updated Mediterranean and Black Sea stock assessments V4 and can be accessed here:

<https://stecf.jrc.ec.europa.eu/dd/medbs/ram>

It is possible to visualize data selecting by species common name, by stock, and by statistical area code (GSA). The parameters represented are fishing mortality (F) over Fref (F0.1 or Fmsy), spawning stock biomass, recruitment, and total catch over the years. Another useful feature is that pointing any line in the graphs it will show you corresponding stock, year and value of the selected variable. An overview table summarizes the selected stocks and the original STECF reports containing the stock assessments can be accessed through a direct link via an URL.

To ensure ease of access for scientific work or further dissemination of stock assessment results a csv file containing the data underlying the dashboard, a download link is available on the bottom right (figure 8):

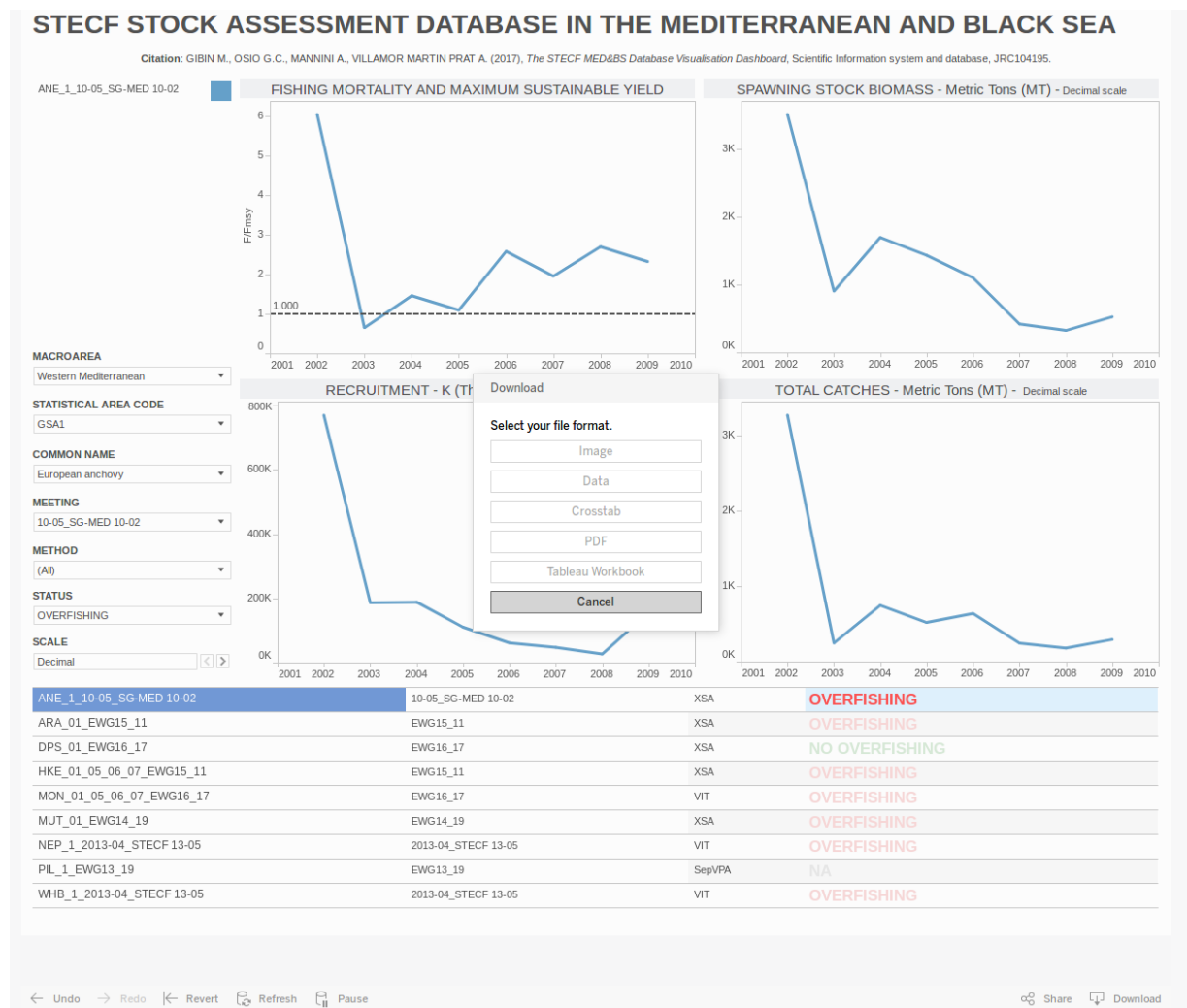


Figure 8: Dashboard data download

### **3. Ram legacy fish stock assessments database**

#### **3.1 General description of RAM**

The RAM Legacy Stock Assessment Database is a compilation of stock assessment results for commercially exploited marine populations from around the world. It is inspired by Dr. Ransom A. Myers' original stock-recruitment database, which is no longer being updated.

A detailed description of the database is given in Ricard et al. 2012

The RAM Legacy Stock Assessment Database (hereafter, RAM Legacy database) is a relational database designed to store data from accessible current model-based fisheries stock assessments for marine fish and invertebrate populations. Time series of spawning stock biomass (SSB), total biomass (TB), recruits (R), total catch (TC) or landings (TL) and fishing mortality (F) from individual stock assessments form the core of the database. Apart from catch/landings, these time series are not raw data, but rather the output of population dynamics models; depending on the type of assessment model and the data reported, not all of these time series were available for every stock. The database also contains details about the time series data, including the age and sex of spawners, age of recruits and the ages used to compute the fishing mortality, as well as biological reference points and some life history information (e.g. growth parameters, age and length at 50% maturity and natural mortality rate). Metadata for each stock assessment consists of taxonomic information about the species and the geographic location of the stock (detailed in 'Links to related databases'), the management body that conducted the assessment and the assessment methodology.

The database is organized in several groups of data which call to each other through the value of one or several variables. In the last version of Ram legacy database, v. 3.8, there are 467 assessments on stocks of 214 different species of fishes, crustaceans and molluscs. World's fisheries areas are divided in 20 regions which are subdivided in up to 214 areas.

STECF Mediterranean and Black Sea stock assessment results have been contributed to RAM Legacy to enhance the coverage in the Mediterranean and Black Sea area which was deficient. The next RAM public release will include, among an update from many other global regions, the data contained in the current dashboard.

## 4 Conclusions

After almost 10 years of stock assessments in the Mediterranean and Black Sea, JRC, acting as STECF Secretariat, extracted available stock assessment data from digital repositories of EWGs and compiled a STECF reference database.

From each assessment contained in the STECF reports yearly time series of stock variables such as: Total Catch (total weight of all fish in the stock), Recruitment (total number of individuals entering yearly in the population), Spawning Stock Biomass (total weight of all sexually mature fish in the stock) and Fishing Mortality were extracted. Potentially more input and output data can be easily extracted thanks to the Github repository to perform further analytical work.

The assessments data are made available through an online interactive dashboard under the STECF Data dissemination web page (<https://stecf.jrc.ec.europa.eu/dd/medbs/ram>) that allows readers to compare and contrast several stock assessments variables. Each stock assessment is linked via an URL to the original source of the stock assessment for ease of access to the full reports.

The STECF database is the reference database for the computation of the Common Fisheries Policy monitoring indicators for the Mediterranean and Black Sea (<https://stecf.jrc.ec.europa.eu/documents/43805/2092142/STECF+18-01+adhoc+-+CFP+Monitoring+2018.pdf>) and for the STECF Fleet balance capacity report (<https://stecf.jrc.ec.europa.eu/documents/43805/1716169/STECF+17-18+-+Balance+capacity.pdf>)

The target audience of the dashboard ranges from governments, fisheries institutes, stakeholders, NGO's and common citizens that want to check the status of marine fisheries resources evaluated.

A copy of the Mediterranean and Black Sea STECF stock assessment results will be included, for the first time, in the next release of the RAM legacy database: a voluntary contributed worldwide stock assessments database, RAM legacy, (<http://ramlegacy.org/>). The RAM Legacy database includes fish stock assessments from all around the world's oceans, and provides a unique source of information to make comparisons between fisheries and to perform global analysis of stock status.

## 5 References

Darby, C.D., Flatman S. (1994). Virtual Population Analysis: Version 3.1 (Windows/Dos) user guide. *Info. Tech. Ser., MAFF Direct. Fish. Res.*, Lowestoft, (1): 85 p.

Hendrik Dörner, John Casey, Natacha Carvalho, Dimitrios Damalas, Norman Graham, Jordi Guillen, Steven J. Holmes, Fabrizio Natale, Giacomo C. Osio, Hans-Joachim Rätz, Cristina Ribeiro and Paraskevas Vasilakopoulos, Collection and dissemination of fisheries data in support of the EU Common Fisheries Policy, accepted in *Ethics in Science and Environmental Politics*. Vol. 18 pp 15:25.

Gibin M., Osio G.C., Mannini A., Villamor Martin Prat A. (2017), The STECF MED&BS Database Visualisation Dashboard, Scientific Information system and database, JRC104195.

Nielsen, A & Berg, CW 2014, 'Estimation of time-varying selectivity in stock assessments using state-space models' *Fisheries Research*, vol 158, pp. 96-101.

Jardim, E., Millar, C. P., Mosqueira, I., Scott, F., Osio, G. C., Ferretti, M., Alzorriz, N., and Orio, A. (2015). What if stock assessment is as simple as a linear model? The a4a initiative. - *ICES Journal of Marine Science*, Vol. 72: 232-236.

Patterson K. (1992). Fisheries for small pelagic species: an empirical approach to management targets. *Review of Fish Biology and Fisheries*, 2: 321-338.

Ricard, D., Minto, C., Jensen, O.P. and Baum, J.K. (2013). Evaluating the knowledge base and status of commercially exploited marine species with the RAM Legacy Stock Assessment Database. *Fish and Fisheries* 13 (4) 380-398. DOI: [10.1111/j.1467-2979.2011.00435.x](https://doi.org/10.1111/j.1467-2979.2011.00435.x)

Shepherd, J. G. (1999). Extended survivors analysis: An improved method for the analysis of catch-at-age data and abundance indices. *ICES Journal of Marine Science*, Vol. 56 (5): 584-591.

Scientific, Technical and Economic Committee for Fisheries (STECF) - Methodology for the stock assessments in the Mediterranean Sea (STECF-16-14); Publications Office of the European Union, Luxembourg; EUR 27758 EN; doi:10.2788/227221.

Scientific, Technical and Economic Committee for Fisheries (STECF) -Monitoring the performance of the Common Fisheries Policy (STECF-Adhoc-18-01). Publications Office of the European Union, Luxembourg, 2018, ISBN XXXXXX, doi:XXXXXXXX, PUBSY No.

## 6 List of abbreviations and definitions

BMSY: SSB that is associated with Maximum Sustainable Yield (MSY)

EWG: Expert Working Group

E: Exploitation Rate ( $F/F+M$ )

F: Instantaneous Rate of Fishing Mortality

F0.1: The fishing mortality rate at which the marginal yield-per-recruit (i.e. the increase in yield-per-recruit in weight for an increase in one unit of fishing mortality) is only ten percent of the marginal yield-per-recruit on the unexploited stock; fishing

FAO: Food and Agriculture Organization of the United Nations

FMSY: Fishing mortality consistent with achieving Maximum Sustainable Yield (MSY)

GFCM: General Fisheries Commission for the Mediterranean

GSA: Geographical SubArea

M: Instantaneous Rate of Natural Mortality

NGO: Non-Governmental Organization

Recruitment: Amount of fish added to the exploitable stock each year due to growth and/or migration into the fishing area, e.g. the number of fish that grow to become vulnerable to the fishing gear in one year would be the recruitment to the fishable stock that year

SSB: Spawning stock biomass; total weight of all sexually mature fish in the stock

STECF: European Commission Scientific Technical Economic Committee for Fisheries



## 7 List of figures

Figure 1: FAO GFCM Geographical Sub areas ( <a href="http://www.fao.org/gfcm/data/map-geographical-subareas">http://www.fao.org/gfcm/data/map-geographical-subareas</a> ).....	4
Figure 2: Assessments performed in each GSA or in merged GSAs.....	9
Figure 3: Assessments performed by species in each GSA, and in merged GSAs.....	10
Figure 4: Stock assessment time coverage.....	13
Figure 5: Stock assessment methods used to evaluate stock status.....	14
Figure 6: Stock status of 71 assessed stock in the Mediterranean and Black Sea.....	15
Figure 7: The STECF Mediterranean and Black Sea stock assessment dashboard.....	16
Figure 8: Dashboard data download.....	17

## 8 List of tables

Table 1: Commercial species assessed in STECF assessments working groups. Scientific name, 3Alpha code English name, Family and Order refer to ASFIS 2017 ( <a href="http://www.fao.org/fishery/collection/asfis/en">http://www.fao.org/fishery/collection/asfis/en</a> ).....	5
Table 2: Summary of the main assessment methods and of the data required (STECF 16-14).....	7
Table 3: Stock reference point values and assessment time coverage.....	11

## **GETTING IN TOUCH WITH THE EU**

### **In person**

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: <http://europa.eu/contact>

### **On the phone or by email**

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
- at the following standard number: +32 22999696, or
- by electronic mail via: <http://europa.eu/contact>

## **FINDING INFORMATION ABOUT THE EU**

### **Online**

Information about the European Union in all the official languages of the EU is available on the Europa website at: <http://europa.eu>

### **EU publications**

You can download or order free and priced EU publications from EU Bookshop at: <http://bookshop.europa.eu>. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see <http://europa.eu/contact>).

## JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.



**EU Science Hub**  
[ec.europa.eu/jrc](https://ec.europa.eu/jrc)



@EU\_ScienceHub



EU Science Hub - Joint Research Centre



Joint Research Centre



EU Science Hub

