



JRC SCIENCE FOR POLICY REPORT

Scientific, Technical and Economic Committee for Fisheries (STECF)

–

West Med assessments: conversion factors, closures, effort data and recreational fisheries (STECF-21-01)

Edited by Fabio Grati; Antonello Sala; Alessandro Mannini, Cecilia Pinto

This publication is a Science for Policy 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 policymaking 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. For information on the methodology and quality underlying the data used in this publication for which the source is neither Eurostat nor other Commission services, users should contact the referenced source. The designations employed and the presentation of material on the maps do not imply the expression of any opinion whatsoever on the part of the European Union concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Contact information

Name: STECF secretariat

Address: Unit D.02 Water and Marine Resources, Via Enrico Fermi 2749, 21027 Ispra VA, Italy

E-mail: jrc-stecf-secretariat@ec.europa.eu

Tel.: +39 0332 789343

EU Science Hub

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

JRC124913

EUR 28359 EN

PDF ISBN 978-92-76-36193-0 ISSN 1831-9424 doi:10.2760/36048

STECF ISSN 2467-0715

Luxembourg: Publications Office of the European Union, 2021

© European Union, 2021



The reuse policy of the European Commission is implemented by the Commission Decision 2011/833/EU of 12 December 2011 on the reuse of Commission documents (OJ L 330, 14.12.2011, p. 39). Except otherwise noted, the reuse of this document is authorised under the Creative Commons Attribution 4.0 International (CC BY 4.0) licence (<https://creativecommons.org/licenses/by/4.0/>). This means that reuse is allowed provided appropriate credit is given and any changes are indicated. For any use or reproduction of photos or other material that is not owned by the EU, permission must be sought directly from the copyright holders.

All content © European Union, 2021

How to cite this report: Scientific, Technical and Economic Committee for Fisheries (STECF) – West Med assessments: conversion factors, closures, effort data and recreational fisheries (STECF-21-01). Publications Office of the European Union, Luxembourg, 2021, EUR 28359 EN, ISBN 978-92-76-36193-0, doi:10.2760/36048, JRC124913.

Abstract

Commission Decision of 25 February 2016 setting up a Scientific, Technical and Economic Committee for Fisheries, C(2016) 1084, OJ C 74, 26.2.2016, p. 4–10. The Commission may consult the group on any matter relating to marine and fisheries biology, fishing gear technology, fisheries economics, fisheries governance, ecosystem effects of fisheries, aquaculture or similar disciplines. This report deals with the conversion factors, closures, effort data and recreational fisheries in the context of the Western Mediterranean stock assessments.

Authors

STECF advice

Abella, J. Alvaro; Bastardie, Francois; Borges, Lisa; Casey, John; Catchpole, Thomas; Damalas, Dimitrios; Daskalov, Georgi; Döring, Ralf; Gascuel, Didier; Grati, Fabio; Ibaibarriaga, Leire; Jung, Armelle; Knittweis, Leyla; Kraak, Sarah; Ligas, Alessandro; Martin, Paloma; Motova, Arina; Moutopoulos, Dimitrios; Nord, Jenny; Prellezo, Raúl; O'Neill, Barry; Raid, Tiit; Rihan, Dominic; Sampedro, Paz; Somarakis, Stylianos; Stransky, Christoph; Ulrich, Clara; Uriarte, Andres; Valentinsson, Daniel; van Hoof, Luc; Vanhee, Willy; Villasante, Sebastian; Vrgoc, Nedo.

EWG 21-01 report

Grati, Fabio; Sala, Antonello; Billet, Norbert; Bolognini, Luca; D'Andrea, Lorenzo; Garcia Del Arco, Antonio; Guijarro, Beatriz; Lehuta, Sigrid; Mannini, Alessandro; Maynou, Francesc; Murenu, Matteo; Ordinas, Francesc; Pinto, Cecilia; Ramírez, J.; Recasens A., Laura; Russo, Tommaso; Sartor, Paolo; Viva, Claudio.

TABLE OF CONTENTS

Background provided by the Commission.....	6
Request to STECF	6
STECF observations	7
STECF comments.....	7
STECF conclusions	10
Contact details of STECF members.....	10
Expert Working Group EWG 21-01 report.....	15
1 Introduction.....	16
2 Background	16
2.1 Terms of Reference for EWG 21-01	17
2.2 Data available and sources of information.....	18
2.2.1 TOR 1. Conversion factors assessment.....	18
2.2.1.1 Fishery Dependent Information (FDI).....	18
2.2.1.2 French logbook and VMS data (GSA7)	18
2.2.2 TOR 2. Existing closures and the proposed additional closures.....	18
2.2.3 ToR3. Demersal stocks fishing mortality by gears other than bottom otter trawls.....	18
2.2.4 TOR 4. Assess the impact of recreational fisheries on the stocks covered by the map	18
3 TOR 1. Conversion Factors assessment	20
3.1 Background	20
3.2 Effort data quality checks, preliminary estimation of Conversion Factors (CF) using the LPUE-ratio approach	20
3.2.1 Fishing days by quarter	20
3.2.2 Number of vessels	20
3.2.3 Landings per Unit Effort and Conversion Factors	22
3.3 Statistical estimation of Conversion factors	26
3.4 Analysis of French data	33
3.4.1 Methodological approach	33
3.4.2 Conversion factors for the French dataset.....	34
3.5 Comparison between the Conversion Factors computed with the FDI data and the values adopted by the Member States	39
3.6 TOR 1 Remarks	40
4 TOR 2. Existing closures and the proposed additional closures.....	42
4.1 Background	42
4.1.1 Italy	44

4.1.1.1	General checks.....	44
4.1.1.2	Specific checks.....	45
4.1.2	France.....	46
4.1.3	Spain	46
4.1.3.1	Report for ICM Technical Report for GSA 6.....	46
4.1.3.2	Report for IEO Technical Reports for GSA 1, GSA 5 and GSA 6	47
4.2	Fishing effort displacement arising from the proposed additional closures	50
4.3	TOR 2 conclusions	50
4.4	TOR 2 remarks.....	51
5	TOR 3. Demersal stocks fishing mortality by gears other than bottom otter trawls.....	52
5.1	Background	52
5.2	Method.....	56
5.3	TOR 3 results	56
5.3.1	Vector of partial F for HKE EMU1-GSAs 1,5,6,7.....	56
5.3.2	Vector of partial F for MUT EMU1-GSA1	58
5.3.3	Vector of partial F for MUT EMU1-GSA6	59
5.3.4	Vector of partial F for MUT EMU1-GSA7	60
5.3.5	Vector of partial F for HKE EMU2-GSAs 8,9,10,11	61
5.3.6	Vector of partial F for MUT EMU2-GSA9	62
5.3.7	Vector of partial F for MUT EMU2-GSA10	63
5.4	TOR 3 remarks.....	64
6	TOR 4. Assess the impact of recreational fisheries on the stocks covered by the map	65
6.1	Background	65
6.1.1	Marine Recreational Fisheries in France	65
6.1.2	Marine Recreational Fisheries in Spain.....	66
6.1.3	Marine Recreational Fisheries in Italy	68
6.1.4	Advice by MEDAC	68
6.1.5	Additional scientific literatures.....	68
6.2	TOR 4 conclusions	69
6.3	TOR 4 remarks.....	70
7	References	71
8	Contact details of EWG 21-01 participants	73
9	List of Background Documents	75

SCIENTIFIC, TECHNICAL AND ECONOMIC COMMITTEE FOR FISHERIES (STECF) - West Med assessments: conversion factors, closures, effort data and recreational fisheries (STECF-21-01)

The report of EWG 20-18 was reviewed by the STECF at its 66th plenary meeting held virtually from 22-26 March 2021.

Background provided by the Commission

The EWG 21-01 was requested to address the following Terms of Reference:

Tor 1. Based on new data (e.g. e-logbook and VMS) to be made available by Member States by mid-February and built in on analyses in STECF 18-09 and 18-13, EWG 21-01 is requested to review the datasets on the trawl fleets exploiting demersal stocks in the western Mediterranean Sea. EWG 21-01 is requested to compare the data with the FDI database (up to year 2019), in order to estimate the conversion factors between fleet segments that will ensure that effort swaps will not lead to an undesirable increase in fishing mortality. Time allowing, fishery/assemblage targeted should also be considered for the conversion factors assessment. The EWG will assess the scientific robustness of the provisional conversion factors adopted in 2020 and, in case these are not adequate, propose alternative conversion factors for the fleet segments for ES, IT and FR.

Tor 2. Based on new proposals for additional closures to be submitted by Member States by Mid-February, which are based on the standardized methodology developed by STECF, EWG 21-01 is requested to review the existing closures and the proposed additional closures (i.e. terms of placement and period). STECF is requested to estimate their efficiency to protect juveniles and spawning aggregations of the demersal species covered by the West Med WMAP. STECF is asked comment on possible fishing effort displacement arising from the proposed additional closures. Time permitting, EWG may also parametrize the models to evaluate the effects of the proposed areas. The additional closures should result in a reduction of between 15% and 25% in the bycatch of juveniles and spawners of each stock covered by the WMAP. For each GSA, in case the closures proposed by Member States are not meeting this criterion, the EWG is requested to propose recommendations for designing alternative closures based on criteria such as but not limited to bathymetry, depth, type of substrate, stock seasonality, establishment of a buffer area etc.

Tor 3. The EWG is requested to evaluate how much gears other than bottom otter trawls, such as gillnets and longlines contribute to demersal stocks fishing mortality and especially F for mature hake. Where fishing mortality for hake or other species covered by the WMAP by such gears is significant, the EWG is requested to propose possible additional management measures for these gears.

Tor 4. Based on available data (including the mapping of available data from DCF/DCRF) and made available by Member States, STECF is requested to assess the impact of recreational fisheries on the stocks covered by the WMAP. The EWG is requested to evaluate for each stock whether recreational fisheries contribute to the demersal stocks total catches and if yes to which amount.

Request to STECF

STECF is requested to review the report of the STECF Expert Working Group meeting, evaluate the findings and make any appropriate comments and recommendations.

STECF observations

The expert working group met online from 1st to 5th of March 2021. The meeting was attended by 19 experts, including one STECF member and two JRC experts. One DG MARE representative and one observer also attended the meeting.

EWG 21-01 was a follow-up to the EWG 20-13 (October 2020), EWG 19-14 (October 2019), EWG 19-01 (March 2019), EWG 18-13 (October 2018) and EWG 18-09 (June 2018).

EWG 21-01 had the following four TORs:

TOR 1. Based on new data (e.g. e-logbook and VMS) to be made available by Member States by mid-February and built in on analyses in STECF 18-09 and 18-13, EWG 21-01 is requested to review the datasets on the trawl fleets exploiting demersal stocks in the western Mediterranean Sea. EWG 21-01 is requested to compare the data with the FDI database (up to year 2019), in order to estimate the conversion factors between fleet segments that will ensure that effort swaps will not lead to an undesirable increase in fishing mortality. Time allowing, fishery/assemblage targeted should also be considered for the conversion factors assessment. The EWG will assess the scientific robustness of the provisional conversion factors adopted in 2020 and, in case these are not adequate, propose alternative conversion factors for the fleet segments for ES, IT and FR.

TOR 2. Based on new proposals for additional closures to be submitted by Member States by Mid-February, which are based on the standardized methodology developed by STECF, EWG 21-01 is requested to review the existing closures and the proposed additional closures (i.e. terms of placement and period). STECF is requested to estimate their efficiency to protect juveniles and spawning aggregations of the demersal species covered by the West Med WMMAP. STECF is asked comment on possible fishing effort displacement arising from the proposed additional closures. Time permitting, EWG may also parameterize the models to evaluate the effects of the proposed areas. The additional closures should result in a reduction of between 15% and 25% in the by catch of juveniles and spawners of each stock covered by the WMMAP. For each GSA, in case the closures proposed by Member States are not meeting this criterion, the EWG is requested to propose recommendations for designing alternative closures based on criteria such as but not limited to bathymetry, depth, type of substrate, stock seasonality, establishment of a buffer area etc.

TOR 3. The EWG is requested to evaluate how much gears other than bottom otter trawls, such as gillnets and longlines contribute to demersal stocks fishing mortality and especially F for mature hake. Where fishing mortality for hake or other species covered by the WMMAP by such gears is significant, the EWG is requested to propose possible additional management measures for these gears.

TOR 4. Based on available data (including the mapping of available data from DCF/DCRF) and made available by Member States, STECF is requested to assess the impact of recreational fisheries on the stocks covered by the WMMAP. The EWG is requested to evaluate for each stock whether recreational fisheries contribute to the demersal stocks total catches and if yes to which amount.

STECF comments

STECF observes that all the ToRs have been addressed.

ToR 1. CONVERSION FACTORS ASSESSMENT

STECF observes that Spain and France presented reports to support their respective current conversion factors allowing transfer of effort allocation between fleet segments. France supports a

1 to 1 conversion factor. STECF notes that Italy uses conversion factors as adopted by Spain and did not provide additional supporting information for those.

STECF notes that the available data for the analysis were 2015-2019 FDI databases hosted by JRC (<https://stecf.jrc.ec.europa.eu/data-dissemination>) aggregated at the level of the quarter or year and at fleet segment, and the 2019 logbook and VMS data for French trawling fleet in the GSA 7 provided by the French ministry.

Two parallel statistical approaches were tested to calculate conversion factors based on FDI data. The first approach considered the six species included in the WMMAP and the second approach involved species representing the 75% of the OTB landings. Most of the FDI-based estimated conversion factors were not statistically different from 1, especially for the fleet segments VL1824 and VL2440. This would mean that in average, the CPUE of a large vessel is not statistically different from the CPUE of a smaller vessel, which may be interpreted as supporting the 1 to 1 conversion factor. However, STECF emphasises the high variability around these average CPUE, which render the differences not statistically significant. This variability indicates large differences within a given fleet segment, e.g. CPUE can vary extensively according to GSA, year and season. Accordingly, STECF underlines that it is not possible to assume that converting a fishing day from a small fleet segment to a large fleet segment will not significantly affect total catches and fishing mortality, depending on when and where that fishing day is used.

This is corroborated by the results of the disaggregated analysis performed at trip level. STECF observes that the analysis carried out with VMS and logbook data for French trawl fleet in GSA 7 successfully estimated the conversion factors at gear level, fleet segment level and gear-fleet segment level. All conversion factors were statistically different from 1, thus suggesting that larger vessels are indeed more efficient than small vessels. In particular, the gear-type (twin rigged OTT vs. single trawl OTB) is a factor explaining large differences in fishing power.

ToR2. EXISTING CLOSURES AND THE PROPOSED ADDITIONAL CLOSURES

STECF observes that no documents were presented for the evaluation of the effect of the actual closures already implemented since 2020 for protecting hake juveniles.

STECF notes that EWG evaluated a document presented by Italy for the assessment of the reduction of juvenile hake catches in GSAs 9, 10 and 11. Different scenarios including the existing closures areas and fishing effort reduction in 2020 (10% reduction compared to baseline 2015-2017), separately and combined were simulated following the methodology described in previous STECF meetings (STECF PLEN 19-03 and STECF 20-01). STECF notes that only one scenario achieved the objective of 20% reduction of catches of juveniles of hake for each of the three GSAs. This scenario considers the 10 closures areas proposed for 2020 and the effort reduction.

STECF observes that no proposal of additional closure areas, related to Article 11.3 of WMMAP, for 2021 were presented by France or Italy.

STECF observes that Spain presented four documents of additional closures, two different proposals for GSA 6, one proposal for GSA 1 and one proposal for GSA 5.

STECF observes that the objective of additional closures has changed as stipulated the joint statement by France and Spain in December 2020 (European Council, statement 5415/1/21 Rev1): "The additional closures should result in a reduction of between 15% and 25% in the by catch of juveniles and spawners of each stock covered by the WMMAP". The term "by catch" used in the literal sentence from the joint statement, was interpreted as catch in the analysis carried out in this ToR.

STECF notes that the two Spanish proposals for GSA 6 used two different sets of data and methodology. The first proposal, a Technical Report elaborated by the ICM-CSIC, analysed the effect of additional measures: effort reduction and changes in mesh size. STECF notes however that this proposal did not analyze separately the juveniles and spawners fractions, did not include considerations on effort displacement, and neither considered the persistency analyses of hotspots of juveniles / spawners in time and space using fishery-independent trawl surveys, which are key technical requirements described in STECF PLEN 19-03 and STECF 20-01. STECF considers thus that the methodology used in this proposal is not appropriate to estimate the efficiency of closure areas to protect juveniles and spawners of the species in the WMMAP.

The other three Spanish proposals are based on IEO Technical Reports for GSA 6, GSA 5 and GSA 1. The three proposals share the same approach, using the scientific survey data to discriminate population fractions and considering the effort displacement. STECF observes that these three proposals meet the standardized methodology developed by STECF.

STECF notes that none of the proposals from Spain reached the objectives required for any fraction of the stocks. The two closure areas proposed in GSA 1 would allow less than 1% reduction in catches for any species. Five temporary closure areas are proposed for GSA 5 implying a limited reduction of catches for the five species presented in the area, the highest effect being an estimated reduction of 2.3% for juveniles and potential spawners of Norway lobster and blue and red shrimp. The closure areas defined in the IEO Technical Report for GSA 6 would only reduce the catch of spawners of Norway lobster by 2%.

STECF notes that closure areas in combination with additional measures improve the reduction rates, but they are not sufficient to achieve the objectives.

STECF notes that in the four Spanish documents, the closure areas were selected in agreement with the fishing sector, but only the proposal for GSA 6 by ICM-CSIC included an analysis of the short-term economic impact of the closure areas in terms of immediate lost revenues (and not considering the medium-term benefits of stock recovery).

STECF observes that the EWG did not address the part of ToR2 involving the exploration of new, not predefined scenarios. STECF underlines that such a task is a comprehensive work that cannot be undertaken during the week of a working group only. Assuming that a model would be already available and up-to-date for a given case study (including relevant spatial information such as GIS layers and VMS data), and notwithstanding the incompressible time and human resources necessary to parameterise new scenarios, run the computations, produce and analyse the results, STECF notes that a significant amount of time and discussion would be spent in defining which closures scenarios should be analysed (where, when, how long) in the absence of any political guidance on preferred options. STECF recalls that defining scenarios is best placed in an iterative and interactive process involving decision-makers and stakeholders ahead of the working group.

ToR3. DEMERSAL STOCKS FISHING MORTALITY BY GEARS OTHER THAN BOTTOM OTTER TRAWLS

STECF observes that from the six species included in the West Med MAP, only European hake and red mullet are caught by fishing gears other than trawl. Nets (GNS and GTR) are responsible for 14% and 32% of hake catches in EMU1 and EMU2, respectively, and lines (LLS) contribute to 1% of hake catches in EMU1. Depending on the GSA, between 4% and 24% of the total catches of red mullet come from nets.

STECF observes that matrices of partial F were computed for each GSA and fishing gear based on the F by age and year estimated in the last assessment and the catch-at-age by fishing gear-GSA. The partial F s have remained rather stable over the most recent years. For the last year analysed (2019) and based on F_{bar} ages, the contribution of GTR to fishing mortality of red mullet was 27% in GSA 1 and 22% in GSA 10. In the case of hake, GNS accounted for 8% of fishing mortality in EMU1 and 24% of fishing mortality in EMU2 and LLS accounted for 4% in EMU1.

The EWG 21-01 proposed management measures for GTR, GNS and LLS based on a proportional reduction of the partial F to the average across either all fished ages or ages that contribute to the F_{bar} . Considering that these gears contribute to the fishing mortality mostly for older ages, if the reduction of fishing mortality is aligned with the spawning seasons of hake and red mullet, it is expected that the management measures would contribute to protect the spawners.

ToR4. ASSESS THE IMPACT OF RECREATIONAL FISHERIES ON THE STOCKS COVERED BY THE MAP

STECF notes that EWG evaluated the impact of the recreational fisheries based on the information included in the following documents: "Report on the impact of recreational marine fisheries in the Spanish Mediterranean in relation to the multi-annual plan for demersal fisheries in the Western

Mediterranean” sent by *General Secretariat for the Fisheries* (Spain) and two documents sent by *General Deputy for Sustainable Fishing* (France): “Study evaluating the impact of marine recreational fisheries in France” and the report “MEDAC Advice for a regulatory framework and efficient management for recreational fisheries in the Mediterranean” based on FAO Technical Guidelines on Responsible Recreational Fisheries. Additional scientific literature was also consulted.

STECF observes that the marine recreational fisheries for the French regions bordering the Mediterranean are described, providing information about fishers population, fishing practices and catch composition. Recreational fishery is a strongly seasonal occupation with a peak of activity during the summer months. Atlantic mackerel, sea bass, and gilthead sea bream are the main species of the recreational fishery representing the 67% of catches. For the species listed in the WMMAP, the combined catches for red mullets (*Mullus spp.*) made up to 2% only.

STECF notes that a comprehensive study of the catch composition of marine recreational fishing in Spanish Mediterranean was carried out in 2021 and it was presented to this EWG. The list of species and corresponding catches by region and modality of recreational fishing was presented. None of the species included in the WMMAP appeared in the catch composition except for the Region of Murcia in the shore-based fisheries and underwater fishing/spear fishing, where combined catches of mullet species (*Mullus spp.*) represented between 5% and 18% (in numbers).

STECF observes that considering that the four crustacean species included in the WMMAP have never been reported as caught by recreational fisheries, that there was only one observation of a hake caught and an unquantified low presence of *Mullus spp.*, EWG concluded that the impact of the recreational fisheries on the stocks covered by the WMMAP is negligible.

STECF conclusions

STECF concludes that the conversion factors between fleet segments adopted in 2020 by Member States should be evaluated based on information at the fishing trip level from VMS and logbooks. Such data are not publicly available and are to be specifically provided by Member States for the analysis to be performed accurately. STECF concludes that trawl type affects significantly the catching power of fishing vessels.

STECF concludes that none of the proposed scenarios of additional closures achieved the objective of reduction of between 15% and 25% in the catch of juveniles and spawners of each stock covered by the WMMAP. Achieving this by means of closures alone would require more ambitious scenarios, adapted to the areas, fisheries and species concerned. Alternatively, the combination of closure areas with effort reductions and technical measures may contribute to achieve these levels of reduction.

STECF recalls that the evaluation of alternative closure scenarios shall follow the technical guidelines provided by STECF PLEN 19-03 and STECF 20-01. STECF underlines also that defining new closure scenarios to be explored is best placed in an iterative and interactive process involving decision-makers and stakeholders.

STECF concludes that other fishing gears than trawl accounts for fishing mortality of hake and red mullet. This contribution may vary between GSAs and fish age group.

STECF concludes that spawners of hake and red mullet can be protected through management measures that ensure the reduction of the fishing mortality attributable to GNS, GTR and LLS during the spawning seasons.

STECF concludes that the recreational fishery in the Western Mediterranean Sea has a negligible or a null impact on the six species target in the WMMAP.

Contact details of STECF members

¹ - Information on STECF members’ affiliations is displayed for information only. In any case, Members of the STECF shall act independently. In the context of the STECF work, the committee members do not represent the institutions/bodies they are affiliated to in their daily jobs. STECF

members also declare at each meeting of the STECF and of its Expert Working Groups any specific interest, which might be considered prejudicial to their independence in relation to specific items on the agenda. These declarations are displayed on the public meeting's website if experts explicitly authorized the JRC to do so in accordance with EU legislation on the protection of personnel data. For more information: <http://stecf.jrc.ec.europa.eu/adm-declarations>

Name	Affiliation¹	Email
Abella, J. Alvaro	Independent consultant	aabellafisheries@gmail.com
Bastardie, Francois	Technical University of Denmark, National Institute of Aquatic Resources (DTU-AQUA), Kemitovet, 2800 Kgs. Lyngby, Denmark	fba@aqu.dtu.dk
Borges, Lisa	FishFix, Lisbon, Portugal	info@fishfix.eu
Casey, John	Independent consultant	blindlemoncasey@gmail.com
Catchpole, Thomas	CEFAS Lowestoft Laboratory, Pakefield Road, Lowestoft, Suffolk, UK, NR33 0HT	thomas.catchpole@cefass.co.uk
Damalas, Dimitrios	Hellenic Centre for Marine Research, Institute of Marine Biological Resources & Inland Waters, 576 Vouliagmenis Avenue, Argiroupolis, 16452, Athens, Greece	shark@hcmr.gr
Daskalov, Georgi	Laboratory of Marine Ecology, Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences	Georgi.m.daskalov@gmail.com
Döring, Ralf (vice-chair)	Thünen Institute [TI-SF] Federal Research Institute for Rural Areas, Forestry and Fisheries, Institute of Sea Fisheries, Economic analyses Herwigstrasse 31, D-27572 Bremerhaven, Germany	ralf.doering@thuenen.de
Gascuel, Didier	AGROCAMPUS OUEST, 65 Route de Saint Briec, CS 84215, F-35042 RENNES Cedex, France	Didier.Gascuel@agrocampus-ouest.fr
Grati, Fabio	National Research Council (CNR) – Institute for Biological Resources and Marine Biotechnologies (IRBIM), L.go Fiera della Pesca, 2, 60125, Ancona, Italy	fabio.grati@cnr.it

Name	Affiliation¹	Email
Ibaibarriaga, Leire	AZTI. Marine Research Unit. Txatxarramendi Ugarteia z/g. E-48395 Sukarrieta, Bizkaia. Spain.	libaibarriaga@azti.es
Jung, Armelle	DRDH, Techopôle Brest-Iroise, BLP 15 rue Dumont d'Urville, Plouzane, France	armelle.jung@desrequinse.tdeshommes.org
Knittweis, Leyla	Department of Biology, University of Malta, Msida, MSD 2080, Malta	Leyla.knittweis@um.edu.mt
Kraak, Sarah	Thünen Institute of Baltic Sea Fisheries, Alter Hafen Süd 2, 18069 Rostock, Germany.	sarah.kraak@thuenen.de
Ligas, Alessandro	CIBM Consorzio per il Centro Interuniversitario di Biologia Marina ed Ecologia Applicata "G. Bacci", Viale N. Sauro 4, 57128 Livorno, Italy	ligas@cibm.it ; ale.ligas76@gmail.com
Martin, Paloma	CSIC Instituto de Ciencias del Mar Passeig Marítim, 37-49, 08003 Barcelona, Spain	paloma@icm.csic.es
Motova, Arina	Sea Fish Industry Authority, 18 Logie Mill, Logie Green Road, Edinburgh EH7 4HS, U.K	arina.motova@seafish.co.uk
Moutopoulos, Dimitrios	Department of Animal Production, Fisheries & Aquaculture, University of Patras, Rio-Patras, 26400, Greece	dmoutopo@teimes.gr
Nord, Jenny	The Swedish Agency for Marine and Water Management (SwAM)	Jenny.nord@havochvatten.se
Prellezo, Raúl	AZTI -Unidad de Investigación Marina, Txatxarramendi Ugarteia z/g 48395 Sukarrieta (Bizkaia), Spain	rprellezo@azti.es
O'Neill, Barry	DTU Aqua, Willemoesvej 2, 9850 Hirtshals, Denmark	barone@aqu.dtu.dk
Raid, Tiit	Estonian Marine Institute, University of Tartu, Mäealuse 14, Tallin, EE-126, Estonia	Tiit.raid@gmail.com
Rihan, Dominic (vice-chair)	BIM, Ireland	rihan@bim.ie

Name	Affiliation¹	Email
Sampedro, Paz	Spanish Institute of Oceanography, Center of A Coruña, Paseo Alcalde Francisco Vázquez, 10, 15001 A Coruña, Spain	paz.sampedro@ieo.es
Somarakis, Stylianos	Institute of Marine Biological Resources and Inland Waters (IMBRIW), Hellenic Centre of Marine Research (HCMR), Thalassocosmos Gournes, P.O. Box 2214, Heraklion 71003, Crete, Greece	somarak@hcmr.gr
Stransky, Christoph	Thünen Institute [TI-SF] Federal Research Institute for Rural Areas, Forestry and Fisheries, Institute of Sea Fisheries, Herwigstrasse 31, D-27572 Bremerhaven, Germany	christoph.stransky@thuenen.de
Ulrich, Clara (chair)	IFREMER, France	Clara.Ulrich@ifremer.fr
Uriarte, Andres	AZTI. Gestión pesquera sostenible. Sustainable fisheries management. Arrantza kudeaketa jasangarria, Herrera Kaia - Portualdea z/g. E-20110 Pasaia – GIPUZKOA (Spain)	auriarte@azti.es
Valentinsson, Daniel	Swedish University of Agricultural Sciences (SLU), Department of Aquatic Resources, Turistgatan 5, SE-45330, Lysekil, Sweden	daniel.valentinsson@slu.se
van Hoof, Luc	Wageningen Marine Research Haringkade 1, IJmuiden, The Netherlands	Luc.vanhoof@wur.nl
Vanhee, Willy	Independent consultant	wvanhee@telenet.be
Villasante, Sebastian	University of Santiago de Compostela, Santiago de Compostela, A Coruña, Spain, Department of Applied Economics	sebastian.villasante@usc.es
Vrgoc, Nedo	Institute of Oceanography and Fisheries, Split, Setaliste Ivana Mestrovica 63, 21000 Split, Croatia	vrgoc@izor.hr

REPORT TO THE STECF

EXPERT WORKING GROUP ON West Med assessments: conversion factors, closures, effort data and recreational fisheries (EWG 21-01)

Virtual meeting, 1-5 March 2021

This report does not necessarily reflect the view of the STECF and the European Commission and in no way anticipates the Commission's future policy in this area

Abstract

Commission Decision of 25 February 2016 setting up a Scientific, Technical and Economic Committee for Fisheries, C(2016) 1084, OJ C 74, 26.2.2016, p. 4–10. The Commission may consult the group on any matter relating to marine and fisheries biology, fishing gear technology, fisheries economics, fisheries governance, ecosystem effects of fisheries, aquaculture or similar disciplines.

This report deals with the management measures for demersal fisheries in the Western Mediterranean Sea. The report explores the datasets on the trawl fleets exploiting demersal stocks to estimate the conversion factors between fleet segments that will ensure that effort swaps will not lead to an undesirable increase in fishing mortality. Most of the FDI-based estimated conversion factors rarely resulted statistically different from 1, especially for the largest fleet segments. On the contrary, France VMS and logbook-based analysis applied to the largest fleet segment showed factors having values statistically different from 1. This highlights the need to have data at fishing trip level to propose a suitable update to the conversion factors adopted in 2020 from the three Member States.

Regarding the proposals for additional closures that Member States should submitted, none of the proposals received reached the objectives required when they were considered exclusively (not in combination of additional measures) for any of the fractions of the species analysed. The only proposals from additional closure areas for 2021 were received from Spain; neither France nor Italy proposed additional closure areas. Due to time constraints, the EWG could not propose recommendations for designing alternative closures.

The EWG assessed the relative importance of fishing gear other than otter bottom trawl to the fishing mortality of the six target species in the West Med MAP and calculated partial mortality vectors for the two species (hake and red mullet) for which set nets or longlines contribute significantly to fishing mortality. EWG was asked to evaluate the potential impact of recreational fisheries on the stocks covered by the MAP. Based on the available information in the background documents and additional scientific literature EWG concludes that the impact of recreational fishery on the stocks covered by the Western Mediterranean Multi-Annual Plan is negligible. In future, it would be recommended to extend the assessment of recreational fisheries' impact to all the species having MCRS.

1 INTRODUCTION

The STECF Expert Working Group EWG 21-01 met virtually from 1st to 5th of March 2021. The chairs of the EWG 21-01, Fabio Grati and Antonello Sala, opened the EWG at 9:00h. The terms of reference for the meeting were reviewed and discussed and consequently the meeting agenda adopted.

The session was managed through plenary and subgroup meetings. The meeting closed at 18:30h on 5 March 2021. The meeting was attended by 19 experts in total, including one STECF member and two JRC experts, with one observer and one person from DG Mare.

2 BACKGROUND

Member States concerned commit to continue with the efficient implementation of measures contained in the closure areas already adopted pursuant to Article 11 of the Western Mediterranean Multi-Annual Plan (hereafter WMAP), and to follow the foreseen calendar, to ensure the best protection of juveniles, in accordance with the most recent STECF advice.

The WMAP foresees that the reduction in fishing mortality, necessary to achieve a Maximum Sustainable Yield (*MSY*) by 1 January 2025, shall be achieved by means of two tools: reduction of fishing effort and closure areas. Article 11(3) of this regulation requires Member States to establish by 17 July 2021 new closure areas to reduce the catches of juveniles and spawners of all stocks subject to the WMAP, based on the best available scientific advice.

The Member States concerned recognise that such scientific advice relates to the existence of concentrations of fish below the minimum conservation reference size and the existence of nursery and spawning grounds of demersal stocks covered by the WMMAP.

Moreover, the Member States concerned commit to ensure, through such additional closures, a significant reduction of catches of juveniles and spawners, following article 11 and the best available scientific advice.

On a regular basis, MS concerned commit to transmit to the Commission the scientific assessment of the implementation of the closure areas, notably taking into account a target between 15-25% reduction of juvenile and spawners bycatch.

When adopting additional closures, Member States will take into account the recommendations of STECF advice and prevent as much as possible the displacement of effort around closure areas, facilitate the implementation of permanent closure areas and endeavour to protect the coastal areas and upper shelf where nurseries and important habitats are located for the stocks under the WMMAP.

The Member States concerned commit to submit all available data on additional closures to STECF by mid-February 2021 to enable the assessment of the impact of these closures on the concerned stocks.

2.1 Terms of Reference for EWG 21-01

The EWG 21-01 was requested to address the following Terms of Reference:

Tor 1. Based on new data (e.g. e-logbook and VMS) to be made available by Member States by mid-February and built in on analyses in STECF 18-09 and 18-13, EWG 21-01 is requested to review the datasets on the trawl fleets exploiting demersal stocks in the western Mediterranean Sea. EWG 21-01 is requested to compare the data with the FDI database (up to year 2019), in order to estimate the conversion factors between fleet segments that will ensure that effort swaps will not lead to an undesirable increase in fishing mortality.

Time allowing, fishery/assemblage targeted should also be considered for the conversion factors assessment. The EWG will assess the scientific robustness of the provisional conversion factors adopted in 2020 and, in case these are not adequate, propose alternative conversion factors for the fleet segments for ES, IT and FR.

Tor 2. Based on new proposals for additional closures to be submitted by Member States by Mid-February, which are based on the standardized methodology developed by STECF, EWG 21-01 is requested to review the existing closures and the proposed additional closures (i.e. terms of placement and period). STECF is requested to estimate their efficiency to protect juveniles and spawning aggregations of the demersal species covered by the West Med WMMAP. STECF is asked comment on possible fishing effort displacement arising from the proposed additional closures. Time permitting, EWG may also parametrize the models to evaluate the effects of the proposed areas. The additional closures should result in a reduction of between 15% and 25% in the bycatch of juveniles and spawners of each stock covered by the WMMAP. For each GSA, in case the closures proposed by Member States are not meeting this criterion, the EWG is requested to propose recommendations for designing alternative closures based on criteria such as but not limited to bathymetry, depth, type of substrate, stock seasonality, establishment of a buffer area etc.

Tor 3. The EWG is requested to evaluate how much gears other than bottom otter trawls, such as gillnets and longlines contribute to demersal stocks fishing mortality and especially *F* for mature hake. Where fishing mortality for hake or other species covered by the WMMAP by such gears is significant, the EWG is requested to propose possible additional management measures for these gears.

Tor 4. Based on available data (including the mapping of available data from DCF/DCRF) and made available by Member States, STECF is requested to assess the impact of recreational fisheries on the stocks covered by the WMMAP. The EWG is requested to evaluate for each stock whether recreational fisheries contribute to the demersal stocks total catches and if yes to which amount.

2.2 Data available and sources of information

During the meeting, the EWG had access to different datasets to progress the TORs. Below it is reported the data available for each TOR.

2.2.1 TOR 1. Conversion factors assessment

2.2.1.1 Fishery Dependent Information (FDI)

The FDI data sources come from the databases hosted by JRC and populated with the different datacalls (<https://stecf.jrc.ec.europa.eu/data-dissemination>). These data are aggregated at the level of the quarter or year and at fleet segment level.

2.2.1.2 French logbook and VMS data (GSA7)

The data submitted by the French ministry to the STECF_EWG_2101 consist in the aggregation of logbook and VMS data for the French trawling fleet in the GSA7. Data are displayed in square spatial units 0.05 decimal degree on a side, in which information regarding vessel ID (anonymised), date, size class, gear, landed weight per species and commercial category are documented.

2.2.2 TOR 2. Existing closures and the proposed additional closures

Two reports concerning the assessment of proposals for spatio-temporal closures related to Article 11.3 of the multi-annual plan for demersal fisheries in the Western Mediterranean - GSA 6 (Northern Spain) made by ICM and IEO, respectively.

Report concerning the assessment of proposals for spatio-temporal closures related to Article 11.3 of the multi-annual plan for demersal fisheries in the Western Mediterranean - GSA 1 (Northern Alboran Sea) made by IEO.

Report concerning the assessment of proposals for spatio-temporal closures related to Article 11.3 of the multi-annual plan for demersal fisheries in the Western Mediterranean - GSA 5 (Balearic Islands) made by IEO.

Management scenarios based on spatial and temporal limitations of fishing effort in the western Mediterranean (GSAs 9, 10 and 11): new analyses and proposals in response to the STECF PLEN 20-01 conclusions.

2.2.3 ToR3. Demersal stocks fishing mortality by gears other than bottom otter trawls

Spanish report supporting conversion factors to allow transfer of effort allocation between fleet segments. French report supporting conversion factors to allow transfer of effort allocation between fleet segments.

2.2.4 TOR 4. Assess the impact of recreational fisheries on the stocks covered by the map

Report on the impact of recreational marine fisheries in the Spanish Mediterranean in relation to the multi-annual plan for demersal fisheries in the Western Mediterranean made by IEO.

Study evaluating the impact of marine recreational fisheries in France.

MEDAC Advice for a regulatory framework and efficient management for recreational fisheries in the Mediterranean based on "FAO Technical Guidelines on Responsible Recreational Fisheries".

3 TOR 1. CONVERSION FACTORS ASSESSMENT

3.1 Background

The analyses for this TOR were mainly based on the data submitted in 2015-2019 by Member States and stored in the Scientific Fisheries Dependent Information (FDI) database developed to support the management of fishing effort management regimes. The FDI dataset hosted in the EU Joint Research Centre was shared to the EWG 21-01.

In particular, data stored in the following FDI tables were used:

- 1) Table A. Catch summary
- 2) Table G. Effort summary
- 3) Table J. Capacity and fleet segment effort

For detailed information of the format and the content of these tables, please visit:

<https://datacollection.jrc.ec.europa.eu/dc/fdi>

3.2 Effort data quality checks, preliminary estimation of Conversion Factors (CF) using the LPUE-ratio approach

The effort and capacity fleet data available through the FDI Data Call (Table G and Table J) were explored to look for outliers and/or inconsistencies issues in term of fishing days and number of vessels reported.

3.2.1 Fishing days by quarter

The number of fishing days by the two main trawler gears (OTB and OTT only for France) by quarter were computed by country and vessel length.

The OTB quarterly fishing activities did not show any outlier but a couple of values in the Corsica Island (FRA-GSA8) in 2015 for VL0612 and in 2017 for VL1218 for which values more than 70 days were observed by quarter. However, these inconsistencies were considered negligible and the fishing days information were considered suitable to further analysis both at countries and fleet segment level.

As for OTB, the OTT quarterly fishing activities did not show any outlier either, even though effort reported in the Balearic Islands (GSA5) could be considered misreported. In Figure 1 and Figure 2, the fishing activities by quarter and fleet segment are showed.

3.2.2 Number of vessels

Number of vessels available through the FDI Data Call (Table J) by countries and fleet segment were extracted for the year 2019.

Because the FDI template has not any data field related directly to the main gear, it has been assumed that DTS (Demersal trawlers and/or demersal seiners) fishing technique could reflect quite well the number of trawlers (see for more details the template and annexes of the FDI Data Call: <https://datacollection.jrc.ec.europa.eu/dc/fdi>).

In Figure 3, the number of vessels by country and fleet segment are showed.

The French fleet is mostly composed by vessels belonging to VL1824 and VL2440 fleet segment (Figure 3) having very few vessels belonging to VL1218 and generally none to the smallest one.

In Spain the smallest fleet segment (VL0612) is under represented, compared to the other three (VL1218, VL1824 and VL2440), while in Italy most of the trawlers belong to VL1218 and VL1824. However, the number of vessels in the other two segments should not be considered negligible (Figure 2).

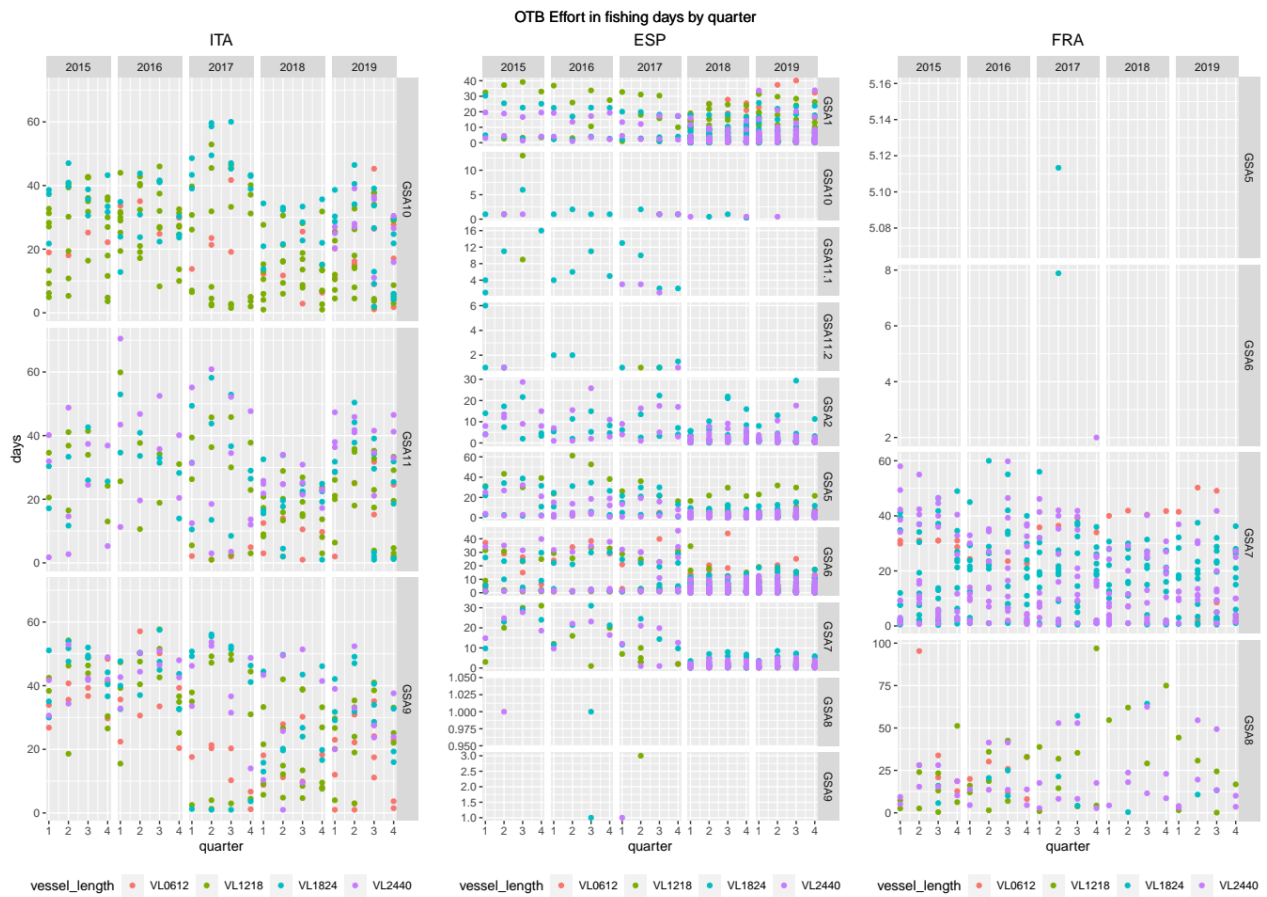


Figure 1. Quarterly fishing activities by otter trawlers (OTB) by countries and fleet segments.

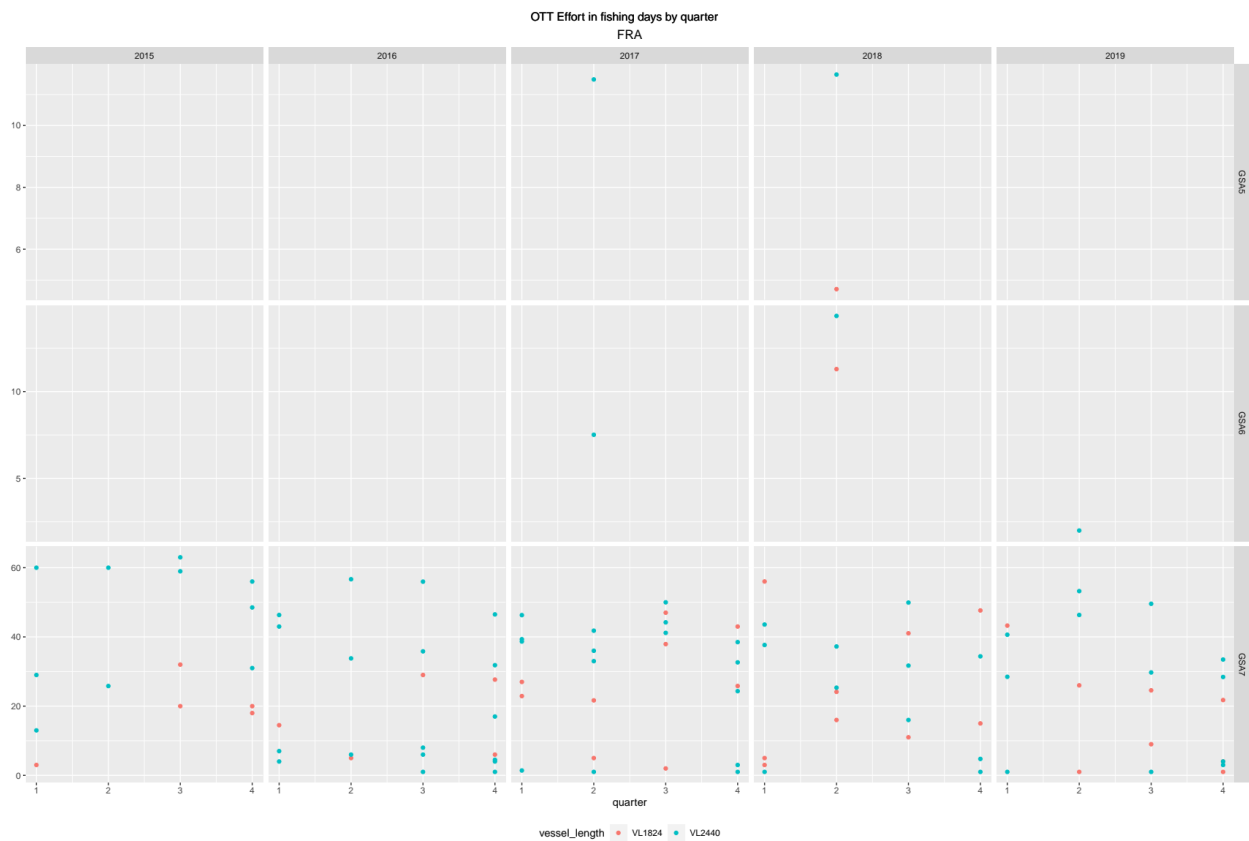


Figure 2. Quarterly fishing activities by French pair trawlers (OTT) by fleet segments.

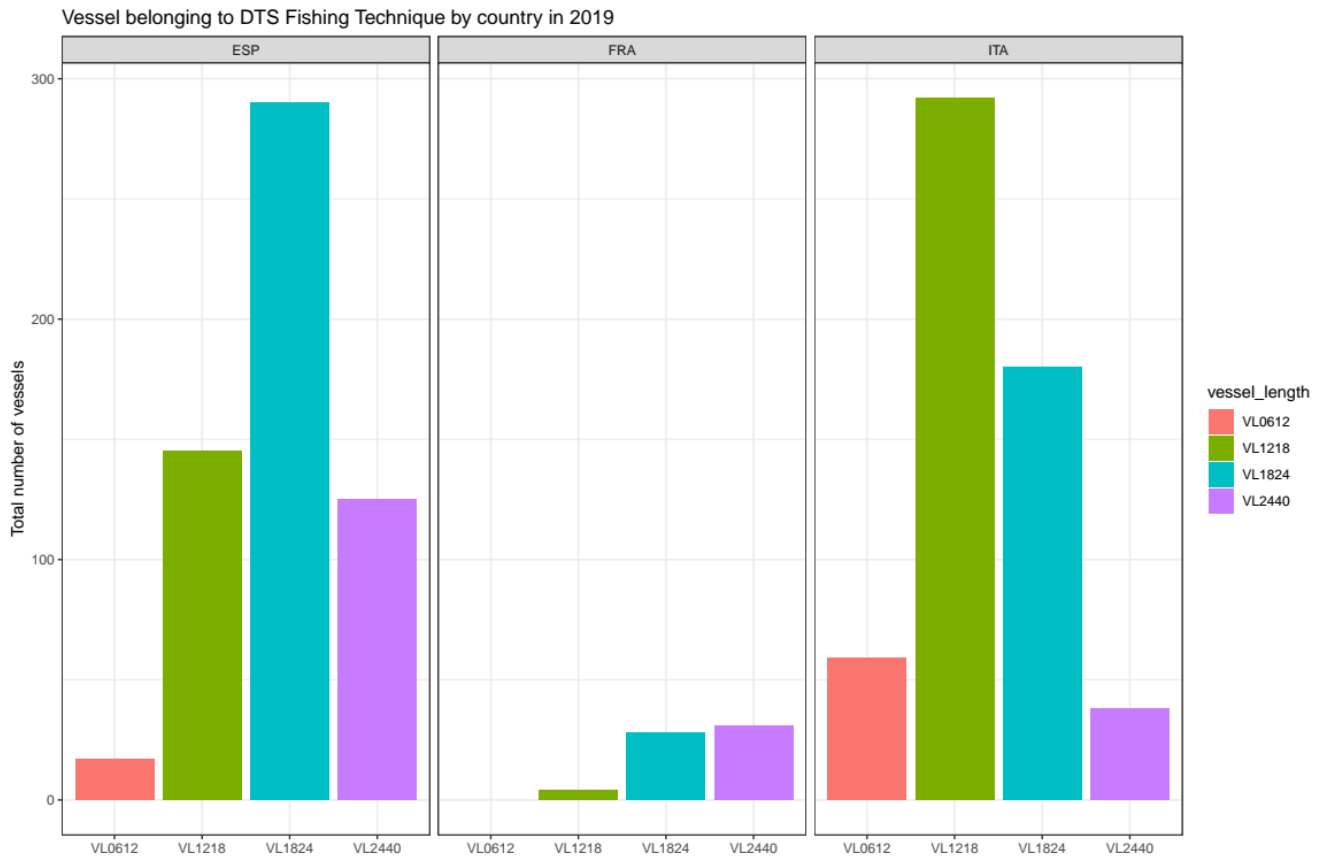


Figure 3. Number of vessels belonging to DTS fishing technique by countries and fleet segments in year 2019.

3.2.3 Landings per Unit Effort and Conversion Factors

To estimate the conversion factor among the four fleet segments (VL0612, VL1218, VL1824 and VL2440) by countries the approach suggested by Wilderbuer et al. [24] adapted for the purpose of the analysis was applied.

Hence, the conversion factors were estimated computing a ratio between the Landings Per Unit Effort (hereafter LPUE) by countries and fleet segments.

In computing the LPUE, the landing in weight by countries and fleet segment (Table A) and the corresponding effort in fishing days (Table G) were considered. The analysis was carried out only for 2019 because vessel length for Spain were provided only for this year after a specific request by EWG 20-13 and EWG 21-01 (this information is missing in the original FDI dataset). Total weight of the species representing the 75% of the OTB landings was considered (see Table 1 for the list of species) in the analysis.

The resulting yield associated to each of the four fleet segments was weighted by the corresponding fleet segment effort in terms of fishing days for each country:

$$LPUE = \frac{\sum_{i,j,z}^{2019} \text{landingsweight}}{\sum_{j,z}^{2019} \text{fishingdays}}$$

where i is the species, j is the fleet segment and z is the country. Eventually an LPUE value for each available combination of country and fleet segment was computed.

Then all ratios among all these LPUE values were computed to obtain the corresponding conversion factors.

For example, to estimate the conversion factor between FRA VL2440 and FRA VL1824, the ratio was computed as:

$$\text{ConversionFactor} = \frac{LPUE^{(FRA_{VL1824})}}{LPUE^{(FRA_{VL2440})}}$$

LPUEs and conversion factors are shown in Figure 4. Furthermore, in the same figure a LPUE profile is reported for which increasing the vessel length, the LPUE values increase reaching the maximum in the largest segment for all the three countries. On average, VL2440 fleet segment is able to land around 250 kg by fishing day in Italy, 200 kg by fishing day in Spain and almost 800 kg by fishing day in France.

The analysis shows that for the two main French fleet segments (VL1824 and VL2440) the conversion factor is not so close to 1, as reported in the French proposal. Indeed, to assign fishing days from VL1824 to VL2440 a factor of 0.7 should be applied (it means that 70 days of VL2440 correspond to 100 for VL1824), while a value of 1.5 should be applied swapping fishing days from VL2440 to VL1824.

In Spain, the most important fleet segments in term of number of vessels are the VL1218, VL1824 and VL2440. Swapping fishing days between VL1218 to VL1824 needs a conversion factor equal to 0.8, while the opposite is achieved multiplying by 1.3. The conversion from VL1218 to VL2440 is 0.7 and a factor of 1.4 should be applied vice-versa. The conversion factor between VL1824 to VL2440 is equal to 0.9 and the opposite is 1.1.

Finally, for Italy swapping fishing days between VL1218 to VL1824 and VL2440 needs conversion factors equal to 0.6 and 0.5, respectively, while between VL1824 and VL2440 a value of 0.8 would be advisable. On the contrary, moving days between VL2440 to VL1824 and VL1218 should need a conversion factor of 1.3 and 2.2, respectively.

Figure 5 shows the results considering only the species reported in the Western Mediterranean WMMAP Regulation (namely ARA, ARS, DPS, HKE, MUT and NEP).

For the two main French fleet segments, the conversion factor to assign fishing days from VL1824 to VL2440 should be 0.8, while a value of 1.3 should be applied swapping fishing days from VL2440 to VL1824.

For Spain, swapping fishing days between VL1218 to VL1824 needs a conversion factor equal to 0.7, while the opposite is achieved multiplying by 1.7. The conversion from VL1218 to VL2440 is 0.4 and a factor of 2.4 should be applied on vice-versa. The conversion factor between VL1824 to VL2440 is equal to 0.7 and the opposite is 1.4.

For Italy swapping fishing days between VL1218 to respectively VL1824 and VL2440 needs conversion factors equal to 0.6 and 0.3, while between VL1824 and VL2440 a value of 0.5 would be advisable. On the contrary, moving days between VL2440 to VL1824 and VL1218 should need a conversion factor of 2 and 3.3, respectively.

Running the analysis only on the six WMMAP species generates higher conversion factors for Spain and Italy, while for France the gap between the two main fleet segments seems lower.

Table 1. List of species considered in the estimation of the LPUE.

3A_CODE	Scientific_name	English_name	3A_CODE	Scientific_name	English_name
ANE	<i>Engraulis encrasicolus</i>	European anchovy	MON	<i>Lophius piscatorius</i>	Angler(=Monk)
ANK	<i>Lophius budegassa</i>	Blackbellied angler	MSF	<i>Arnoglossus laterna</i>	Mediterranean scaldfish
ARA	<i>Aristeus antennatus</i>	Blue and red shrimp	MTS	<i>Squilla mantis</i>	Spottail mantis shrimp
ARS	<i>Aristaeomorpha foliacea</i>	Giant red shrimp	MUE	<i>Murex spp</i>	Murex
BAS	<i>Serranus spp</i>	Combers nei	MUL	<i>Mugilidae</i>	Mulletts nei
BOG	<i>Boops boops</i>	Bogue	MUR	<i>Mullus surmuletus</i>	Surmullet
BPI	<i>Spicara maena</i>	Blotched picarel	MUT	<i>Mullus barbatus</i>	Red mullet
BRF	<i>Helicolenus dactylopterus</i>	Blackbelly rosefish	MUX	<i>Mullus spp</i>	Surmullets(=Red mullets) nei
CBC	<i>Cepola macrophthalma</i>	Red bandfish	MZZ	<i>Osteichthyes</i>	Marine fishes nei
CIL	<i>Citharus linguatula</i>	Spotted flounder	NEP	<i>Nephrops norvegicus</i>	Norway lobster
COE	<i>Conger conger</i>	European conger	OCC	<i>Octopus vulgaris</i>	Common octopus
CTC	<i>Sepia officinalis</i>	Common cuttlefish	OCT	<i>Octopodidae</i>	Octopuses, etc. nei
CVW	<i>Chlorophthalmus agassizi</i>	Shortnose greeneye	ODL	<i>Oedalechilus labeo</i>	Boxlip mullet
DPS	<i>Parapenaeus longirostris</i>	Deep-water rose shrimp	OMZ	<i>Ommastrephidae</i>	Ommastrephidae squids nei
DPX	<i>Perciformes</i>	Demersal percomorphs nei	OUW	<i>Alloteuthis spp</i>	Alloteuthis squids nei
EDT	<i>Eledone moschata</i>	Musky octopus	PAC	<i>Pagellus erythrinus</i>	Common pandora
EOI	<i>Eledone cirrhosa</i>	Horned octopus	PDZ	<i>Pandalidae</i>	Pandalid shrimps nei
FGX	<i>Gobiidae</i>	Freshwater gobies nei	PIL	<i>Sardina pilchardus</i>	European pilchard(=Sardine)
FIN	<i>Osteichthyes</i>	Finfishes nei	POD	<i>Trisopterus minutus</i>	Poor cod
FNT	<i>Phyllonotus trunculus</i>	Banded murex	PPX	<i>Perciformes</i>	Pelagic percomorphs nei
GBN	<i>Gobius niger</i>	Black goby	SBA	<i>Pagellus acarne</i>	Axillary seabream
GFB	<i>Phycis blennoides</i>	Greater forkbeard	SBG	<i>Sparus aurata</i>	Gilthead seabream
GRQ	<i>Geryon longipes</i>	Mediterranean geryon	SFS	<i>Lepidopus caudatus</i>	Silver scabbardfish
GUR	<i>Aspitrigla cuculus</i>	Red gurnard	SIL	<i>Atherinidae</i>	Silversides(=Sand smelts) nei
GUU	<i>Chelidonichthys lucerna</i>	Tub gurnard	SPC	<i>Spicara smaris</i>	Picarel
HKE	<i>Merluccius merluccius</i>	European hake	SQM	<i>Illex coindetii</i>	Broadtail shortfin squid
HMM	<i>Trachurus mediterraneus</i>	Mediterranean horse mackerel	SQR	<i>Loligo vulgaris</i>	European squid
HOM	<i>Trachurus trachurus</i>	Atlantic horse mackerel	SQZ	<i>Loliginidae</i>	Inshore squids nei
IAX	<i>Sepia spp</i>	Cuttlefishes nei	SRG	<i>Diplodus spp</i>	Sargo breams nei
IOD	<i>Liocarcinus depurator</i>	Blue-leg swimcrab	SYC	<i>Scyliorhinus canicula</i>	Small-spotted catshark
LKO	<i>Plesionika heterocarpus</i>	Arrow shrimp	TGS	<i>Penaeus kerathurus</i>	Caramote prawn
MAC	<i>Scomber scombrus</i>	Atlantic mackerel	WEG	<i>Trachinus draco</i>	Greater weever
MAZ	<i>Scomber spp</i>	Scomber mackerels nei	WHB	<i>Micromesistius poutassou</i>	Blue whiting(=Poutassou)
MLR	<i>Chelon labrosus</i>	Thicklip grey mullet			

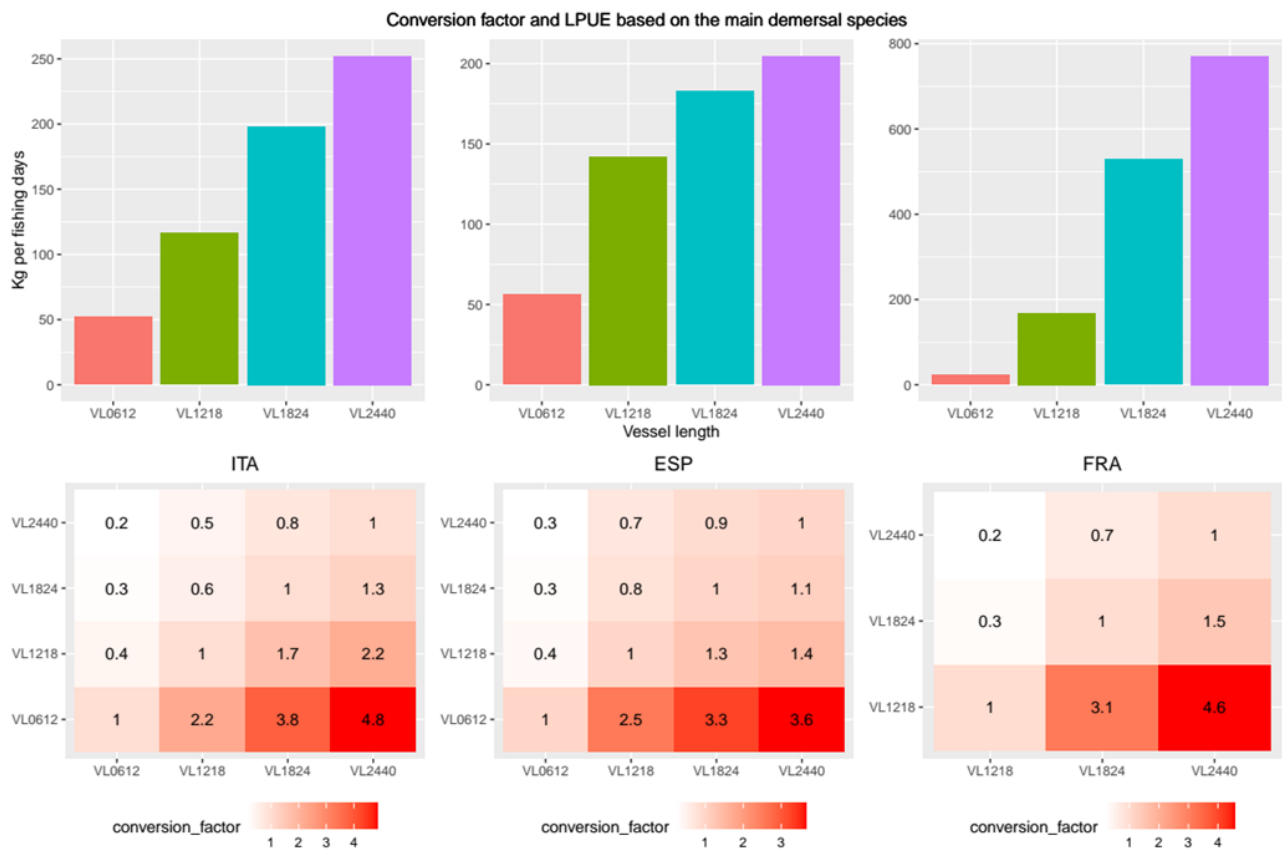


Figure 4. Landings Per Unit Effort (LPUE) and correspondent conversion factors by countries and fleet segment.

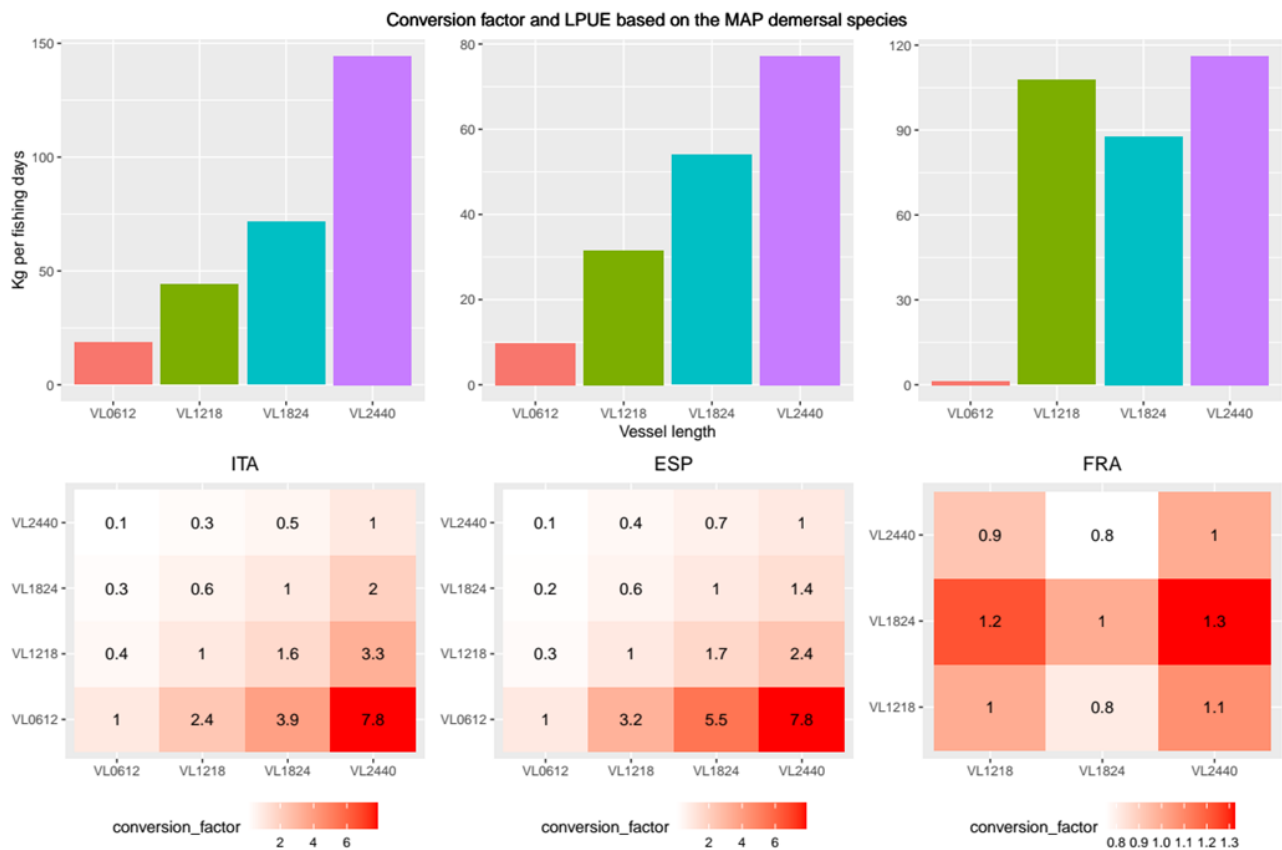


Figure 5. Landings Per Unit Effort (LPUE) and correspondent conversion factors by countries and fleet segment based on the six WMMAP species only.

3.3 Statistical estimation of Conversion factors

Overall, the methodological approach applied in this TOR is based on the assumption that CPUE represents a proxy of fleet segment performances and, ultimately, of the fishing mortality exerted on the species [24].

Under this assumption, it is possible to estimate some fishing power correction (FPC) factors to compare the trawling catch data corresponding to different fleet segment or groups of trawlers. This kind of estimation should be carried out using a paired tows approach, which is possible only in experimental conditions. In this EWG, the basic approach described by Wilderbuer et al. [24] was modified and applied to compare aggregated catch profiles of different fleet segments at the level of species, fleet segment and country. Namely, the CPUE of each fleet segment and country was computed as:

$$CPUE_{fs,c} = \frac{\sum_{s=1}^S (CPUE|fs,c,s) \times (Effort_{fs,c,s})}{S}$$

Where fs is the fleet segment, c is the country, S is the set of species considered and $Effort$ is the fishing effort in days. Then, the Conversion Factor between two fleet segments of the same country was computed as:

$$CF_{i,j} = \frac{CPUE_i}{CPUE_j}$$

FDI data covering the period 2015-2019 were inspected for Spain, France and Italy (Table 2). Effort in fishing days and catches in kg were combined at the level of country, GSA, fishing technique, fleet segments and season. The corresponding values of CPUE and species were computed at the same level. The subsequent analyses were carried out in parallel considering:

1. Only the species in the WMMAP: ARS, ARA, DPS, NEP, HKE, and MUT – **WMMAP** approach hereafter;
2. A set of 67 species accounting for the 75% of the total catches in weight were selected according to the methodologies applied in the EWG 15-19 – **S75%** approach hereafter [20].

In this way, two datasets were created and submitted to the following procedure:

1. FDI Effort and Catches data are merged at the levels of species, country code, quarter, fleet segment (defined as vessel length) and sub region (GSA) to generate the CPUE dataset in which CPUE values (in kg/Fishing day) at the same levels are computed as the ration between Total weight landings (in kg) and Fishing days. The main statistics for the CPUEs datasets are reported in Table 1;
2. These CPUEs matrices are used to compute mean values of CPUE by country, species and fleet segment. In practice, the seasonality effect (which was considered as an important factor affecting CPUE) was removed by computing the weighted means of CPUEs by quarter in which the effort represented the weighting factor. Two sets of CPUE by species, fleet segment and country were obtained. The values of these CPUE sets are represented in Figure 1 and Figure 2. These data were also used to statistically compare the fleet segments belonging to the same country and test their differences. Specifically, a Wilcoxon test between paired (by species) data was applied;
3. Finally, CPUE by species, fleet segment and country were combined to estimate the mean value of CPUEs by country and fleet segment, which represent the final input data for the computation of the conversion factors;
4. The conversion factors (CF) between fleet segments of the same Member State was computed as the ratio between the corresponding CPUEs.

The final output of the analysis was represented by country-specific tables of the CV for the fleet segments and related plots.

An overview of the CPUE by species, fleet segment and country for both the S75% and WMMAP approaches is provided in Figure 6 and Figure 7, respectively. It seems that CPUEs for the Spanish fleet segments are much lower than French (especially) and Italian values. These discrepancies could be determined by the application of different procedures for the computation of Effort and Catches in the FDI data submitted by Member States. Another aspect that is important to stress is the lack of a clear monotonic relationship between vessel size and species-specific CPUEs (see Figure 7).

Table 2. Number of records in the two CPUE databases, by groups.

WMMAP approach					S75% approach				
Number of CPUE records by country and fleet segment									
	VL0612	VL1218	VL1824	VL2440		VL0612	VL1218	VL1824	VL2440
ESP	28	82	87	92	ESP	251	564	682	630
FRA	0	16	24	28	FRA	0	49	180	228
ITA	49	72	72	72	ITA	352	528	516	466
Number of CPUE records by GSA and fleet segment									
	VL0612	VL1218	VL1824	VL2440		VL0612	VL1218	VL1824	VL2440
GSA1	11	24	20	21	GSA1	102	172	174	139
GSA10	22	24	24	24	GSA10	135	171	162	144
GSA11	6	24	24	24	GSA11	56	171	170	158
GSA5	0	23	24	24	GSA5	0	126	178	149
GSA6	17	21	24	23	GSA6	149	200	207	202
GSA7	0	14	35	40	GSA7	0	66	285	298
GSA8	0	16	8	12	GSA8	0	49	18	70
GSA9	21	24	24	24	GSA9	161	186	184	164
Number of CPUE records by GSA and country									
	ESP	FRA	ITA			ESP	FRA	ITA <td></td>	
GSA1	76	0	0	GSA1	587	0	0	GSA1	587
GSA10	0	0	94	GSA10	0	0	612	GSA10	0
GSA11	0	0	78	GSA11	0	0	555	GSA11	0
GSA5	71	0	0	GSA5	453	0	0	GSA5	453
GSA6	85	0	0	GSA6	758	0	0	GSA6	758
GSA7	57	32	0	GSA7	329	320	0	GSA7	329
GSA8	0	36	0	GSA8	0	137	0	GSA8	0
GSA9	0	0	93	GSA9	0	0	695	GSA9	0

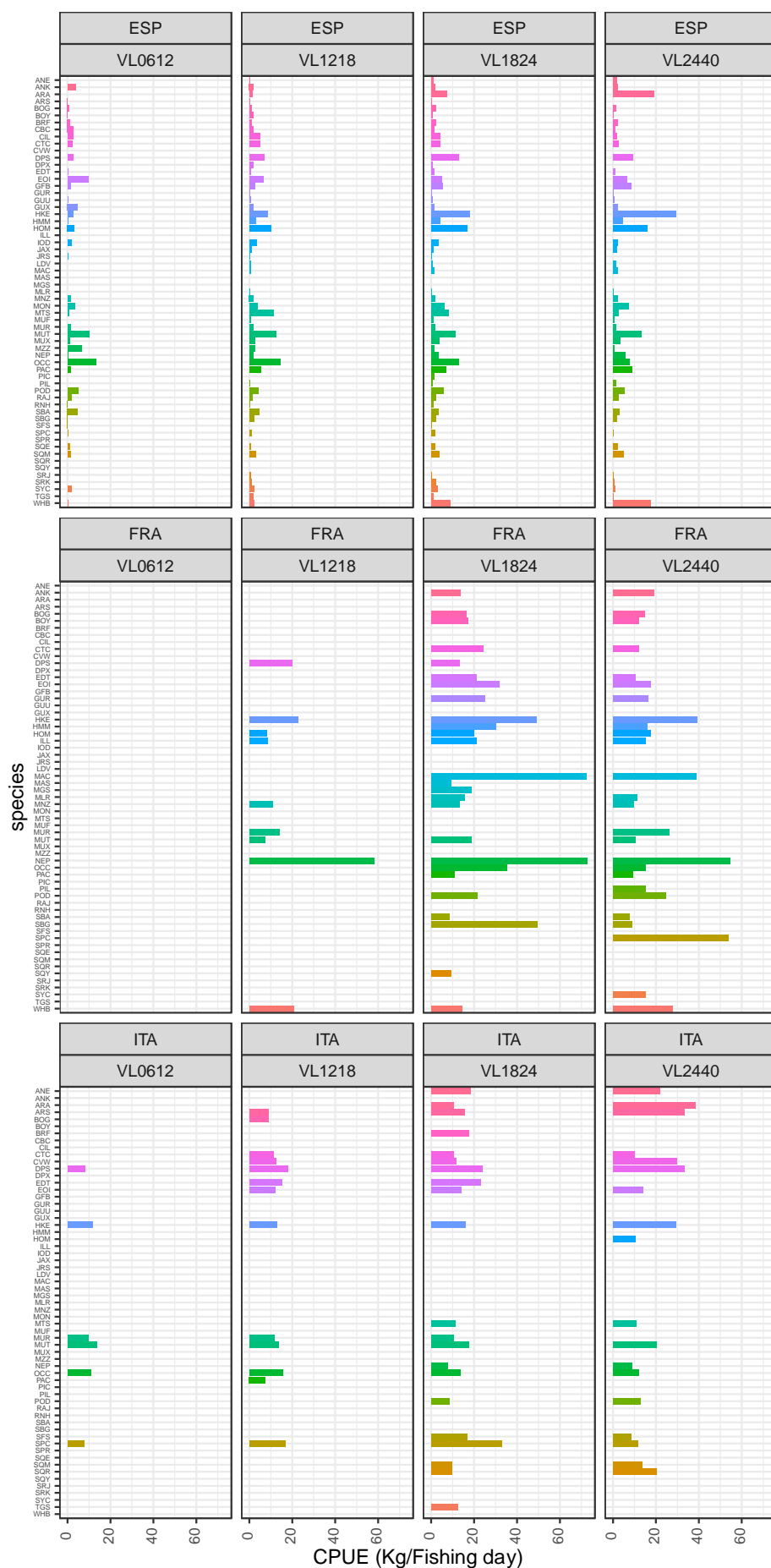


Figure 6. CPUE by species, fleet segment and country as obtained with the S75% approach.



Figure 7. CPUE by species of the WMAP, fleet segment and country.

This results are not in disagreement with the ones of the general analyses of FDI datasets (section 2.1 of this document, *§Terms of Reference for EWG 21-01*), since the average CPUEs by fleet segments (Figure 8 and Figure 9, top panels) follow a monotonic trend with respect to vessel size, but they emphasize that the CPUE of a given fleet segment for a given species could largely differ from the mean overall CPUE of the same fleet segment. Good examples of these differences are the CPUEs for DPS in Italy and in France: the highest values of CPUEs for this species correspond to VL1824 in Italy and VL1218 in France, but the highest average CPUEs in the countries correspond to VL2440 in Italy and VL1824 in France.

The Conversion Factors returned by the S75% approach are, in most of the cases, not significantly different from 1. The exceptions are represented by:

- For Spain, the CF between VL0612 and the other fleet segments;
- For France and Italy, the CF between VL1218 and VL1824. In these cases, the CF are near to 1.

The Conversion Factors returned by the WMAP approach are always not significantly different from 1. This discrepancy could be easily explained with the fact that, in WMAP approach, the relative contribution of species-specific CPUEs is higher.

It is worth noting that CPUE estimated for the Spanish fleet segments are much lower than those estimated for Italy and France, which seem comparable.

Although this does not affect the corresponding CF, which are computed only at the country level and not aimed at comparing fleet segments of different countries, it is possible to speculate about the potential reasons. The main hypothesis is that the approaches to define fishing effort are different between countries, and so the CPUE are scaled accordingly.

The same CF are reported as table by country and by approach in Table 3 for comparative purposes. The values for the “intermediate” fleet segments (VL12-18 and VL18-24) and for the largest fleet segments (VL18-24 and VL24-40) are usually close to 1. In contrast, the CF of the VL0612 on the other fleet segments is always lower than 1 and, in some cases (e.g. S75% approach on Spanish data), statistically different from 1.

Table 3. Tables of the Conversion Factors estimated. * marks values significantly different from 1.

WMMAP approach					S75% approach				
France									
	VL1218	VL1824	VL2440			VL1218	VL1824	VL2440	
VL1218	1	0.7	0.8		VL1218	1	0.8	1.1	
VL1824	1.4	1	1.1		VL1824	1.3	1	1.4*	
VL2440	1.3	0.9	1		VL2440	0.9	0.7*	1	
Italy									
	VL0612	VL1218	VL1824	VL2440		VL0612	VL1218	VL1824	VL2440
VL0612	1	0.8	0.5	0.3	VL0612	1	0.9*	0.8*	0.5
VL1218	1.2	1	0.6*	0.3	VL1218	1.2*	1	0.9	0.5
VL1824	2	1.6*	1	0.6	VL1824	1.3*	1.1	1	0.6
VL2440	3.6	2.9	1.8	1	VL2440	2.1	1.8	1.6	1
Spain									
	VL0612	VL1218	VL1824	VL2440		VL0612	VL1218	VL1824	VL2440
VL0612	1	0.6	0.3	0.2	VL0612	1	0.9*	0.7*	0.6*
VL1218	1.7	1	0.6	0.4*	VL1218	1.1*	1	0.8*	0.7
VL1824	2.9	1.7	1	0.7	VL1824	1.4*	1.3*	1	0.9
VL2440	4.2	2.5*	1.5	1	VL2440	1.6*	1.4	1.2	1

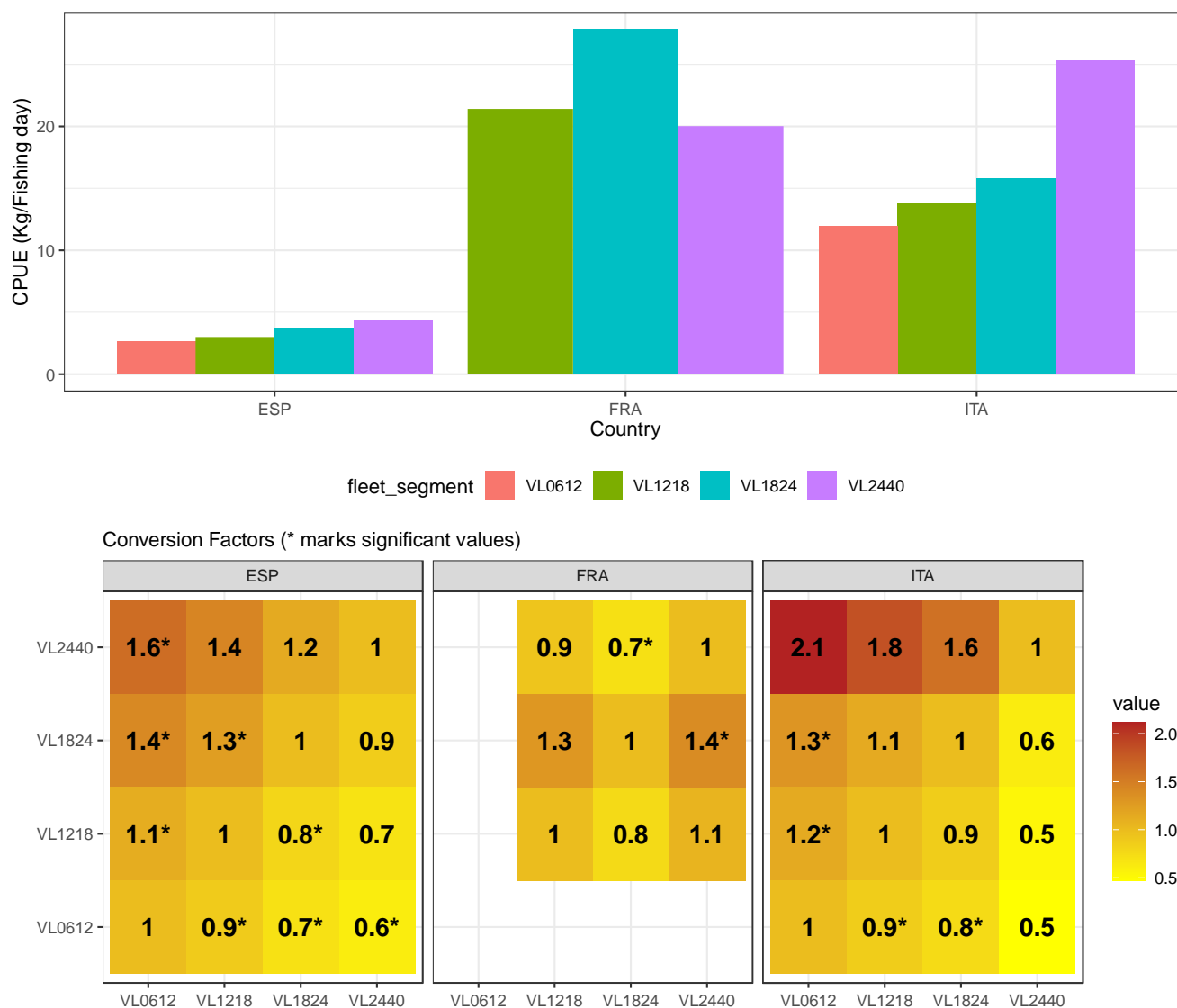


Figure 8. Top panel: average CPUE by fleet segment and country according to the S75% approach; Bottom panel: matrices representing the Conversion Factors by pair of fleet segment, by country, using a yellow-red colour scale. Values of the CF are reported and marked if significantly different from 1.

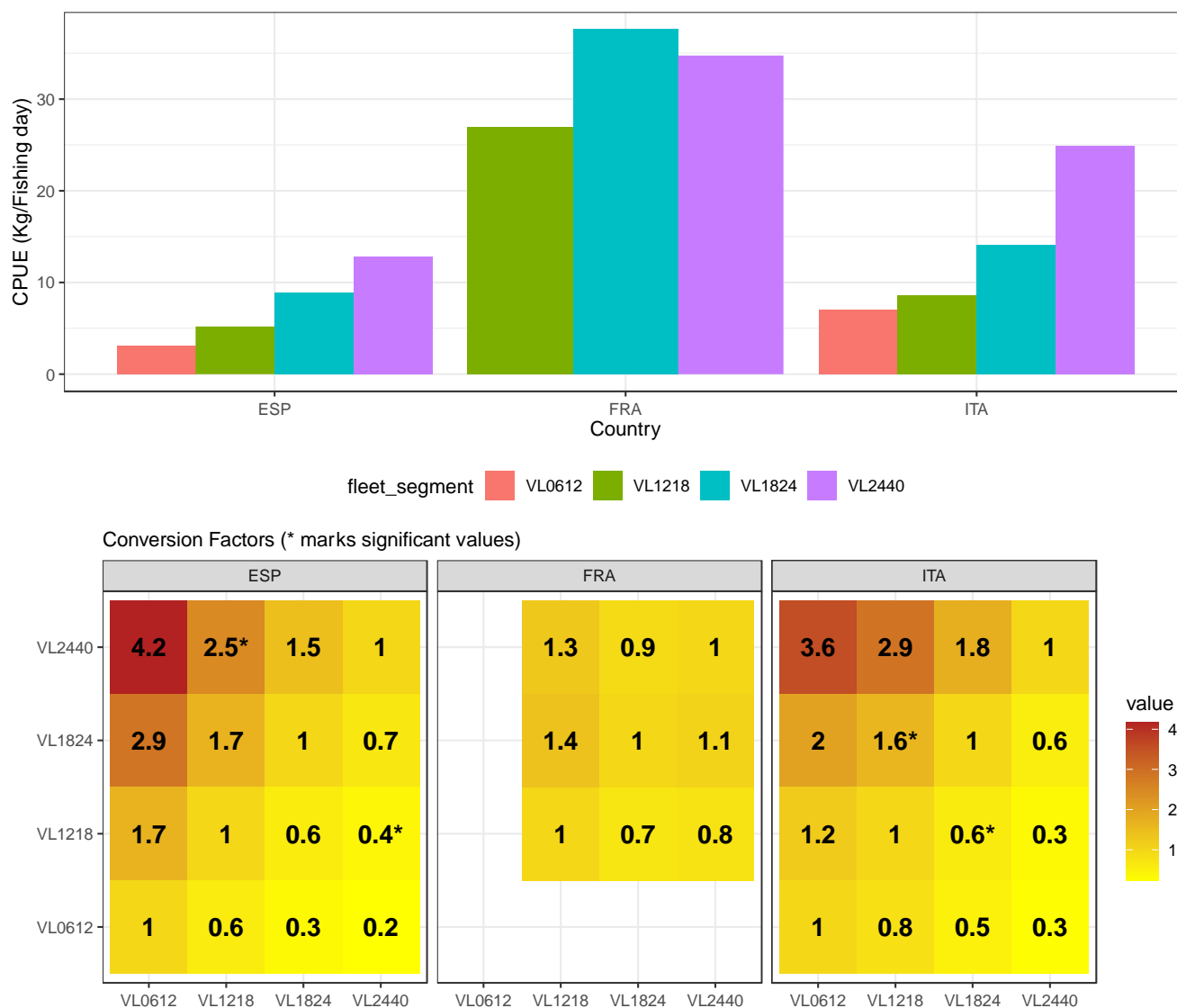


Figure 9. Top panel: average CPUE by fleet segment and country according to the WMMAP approach. Bottom panel: matrices representing the Conversion Factors by pair of fleet segment, by country, using a yellow-red colour scale. Values of the CF are reported and marked if significantly different from 1.

3.4 Analysis of French data

3.4.1 Methodological approach

The data submitted by the French ministry to the STECF_EWG_2101 consist in the aggregation of logbook and VMS data for the French trawling fleet in the GSA7. Data are displayed in square spatial units 0.05 decimal degree on a side, in which information regarding vessel ID (anonymised), date, size class, gear, landed weight per species and commercial category are documented. Species selected for the study correspond to the main demersal species found in demersal trawler in the area – some species reported in the dataset were obvious errors, such as Capelin (*Mallotus villosus*) or the American anglerfish (*Lophius americanus*), and were removed prior further investigations. Species selected for the study are listed in Table 4, and amount for 96% of the total catch.

First, data were reorganized in a trip*species matrix containing landed weight, so that each row corresponds to a given fishing trip (1 vessel, 1 day). For each trip, information regarding vessel size, time spent trawling and gear used were also stored.

To estimate the ratio between fleet segments, we focus on total landed weight across all species per fishing trip. A fishing trip corresponds to one vessel and one day. In GSA 7, 4 fleet segments were identified by the combination of 2 vessel size-classes (18-24m and 24-40m) and 2 gears, classic demersal otter trawl (FAO code "OTB") and twin otter trawls ("OTT"), and a total of 9,191 fishing trips across these 4 fleet segments were investigated (Figure 10).

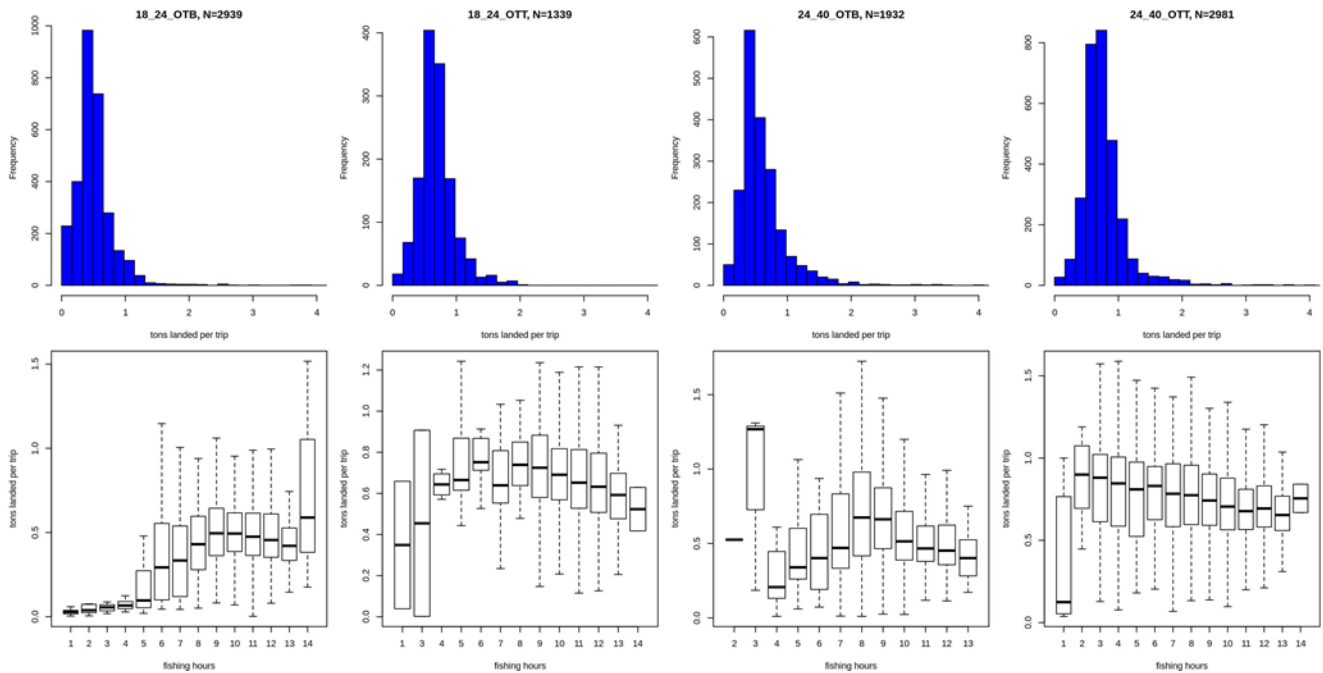


Figure 10. Upper panel: Statistical distribution of the landed weight per trip, for the 4 fleet segments considered. Lower panel: relationship between landed weight per trip (y-axis) and time spent fishing per trip (x-axis, in hours).

Our aim is to compute conversion factors between these 4 fleet segments. To do so, let us denote X_i the random variable describing the total landed weight of a fishing trip of fleet segment i .

Let us denote C_{fij} the conversion factor from fleet i to fleet j . We propose to base the C_{fij} computation on the ratio distribution of the landings of the two fleet segments. Assuming that X_i follows a log-normal distribution, with mean μ_i and variance σ_i^2 , the expectation of the X_i/X_j ratio is given by:

$$E(X_i/X_j) = e^{\left(\mu_i - \mu_j + \frac{1}{2}(\sigma_i^2 + \sigma_j^2 - 2\sigma_{ij})\right)}$$

where σ_{ij} is the covariance between X_i and X_j and equals 0 when both are independent.

Under this formulation, both the mean and the variance of the initial distributions contributes to the expectation of their ratio, and as a result, the expectation of the ratio distribution of a variable over itself will be >1 . This property is not very convenient in our context, where we intuitively wish to have a conversion factor equal to one when we consider the same fleet segment. To solve this, we propose to write Cf_{ij} as follows:

$$Cf_{ij} = \frac{E(X_i/X_j)}{E(X_i/X_i)}$$

That is, the expectation of the ratio distribution of the landings of the two fleet segments, scaled by the expectation of the ratio distribution of the landings of the first fleet segment with itself. $E(X_i/X_j)$ serves as a scaling factor here, allowing the resulting Cf_{ij} value to represent the multiplicative factor between the average landings of both fleets.

To empirically compute Cf_{ij} , we first produce two bootstrap samples from X_i , noted X_i^* and $X_{i'}^*$ and one bootstrap sample from X_j , noted X_j^* , by randomly sampling with replacement 1000 values within our data. The advantage of using bootstrap samples here is that we free ourselves from a distributional assumption on X_i .

Then, we compute X_i^*/X_j^* and $X_{i'}/X_{i'}^*$ for which we assume a log-normal distribution, and fit it to both. In some rare instances, realizations of X_i^*/X_j^* and $X_{i'}/X_{i'}^*$ could take extreme values, so we decided to remove realizations above 30 before the log-normal fit (30 was chosen so that we keep more than 99% of our samples every time). Once the log-normal distributions were fitted, we computed their expectations from their parameter estimates, and computed the ratio of these expectations to get a single bootstrap estimate of Cf_{ij}^* . We then repeated this process 1000 times to access the bootstrap distribution of Cf_{ij}^* , from which we extracted the median value and associated 95% confidence intervals.

3.4.2 Conversion factors for the French dataset

The resulting Conversion Factors shown in Table 5 are characterized by strong statistical significance, as all are significantly different from 1, except those on the diagonal that focuses on the fleet over itself. Further conversion factors computed using slightly different analytical settings are provided in the tables listed below:

- Table 6, only focusing on fleet size;
- Table 7, only focusing on gear type;
- Table 8, only considering WMMAP species present in GSA7 (Hake, Red Mullet, Norway Lobster and Deep-Water Rose Shrimp);
- Table 9, only considering WMMAP species and fleet size segments;
- Table 10, only considering WMMAP species and gear.

This procedure relies on the assumption that the ratios X_i^*/X_j^* and $X_{i'}/X_{i'}^*$ follow a log-normal distribution. We checked this carefully, repeatedly sampling our data and fitting log-normal distributions to the resulting ratios. Some examples of log-normal fits are provided in Figure 11, illustrating that the log-normal distribution is indeed a very reasonable choice.

Table 4. List of species considered for the computation of conversion factors based on French data.

FAO	Scientific_name	Common_name	FAO	Scientific_name	Common_name
ANE	<i>Engraulis encrasicolus</i>	European anchovy	OCC	<i>Octopus vulgaris</i>	Common octopus
BAS	<i>Serranus spp</i>	Combers nei	OCT	<i>Octopodidae</i>	Octopuses, etc. nei
BIB	<i>Trisopterus luscus</i>	Pouting(=Bib)	OUL	<i>Alloteuthis subulata</i>	European common squid
BLL	<i>Scophthalmus rhombus</i>	Brill	PAC	<i>Pagellus erythrinus</i>	Common pandora
BOG	<i>Boops boops</i>	Bogue	PAX	<i>Pagellus spp</i>	Pandoras nei
BRF	<i>Helicolenus dactylopterus</i>	Blackbelly rosefish	PIL	<i>Sardina pilchardus</i>	European pilchard(=Sardine)
BSS	<i>Dicentrarchus labrax</i>	European seabass	POD	<i>Trisopterus minutus</i>	Poor cod
CBC	<i>Cepola macrophthalma</i>	Red bandfish	RAJ	<i>Rajidae</i>	Rays and skates nei
CIL	<i>Citharus linguatula</i>	Spotted flounder	RJA	<i>Raja alba</i>	White skate
COE	<i>Conger conger</i>	European conger	RJC	<i>Raja clavata</i>	Thornback ray
CPR	<i>Palaemon serratus</i>	Common prawn	RJH	<i>Raja brachyura</i>	Blonde ray
CSH	<i>Crangon crangon</i>	Common shrimp	RJM	<i>Raja montagui</i>	Spotted ray
CTB	<i>Diplodus vulgaris</i>	Common two-banded seabream	RJN	<i>Raja naevus</i>	Cuckoo ray
CTC	<i>Sepia officinalis</i>	Common cuttlefish	RJU	<i>Raja undulata</i>	Undulate ray
CTL	<i>Sepiidae, Sepiolidae</i>	Cuttlefish, bobtail squids nei	ROL	<i>Gaidropsarus spp</i>	Rocklings nei
DAB	<i>Limanda limanda</i>	Common dab	RPG	<i>Pagrus pagrus</i>	Red porgy
DEC	<i>Dentex dentex</i>	Common dentex	SBA	<i>Pagellus acarne</i>	Axillary seabream
DGS	<i>Squalus acanthias</i>	Picked dogfish	SBG	<i>Sparus aurata</i>	Gilthead seabream
DPS	<i>Parapenaeus longirostris</i>	Deep-water rose shrimp	SBL	<i>Hexanchus griseus</i>	Bluntnose sixgill shark
EJE	<i>Sepia elegans</i>	Elegant cuttlefish	SBR	<i>Pagellus bogaraveo</i>	Blackspot(=red) seabream
FLE	<i>Platichthys flesus</i>	European flounder	SCK	<i>Dalatias licha</i>	Kitefin shark
FOR	<i>Phycis phycis</i>	Forkbeard	SCL	<i>Scyliorhinus spp</i>	Catsharks, nursehounds nei
FOX	<i>Phycis spp</i>	Forkbeards nei	SCS	<i>Scorpaena spp</i>	Scorpionfishes, rockfishes nei
GFB	<i>Phycis blennoides</i>	Greater forkbeard	SDV	<i>Mustelus spp</i>	Smooth-hounds nei
GOB	<i>Gobius spp</i>	Atlantic gobies nei	SFS	<i>Lepidopus caudatus</i>	Silver scabbardfish
GSM	<i>Buglossidium luteum</i>	Solenette	SHD	<i>Alosa alosa, A. fallax</i>	Allis and twaite shads
GUG	<i>Eutrigla gurnardus</i>	Grey gurnard	SHR	<i>Diplodus puntazzo</i>	Sharpsnout seabream
GUR	<i>Aspitrigla cuculus</i>	Red gurnard	SOL	<i>Solea solea</i>	Common sole
GUU	<i>Chelidonichthys lucerna</i>	Tub gurnard	SOS	<i>Solea lascaris</i>	Sand sole
GUX	<i>Triglidae</i>	Gurnards, searobins nei	SPC	<i>Spicara smaris</i>	Picarel
HKE	<i>Merluccius merluccius</i>	European hake	SQU	<i>Loliginidae, Ommastrephidae</i>	Various squids nei
HMM	<i>Trachurus mediterraneus</i>	Mediterranean horse mackerel	SQY	<i>Squillidae</i>	Squillids nei
HOM	<i>Trachurus trachurus</i>	Atlantic horse mackerel	SQZ	<i>Loliginidae</i>	Inshore squids nei
ILL	<i>Illex spp</i>	Shortfin squids nei	SRG	<i>Diplodus spp</i>	Sargo breams nei
JOD	<i>Zeus faber</i>	John dory	SSB	<i>Lithognathus mormyrus</i>	Sand steenbras

FAO	Scientific_name	Common_name	FAO	Scientific_name	Common_name
JRS	<i>Raja asterias</i>	Mediterranean starry ray	SWA	<i>Diplodus sargus</i>	White seabream
LEZ	<i>Lepidorhombus spp</i>	Megrims nei	SWO	<i>Xiphias gladius</i>	Swordfish
MAC	<i>Scomber scombrus</i>	Atlantic mackerel	SYC	<i>Scyliorhinus canicula</i>	Small-spotted catshark
MAS	<i>Scomber japonicus</i>	Chub mackerel	SYT	<i>Scyliorhinus stellaris</i>	Nursehound
MEG	<i>Lepidorhombus whiffiagonis</i>	Megrim	TUR	<i>Psetta maxima</i>	Turbot
MGA	<i>Liza aurata</i>	Golden grey mullet	UCA	<i>Umbrina canariensis</i>	Canary drum(=Baardman)
MKG	<i>Microchirus variegatus</i>	Thickback sole	UUC	<i>Uranoscopus scaber</i>	Stargazer
MLR	<i>Chelon labrosus</i>	Thicklip grey mullet	WEG	<i>Trachinus draco</i>	Greater weever
MNZ	<i>Lophius spp</i>	Monkfishes nei	WHB	<i>Micromesistius poutassou</i>	Blue whiting(=Poutassou)
MUF	<i>Mugil cephalus</i>	Flathead grey mullet	WHG	<i>Merlangius merlangus</i>	Whiting
MUR	<i>Mullus surmuletus</i>	Surmullet	WRA	<i>Labridae</i>	Wrasses, hogfishes, etc. nei
MUT	<i>Mullus barbatus</i>	Red mullet	MGS	<i>Mugil spp</i>	Mugil spp
NEP	<i>Nephrops norvegicus</i>	Norway lobster			

Table 5. Conversion Factors estimated between fleet segments, based on all species. 18-24 and 24_40 refers to vessel size in m; OTB for classic demersal otter trawl, OTT for otter twin trawl. Numbers in brackets are the 95% confidence intervals of the conversion factor estimate. The table reads "1 unit of fleet segment in row corresponds to CF units of the fleet segment in column", for example 1 unit of 24_40_OTT corresponds to 1.8 unit of 18_24_OTB.

	18_24_OTB	18_24_OTT	24_40_OTB	24_40_OTT
18_24_OTB	1 [0.91-1.1]	0.6 [0.54-0.64]	0.77 [0.71-0.84]	0.54 [0.5-0.59]
18_24_OTT	1.66 [1.55-1.79]	1 [0.95-1.05]	1.3 [1.23-1.37]	0.92 [0.87-0.97]
24_40_OTB	1.29 [1.19-1.39]	0.77 [0.72-0.82]	1 [0.94-1.07]	0.71 [0.66-0.75]
24_40_OTT	1.8 [1.67-1.94]	1.09 [1.03-1.15]	1.41 [1.34-1.5]	1 [0.95-1.06]

Table 6. Conversion Factors only considering size-based fleet segments based on all species. See Table 5 for a detailed description.

	18_24	24_40
18_24	1 [0.91-1.1]	0.73 [0.68-0.79]
24_40	1.35 [1.26-1.46]	1 [0.94-1.06]

Table 7. Conversion Factors only considering gear-based fleet segments based on all species. See Table 5 for a detailed description.

	OTB	OTT
OTB	1 [0.92-1.1]	0.62 [0.57-0.67]
OTT	1.59 [1.49-1.7]	1 [0.95-1.06]

Table 8. Conversion Factors considering size- and gear-based fleet segments based on WMMAP species. See Table 5 for a detailed description.

	18_24_OTB	18_24_OTT	24_40_OTB	24_40_OTT
18_24_OTB	1 [0.91-1.1]	0.73 [0.67-0.79]	0.85 [0.78-0.94]	0.65 [0.59-0.71]
18_24_OTT	1.36 [1.27-1.48]	1 [0.93-1.07]	1.17 [1.08-1.27]	0.89 [0.83-0.96]
24_40_OTB	1.17 [1.06-1.29]	0.85 [0.79-0.93]	1 [0.91-1.09]	0.76 [0.7-0.83]
24_40_OTT	1.53 [1.41-1.66]	1.12 [1.05-1.21]	1.31 [1.2-1.42]	1 [0.92-1.08]

Table 9. Conversion Factors considering size-based fleet segments based on WMMAP species. See Table 5 for a detailed description.

	18_24	24_40
18_24	1 [0.92-1.09]	0.8 [0.73-0.87]
24_40	1.25 [1.14-1.36]	1 [0.92-1.09]

Table 10. Conversion Factors considering gear-based fleet segments based on WMMAP species. See Table 5 for a detailed description.

	OTB	OTT
OTB	1 [0.91-1.09]	0.71 [0.65-0.78]
OTT	1.39 [1.28-1.5]	1 [0.93-1.08]

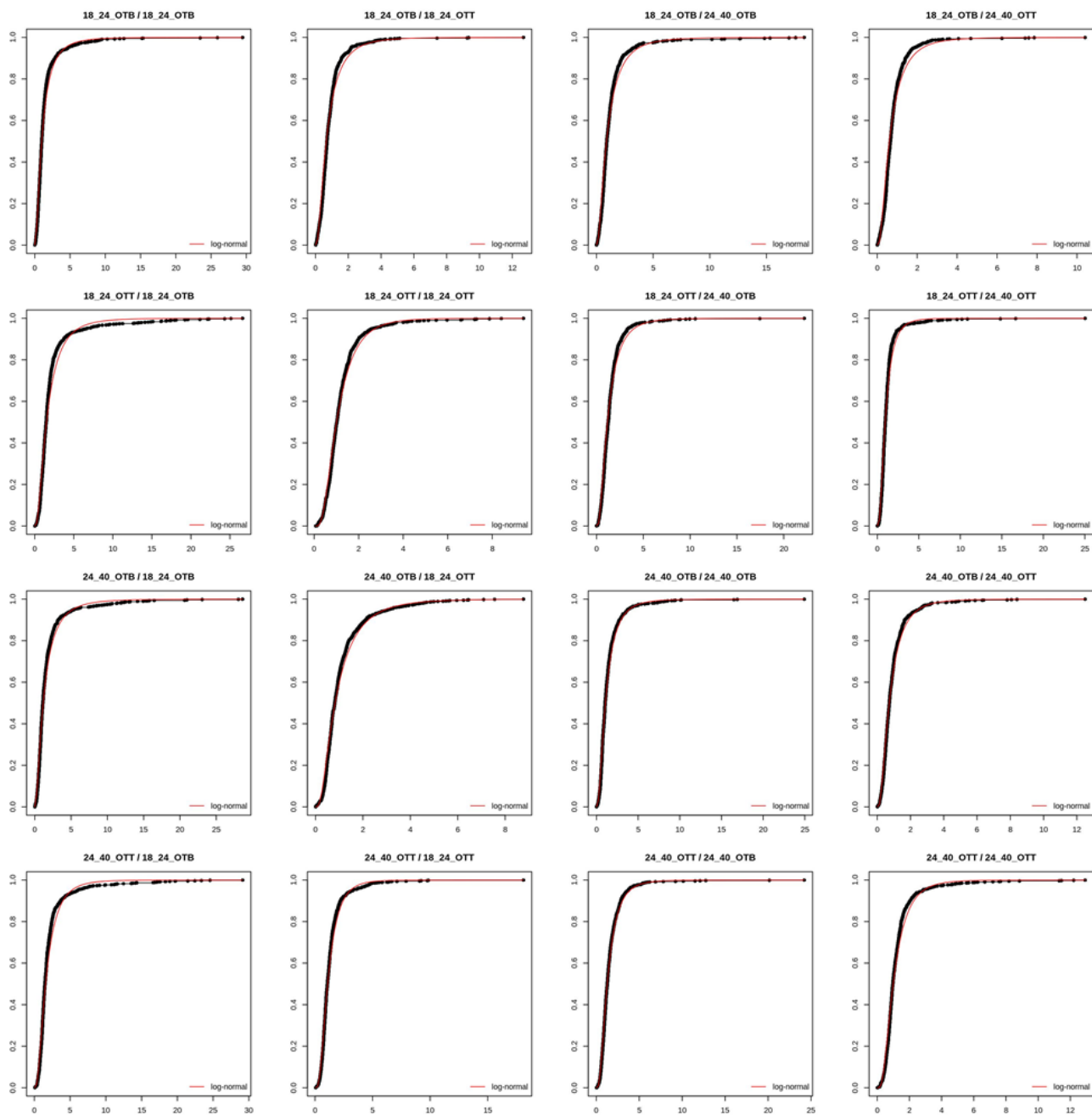


Figure 11. Observed (dots) and log-normal fitted (red line) cumulative density function of various ratios X^*_i/X^*_j .

3.5 Comparison between the Conversion Factors computed with the FDI data and the values adopted by the Member States

Following a specific request of DGMARE, in Table 11-Table 13 we show the Conversion Factors computed using the FDI data and those adopted by the Member States (France, Italy, and Spain).

Table 11. Comparison between the Conversion Factors computed with the FDI data (LPUE-ratio and the CPUE approaches) and the values adopted by Italy.

From	to	LPUE ratio	CPUE analysis	Adopted by MS
VL0612	VL1218	0.4	0.8	1.0
VL0612	VL1824	0.3	0.5	0.8
VL0612	VL2440	0.2	0.3	0.7
VL1218	VL0612	2.2	1.2	1.0
VL1218	VL1824	0.6	0.6	1.0
VL1218	VL2440	0.5	0.3	0.8
VL1824	VL0612	3.8	2.0	1.2
VL1824	VL1218	1.7	1.6	1.0
VL1824	VL2440	0.8	0.6	0.8
VL2440	VL0612	4.8	3.6	1.3
VL2440	VL1218	2.2	2.9	1.2
VL2440	VL1824	1.3	1.8	1.0

Table 12. Comparison between the Conversion Factors computed with the FDI data (LPUE-ratio and the CPUE approaches) and the values adopted by France.

From	to	LPUE ratio	CPUE analysis	VMS/Logbook	Adopted by MS
VL0612	VL1218	NA	NA	NA	NA
VL0612	VL1824	NA	NA	NA	NA
VL0612	VL2440	NA	NA	NA	NA
VL1218	VL0612	NA	NA	NA	NA
VL1218	VL1824	0.3	0.7	NA	NA
VL1218	VL2440	0.2	0.8	NA	NA
VL1824	VL0612	NA	NA	NA	NA
VL1824	VL1218	3.1	1.4	NA	NA
VL1824	VL2440	0.7	1.1	0.73	1.0
VL2440	VL0612	NA	NA	NA	NA
VL2440	VL1218	4.6	1.3	NA	NA
VL2440	VL1824	1.5	0.9	1.3	1.0

Table 13 - Comparison between the Conversion Factors computed with the FDI data (LPUE-ratio and the CPUE approaches) and the values adopted by Spain.

From	to	LPUE ratio	CPUE analysis	Adopted by MS
VL0612	VL1218	0.4	0.6	1.0
VL0612	VL1824	0.3	0.3	0.8
VL0612	VL2440	0.3	0.2	0.7
VL1218	VL0612	2.5	1.7	1.0
VL1218	VL1824	0.8	0.6	1.0
VL1218	VL2440	0.7	0.4	0.8
VL1824	VL0612	3.3	2.9	1.2
VL1824	VL1218	1.3	1.7	1.0
VL1824	VL2440	0.9	0.7	0.8
VL2440	VL0612	3.6	4.2	1.3
VL2440	VL1218	1.4	2.5	1.2
VL2440	VL1824	1.1	1.5	1.0

3.6 TOR 1 Remarks

According to TOR 1, the FDI datasets for France, Italy and Spain on the trawl fleets exploiting demersal stocks in the western Mediterranean Sea were revised. In addition, an independent analysis on new French data submitted for this EWG was performed. As a first step, the FDI dataset was explored to detail its representativeness and estimate aggregated CF.

Then, a statistical analysis was carried out on disaggregated FDI data using two parallel approaches: the first one considering a large array of species (accounting for the 75% of the total landings, as suggested by the definition of the TOR itself), the second one considering only the six species of the WMMAP.

This statistical analysis allowed also to assess the significance of the estimated Conversion Factors (CF). Lastly, the detailed data provided by France, allowing to work at the fishing trip level, were investigated and a methodology was produced to statistically estimate conversion factors and associated confidence intervals. The methodology was quite successful at computing these conversion factors in terms of statistical significance and, besides the pure fleet size effect, highlighted the very strong impact of gear type in GSA 7.

The results indicate that:

- As demonstrated in previous EWG (e.g. EWG-18-09), the size of the vessels is certainly one of the factors affecting their performances and their CPUE, which was considered the proxy for fishing mortality and impacts on the stocks, but it is not enough to capture the heterogeneity in the FDI data and return a reliable and consistent model to compare different fleet segments;
- The experts involved in this TOR discussed about other potential factors affecting CPUE and agreed about the importance of technical differences among gear types and spatial behaviour of vessels – especially in relation with seasonality of sea conditions;
- Although some patterns were detected (e.g. the lower CPUE for VL0612), it is not possible to estimate robust and reliable values of the Conversion Factors, that could be proposed as alternative to the ones applied by the three Member States, from FDI data;
- To accomplish this goal, more detailed and updated data (e.g. e-logbook and VMS) should be made available by Member States as done by France for this EWG;

- Most of the FDI-based estimated CF are close to 1, and especially for the largest fleet segment, while most of the VMS and logbook-based CF statistically differ from 1. This highlights the need to obtain more detailed data, at the fishing trip level, to propose a suitable update to the conversion factors adopted in 2020 by the three Member States.
- Therefore, based on the analysis of FDI data, the provisional conversion factors adopted in 2020 by the three Member States seem reasonable, at least for the largest and adjacent fleet segments; however, the analysis of VMS and log-book data suggests that, depending on the gear type, conversion factor between adjacent fleet segments can strongly differ from 1;
- In contrast, the results support that a CF near to 1 is not appropriate to convert the effort of the VL0612 into the effort of largest fleet segments.

For comparative purposes, the CF returned by the two analyses of FDI data are reported together with the CF adopted by each Member State.

4 TOR 2. EXISTING CLOSURES AND THE PROPOSED ADDITIONAL CLOSURES

4.1 Background

According to paragraph 1 of Article 11 of Regulation (EU) 2019/1022 [19], *“the use of trawls in the western Mediterranean Sea shall be prohibited within six nautical miles from the coast except in areas deeper than the 100 m isobath during three months each year and, where appropriate, consecutively, on the basis of the best available scientific advice”*. As included in paragraph 2 of this Article, *“by way of derogation from paragraph 1, and provided that it is justified by particular geographical constraints, such as the limited size of the continental shelf or the long distances to fishing grounds, Member States may establish, on the basis of the best available scientific advice, other closure areas, provided that a reduction of at least 20% of catches of juvenile hake in each geographical subarea is achieved”*.

These closure areas were regulated in each Member State by the following national regulations. In France, the six miles/100 m isobath have been closed for 3 months in GSA 8, whereas two zones in GSA 7 were closed for bottom trawling for 8 and 6 months, respectively *“Arrêté du 20 décembre 2019 portant modification de l’arrêté du 28 février 2013 portant adoption d’un plan de gestion pour la pêche professionnelle au chalut en mer Méditerranée par les navires battant pavillon français”* [1]. In Italy, ten Fisheries Restricted Areas have been enacted in GSAs 9, 10 and 11 in which any towed gear has been prohibited [3]. In Spain, several temporal and permanent closure areas were enacted in GSAs 1, 2, 5, 6 and 7, where bottom trawl is prohibited and in all GSAs, except in some closure areas in GSA6, gillnets and longline are also prohibited [15] [16].

Paragraph 3 of Article 11, states that, *“by 17 July 2021 and on the basis of the best available scientific advice, the Member States concerned shall establish other closure areas where there is evidence of a high concentration of juvenile fish, below the minimum conservation reference size, and of spawning grounds of demersal stocks, in particular for the stocks concerned”*. Member States should submit, by 15th February 2021, closure area proposals and scientific evidence for Commission and STECF evaluation.

To address TOR 2 ‘review the existing closures and the proposed additional closures’, a common check list was built for formally evaluating all documents submitted by Member States, on the basis of the document received by Spain, and taking into account their peculiarities. The checklist was used as a reference to consistently evaluate the three documents, and it includes some general points and some specific ones for reviewing documents related to paragraphs 2 and 3 of Article 11.

The methodology described by STECF for hake juveniles in STECF 19-03 [21] and 20-01 [22] to estimate catch reductions of spawners and juveniles of all stocks targeted by the WMMAP (*Merluccius merluccius*, *Mullus barbatus*, *Aristeus antennatus*, *Nephrops norvegicus*, *Aristaeomorpha foliacea* and *Parapenaeus longirostris*) was used as a reference to evaluate the methodologies proposed by MSs: *“The assessment of the best location and timing for closures should compare and overlay a) where the fisheries are taking place and the likely catch composition and b) where juveniles are most likely to be distributed, in order to assess the expected impact of the fisheries on the juvenile stock component. Juvenile hake habitats can be modelled using fishery-independent trawl surveys and applying persistency analyses of the juvenile hake distribution to document hotspots in time and space. Alternative methods for predicting juvenile distributions exist such as multicriteria analysis that could generate habitat suitability maps”*.

Additionally, STECF 20-01 concluded that, for Italy, i) *“the proposed derogations to the 3-month, 6 nm/100 m isobath closure prescribed under Article 11 of Regulation (EU) 2019/1022 paragraph*

1 are not justified by the arguments based on geographical constraints and/or high costs to reach the fishing grounds”; ii) “the anticipated reductions in juvenile hake catch arising from alternative scenarios for trawling closures by way of derogation to Article 11.1, depend to a greater or lesser extent on whether the anticipated West Med WMMAP background effort reductions are taken into account in the simulated scenarios” and iii) “the performance of the closures cannot be fully assessed against the Art 11.2 requirement, because the results were presented merged for the three GSAs. Hence, it is not possible to assess the expected change in catches of juvenile hake for each GSA separately”.

The following documents were received and reviewed, and Table 14 summarizes all the data included for each report and the sources of information.

- From France, no document was received.
- From Italy, “Report MAP EMU 2_ 26_February 2021_rel.2_1.pdf”.
- From Spain,
 - “DOC 2. EN. SPAIN MAP MED REPORT GSA 5-COURTESY TRANSLATION IEO.pdf”,
 - “DOC 3. EN. SPAIN MAP MED GSA 1 REPORT IEO - COURTESY TRANSLATION.pdf”,
 - “DOC 4-1. EN. Technical_Report_Article11.3_ICM-CSIC_v20210219_final.pdf”,
 - “DOC 4-2 EN. SPAIN MAP MED REPORT GSA 6 IEO -COURTESY TRANSLATION.pdf”.

Table 14. Summary table of the type of data and period considered in each of the reports reviewed during the EWG. LFD: Length frequency distribution; VMS: Satellite-based vessel monitoring system; EMODnet: European Marine Observation and Data network; DCF: Data Collection Framework.

		GSA 1 – IEO		GSA 5 - IEO		GSA 6 – ICM		GSA 6 - IEO	
Type of data		Time series covered	Source	Time series covered	Source	Time series covered	Source	Time series covered	Source
Bathymetry		—	EMODnet	—	EMODnet	—	EMODnet	—	EMODnet
Effort footprint		Area1: 2017- 2018 Area 2: 2016- 2018	VMS official data	2016- 2018	VMS official data	2016- 2019	VMS official data	2016- 2018	VMS official data
Fishery independent	Georeferenced abundance	Not specified	MEDITS	Not specified	MEDITS	—	—	Not specified	MEDITS
	LFD	Not specified	MEDITS	Not specified	MEDITS	—	—	Not specified	MEDITS
Fishery dependent	Landings	—	—	—	—	2016- 2019	Daily landings	—	—
	Discards	—	—	—	—	—	—	—	—
	LFD	—	—	—	—	—	—	—	—
Biology	Maturity	—	Bibliography and DCF	—	Bibliography and DCF	—	—	—	Bibliography and DCF

Table 14 (*cont.*). Summary table of the type of data and period considered in each of the reports reviewed during the EWG. LFD: Length frequency distribution; VMS: Satellite-based vessel monitoring system; ETOPO; DCF: Data Collection Framework.

		GSA 9		GSA -10		GSA 11	
Type of data		Time series covered	Source	Time series covered	Source	Time series covered	Source
Bathymetry		—	ETOPO	—	ETOPO	—	ETOPO
Effort footprint		2016-2019	VMS official data	2016-2019	VMS official data	2016-2019	VMS official data
Fishery independent	Georeferenced abundance	Trends: 1994-2019 Nurseries modelling: 1994-2010	MEDITS, MEDISEH Project [Errore. L'origine riferimento non è stata trovata.]	Trends: 1994-2019 Nurseries modelling: 1994-2010	MEDITS, MEDISEH Project	Trends: 1994-2019 Nurseries modelling: 1994-2010	MEDITS, MEDISEH Project
	LFD	2015-2019	MEDITS	2015-2019	MEDITS	2015-2019	MEDITS
Fishery dependent	Landings	2015-2019	DCF Data	2015-2019	DCF Data	2015-2019	DCF Data
	Discards	2015-2019	DCF Data	2015-2019	DCF Data	2015-2019	DCF Data
	LFD	2015-2019	DCF Data	2015-2019	DCF Data	2015-2019	DCF Data
Biology	Maturity	—	—	—	—	—	—

4.1.1 Italy

The document "Report MAP EMU 2_26 February 2021_rel2_1.pdf" was reviewed following the procedure explained in the Background section.

4.1.1.1 General checks

- Typology of data considered (commercial, experimental, or both):
 - LFD MEDITS – selectivity ogive (50 mm diamond mesh): to reconstruct (as a proxy) the commercial LFD
 - LFD of landings and discards: georeferenced data are scattered in space and time
 - n/km^2 , kg/km^2 (<20 cm TL) → spatial distribution on juveniles, from MEDITS
 - VMS data
 - Catches (landings + discards) <20 cm (2015-2017): from DCF Data Call; tons and number of individuals.
 - Bathymetric data: ETOPO
- Years used:
 - For each set of data, see Table 1
 - Baseline years used for catch reduction: average years 2015-2017
- Typology of the closure areas:
 - In August 2020, 10 FRAs enter into force; for each FRA information of the area closed to towed gears is reported.
 - As a response to STECF-20-01, new simulations were carried out taking into account the closure of the whole coastal areas within 6 nautical miles / 100 m depth (following Article 11.1).

- Check if used information allows the use of georeferenced distribution of species: Georeferenced information on species distribution from MEDITS data in GSA 9, 10, and, 11 is used.
- Check if effort displacement has been considered in the proposals: Yes, using a gravimetric approach, from closed areas to open ones. Methodology is not fully detailed or reference provided, although the details could be found in the previous report provided by Italy (see [22]).
- Inclusion of the assessment of alternative scenarios: 12 different scenarios have been included, according to two sets: Set 1 (considering only closure areas) and Set 2 (Set 1 plus 10% effort reduction from 2015-2017). For each set, six scenarios were simulated:
 - Scenario 0: *Status quo* as in 2015-2017.
 - Scenario 1: Considering the 10 FRAs.
 - Scenario 2: Application of paragraph 1 from Article 11 (prohibition of using trawls within six nautical miles from the coast except in areas deeper than the 100 m isobath during three consecutive months each year), considering the closure in winter (January-March).
 - Scenario 3: As in Scenario 2, but for spring (April-June).
 - Scenario 4: As in Scenario 2, but for summer (July-September).
 - Scenario 5: As in Scenario 2, but for autumn (October-December).
- Check methodology applied follows specifications in STECF PLEN 19-03 (pp 84-91) and in STECF 20-01 (pp 67-79):
 - Spatial distribution of the species, of the catch and effort data combined: Distribution of species and effort combined, but not catch composition.
 - Modelling hotspots of juveniles or potential spawners using fishery-independent trawl surveys: Yes.
 - Persistency analyses of hotspots of juveniles and spawners in time and space: Yes.
 - Alternative methods (such as multicriteria analysis that could generate habitat suitability maps), if necessary: No.

4.1.1.2 Specific checks

Article 11, paragraph 2

- Check the 20% reduction in hake juveniles is reached: The results for each option (as combination set+scenario) were shown by each GSA separately. The objective was reached, for each GSA, only when the 10% reduction of fishing effort is considered together with the proposed 10 FRAs. This suggests that the permanent closure of these areas is more effective than the three-month closure in the coastal bottoms.
- Justification of the geographical constraint (narrow continental shelf or distance to fishing ground or other suggested by MS): according to the document, the continental shelf is narrow and the fishing effort is higher outside than inside the coastal area that may be closed following paragraph 1 of Article 11. Hence, proposed FRAs will be more effective when reducing the catch of juveniles of hake than the coastal ban. Additionally: i) the coastal ban may actually increase the effort on hake nursery areas, and ii) it may have consequences for smaller boats which are not able to go far from the coast (due to their dimension or higher fuel cost, etc.) as they will have to stop for 3 months.

Article 11, paragraph 3

Italy did not propose additional closure areas for 2021 and in the area closures proposed for the derogation of Article 11.1, there are no references to other species targeted by the WMMAP or population fractions other than juvenile hake.

4.1.2 France

France did not propose any additional closure related to the application of Article 11.3.

4.1.3 Spain

The documents "DOC 2. EN. SPAIN MAP MED REPORT GSA 5-COURTESY TRANSLATION IEO.pdf", "DOC 3. EN. SPAIN MAP MED GSA 1 REPORT IEO - COURTESY TRANSLATION.pdf", "DOC 4-1. EN. Technical_Report_Article11.3_ICM-CSIC_v20210219_final.pdf", "DOC 4-2 EN. SPAIN MAP MED REPORT GSA 6 IEO -COURTESY TRANSLATION.pdf" were reviewed following the procedure explained in the Background section.

4.1.3.1 Report for ICM Technical Report for GSA 6

General checks

- Typology of data considered (commercial, experimental, or both):
 - VMS data.
 - Daily landings: biomass and economic income.
 - Discards not included, therefore juveniles not included for any species (hake, Norway lobster, deep-water rose shrimp and red mullet).
 - E-logbook: to estimate effective fishing hours.
 - Bathymetric data: EMODnet
- Years used:
 - For each set of data, see Table 14
 - Baseline years used for catch reduction: average 2016-2019, except for the no-take area "Iluç of Roses" for which the period is 2009-2012.
- Typology of closure areas:
 - Temporal closure areas in force since 2020 (Art. 11.2), with some modifications regarding periods of the year.
 - Additional closure areas proposed (Art 11.3): permanent and temporary no-take zones.
- Check if used information allows the use of georeferenced distribution of species: No maps of nursery or spawning areas were provided, so the degree of overlap with the proposed closure areas could not be checked. A proxy of the georeferenced distribution of species has been plotted crossing VMS and landings for each species.
- Check if effort displacement has been considered in the proposals: The effort displacement has not been considered for any species.
- Inclusion of assessment of alternative scenarios: No alternative closure areas or periods have been assessed. This report included some scenarios combining closures with either fishing effort reduction or changes in mesh selectivity (based on non-empirical approach). However, they were not evaluated because are out of the scope of ToR 2.
- Check methodology applied follows specifications in STECF PLEN 19-03 (pp 84-91) and in STECF 20-01 (pp 67-79):
 - Spatial distribution of the species, of the catch and effort data combined: A proxy to the distribution of species was made combining landings and effort.
 - Modeling hotspots of juveniles or potential spawners using fishery-independent trawl surveys: No data on juveniles or spawners were analyzed.
 - Persistency analyses of hotspots of juveniles and spawners in time and space: no data on juveniles or spawners were analyzed.

- Alternative methods (such as multicriteria analysis that could generate habitat suitability maps), if necessary: No.

Specific checks

Article 11, paragraph 2

The analysis of the existent closure areas (aiming to reach a 20% reduction in hake juveniles catches) is included in the analysis together with the proposal of new closures, so it could not be evaluated separately. However, as the information used consisted only of landings data, individuals <MCRS were not considered in this analysis, and hence, the estimation of hake juveniles reduction in the catches is not calculated.

Article 11, paragraph 3

- Check that proposals reach 15% to 25% reduction of catch of juveniles and spawners of all stocks covered by the WMMAP: The information used consisted only on landings, no population fractions (juvenile and/or spawners) of any of the species covered by the WMMAP is considered in the analyses. Estimations based on the landings do not reach 15-25% percentages reduction for any of the whole species in GSA 6.
- Check if reports include references to sensitive habitats: No specific references to sensitive habitats.
- What has been considered juveniles for blue and red shrimp: No population fraction considered for the assessment of the closures.
- Which stocks are considered: *Merluccius merluccius*, *Mullus barbatus*, *Aristeus antennatus*, *Nephrops norvegicus* and *Parapenaeus longirostris*.

4.1.3.2 Report for IEO Technical Reports for GSA 1, GSA 5 and GSA 6

General checks

- Typology of data considered (commercial, experimental, or both):
 - For the effort footprint, VMS from 2016 to 2018 is used. For GSA 1, two different closure areas are proposed; for one of the them, VMS data was considered for 2017-2018, as in 2016 there was a closure period in April (the month also included in the current proposal), and thus, there was no effort footprint for April 2016.
 - Research surveys (MEDITS) data interpolated using GAMs: For GSA 5, data is available only for Mallorca and Menorca. Ibiza and Formentera are not covered. For GSA 1 and GSA 6 maps of stations are missing.
 - LFD from MEDITS
 - Bathymetric data: EMODnet
- Years used:
 - For each set of data, see Table 1.
 - Baseline years used for catch reduction: average 2016-2018
- Typology of closure areas:
 - GSA 1: One temporal and one permanent closure areas are proposed.
 - GSA 5: Five temporal closure areas are proposed:
 - GSA 6: Several permanent closure areas.

The analysis does not include the closure areas adopted in 2020 to protect juvenile hake, neither the effort reduction from 2020 and 2021.

- Check if used information allows the use of georeferenced distribution of species: Georeferenced information on species distribution from MEDITS data in GSA 1 and GSA 6 and only partially in GSA 5 (Mallorca and Menorca only) is used.

- Check if effort displacement has been considered in the proposals: For GSA 1 and GSA 6, the homogeneous displacement to the nearby zones on the same bathymetric range has been considered, but the methodology is not entirely clear. For GSA 5, the same approach was followed for Mallorca and Menorca, but for Ibiza and Formentera, the effort displacement has not been considered, as there is no georeferenced information of species distribution.
- Inclusion of assessment of alternative scenarios:
 - GSA 1: A work in progress on alternative polygons in areas adjacent to those evaluated is mentioned, but not assessed.
 - GSA 5: There is a proposal but it is not assessed.
 - GSA 6: No proposals of alternative scenarios.
- Check methodology applied follows specifications in STECF PLEN 19-03 (pp 84-91) and in STECF 20-01 (pp 67-79):
 - Spatial distribution of the species, of the catch and effort data combined: Maps of standardized abundance modeled and maps of outcomes of the effort footprint; not catch composition.
 - Modeling hotspots of juveniles or potential spawners using fishery-independent trawl surveys: Yes.
 - Persistency analyses of hotspots of juveniles and spawners in time and space: Yes.
 - Alternative methods (such as multicriteria analysis that could generate habitat suitability maps), if necessary: No.

Specific checks

Article 11, paragraph 2

No analysis of the existing closure areas is included in any of the reports.

Article 11, paragraph 3

- Check that proposals reach 15% to 25% reduction of catch of juveniles and spawners of all stocks covered by the WMMAP: The proposals do not reach 15-25% percentages reduction for any fraction of the species analysed in any of the GSAs.
- Check if reports include references to sensitive habitats: Their importance is mentioned for GSA 1 and GSA 5, but the effect of the closure areas is not analyzed. For GSA 6, there is no mention.
- What has been considered juveniles for blue and red shrimp:
 - GSA1: There is no definition for juveniles.
 - GSA 5: Individuals <25 mm CL (length at first maturity in this area according to [9]).
 - GSA 6: Individuals <22 mm CL (length at first maturity in this area according to DCF data).
- Which stocks are considered
 - For all GSAs (1, 5 and 6): *Merluccius merluccius* (<MCRS and potential spawners), *Parapenaeus longirostris* (<MCRS and potential spawners), *Nephrops norvegicus* (potential spawners), and:
 - GSA 1: *Aristeus antennatus* (potential spawners, but using a different methodology).
 - GSA 5: *Aristeus antennatus* (<length at first maturity, potential spawners) and *Mullus surmuletus* (potential spawners) instead of *Mullus barbatus*.
 - GSA 6: *Aristeus antennatus* (<length at first maturity and potential spawners) and *Mullus barbatus* (potential spawners)

4.2 Fishing effort displacement arising from the proposed additional closures

There are different approaches to analyse the effect of the proposed additional closures on the fishing effort displacement. One of them is using spatial prediction models that allow to apply different options and compare them (from removing the effort to different ways to reallocate it), although they need several assumptions to be taken.

A variety of 'effort displacement models' can be employed to forecast the possible displacement effects, and, according to the available knowledge and the collected georeferenced data, these models range from the simplest (i.e. homogeneous redistribution, bathymetric weighted redistribution, gravimetric redistribution) to more complex frameworks that can explicitly integrate the spatial dimension in an individual based simulator of fishery closure scenarios with biological and effort feedbacks. These includes but are not limited to aspects that are still to be fully understood before being able to integrate them into forecasting models: the explicit consideration of the potential increase of biomass productivity and the potential spill over effect from closure areas, taking also into account the potential impact of the closures in the biomass in those areas still opened to fishing and consequently on the fleet displacement behaviour. These aspects must be taken into account "a posteriori" in order to be introduced in a reliable way on the analysis.

The Article 3 of the WMMAP states that it "shall implement the ecosystem-based approach to fisheries management in order to ensure that negative impacts of fishing activities on the marine ecosystem are minimised. It shall be coherent with Union environmental legislation, in particular with the objective of achieving good environmental status by 2020 as set out in Article 1(1) of Directive 2008/56/EC" [5]. Thus, the application of the WMMAP must result not only in the achievement of the *MSY* of the target species but also contribute to the maintenance of biological diversity and habitats, food webs, sea floor and benthic ecosystems integrity. Since all of these interests can be geospatially (but also temporally) targeted and located, the distribution of sensitive and essential fish habitats should be taken into account in the design of closure areas, which may contribute to the recovery of both resource populations and sensitive and essential fish habitats.

Other parts of the TOR (parametrization of the models and designing alternative closures proposal) could not be performed due to time limitations and lack of data to parameterize potential modelling frameworks.

4.3 TOR 2 conclusions

- None of the proposals of closure areas (neither those for Article 11, paragraph 2, nor those for Article 11, paragraph 3) reached the objectives required when they are considered exclusively (not in combination of additional measures) for any of the fractions of the species analysed.
- For France, no proposal of additional closure areas for 2021, following Article 11 paragraph 3, was received.
- For Italy, a document assessing the reduction of juvenile hake catches in GSAs 9, 10 and 11 from different scenarios including closure areas and fishing effort reduction, separately and combined was reviewed. When the closure areas considered were the 10 FRAs proposed for 2020, the combination these together with effort reduction resulted in a 20% reduction of juveniles' hake catches for each of the three GSAs. Other species were not included in the analysis. No proposal of additional closure areas for 2021 was received.
- For Spain, four documents proposing new additional closure areas for 2021 were reviewed, one for GSA 1 (IEO), and one for GSA 5 (IEO) and two for GSA 6 (one from IEO and one from ICM). None of the closure scenarios proposed for GSA 1, GSA 5 and GSA 6 reached the required expected reduction of juveniles or mature stages. The two documents of the same area used different sources of data and methodology. The one from ICM only considered landings, so the juveniles and spawners fractions of the species covered by the WMMAP could not be separately analyzed. Additionally, this document included the effect of additional management measures (effort reduction and technical measures: selectivity); however, the effect of these measures was not assessed by the EWG.

4.4 TOR 2 remarks

- In relation to the baseline year (as the reference from which the catch reduction is estimated), the initial proposal was to use 2020; if not available, the most recent available year should be used (2019). However, EWG considers that using a single year as a reference may not be adequate, due to the high interannual variability in catches from demersal gears. For this reason, the EWG suggests to use an average of at least three consecutive years. Additionally, the peculiarities of 2020 (both the COVID-19 pandemic, which have effects of the performance of the fleets, and being the first year of the implementation of closure areas) may suggest not to consider this year as a reference.
- Although some effects of the closure areas can be estimated beforehand using mathematical simulation models, their real effect will only be evaluated after their application, due to the uncertainty and complexity of the processes involved.
- The general timeline should be rethought accounting for the time needed for the entire process, including the collection of data to the application of methodologies to assess the proposals and the management implementation. It should also be considered that the entire process includes different stakeholders (administration, fishing sector and scientists).
- The application of different management measures without assessing the effects of those already in force may undermine future evaluation of the effects of each management measures separately.
- The real effect of the closure areas in force for protecting hake juveniles since 2020 were not evaluated in any of the documents presented.
- In addition of the proposals made by STECF 19-03 and STECF 20-01, and in accordance with the CFP [18], the socio-economic impacts of the management measures to be applied (such as closure area) should also be considered, and hence, be estimated using appropriate spatially-explicit models.

5 TOR 3. DEMERSAL STOCKS FISHING MORTALITY BY GEARS OTHER THAN BOTTOM OTTER TRAWLS

5.1 Background

The EWG 21-01 is requested to evaluate how much gears other than bottom otter trawls, such as gillnets and longlines contribute to demersal stocks fishing mortality and especially F for mature hake. Where fishing mortality for hake or other species covered by the WMMAP by such gears is significant, the EWG is also requested to propose possible additional management measures for these gears.

The 2013 reform of the Common Fisheries Policy (EU Reg. 1380/2013) includes the concept of regionalisation based on Multi Annual Plans to promote regional cooperation on conservation measures. A multiannual plan for demersal fisheries in the WMMAP, concerning Mediterranean Spain, Mediterranean France and Western Italy was adopted recently by the European Parliament (February 2019) and the Council (June 2019) and entered into force on 1st of January 2020 (COM/2018/0115 final – 2018/050 (COD)).

Among other things, the WMMAP establishes an important reduction of fishing effort (up to 40% over the period 2020-2024), designing fisheries restricted areas (or area closures), and promoting more selective fishing gear. The geographical scope is the Western Mediterranean geographical subareas adjacent to EU Member States Spain, France and Italy: GSAs 1, 2, 5, 6, 7, 8, 9, 10 and 11, grouped into two spatial units EMU (*Effort Management Units*): EMU1 for GSAs 1 to 7 and EMU2 for GSAs 8 to 11 (Figure 12).

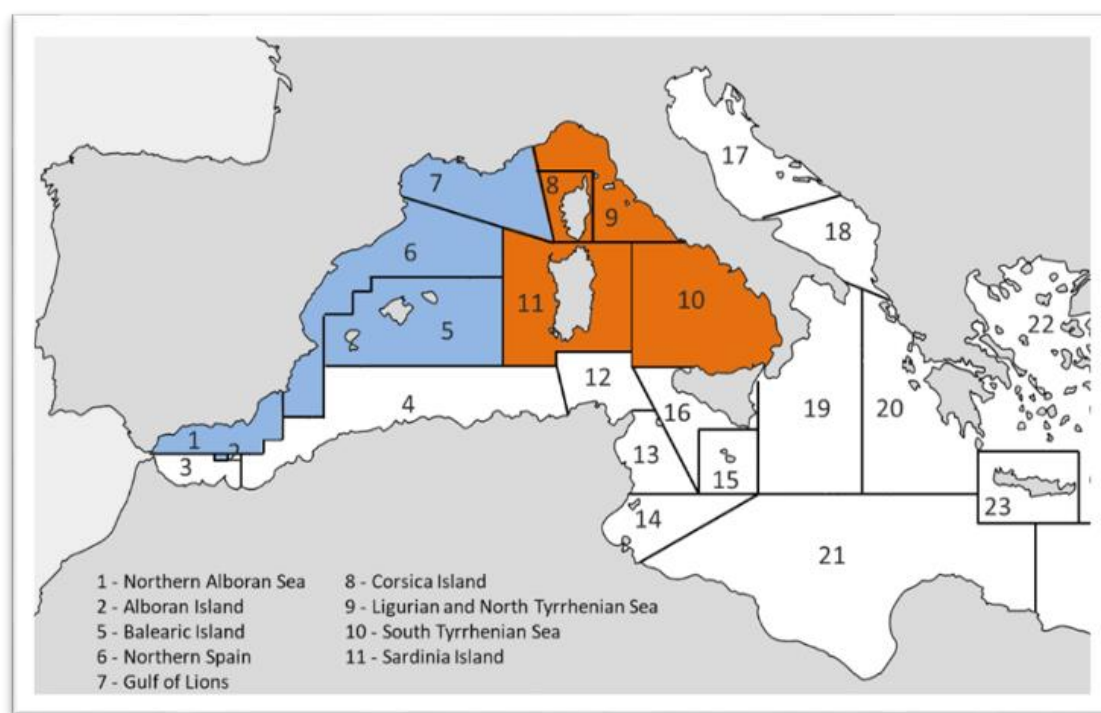


Figure 12. Mediterranean fishing management units ("GSAs") under the WMMAP for demersal fisheries. The west GSAs are grouped as *Effort Management Unit 1* (EMU1) for management purposes and highlighted in blue, while the east GSAs are designated EMU2, in red.

Table 15 shows the six species as category 1 stocks included in the WMMAP. These are the main demersal stocks targeted by the trawl fleets. The main target of the plan is to produce an MSY for demersal fisheries. The plan (COM/2018/0115 final – 2018/050 (COD)) states that "The target fishing mortality, in line with the ranges of F_{MSY} defined in Article 2, shall be achieved on a progressive, incremental basis by 2020 where possible, and by 1st of January 2025 at the latest, for the stocks concerned Table 15, and shall be maintained thereafter within the ranges of F_{MSY} ."

Table 15. Species covered by the WMMAP for demersal fisheries.

Common name	Scientific name	FAO 3-alpha code
Hake	<i>Merluccius merluccius</i>	HKE
Red mullet	<i>Mullus barbatus</i>	MUT
Deep-water rose shrimp	<i>Parapenaeus longirostris</i>	DPS
Norway lobster	<i>Nephrops norvegicus</i>	NEP
Giant red shrimp (only EMU2)	<i>Aristaeomorpha foliacea</i>	ARS
Blue and red shrimp	<i>Aristeus antennatus</i>	ARA

To respond to ToR 3, EWG 21-01 based the analysis on the vectors of fishing mortality estimated during EWG 20-09 “Western Mediterranean stock assessments”, which updated the stock assessments from EWG 19-10. The report EWG 20-09 included stock assessments for all the species listed in Table 15, at the GSA level or EMU level (Table 16). Note that in the case of GSA05 the *Mullus* species assessed was striped red mullet (*Mullus surmuletus* MUR), and not *Mullus barbatus*.

From the 6 species listed as category 1 species, only European hake and the two red mullets have catches from fishing gears other than trawl. That is, all reported catches for Norway lobster, deep-water rose shrimp, giant red shrimp and blue and red shrimp come exclusively from otter bottom trawl (OTB). Table 16 lists the stocks assessed in EWG 20-09, along with the relative contribution of the different fishing gears.

The relative importance of OTB and other gear in the landings of the hake and red mullet are shown in the charts of Figure 13 and Figure 14. In EMU1 the largest share of landings of hake and red mullet are produced by OTB (note that other gear “OTH” corresponds basically to French OTM and OTT, with the same selection pattern as OTB in the catch at length data). In EMU2, the contribution of other fishing gear is higher than in EMU1, particularly for hake.

Figure 14 shows the relative contribution to the demersal catches of fishing gears by EMU and GSA. In GSA 1, 5 and 6 the relative importance of gears other than OTB is low, typically <10% for hake. In GSA 7, the importance of the Spanish LLS has reduced considerably over time and it produced <10% of the landings in recent years.

In GSA7 the trawl effort is applied by three trawl fleets coded OTB, OTM and OTT, but with the same selection pattern for hake and red mullet, according to the catch at length data.

In EMU2, the importance of gears other than OTB is higher than in EMU1, particularly in GSA 10 for hake and red mullet. In GSA 11 only OTB reported landings of both species.

As regards the discards, the available information shows that they come mostly from trawlers for both HKE and MUT (Figure 15), although the quantities reported are low, typically <5% of catches.

Table 16. Contribution of trawling fleets and fleets using other gears to the catches of the main target stocks in the Western Mediterranean (average of 2017-2019 values), based on fisheries production data made available by JRC to this EWG.

EMU	Stock (species and area)	Annual catches (t)	% trawl ⁽¹⁾	Other gear
EMU1	HKE 1_5_6_7	3456	85%	nets (GTR or GNS): 14% bottom longline (LLS): 1%
EMU1	MUT 1	189	82%	nets (GTR or GNS): 18%
EMU1	MUT 6	1410	93%	nets (GTR or GNS): 7%
EMU1	MUT 7	309	96%	GTR or GNS 3%
EMU1	DPS 1_5_6_7	1188	100%	
EMU1	NEP 5	67.5	100%	
EMU1	NEP 6	279	100%	
EMU1	ARA 1	118	100%	
EMU1	ARA 5	209	100%	
EMU1	ARA 6_7	603	100%	
EMU2	HKE 8_9_10_11	2463	58%	nets (GTR or GNS): 32%
EMU2	MUT 9	2058	96%	nets (GTR or GNS): 4%
EMU2	MUT 10	329	76%	nets (GTR or GNS): 24%
EMU2	DPS 9_10_11	2250	100%	
EMU2	NEP 9	324	100%	
EMU2	NEP 11	35	100%	
EMU2	ARA 9_10_11	411	100%	
EMU2	ARS 9_10_115	620	100%	

Note: (1) "trawl" is exclusively OTB in GSAs 1, 5 and 6, but combines OTB, OTM and OTT in GSA 7 (France).

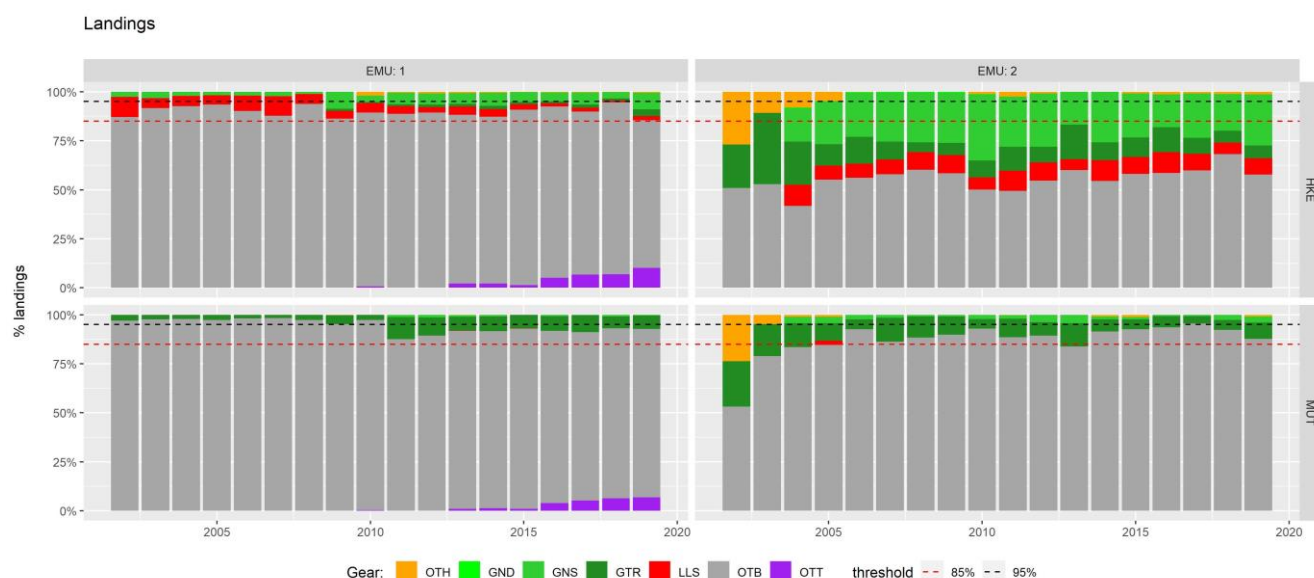


Figure 13. Proportion of landings for hake (HKE, top) and red mullet (MUT, bottom) by EMU. Dotted lines indicate 85% and 95% contributions.

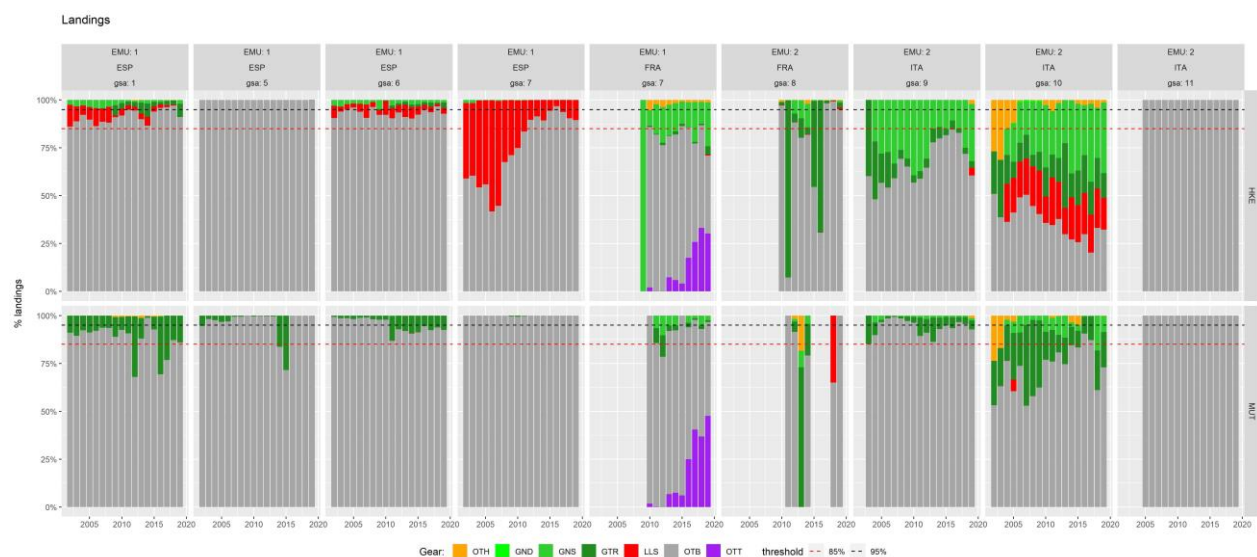
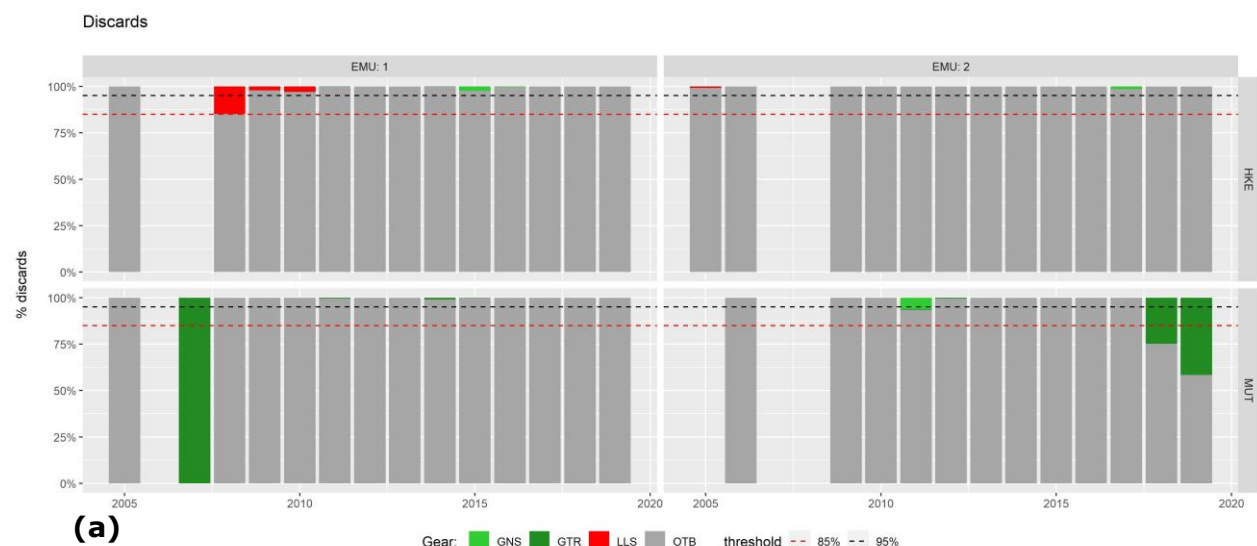
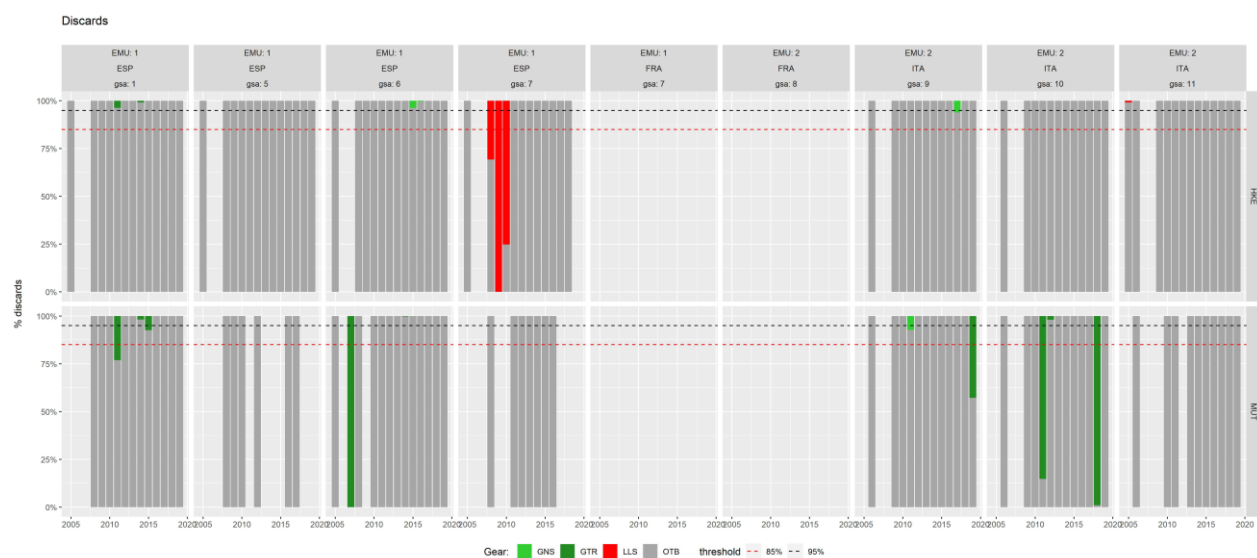


Figure 14. Proportion of landings by gear for hake (HKE, top) and red mullet (MUT, bottom) in each GSA by year. Dotted lines indicate 85% and 95% contributions.



(a)



(b)

Figure 15. Proportion of discards by gear for hake (HKE, top) and red mullet (MUT, bottom) in each EMU (A) and GSA (B) by year. Dotted lines indicate 85% and 95% contributions.

5.2 Method

For each stock of hake and red mullet a vector of partial F was computed for each fishing gear accounting for more than 1% of the catches in weight. To this end, the catch at length in numbers per fishing gear made available by the JRC as files `landings.csv` and `discards.csv` was converted to catch at age in numbers ("slicing") using routine *I2a* of FLR package *FLa4a* and the relative contribution to F was computed according to the formula:

$$F_{a,g}^y = F_a^y \frac{C_{a,g}^y}{\sum_j C_{a,j}^y}$$

where F_a^y is the vector of fishing mortality at age a for each year y , $C_{a,g}^y$ is the reconstructed catch-at-age in numbers a for year y and each area x fishing gear g combination (G is the total number of area x fishing gear combinations). The F_a^y vector was obtained from the R objects in electronic Appendix I of EWG 20-09.

After the slicing procedure, the SOP correction factors were applied to catch numbers at age by GSA and gear and then the partial F computed.

For hake in EMU2 (GSAs 8,9,10,11), and red mullet in EMU2 (GSA 9 and GSA 10) the age slicing routine was applied by sex accordingly with the data procedure preparation adopted during the assessments of EWG 20-09.

Regarding the time-span of the reconstructed catch-at-age series ($C_{a,g}^y$) it is important to note that the length frequency data for fishing gear other than OTB was consistently available only from 2010 in the Spanish GSAs and 2011 in the French GSA, despite the existence of information on total catches since 2002 in some cases.

In the Italian GSAs total catches and landings at length information are available since 2002 (2012 in GSA 8), while discard at length are consistently available since 2009. Hence, the partial F vectors were calculated for the last decade.

The results presented and discussed in the following sections refer to the most recent year in the assessment (2019), although the relative importance of the various fishing gears have remained stable over time in the last years.

5.3 TOR 3 results

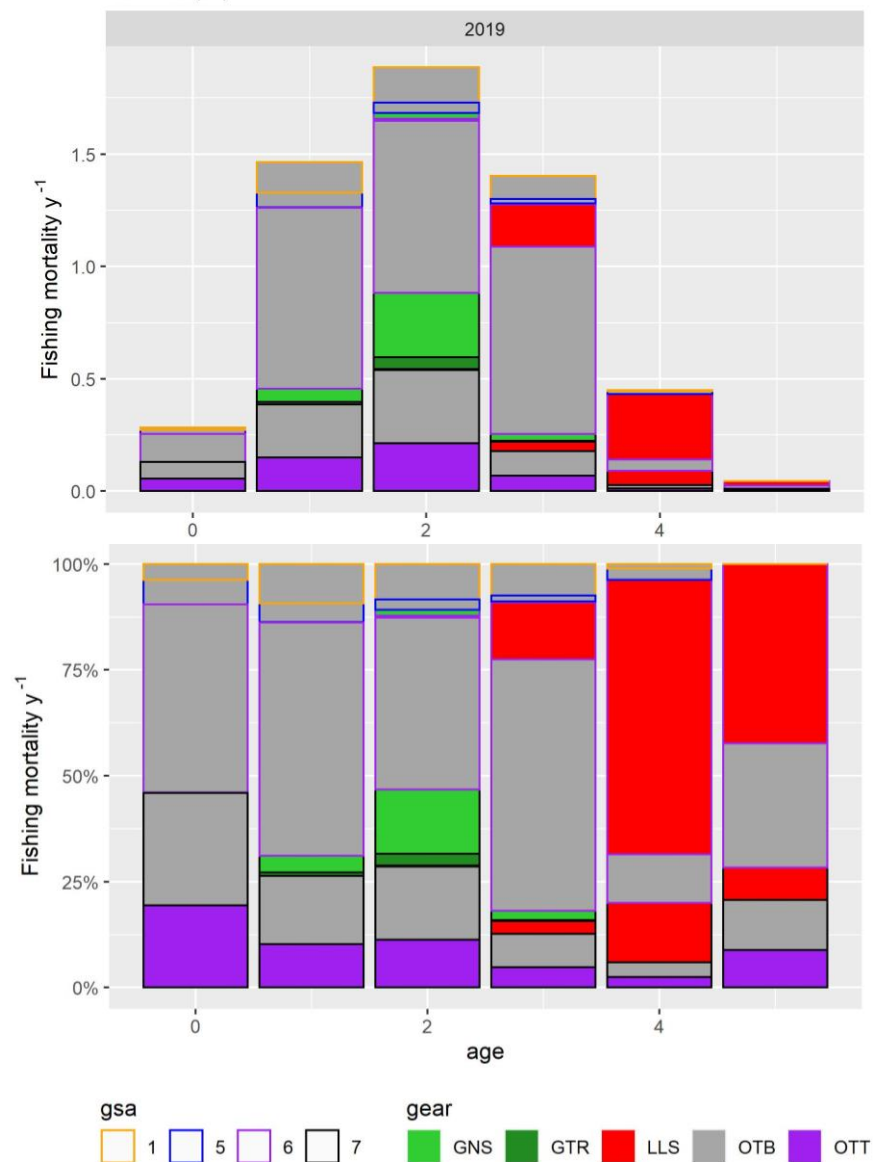
Effort Management Units EMU1 for GSAs 1 to 7

5.3.1 Vector of partial F for HKE EMU1-GSAs 1,5,6,7

The vector of partial F for hake corresponding to the stock assessment unit in EMU1 (GSAs 1, 5, 6 and 7) is shown in the following figures and table.

European hake

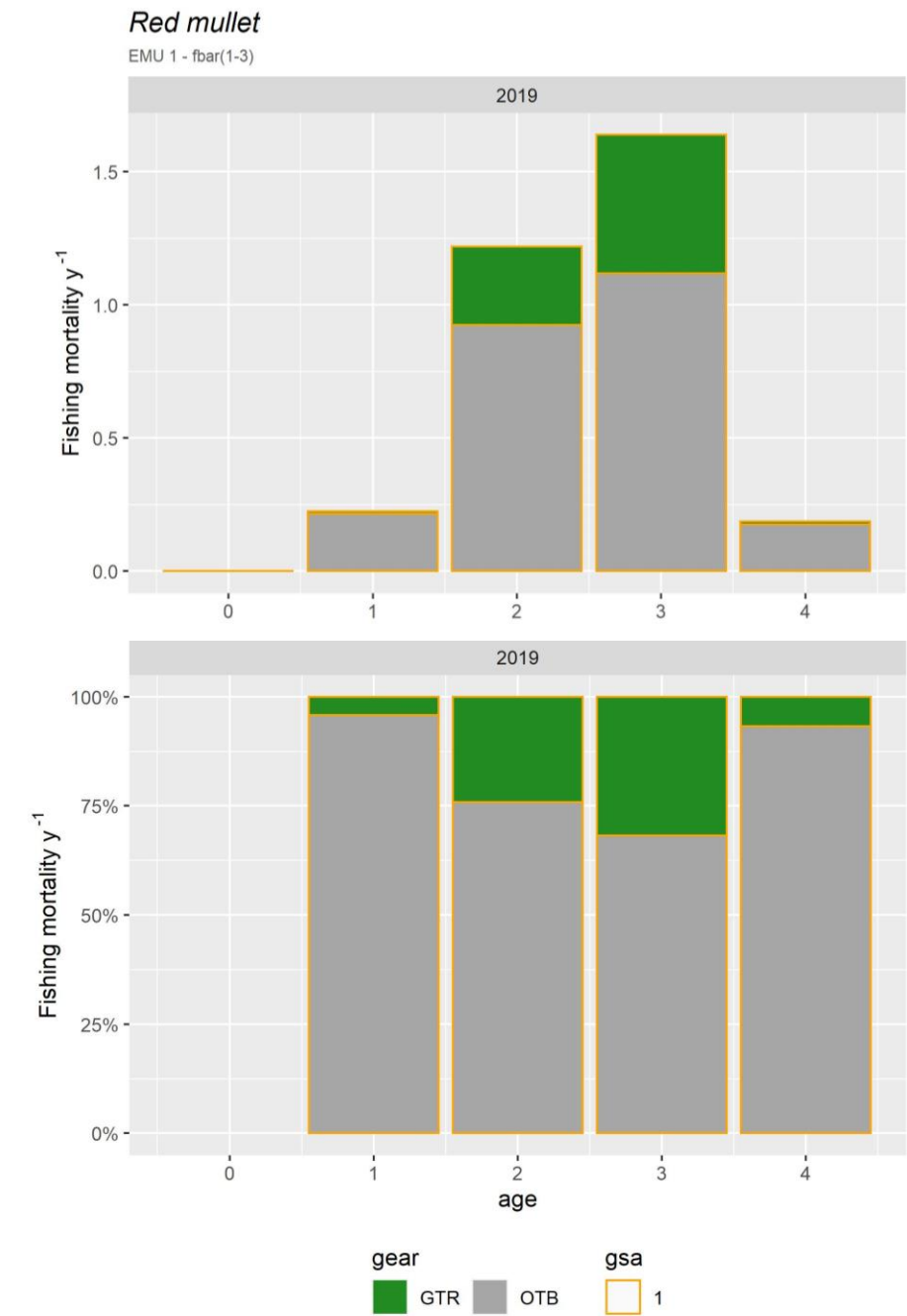
EMU 1 - fbar(1-3)



year	area	0	1	2	3	4	5
2019	1.GTR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2019	1.OTB	0.0103	0.1330	0.1574	0.1047	0.0055	0.0000
2019	5.OTB	0.0185	0.0751	0.0521	0.0231	0.0154	0.0000
2019	6.GNS	0.0000	0.0010	0.0257	0.0033	0.0000	0.0000
2019	6.LLS	0.0000	0.0000	0.0075	0.1804	0.3024	0.0191
2019	6.OTB	0.1244	0.8056	0.7762	0.8524	0.0572	0.0141
2019	7.GNS	0.0001	0.0532	0.2686	0.0299	0.0000	0.0000
2019	7.GTR	0.0000	0.0105	0.0505	0.0040	0.0000	0.0000
2019	7.LLS	0.0000	0.0001	0.0020	0.0245	0.0397	0.0021
2019	7.OTB	0.0721	0.2280	0.3212	0.1087	0.0169	0.0055
2019	7.OTT	0.0570	0.1579	0.2259	0.0728	0.0128	0.0045
2019	Total F	0.2825	1.4645	1.8872	1.4039	0.4498	0.0452

5.3.2 Vector of partial F for MUT EMU1-GSA1

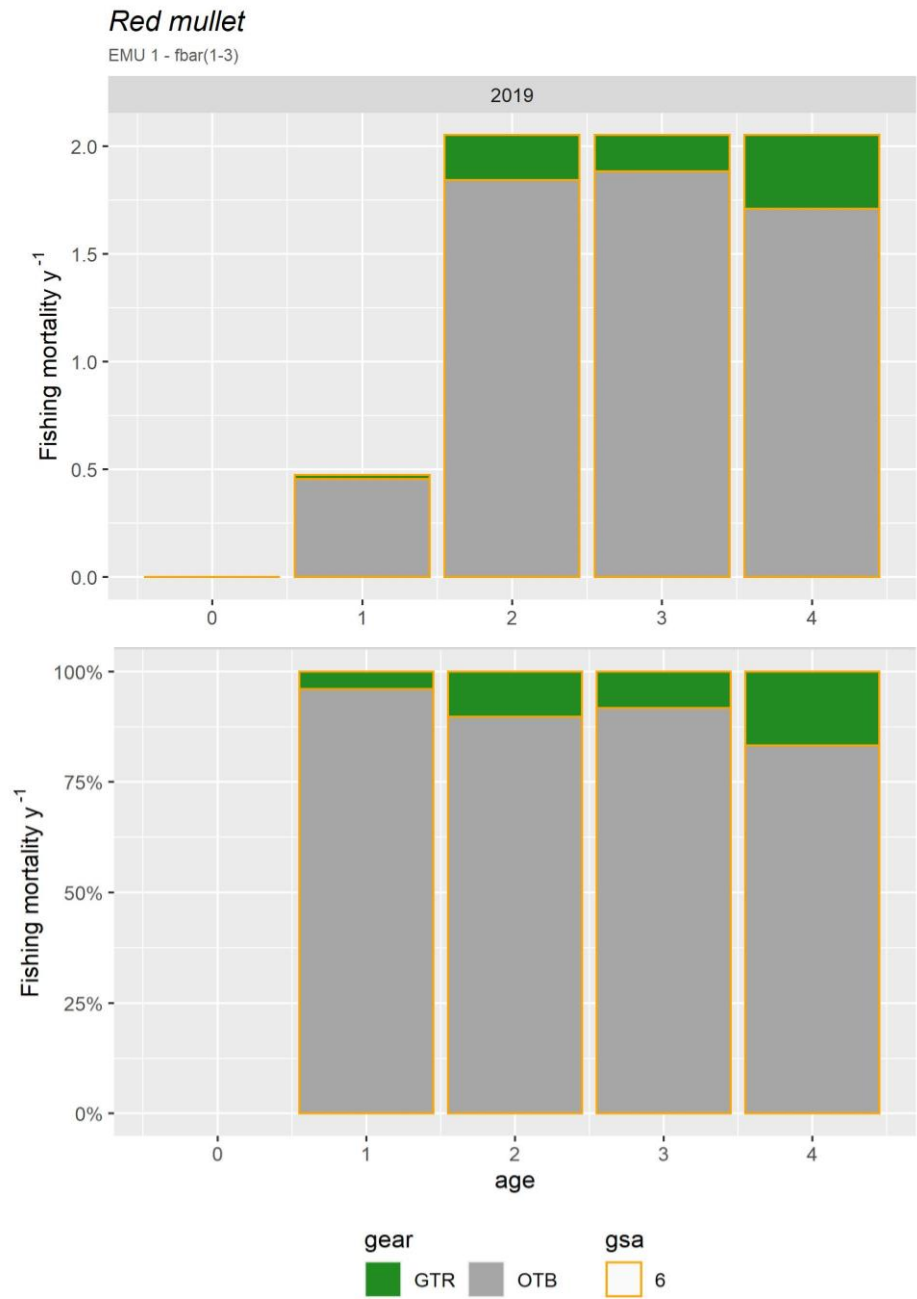
The vector of partial F for red mullet corresponding to the stock assessment unit in EMU1 in GSA 1 is shown in the following figures and table.



year	area	1	2	3	4
2019	1.GTR	0.0094	0.2949	0.5216	0.0127
2019	1.OTB	0.2156	0.9242	1.1182	0.1749
2019	EMU1	0.2250	1.2191	1.6398	0.1876

5.3.3 Vector of partial F for MUT EMU1-GSA6

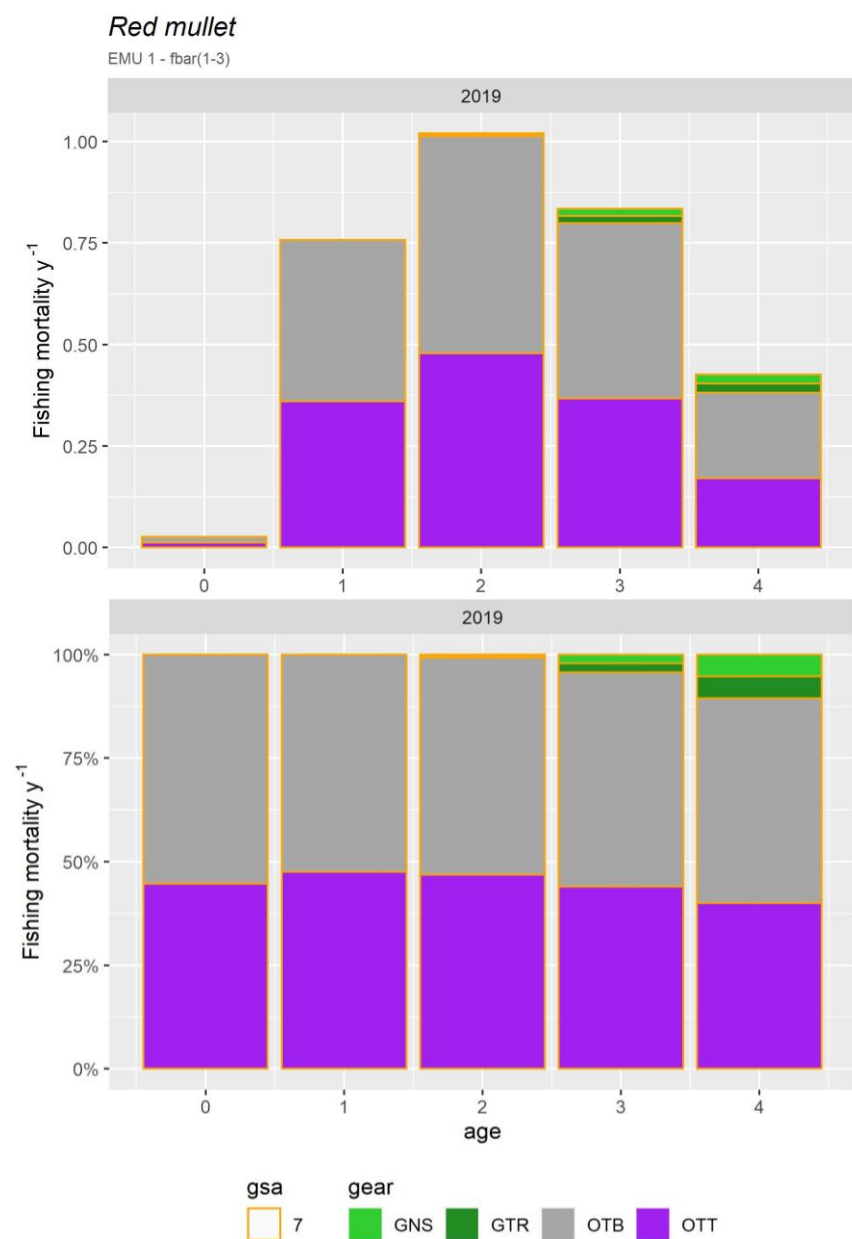
The vector of partial F for red mullet corresponding to the stock assessment unit in EMU1 GSA 6 is shown in the following figures and table.



year	area	0	1	2	3	4
2019	7.GTR	0.0000	0.0190	0.2100	0.1700	0.3440
2019	7.OTB	0.0000	0.4560	1.8430	1.8830	1.7090
2019	EMU1	0.0000	0.4750	2.0530	2.0530	2.0530

5.3.4 Vector of partial F for MUT EMU1-GSA7

The vector of partial F for red mullet corresponding to the stock assessment unit in EMU1 GSA 1 is shown in the following figures and table.

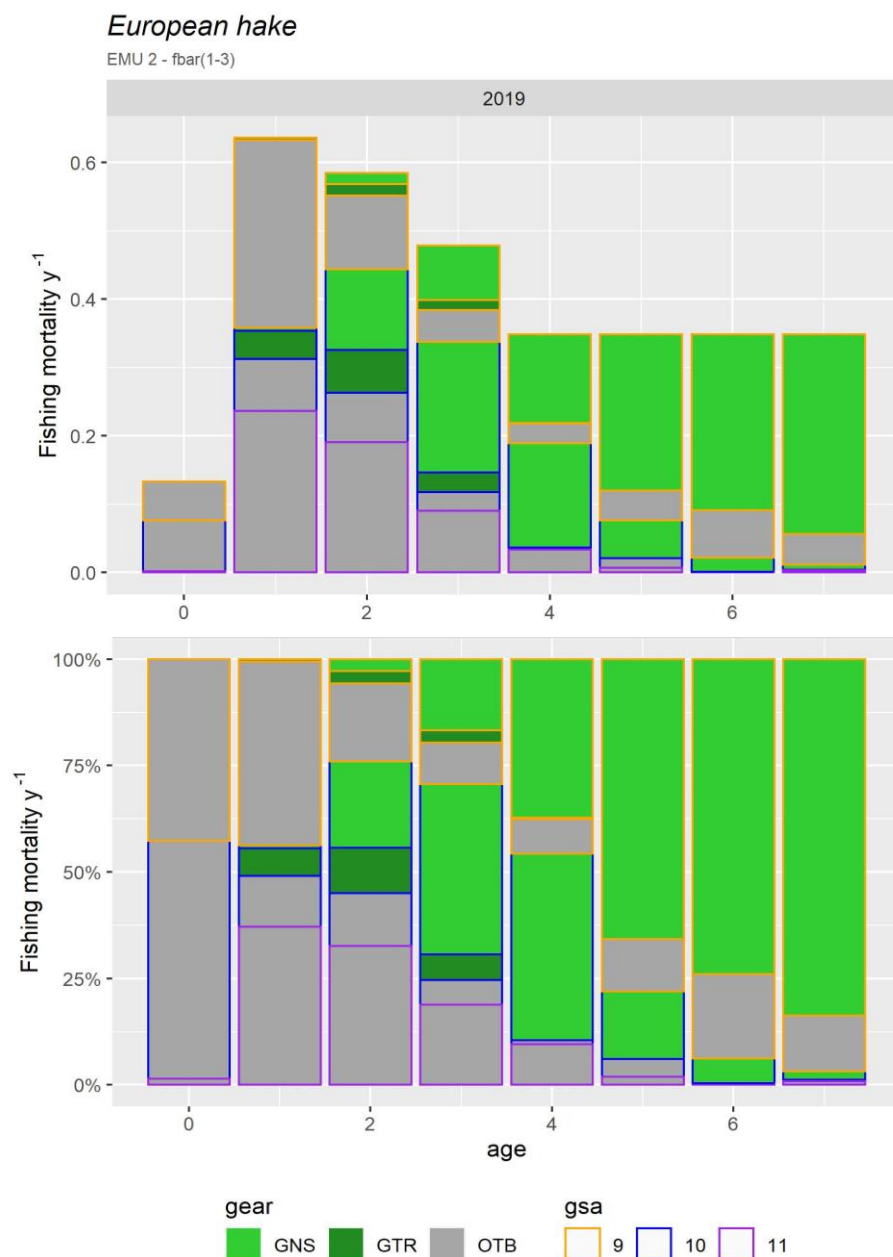


year	area	0	1	2	3	4
2019	7.GNS	0.0000	0.0000	0.0038	0.0181	0.0226
2019	7.GTR	0.0000	0.0000	0.0038	0.0181	0.0226
2019	7.OTB	0.0150	0.3970	0.5351	0.4314	0.2108
2019	7.OTT	0.0121	0.3604	0.4779	0.3674	0.1709
2019	EMU1	0.0271	0.7574	1.0205	0.8350	0.4269

Effort Management Units EMU2 for GSAs 8 to 11

5.3.5 Vector of partial F for HKE EMU2-GSAs 8,9,10,11

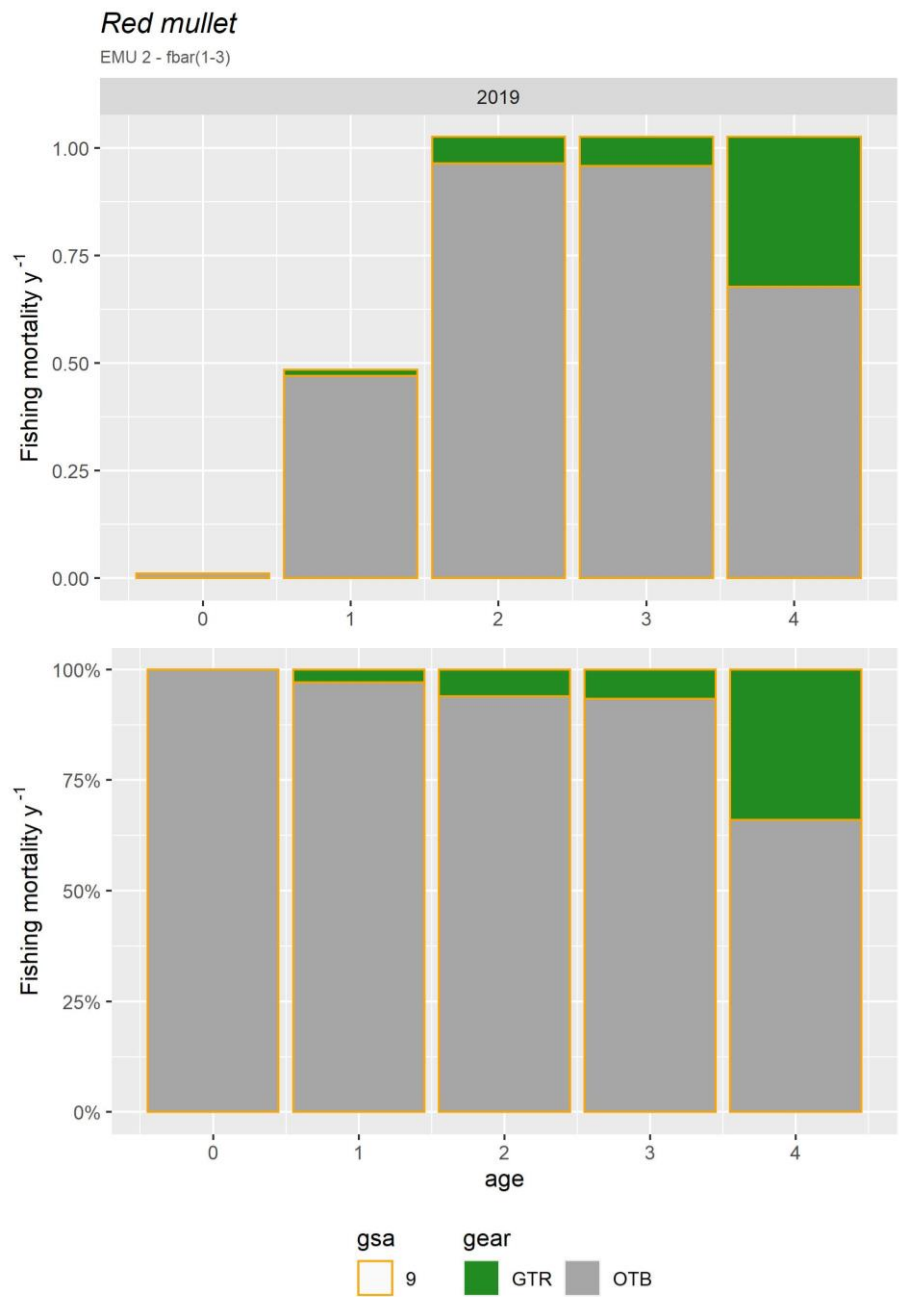
The vector of partial F for European hake corresponding to the stock assessment unit in EMU2 (GSAs 8, 9, 10, 11) is shown in the following figures and table.



year	area	0	1	2	3	4	5	6	7
2019	9.GNS	0.0000	0.0005	0.0162	0.0798	0.1300	0.2291	0.2579	0.2921
2019	9.GTR	0.0000	0.0036	0.0171	0.0142	0.0010	0.0000	0.0000	0.0000
2019	9.OTB	0.0567	0.2745	0.1073	0.0466	0.0282	0.0429	0.0692	0.0456
2019	10.GNS	0.0000	0.0042	0.1186	0.1911	0.1528	0.0554	0.0204	0.0068
2019	10.GTR	0.0000	0.0414	0.0625	0.0288	0.0000	0.0000	0.0000	0.0000
2019	10.OTB	0.0741	0.0763	0.0726	0.0278	0.0033	0.0144	0.0000	0.0011
2019	11.OTB	0.0020	0.2363	0.1904	0.0900	0.0333	0.0068	0.0012	0.0031
2019	EMU2	0.1328	0.6367	0.5847	0.4783	0.3487	0.3487	0.3487	0.3487

5.3.6 Vector of partial F for MUT EMU2-GSA9

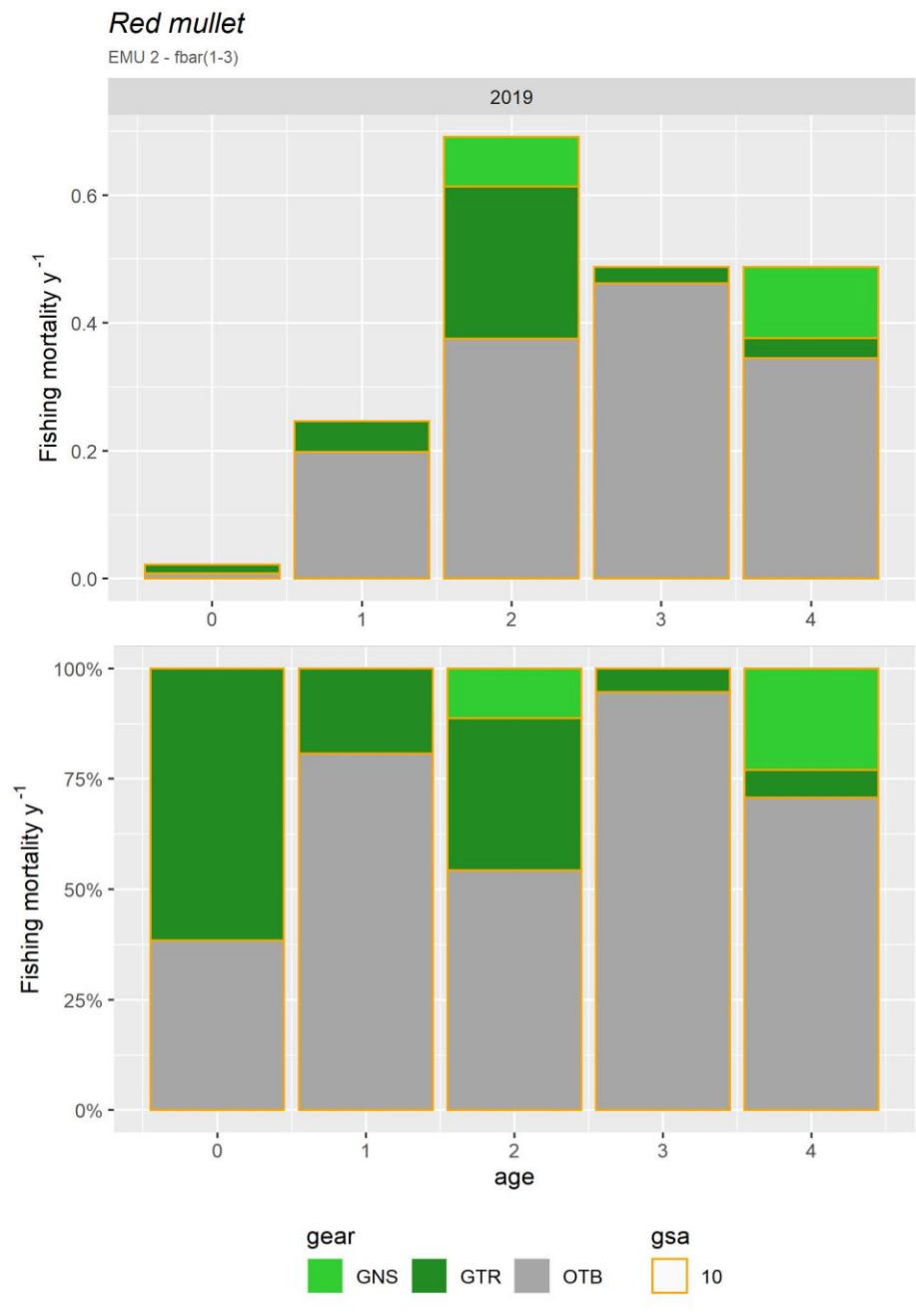
The vector of partial F for red mullet corresponding to the stock assessment unit in EMU2 GSA9 is shown in the following figures and table.



year	area	0	1	2	3	4
2019	9.GTR	0.0000	0.0143	0.0620	0.0682	0.3493
2019	9.OTB	0.0112	0.4707	0.9640	0.9579	0.6767
2019	EMU2	0.0112	0.4850	1.0261	1.0261	1.0261

5.3.7 Vector of partial F for MUT EMU2-GSA10

The vector of partial F for red mullet corresponding to the stock assessment unit in EMU2 GSA10 is shown in the following figures and table.



year	area	0	1	2	3	4
2019	10.GNS	0.0000	0.0000	0.0783	0.0000	0.1119
2019	10.GTR	0.0135	0.0475	0.2378	0.0261	0.0307
2019	10.OTB	0.0084	0.1985	0.3752	0.4616	0.3451
2019	EMU2	0.0220	0.2460	0.6914	0.4877	0.4877

5.4 TOR 3 remarks

From the results in the previous section, it is clear that trawlers (OTB, with OTT in GSA7) are the main contributor to fishing mortality for the hake and red mullet target stocks of the demersal fishery in the Western Mediterranean. Additionally, OTB is the sole contributor to fishing mortality of the four crustacean species that are also target stocks in the WMMAP.

However, in some stocks other gears (LLS, GNS and GTR) contribute considerably to fishing mortality (following table). The contribution of each gear to overall fishing mortality can be assessed in terms of F_{bar} or in terms of F averaged over all size classes; the results are very similar because the stocks analysed have only 5 age classes, but the percent contributions are not exactly the same. As example of species where fishing gears other than trawl contribute significantly to fishing mortality, consider for instance the case of red mullet in EMU1 where GTR accounts for 27% to fishing mortality (based on F_{bar}) or, in EMU2, the case of hake where 24% of fishing mortality come from GNS. For red mullet, in GSA 10, 22% of fishing mortality is generated by GTR.

EWG 21-01 recommends reducing effort proportionally to partial F for each additional non-trawl gear. This can be implemented in two ways, a) proportionally to the average across all fished classes, or b) proportionally to the average across classes that contribute to the F_{bar} computation only. The following table shows the proportion of F by gear type. Note that fishing gears other than trawl contribute to the fishing mortality mostly for older age classes (spawners). Hence, a reduction of fishing mortality from these fishing gears (LLS, GNS, GTR) would maximize the contribution of such a conservation measure to the protection of spawners if fishing effort of these gears would be managed during the months of spawning peaks, which are winter-spring (December to May) for hake and spring-summer (April to August) for red mullet.

		Partial F contribution		based on F average				based on Fbar				
		Stock	Favg	Fbar	OTB	GNS	GTR	LLS	OTB	GNS	GTR	LLS
EMU1	HKE 1_5_6_7	0.92	1.59	81.5%	6.9%	1.2%	10.4%	86.1%	8.0%	1.4%	4.5%	
	MUT1	0.82	1.03	74.4%	--	25.6%	--	73.2%	--	26.8%	--	
	MUT6	1.33	1.53	88.8%	--	11.2%	--	91.3%	--	8.7%	--	
	MUT7	0.61	0.67	97.1%	1.4%	1.4%	--	98.3%	0.8%	0.8%	--	
EMU2	HKE 8_9_10_11	0.40	0.57	46.6%	48.2%	5.2%	--	66.0%	24.1%	9.9%	--	
	MUT 9	0.71	0.85	86.2%	--	13.8%	--	94.3%	--	5.7%	--	
	MUT 10	0.39	0.48	71.8%	9.8%	18.4%	--	72.6%	5.5%	21.9%		

6 TOR 4. ASSESS THE IMPACT OF RECREATIONAL FISHERIES ON THE STOCKS COVERED BY THE MAP

6.1 Background

Regulation (EU) 2019/1022 of the European Parliament and of the Council of 20 June 2019 establishes a multi-annual plan for demersal fisheries in the WMMAP. In more detail, Reg. (EU) 2019/1022, Article 1(2), identifies six target species:

- Blue and red shrimp (*Aristeus antennatus*) in GFCM subareas 1, 5, 6 and 7;
- Deep-water rose shrimp (*Parapenaeus longirostris*) in GFCM subareas 1, 5, 6 and 9-10-11;
- Giant red shrimp (*Aristaeomorpha foliacea*) in GFCM subareas 9-10-11;
- European hake (*Merluccius merluccius*) in GFCM subareas 1-5-6-7 and 9-10-11;
- Norway lobster (*Nephrops norvegicus*) in GFCM subareas 5, 6, 9 and 11;
- Red mullet (*Mullus barbatus*) in GFCM subareas 1, 5, 6, 7, 9, 10 and 11.

According to the WMMAP “Where scientific advice indicates that recreational fishing is having a significant impact on the fishing mortality of a stock listed in Article 8.1(2), the Council may set non-discriminatory limits for recreational fishers”. Moreover, article 8.3, foresees that the Member States shall take the necessary and proportionate measures to monitor and collect data leading to a reliable estimate of the actual levels of recreational catches, where these have a significant impact on the fishing mortality of the above-mentioned species. Based on available data (including the mapping of available data from DCF/DCRF) and made available by the Member States, EWG 21-01 is requested to assess the impact of recreational fisheries on the stocks covered by the WMMAP. EWG 21_01 is requested to evaluate for each stock listed in Art. 1(2) whether recreational fisheries contribute to the demersal stocks total catches and, if yes, to which amount.

The background documents provided to this EWG arose from *FranceAgriMer* (France), from the *Subdirectorate on Scientific Investigation and Marine Reserves, General Deputy for Sustainable Fishing, General Secretariat for the Fisheries* (Spain), and from *Medac* advice for a regulatory framework and efficient management for recreational fisheries in the Mediterranean based on “FAO Technical Guidelines on Responsible recreational fisheries”.

In addition to the above-mentioned documents, EWG 21-01 carried out a review of the available scientific literature to verify the eventual presence of additional information.

6.1.1 Marine Recreational Fisheries in France

The study by FranceAgriMer [7] was conducted in France in 2017, and it was aimed at better understanding the recreational fishers population, describing fishing practices (frequency of trips, fishing methods, fishing period, etc.), and refining the estimate of catches.

The methodology adopted consisted of a telephone survey and the subsequent constitution of a panel of fishers. The telephone survey was used to identify the statistical universe (population of recreational fishers), to estimate the participation rate, and to provide a description of this practice in the subsequent panel used to collect data on catches via a logbook for one year. The telephone survey was carried out on a sample of 14,320 households, whereas the number of panellists involved was 256.

A total of 2,743,400 recreational fishers older than 15 years were estimated in France. For the regions bordering the Mediterranean waters (Occitania, Provence-Alpes-Côte d’Azur, and Corse) the recreational fisheries population ranging from 20,000 to 200,000 (Table 17).

The study also highlighted a very pronounced seasonality of this activity: it peaks during summer months (July and August, respectively 57% and 67%), while it is less practiced during winter (10% in January). Based on the answer from panellists, among Mediterranean Regions, the Provence-Alpes-Côte d’Azur (PACA) was the most frequented by recreational fishers during the year (12%), followed by Occitania (11%) and Corse (3%). Concerning the catch composition, the three most abundant species that panellists caught at sea in France were represented by Atlantic mackerel (*Scomber scombrus*) 30%, seabass (*Dicentrarchus labrax*) 27%, and gilthead seabream (*Sparus aurata*) 26%, while red mullets (*Mullus* spp.) made up only the 2%.

EWG 21-01 notes that apart from *Mullus* spp., which could include a fraction of *Mullus barbatus*, none of the other species included in the WMMAP appears in the list.

Table 17. Estimation of angler population in the Mediterranean department of France by FranceAgriMer [7].

Municipalities	Occitania	PACA Provence-Alpes-Côte d'Azur
Coastal municipalities (< 20 km from the shoreline)	20,000 - 50,000	50,000 - 100,000
Coastal municipalities (> 20 km from the shoreline)	50,000 - 100,000	100,00 - 200,000
Other municipalities	100,00 - 200,000	< 20,000

6.1.2 Marine Recreational Fisheries in Spain

The information presented below are based on a study on Marine Recreational Fisheries (MRF) in Spain conducted by IEO [10] in 2021.

6.1.2.1 Recreational fishing on the Andalusian coastline

Recreational sea fishing, or recreational fishing, is a leisure activity with a great socio-economic impact. Currently, there are more than 268,000 licenses granted by the Regional Ministry of Agriculture, Fisheries and Rural Development, distributed unequally in its 4 classes or modalities of fishing (land, boat, collective and underwater).

There are different methodologies for collecting information on recreational fishing, the most common being online, telephone or "in situ" surveys or visual censuses. Besides, a methodology consists of the involvement of the recreational fishers themselves in the collection of their "Self-sampling" activity when they carry it out. To this end, a series of forms have been developed which have been incorporated into the digital platform "DPesca" and it is the fisher himself, at the end of his day's fishing, who enters all the information. The following is a brief compilation of the composition of the catches made by recreational fishing on the Andalusian Mediterranean coast.

Composition of catches on the Andalusian Mediterranean coastline:

In 2019, the Regional Department of Agriculture, Farming, Fishing and Sustainable development of the Junta de Andalucía published a report in which the information on catches is characterised by the target species of preference of anglers, not by the composition of the catches themselves.

Forty-three fish species were recorded on the Mediterranean coast, with gilthead seabream, red porgy, sea bass and sea bream being the preferred target species. EWG 21-01 notes that none of the species included in the WMMAP appears in the list.

- Catches composition of spearfishing: the information on the catches made by spearfishing has been collected through the DPesca digital platform throughout 2019 and 2020. A total of 665 trips to the sea have been made, obtaining a total of 1475 individuals caught, belonging to 54 species from 17 different families of fish and 1 of molluscs. EWG 21-01 notes that none of the species included in the WMMAP appears in the list.
- Catch composition of boat fishing catches: the data were obtained from the results of a project carried out by the fishers of the Al Andalus Association for Responsible Fishing and the General Secretariat for Fisheries in 2013, with data referring to fishing from boats in the Cabo de Gata-Níjar Marine Reserve. In total, 1043 fishing days have been analysed, with a total of 8076 individuals caught belonging to 29 different species. EWG 21-01 notes that none of the species included in the WMMAP appears in the list.

- Catch composition of the shore-based fishery: the data have been obtained from sampling carried out in two different projects. In 2010, a study was carried out on the coast of Granada, with 43 interviews at two points along the coast, and in 2019, 215 interviews were carried out in two areas along the coast of Malaga. The data collected corresponds to catches made by shore-based recreational fishers. A total of 26 species of fish and 2 species of molluscs have been identified. EWG 21-01 notes that none of the species included in the WMMAP appears in the list.

6.1.2.2 Recreational fishing on the Murcian coastline

- Catch composition on the Mediterranean coast of Murcia: a total of 471 surveys were conducted between 2017-2020 of which 233 (41.53%) were conducted to define the RF from boat, 220 (39.21%) correspond to interviews conducted to define the RF from shore, 67 (11.94%) to define the RF in diving and 41 (7.31%) online interviews. The composition of the catches is made up of about 22 species, among which mainly white seabream, squid, gilthead seabream and combers (*Serranus spp*) dominate. EWG 21-01 notes that none of the species included in the WMMAP appears in the list.
- Catch composition of underwater fishing/spearfishing: the data provided for this type of fishing were obtained by chance when monitoring fishing from boats and beach, with 15 interviews from boats and 51 from the beach. Catches in this mode comprised 9 species, of which flathead grey mullet and red mullet together accounted for 50% of the catches. In this type of fishing activity, *Mullus spp.* is about 18% (in number) of the catches. However, EWG 21-01 is not able to establish if the catches belong to the target species *M. barbatus* or the congeneric species *M. surmuletus*.
- Catch composition of boat fishery catches: the catches of this fishing modality are made up of 10 species, mainly squid (*Loligo vulgaris*) (36.07%), followed by tuna (12.69%, little tunny (*Thunnus alletteratus*), as well as albacore (*T. alalunga*) and some Atlantic bluefin tuna (*T. thynnus*) and horse mackerel (12.44%). EWG 21-01 notes that none of the species included in the WMMAP appears in the list.
- On-board fishing using with longline species: the on-board fishing using with longline species is the second most used modality in boat fishing, being the gear used in 25.75% (60) of the total number of surveys carried out. The catches are made up of 8 species such as comber (*Serranus hepatus*), pearly razorfish (*Xyrichtys novacula*) great pompano, Atlantic pomfret, grey mullet, Atlantic horse mackerel, gilthead seabream, and saddled seabream, all in the same proportion. EWG 21-01 notes that none of the species included in the WMMAP appears in the list.
- On-board fishing using surface trolling fishing: the RF with surface trolling lines is the third most used modality in boat fishing, being the gear used in 20.17% (47) of the total number of surveys carried out. The catches are made up of 8 species among which tuna (33.33%) mainly *T. alletteratus* and scombrids (16.66%) (*Auxis thazard thazard*) dominate, with the rest of the catches being divided in the same proportion between great pompano, horse mackerel, saddled seabream, dentex, black seabream and squid. EWG 21-01 notes that none of the species included in the WMMAP appears in the list.
- Catch composition of shore-based fisheries: in the surveys carried out, a total of 25 species of fishes were identified as being caught using four different types of fishing from the shore: buoy fishing, bottom fishing, spinning and surfcasting, mainly. The specific composition of the catches is made up of 34.72% white breams, followed by gilthead sea bream and salps, which account for 13.95% and 13.06%, respectively. In this type of fishing activity *Mullus spp.* is less than 5% (in number) of the catches. However, EWG 21-01 is not able to establish if the catches belong to the target species *M. barbatus*, or the congeneric species *M. surmuletus*.
- Catch composition of the shore-based surfcasting fishery: this type of fishing accounts for 28% of the gear used in coastal fishing. This type of fishing is the one that catches the largest number of species, 11, of which 4 (bogue, Atlantic gobies nei and red porgy) have catches of less than 1%. The specific composition of the catches of this type of gear is

dominated by sea breams, which account for 49% of the catches. Smaller quantities of salemas, wrasses, saddled sea bream and sea bass are also caught. EWG 21-01 notes that none of the species included in the WMMAP appears in the list.

- Catch composition of shore-based buoy fisheries: this modality accounts for 25.45% of the gear used in coastal fishing. The catch of this modality is made up of 7 species, among which white seabream dominate, accounting for 48.93% of the catches, followed by saddled sea bream, which accounts for 23.40% of the catches, as well as sea bass, salema, Mediterranean rainbow wrasse, gilthead bream and grey mullet. EWG 21-01 notes that none of the species included in the WMMAP appears in the list.
- Catch composition from shore fishing with spinning modality: this modality accounts for 10.45% of the gear used in coastal fishing. The catch of this modality is made up of 8 species, among which salema dominates, accounting for 32.69% of the catch, followed by white seabream, accounting for 28.85% of the catch, as well as *Serranus spp.* (17.31%) and other species such as Morays, grey mullet, gilthead bream, Mediterranean rainbow wrasse and saddled sea bream. EWG 21-01 notes that none of the species included in the WMMAP appears in the list.

6.1.3 Marine Recreational Fisheries in Italy

No documents regarding the marine recreational fishery activity in the area covered by WMMAP has been sent to EWG 21-01 by the Italian Authority.

6.1.4 Advice by MEDAC

MEDAC provided an advice on the marine recreational fishing in the Mediterranean in a document dated 2016 [13]. The document aims to provide some initial light to managers and decision-makers based on the soundest piece of scientific literature about recreational fisheries management, with the hope that the EU and the Member States adopt it and take it into account and start developing serious recreational fisheries managing and regulations. Different aspects are considered, structured in sections such as the description and development of a regulatory framework, the management framework for sustainable recreational fisheries, the policy and institutional framework, the recreational fisheries management and practices, other than the information, knowledge sharing and research. EWG 21-01 notes that among the main species targeted in EU Mediterranean by fishing modality (coast, boat, spearfishing) none of the species included in the WMMAP appears in the list.

6.1.5 Additional scientific literatures

In general, recreational fishing in the Mediterranean waters has not been the subject of a generalised study to allow the correct characterisation of the activity.

In 2018, a study was carried out as part of the SICORE project [17], in the communities of Catalonia, Valencia, and Murcia in the Mediterranean. Most of the work on recreational marine fisheries in the Mediterranean has been carried out in the Balearic Islands due to the high activity of this type of fishing in its waters, with few studies carried out in the Valencian Community and Murcia. This report shows that 90 different taxa (87 fish and 3 cephalopods) have been studied in the different types of work analysed up to 2018. The most studied species have been of the genus *Diplodus* spp (sargo breams) and to a lesser extent *Dicentrarchus labrax* (seabass). Of all the papers reviewed, red mullet appears in 11 of them, most of which do not specify their relative importance in the catches. White shrimp, Norway lobster, blue and red shrimp and hake do not appear in the lists as they are species that are not caught by RF in the Spanish Mediterranean.

Another report analyses recreational fishing in 10 Sites of Community Importance (SCIs) areas of the Life+Intemares project [6]. Five sites are located in the Mediterranean Sea: Canal de Mallorca, Canon de Cap de Creus, Sur de Almeria, Isla Columbretes and Isla de Alborano. This study only mentions the catch of hake by bottom fishing with electric fishing reels in the deep part of the Cap de Creus canyon and in the south of Almeria and Seco de los Olivos, and the

catch of red mullet by spearfishing in the south of Almeria and Seco de los Olivos, but in both cases, the relative importance of these species concerning the total catch is not reported.

In a socio-economic, environmental, and legislative study of RF in the Mediterranean coast, none of the target species of WMMAP appears as important. The target species for bottom fishing are: *Seriola dumerili*, groupers nei, *Dentex*, red porgy, squid and midsize squid; for shore fishing, sea bass, gilthead sea bream, white seabream (*D. sargus sargus*), meagre, leerfish and mackerel, bluefish, Frigate tuna, saddled sea bream, red porgy, squid and midsize squid [2].

In another study on sea fishing in Cap de Creus [12], 39 species were identified in the catches of the PMR, the most representative in number and weight being Mediterranean rainbow wrasse (*Coris julis*) and comber (*Serranus cabrilla*). EWG 21-01 notes that none of the species included in the WMMAP appears in the list of species targeted by RF.

Also, in a review carried out considering several locations in the Mediterranean, including Las Medas and Tabarca, it was found that the species mostly caught from both boat and shore fishing were *S. cabrilla* and *C. julis*, while at the family level, sparids and serranids dominated. In spearfishing, seabreams (*D. sargus sargus* and *D. vulgaris*), sea bass and octopus were the species with the highest catches. EWG 21-01 notes that none of the species considered by the WMMAP appears on the list of vulnerable species caught by recreational fishing (Font and Lloret, 2014).

In the Balearic Islands, a study carried out on the island of Mallorca found that the most popular recreational fishing method was from boats, followed by fishing from land and underwater fishing [14]. EWG 21-01 notes that among the 60 species identified in this study, none of them are species included in the WMMAP, only one species congeneric to one of them, the striped red mullet appears in the list.

In the work made by J. Lloret et al. [11], the authors evaluated the fishing pressure exerted by the most common recreational and small-scale fishing practices on vulnerable target and bycatch species in coastal and offshore waters of the western Mediterranean. By combining multiple data sources, a unique dataset on catches at multiple sites in these areas by recreational and small-scale fisheries was assembled, covering the period from 1997 to 2015. This work reported catches for European hake for the whole West Med of 0.18% for offshore recreational boat fishing (respect to the total catch, per fishing type, in coastal waters). This paper reported that in 2017 the Spanish recreational boat fishers declared a catch of 0.002 tonnes of *M. merluccius* coming from offshore waters, EWG 21-01 notes that no other species listed in the EU WMMAP have been here reported.

Another work made by Dedeu et al. [4] on the first nationwide assessment of marine recreational fishing catch compositions in Spain, reported catch data from 7,848 recreational fishers using an online survey that was conducted from February 2016 to February 2017. For the Mediterranean coastal area, catch compositions (in percentage by weight) for shore fishing, boat fishing and spearfishing representing 90% of the total catch is presented. EWG 21-01 notes that none of the species listed in the WMMAP appears on the list.

Silvestri et al. [23] reports the performance of certain sorts of recreational longlines in two areas of the Ligurian Sea (GSA 9). The analysis of the catches obtained with 167 fishing actions carried out with longlines by recreational fishers in two different areas of the Ligurian Sea, shows that none of the target species of WMMAP is present in the catches.

6.2 TOR 4 conclusions

EWG 21-01 is requested to evaluate for each stock whether recreational fisheries contribute to the demersal stocks' total catches and if yes to which amount, to assess the impact of recreational fisheries on the stocks covered by the WMMAP.

EWG 21-01 observes shreds of circumstantial evidences of the presence of European hake and *Mullus* spp. in the catch composition of recreational fisheries in the western Mediterranean, but without a clear indication about their relative importance or distinguishing congeneric species for *Mullus* spp.

The EWG 21-01 also notes that the four crustaceans considered by WMMAP have never been reported as caught by recreational fisheries.

Based on the information available in these documents the EWG 21-01 concludes that is reasonable to assume as not significant the contribution of the recreational fisheries on the demersal stocks covered by the WMMAP, essentially due to no matching between species targeted by recreational fisheries and the species listed in the WMMAP.

6.3 TOR 4 remarks

From the analysis of the documents sent by the Member States and the additional scientific literature analysed, it is clear that the impact of marine recreational fisheries on the stocks covered by the WMMAP is negligible. Only for hake and red mullets a few catches are reported. In the case of hake, a catch of 2 Kg/year is reported, while in the case of *Mullus* spp. it is not possible to establish whether it refers to *M. barbatus* or its congeneric *M. surmuletus*. However, it seems reasonable to assume that being targeted by spearfishers, these catches mostly refer to *M. surmuletus*.

The very low impact of marine recreational fisheries on the stocks covered by the WMMAP could be due to the fact that the spatial distribution of these species and the fishing grounds of recreational fishing do not match. In addition, the gears commonly used by recreational fishers are not efficient for most of the species covered by the WMMAP. In future, it would be recommended to extend the assessment of the impact of recreational fishing to all the species having MCRS.

7 REFERENCES

1. Arrêté du 20 décembre 2019 portant modification de l'arrêté du 28 février 2013 portant adoption d'un plan de gestion pour la pêche professionnelle au chalut en mer Méditerranée par les navires battant pavillon français - AGRM1936906A.
2. ASPA, 2017. Estudio socio-económico, ambiental y legislativo sobre la pesca marítima en el litoral español. (<http://www.queremospesca.org/wp/wp-content/uploads/ESTUDIO-SOCIOECONOMICO-AMBIENTAL-Y-LEGISLATIVO-SOBRE-LA-PESCA-MARI%CC%81TIMA-EN-EL-LITORAL-ESPAN%CC%83OL3.pdf>).
3. Decreto direttoriale n. 9045689 del 6 agosto 2020 - Decreto di attuazione art. 6, comma 1 del DM 13128 del 31.12.2019 - Individuazione delle zone vietate alla pesca professionale esercitata con gli attrezzi "rete a strascico a divergenti", "sfogliara rapido", "reti gemelle a divergenti", "reti da triano pelagiche a coppia", "reti da traino pelagiche a divergenti" e "draghe tirate da natanti (ex traino per molluschi)" nelle GSA 9, 10 e 11 ai sensi dell'art. 11, comma 2 del Reg. (UE) n° 1022/2019/2020.
4. Dedeu, A. L., Boada, J. & Gordo, A., 2019. The first estimates of species compositions of Spanish marine recreational fishing reveal the activity's inner and geographical variability. *Fish. Res.* 216, 65–73.
5. Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).
6. Font, T. and Lloret, J., 2014. Biological and Ecological Impacts Derived from Recreational Fishing in Mediterranean Coastal Areas, *Reviews in Fisheries Science and Aquaculture*, 22(1): 73-85.
7. FranceAgriMer, 2018. Étude sur l'évaluation de l'activité de pêche de loisirs en France métropolitaine (dont la Corse). Les études de FranceAgriMer, 88 pp.
8. Giannoulaki M., A. Belluscio, F. Colloca, S. Fraschetti, M. Scardi, C. Smith, P. Panayotidis, V. Valavanis M.T. Spedicato (Eds), 2013. Mediterranean Sensitive Habitats (MEDISEH). DG MARE Specific Contract SI2.600741, Final Report, 557 p
9. Guijarro B., E. Massutí, J. Moranta, P. Díaz, 2008. Population dynamics of the red shrimp *Aristeus antennatus* in the Balearic Islands (western Mediterranean): Short spatio-temporal differences and influence of environmental factors. *Journal of Marine Systems*, 71: 385-402.
10. IEO, 2021. Report on the impact of recreational marine fisheries in the Spanish Mediterranean in relation to the multi-annual plan for demersal fisheries in the Western Mediterranean, (2021). Subdirectorate on Scientific Investigation and Marine Reserves General Deputy for Sustainable Fishing. General Secretariat for the Fisheries. Reference number P22104, 15 pp.
11. Lloret, J., Biton-Porsmoguer, S., Carreño, A., Di Franco, A., Sahyoun, R., Melià, P., Claudet, J., Sève, C., Ligas, A., Belharet, M., Calò, A., Carbonara, P., Coll, M., Corrales, X., Lembo, G., Sartor, P., Bitetto, I., Vilas, D., Piroddi, C., Prato, G., Charbonnel, E., Bretton, O., Hartmann, V., Prats, L., Font, T., 2019. Recreational and small-scale fisheries may pose a threat to vulnerable species in coastal and offshore waters of the western Mediterranean. *ICES J. Mar. Sci.* 77, 2255–2264.
12. Lloret, J., Riera, V., Zaragoza, N., Caballero, D., Font, T., Casadevall, M., 2008. Pesca marítima recreativa i conservació dels peixos litorals: el cas del cap de Creus. *AIEE, Figueres*, 39(2008), 159-172.
13. MEDAC, 2016. MEDAC Advice for a regulatory framework and efficient management for recreational fisheries in the Mediterranean based on "FAO Technical Guidelines on Responsible Recreational Fisheries". Report Ref: 155/2016, 30 pp.

14. Morales-Nin, B., Moranta, J., García, C., Tugores, M.P., Grau, A.M., Riera, F., Cerdà, M., 2005. The recreational fishery off Majorca Island (western Mediterranean): some implications for coastal resource management. *ICES J. Mar. Sci.* 62, 727–739.
15. Orden APA/423/2020, de 18 de mayo, por la que se establece un plan de gestión para la conservación de los recursos pesqueros demersales en el mar Mediterráneo.
16. Orden APA/753/2020, de 31 de julio, por la que se modifica el Anexo III de la Orden APA/423/2020, de 18 de mayo, por la que se establece un plan de gestión para la conservación de los recursos pesqueros demersales en el mar Mediterráneo.
17. Pita, P., Alós J., Antelo, M., Artetxe, I., Biton-Porsmoguer, S., Cuadros, A., Feas, J., Font, T., Beiro, J., García-Charlton, J.A., Gordo, A., Lloret, J., Miranda, F., Morales-Nin, B., Mugerza, E., Palmer, M., Pascual-Fernández, J.J., Ruiz, J., Sandoval, V., Santolini, E., Zarauz, L. y Villasante, S. (2018). Estado del arte de la investigación sobre pesca marítima recreativa en España. En: Pita, P. y Villasante, S. (Eds.): Informe técnico del Proyecto SICORE. Santiago de Compostela, España, 42 pp.
18. Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC.
19. Regulation (EU) 2019/1022 of the European Parliament and of the Council of 20 June 2019 establishing a multiannual plan for the fisheries exploiting demersal stocks in the western Mediterranean Sea and amending Regulation (EU) No 508/2014.
20. Scientific, Technical and Economic Committee for Fisheries (STECF) – Landing Obligation - Part 6 (Fisheries targeting demersal species in the Mediterranean Sea) (STECF EWG 15-19), 2015. Sala A., and Damalas D. (eds.). Publications Office of the European Union, Luxembourg, ISSN 1831-9424, ISBN 978-92-79-54006-6, doi:10.2788/65549, EUR 27600 EN, JRC 98678, 268 pp.
21. Scientific, Technical and Economic Committee for Fisheries (STECF) – 62nd Plenary Meeting Report (PLEN 19-03). Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-14169-3, doi: 10.2760/1597, JRC118961, 154 pp.
22. Scientific, Technical and Economic Committee for Fisheries (STECF) – 63rd Plenary Report–Written Procedure (PLEN-20-01). Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-18117-0, doi:10.2760/465398, JRC120479.
23. Silvestri, R., Cassola, F., Viva, C., Voliani, A., 2019. Recreational fishery by longline in two areas of the Ligurian Sea. *Biol. Mar. Mediterr.* 26 (1): 369-370.
24. Wilderbuer, T.K., Kappenman, R.F., Gunderson, D.R., 1998. Analysis of Fishing Power Correction Factor Estimates from a Trawl Comparison Experiment. *North American Journal of Fisheries Management* 18: 11–18.

8 CONTACT DETAILS OF EWG 21-01 PARTICIPANTS

¹ - Information on EWG participant's affiliations is displayed for information only. In any case, Members of the STECF, invited experts, and JRC experts shall act independently. In the context of the STECF work, the committee members and other experts do not represent the institutions/bodies they are affiliated to in their daily jobs. STECF members and experts also declare at each meeting of the STECF and of its Expert Working Groups any specific interest which might be considered prejudicial to their independence in relation to specific items on the agenda. These declarations are displayed on the public meeting's website if experts explicitly authorized the JRC to do so in accordance with EU legislation on the protection of personnel data. For more information: <http://stecf.jrc.ec.europa.eu/adm-declarations>

Participant table to be updated by secretariat

STECF members		
Name	Affiliation¹	<u>Email</u>
Fabio Grati (EWG co-chair)	CNR Ancona Italy	fabio.grati@cnr.it

Invited experts		
Name	Affiliation¹	<u>Email</u>
Norbert Billet	IFREMER France	norbert.billet@ifremer.fr
Luca Bolognini	CNR Ancona Italy	luca.bolognini@cnr.it
Gregoire Certain	IFREMER France	gregoire.certain@ifremer.fr
Lorenzo D'Andrea	University of Rome 2 Italy	dandrea.lorenz@gmail.com
Antonio Garcia Dell'Arco	ICM-CSIC Spain	jagarcia@icm.csic.es
Beatriz Guijarro	IEO Spain	beatriz.guijarro@ieo.es

Sigrid Lehuta	IFREMER France	slehuta@ifremer.fr
Francesc Maynou	ICM CSIC Spain	maynouf@icm.csic.es
Matteo Murenu	Univerist of Cagliari Italy	mmurenu@unica.it
Francesc Ordinas	IEO Spain	xisco.ordinas@ieo.es
John Ramirez	ICM CSIC Spain	j.gabriel@icm.csic.es
Laura Recasens	ICM CSIC Spain	laura@icm.csic.es
Tommaso Russo	University of Rome 2 Italy	Tommaso.Russo@Uniroma2.it
Antonello Sala (EWG co-chair)	CNR Ancona Italy	antonello.sala@cnr.it
Paolo Sartor	CIBM Livorno Italy	psartor@cibm.it
Claudio Viva	CIBM Livorno Italy	viva@cibm.it

JRC experts		
Name	Affiliation¹	Email
Alessandro Mannini	JRC	alessandro.mannini@ec.europa.eu
Cecilia Pinto	JRC	cecilia.pinto@ec.europa.eu

European Commission		
Name	Affiliation¹	<u>Email</u>
Alessandro Mannini	JRC, STECF secretariat	jrc-stecf-secretariat@ec.europa.eu
Anne-Cecile Dragon	DGMARE D1	Anne-Cecile.Dragon@ec.europa.eu

Observers		
Name	Affiliation¹	<u>Email</u>
Marzia Piron	MEDAC	marzia_piron@hotmail.it

9 LIST OF BACKGROUND DOCUMENTS

Background documents are published on the meeting's web site on:
<http://stecf.jrc.ec.europa.eu/ewg2101>

List of background documents:

EWG 21- – Doc 1 - Declarations of invited and JRC experts (see also section 8 of this report – List of participants)

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: https://europa.eu/european-union/contact_en

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: https://europa.eu/european-union/contact_en

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: https://europa.eu/european-union/index_en

EU publications

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

STECF

The Scientific, Technical and Economic Committee for Fisheries (STECF) has been established by the European Commission. The STECF is being consulted at regular intervals on matters pertaining to the conservation and management of living aquatic resources, including biological, economic, environmental, social and technical considerations.

The European Commission's science and knowledge service

Joint Research Centre

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



@EU_ScienceHub



EU Science Hub - Joint Research Centre



Joint Research Centre



EU Science Hub



Publications Office
of the European Union