ISSN 2467-0715

Scientific Technical and Economic Committee for Fisheries (STECF) – Fishing effort regime for demersal fisheries in West Med (STECF-25-11)

Final draft report pending publication numbers for webpage release

Bastardie F., Döring, R., Pierucci A. (eds.)

2025

Joint Research Centre

EUR 28359 EN

This document is a publication 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 contents of this publication do not necessarily reflect the position or opinion 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.

EU Science Hub
https://joint-research-centre.ec.europa.eu

Luxembourg: Publications Office of the European Union, 2025

© European Union, 2025



The reuse policy of the European Commission documents 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). Unless 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 European Union permission must be sought directly from the copyright holders.

How to cite this report: European Commission, Joint Research Centre, *Scientific Technical and Economic Committee for Fisheries (STECF) – Fishing effort regime for demersal fisheries in West Med (STECF-25-11)*. Bastardie, F., Döring, R and Pierucci, A. Publications Office of the European Union, Luxembourg, 2025.

Contents

1.1. Abstract 4

1.2. Authors 5

1.3. SCIENTIFIC, TECHNICAL AND ECONOMIC COMMITTEE FOR FISHERIES (STECF) - Fishing effort regime for demersal fisheries in West Med (STECF-25-11) 6

1.4. Request to the STECF 6

1.5. STECF comments 6

1.6. STECF conclusions 20

1.7. References 22

1.8. Contact details of STECF members 22

2. Expert Working Group EWG-25-11 report 27

2.1. Introduction 28

2.2. Terms of Reference for EWG 25-11 32

A. References to most recent legal texts: 34

B. Management scenarios 36

C. Templates of tables for outputs 40

3. Main findings 45

3.1. Key findings for EMU1 (GSAs 1 2 5 6 7) 45

3.1.1. ISIS-Fish simulations 45

3.1.2. IAM Simulations 48

3.2. Key findings for EMU 2 (GSA 8-9-10-11) 54

3.2.1. Bemtool simulations 54

4. (TOR1) Time series of fishing effort updated to 2024 61

4.1. EMU 1 63

4.1.1. Time series by MS, GSA, fleet segment, gear 63

4.1.2. Comparison between FDI data and effort reference levels in EU Regulation 2019/2236, 2021/90, 2022/110, 2023/195, 2024/259 and 2025/219. 66

4.2. EMU 2 70

4.2.1. Time series by MS, GSA, fleet segment, gear 70

4.2.2. Comparison between FDI data and effort reference levels in EU Regulation 2019/2236, 2021/90, 2022/110, 2023/195, 2024/259 and 2025/219. 73

5. (TOR 2b) Estimate and discuss the measures to support the fleet and the consequences of fuel costs changes 78

5.1. Measures to support the fleet 78

5.2. Consequences of fuel costs changes in 2022-2024 81

5.3. Modeling of energy costs 84
6. (ToR 2a3a) Update the relationship between fishing effort and fishing mortality in the Effort Management Units 1 and 2 (EMU1 and EMU2) 85
6.1. (ToR3a) Partial fishing mortality ($\boldsymbol{Fpart}$) 91
6.1.1. Effort Management Unit EMU 1 91
6.1.2. Effort Management Unit EMU 2 93
6.2. (ToR 2a) Relationship between fishing effort and fishing mortality 96
6.2.1. Effort Management Unit EMU 1 96
6.2.2. Effort Management Unit EMU 2 115
6.3. Validate the estimation of Partial catch at age 130
6.4. (ToR 3a) Attempts to deduce next Effort 2026 levels from the F-E relationships 134
6.5. (ToR 3a) Possibility for change in efficiency induced by the effort reduction - Spatial effort allocation analysis of the Spanish fleet in EMU1 138
6.6. ToR 3a Possibility for change in efficiency induced by the effort reduction. How did the spatio-temporal closure established in 2020 in the Gulf of Lions affected fishing effort and CPUEs. 143
6.7. The catch of Hake under legal commercial size (20cm) 144
6.8. Effort redistribution in GSA 7 following spatio-temporal closure. 147
7. (ToR 3) Progress in operational mixed-fisheries models 155
7.1. ISIS-Fish in EMU 1 155
7.1.1. Implementation progress in EWG 25-11 155
7.1.2. Stocks and spatial distribution 155
7.1.3. Fishing fleets in ISIS-Fish 156
7.1.4. Economic indicators 161
7.1.5. Sources of data 161
7.1.6. Management scenarios considered in ISIS-Fish 162
7.2. IAM in EMU 1 163
7.2.1. Recall on the main issues and conclusions from EWG 24-12 163
7.2.2. Implementation progress in EWG 25-11 163
7.2.3. Stocks in the IAM model 164
7.2.4. Fishing fleets in the IAM model 166
7.2.5. Economic indicators in IAM 179
7.2.6. Management scenarios considered in IAM 184
7.3. BEMTOOL in EMU2 199
7.3.1. Recall on the main issues and conclusions from EWG 24-12 199
7.3.2. Implementation progress in EWG 25-11 200

7.3.3. Stocks in the BEMTOOL model 200
7.3.4. Fishing fleets in BEMTOOL 202
7.3.5. Economic indicators in BEMTOOL 204
7.3.6. Sources of data 204
7.3.7. Management scenarios considered in BEMTOOL 204
8. (ToR4) Management scenarios and results 206
8.1. ISIS-Fish in EMU 1 206
8.1.1. ISIS-Fish simulation outcomes 206
8.1.2. Discussion of the ISIS-Fish outcomes 216
8.2. IAM in EMU1 219
8.2.1. IAM Simulation outcomes 219
8.2.2. Detailed IAM outcomes 221
8.2.3. Socioeconomic indicators in IAM 241
8.2.4. General considerations using IAM in EMU1 268
8.3. BEMTOOL in EMU2 268
8.3.1. Stock status outcomes in BEMTOOL 269
8.3.2. Socioeconomic outcomes in BEMTOOL 270
9. Remaining issues and future steps 291
9.1. ISIS-Fish in EMU 1 291
9.2. IAM in EMU 1 292
9.3. BEMTOOL in EMU 2 293
10. References 294
11. Annexes 295
Annex 1. Supplementary Material (EWG25-11 -EMU1- IAM – ToR 3b) 295
Annex 2. Contact details of EWG-25-11 participants 318
12. List of electronic Annexes 320
13. List of Background Documents 320

1.1. 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 is the 14th of a suite of STECF EWG reports dedicated to the evaluation of the implementation of the Western Mediterranean Sea Multi-Annual management Plan. The report was presented to and reviewed by the STECF during its plenary meeting 10-14 November 2025.

1.2. Authors

STECF advice:

Ballesteros, Marta; Bastardie, Francois; Casey, John; Colaço, Ana; Cuende de Francisco, Elsa; Döring, Ralf; Drouineau, Hilaire; Grati, Fabio; Griffiths, Christopher; Hidalgo, Manuel; Ibaibarriaga, Leire; Jackson, Emmet; Jardim, Ernesto; Jung, Armelle; Ligas, Alessandro; Lucchetti, Alessandro; Mannini, Alessandro; Moore, Claire; Motova-Surmava, Arina; Nimmegeers, Sofie; Nord, Jenny; Pinto, Cecilia; Prellezo, Raúl; Raid, Tiit; Russo, Tommaso; Sabatella, Evelina Carmen; Savina-Rolland, Marie; Spedicato, Maria Teresa; Steins, Nathalie; Stransky, Christoph; Tserpes, George; Ulrich, Clara; Uriarte, Andres; Uusitalo, Laura; Valentinsson, Daniel

EWG-25-12 report: Bastardie, Francois; Döring, Ralf; Accadia, Paolo; Bitetto, Isabella; Carreton, Marta; Certain, Gregoire; Couve, Pablo; Garriga Panisello, Mariona; Genthon, Tanguy; Gourguet, Sophie; Leforestier, Sophie; Lehuta, Sigrid; Liontakis, Angelos; Merzéréaud, Mathieu; Metz, Sebastien; Murenu, Matteo; Perez-Rodriguez, Alfonso; Pierucci, Andrea; Sabatella, Evelina Carmen; Sala-Coromina, Joan

1.3. SCIENTIFIC, TECHNICAL AND ECONOMIC COMMITTEE FOR FISHERIES (STECF) - Fishing effort regime for demersal fisheries in West Med (STECF-25-11)

1.4. Request to the STECF

STECF is requested to evaluate the findings of the STECF Expert Working Group meeting, as well as those of the associated ad hoc reports, and make any appropriate comments and recommendations.

1.5. STECF comments

Three documents were evaluated by the STECF

1. Report of the Expert Working group 25-11: Fishing effort regime for demersal fisheries in West Med.
2. Ad hoc contract report (STECF 25103): Fishing effort scenarios for demersal fisheries in the western Mediterranean Sea (EMU 2).
3. Ad hoc contract report (STECF 25105): Efficiency of permanent closure areas under 600m depth in the Western Mediterranean Sea.

The two contracts were performed after the EWG meeting. Taken together, the EWG 25-11 report and the two contract reports provide additional insights to support current and future evaluations of the implementation of the Western Mediterranean Multi-Annual Management Plan (West Med MAP).

STECF firstly reviewed and commented the three documents separately, then common comments and conclusions were drawn.

The ad hoc contract reports are published on:

https://stecf.ec.europa.eu/document/32534030-de3c-4748-a28b-c2fce855c5ff

1. Report of the Expert Working group 25-11

EWG 25-11 is the fourteenth of a series of expert working groups dedicated to evaluating the implementation of the West Med MAP. The EWG was given an extensive set of ToRs, which are summarised and commented below. STECF considers that the EWG adequately addressed its TORs but encountered severe procedural difficulties that affected the group's performance; these are commented first.

Process feedback (see also ToR 7.1 in this plenary report)

STECF notes that the detailed management scenarios needed for simulation were not delivered until the first morning of the EWG meeting. The lack of early detail delayed model preparation, causing most of the meeting to be spent on the setup of the models. As a result, initial model outputs were only available on the final day of the EWG meeting, leaving insufficient time to fully review and reach conclusions on all simulations.

STECF notes that in 2025 the West Med MAP moved from its transition phase to its permanent phase, meaning that provisions concerning the “most vulnerable stock” and the “Voluntary Temporary Compensation scheme” are now part of the 2025 regulation on maximum permissible fishing effort. As the most vulnerable stock may now change from year to year, the results from the stock assessment EWG (EWG 25-09) are now of greater importance for setting up the simulation scenarios. STECF notes several data issues had to be resolved at the start of the meeting. Stock objects from the Western Mediterranean stock assessment EWG need to be shared in due time ahead of the EWG, as well as partial F and partial catch-at-age matrices by gear. Therefore, improving communication and alignment between the two EWGs is crucial, especially considering the limited time between the two EWGs.

In addition, STECF recalls that the following data are also needed before the meeting starts ; i) all relevant FDI data; ii) all necessary economic data, including GSA-level data in EMU 2 not available from the AER; iii) the management scenarios to be assessed, together with all data needed to simulate them (e.g. VMS–logbook spatial data for spatial scenarios); iv) an overview of national implementation measures, such as additional fishing days, if compensation mechanisms are to be evaluated.

Furthermore, in order to keep the EWG time for discussions, model cross-checking and common conclusions, all preparatory work should be organised and completed before the meeting. Options include *ad-hoc* contracts for modellers to run the scenarios and a preparatory meeting to compile and verify input data and set up the simulation models.

STECF finally notes that one *ad-hoc* contract relied on the draft EWG 25-11 report, which had not yet been endorsed by STECF. Although the *ad-hoc* contract report’s author was also involved in the EWG, the version used may not reflect the final STECF report. Therefore, any findings from the *ad-hoc* contract referring to the EWG 25-11 report should be revisited once the report is finalized and endorsed by STECF.

Some of the aforementioned points are further discussed under ToR 7.1 in this plenary report dealing with the 2026 West Med MAP work programme.

ToR 1. Time series of fishing effort

STECF notes that, as requested, time series of fishing effort (fishing days, days at sea, hours at sea, GT × fishing days, and kW × fishing days) were produced by country (Spain, France, Italy), EMU (1 and 2), GSA (1, 5, 6, 7, 8, 9, 10, 11), gear (OTB, OTT, GNS, GTR, LLS, other), and fleet segment (<12 m, 12–18 m, 18–24 m, >24 m). Graphs for fishing days are presented in the report; all remaining data are provided in Annex I (Excel workbook).

STECF notes that for both EMU 1 and EMU 2, trends in fishing effort (fishing days) by gear and fleet segment were generally stable or decreasing over 2015–2024. Exceptions include FRA–GSA7–OTT and ESP–GSA5–GTR, which showed increasing trends.

EWG 25-11 compared the effort deployed in 2024, as estimated using FDI data, with the effort ceiling as per the fishing opportunities regulations (Reg. 2024/259 and Reg. 2025/219). In EMU 1, the 2024 effort ceiling was largely above the deployed effort for French trawlers (+49%), but slightly below the deployed effort for Spanish trawlers (-8%). For both Member States, the 2025 effort ceilings were set lower than the fishing days reported for 2024, in spite of compensation provisions at Member State, métier, and vessel level. In EMU 2, the 2024 effort ceilings were higher than the deployed 2024 effort for both Italian (+13%) and French trawlers (+36%). In 2025, both Member States received lower effort ceilings than their 2024 declared effort. STECF also notes that France received 2025 fishing opportunities for the deep-water métier, despite no such activity being declared in previous years or in 2024 according to the FDI data.

ToR 2a. Relationship between F and fishing effort

The EWG updated the relationships between fishing effort and fishing mortality in EMU 1 and EMU 2 using the most recent stock assessment results from EWG 25-09 (F_{bar} by species) and the corresponding time series of deployed effort by gear from the 2025 FDI data call.

STECF notes that the results of the fishing mortality-effort (F-E) analysis need to be interpreted on a case-by-case basis. As in previous West Med analyses produced by STECF, no consistent linear relationship across GSAs and stocks was observed for any gear. At stock level, the relationship was sometimes significantly positive (e.g. HKE in GSAs 1_5_6_7, DPS_5_6_7, and ARA_6_7); however, when examined separately by GSA, relationships were generally weak and sometimes inverse. STECF reminds also that these relationships are difficult to analyse for nets and hooks, as effort expressed in days does not properly reflect the true level of deployed effort by such gears.

These findings indicate that F-E dynamics are gear- and area-specific, likely influenced by differences in selectivity, temporal patterns of effort, local ecological conditions, and potential changes in catch efficiency during the effort reduction period (see ToR 3a). Significant correlations observed for several gears highlight the need to incorporate gear- and area-specific effort considerations in management to avoid overexploitation.

ToR 2b. Information on subsidies and consequences of fuel cost changes

The EWG addressed: i) measures supporting the fleet; ii) the effects of fuel price changes during 2022–2024; and iii) approaches for modelling energy costs. Main findings are:

i) Measures to support the fleet

The EWG used and commented the findings of three *ad-hoc* contracts completed in 2024, which collected information on subsidies in Spain, France, and Italy, focusing on trawl vessels operating in the Western Mediterranean. The EWG summarised the mandatory temporary cessation (MTC) schemes implemented by France, Italy, and Spain. While they are all aimed at reducing trawl effort and support income during temporary cessations, they differ in implementation, traceability, and calculation methods among Member States. PLEN 24-03 concluded that payments related to MTC could, in principle, be integrated into West Med MAP modelling. However, PLEN 24-03 highlighted persistent data gaps due to pending payments, incomplete reporting, and inconsistencies in timing.

To improve future analyses, STECF notes that the EWG 25-11 suggested that temporary cessation payments be provided in a standardised and complete format. That would include (i) annual breakdown of actual payments; (ii) breakdown by GSA and fleet segment aligned with West Med MAP units; (iii) clear identification of the measure associated with each payment; (iv) inclusion of both EU and national funding shares.

Information on permanent cessation schemes was also reviewed. France's 2022 decommissioning plan removed 14 vessels (1,471 GT; 4,424 kW), already incorporated into the model baseline. Spain's 2024 action plan includes a decommissioning scheme for segments considered to be out of balance between capacity and fishing opportunities, and Italy's 2024 action plan foresees the withdrawal of 4,563 GT in GSAs 9, 10, and 11. Scrapping measures will take effect from 2026 and are being integrated into the simulation of the bio-economic model for all scenarios.

(ii) Consequences of fuel cost changes in 2022–2024

Using EUMOFA data, the EWG reported trends in marine fuel price for Spain, Italy, and France from 2020 to 2025 (partially). Prices showed high volatility, and the EWG analysed how this impacted operating costs, profitability, and effort decisions.

STECF notes that the EWG reports that the ratio of energy costs to revenues increased markedly for many fleet segments between 2020 and 2023. Larger and more energy-intensive trawl fleets were most affected, underscoring the vulnerability of Mediterranean fleets to fuel price fluctuations.

(iii) Modelling of energy costs

The EWG discussed potential improvements for modelling fuel consumption and concluded that combining energy audit data with high-resolution logbook information can support fisheries-specific estimates of daily fuel use based on vessel characteristics. In this context, STECF notes that the ongoing DecarbonyT project (Decarbonisation of the fishing fleet in the Mediterranean and Black Sea https://decarbonyt.eu/) will provide further tools. In particular, Task 2 of this project will develop an application to model vessel-level fuel consumption during steaming and fishing phases, providing bottom-up estimates of fuel use and carbon emissions at fleet-segment level.

ToR 3a. Partial fishing mortalities

In continuity of EWG 25-09, the EWG completed the calculation of partial fishing mortalities (F_part) in 2024 by species, GSA, gear and age for EMU 1 and EMU 2 using stock assessment values. STECF notes that F_part varies across fleet segments and GSAs in both EMUs, but **OTB segments account for the highest** F_part for the majority of stocks.

STECF notes that the EWG developed a number of analyses under this ToR.

The EWG discussed, for the first time, whether the significant positive linear relationships for some fleet segments and stocks developed under ToR 2a might be used as a guide to determining the approximate level of effort required to achieve a desired fishing mortality rate i.e. if the F-E relationship is significant and positive, for a given value of F on the y-axis, the corresponding level of effort can simply be read from the x-axis. The EWG suggested that future bioeconomic modelling under the West Med MAP could explore such an approach further.

The EWG also analysed the p**otential changes in catch efficiency linked to effort reduction in two cases. The first case was for Spain in EMU 1.** The spatial fishing patterns of the Spanish fleet were analysed using VMS data (2024) and earlier data (for the year 2021, available from a previous effort EWG). Beyond the fact that most days at sea are spent in **GSA 6, the** analysis detected a likely displacement of effort towards more offshore areas between 2021 and 2024, especially in **GSA 1,** probably rather due to reduced activity of smaller vessels rather than a systematic shift by all vessels. Confirmation would require access to vessel-level VMS data. Considering that management is organised by gear and vessel size and not by GSA, the EWG reflected that the fleet may concentrate effort in high-density stock areas in response to restricted effort. Such behaviour can blur F-E relationships and complicate management, particularly when other measures (closures, selectivity changes, effort limits and/or fleet restructuring) interact with effort dynamics.

The second case was for the **spatio-temporal closure established in the Gulf of Lion (GSA 7) since 2020.** The measure consists of two seasonal closures designed to protect juvenile hake (*Merluccius merluccius;* HKE). The EWG examined: i) changes in juvenile hake catches since 2020, ii) redistribution of effort; and iii) trends in CPUE. STECF has specific comments on these three points:

- Regarding point i), STECF notes that the proportion of hake catches below MCRS remains very high (~50%), driven mainly by **poor size selectivity** of the gear (40 mm square mesh). The closure has **not reduced** the proportion of undersized hake; with inter-annual variation reflecting recruitment strength rather than management effects.

- Regarding point ii), STECF notes that trawlers have adapted to the closure. They shift effort to the **boundaries** of the closure when it is active and concentrate more in the **central area** when it is open. The total effort in the area when it is open is slightly higher than before the establishment of the closure for the same period. In parallel, a marked decrease in effort in **coastal areas** was

observed. The EWG suggests though that the overall reduction in effort in GSA 7 is attributed mainly to the **West Med MAP effort reductions**, not to the closure itself. Finally, the EWG also compared trends in effort expressed in days (the unit of fishing effort ceilings) or in hours. Effort in GSA 7 effectively decreased by **27% in fishing hours** over 2020–2024, consistent with West Med MAP effort reductions.

- Regarding point iii), STECF notes that in areas outside the closure when it is in force and within the areas outside the closed season, strongest CPUE increases have been observed for **red mullets (*Mullus* spp.; MUX)** and monkfishes (*Lophius* spp.; **MNZ)**, and less so for **hake** and **octopuses (Octopodidae; OCT)** from which only hake and red mullet is included in the West Med MAP. Total CPUE (TOT CPUE, all species combined) also increased, likely due to the combined effects of effort reductions and the 8-months resting period created by this closure. Investigating patterns more closely, monthly CPUE analysis indicates that juvenile catches were **not reduced**, despite good compliance, because the low gear selectivity means that fishing during the 4-months open period removes any benefit gained in protecting the juveniles during the closure.

STECF notes thus that, overall, both the spatio-temporal closure and the broader effort reductions **may have improved exploitation status** for several stocks in GSA 7. However, these indications — primarily based on CPUE — will require confirmation through future stock assessments.

ToR 3b. Effort and catch management scenarios for all demersal gears in EMU 1 and EMU 2

The EWG was requested to simulate a wide range of effort management scenarios for EMU 1 and EMU 2 up to 2030 (see Table 1.5.1). The EWG used three bioeconomic models, depending on the EMU: Isis-Fish (primarily hake in EMU 1), IAM (EMU 1), and BEMTOOL (EMU 2). Across these models, simulations covered the following scenario types: Status quo (SQ), Trawler-only effort reduction (A), Temporary selectivity measures (B), Permanent selectivity measures (C), 12-months deep closures (D), 5% 12-months closures at 200–500 m (E) and Catch limits (F), with some additional variations (Table 1.5.1). STECF notes that, due to the procedural, technical, and time constraints described above, only 8 of the 9 requested scenarios could be implemented during the meeting. STECF also observes that, by design, some scenarios could not be simulated with the modelling platforms available at the meeting (e.g. spatial scenarios D and E cannot be run with non-spatial models). In contrast, additional scenarios were required as preparatory steps before the requested simulations could be executed. Overall, there was no time available for the EWG to collectively exchange on the outcomes from the simulation results.

The scenarios requested and those actually completed are summarised in Table 1.5.2. STECF notes that the SMART model simulations listed in the table were completed separately under *ad-hoc* contract STECF 25103 after the EWG meeting. STECF's review of this contract is provided later in the report (see Section 2). This sequencing of work prevented any collective discussion of results across the different modelling approaches.

Table 1.5.1: Management scenarios requested to EWG-25-11.

Scenario for 2026 and beyond	**Trawler effort levels to Achieve F_{MSY} of most vulnerable stock**	**Compensation Mechanism for trawlers**	**Set nets (GNS&GTR) Catch Limit for HKE levels As well as Effort level (fishing days) LLS**	**Catch Limit level For ARS and ARA**	**Conservation Measures (Spatial)**	**Conservation Measures (Selectivity)**
SQ What happened in 2025	Same effort in 2026 as in FO2025	Same level of compensation in 2026 and beyond as in 2025	Levels of 2025	Level of 2025	keep closure areas adopted until 2025 (see Annex A of the EWG report)	2025 implementation: Full ES fleet, 2 thirds of FR fleet
A F_{MSY} in 2026 and beyond from trawling effort reduction only	2026: level of reduction that secures F_{MSY} in 2026 and beyond for all stocks (based on most vulnerable stock in each EMU)	**A1** 2026: 50% of compensation gained in 2025 implementation and same for 2027 and onwards	Levels of 2025	Level of 2025	Keep closure areas adopted until 2025 (see Annex A of the EWG report)	2025 implementation: Full ES fleet, 2 thirds of FR fleet
		A2 Same level of compensation in 2026 and beyond as in 2025				
B Temporary selectivity	2026: level of reduction that secures F_{MSY} in 2026 and beyond for all stocks (based on most vulnerable stock in each EMU)	Same level of compensation in 2026 and 2027 as in2025 and no more compensation after	Levels of 2025	Level of 2025	Keep closure areas adopted until 2025 (see Annex A of the EWG report)	increase in selectivity with mandatory square mesh size of 45mm in coastal and 50mm in deep- water in codend for all trawlers in ES, FR & IT in 2026 but then changed back to 40mm for all as of 2027

C Permanent selectivity	2026: level of reduction that secures F_{MSY} in 2026 and beyond for all stocks (based on most vulnerable stock in each EMU)	Same level of compensation in 2026 and beyond as in 2025	Levels of 2025	Level of 2025	Keep closure areas adopted until 2025 (see Annex A of the EWG report).	Permanent increase in selectivity with mandatory selectivity measures (e.g. square mesh size of 45mm in coastal and 50mm in deep-water, codend length, flying doors) for all trawlers in ES, FR & IT in 2026 and beyond
D 12-month Deep closures	2026: level of reduction that secures F_{MSY} in 2026 and beyond for all stocks (based on most vulnerable stock in each EMU)	**D1** 2026: 50% of compensation gained in 2025 implementation and same for 2027 and onwards **D2** Same level of compensation in 2026 and beyond as in 2025	Levels of 2025	Level of 2025	Keep closure areas adopted until 2025 (see Annex A of the EWG report). in addition, an increase of 12-month closure areas for trawlers to deeper waters (depths depending on stocks biology	2025 implementation: Full ES fleet, 2 thirds of FR fleet
E 5% 12-month closures in waters between 200m and 500m	2026: level of reduction that secures F_{MSY} in 2026 and beyond for all stocks (based on most vulnerable stock in each EMU)	**E1** 2026: 50% of compensation gained in 2025 implementation and same for 2027 and onwards **E2** Same level of compensation in 2026 and beyond as in 2025	Levels of 2025	Level of 2025	Keep closure areas adopted until 2025 (see Annex A of the EWG report). in addition, an increase of 12-month closure areas for trawlers to deeper waters (depths depending on stocks biology	2025 implementation: Full ES fleet, 2 thirds of FR fleet
F Catch limits	2026: level of reduction that secures F_{MSY} in 2026 and beyond for all stocks (based on most vulnerable stock in each EMU)	Same level of compensation in 2026 and beyond as in 2025	25% reduction from 2024 level (starting from 2026 and then maintained)	2025 level of reduction that secures F_{MSY} in 2026 for ARA and ARS	Keep closure areas adopted until 2025 (see Annex A of the EWG report).	2025 implementation: Full ES fleet, 2 thirds of FR fleet

Source: PLEN-25-03 elaboration based on EWG-25-11 report.

Table 1.5.2. Simulations carried out by the EWG and additional SMART ad hoc contract.

		EMU1		EMU2	
		ISIS-Fish	IAM	SMART	BEMTOOL
		EWG 25-11	EWG 25-11	Ad-hoc 25103	EWG 25-11
REQUESTED SCENARIOS	**SQ**	X	X	X	X
	A1	X	X	X	
	A2			X	
	B	X	X		X
	C	X	X		
	D1			X (D800)	
	D2	X			
	E1			X	
	E2				
	F		X	X	X
ADDITIONAL SCENARIOS	**SQ2024**	X			
	A0		X		
	B0				X
	C0		X		
	D600			X	
	D700			X	
	F0				X

Source: PLEN-25-03 elaboration based on EWG-25-11 report.

The main findings from each simulation are presented below, by model.

Isis-fish (EMU 1)

Simulations focusing on hake in EMU 1 indicated that hake biomass is expected to increase under the status quo scenario, assuming the larger mesh size introduced in 2025 remains in place. Reverting to the smaller mesh size (scenario B) would negate these gains.

The additional SQ2024 scenario (same effort level but without selectivity measures) would lead to higher fishing mortality and lower SSB than the SQ scenario, evidencing the gain attributed to the selectivity measures. The model projects economic benefits for netters and longliners due to larger fish sizes but highlights the need for adaptive catch limits to prevent premature closure of these fisheries.

Scenario A1 (F_{MSY} in 2026 from trawling effort reduction and removal of 50% of compensatory days) indicates hake fishing mortality would fall below F_{MSY} and SSB would be close to B_{MSY} in 2030, though with negative economic impact for Spanish trawlers (-6% variation of gross profit margin in 2030 with respect to 2024).

Under Scenario C (full adoption of 45 mm square mesh codend for OTB, and OTT ban by all French trawlers from 2026 on), results are mixed: fishing mortality for ages 1-3 (F_{bar}) increases slightly , but F on age-0 hake decreases (due to the increased size selectivity).Scenario D2 (permanent closure >600 m to protect ARA) shows no additional reduction in hake fishing mortality compared with status quo and indicates higher F on age-0 hake, likely due to effort displacement into coastal areas where juvenile concentrate.

IAM (EMU 1)

IAM is a non-spatial model; spatial scenarios were therefore not tested.

Across scenarios, maintaining 2025 deployed effort levels (scenarios SQ, B, C), the model's projections fail to achieve F_{MSY} for all stocks by 2026, primarily due to insufficient reductions in fishing mortality for Norway lobster (NEP) in GSA6, the most vulnerable stock. Scenario A0 that includes effort reductions to successfully bring all stocks to F_{MSY} by 2026, generates the largest increases in biomass but also the largest reductions in landings and profits.

Regarding the selectivity measures, maintaining the mesh size change introduced in 2025 is beneficial; while returning to 40mm mesh size (scenario B) is detrimental with increase catches of undersized hake and long-term negative effects on the biomass recovery. However, the scenario with permanent selectivity measures implemented in 2026 and beyond (scenario C) does not lead to big differences with respect to the SQ scenario as it concerns only a few vessels (those that did not implement selectivity measures in 2025).

The scenario A1, which couples the selectivity measures with a reduction in trawling effort, results in a fishing mortality closer to F_{MSY} for NEP in GSA 6 and below F_{MSY} for all the other stocks. Scenario A0 that secures reaching F_{MSY} by 2026 for all stocks requires substantial effort reductions in Spanish trawlers (~63%) with subsequent negative economic consequences.

Scenario F (dynamic catch limits targeting blue and red shrimp (*Aristeus antennatus,* ARA) similarly achieves F_{MSY} across stocks and spreads negative economic impacts more evenly among gears.

Overall, scenarios A0, C0 and F would reach F_{MSY} in 2026 and produce the strongest improvements in SSB by 2030. However, all of these scenarios show severe short-term economic impacts for Spanish trawlers, while hook fisheries in both countries and French trawlers are expected to benefit from biomass increases.

BEMTOOL (EMU 2)

The version used is non-spatial, therefore, spatial scenarios were not tested.

Simulations examined combinations of effort reductions and selectivity improvements to reach F_{MSY} for Norway lobster in GSA 11. Under SQ, B0, and F0, trawlers are constrained by catch limits for red shrimps, which regulate effort for deep-water trawling segments (OTB_DWS, OTB_MDD). Under scenarios B and F, trawling effort is reduced substantially—~80% fewer fishing days for OTB_DEF compared to 2025 — to reach F_{MSY} for Norway lobster in GSA 11. In contrast to scenarios SQ, B0 and F0, the scenarios with trawling effort reduction (B and F) predict SSB will rise quickly, reaching B_{pa} in 2–3 years for all stocks. However, these scenarios also project reduced short-term revenues for trawlers across GSAs, while passive gears benefit from reduced competition. Scenario B, which combines strong effort reductions with temporary selectivity improvements, yields the best outcomes for passive gears in terms of catches and revenues. For trawlers, the highest gross profit margins are obtained for scenario SQ in GSAs 9 and 10, and for scenarios B and F in GSA 11.

Summary across EMU 1 and EMU 2

Across models, results indicate that current management measures (SQ scenario) are not sufficient to successfully bring all stocks to F_{MSY} in 2026 nor by 2030. Additional effort reductions and/or dynamic catch limits are needed, especially for the most vulnerable stocks, with the subsequent negative economic impacts for some of the fleet segments. Reverting to smaller mesh sizes has been shown to jeopardise progress to F_{MSY}, while a reduction of the compensation mechanisms seems to facilitate progress towards F_{MSY}. The impacts of the adoption of permanent selectivity measures are not conclusive across models as they only involve a few number of vessels.

However, STECF stresses that the simulation outputs should be considered as indicative of likely future directions of changes, rather than precise predictions, and must be interpreted with caution. STECF recalls also that the models do not include trophic interactions or dynamic responses in fishery behaviour and stock productivity. Additionally, spatial analyses using VMS data (see ToR 3a) show that spatio-temporal closures, such as those in the Gulf of Lion, can influence catch efficiency and stock recovery. These effects are not fully captured in the bioeconomic models.

ToR 4b. Synoptic overview of the outcomes

STECF notes that the EWG was unable to fully address ToR 4b because modelling results were only available on the final day of the meeting, leaving insufficient time for discussion or interpretation. Only the status quo scenario was run across all bioeconomic models, while one scenario (E2) was not implemented in any model. As each model has its own structure and assumptions, and despite the standardisation of output indicators, results from different models are not fully comparable. Cross-model discussion and a shared understanding of model behaviour, necessary for deriving general conclusions, were not possible, and the individual model results should therefore be interpreted with caution.

The analysis presented by EWG 25-11 provides a solid basis for deriving economic insights using the four indicators agreed in EWG 24-12: Gross Value Added, Gross Profit, Gross Profit Margin, and Full Time Equivalent. The current analysis does not evaluate broader downstream impacts on related sectors (e.g. processing, ancillary services, fishing communities). Acknowledging these limitations would strengthen interpretation and guide future research.

Furthermore, STECF notes that these are strictly economic indicators, not socio-economic ones, as they reflect financial performance and employment, but not wider social impacts. Incorporating social and community-level impacts would provide a more complete picture of the management plan's effects on overall socio-economic sustainability. In this context, STECF highlights that the social dimension toolbox developed through recent STECF EWGs on Social Data (EWG 24-05, EWG 25-02) offers relevant resources, including National Fisheries Profiles (https://oceans-and-fisheries.ec.europa.eu/national-fisheries-profiles_en), Fisheries Community Profiles, social indicators, social data calls (https://dcf.ec.europa.eu/data-calls/social_en), and the Annual Social Report (EWG 25-13). While some tools are still under development, they offer a useful starting point for future work. Their potential use in support of analyses of the West Med demersal effort regime should be explored in line with future strategic objectives and planning.

2. *Ad-hoc* contract report (STECF 25103): Fishing effort scenarios for demersal fisheries in the western Mediterranean Sea (EMU 2)

The main objective of this *ad-hoc* contract was to apply the SMART model (Russo et al., 2014; D'Andrea et al., 2020) to all demersal fishing gears in EMU 2 to simulate the management scenarios requested to EWG 25-11. STECF notes that SMART has been used in previous EWGs assessing fishing effort regimes for demersal fisheries in the Western Mediterranean, particularly for spatial management scenarios. This year, however, SMART experts were unable to attend EWG 25-11, and model simulations could not be included in the report. Consequently, the results from this *ad-hoc* contract serve as a complementary contribution to the EWG 25-11 report described above, in line with previous years.

The SMART model for EMU 2 was set up using updated 2024 data, including stock data from EWG 25-09, catches, VMS-derived effort, and biological and economic information. A total of eight management scenarios were simulated: SQ, A1, A2, D600, D700, D800, E, and F (cf Table above). STECF notes that the D600, D700, and D800 scenarios reflect the D1 scenario, with varying thresholds for deep-water closures, while scenario E corresponds to the requested E1 scenario. For both D1 and E1 scenarios, 50% of the compensation gain achieved in 2025 was applied in 2026, and the same level of compensation as in 2025 was maintained from 2027 onwards. Additionally, the D600, D700, and D800 scenarios, involving 12-months closures of waters deeper than 600m, 700m, and 800m respectively, were included to assess the progressive impacts of closing deeper areas.

STECF notes that Scenario E, defined in the TORs as a closure of 5% of fishing grounds between 200m and 500m for trawlers, was implemented based on the Core Fishing Ground Analysis developed by ICES (https://github.com/ices-taf/MBCG_trade-off). Core Fishing Grounds were defined as the smallest area required to maintain 95% of current GVA, using the methodology of Ban and Vincent (2009) and Fabbrizzi et al. (2023), and applying the 'prioritizr' package in R (Hanson et al., 2023). A randomly selected block of cells, equal to 5% of the Core Fishing Grounds within the 200–500m depth range, was then closed to fishing in addition to existing closures. This approach has previously been applied in EMU 2 and other Mediterranean case studies (Sbrana et al., 2025).

STECF emphasizes that scenario definitions can be subject to different interpretations in terms of model parametrisation. To ensure meaningful comparisons, scenario assumptions must be clearly defined and discussed during model setup. Transparent documentation of assumptions is essential for consistent interpretation across analyses.

STECF notes that despite being a key species in deep-water fisheries, blue and red shrimp could not be fully included in the SMART model due to the absence of an analytical assessment (stock Category 5 in STECF EWG 25-09). As a result, the implementation of maximum catch limits for this stock could not be simulated.

Results from the SMART model indicate that all alternative management scenarios (A1–F) reduced F and increased SSB relative to the Status Quo (SQ), with stronger effort reductions yielding greater biological benefits. D-type scenarios, particularly D600, provided the strongest conservation outcomes. Conversely, SQ and Scenario E maintained higher fishing pressure and limited biomass recovery.

STECF further notes that stock-specific responses varied across scenarios. Scenario D600 achieved the greatest F reduction for giant red shrimp (*Aristaeomorpha foliacea*, ARS), while Scenario E was most effective for deep-water rose shrimp. Norway lobster in GSA 9 and GSA 11 showed reductions in F only under scenarios A and F. Red mullet was unaffected by spatial measures, as its main fishing grounds fall outside closure areas. None of the scenarios brought F below F_{MSY} for giant red shrimp, red mullet, or Norway lobster, while hake reached or remained below F_{MSY} in all scenarios.

Regarding SSB, all scenarios projected giant red shrimp, deep-water rose shrimp, and red mullet above Bpa. Hake was close to but slightly below Bpa, while the two Norway lobster stocks were below Bpa, but above Blim. STECF notes that the sharp increase in hake recruitment estimated for 2024 may influence these projections. Strong fluctuations across scenarios also reflect high uncertainty for future stock dynamics.

Scenarios with stronger F reductions (e.g. D600–D800) resulted in stable or increased catches in 2030 compared to 2026, while scenarios maintaining high exploitation (e.g. SQ, F) showed reduced catches in 2030. This underscores the mid-term benefits of mortality reduction, especially for rebuilding stocks.

Finally, STECF notes that from an economic perspective, all scenarios except E showed higher profitability and full-time equivalent employment than SQ. D-type scenarios delivered the largest short-term improvements in gross profit margin and employment due to reduced costs and improved stock status. By 2030, D700 emerged as the scenario combining strong economic performance and sustainable exploitation levels.

STECF recalls that in 2024 (PLEN 24-03), the limited number of SMART model iterations led to concerns over result robustness. The longer time-frame provided under the ad-hoc contract improved computational feasibility but was still insufficient to simulate all requested scenarios. Moreover, running simulations after EWG 25-11 reduced chances for model comparison and postponed the finalisation of technical discussions.

3. *Ad-hoc* contract report (STECF 25105): Efficiency of permanent closure areas under 600m depth in the Western Mediterranean Sea

The second *ad-hoc* contract had two main objectives: (1) to compile and summarize literature on permanent deep-water closures in the Mediterranean Sea, with a focus on the socio-economic impacts of fisheries operating below 600 m depth, and (2) to assemble available data to set up a spatial BEMTOOL model for EMU 2.

STECF notes that the literature review included six documents: three related to EMU 1, two to EMU 2, and one covering both EMUs. These documents comprised the draft West Med effort regime report (EWG 25-11) and the previously described ad-hoc contract nº 25103. One of the reviewed documents (*ad-hoc* contract 2217) had already been assessed by STECF in PLEN 22-02.

The main findings and limitations of each document are summarized in Tables 1.5.3 and 1.5.4 for EMU 1 and EMU 2, respectively.

Table 1.5.3. Synthesis of the literature review on the socio-economic impact of the deep-water closures for EMU 1.

Management Unit: EMU 1					
Source	**Fleets covered**	**Stocks covered**	**Deep-water closures**	**Main findings**	**Limitations**
STECF ad hoc 2217 (based on BEMTOOL model)	DTS >12 m; Spain and France	ARA1 and ARA67	Closure areas under 600 m and 800 m	increased ARA SSB (+4 for 800 m and +17% for 600 m in GSA1) and decreased GVA for Spanish trawlers	+ only trawlers and two stocks were dynamically modelled + Spanish economic data were estimated (not available) + closures were simulated without effort reallocation
STECF EWG 25-11 (based on Isis-Fish model)	Trawlers, gillnets and longlines; Spain and France	HKE1-5-6-7	Closure areas under 600m	No further hake F reduction vs SQ; age-0 F slightly rises (effort shifts inshore), and catch changes are minimal.	+ Spanish liners and netters need to be more accurately spatially described + Only hake modelled.
ICATMAR report Carretón et al. (2023)	Trawlers GSA 6	Focus on ARA fishery	Closure areas under 600 m and 800 m	Average yearly revenue losses under a 600 m limit were 35% in the North zone of GSA 6 and 27% in the Center	+ No model used for projections + Not possible to take into account stock recovery in the medium and long term + Only revenues considered as economic indicator
GFCM pilot study on deep-sea fisheries in Spanish waters	Trawlers GSA 6 (Spain)	Focus on ARA fishery	Fisheries operating at 800-1000 m	30% of the revenues coming from 500-1000 m of depth. No effect of ban 800-1000 m, but results may be masked by the recovery trend stocks due to management measures in force	Preliminary results

Source: PLEN-25-03 elaboration based on STECF 25105 ad-hoc contract report.

Table 1.5.4. Synthesis of the literature review on the socio-economic impact of the deep-water closures for EMU 2.

Management Unit: EMU 2					
Source	**Fleets covered**	**Stocks covered**	**Deep-water closures**	**Main findings**	**Limitations**
STECF ad hoc 2217 (based on BEMTOOL model)	Trawlers and polyvalents	ARA, ARS, HKE, DPS, NEP9, MUT9 and MUT10	Closure areas under 600 m and 800 m	The closure increases the GVA of the segments with lower overlap to spawning grounds (GSA 10 and GSA 11 DTS > 24 m).	The closures are simulated through an implicit approach, with no possibility to mimic effort reallocation
ABIOMMED project Sbrana et al. (2025)	Trawlers > 15 m	ARA, ARS, NEP, DPS, MUT, HKE and others (not in the MAP).	Closure areas under 600 m, 700 m and 800 m	Decrease in catches of deep-sea crustaceans Decrease in profits of -5% for 600 m and -15% for 800 m	+ Projections useful only for the short term + Not covering vessels < 12 m of length and other gears than trawlers
STECF ad hoc 25103 (based on SMART model)	Trawlers and longlines > 12 m	ARA, ARS, NEP, DPS, MUT, HKE and others (not in the MAP).	Closure areas under 600m, 700m and 800m	The profitability and the number of fleet segments operating under viable conditions increase compared to the SQ	+ Not covering vessels < 12 m as well as gillnets and trammel nets. + No GVA and GP projections

Source: PLEN-25-03 elaboration based on STECF 25105 ad-hoc contract report.

In EMU 1, the closure of areas deeper than 800 m had a minimal impact on the Spanish fleet, with only a 1% loss in revenue according to the ICATMAR report. In contrast, a closure at 600 m significantly reduced fleet profitability. For EMU 2, results were mixed: Sbrana et al. (2025) projected profit reductions of 5% and 15% for closures at 800 m and 600 m, respectively, while STECF *ad-hoc* contract 25103 reported increased profitability for spatial closure scenarios compared to the status quo.

STECF notes that the studies included in the literature review use different models and methodologies, each with varying strengths and limitations. While they offer valuable qualitative insights, the economic results are not directly comparable in quantitative terms. STECF notes that the social component was not included in the analysis performed.

Beyond the literature review, STECF observes the *ad-hoc* contract provided “apparent fishing hours” for Western Mediterranean trawlers (EMU 1 and EMU 2) based on recent Global Fishing Watch (GFW) data. The average effort from 2021 to 2024 exerted at depths below 800 m was 1.64%, and 8.5% below 600 m. STECF notes that since 2024, permanent closures below 800 m are included as measures under Article 8 of the Mediterranean and Black Sea fishing opportunities regulations (Regulation (EU) 2024/259 and Regulation (EU) 2025/219). The implementation of these measures from the compensation mechanism may influence spatial effort allocation and lead to considerable year-to-year variability depending on the adoption level, which should be considered into bioeconomic simulations. Additionally, STECF notes that AIS-based data from GFW may produce biased effort estimates in some cases (Hintzen et al., 2025). Thus, GFW-derived effort data should be validated and, if necessary, supplemented with alternative sources to ensure reliable model inputs.

Regarding the second task, the ad-hoc contract's report identified the needed data sources to parametrise the spatial BEMTOOL model. In addition to the standard BEMTOOL inputs, the spatial version requires AIS data (ideally complemented with VMS to improve spatial resolution), GFCM and EU fleet register data to match AIS tracks with fleet segments, FDI spatial effort and landings data for total effort calibration, MEDITS data for spatial stock distribution, and logbook data for refined spatial catch estimates. While most of these data are publicly available, VMS and logbook data require a dedicated data call, with appropriate data use disclaimers.

STECF notes that the spatial BEMTOOL model, developed within the SEAwise project (https://seawiseproject.org/), has been applied to Adriatic demersal fisheries and deep-water fisheries in the western Ionian Sea. This model builds on the BEMTOOL framework already used in EMU 2, enabling the simulation of spatial management measures. However, STECF highlights that the SMART model, which is also suited for spatial analyses, is already in use in EMU 2. Introducing an additional spatial bioeconomic model could complicate the interpretation of results and should be carefully considered within the context of the West Med effort regime EWG. If spatial BEMTOOL is used alongside SMART, a thorough cross-model comparison and discussion will be necessary to ensure coherent and robust policy advice.

1.6. STECF conclusions

General conclusions on the process

STECF concludes that future evaluations of the West Med MAP would require a more efficient process, timely data and tasks delivery. The stock assessment EWG should receive clear requests for essential outputs, particularly stock objects and partial Fs, and all relevant datasets (AER, economic by GSA, FDI, and, when needed, VMS and logbook data) must be available well ahead of the EWG. A well-planned timely data call is needed for VMS and logbook data when spatial analyses are foreseen.

STECF emphasizes the need for precise and timely definition of simulation scenarios. Models must be based on assumptions that accurately reflect the intended management measures. For novel combinations of measures, such as the 5% increase in closed areas proposed in Scenario E of EWG 25-11, early engagement with modellers is recommended to avoid inconsistent interpretations. In this regard, STECF concludes that DG MARE should issue *ad-hoc* contracts so that models can be parametrised and run before the meeting.

Overall, STECF stresses that a clear planning, timely submission and prioritisation of ToRs by DG MARE will help ensure that future EWGs can fully address their tasks and provide robust advice.

EWG 25-11 report

Regarding ToR 1 – Time series of fishing effort, STECF concludes that most fishing effort trends (fishing days) in EMU 1 and EMU 2 were stable or decreasing between 2015 and 2024. For several fleet segments though, the effort ceilings in Regulation (EU) 2024/259 exceed the deployed effort reported in FDI, particularly in EMU 1, meaning the ceilings may not be as limiting as intended.

Regarding ToR 2a – Relationship between F and fishing effort, STECF concludes that no consistent linear F–Effort relationship was found across all GSAs, gears or stocks, confirming that reductions in fishing days do not automatically translate into proportional reductions in fishing mortality. These relationships require continued monitoring and should inform future effort-level testing in the bioeconomic models.

Regarding ToR 2b – Subsidies and fuel cost changes, STECF concludes that available information on temporary cessation payments remains incomplete and should be standardised (e.g. annual, by GSA/segment, by measure, EU/national share). Fuel price volatility has had significant impacts on

operating costs, especially for energy-intensive trawler segments. Improved modelling of energy costs, including expected outcomes from projects such as DecarbonyT, would strengthen future analyses.

Regarding ToR 3a – Partial fishing mortalities & catch efficiency, STECF concludes that partial Fs were produced for all species and gears, with OTB segments generally contributing most to fishing mortality. Spatial analyses suggest effort displacement under effort restrictions and closures, highlighting the importance of accounting for behavioural responses. In GSA 7, the 2020 spatio-temporal closure did not reduce juvenile hake catches, largely due to poor selectivity, although CPUE improved in some areas due to effort reductions.

Regarding ToR 3b – Based on model outputs from 8 out of 9 requested management scenarios, STECF concludes that maintaining 2025 selectivity measures is critical for progress towards F_{MSY}, particularly for hake and Norway lobster. The current management measures (simulated in the Status quo scenario) are not sufficient to bring all stocks to F_{MSY}. Additional management measures are needed to achieve biological objectives, in particular, for most vulnerable stocks. However, these may lead to short-term negative economic impacts for some trawling segments. Results from different models are not directly comparable and should be interpreted cautiously, as a lack of time prevented any discussion on the interpretation of the results during the EWG.

Regarding ToR 4a/4b – Synthesis of results, STECF concludes that a full synoptic overview was not possible due to late availability of model outputs. The EWG delivered synthesis tables with short-term (2026) and mid-term (2030) economic indicators, but these reflect economic, not socio-economic, impacts. Broader social effects were not assessed. Future analyses could consider integrating social indicators (National Fisheries Profiles, social data calls, ASOR) where relevant.

SMART *ad-hoc* contract

STECF concludes that the SMART model simulations for EMU 2 provide valuable complements to the results of EWG 25-11, particularly for the evaluation of spatial management measures. However, the absence of cross-discussion with the EWG limited the ability to fully interpret the results and may impede the development of robust scientific advice.

Based on the SMART model outputs, STECF concludes that all alternative scenarios (A1–F) resulted in lower F and higher SSB compared to the Status quo scenario (SQ), with the magnitude of change linked to the degree of effort reduction. D-type scenarios involving 12-month deep-water closures generally provided the most favourable conservation outcomes.

Deep-water and spatial BEMTOOL *ad-hoc* contract

STECF concludes that according to the simulations performed in the ad-hoc contract, closures at 600 metres would substantially reduce profitability for the Spanish fleet in EMU 1. For EMU 2, results were contrasted across studies. STECF notes that the absence of an analytical assessment for blue and red shrimp, a high-value species central to EMU 2 deep-water fisheries, limits the completeness of current economic analyses.

STECF concludes that, beyond the inputs required for the standard BEMTOOL model, the spatial version requires additional data. Most datasets are publicly accessible except for logbook and VMS data, which would require dedicated data requests.

Spatial BEMTOOL can extend the capabilities of the existing BEMTOOL model by enabling simulation of area-based management measures. However, since the SMART model is already implemented for spatial management evaluation in EMU 2, STECF concludes that introducing an additional model would add complexity to results interpretation. If spatial BEMTOOL is adopted for future EWGs, a structured cross-model comparison should be conducted to ensure coherent and consistent policy recommendations.

1.7. References

Ban C, Vincent A. (2009). Beyond marine reserves: exploring the approach of selecting areas where fishing is permitted, rather than prohibited. PLoSOne2009;1–8. https://doi.org/10.1371/journal.pone.0006258

Carretón, M., Sala-Coromina, J., Blanco, M., & Company, J. B. (2023). Report on the economic impact of eventual restrictions on bottom trawling at depths shallower than 1000 m in the Northern GSA06. Institut Català de Recerca per a la Governança del Mar (ICATMAR). https://doi.org/10.57645/10.8080.05.2

D'Andrea L., Parisi A., Fiorentino F., Garofalo, G., Gristina, M., Cataudella, S., Russo, T. (2020). smartR: An r package for spatial modelling of fisheries and scenario simulation of management strategies. Methods Ecol Evol., 11: 859-868. https://doi.org/10.1111/2041-210X.13394

Fabbrizzi, E., Giakoumi, S., De Leo F. (2022). The challenge of setting restoration targets for macroalgal forests under climate changes. J Environ Manage 2023; 326:116834. https://doi.org/10.1016/j.jenvman.2022.116834

Hanson, J.O., Schuster, R., Morrell, N. (2023). prioritizr: systematic conservation prioritization in R. CRAN, 2023. https://cran.r-project.org/web/packages/prioritizr/index.html. Accessed on 23/11/2023.

Hintzen, N. T., Brigden, K., Kaastra, H.-J., Mackinson, S., Pastoors, M. A., van de Pol, L., and Bartolino, V. 2025. Bias in Global Fishing Watch AIS data analyses results in overestimate of Northeast Atlantic pelagic fishing impact. ICES Journal of Marine Science, 82. https://doi.org/10.1093/icesjms/fsaf033

Russo, T., Parisi, A., Garofalo, G., Gristina, M., Cataudella, S., & Fiorentino, F. (2014). SMART: A spatially explicit bio-economic model for assessing and managing demersal fisheries, with an application to Italian trawlers in the Strait of Sicily. PLOS ONE, 9(1), 1-18. https://doi.org/10.1371/journal.pone.0086222

Sbrana, A., Galli, S., Casini, M., Carlucci, R., Dassenakis, M., Fiorentino, F., Follesa, M. C., Garofalo, G., Georges, V., Isajlović, I., Klancnik, K., Lauria, V., Maiorano, P., Manfredi, C., Mavrič, B., Pagou, K., Papadopoulou, N., Paramana, T., Paraskevpoulou, V., … Russo, T. (2025). Exploring spatial-based management scenarios to protect the seafloor in different areas of the Mediterranean Sea. ICES Journal of Marine Science, 82(3), fsaf023. https://doi.org/10.1093/icesjms/fsaf023

1.8. 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: https://stecf.ec.europa.eu/how-get-involved_en

Name	Affiliation[1]	Email
Ballesteros, Marta	Spanish Institute of Oceanography (IEO-CSIC), Center of Vigo, Subida a Radio Faro 50-55, Vigo, Spain.	marta.ballesteros@ieo.csic.es
Bastardie, François	Technical University of Denmark, National Institute of Aquatic Resources (DTU-AQUA), Kemitorvet, 2800 Kgs. Lyngby, Denmark	fba@aqua.dtu.dk
Casey, John	Independent consultant	blindlemoncasey@gmail.com
Colaço, Ana	University of the Azores, Institute of Marine Sciences - OKEANOS. Rua Professor Doutor Frederico Machado 4, 9900-140 Horta, Portugal	maria.aa.colaco@uac.pt
Cuende de Francisco, Elsa	AZTI (Member of the Basque Research and Technology Alliance). Marine Research Unit. Center of Sukarrieta, Bizkaia, Spain.	ecuende@azti.es
Döring, Ralf	Thünen Institute [TI-SF] Federal Research Institute for Rural Areas, Forestry and Fisheries, Institute of Sea Fisheries, Economic analyses unit Herwigstrasse 31, D-27572 Bremerhaven, Germany	ralf.doering@thuenen.de
Drouineau, Hilaire	INRAE, UR EABX, 50 avenue de Verdun, 33612 Cestas Cedex, France	hilaire.drouineau@inrae.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	Affiliation[1]	Email
Griffiths, Christopher	Swedish University of Agricultural Sciences (SLU), Department of Aquatic Resources, Turistgatan 5, SE-45330, Lysekil, Sweden	christopher.griffiths@slu.se
Hidalgo, Manuel	Spanish Institute of Oceanography (IEO, CSIC), Balearic Oceanographic Center (COB), Palma, 07015, Spain	jm.hidalgo@ieo.csic.es
Ibaibarriaga, Leire	AZTI. Marine Research Unit. Txatxarramendi Ugartea z/g. E-48395 Sukarrieta, Bizkaia. Spain.	libaibarriaga@azti.es
Jackson, Emmet	Bord Iascaigh Mhara (BIM), Ireland's Seafood Development Agency.	Emmet.jackson@bim.ie
Jardim, Ernesto	IPMA - Instituto Português do Mar e da Atmosfera Rua C do Aeroporto. 1749-077 Lisboa. Portugal	ernesto.jardim@gmail.com
Jung, Armelle	DRDH, Techonopôle Brest-Iroise, BLP 15 rue Dumont d'Urville, Plouzane, France	armelle.jung@desrequinsetdeshommes.org
Ligas, Alessandro (vice-chair)	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
Lucchetti, Alessandro	National Research Council (CNR) – Institute for Biological Resources and Marine Biotechnologies (IRBIM), Largo Fiera della Pesca, 2, 60125, Ancona, Italy	alessandro.lucchetti@cnr.it
Mannini, Alessandro	CNR IRBIM Ancona, Largo Fiera della Pesca, 260125 Ancona ITALY	alessandro.mannini@irbim.cnr.it
Moore, Claire	Marine Institute, Renville, Galway, Ireland	claire.moore@marine.ie

Name	Affiliation[1]	Email
Motova - Surmava, Arina	Sea Fish Industry Authority, 18 Logie Mill, Logie Green Road, Edinburgh EH7 4HS, UK	arina.motova@seafish.co.uk
Nimmegeers, Sofie	Flanders research institute for agriculture, fisheries and food, Belgium	Sofie.Nimmegeers@ilvo.vlaanderen.be
Nord, Jenny (vice-chair)	Swedish Agency for Marine and Water management	jenny.nord@havochvatten.se
Pinto, Cecilia	Università di Genova, DISTAV - Dipartimento di Scienze della Terra, dell'Ambiente e della Vita, Corso Europa 26, 16132 Genova, Italy	cecilia.pinto@edu.unige.it
Prellezo, Raúl (chair)	AZTI -Unidad de Investigación Marina, Txatxarramendi Ugartea z/g 48395 Sukarrieta (Bizkaia), Spain	rprellezo@azti.es
Raid, Tiit	Estonian Marine Institute, University of Tartu. Mäealuse 14, Tallinn, EE-126, Estonia	tiit.raid@gmail.com
Russo, Tommaso	University of Rome Tor Vergata, via della Ricerca Scientifica snc, 00133 Rome, Italy	Tommaso.Russo@Uniroma2.it
Sabatella, Evelina Carmen	National Research Council (CNR) – Institute for Research on Population and Social Policies (IRPPS), Corso S. Vincenzo Ferreri, 12, 84084 Fisciano, Salerno, Italy	evelinacarmen.sabatella@cnr.it
Savina-Rolland, Marie	Ifremer, 8 rue François Toullec 56100 Lorient	Marie.Savina.Rolland@ifremer.fr
Spedicato, Maria Teresa	Fondazione COISPA Via dei trulli 18-20 70126 Bari, Italy	spedicato@fondazionecoispa.org

Name	Affiliation[1]	Email
Steins, Nathalie	Wageningen Marine Research Korringaweg 7 4401 NT Yerseke The Netherlands	nathalie.steins@wur.nl
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
Tserpes, George	Hellenic Center for Marine Research (HCMR), Thalassokosmos, 71500 Gournes Pediados, Crete, Greece	gtserpes@hcmr.gr
Ulrich, Clara	IFREMER, Rue de l'Ile d'Yeu, 44311 Nantes, France	Clara.Ulrich@ifremer.fr
Uriarte, Andres	Independent expert	auriartes@hotmail.com
Uusitalo, Laura	Natural Resources Institute Finland (Luke), Finland	laura.uusitalo@luke.fi (secondary: laura.uusitalo@iki.fi)
Valentinsson, Daniel	Swedish University of Agricultural Sciences (SLU), Department of Aquatic Resources, Turistgatan 5, SE-45330, Lysekil, Sweden	daniel.valentinsson@slu.se

REPORT TO THE STECF

EXPERT WORKING GROUP ON
Fishing effort regime for demersal fisheries in West Med (EWG-25-11)

Virtual meeting, 5th-10th of October 2025

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

2.1. Introduction

This report is the 14th of a suite of STECF EWG reports dedicated to the evaluation of the fishing effort and catch limit regime in the Western Mediterranean Sea.

The first EWG in June 2018 (STECF 18-09) addressed a number of issues related to managing fisheries with fishing effort regimes. Building on a review of previous experiences worldwide, the report highlighted the main and well-known concern that catchability estimates (relationship between fishing effort and fishing mortality) are imprecise and vary systematically since fishers will tend to increase their efficiency in order to maintain their historical catch and revenue levels in spite of effort reductions. This was corroborated by quantitative analyses of differences in catch efficiency between fishing trips using trip-based data from Italy and Spain, differences that are only little explained by features such as vessel size or fishing area. Also, a study was presented monitoring continuous increase in gear size (width, opening, twin trawl etc) in the Mediterranean, highlighting a potential for further increase in fishing efficiency that may counteract the expected effect of effort reduction. Finally, a comparison of the completeness and consistency of the various datasets on catch and effort by fleet segments available at the JRC was performed, highlighting a number of gaps.

The second EWG in October 2018 (STECF 18-14) built further on these results. The relationship between fishing effort and fishing mortality, aggregated at the level of fleet segment and year, was analysed for a number of the MAP stocks using the available time series of stock assessment. This relationship was shown to be never linear, and in most cases it cannot even be detected in the time series. This means that a reduction of fishing effort will not translate by a similar reduction of fishing mortality at least in the first years of implementation. Secondly, the trips analyses were extended to new data from France, showing similar results as for Italy and Spain. Finally, a first review of existing bioeconomic mixed fisheries models in the Western Med was conducted. Considering that many models were potentially available but that none of them was directly operational for the purpose of the MAP, a 2 years road map was agreed to improve the availability and use of such models.

Accordingly, the third EWG in March 2019 (STECF 19-01) focused uniquely on updating and improving mixed-fisheries models. Several models of various complexity were presented and tested for the two regions (EMU1 & and EMU2). Good progresses were achieved but the most important issue left was the need to develop a single combined model for EMU1 including data from both Spain and France together, instead of the existing models by GSA. In addition, the EWG listed numerous other issues and future questions regarding data and models' dimensions (e.g. stock definition, inclusion of other species than the MAP species etc).

The fourth EWG in October 2019 (STECF 19-14) was the continuation of this work, progressing further on these issues in order to have models and datasets fully operational for providing mixed-fisheries advice on the MAP. In particular, a first version of a combined IAM model for EMU1 was presented, including both Spanish and French fleets but including only hake data. Two models were run in parallel for EMU 2 (BEMTOOL and SMART), providing different insights on future development. During the EWG 19-14, specific focus was also given to how to simulate closed areas in the bio-economic models to evaluate their potential impact in the medium-term.

The fifth EWG in October 2020 (STECF 20-13) was largely an update of STECF 19-14 regarding models and scenarios (see ToRs). The models were updated with the most recent assessment data (from STECF EWG 20-09) and FDI effort data (from STECF 20-10) and extended to cover some of the gaps previously identified (mainly for EMU 1), and a number of scenarios were run. Additional issues were though considered. In 2020, the West Med MAP has been implemented since January 1st, through Regulation (EU) 2019/1022, with fishing opportunities in terms of maximum allowable fishing effort in fishing days fixed for 2020 in

Council Regulation (EU) 2019/2236. The EWG compared the reference levels used for fishing effort quotas and discussed the implications of the sometimes large discrepancies observed between scientific and policy data.

The sixth EWG in March 2021 (STECF EWG 21-01) explored the datasets on the trawl fleets exploiting demersal stocks to estimate the conversion factors between fleet segments to ensure that effort swaps will not lead to an undesirable increase in fishing mortality. The EWG highlighted the need to have data at fishing trip (VMS data) level when estimating conversion factors. The impact of recreational fishery on the stocks covered by the Western Mediterranean Multi-Annual Plan was found to be negligible. The EWG also assessed the proposals for additional closure areas for 2021 received from Spain, but had no time nor data to propose alternative closure areas for EMU 1 and 2.

The seventh EWG held the last week of September 2021 (STECF EWG 21-13) was partially an update of STECF 20-13 and partially an update of STECF 21-01. The models were updated with the most recent assessment data (from STECF EWG 21-11) and FDI effort data (from STECF 21-12) and extended (compared to last year) to run scenarios accounting for alternative selectivity and introduction of TACs. The EWG updated the F-E relationships and estimated conversion factors at metier and stock level. In 2021, the second year of the West Med MAP has been implemented since January 1st, through Regulation (EU) 2021/90, setting fishing opportunities in terms of maximum allowable fishing effort in fishing days for 2021. This year as well the EWG compared the reference levels used for fishing effort quotas and found large discrepancies between scientific and policy data, the implications were discussed during the EWG.

The eighth EWG held the first week of March 2022 (STECF EWG 22-01) was a technical exercise to improve the mixed-fisheries modelling frameworks in preparation of future EWGs. The EWG focused on the evaluation of two specific management measures considered in the western Mediterranean MAP: maximum catch limits (MCLs) and closure areas. In order to evaluate these measures in isolation from others considered in the western Mediterranean management plan, effort reductions applied in 2022 following Regulation (EU) 2022/110 were not considered during EWG 22-01. MCLs on ARA and ARS (following Regulation (EU) 2022/110) and on HKE and existing closure areas were evaluated. EWG 22-01 evaluated the possibility of defining additional closure areas with the available data and highlighted numerous limitations in the process.

The ninth EWG held the last week of September 2022 (STECF EWG 22-13) was partially an update of STECF 21-13. The models were updated with the most recent assessment data (from STECF EWG 22-09) and FDI effort data (from STECF 22-10) and extended (compared to last year) to run scenarios accounting for effort reductions of trawlers, longliners and netters at the same time. Additionally, vessel number reduction was considered as well. No additional closure areas from the existing ones were considered and MCLs were accounted only for ARA and ARS stocks. An increase in selectivity was accounted for as well. All management scenarios were run twice under two different economic regimes during projections: the first with fuel price fixed as the average price estimated for 2022, the second one with fuel price increased by 120% from 2023 onwards. The EWG updated the F-E relationships and estimated F by GSA and by gear for all stocks. In 2022, the third year of the West Med MAP has been implemented since January 1st, through Regulation (EU) 2022/110, setting fishing opportunities in terms of maximum allowable fishing effort in fishing days and in 22 terms of the maximum catch limits (MCLs) for 2022. This year as well the EWG compared the reference levels used for fishing effort quotas and found large discrepancies between official and policy data, the implications were discussed during the EWG.

The 10th EWG held the last week of February 2023 (STECF EWG 23-01) was partially dedicated to continue the development of socio-economic indicators to be used in the evaluation of management measures for the West Med MAP in both West Med management units. Two roadmaps were discussed, a short term approach and a long term approach which would consider the expansion of all the mixed-fisheries bio-economic models to both management units. As a first step, the EWG focused on the proposal of harmonizing the economic indicators across the models implemented in order to make projections comparable for the next EWG. The second half of the EWG was partially an update of the technical exercise held during EWG 22-01 on the evaluation of closure areas in EMU 1 and 2. New closure areas for 2023 were submitted solely by Spain. The EWG tested the effect of existing and additional closure areas in EMU 2 (GSA 9, 10, 11) and GSA 7 but not GSA 1, 5 and 6. Finally the EWG revised Article 8 of the 2023 fishing opportunities under the West Med MAP (COUNCIL REGULATION (EU) 2023/195), which lists the compensation mechanisms that MSs can implement within the West Med MAP to obtain additional fishing days in 2023.

The 11th EWG was held the last week of September 2023 (STECF EWG 23-11) and it was partially an update of STECF 22-11. The models were updated with the most recent assessment data (from STECF EWG 23-09) and FDI effort data (from STECF 23-10). Within the scenarios the models accounted for all the effort reductions on trawlers since 2020, the MCLs on ARA and ARS and the closure areas implemented since 2020. Compensation mechanisms (increase of 3.5% of effort) obtained by MSs in 2023 were accounted for as well together with vessel capacity reduction due to decommissioning schemes. Scenarios tested the effect of compensation mechanisms in 2024 and the effort reduction needed to reach Fmsy for all stocks in 2025, only two scenarios, Status quo and L (selectivity improvement on the deep-water fleet) did not account for the Fmsy constraint. This year as well the EWG compared the reference levels used for fishing effort quotas and found discrepancies between official and policy data, the implications were discussed during the EWG.

The 12th EWG was held the first week of March 2024 (STECF EWG 24-01). No scenarios were run during this EWG as the focus of the working group was to discuss future developments of the modelling frameworks specifically concerning the harmonisation of socio-economic indicators and the harmonisation of multiple modelling outcomes to deliver a unified scientific advice. Additionally, the group discussed the potential of developing a single modelling framework to be extended to the whole area of the western Mediterranean. Next to the developments needed, the group presented the timeframes necessary to implement each development to clarify what is achievable to present more harmonized results during STECF PLEN 24-03. The group concluded that the harmonisation and further socio-economic indicators could be implemented by the next EWG in autumn, pending on the availability of additional data requested through an ad-hoc contract. Instead, the harmonisation of outputs of multiple modelling frameworks will be possible by STECF PLEN 24-03 without an extension of all the model frameworks or of a single model framework.

This 13th EWG was held the first week of October 2024 (STECF EWG 24-12) and it was partially an update of STECF 23-11. The models were updated with the most recent assessment data (from STECF 24-10) and FDI effort data (from STECF 24-11). Fourteen scenarios were requested by the TORs, 10 of those as priority scenarios. During the EWG 9 of the priority scenarios were implemented within the modelling frameworks, the 10th (Scenario G) could not be run due to the time constraints and the need to implement a high number of simulations to implement it. Within all scenarios the models accounted for all the effort reductions on trawlers since 2020, the MCLs on ARA and ARS in place since 2022 and the closure areas implemented since 2020. Compensation mechanisms (increase of 4.5% of effort) obtained by MSs in 2024 were accounted for as well together with vessel capacity reduction due to decommissioning schemes. Scenarios estimated the trawlers' effort reduction needed to

reach Fmsy-proxy or Freduced after accounting for remedial measures (implementation of 45mm square mesh size and implementation of a closure area between May and September up to 200m depth), effort reduction of longliners and a quota reduction of European hake catches by set nets (gillnets and trammel nets). Each measure was added sequentially in single scenarios to be able to quantify the effect of a single measure on the reduction of trawlers effort estimated. Testing of additional remedial measures, such as a 50 mm square mesh size implemented on the deep water fleet and a spatial closure area under 600m of depth in EMU1, were requested but were not tested within the mixed fisheries bio-economic models due to data limitations and time constraints.

The 14th EWG was held the second week of October 2025 (STECF 25-11) and was informed by the most recent assessment data (from STECF EWG 25-09), FDI data (STECF EWG 25-10) and AER data. Beside conditioning the status quo scenario, 9 scenarios were requested by the TORs. It was found that not all scenarios could be run by all the bioeconomic platforms due to their respective capabilities (spatial vs non-spatial models, mono or multispecies), and all but two scenarios were run. EMU2 simulations were covered by only one model (BEMTOOL) as the experts to run the second model (SMART) could not attend the EWG. Among the two, the spatial scenarios, one (Scenario E) was judged lacking guidance and preparatory work to run it adequately, and the other was put aside due to lack of time and preparatory work (Scenario D), the TORs having not been received in advance of the EWG. Within all scenarios the models accounted for all the effort reductions on trawlers since 2020, the MCLs on ARA and ARS in place since 2022 and the closure areas implemented since 2020, as well as compensation mechanisms that were introduced for 2025. Scenarios estimated that following the Fmsy approach for the most vulnerable stock as the West Med plan stipulates would require the effort reduction in both EMUs.

The Regulation (EU) 2019/1022 (Art.2) define the “most vulnerable stock” as “the stock for which, at the time of the setting of the maximum allowable fishing effort, the fishing mortality of the previous year is the furthest from the FMSY point value determined in the best available scientific advice”. There are differences in the status of the most vulnerable stock in each effort management group that imply that the fishing mortality needs to be managed differently between effort management units (EMU), namely EMU 1 (GFCM GSAs 1, 2, 5, 6 and 7) and EMU 2 (GFCM GSAs 8, 9, 10 and 11). From the STECF stock assessment outcomes (STECF EWG 25-09) it was found that the F2024/FMSY ratios define the most vulnerable stocks as the Norway lobster (NEP6) in EMU1 and Norway Lobster (NEP11) in EMU 2.

The EWG Stock Assessment expresses uncertainty regarding the provision of catch advice, even though its Terms of Reference required such advice. In contrast, the WestMED plan does not mandate catch advice, as it establishes fishing opportunities based on FMSY. The challenge arises when catch advice aligned with FMSY becomes counterproductive. For instance, the current advice suggests increasing the catch for hake even though the stock is below the Blim (biological limit). Advising an increase in catch while the stock is declining toward low and risky levels does not make sense. There is little chance that the fleet will be able to catch the advised levels, as the stock biomass cannot sustain those amounts. Providing catch advice is a crucial step toward establishing catch limits based on short-term forecasts, similar to the approach taken by ICES for the Northeast Atlantic. If such initiative was encouraged by previous EWG, currently, catch limits are being implemented through "remedial measures" for two ARA stocks, as allowed by the WestMED Plan. The EWG Stock Assessment provides information on stock status in terms of F/FMSY ratios, which does not necessitate specific catch advice. EWG Effort recognise that offering catch advice may conflict with recommendations from the EWG, which does not consider catch as an input target. The primary issue is that the plan is driven by the most vulnerable stock deciding on the target F to follow.

The EWG 25-11 was the first EWG meeting after the West Med Map moved into the permanent phase in 2025 (2020-2024 were the transition period with projections of EWG 24-12 in 2024 for 2025). Therefore, other requirements for the management have to be considered, including that the 'most vulnerable stock' is now of greater importance for limiting fishing effort. For the European Commission this implies that the outcome of the STECF EWG 25-09 on the stock assessment is of even greater importance. This has consequences for the definition, for example, of the scenarios to be tested in the West Med Map EWG. Another factor different in 2025 from 2024 was the agreement in the Fisheries Council to introduce compensation mechanisms (FO 2025 Art. 8).

In preparation of the EWG DG Mare stated that drafting the TOR for EWG 25-11 is more time sensitive as the results of the stock assessment EWG needs to be taken into account. The final TOR for the meeting were available then only Monday morning of the EWG meeting (October 6th).

The modelers received 5 schematic scenarios which were insufficient to parametrise the models. Therefore, not having the final scenarios in advance of the EWG meant that a lot of preparatory work for the running of the models needed to be done during the week of the EWG and preliminary results of the model runs were only available on Friday. That again didn't allow, for example, the economic subgroup to look at the modelling results and draw conclusions from it while conducting such feedback on the simulation outcomes was requested by the ToR (ToR 4).

The tight timeline between the stock assessment EWG and the West Med plan EWG led also to some data issues which needed to be solved at the beginning of the week. Also, not all FDI and AER data was available on Monday morning.

In addition, the MS were asked to allow the utilisation of data, e.g. VMS data, which they granted but for some of the data it was still unclear Monday morning if it will be available. It will be necessary for 2026 to better prepare the meeting regarding the data requests to MS. In the discussion in the EWG it was mentioned that the MS would prefer a formal data call with clear guidelines even if they don't need to upload the data, for example, in a database. Experts in the EWG need to have access to the data in advance of the meeting to be able to parameterize their models.

As in 2024, the modelers were due to time constraints not able to run all scenarios demanded by DG Mare. Therefore, the EWG needed then to limit the number of scenarios and discussed priority scenarios with DG Mare. Some modellers run scenarios even after the EWG ended, but this creates concerns about quality checking left up to the chairs lacking the expertise and discussion of the EWG to do so. The objective was to run the same scenarios by all three models and then, if time allows, to run extra scenarios which were not of highest priority. Due to the time and data preparation limitations especially the scenarios including closed areas couldn't be run.

The Effort EWG is now even more dependent on the outcome of the stock assessment group (see ‚most vulnerable stock') and as there were also changes in that EWG it was not always straightforward to get the necessary information from the stock assessment EWG.

2.2. Terms of Reference for EWG 25-11

The objectives of the TORs are to build fishing effort scenarios, coupled with catch limits and other complementary management measures, that will ensure achieving and maintaining MSY for all Western Mediterranean demersal target stocks in the permanent

phase of the West Med MAP, i.e. in the new context of using the Fmsy ranges developed by EWG 24-02 and those updated in EWG 25-09. The EWG 25-11 is requested to:

TOR 1. Based on data available, including the work of the FDI EWG in September 2025, compile and provide complete sets of annual data on fishing effort for all demersal fishing gear from 2015 to 2024. This should be described in terms of fishing days, days at sea, GT*days, fishing hours and nominal effort by Member State, GSA, vessel lengths[1] (4 fleet segments: < 12m, 12m to 18m, 18m to 24m and > 24m) and, where possible, by fishing gear.

TOR 2. a. Update the F-E analyses for Effort Management Units 1 and 2, as well as by GSA when relevant, with the most recent socio-economic and biological data and the most recent stock assessments' results. Time allowing, provide a summary of statistically significant F-E ratio estimates and discuss a way forward.

b. Building on 2024 STECF ad-hoc contracts (for France, Italy and Spain), complete the work started by EWG 24-12 to estimate and discuss the measures to support the fleet and the consequences of fuel costs changes in 2022-2024 as well as in the current year for the different types of vessel sizes and fishing gear, with the most updated (quantitative) available data and (qualitative) expert knowledge.

TOR 3. a. In continuity of STECF EWG 25-09[2], complete the calculations of partial fishing mortality per fishing gear, age class and GSA for demersal stocks under the West Med MAP. This would provide estimates for the effort reduction per Member State corresponding to the reduction in fishing mortality advised by STECF EWG 25-09[3] and use it as the level of reduction used by this STECF EWG (25-11) to drive the fishing effort scenarios for each Member State fleets and achieve Fmsy for the most vulnerable stock in both Effort Management Units (EMU) 1 and 2.

b. Develop effort and catch management scenarios for all demersal fishing gear (e.g. bottom trawls, nets, longlines) in EMU1 and EMU2. Scenarios should account for the management measures adopted since 2020 in the context of the West Med MAP, including measures associated with the compensation mechanism. The scenarios aim at identifying and evaluating the best levels of management measures, e.g. effort and catch limits, to ensure that the stocks concerned shall be within the Fmsy ranges (or F levels from EWG 24-02, EWG 24-10 and EWG 25-09). Scenarios should follow the new legal provisions stemming from the West Med MAP, notably the use of Fmsy ranges (Art 4 and 6 of the MAP) following Table 1. Requested management scenarios, including the compensation mechanism implemented up till 2025, are

[1] See ToR 6.5 in STECF PLEN 21-03 pages 120-121 and Annex pages 155-167.

[2] Scientific, Technical and Economic Committee for Fisheries (STECF) - Stock assessments in the Western Mediterranean Sea (STECF25-09). Publications Office of the European Union, Luxembourg, 2025, Page xx Table 2, Column "Change in F" where Change in F is % change in F 2026 relative to 2024

[3] Scientific, Technical and Economic Committee for Fisheries (STECF) - Stock assessments in the Western Mediterranean Sea (STECF25-09). Publications Office of the European Union, Luxembourg, 2025, Page xx Table 2, Column "Change in F" where Change in F is % change in F 2026 relative to 2024

provided in Table 2 in Annex as well as the references to the legal texts adopted for the implementation of EU-level and national management measures in place since 2020.

c. For stocks below Bpa and Blim, the EWG should test the effects, measured in terms of reduction in F and in catch, of the conservation measures for the stocks listed in Table 1 and identified in Table 2 of Annex B.

TOR 4. a. On the basis of the simulated scenarios under TOR 3 a, b and c, STECF is requested to include a comprehensive analysis of the socio-economic impacts of the proposed management scenarios, incorporating available data, including but not limited to data resulting from the 2024 ad-hoc contracts. The socio-economic indicators should consider the potential effects on gross profit margins, or GVAs and employment levels within the demersal fishing fleets, providing valuable insights for the overall socio-economic sustainability of the sector.

b. Based on the advice structure developed in 2021 (EWG 21-13) and the template tables for outputs (Tables 4.1-4.3 in Annex C), provide a synoptic overview of: (i) the source of data and methods, (ii) the management advice, (iii) the socio-economic indicators for the West Med MAP management scenarios developed under TOR 3. This overview should offer a clear and concise summary of the socio-economic implications of the proposed management measures, aiding in the assessment of the potential socio-economic impacts of the scenarios in the context of achieving and maintaining MSY in 2026 and after for demersal target stocks in the western Mediterranean. In particular, STECF is requested to interpret model outcomes and discuss the conservation impact on stocks of the different management measures, such as changes in selectivity, permanent closures, temporary closures and temporary cessations etc.

Annexes

A. REFERENCES TO MOST RECENT LEGAL TEXTS:

- Annex I of 2020[4], Annex III of 2021[5], Annex III of 2022 Fishing Opportunities[6], Annex III of 2023 Fishing Opportunities[7], Annex III of the 2024 Fishing Opportunities[8] and **Annex IV of the 2025 Fishing Opportunities**[9].

- **French** Ministerial Decree for closures below 800m (“Arrêté du 21 octobre 2024 portant fermeture de la zone comprise entre les bathymétries 800 et 1 000 mètres en mer Méditerranée pour les chalutiers battant pavillon français “) and for the compensation mechanism in 2025 (« Arrêté du 25 avril 2025 portant nouvelles zones de fermetures spatio-temporelles en mer Méditerranée pour certains navires battant pavillon français pour l’année 2025 »).

- **Spanish** Ministerial Decrees for 2025:

    - allocation of fishing opportunities: BOE-A-2025-2667 and BOE-A-2025-9620
    - implementation of 45/50mm: BOE-A-2025-6576
    - retrieval of 800m ban (that was adopted in 2024): BOE-A-2025-1716
    - implementation of flying doors: BOE-A-2025-15820

- **Italian** Ministerial Decrees for 2025:
    - D.D. 370916 del 7/8/2025 Misure di contenimento dello sforzo di pesca nelle GSA 8, 9, 10 e 11 - Annualità 2025
    - Istituzione di zone di chiusura temporanea e relative misure di gestione dell'attività di pesca nelle GSA 8, 9, 10 e 11

[4] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CONSIL:ST_10485_2020_INIT&qid=1655826077148&from=EN

https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R1485&qid=1655826077148&from=EN

[5] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R0090&qid=1655826077148&from=EN

[6] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R0110&qid=1655826077148&from=EN

[7] https://eur-lex.europa.eu/legal-content/AUTO/?uri=CELEX:32023R0195&qid=1688397098419&rid=1

[8] COUNCIL REGULATION (EU) 2024/259 of 10 January 2024 fixing for 2024 the fishing opportunities for certain fish stocks and groups of fish stocks applicable in the Mediterranean and Black Seas

[9] COUNCIL REGULATION (EU) 2025/219 of 30 January 2025 fixing for 2025 the fishing opportunities for certain fish stocks and groups of fish stocks applicable in the Mediterranean and Black Seas

B. MANAGEMENT SCENARIOS

For each scenario, the models have to be run with the management measures adopted at EU and national level between 2020 and 2025, which from 2022 onwards include both effort, catch management measures, remedial measures and measures from the compensation mechanism.

Namely, for trawlers: 10% reduction of effort applied in 2020, 7,5% reduction of effort applied in Spain and France in 2021 (resp. 10% reduction in Italy in 2021), 6% reduction of effort applied in all 3 Member States in 2022, except for French and Spanish vessels active in GSA 7 in France where the reduction is of 4% from the compensation mechanism and, in 2023, 7% for Italy while 3,5% for 90% of the fleet from France and Spain from the compensation mechanism. For 2024, 9,5% effort reduction for trawlers and the compensation mechanism for the French and Spanish fleets (see Article 8 of the 2024 Fishing Opportunities Regulation). Finally, for 2025, the first year of the permanent phase of the MAP, the reductions in fishing effort for trawlers were calculated based on the most vulnerable stock (i.e. hake in EMU1 and hake in EMU2) and implemented based on the contributions of each Member State.

For EWG 25-11, the percentages of reduction of trawlers effort given in the scenarios are calculated in reference to the previous year, i.e. the 2025 Fishing Opportunities Regulation. Comparatively, during the MAP transition period (2020-2024), all trawling effort reductions were applied to the baseline (which corresponds to the average value of FDI fishing effort by fleet between 2015 and 2017).

Scenarios should be run till 2030 in order to estimate the short- and mid-term impact of the management measures from a stock as well as a socio-economic perspective. However, the interpretation of the model outputs should focus on achieving and maintaining MSY as well as identifying the best combination of measures for this.

To be noted, in all scenarios, to account for closure areas the catchability is adjusted to reflect the closure areas adopted in French, Italian and Spanish national legislations, see list of most recent closures in Annex A to be compiled with closures adopted in previous years.

Finally and importantly, the compensation measures implemented in 2025 allowed trawling vessels to be rewarded with additional fishing days in exchange for changes in fishing practices (e.g. spatial closures, increase in selectivity). Similar use of the compensation measures is expected in 2026 and after.

Table 1 Criteria for the identification of the most vulnerable stock (Art. 2.3 of the MAP) and the use of Fmsy ranges level in line with Art 4 and 6 of the West Med MAP

West MED MAP Fmsy ranges provisions
EMU or Effort group code in EMU 1 or 2?
Which is the most vulnerable stock?

Effort may be set above the Fmsy range if all concerned stocks are above Bpa (Art 4(5))?

*-If **NO** Fupper cannot be used*

*-If **YES**, conditions a,b,c could apply in particular c ("in order to limit variations in maximum allowable fishing effort between consecutive years to not more than 20%.")*

Is the most vulnerable stock below Bpa (Art 6(1))?

*-If **YES** only reduced Flow – Fmsy can be used + remedial measures*

Is the most vulnerable stock below Blim (Art 6(2))?

*-If **YES** only reduced Flow – Fmsy can be used + remedial measures*

Table 2 Management Scenarios for FO2026

Scenario for 2026 and beyond	**Trawler effort levels to achieve Fmsy of most vulnerable stock**	**Compensation Mechanism for trawlers**	**Set nets (GNS&GTR) Catch Limit for HKE levels** **As well as** **Effort level (fishing days) LLS**	**Catch Limit level for ARS and ARA**	**Conservation Measures (Spatial)**	**Conservation Measures (Selectivity)**
SQ what happened in 2025	Same effort in 2026 as in FO2025	Same level of compensation in 2026 and beyond as in 2025	Levels of 2025	level of 2025	keep closure areas adopted until 2025 (see Annex A)	2025 implementation: Full ES fleet, 2 thirds of FR fleet
A Fmsy in 2026 and beyond from trawling effort reduction only	2026: level of reduction that secures **Fmsy in 2026** and beyond for all stocks (based on most vulnerable stock in each EMU)	**A1.** 2026: 50% of compensation gained in 2025 implementation and same for 2027 and onwards **A2.** Same level of compensation in 2026 and beyond as in 2025	Levels of 2025	Level of 2025	keep closure areas adopted until 2025 (see Annex A)	2025 implementation: Full ES fleet, 2 thirds of FR fleet

B temporary selectivity	2026: level of reduction that secures **Fmsy in 2026** and beyond for all stocks (based on most vulnerable stock in each EMU)	Same level of compensation in 2026 and 2027 as in 2025 and no more compensation after	Levels of 2025	Level of 2025	keep closure areas adopted until 2025 (see Annex A)	increase in selectivity with **mandatory** square mesh size of 45mm in coastal and 50mm in deep-water in codend for all trawlers in ES, FR & IT in 2026 but then **changed back to 40mm for all as of 2027**
C Permanent selectivity	2026: level of reduction that secures **Fmsy in 2026** and beyond for all stocks (based on most vulnerable stock in each EMU)	Same level of compensation in 2026 and beyond as in 2025	Levels of 2025	Level of 2025	keep closure areas adopted until 2025 (see Annex A)	**Permanent** increase in selectivity with **mandatory** selectivity measures (e.g. square mesh size of 45mm in coastal and 50mm in deep-water, codend length, flying doors) for all trawlers in ES, FR & IT in **2026 and beyond**
D 12-month deep closures	2026: level of reduction that secures **Fmsy in 2026** and beyond for all stocks (based on most vulnerable stock in each EMU)	**D1.** 2026: 50% of compensation gained in 2025 implementation and same for 2027 and onwards **D2.** Same level of compensation in 2026 and beyond as in 2025	Levels of 2025	Level of 2025	closure areas adopted until 2025 (see Annex A) with in addition an increase of **12-month closure areas for trawlers to deeper waters** (depths depending on stocks biology)	2025 implementation: Full ES fleet, 2 thirds of FR fleet
	2026: level of reduction that	**E1.** 2026: 50% of compensation gained in 2025 implementation and same for 2027 and onwards			closure areas adopted until 2025 (see Annex A) with in addition an	

E 5% 12-month closures in waters between 200m and 500m	secures **Fmsy in 2026** and beyond for all stocks (based on most vulnerable stock in each EMU)	**E2.** Same level of compensation in 2026 and beyond as in 2025	Levels of 2025	Level of 2025	increase to 5% of the fishing grounds between 200m and 500m closed for 12-month for trawlers	2025 implementation: Full ES fleet, 2 thirds of FR fleet
F catch limits	2026: level of reduction that secures **Fmsy in 2026** and beyond for all stocks (based on most vulnerable stock in each EMU)	Same level of compensation in 2026 and beyond as in 2025	25% reduction from 2024 level (starting from 2026 and then maintained)	2025: level of reduction that secures Fmsy in 2026 for ARA and ARS	keep closure areas adopted until 2025 (see Annex A)	2025 implementation: Full ES fleet, 2 thirds of FR fleet

Please note that for each scenario the closure areas adopted between 2020 and 2025 should be taken into account (see Annex A).

In addition, for each scenario, the number of authorised trawling vessels should be, as per the latest estimations, 656 for Italian trawlers, 47 for French trawlers and 588 for Spanish trawlers. For longliners, the number of vessels are: 921 for France, 4051 for Italy and 1431 for Spain. Simulations including number of vessels for Italy in 2026 should account for the foreseen level of Permanent Cessation planned for 2026 as in the Directoral Decree n. 319453 of 17 July 2024[10]

C. TEMPLATES OF TABLES FOR OUTPUTS

1) Biological outputs for all West Med stocks

Table 4.1: Total catches by management scenarios for 2026 for single-stock advice (based on STECF 25-09 outputs) and scenarios:

Stock	Single-stock catch advice for 2026	Catches per scenario 2026 (in tons)					
		a	b	c	d	e	f
One line per stock							

Table 4.2: Fishing Mortality (F) by management scenarios for 2026 for single-stock advice (based on STECF 25-09 outputs) and scenarios:

Stock	Single-stock advice F for 2026	F(2026) resulting from scenario					
		a	b	c	d	e	f
One line per stock							

Legend:

	F2026 < Fmsy
	Fmsy < F2026 < Fpa
	Fpa < F2026 < Flim
	F2026 > Flim

[10] https://www.politicheagricole.it/flex/cm/pages/ServeAttachment.php/L/IT/D/1%252F0%252Fc%252FD.0c8f1aeb19e25af95efd/P/BLOB%3AID%3D21868/E/pdf?mode=download

Table 4.3: Spawning stock biomass (SSB) by management scenarios for 2026 for single-stock advice (based on STECF 25-09 outputs) and scenarios:

Stock	Single-stock advice SSB for 2026	SSB(2026) resulting from scenario					
		a	b	c	d	e	f
One line per stock							

Legend:

	SSB2026 >Bpa
	SSB2026 > Blim Fpa
	Blim < SSB2026 < Bpa
	SSB2026 < Blim

2) <u>Socio-economic outputs for all West Med stocks</u>

As in previous years since 2022, the scenarios' socio-economic outputs should be summarized in a table with estimates in 2026 (short-term) and by 2030 (mid-term), for each fleet segment and each Member State the landings of the main stocks could be used to calculate the socio-economic indicators:

Table 5. Synthesis table for scenarios

Scenarios	MS	Estimated level of F for target species in 2026	Estimated level of F for target species in 2026, resp. 2030	Estimated % landings of target species change 2020-2026	Estimated % landings of target species change 2020-2026, resp. 2030	Estimated % variation of profitability (gross profit margin) 2025-2026 and 2020-2026	Estimated % variation of profitability (gross profit margin) 2025-2026 and 2020-2026	Estimated % variation of FTE on-board 2020-2026	Estimated % variation of FTE on-board 2020-2026, resp. 2030	Estimated % Gross profit margin 2020-2026, resp. 2030	Estimated % variation of FTE on-board 2020-2026, resp. 2030	Estimated Number of fleet segments in green (which cover costs and may be financially viable) in 2026, resp. 2030
A	ES											
	FR											
	IT											
B	ES											
	FR											
	IT											
C	ES											
	FR											
	IT											
D	ES											
	FR											

	I T											
E	**E S**											
	F R											
	I T											

3. MAIN FINDINGS

3.1. Key findings for EMU1 (GSAs 1 2 5 6 7)

3.1.1. ISIS-Fish simulations

The status quo (**SQ**) scenarios shows that the selectivity efforts made in 2025 significantly reduce hake fishing mortality (-20% from 2024 fishing mortality) and bring it closer to Fmsy (+25%) with changes in effort levels compared to 2024 between +7% and -24% depending on the fleets (Fig xx).

The comparison with the same effort level without selectivity measures nor OTT ban (additional scenario **SQ2024**) clearly evidences the gain attributed to selectivity as the fishing mortality is only reduced by 3%. The impact on hake catches, is positive for all fleets with hake catches in 2025 higher than in 2024. This is partly due to the positive stock dynamics in 2025 (high recruitment 2024) as illustrated by the high catches in the scenario **SQ2024** as well. But **SQ** catch exceed **SQ2024** catch from 2027 on due to the rapid improvement in stock SSB brought by improved selectivity leading to catch values in 2030 5 to 27% higher than **SQ2024** (two times higher for Spanish liners). Spanish netters benefit from reduced competition and higher hake biomass but reach their MCL early in the year (activity stops) in all runs from 2025 on. It is important to mention, that the description of these segments is really rough in the model in the absence of accurate VMS-logbook data. We do not pretend that results are accurate, and they must at least be considered uncertain. However, the model behavior shed light on the risk of the MCL for netters to become limiting if the increase in hake biomass is not followed by increased MCL

Reducing the compensations to 50% of their 2025 level from 2026 on (scenario **A1**), brings fishing mortality below Fmsy (0.42) and SSB rises almost to Bmsy value. Results are contrasted regarding catches in **scenario A1**. The loss of catch due to decreased effort is rapidly compensated by increased biomass for French trawlers, and the smallest coastal Spanish trawlers, for which catches in 2030 in **A1** even exceed **SQ** values. On the contrary, the decrease in effort for Spanish offshore trawlers is greater and catches drop below 2024 level and stay low over the simulation. This scenario benefits non-trawler fleets (except Spanish netters).

Scenario A0 could not be run to assess the effort needed to reach Fmsy in 2026, but from the results obtained with SQ and A1, it can be roughly estimated than a reduction in compensation of 25% of their 2025 level should bring hake very close to Fmsy.

The selectivity improvements were not adopted by the whole French fleet in 2025. Around 3/4 of the vessels (25 vessels over 41) changed to 45mm, 2 changed to 50 mm and 11 quit OTT. Scenario **C1** evaluates the benefit of an adoption of the 45mm mesh and OTT ban by the whole French trawler fleet from 2026 on. Our modeling surprisingly predicts a slight increase in Fbar with this scenario. The reason is yet unclear, however, simulations clearly show a decrease in age 0 fishing mortality with **C1** compared to **SQ**, yet a slight increase in age 1+ fishing mortalities (NB: age1 to 3 are considered in Fbar calculation). The theoretical curves for 45mm indeed predict

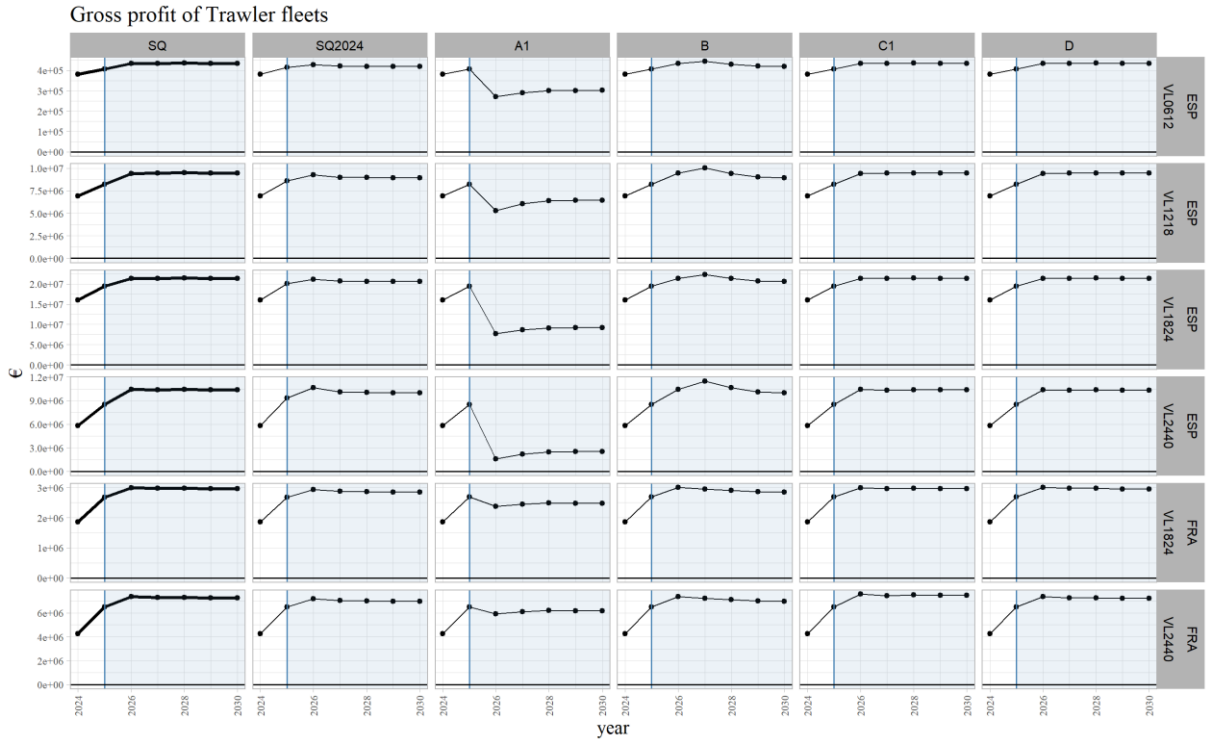
changes in retention probability compared to 40mm only for fish lengths below 19cm, which corresponds to age 0 fish. It is possible that the increase in fishing mortality of older fish is due to the return to 45mm mesh by the two vessels that adopted 50mm mesh in 2025. This is consistent with a difference in catch that is small and mainly concerns larger French trawlers who reach higher catches in **C1** than in **SQ**. On the contrary, catches by French netters are slightly reduced.

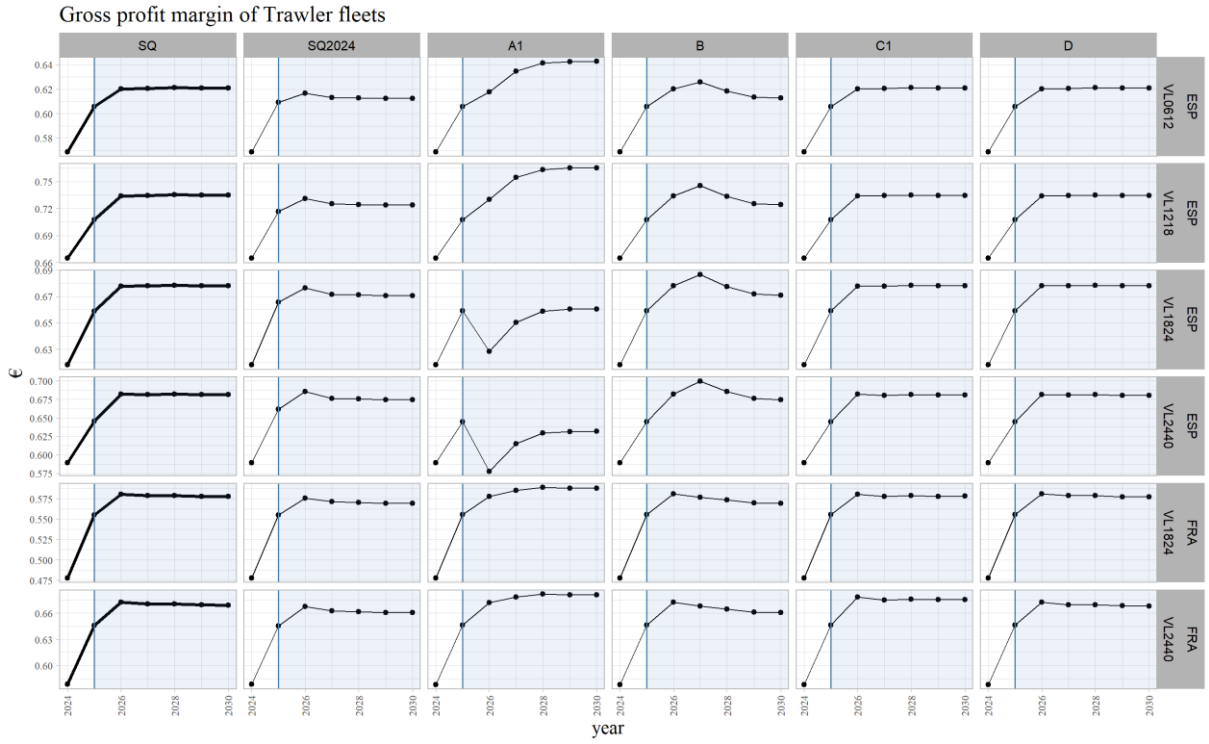
Simulations demonstrate that selectivity improvements need to be maintained through time to allow lasting fishing mortality reduction. Scenario **B** shows the increase in fishing mortality in 2027 when selectivity measures are abandoned and the almost immediate return to a fishing pressure equal to **SQ2024** level (a situation where no selectivity effort were made at all). Fishing mortality even exceeds **SQ2024** level in 2027-2029 due to the extra catches induced by the stock recovery over 2025-2026. Indeed, SSB drops back from 2028 on. Predicted catches of French trawlers, netters and liners from both countries immediately drop in 2027 and stabilise at levels lower than in **SQ** (equivalent to **SQ2024**). For Spanish trawlers however, catches first rise in 2027 above **SQ** values before dropping to **SQ2024** values.

A number of spatial and spatio-seasonal closures have been implemented by both countries since 2020. They were all reproduced in simulations. In addition, a permanent closure of the fishing grounds below 600m depth is experimented in Scenario **D2**. It shows no extra reduction of the average fishing mortality compared to SQ. However, it slightly increases fishing mortality of age 0 hake, possibly because of effort reallocation to more coastal areas where juveniles concentrate. Changes induced in catches are very small.

Despite differences in hake catches between the scenarios, the differences in gross value added for trawlers in 2030 are small between scenarios **SQ, SQ2024, B, and C1**. One reason lies in the limited share of hake in landed values of trawlers. GVA is predicted to be higher in 2030 than in 2024 and 2025 for all trawler segments, and **SQ** provides higher added values that the other scenarios except for the larger French trawlers that benefit more in the scenario **C1 r**esults possibly due to higher catches of larger and more expensive hake. However, interpretation should be careful, because the selectivity measures adopted are assumed to only impact hake catches. It is difficult to foresee how they would impact other species catch in reality and if they would result in either a loss in landings due to higher escapement or a gain from higher stock protection in the long term. The lower effort and consequently reduced fuel costs in scenario **A1**, does not compensate for the lower landed value, particularly for Spanish fleets. As for French netters, GVA follows hake catches. As mentioned, due to early choke effects, the situation is more complicated for Spanish netters, and value added does not reflect landings.

Figure 3.1.1: ISIS-Fish EMU1. Gross profit and gross profit margin of the different trawler fleet segments under alternative management scenarios.





3.1.2. IAM Simulations

In EMU 1, several stocks are currently overexploited, including Nephrops in GSA 6 (NEP6), Hake in GSAs 1-5-6-7 (HKE1567), red mullet in GSA 1 (MUT1), and blue and red shrimp in GSAs 1-2 (ARA12) and in GSAs 6-7 (ARA67).

The seven scenarios investigated using the IAM model in EWG 25-11 all simulated the implementation of both selectivity improvements and an initial reduction in fishing effort in 2025. This initial effort reduction was driven by the difference between the lower fishing effort from the 2024 regulation (FO2024) and the actual 2024 effort (based on FDI data), primarily impacting Spanish and French trawlers. Regarding selectivity improvement, in 2025 Spain has required its fleet to use a 45 mm mesh size for coastal trawlers and a 50 mm mesh size for deep-water trawlers. In France, the adopted compensation measures have resulted in some trawlers switching to a 45 mm mesh size, others to a 50 mm mesh size, and some abandoning the use of the Otter twin trawl (OTT). These combined measures successfully initiated a decrease in fishing mortality (F) across all stocks, with the Hake Fbar showing significant movement toward F_{MSY} in 2025 ($F2024/F_{MSY}$ =1.56; $F2025/ F_{MSY}$ =1.15).

The **scenarios SQ**, **B**, and **C** are implemented with a constant fishing effort corresponding to the values of FO2024 and **scenario A1** assumes that, from 2026 onward, only half of the compensation received in 2025 is maintained. Simulations revealed that those scenarios, which rely only on the 2025 remedial measures and fixed or slightly reduced effort, fail to achieve the objectives of reaching F_{MSY} for all stocks. This is primarily driven by the fishing mortality for the NEP6 stock remaining above its F_{MSY} target. **Scenarios SQ**, **B,** and **C** show fishing mortality far above F_{MSY} for NEP6 and ARA67; with the ones of HKE1567, MUT1, and ARA12 remaining slightly above. **Scenario A1**, which incorporates a 50% effort compensation reduction from 2026, is more successful, achieving F_{MSY} for all stocks except NEP6, even if the fishing mortality of NEP6 is brought closer to the target.

A specific comparison between **scenarios SQ and C** (maintaining selectivity) and **scenario B** (simulating a return to 40 mm mesh size for all trawlers from 2026) was conducted to assess the effectiveness of the 2025 selectivity measures. The results demonstrate that a return to the 40 mm mesh size in scenario B has detrimental long-term biological effects, notably by causing a significant increase in the catch of Hake and Nephrops juveniles. Although scenario B shows a sharp, short-term increase in Hake landings between 2026 and 2027, this effect is quickly reversed, leading to landings lower than those in **scenarios SQ, A1, and C** from 2029 onwards. Economically, the temporary slight improvement in Gross Profit experienced in 2027 converges back to the lower levels of SQ and C by 2028. Therefore, Scenario B, while offering a marginal, temporary economic gain, fails both the biological objectives and long-term improved economic performances.

In contrast, the **scenarios A0, C0, and F** require substantial effort adjustments to meet the F_{MSY} for NEP6 (and constraints on ARA), thereby successfully achieving F_{MSY} for all target stocks in 2026. The required reduction in Spanish trawler effort proved sufficient to bring HKE1567 to F_{MSY} without requiring further reduction of French trawler effort, confirming that NEP6 is the most constraining stock for coastal trawling. **Scenarios A0 and C0** rely on a Maximum Catch Limit (MCL) on ARA,

whereas **scenario F** adjusts deep-water trawling effort directly to reach F_{MSY} for ARA12 and ARA67. This key difference results in a less pronounced reduction in deep-water trawling effort in **scenario F** compared to A0/C0 with the MCL constraint, but conversely necessitates a greater reduction in coastal trawling effort under scenario F. Additionally, scenario F includes a specific 25% reduction in the HKE1567 MCL for fleets using set gillnets (GNS) or trammel nets (GTR); this measure leads to notable negative economic repercussions for the DFN, PGP, PMP, and HOK fleets that are concerned by the MCL.

Despite biological positive impacts, the reduction in fishing effort in scenarios A0, C0, and F leads to severe short-term negative socio-economic impacts for Spanish trawlers. The effort reduction required (ranging from 30% to 76% in 2026, depending on the specific scenario and fleet-metier) triggers a significant decline across key economic indicators, including Gross Value Added (GVA), Gross Profit (GP), and Full-Time Equivalent (FTE) employment. Although operating costs decreased, it appears that it would not cover the important decrease in income resulting from effort reductions, especially with fixed costs remaining unaffected. Consequently, a significant drop below zero in Gross Profit of Spanish trawlers is globally expected in both the short and long term. Other fleet segments, such as French and Spanish vessels using hooks (HOK) and French trawlers, are expected to benefit economically from the increased exploited stock biomasses resulting from the Spanish trawler effort reduction.

Figure 3.1.2 EMU1 (IAM model). Predicted Fishing mortalities (**Fbar**) by modelled stock (in row) under alternative scenarios (in column). Historical values are given in the white areas and simulated values in the blue area. Simulations are displayed until 2030 and the second vertical black lines indicate the year 2025. F_{MSY} from EWG 25-09 stock assessments are represented with a dotted line. The stocks are as follow (from top to bottom): hake GSAs1-5-6-7 (HKE1567), red mullet GSA1 (MUT1), red mullet GSA6 (MUT6), Norway lobster GSA6 (NEP6), blue and red shrimp GSAs1-2 (ARA12), blue and red shrimp GSAs6-7 (ARA67).

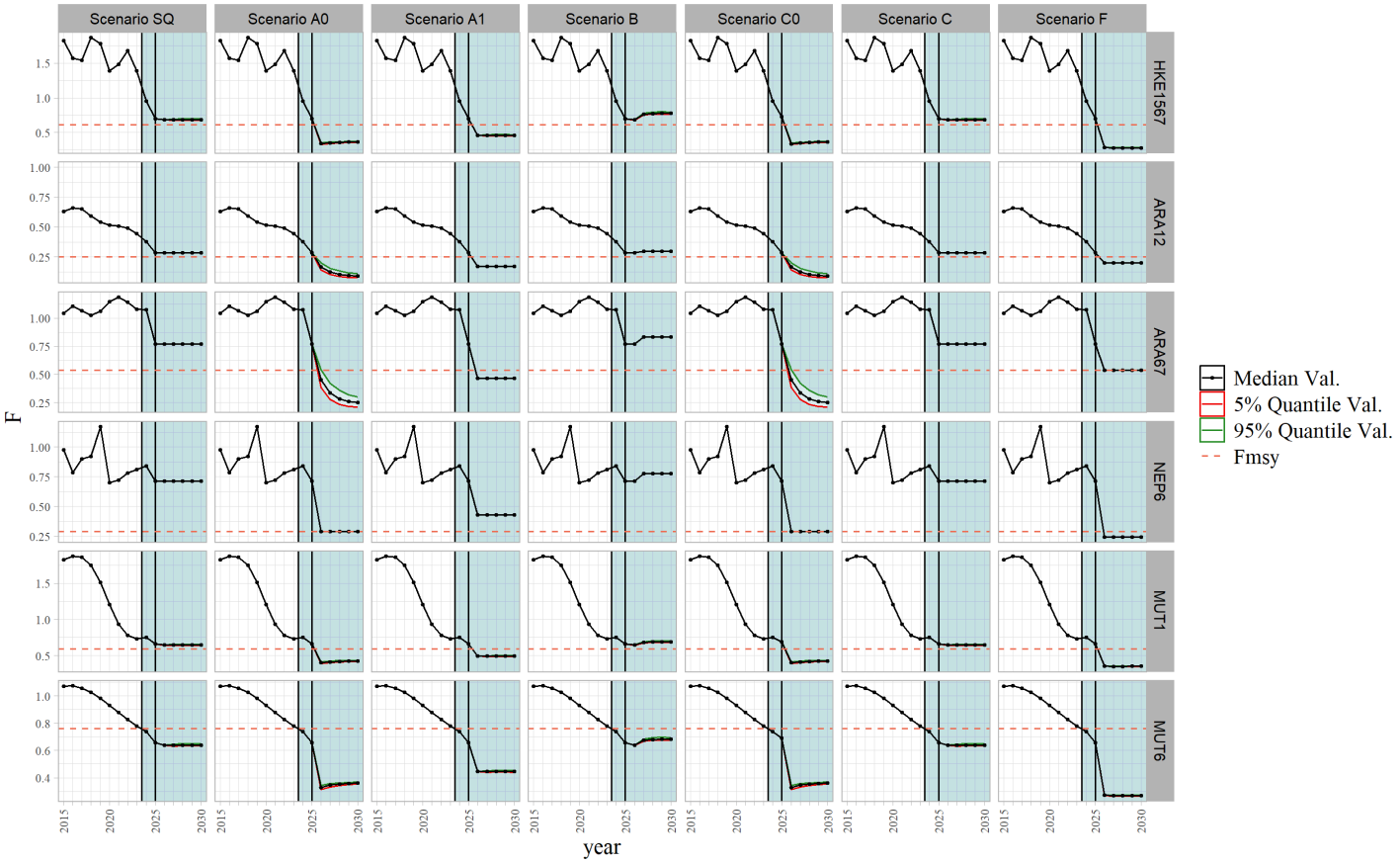


Figure 3.1.3 EMU1 (IAM model). Predicted Spawning Stock Biomasses (**SSB**) by modelled stock (in row) under alternative scenarios (in column). Historical values are given in the white areas and simulated values in the blue area. Simulations are displayed until 2030 and the second vertical black lines indicate the year 2025. The stocks are as follow (from top to bottom): hake GSAs1-5-6-7 (HKE1567), red mullet GSA1 (MUT1), red mullet GSA6 (MUT6), Norway lobster GSA6 (NEP6), blue and red shrimp GSAs1-2 (ARA12), blue and red shrimp GSAs6-7 (ARA67).

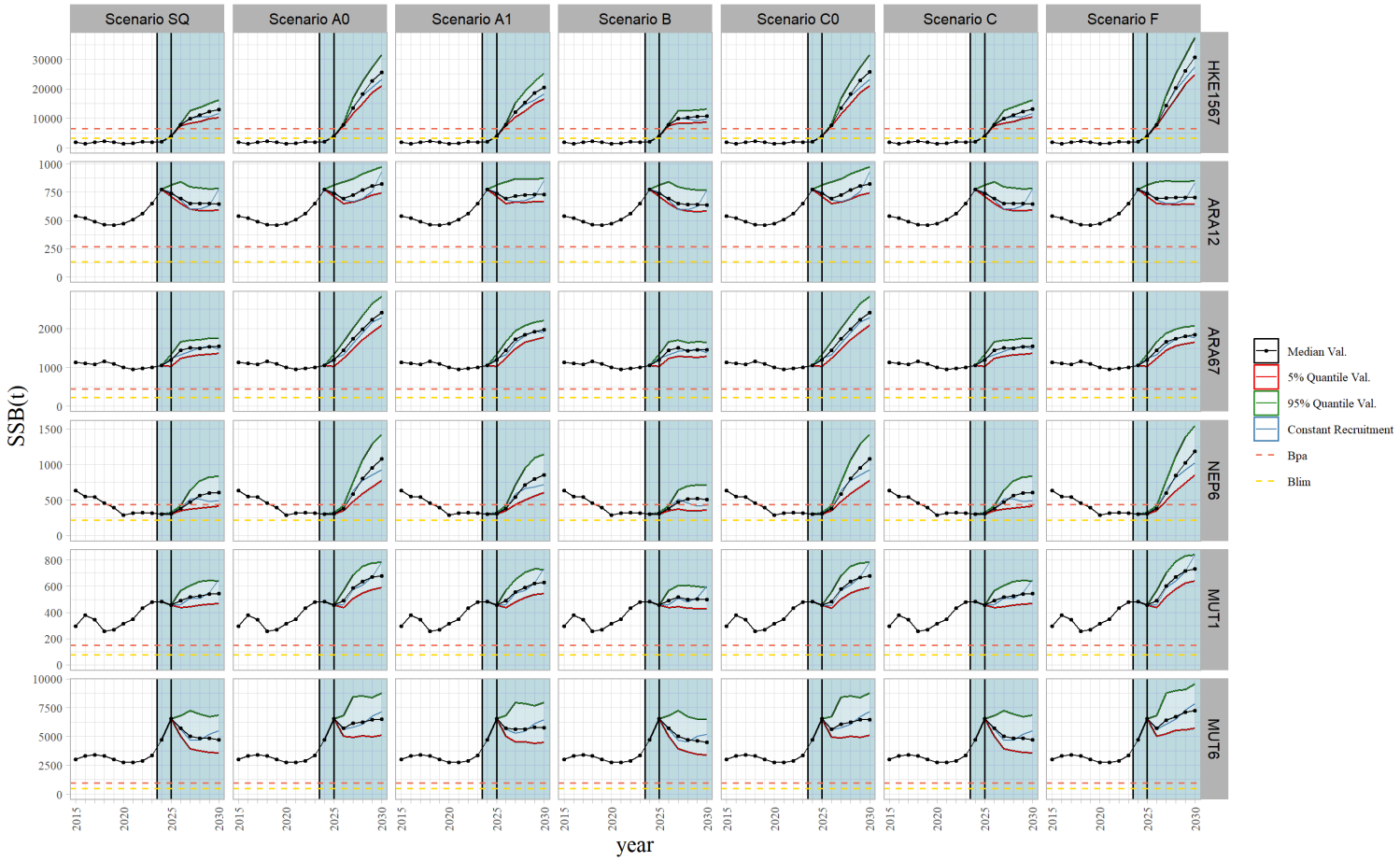


Figure 3.1.4 EMU1 (IAM model). SCENARIOS SQ, B, A1, A0, F. Evolution of the **total annual fishing effort** (in fishing days) by trawler (**DTS**) fleet segments under alternative scenarios from 2024 to 2030. Historical values (source: FDI) are given in the white areas and simulated values in the coloured area. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French demersal trawlers 18-24m, French demersal trawlers >24m, Spanish trawlers < 12m, Spanish trawlers 12-18m, Spanish trawlers 18-24m, and Spanish trawlers >24m.

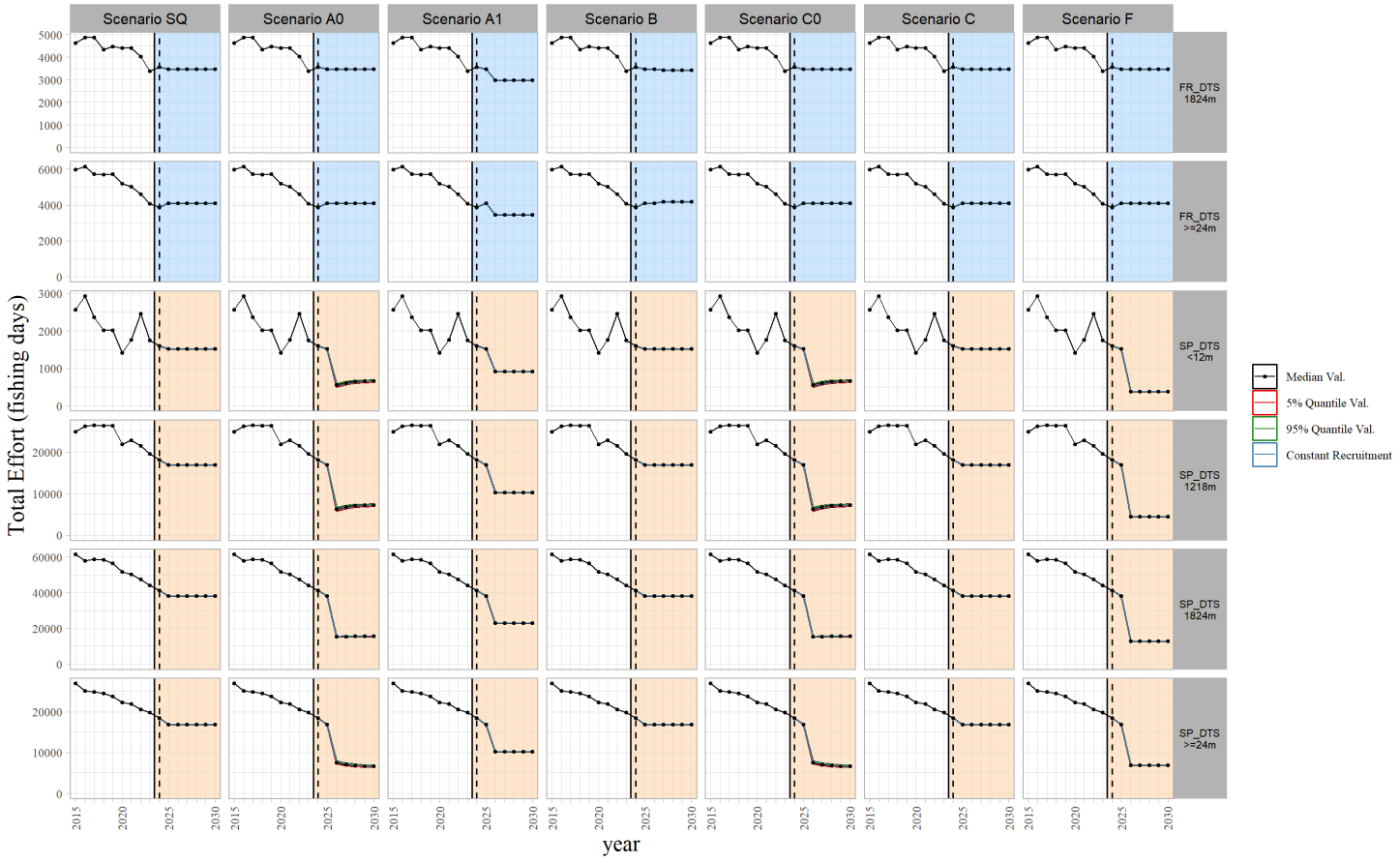
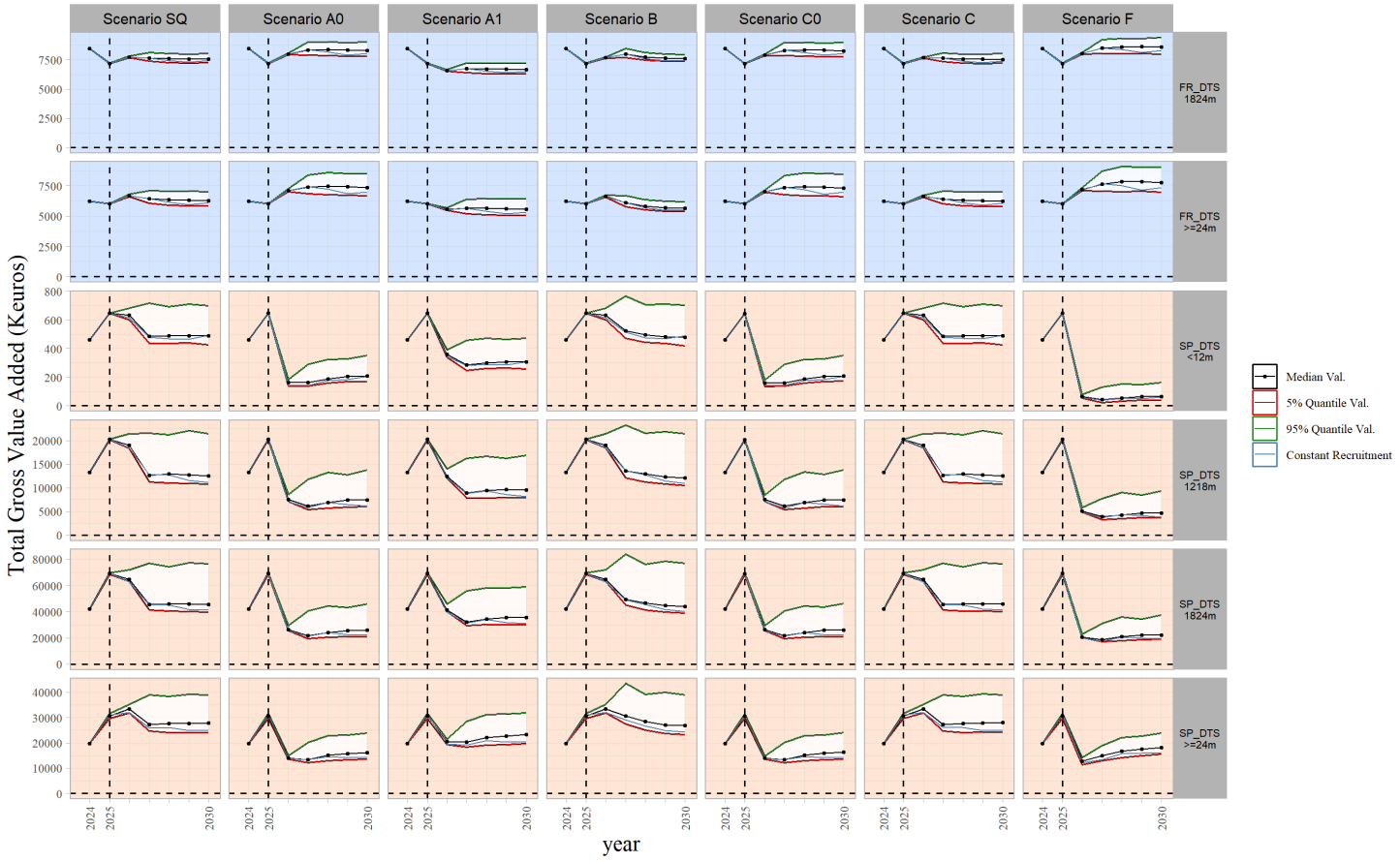


Figure 3.1.5 EMU1 (IAM model). Evolution of the total Gross Value Added (**GVA**, in K euros) by trawler (**DTS**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French demersal trawlers 18-24m, French demersal trawlers >24m, Spanish trawlers < 12m, Spanish trawlers 12-18m, Spanish trawlers 18-24m, and Spanish trawlers >24m.18-24m, and Spanish trawlers >24m.



3.2. Key findings for EMU 2 (GSA 8-9-10-11)

3.2.1. Bemtool simulations

The most overexploited stocks in EMU 2 are the Norway lobster (NEP) in GSA 9 and in GSA 11. The setting of a maximum catch limit included in the EU Regulation 2022/110 would allow to approach F_{MSY} for giant red shrimp (ARS), but not for NEP. During EWG 25-11, several combinations of management measures are simulated to approach the F_{MSY} of Norway lobster, including effort quotas on demersal trawlers and selectivity improvement, integrating the measures currently in force, as hake catch limits on gillnets and trammel nets and effort quotas for longlines.

Effort level

In terms of fishing days, in the **SQ scenario** an increase for trawlers at a similar level of the 2024 fishing opportunity is assumed, after a transition year (2025) with +18% due to an agreed compensation mechanism (for the closure of the areas below 800 m depth and a fishing ban in October). In all scenarios, the total number of fishing days takes into account the reduction in the number of vessels foreseen by the scrapping regulation. in the **SQ scenario** the trawlers are affected by catch limits on red shrimp.

In the **status quo, B0 and F0 scenarios** the trawlers are impacted by the catch limits of red shrimps that regulates the effort of OTB_DWS and OTB_MDD and the effort is set to a level like 2024, thus increased compared to 2025. The PGP and HOK are regulated through catch limits on nets and effort quotas for longlines, following the scenarios specification.

In contrast, the **scenarios B and F** significantly impact demersal trawling activities aimed at achieving the F_{MSY} target for Norway lobster. The scenarios B and F also affect gillnet and trammel net fishing due to the catch limits on hake and to the effort quotas on longlines. Specifically, **scenarios F0 and F** further reduce the current hake catch limits for gillnets, trammel nets, and the effort quotas for longlines; scenario F, in addition to F0, also significantly reduces the demersal effort of trawlers to meet the reduced fishing mortality for Norway lobster.

The **scenarios B and F** impact the OTB_DEF effort to reach the F_{MSY} of Norway lobster, with a -80% of reduction in the fishing days. In **Scenarios B and B0** a temporary (only in 2026) selectivity improvement (from 40 mm to 45 mm square mesh size) is introduced.

Stock status and F-target achievement

The projections of ARS and ARA (blue and red shrimp) fishing mortality, with catches regulated by the catch limits, show that keeping the current catch limit constant from 2025 to 2028 would reduce the F below the F_{MSY}, highlighting the importance of updating and possibly increasing the yearly catch limit proportionally to the improvement in the stock's status. Moreover, the results of MUT9, MUT10 and DPS show that the underutilization of such stocks would be

more evident for **scenarios B and F** in respect to the other tested scenarios. Moreover, these two scenarios would determine an underutilization also of HKE.

The projections of spawning stock biomass (SSB) across scenarios show for European hake that all scenarios, including the status quo scenario, allow to maintain an SSB level well above B_{lim}, with **scenarios B and F** allowing to reach in 2-3 years the B_{pa} level.

For ARS and DPS, SSB levels exceed B_{pa} across all explored scenarios, while the stocks currently are already within the biomass reference levels. For red mullet in GSA 9 (MUT9) and 10 (MUT10) and NEP9, SSB is expected to rise steadily in **scenarios B and F**, whereas in SQ, B0, and F0 it stabilizes from 2026 onward because catch limits on ARS and ARA shift fishing effort from deep-water grounds toward coastal areas. For NEP11, under **scenarios B and F** the SSB rises steadily and reaches Bpa, while under SQ, B0, and F0 it is expected to decline gradually toward Blim from 2026 onward, as ARS and ARA catch limits shift effort from deep-water grounds to coastal areas.

Socioeconomic effects

Across all GSAs, DTS revenues are projected to decline, especially in the short term, under **scenarios B and F** due to the reduction in fishing days, whereas PGP and HOK are expected to benefit from this trawler-specific measure.

Projections of Gross Value Added (GVA) and Gross Profit (GP) show that, for DTS in GSAs 9 and 10, the status quo scenario yields the highest values, followed by B0 and F0. In GSA 11, however, scenarios B and F perform better. For PGP and HOK across all sub-areas, scenario B, which imposes the largest reduction in trawler effort and a temporary improvement in selectivity, delivers the best outcomes.

For HOK, all scenarios show improvements across all socio-economic indicators in both 2026 and 2030. For DTS, the 2026 decline is smallest under SQ (about −14% relative to 2020), while other scenarios see GVA drops of roughly −45%. By 2030, the GVA reduction under SQ is almost fully absorbed (−2% respect to 2020), whereas other scenarios remain −20% to −30%, depending on the case.

For PGP, in 2026 all scenarios except status quo show reduced indicators by ~-50% relative to 2020; by 2030, GVA exceeds its 2020 level.

Only one DTS fleet segment (VL 06-12) shows a higher GP in 2026 and 2030 in respect to 2020 in the explored scenario. HOK fleet segment results show an increase in all scenarios. Moreover, all DTS fleet segments show positive GP in 2026 and 2030 for scenarios SQ, B and F, while 2 out of 4 in scenario B0 and 3 out of 4 in scenario F0.

Limitations

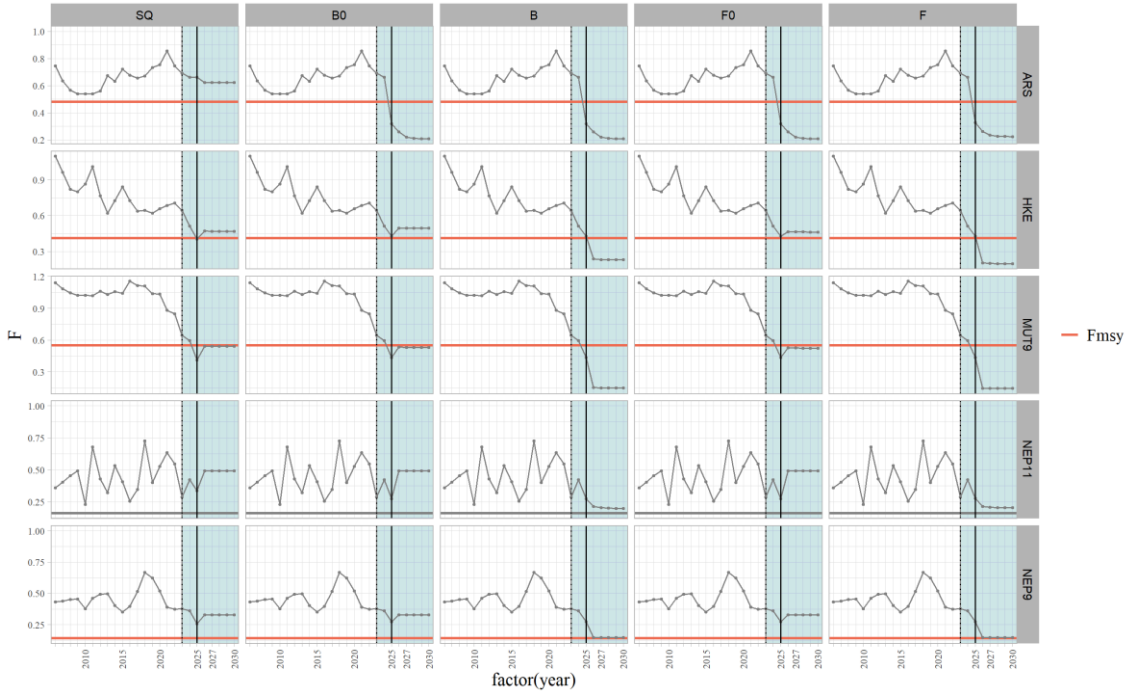
The lack of an analytical assessment for key stocks as ARA, MUT10 and DPS should be considered as an additional amount of uncertainty on the projections, although proxies were used in the model. This is particularly concerning for

ARA, for which a catch-limit regulation is in force, and for DSP, a major resource in the area.

Moreover, the GP and the GPM do not take into account possible subsidies received by operators to face the recent fuel costs increase and the decrease in the number of effort quotas, because this information was not readily available prior to the EWG. This may have impacted negatively on the economic indicators, projecting a worse situation in respect to the actual one (underestimating the GPM).

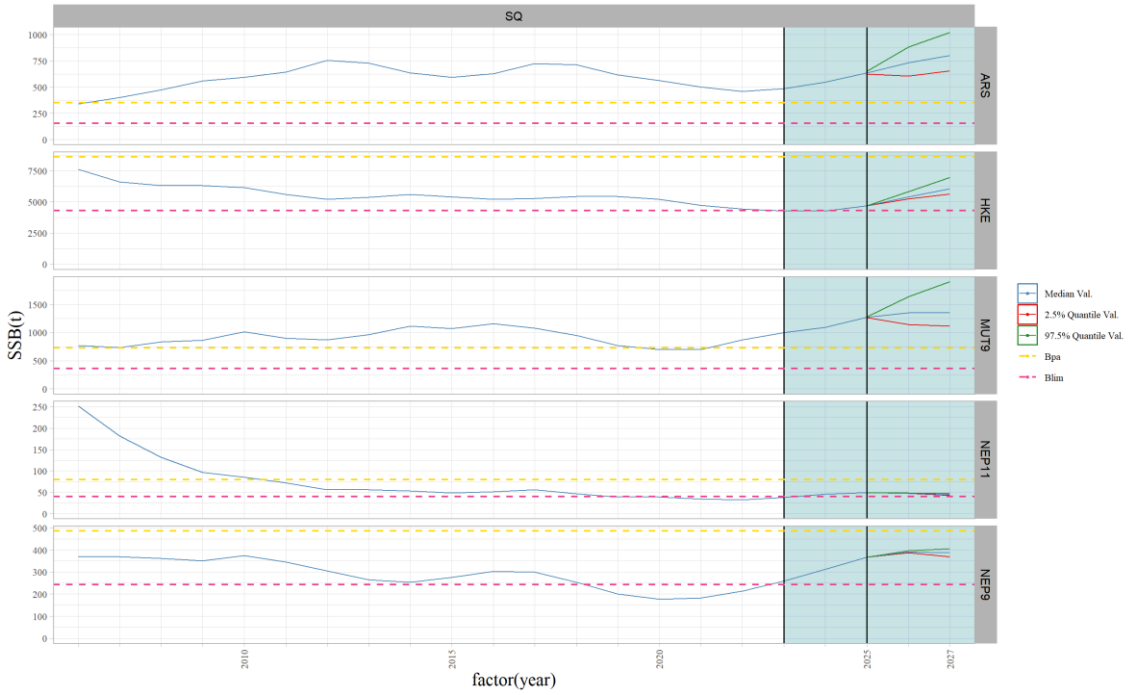
In the model, a linear relationship between FTE and total fishing days has been assumed for simplicity also in this EWG. Nevertheless, this assumption should be verified through a specific analysis on historical data. Moreover, the test of the adaptation of the catch limit to the status of the stock (e.g. FMSY, SSB) that is expected to change during the application of management measures is a potential step to be investigated in the future.

Figure 3.2.1. EMU2 (BEMTOOL model). SCENARIOS SQ, B0, B, F0 and F. Predicted Fishing mortalities (Fbar) by modelled stock (in row) under alternative scenarios (in column). Simulations are displayed until 2030 and the second vertical black lines indicate the year 2025. Fmsy stands for Fmsy proxy with values from EWG 25-09 stock assessments. The stocks are as follow (from top to bottom): giant red shrimp in GSAs 9-10-11 (ARS), European hake (HKE) in GSAs 9-10-11, red mullet in GSA 9 (MUT9), Norway lobster in GSA 11 (NEP11) and Norway lobster GSA9 (NEP9).



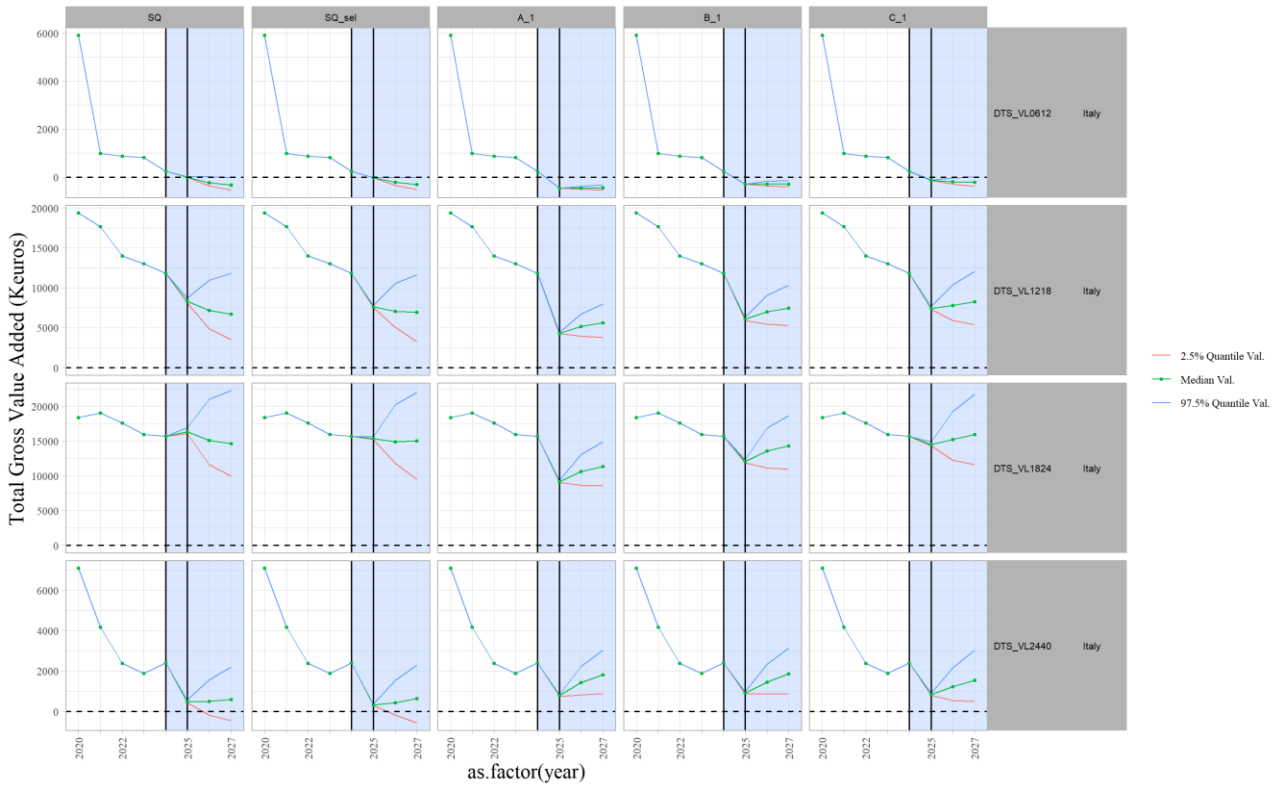
Source: own elaborations.

Figure 3.2.2 EMU2 (BEMTOOL model). SCENARIOS SQ, B0, B, F0 and F. Predicted spawning stock biomass (SSB) by modelled stock (in row) under alternative scenarios (in column. Simulations are displayed until 2030 and the second vertical black lines indicate the year 2025. Blim and Bpa are from EWG 25-09. The stocks are as follow (from top to bottom): giant red shrimp in GSAs 9-10-11 (ARS), European hake (HKE) in GSAs 9-10-11, red mullet in GSA 9 (MUT9), Norway lobster in GSA 11 (NEP11) and Norway lobster GSA9 (NEP9).



0Source: own elaborations.

Figure 3.2.3 EMU2 (BEMTOOL model). SCENARIOS SQ, B0, B, F0 and F. Evolution of the total Gross Value Added (GVA, in K euros) for trawler (DTS) fleet segments under alternative scenarios from 2020 to 2027. Vertical black lines indicate the year 2023 and 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): trawlers < 12 m, trawlers 12-18, trawlers 18-24, trawlers >24 m.



Source: own elaborations.

Figure 3.3.2. EMU2 (BEMTOOL model). SCENARIOS SQ, B0, B, F0 and F. Evolution of the total Gross Value Added (GVA, in K euros) for DTS (trawlers), polyvalent (PGP) and hooks (HOK) fleet segments under alternative scenarios from 2020 to 2027. Vertical black lines indicate the year 2023 and 2025. Scenarios are in column and fleet segments in row.

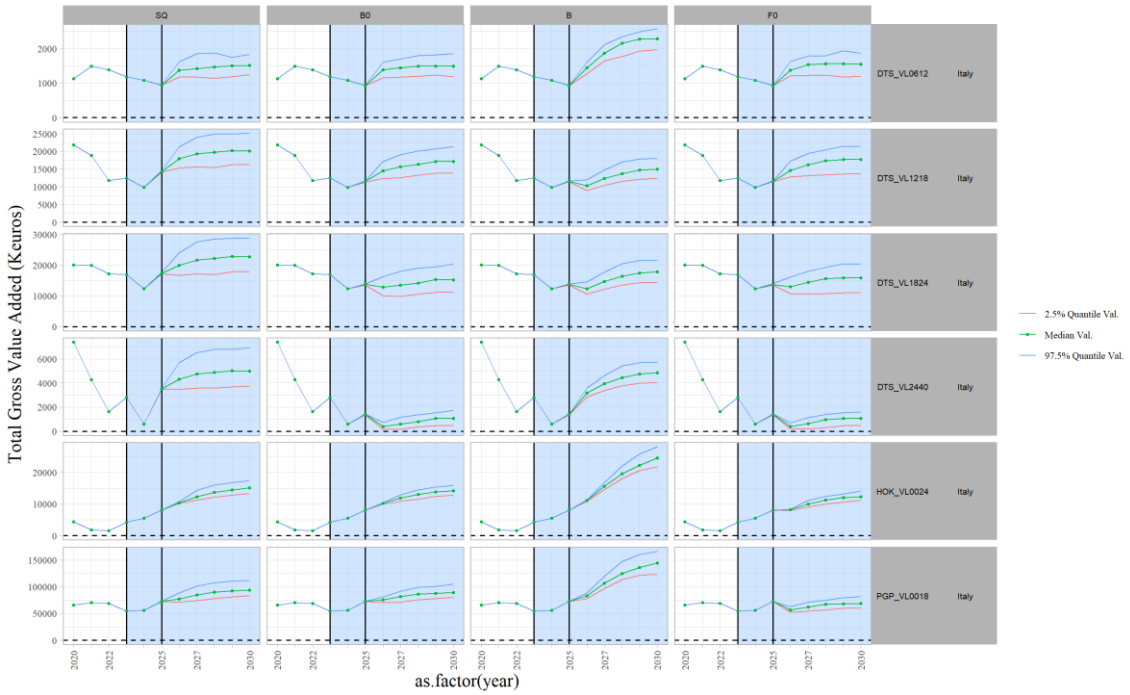
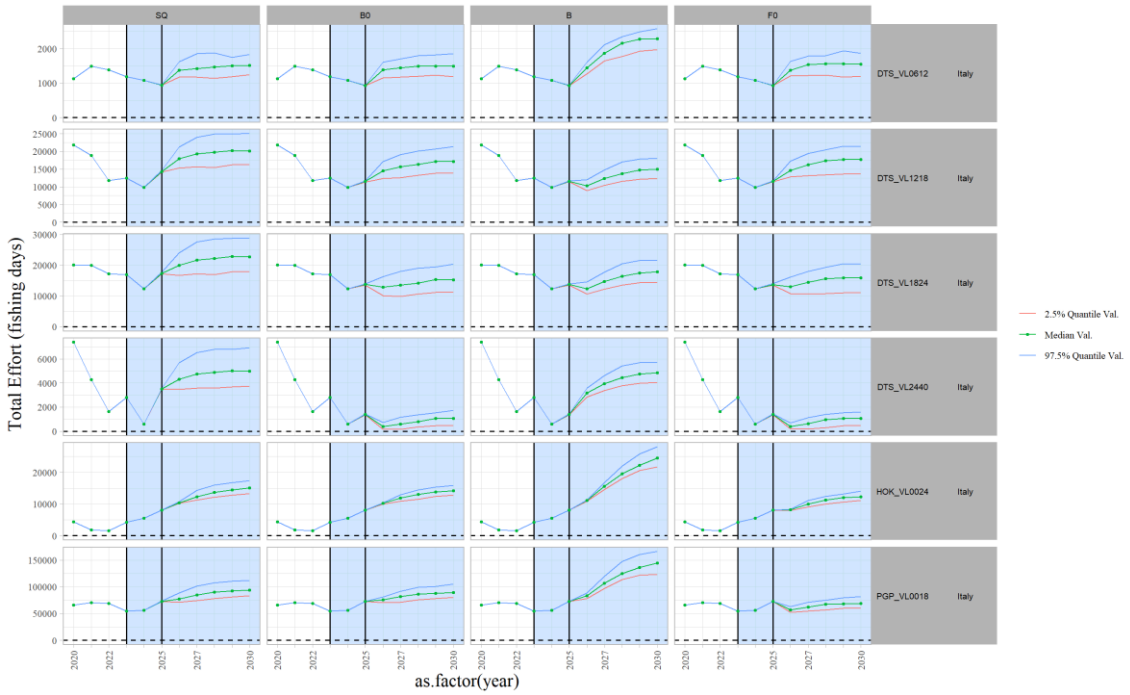


Figure 3.2.5 EMU2 (BEMTOOL model). SCENARIOS SQ, B0, B, F0 and F. Evolution of total number of fishing days for DTS (trawlers), polyvalent (PGP) and hooks (HOK) fleet segments under alternative scenarios from 2020 to 2027. Vertical black lines indicate the year 2023 and 2025. Scenarios are in column and fleet segments in row.



Source: own elaborations.

4. (TOR1) TIME SERIES OF FISHING EFFORT UPDATED TO 2024

EWG 25-11 presents the trends of effort expressed in fishing days for Spain, France and Italy in the period 2015-2024 for the following gears: bottom otter trawl (OTB), multi-rig otter trawl (OTT), set gillnet (GNS), trammel net (GTR), and set longline (LLS). A complete set of tables and graphs for fishing days, days at sea, hours at sea, GT x fishing days, and kW x fishing days by Country (Spain, France, Italy), EMU (1 and 2), GSA (1, 5, 6, 7, 8, 9, 10, 11), gear (OTB, OTT, GNS, GTR, LLS, OTHER), and length class (<12m, 12-18m, 18-24m, >24m) can be found in Annex I.

Regarding the category "OTHER", the EWG 25-11 is considering the gear coding in the FDI datacall, It has been decided to include under this gear the followings gear codes: GND; GNC; GTN; FPO; FPN; FYK; PTB; OTM. It is also worth mentioning that even though, in total, this category corresponds to about 13% of the total effort (in fishing days) of demersal gears, the actual target species of the WestMed MAP is negligible. For example, in the case of FPO that has the lion's share of fishing effort on OTHER demersal gears, no West Med MAP target species are included in the top-15 species, in terms of catch weight.

Table 4.1. Gears included in the "Other" demersal gears based on FDI data call classification

Gear classes	Gear type description	Gear code	Mean %share of fishing effort in the category "OTHER" for the period 2020-2024
Gillnets and entangling nets	Driftnets	GND	4.1%
Gillnets and entangling nets	Encircling gillnets	GNC	6.7%
Gillnets and entangling nets	Combined gillnets-trammel nets	GTN	3.9%
Traps	Pots and Traps	FPO	74.8%
Traps	Fyke nets	FYK	9.6%
Trawls	Bottom pair trawl	PTB	<1%
Trawls	Midwater otter trawl	OTM	<1%

Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Table 4.2. Top 15 caught species by FPO (Pots and Traps) (in terms of catch weight)

Gear	Species (Alpha3)	Scientific name	Weight (t)
FPO	WHE	*Buccinum undatum*	7971
FPO	OCC	*Octopus vulgaris*	6117

FPO	SCR	*Maja squinado*	1856
FPO	COE	*Conger conger*	1279
FPO	CTC	*Sepia officinalis*	988
FPO	NSQ	*Tritia mutabilis*	748
FPO	CRB	*Callinectes sapidus*	416
FPO	LBE	*Homarus gammarus*	397
FPO	JDV	*Maja brachydactyla*	395
FPO	LKW	*Plesionika edwardsii*	323
FPO	CRE	*Cancer pagurus*	314
FPO	CPR	*Palaemon serratus*	245
FPO	CRG	*Carcinus maenas*	210
FPO	MTS	*Squilla mantis*	196
FPO	OCT	Octopodidae	148

Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Before the presentation of the effort time series per EMU, EWG 25-11 performed a comparative analysis of the data retrieved from the 2025 and the 2024 FDI data calls. The analysis indicates that there is an overall -1.8% reduction in fishing days for all countries for the whole period 2015-2023. The 81% of the records for the period 2015-2022 are equal or almost equal (<1% difference), while for an additional 10% of records, rather small differences (between 1% and 10%) appear.

Furthermore, the latest data call, which is used in EWG 25-11, cover existing gaps in time series of the 2024 FDI data call. Therefore, the latest database contains much more records (about 401 new records), most of them from the Spanish fleet larger than 12m and for the reference year 2020. On the other hand, there are about 90 records erased from the new database, most of them stemming from the Italian small-scale fleet for the reference year 2023. No specific patterns appeared in terms of GSAs, years or gears.

Finally, there are 8% of records showing greater than 10% - in absolute terms - differences between the two data sources. However, these records do not significantly affect the total fishing effort for the whole period under investigation. A deeper look to these differences, indicate that most of discrepances stemming from Spain data revisions.

4.1. EMU 1

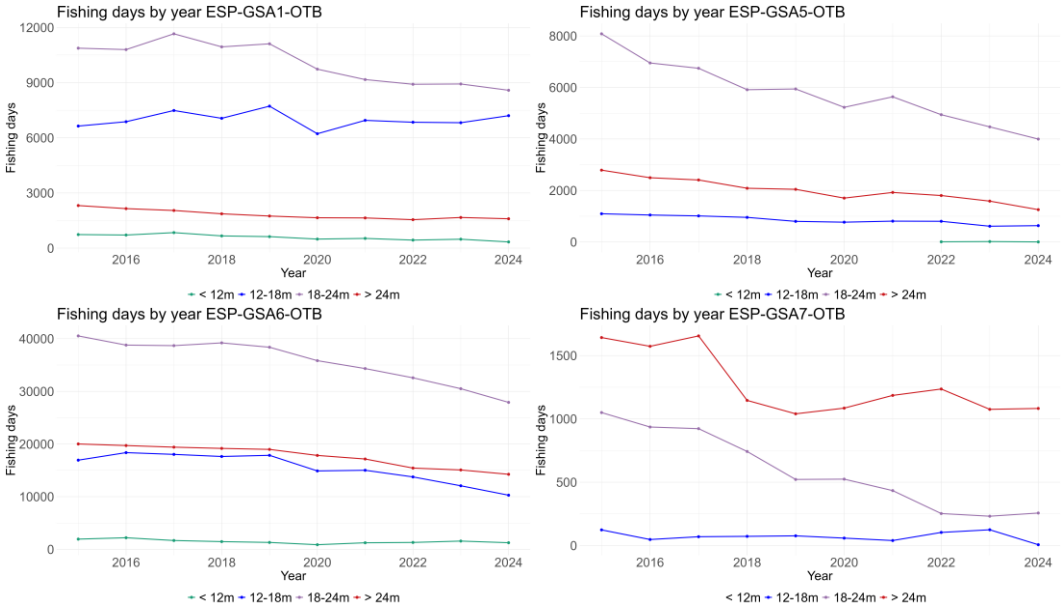
4.1.1. Time series by MS, GSA, fleet segment, gear

In EMU 1, EWG 25-11 noted a general and gradual decrease in fishing effort in terms of fishing days from 2015 to 2024. Regarding the fishing days (fishing effort), usually the existing trends, whether diminishing or steady, remain. Overall, in terms of total fishing days there was a 10.6% reduction from 2023 to 2024.

In general, OTB demonstrates higher fishing days for larger vessels (18-24m and >24m) across most GSAs, with a slight downward trend over time in many areas, except for GSA1 and GSA8 which shows a stable trend. In contrast, GTR is typically dominated by smaller vessels (<12m and 12-18m) and exhibits more stable trends over time in Spain, but not in France. GNS generally has lower fishing days compared to OTB and GTR, with greater variability year-to-year, but with a declining trend. Similarly, LLS also records lower fishing days than OTB and GTR, with more stable trends and bigger vessels disappearing in time.

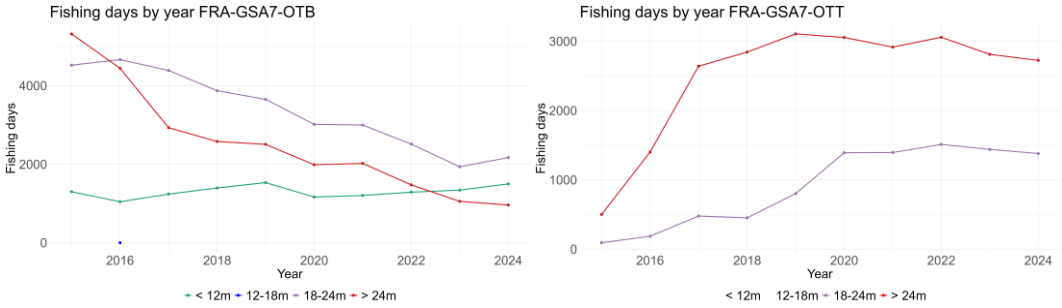
Some small exceptions are observed, particularly for gears with low effort in specific GSAs. For instance, GNS in GSA5, after several years of increasing fishing days, a trend break occurs in 2022, resulting in a decline in fishing days since now.

Figure 44.1.1. Spain: time series of OTB fishing effort expressed in fishing days by fleet segment and GSA (figure for GSA2 is omitted due to low effort).



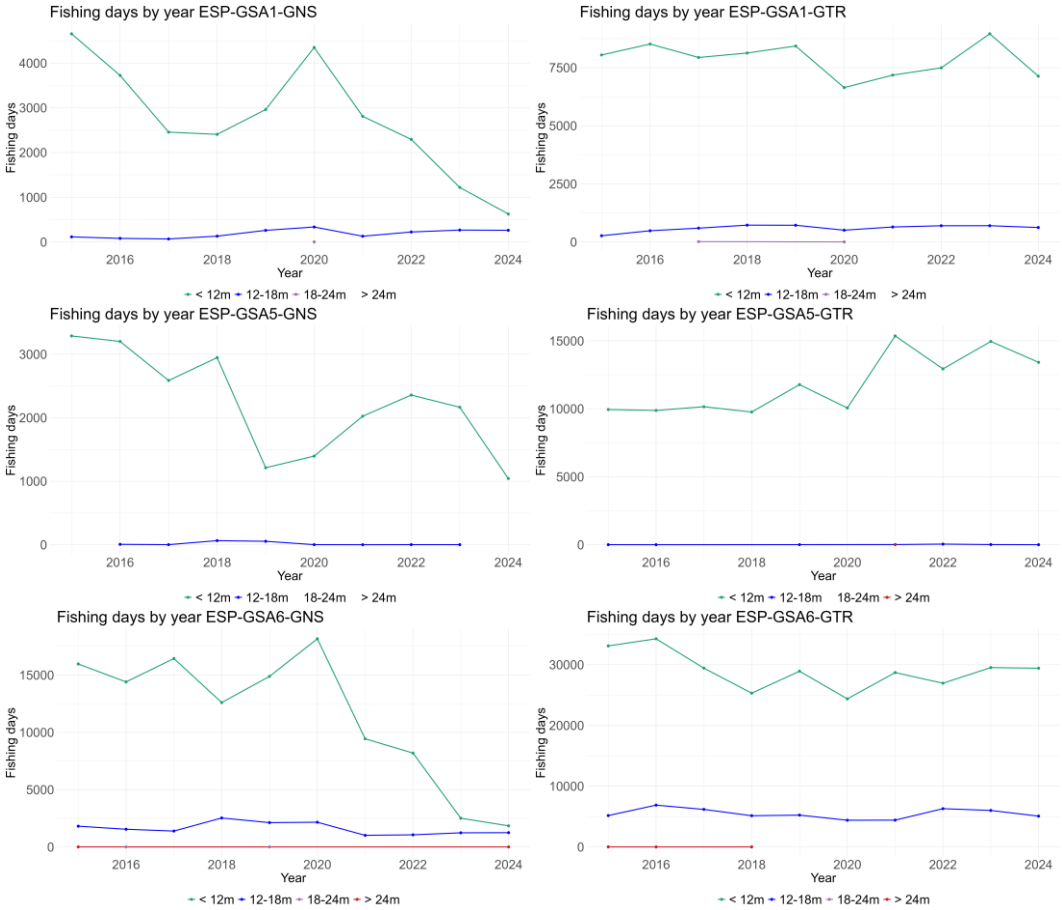
Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Figure 4.1.2. France: time series of OTB and OTT fishing effort expressed in fishing days by fleet segment in GSA7.



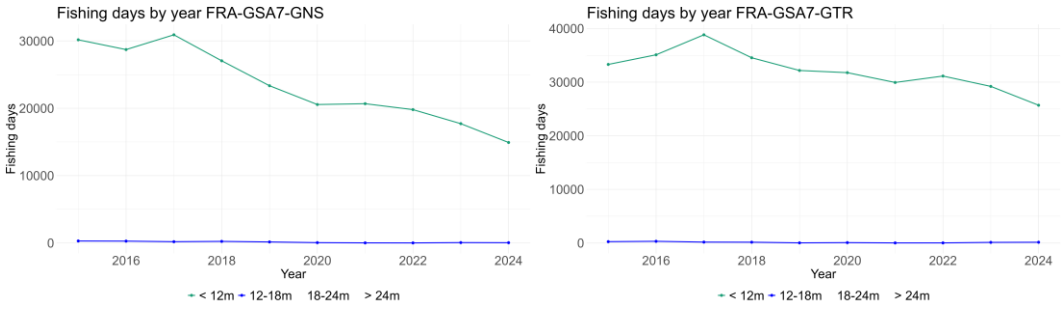
Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Figure 4.1.3. Spain: time series of GNS and GTR fishing effort expressed in fishing days by fleet segment and GSA.



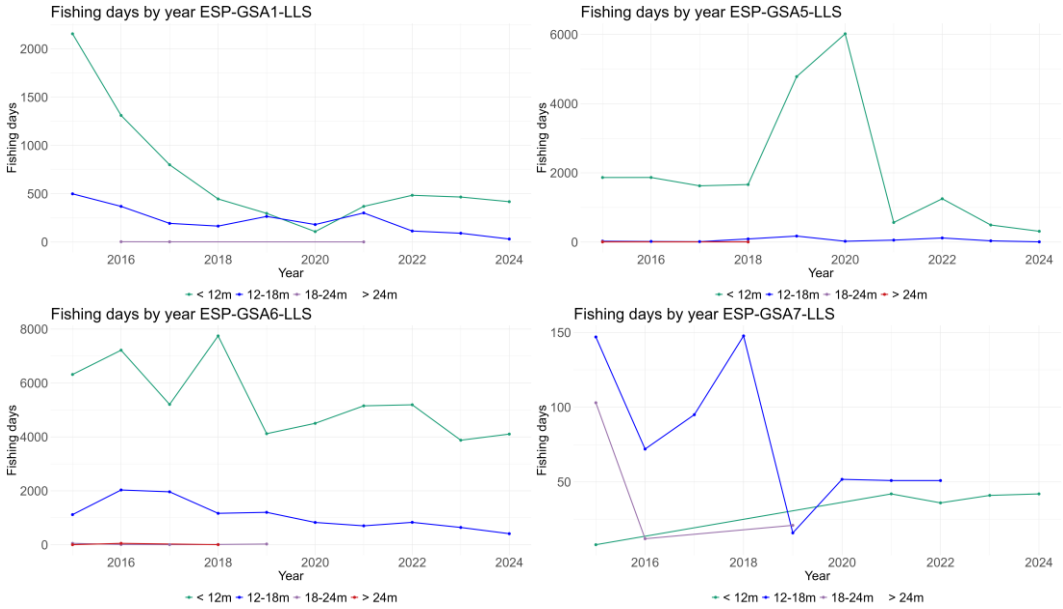
Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Figure 4.1.4. France: time series of GNS and GTR fishing effort expressed in fishing days by fleet segment and GSA.



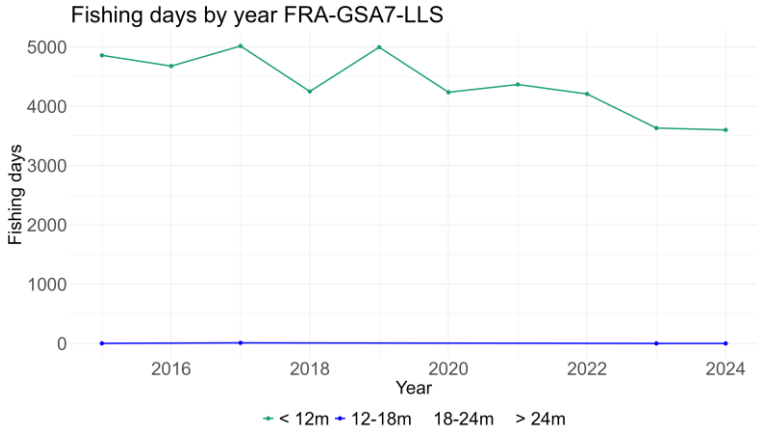
Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Figure 4.1.5. Spain: time series of LLS fishing effort expressed in fishing days by fleet segment and GSA.



Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Figure 4.1.6. France time series of LLs fishing effort expressed in fishing days by fleet segment and GSA 7.



Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

4.1.2. Comparison between FDI data and effort reference levels in EU Regulation 2019/2236, 2021/90, 2022/110, 2023/195, 2024/259 and 2025/219.

The fishing effort (in fishing days) from the FDI database and the fishing effort from the Regulation were compared as last year to verify if the effort reported in the FDI database is consistent with values dictated by the Regulation. Only the FDI fishing effort from GSAs 1, 2, 5, 6 and 7 of trawl gears were considered. For the French and Spanish data, the trawl gears correspond to OTB, OTM, OTT, PTB, PTM and TBB as per EU Regulation 2019/2236.

The 2020, 2021, 2022 and 2023 fishing opportunities were not compared with the 2020, 2021, 2022 and 2023 values of fishing effort (in fishing days) from the FDI database in this EWG to simplify the tables, as the Multiannual plan are no longer in the transition period. These comparisons are available in the EWG 24-12 report.

The 2024 fishing opportunities were compared with the 2024 values of fishing effort (in fishing days) from the FDI database (table 4.1.1-2). The percentage of change between the Regulation and the FDI fishing effort was calculated as the difference between the effort in the regulation and the FDI effort divided by the effort in the regulation multiplied by 100.

For French trawlers, the 2024 Regulation resulted in a 49 % higher number of fishing days than those declared in the FDI dataset for 2024.

For Spanish trawlers, the 2024 Regulation was lower by 8 % than the fishing days declared in the FDI dataset for 2024.

The effort levels in Regulation 2025/219 are presented but not compared with FDI data, since this year's compensation mechanisms are not previously defined as they were during the transitional period, and now depend on decision by MS, métier, and even individual vessels. For French and Spanish trawlers, the 2025 Regulations number of fishing days was lower than the fishing days declared in the FDI dataset for 2024.

Table 4.1.1. Comparison of fishing effort (in fishing days) of French trawlers in GSAs1, 2, 5, 6 and 7 from the FDI database and the fishing effort from Regulation 2019/2236, Regulation 2021/90, Regulation 2022/110, Regulation 2023/195, Regulation 2024/259 and Regulation 2025/219 for EMU1.

Stock group	Fleet segment	FDI baseline: average of 2015-2017 fishing effort $E_{2015-2017}$	FDI Fishing effort in 2020	2020 Regulation	FDI Fishing effort in 2021	2021 Regulation	FDI Fishing effort in 2022	2022 Regulation	FDI Fishing effort in 2023	2023 Regulation	FDI Fishing effort in 2024	2024 Regulation	% of change between the 2024 Regulation and 2024 FDI effort	2025 Regulation
Red mullet in GSAs 1, 5, 6 and 7; Hake in GSAs 1-5-6-7; Deep-water rose shrimp in GSAs 1, 5 and 6; Norway lobster in GSAs 5 and 6	≥ 18 m and < 24 m	4793	4468	5144	4493	4715	4077	4372	3359	3972	1499	3429	56%	2023
	≥ 24 m	6142	5414	6258	5219	5737	4822	5320	4105	4833	3550	4173	15%	2462
TOTAL FISHING EFFORT OF FRENCH TRAWLS		**10935**	**9882**	**11402**	**9712**	**10452**	**8899**	**9692**	**7464**	**8805**	**3864**	**7602**	**49%**	**4485**

Source: MS data submission under the 2025 Fisheries Dependent FDI data call - MARE/D/MM (2025).

Table 4.1.2. Comparison of fishing effort (in fishing days) of Spanish trawlers in GSAs 1, 2, 5, 6 and 7 from the FDI database and the fishing effort from Regulation 2019/2236, Regulation 2021/90, Regulation 2022/110, Regulation 2023/195, Regulation 2024/259 and Regulation 2025/219 for EMU1.

Stock group	Fleet segment	FDI baseline: average of 2015-2017 fishing effort $E_{2015-2017}$	FDI Fishing effort in 2020	2020 Regulation	FDI Fishing effort in 2021	2021 Regulation	FDI Fishing effort in 2022	2022 Regulation	FDI Fishing effort in 2023	2023 Regulation	FDI Fishing effort in 2024	2024 Regulation	% of change between the 2024 Regulation and 2024 FDI effort	2025 Regulation
Red mullet in GSAs 1, 5, 6, 7; Hake in GSAs 1, 5, 6, 7; Deep-water rose shrimp in GSAs 1, 5, 6; Norway lobster in GSAs 5 and 6.	< 12 m	2708	1373	2260	1762	2072	1755	1921	2072	1745	1600	1507	-6%	317
	≥ 12 m and < 18 m	25122	21120	24284	21826	22260	20673	20641	18709	18752	17336	16189	-7%	3400
	≥ 18 m and < 24 m	51341	44886	45563	41401	41766	38416	38728	36034	35184	33725	30375	-11%	6379
	≥ 24 m	19327	16509	16047	13932	14710	12023	13640	11832	12392	11334	10698	-6%	2247
Blue and red shrimps in GSA 1,5,6,7	< 12 m	2	0	0	0	0	0	0	0	0	0	0	0	0
	≥ 12 m and < 18 m	786	630	1139	877	1044	768	968	902	879	841	759	-11%	160
	≥ 18 m and < 24 m	7967	6161	10822	8341	10574	8555	9805	8288	8908	7452	7690	3%	1615
	≥ 24 m	6918	5634	9066	8156	8488	8360	7871	7757	7151	7124	6173	-15%	1297
TOTAL FISHING EFFORT OF SPANISH TRAWLS		**114171**	**96313**	**109181**	**96296**	**100914**	**90549**	**93574**	**85594**	**85011**	**79411**	**73391**	**-8%**	**15415**

Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

4.2. EMU 2

4.2.1. Time series by MS, GSA, fleet segment, gear

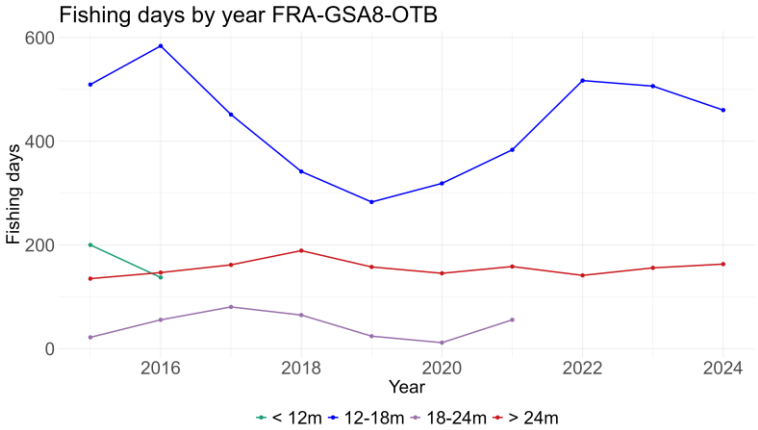
In EMU 2, similarly to what was observed for EMU 1, EWG 25-11 noted gradual decreasing trends or stable trends in fishing effort in terms of fishing days from 2015 to 2024, with some exceptions with increasing levels compared with last year.

Fishing effort has generally shown a decline over time, particularly noticeable after 2019, which could be attributed to various factors such as changes in fishing regulations. OTB consistently exhibits the highest fishing effort, especially among larger vessels, although there is a declining trend in most areas and reaching certain stability in recent years. In contrast, GNS, GTR, and LLS, which are predominantly used by smaller vessels, display more stable trends with several fluctuations in certain regions.

GNS and GTR, commonly used by smaller vessels, shows stable or decreasing effort in some areas, with exception of France in relation to recent years. LLS, also commonly used by smaller vessels, has the lowest effort among gear types, experiences minor fluctuations within certain stable trends. This differentiation in gear use indicates specialization based on vessel size and regional conditions, reflecting shifts in fishing strategies and evolving practices in certain areas.

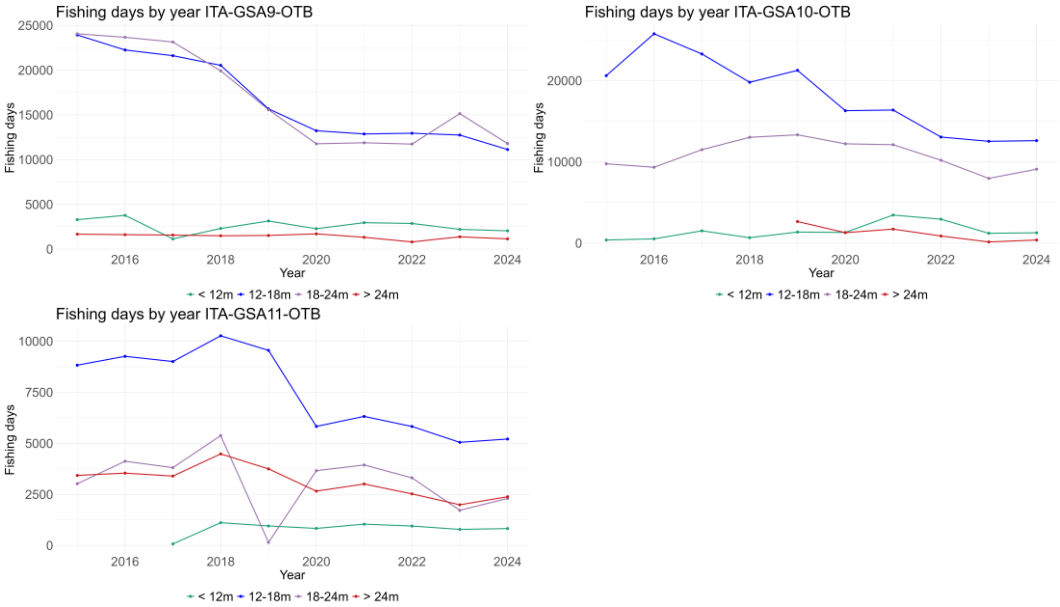
Some exceptions may be: OTB for GSA 10; GNS and GTR for GSA8; and LLS for GSA 9 & 11. These GSAs exhibits a slight increase for 2024 in comparison to 2023.

Figure 4.2.1. France: time series of OTB fishing effort expressed in fishing days by fleet segment in GSA 8.



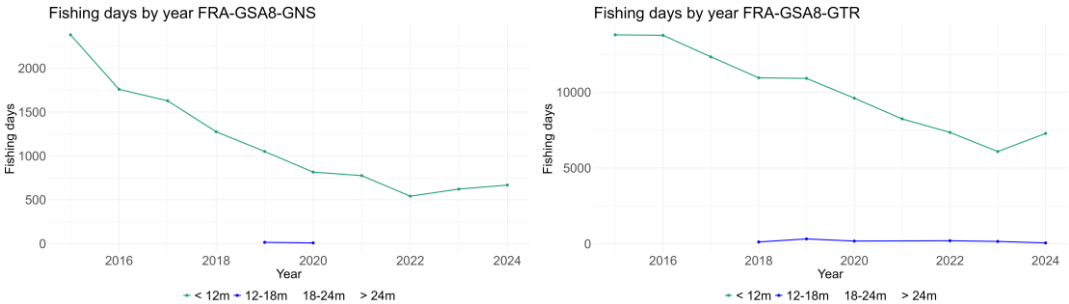
Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Figure 4.2.2. Italy: time series of OTB fishing effort expressed in fishing days by fleet segment and GSA.



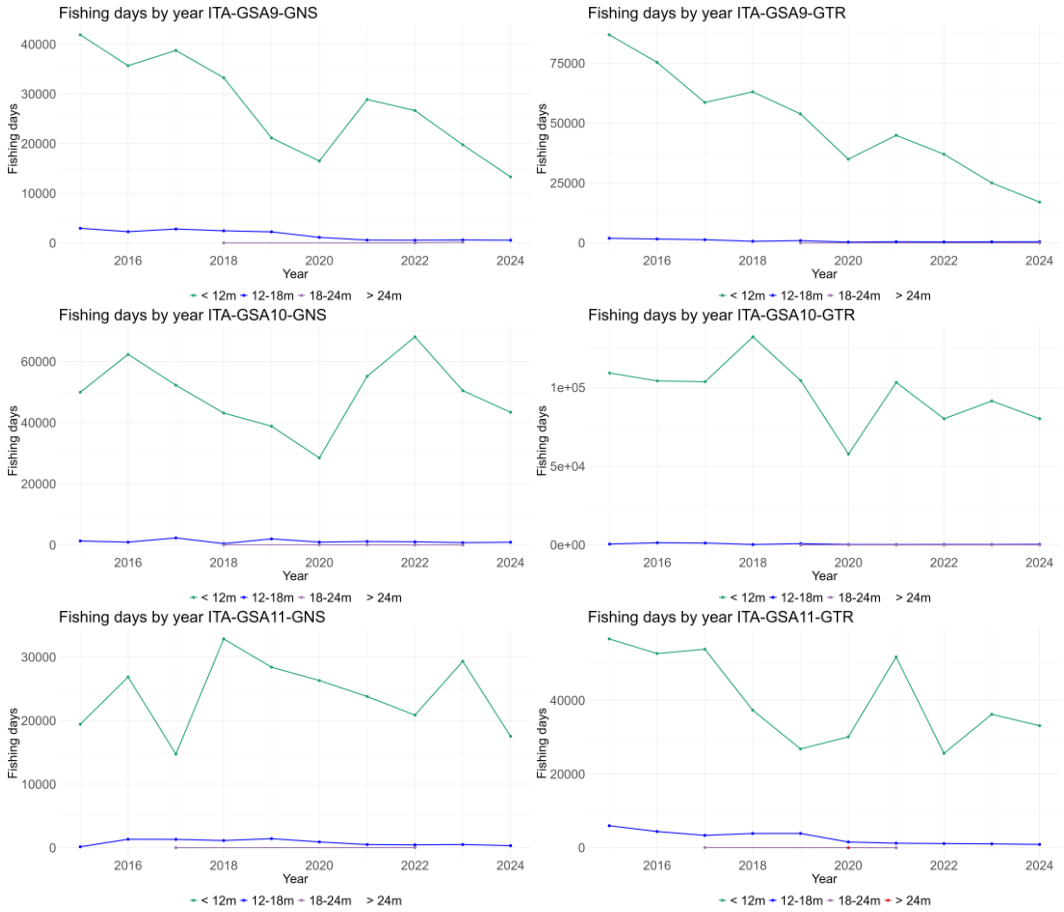
Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Figure 4.2.3. France: time series of GNS and GTR fishing effort expressed in fishing days by fleet segment in GSA 8.



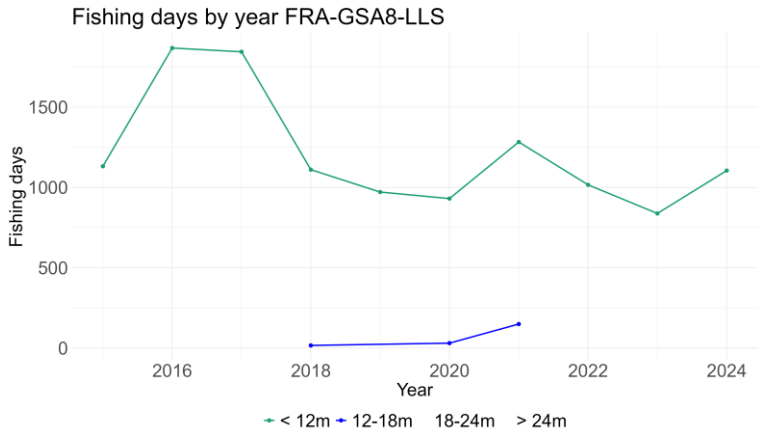
Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Figure 4.2.4. Italy: time series of GNS and GTR fishing effort expressed in fishing days by fleet segment and GSA.



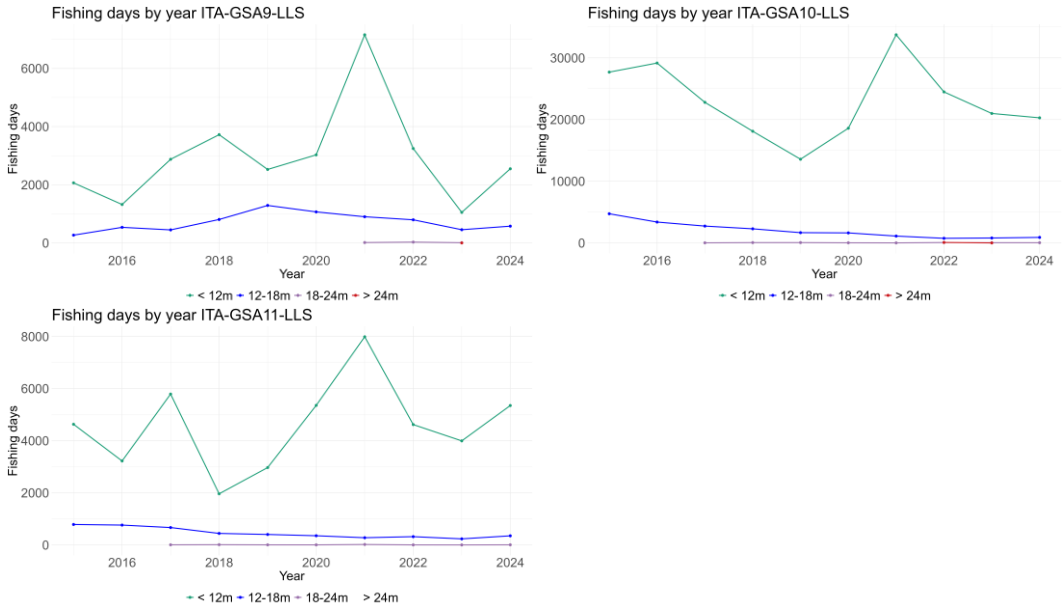
Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Figure 4.2.5. France: time series of LLS fishing effort expressed in fishing days by fleet segment and GSA 8.



Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Figure 4.2.6. Italy: time series of LLS fishing effort expressed in fishing days by fleet segment and GSA.



Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

4.2.2. Comparison between FDI data and effort reference levels in EU Regulation 2019/2236, 2021/90, 2022/110, 2023/195, 2024/259 and 2025/219.

The fishing effort (in fishing days) from the FDI database and the fishing effort from the Regulation were compared. Only the FDI fishing effort from GSAs 9-10-11 of trawl gears was considered for the Italian data and the FDI fishing effort from GSA 8 for French data. For both countries, the trawl gears correspond to OTB, OTM, TBB, and PTM, as listed in the 2019/2236 Regulation.

The 2020, 2021, 2022 and 2023 fishing opportunities were not compared with the 2020, 2021, 2022 and 2023 values of fishing effort (in fishing days) from the FDI database in this EWG to simplify the tables, as the Multiannual plan are no longer in the transition period. These comparisons are available in the EWG 24-12 report.

The 2024 fishing opportunities were compared with the 2024 values of fishing effort (in fishing days) from the FDI database (table 4.2.1-2). The percentage of change between the effort in the Regulation and the FDI fishing effort was calculated as the difference between the effort in the Regulation and the FDI effort divided by the effort in the Regulation multiplied by 100.

For Italian trawlers, the 2024 Regulation resulted in a 13 % higher number of fishing days than those declared in the FDI dataset for 2024.

For French trawlers, the 2024 Regulation was higher by 36 % than the fishing days declared in the FDI dataset for 2024.

Regulation 2025 is only presented, since this year's compensation mechanisms are not previously defined as they were during the transitional period, and now depend on decisions by MS, metier, and even individual vessels. For Italian and French trawlers, the 2025 the number of fishing days in the regulation was lower than the fishing days declared in the FDI dataset for 2024.

In the 2025 Regulation, fishing opportunities were allocated for France in EMU2 for the Deep-water metier, but neither in previous years nor 2024 were any fishing days declared in the FDI data.

Table 4.2.1. Comparison of fishing effort (in fishing days) of Italian trawlers in GSAs 9, 10 and 11 from the FDI database and the fishing effort from Regulation 2019/2236, Regulation 2021/90, Regulation 2022/110, Regulation 2023/195, Regulation 2024/259 and Regulation 2025/219 for EMU2.

Stock group	Fleet segment	FDI baseline: average of 2015-2017 fishing effort $E_{2015-2017}$	FDI Fishing effort in 2020	2020 Regulation	FDI Fishing effort in 2021	2021 Regulation	FDI Fishing effort in 2022	2022 Regulation	FDI Fishing effort in 2023	2023 Regulation	FDI Fishing effort in 2024	2024 Regulation	% of change between the 2024 Regulation and 2024 FDI effort	2025 Regulation
Red mullet in GSAs 9, 10 and 11; Hake in GSAs 9-10-11; Deep-water rose shrimp in GSAs 9-10-11; Norway lobster in GSAs 9 and 10.	< 12 m	3374	4472	3081	7664	2824	6934	2534	4212	2294	3396	1969	-72%	1202
	≥ 12 m and < 18 m	52679	31427	46350	34290	42487	29077	38110	27100	34505	20984	29613	29%	18064
	≥ 18 m and < 24 m	35031	24557	31170	27528	28572	23035	25629	22975	23205	19229	19915	3%	12148
	≥ 24 m	4680	4619	4160	5786	3813	3652	3421	3122	3097	1636	2658	38%	1622
Giant red shrimp in GSAs 9, 10 and 11.	< 12 m	567	130	510	101	101	57	57	31	31	78	326	76%	199
	≥ 12 m and < 18 m	3345	3963	3760	1297	1221	2859	2702	3460	3338	2953	2402	-23%	1465
	≥ 18 m and < 24 m	2838	3744	3028	1202	1039	2933	2492	2558.4	2346	2767	1934	-43%	1180
	≥ 24 m	450	1231	405	489	232	788	363	592	202	560	259	-116%	158
TOTAL FISHING EFFORT OF ITALIAN TRAWLS		**102964**	**74143**	**92464**	**78357**	**80289**	**69335**	**75308**	**64050**	**69018**	**51603**	**59076**	**13%**	**36038**

Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

Table 4.2.2. Comparison of fishing effort (in fishing days) of French in GSAs 8, 9, 10, and 11 from the FDI database and the fishing effort from Regulation 2019/2236, Regulation 2021/90, Regulation 2022/110, Regulation 2023/195, Regulation 2024/259 and Regulation 2025/219 for EMU2.

Stock group	Fleet segment	FDI baseline: average of 2015-2017 fishing effort $E_{2015-2017}$	FDI Fishing effort in 2020	2020 Regulation	FDI Fishing effort in 2021	2021 Regulation	FDI Fishing effort in 2022	2022 Regulation	FDI Fishing effort in 2023	2023 Regulation	FDI Fishing effort in 2024	2024 Regulation	% of change between the 2024 Regulation and 2024 FDI effort	2025 Regulation
Red mullet in GSAs 8, 9, 10 and 11; Hake in GSAs 8, 9, 10 and 11; Deep- water rose shrimp in GSAs 9, 10 and 11; Norway lobster in GSAs 9 and 10.	< 12 m	169	0	208	0	191	0	117	0	161	0	139	100%	138
	≥ 12 m and < 18 m	515	319	833	383	764	517	709	506	644	460	556	17%	551
	≥ 18 m and < 24 m	53	20	208	55	191	0	117	0	161	0	139	100%	138
	≥ 24 m	148	151	208	160	191	141	117	156	161	163	139	-17%	138
TOTAL FISHING EFFORT OF FRENCH TRAWLS		**884**	**490**	**1457**	**598**	**1337**	**658**	**1060**	**662**	**1127**	**623**	**973**	**36%**	**965**

Source: MS data submission under the 2025 Fisheries Dependent data call - MARE/D/MM (2025).

5. (TOR 2B) ESTIMATE AND DISCUSS THE MEASURES TO SUPPORT THE FLEET AND THE CONSEQUENCES OF FUEL COSTS CHANGES

The objective of the analysis is to building on 2024 STECF ad-hoc contracts (for France, Italy and Spain), complete the work started by EWG 24-12 to estimate and discuss the measures to support the fleet and the consequences of fuel costs changes in 2022-2024 as well as in the current year for the different types of vessel sizes and fishing gear, with the most updated (quantitative) available data and (qualitative) expert knowledge.

5.1. Measures to support the fleet

Three ad hoc contracts have been issued in 2024 to collect specific information regarding payments of subsidies in Spain, France and Italy prioritising vessels operating in the Western Mediterranean Sea. The report for Italy was assessed by STECF during the July plenary session (PLEN 24-02). The reports for France and Spain were available to the STECF November plenary (PLEN 24-03).

Based on the assessments of these contracts, STECF 24-03 concluded that subsidies related to mandatory **temporary cessation of fishing activities** could eventually be integrated in the scenarios modelled in the West Med MAP EWGs. These types of subsidies are well suited for inclusion in models because, as highlighted by the three ad hoc contracts, they exhibit a relatively stable structure over time and are backed by more consistent reliable data from official administrative sources. Other types of subsidies, such as those implemented in recent years to mitigate the impacts of extraordinary events, are not suitable for inclusion in models because of the unpredictability of their future levels.

However, STECF 24-03 noted persistent gaps in data availability, mainly related to payments that are still under processing or awaiting certification, together with incomplete reporting and inconsistencies in the timing of subsidy payments.

The Mandatory Temporary Cessation (MTC) schemes in France, Spain and Italy provide financial support to fishing vessels for temporary cessation.

- France: MTC funds target trawlers and small-scale fisheries in the Gulf of Lion and Corsican waters (GSAs 7–8). Payments are based on a vessel's previous turnover and cessation days, with eligibility requiring at least 120 operational days over the previous two years. Compensation varies by vessel size and skipper-ownership, financed initially by EMFF and later EMFAF. However, about 34% of 2022 payments lacked identifiable vessel data, complicating fleet-segment analysis. Annual ministerial decrees define cessation periods, which vary yearly.
- Spain: Spain's MTC covers demersal vessels in GSAs 1, 2, 5, 6, and 7, aiming for up to a 30% reduction in fishing effort over five years. Payments are based on gross tonnage (GT) and assigned fishing days, with larger vessels receiving higher compensation. Funded through EMFF/EMFAF, Spain applies

similar 120-day eligibility criteria. Implementation faces challenges due to owner-level rather than vessel-level reporting, hindering precise data aggregation.

- Italy: Italy applies MTC to trawlers in GSAs 9, 10, and 11, requiring around 30 cessation days per year, with additional days progressively added since 2019. Payments depend on vessel GT and number of cessation days, providing uniform support across fleets under EMFF Measure 1.33. Beneficiaries are publicly listed annually, and vessels must also meet the 120-day operational threshold.

Overall, the three countries apply MTC schemes with similar objectives - reducing trawl effort and supporting income during temporary closures - but differ in implementation, data traceability, and calculation methods

Table 5.1.1 - Operating subsidies by year and country for the Temporary Cessation of fishing activities to mitigate the impact of the COVID-19 outbreak (TC_Covid_199) and the Mandatory temporary cessation of fishing activities (MTC)

	2019	2020	2021	2022	2023	Total
FR		2,462,982	458,423	1,020,890		3,942,295
MTC			458,423	1,020,890		1,479,313
TC_Covid_19		2,462,982				2,462,982
IT	1,173,850	1,481,275	1,736,938	3,358,663	403,795	8,154,520
MTC	1,173,850	1,481,275	1,301,035	1,140,889	243,396	5,340,445
TC_Covid_19			435,902	2,217,773	160,399	2,814,075
SP	130,424	578,180	332,890	348,947	126,694	1,517,135
MTC	130,424	284,653	332,890	348,947	126,694	1,223,607
TC_Covid_19		293,528				293,528
Total	1,304,274	4,522,438	2,528,250	4,728,500	530,489	13,613,951

Source: 2024 ad hoc contracts regarding payments of subsidies in Spain, France and Italy for vessels operating in the Western Mediterranean Sea

As observed through the analysis of the ad hoc contracts, significant differences emerge among the three countries in both the methods used to calculate payments and the timing of their disbursement, reflecting distinct administrative procedures. More importantly, as also highlighted by STECF 24-03, although all three contracts provide basic subsidy data, the information remains partial and incomplete for several

measures and reference years. Data for the most recent periods are still being processed, resulting in temporal gaps that hinder a comprehensive assessment of recent subsidy impacts.

Additional data on payments for temporary cessations were subsequently made available by the Commission to EWG 25-11. These data include EMFF support (EUR), EMFF eligible expenditure (EUR), and the number of operations by port and vessel length classes, together with an annual breakdown of EMFF support. However, several key aspects remain unclear, such as: whether the yearly breakdown is based on the date of payment or the reference year of the cessation; whether the figures refer only to the EU contribution or to the total public expenditure (EU + national shares); which specific measures are included (e.g. only Measure 1.33 – Temporary cessation, or also Measure 5.69 and other operational subsidy measures).

Even more importantly, for the integration of this information into the scenarios modelled under the West Med MAP EWGs, it would be valuable to obtain the list of beneficiaries with their EU fleet register number (or, alternatively, an aggregation by fleet segment), to ensure alignment with the WestMedPlan segmentation and management units (EMUs).

The EWG therefore considers that, in future work, data on temporary cessation payments should be made available in a more standardised and complete format, ensuring:

- a breakdown by year of the actual payment;
- a breakdown by GSA and fleet segment, consistent with the WestMedPlan management units;
- clear identification of the measure to which each payment relates; and
- inclusion of both the EU and national funding shares.

EWG 25-11 also examined the information available on the **permanent cessation scheme**, implemented in France in 2022 and recently initiated under EMFAF in Italy.

For France, a permanent cessation plan was implemented in 2022, resulting in the withdraw of 14 vessels, for a total of 1,471 GT and 4,424 kW. This information is integrated into the baseline of the scenarios modelled.

For Spain, a decommissioning plan aimed at adjusting the fleet's fishing capacity has been included as an additional, exceptional measure in the 2024 action plan for segments in imbalance (2024 Spanish fleet report link).

For Italy, the permanent cessation plan is described in the *2024 Italian Fleet Report* (link, Annex A: *Action plan for fleet segments found to be in imbalance, setting out the adjustment objectives and tools to achieve balance*). According to this plan, a total of 4,563 GT will be withdrawn in GSAs 9, 10, and 11. The criteria for obtaining funding for vessel decommissioning state that the fishing vessel must have carried out fishing activities at sea for at least 90 days during the last two calendar years preceding the date of submission of the aid application. National ministerial decrees approving the final lists of vessels have already been issued for some fleet

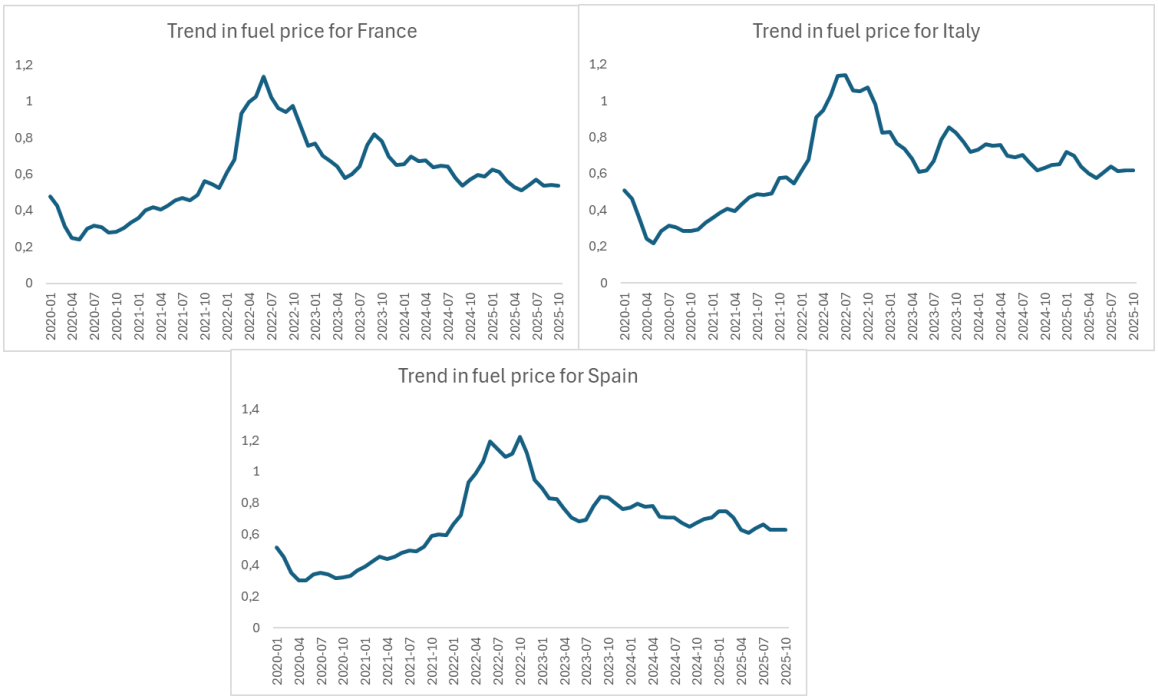
segments, while the remaining decrees are expected to be finalized in the coming weeks. The scrapping is scheduled to take effect from 2026. This information is currently being integrated into the scenarios modelled by the EWG.

5.2. Consequences of fuel costs changes in 2022-2024

Over the past three years, marine fuel prices have shown strong volatility in the Mediterranean region. The 2022 energy shock caused by the war in Ukraine led to historic price peaks, followed by a partial correction in 2023–2025. These dynamics weigh heavily on operating costs, fleet profitability, and fishing effort decisions.

To get the most up-to-date information and analysis on marine fuel price trends, the EUMOFA database has been queried. Figure 5.2.1 reports the fluctuations of the average marine fuel oil prices (in euro) for Spain, Italy and France from 2020 to 2025. In the 3 MS, fuel prices began with a gradual increase through 2020 and 2021, reaching a sharp peak around mid-2022. After this peak, prices declined but began to rise slightly again toward late 2023. Afterwards, fuel prices declined and remained relatively flat, with only a gentle upward slope toward the beginning of 2025. Overall, all three countries saw a significant spike in fuel prices in mid-2022, likely due to external economic or geopolitical factors, followed by a period of decline and a mild recovery or stabilization in the subsequent months.

Figure 5.2.1 Fluctuations of the average marine fuel oil prices for Spain, Italy, France (2020 – October 2025).



Source: EUMOFA database

The "Average Fuel Prices" table (Table 5.2.1) offers an overview of fuel costs per liter in euros across France, Spain and Italy from 2020 to 2023. In the French Mediterranean fleet, DTS vessels experienced the largest rise from €0.62/l in 2020 to

€0.91/l in 2022, while DFN and HOK segments showed more modest changes. By 2023, prices for all segments decreased slightly compared to 2022, resulting in a small net change over the 2020-2023 period for DFN vessels. Spanish Mediterranean fleets faced sharp increases over the same period, with DFN vessels seeing the highest surge of 140%, and DTS and HOK segments rising by 99% and 90%, respectively. Although prices decreased slightly in 2023, they remained significantly above 2020 levels. Italian fleets operating in GSAs 9, 10 and 11 had high absolute fuel prices, particularly for HOK and PGP vessels, with substantial increases between 2020 and 2022 of around 70–74%, followed by a moderate decrease in 2023. Overall, the data highlight both geographic and fleet-segment variations, with Spanish fleets experiencing the steepest relative increases, French fleets showing the most moderate changes, and Italian fleets having the highest absolute prices.

Table 5.2.1. Average fuel prices by country and fleet segment, 2021-2023

		Average fuel prices (euro/liters)				
MS	Fishing technique	2020	2021	2022	2023	**2023/2020**
France (Med)	DFN	0,76	0,82	0,88	0,74	-2%
	DTS	0,62	0,87	0,91	0,81	31%
	HOK	0,71	0,80	0,88	0,77	9%
Spain (Med)	DFN	0,33	0,56	0,86	0,78	140%
	DTS	0,39	0,56	0,84	0,77	99%
	HOK	0,41	0,58	0,85	0,78	90%
Italy (GSA9, GSA10, GSA11)	DTS	0,51	0,65	1,00	0,88	73%
	HOK	0,52	0,62	1,03	0,91	74%
	PGP	0,57	0,81	1,15	0,97	70%

Data source: FR and ESP: MS data submissions under the DCF 2024 Fleet Economic. ITA: data at GSA level provided by the MS.

Table 5.2.2 highlights the evolving share of energy costs relative to revenues across different Mediterranean countries and fleet segments from 2020 to 2023. In France, energy costs accounted for a relatively small portion of revenues for DFN and HOK vessels, remaining under 10% for most years, while DTS vessels faced substantially higher shares, rising from 24% in 2020 to a peak of 37% in 2022 before slightly decreasing to 34% in 2023. Spanish fleets show a similar pattern, with DFN and HOK vessels maintaining low shares, although DFN costs peaked at 17% in 2022, whereas DTS vessels experienced a pronounced increase from 17% in 2020 to 32% in 2022, falling slightly to 28% in 2023. Italian fleets in GSAs 9, 10 and 11 faced the highest energy cost burdens, particularly DTS vessels, which rose from 26% in 2020 to 41% in 2022 and decreased moderately to 37% in 2023, while HOK and PGP segments experienced smaller but notable increases over the same period. Overall, the data indicate that energy costs represent a significant and growing share of revenues for larger and more energy-intensive vessels, particularly DTS segments, highlighting the potential impact of fuel price fluctuations on the economic profitability of Mediterranean fleets.

Table 5.2.2. Energy costs as a share of revenues by year

		Energy costs as a share of revenues			
MS	Fishing technique	2020	2021	2022	2023
France (Med)	DFN	5%	9%	9%	8%
	DTS	24%	27%	37%	34%
	HOK	5%	7%	9%	5%
Spain (Med)	DFN	5%	8%	17%	8%
	DTS	17%	19%	32%	28%
	HOK	6%	6%	10%	7%
Italy (GSA9, GSA10, GSA11)	DTS	26%	31%	41%	37%
	HOK	13%	12%	16%	16%
	PGP	9%	14%	15%	13%

Data source: FR and ESP: MS data submissions under the DCF 2024 Fleet Economic. ITA: data at GSA level provided by the MS.

5.3. Modeling of energy costs

In the models applied by the EWG 25-11, AER data on energy costs are used for Spanish and French EMUs. These data include the official data sets provided by the Member States till the year 2023 and projections for the year 2024 and 2025. AER projections are based on fuel prices that are obtained from EUMOFA website for each MS. The AER method to estimate the fuel price in year+1 (i.e., 2024 in this AER) is to apply the percentage change between years 2023 and 2024 of the fuel prices reported by EUMOFA.

Energy costs (All fleet segments)

$$Energy\_costs_{t+1,f} = Energy\_costs_{t,f} \frac{Energy\_consumption_{t+1,f}}{Energy\_consumption_{t,f}} \times \frac{Fuel\_price_{t+1,m}}{Fuel\_price_{t,m}} \ ($$

$$Energy\_costs_{t+2,f} = Energy\_costs_{t+1,f} \frac{Energy\_consumption_{t+2,f}}{Energy\_consumption_{t+1,f}} \times \frac{Fuel\_price_{t+2,m}}{Fuel\_price_{t+1,m}}$$

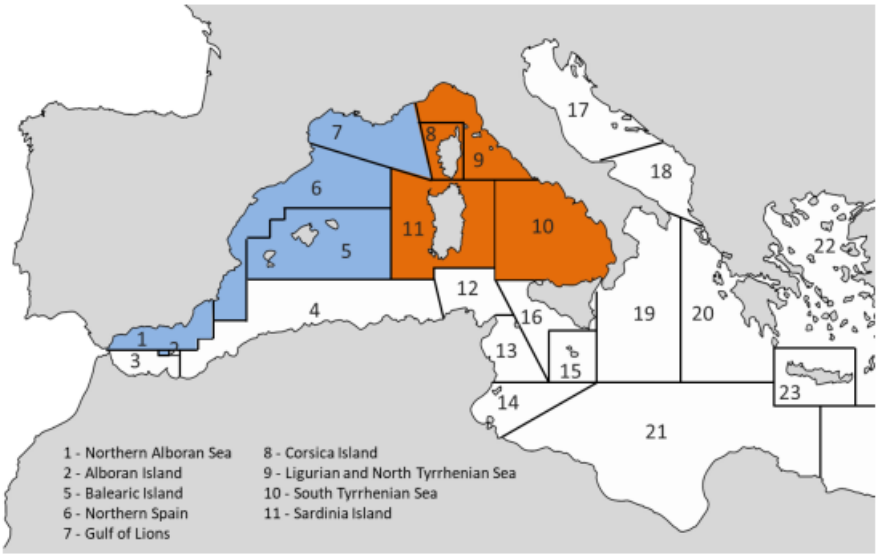
The Italian dataset is not retrieved by the AER because in the AER data are available only by the whole country and not by GSA. Therefore, the same changes in fuel prices estimated for the whole Italian segments have been applied to the GSA covered by the WestMedPlan (in continuity with approach used in previous years).

The EWG discussed possible improvements in modelling energy costs in the future. Sala et al. (2022) conducted energy audits on a test fleet representing three typical Mediterranean trawl fisheries (midwater pair trawl, bottom otter trawl, and Rapido beam trawl) demonstrating that fuel consumption rates vary widely with gear type and vessel size. To obtain fisheries-specific fuel use estimates, datasets combining energy audits and high-resolution logbook information were used to model daily fuel consumption as a function of vessel length overall (LOA). This LOA-based theoretical fuel use model was then scaled to estimate daily fuel consumption across the national fleet and its segments. Using the parameters published in Sala et al. (2022), the model can estimate mean hourly fuel consumption for each fishery or vessel. The model has been used to infer specific fuel consumption per fishing day, including steaming and towing, for each fishery and vessel segment (ICES, 2024). The ongoing DecarbonyT project (Decarbonisation of the fishing fleet in the Mediterranean and Black Sea) will also provide useful tools in this context. In particular, task 2 of the project will develop an application that models the fuel consumption of individual vessels (including steaming and fishing phases) to obtain a bottom-up estimation of the fuel consumption and carbon emission at the scale of fleet segment (https://decarbonyt.eu/task-1/subtask-1b/).

6. (ToR 2a3a) Update the relationship between fishing effort and fishing mortality in the Effort Management Units 1 and 2 (EMU1 and EMU2)

The EWG 25-11 is requested to analyse the F-E relationship in the two EMUs (Effort Management Units): EMU1 for GSAs 1 to 7 and EMU2 for GSAs 8 to 11 (Figure 6.1).

Figure 6.1. - Mediterranean fishing management units ("GSAs") under the WestMedMAP for demersal fisheries. The west GSAs are grouped as Effort Management Units for management purposes; with EMU1 grouping the GSAs in the west (highlighted in blue) while the east GSAs are grouped in the EMU2 (in orange)



Source: Own elaboration

To respond to ToR 2.a, the EWG 25-11 based the analysis on the most recent stock assessment results from EWG 25-09 "Western Mediterranean stock assessments". The EWG 25-09 provided the stock objects with all the information by stock and gear, and the model objects with the result of the assessment for all the species listed in table 6.1 (species as category 1 stocks included in the WestMedMAP), at the GSA level or EMU level.

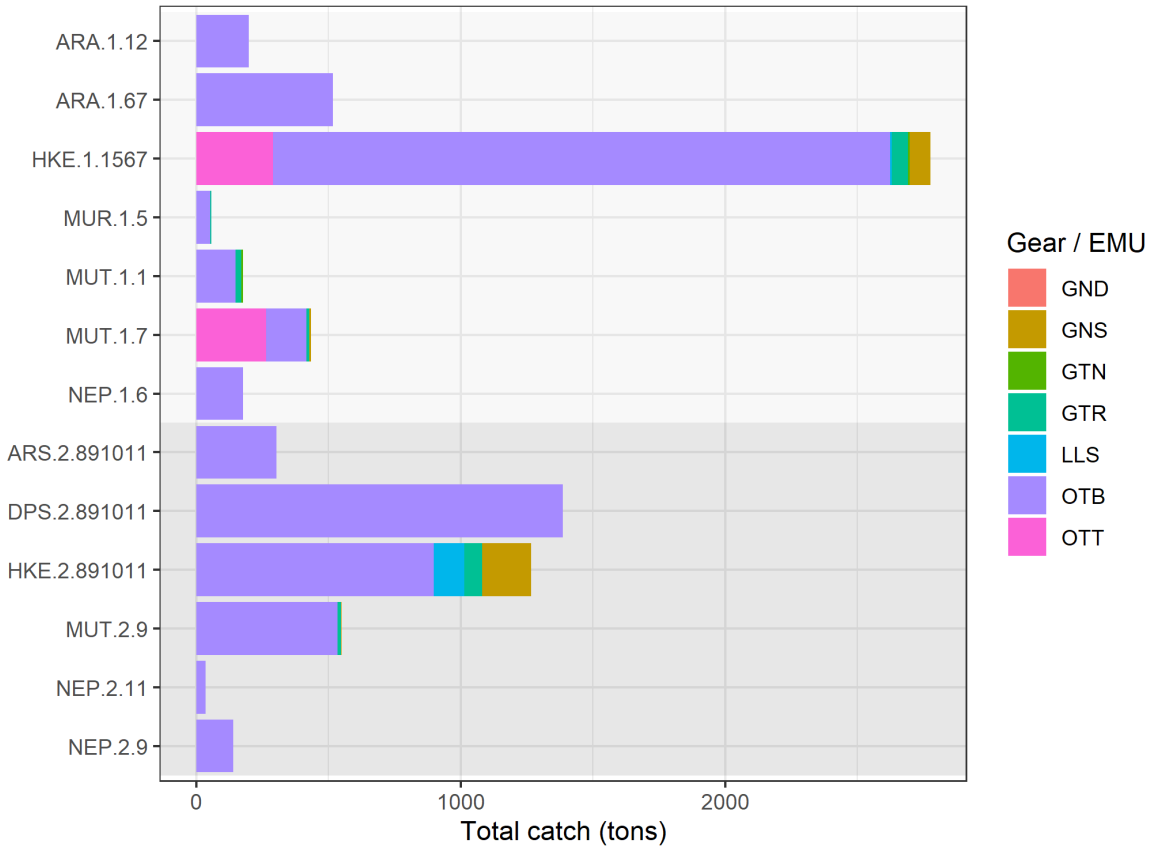
The analysis was performed considering the main gears targeting the species to evaluate their contribute to the fishing mortality of demersal stocks (Figure 6.2, Table 6.2).

Table 6.1: Species covered by the WestMedMAP for demersal fisheries.

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

Source: Own elaboration.

Figure 6.2: Contribution of trawling fleets and fleets using other gears to the catches of the main target stocks in the Western Mediterranean, based on landings+discards data for 2024s.



Source: Own elaboration.

Table 6.2: Contribution of trawling fleets and fleets using other gears to the catches of the main target stocks in the Western Mediterranean, based on landings+discards data for 2024.

species	EMU	stock	OTB	GTR	GNS	LLS	GND	OTT	GTN
ARA	1	ARA.1.12	100.0						
ARA	1	ARA.1.67	100.0						
HKE	1	HKE.1.1567	84.1	2.2	2.8	0.2		10.4	0.2
MUR	1	MUR.1.5	91.2	7.0	1.8				
MUT	1	MUT.1.1	84.7	12.5					2.8
MUT	1	MUT.1.7	35.5	2.3	1.6			60.6	
NEP	1	NEP.1.6	100.0						
ARS	2	ARS.2.891011	100.0						
DPS	2	DPS.2.891011	100.0						
HKE	2	HKE.2.891011	70.9	5.2	14.7	9.2			
MUT	2	MUT.2.9	96.9	2.5	0.5				
NEP	2	NEP.2.11	100.0						
NEP	2	NEP.2.9	100.0						

Source: Own elaboration

Adapting the script developed by EWG 25-01, the procedure estimates partial fishing mortality (F) starting from the partial stock objects by year, by gear and by country provided by EWG 25-09. The procedure loads, for all stocks listed in Table 6.1, the standard stock assessment outputs from the respective EWG assessments and compiles them into a single list of **FLStocks** objects (see **FLR** website for more).

Within each FLStocks object, the first FLStock corresponds to the assessment output (i.e. fit + stk), the second represents the input stock used in the assessment, and the remaining elements correspond to the stocks associated with each level that contribute, in terms of partial catch and partial F, to more than 1% of the total catch in weight. To distinguish levels, species, EMU, and stock unit codes were separated by a single period (e.g. HKE.1.1567 refers to hake in EMU 1, stock unit comprising GSAs 1, 5, 6, and 7).

This structure provides the key advantage of integrating all related information within a unified framework, facilitating both data handling and computational efficiency during analysis. The properties of FLStocks allow for the calculation of catch and F proportions directly from the information stored in the different slots of each FLStock.

Using the properties and structure of the FLR framework, the relative contribution to F was computed according to the following formula:

$$F_{a,g}^{y} = F_{a}^{y} \frac{C_{a,g}^{y}}{\sum_{j}^{G} C_{a,j}^{y}}$$

where F_{a}^{y} is the vector of fishing mortality at age a for each year y obtained from the R Model objects from STECF EWG 25-09, $C_{a,g}^{y}$ 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).

Regarding the time-span of the reconstructed catch-at-age series $C_{a,j}^{y}$ 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 start to be available since 2009. Hence, the partial F vectors were calculated since 2013.

The partial fishing mortality was estimated for each species, GSA area, gear age and year combination. Next, the partial F_{bar} was calculated as the average value of the partial fishing mortality for the range of ages considered to estimate the F_{bar}.

For each stock, the relationship between the effort (days at sea) and the partial F_{bar} was analyzed throughout a bivariate analysis that measures the strength of association between two variables and the direction of the relationship. Explicitly, a linear regression was fit.

To properly link and find the relationship between the effort (days at sea) and the fishing mortality, a check of target assemblages from FDI dataset matching with the landings by gear for the selected GSAs and species was done. The results shown in the table below highlight that effort is related to a maximum of 12 assemblages (Table 6.3).

For the purposes of the analysis and taking in to account the biology and depth distribution of the species EWG 25-11 uses what was stated by EWG 24-10 i.e. the DWS assemblage should be excluded from the total effort for red mullet in each EMU and GSA, while for ARA and ARS only the efforts belonging to CRU, DWS, DES, MDD and NK assemblages should be conversely considered.

Table 6.3: Target assemblages related to the areas and species object of the analysis (code match).

Code.match	Code	Target.assemblage.description
	ANA	Anadromous
CAT	CAT	Catadromous
CEP	CEP	Cephalopods
CRU	CRU	Crustaceans
DEF	DEF	Demersal fish
	DES	Demersal benthic species
DWS	DWS	Deep-water species
FIF	FIF	Finfish
	FWS	Freshwater species
	GLE	Glass eel
LPF	LPF	Large pelagic fish
	MCD	Mixed crustaceans and demersal fish
	MCF	Mixed cephalopods and demersal fish
MDD	MDD	Mixed demersal and deep water species
	MIS	Miscellany
MOL	MOL	Molluscs
	MPD	Mixed pelagic and demersal fish

Code.match	Code	Target.assemblage.description
SLP	SLP	Small and large pelagic fish
SPF	SPF	Small pelagic fish
NK	NK	not known

Source: Own elaboration.

6.1. (ToR3a) Partial fishing mortality (F_{part})

The calculations of partial fishing mortality ((F_{part}) or partial F hereafter) by species, GSA area, gear and age, presented and discussed in the following sections, refer to the most recent year in the assessment (2024), although the relative importance of the various fishing gears have remained stable over time in the last years.

The partial fishing mortality (F_{part}) patterns by age likely reflect both the spatial distribution of fishing effort and gear selectivity, but exact correspondence cannot be guaranteed due to data limitations and model assumptions.

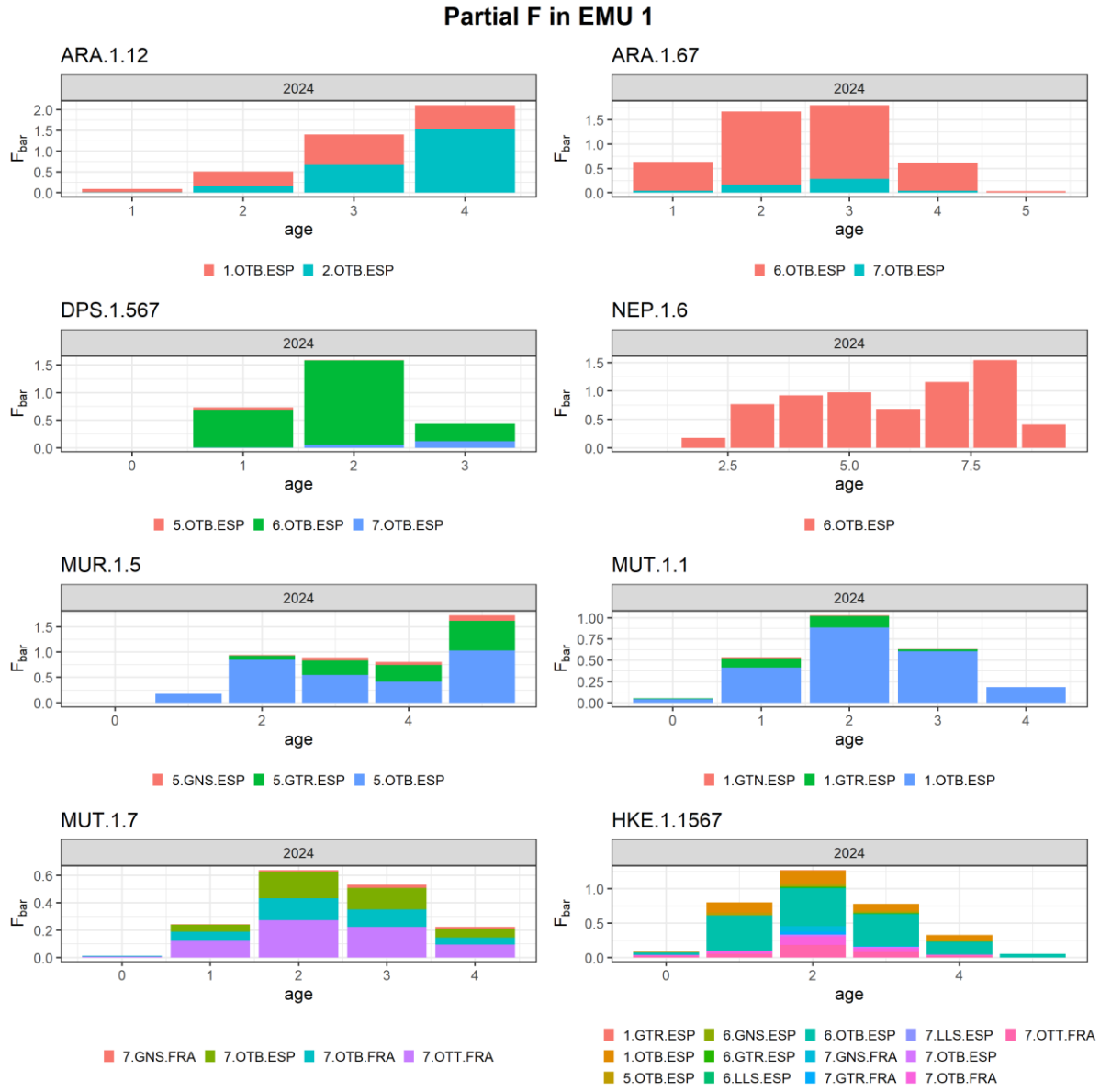
6.1.1. Effort Management Unit EMU 1

The analysis of fishing mortality (**(**F_{bar}**)**) and catch composition for **EMU 1** during **2024** highlights distinct exploitation patterns across stocks and GSAs.

Catches are generally dominated by OTB fleets, with varying contributions from GTR, GNS, LLS, and OTT, depending on the stock and area.

Overall patterns of fishing mortality and fleet contribution (partial F) are illustrated in the corresponding panels of Figure 6.1.1.

Figure 6.1.1 - Partial Fbar by age as a function of fishing effort in days in EMU 1 stocks, year 2024.



Source: Own elaboration.

Aristeus antennatus – EMU_1 (GSA 1–2): **ARA.1.12**

In the stock unit ARA.1.12, all catches were taken by OTB fleets. The corresponding fishing mortality shows the highest values mainly at ages 3–4. Between the two GSAs, the partial mortality at age 3 is evenly distributed, while at age 4 it originates primarily from GSA 2.

Aristeus antennatus – EMU_1 (GSA 6–7): **ARA.1.67**

Similar to ARA.1.12, ARA.1.67 catches are exclusively taken by OTB fleets. Regarding the partition of fishing mortality, the majority is attributed to GSA 6, particularly for ages 2 and 3.

Parapenaeus longirostris – EMU_1 (GSA 5–6–7): **DPS.1.567**

DPS.1.567 is fished predominantly in GSA 6, mainly by OTB fleets. This is reflected in the partial fishing mortality, which peaks at ages 1 and especially 2.

Mullus surmuletus – EMU_1 (GSA 5): **MUR.1.5**

For MUR.1.5, the highest partial fishing mortality occurs at age 5, mainly due to OTB, although GTR fleets also contribute significantly. Lower partial F values are observed for GNS.

Mullus barbatus – EMU_1 (GSA 1): **MUT.1.1**

MUT.1.1 is caught by three fleets (OTB, GTR, GNS). The highest catches and fishing mortality values are associated with OTB, followed by GTR. Partial fishing mortality peaks at age 2, largely due to OTB, with notable values also at ages 1 and 3. GTR contributes moderately, while GNS shows very low partial F values at ages 1 and 2.

Mullus barbatus – EMU_1 (GSA 7): **MUT.1.7**

MUT.1.7 is caught mainly by OTB (in both Spain and France), GTR (in Spain), and OTT (in France). Trawl fleets (OTB and OTT) show the highest partial fishing mortality, concentrated at ages 2 and 3, with similar relative contributions between Spanish and French fleets. Very low partial F values are observed for GTR in France at ages 2–4.

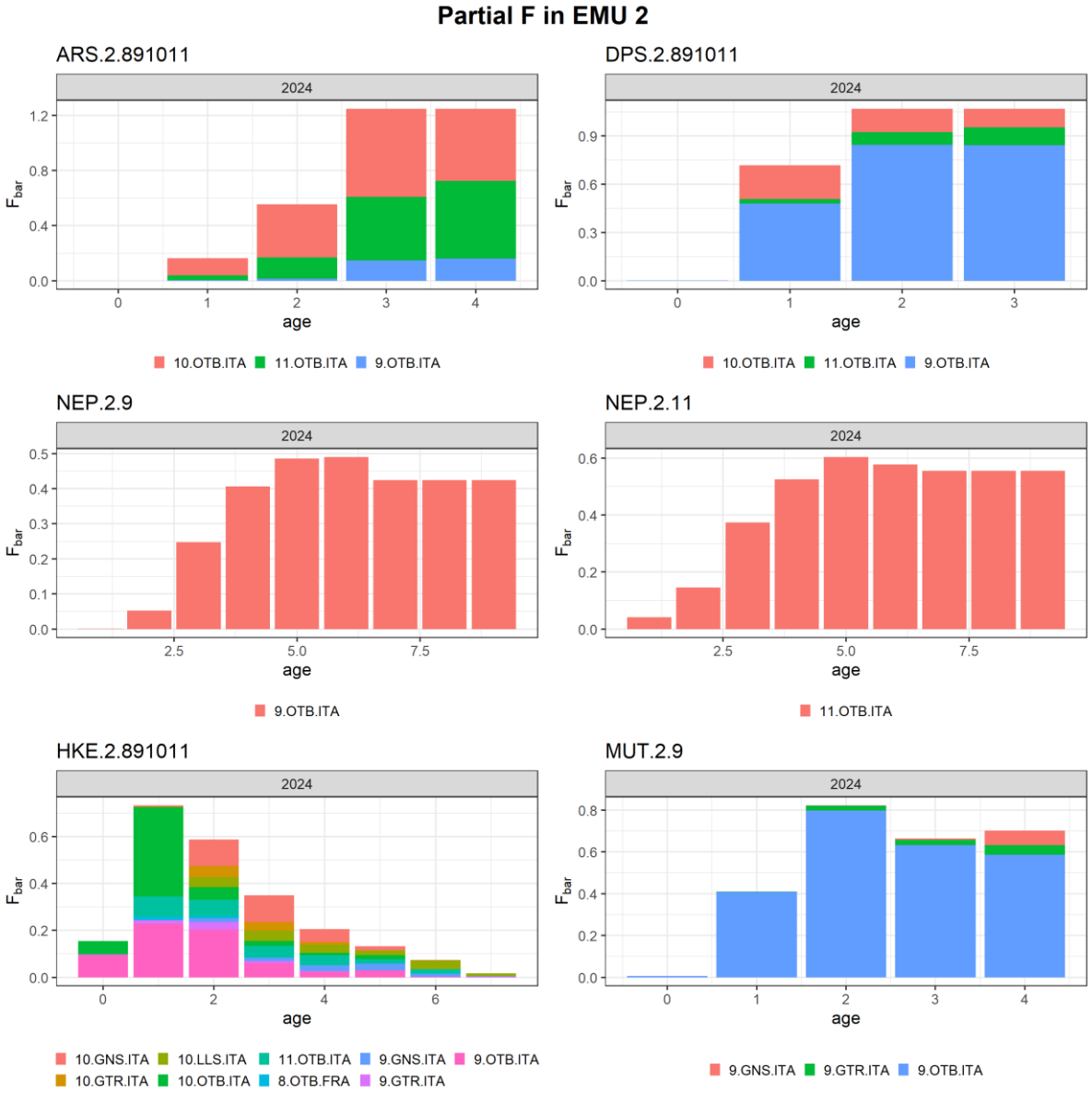
Merluccius merluccius – EMU_1 (GSA 1–5–6–7): **HKE.1.1567**

Analysis of 2024 data indicates that most fishing mortality occurs in Spanish OTB fleets, at ages 1–4 in GSA 6 and ages 1–2 in GSA 1. High partial F values are also recorded for French OTB and OTT fleets at ages 2–3. Overall, age 2 shows the highest partial fishing mortality across all fleets and areas.

6.1.2. Effort Management Unit EMU 2

The analysis of partial F and catch composition for EMU 2 highlights clear differences across species and GSAs. In most cases, the OTB fleet dominates catches and drives fishing mortality, although other gears (GTR, GNS) contribute for specific stocks and age groups as described by Figure 6.1.2 and text below.

Figure 6.1.2- Partial Fbar by age as a function of fishing effort in days in EMU 2 stocks, year 2024.



Source: Own elaboration.

Aristaeomorpha pholiacea - EMU_2 (GSA_8_9_10_11): **ARS.2.891011**

Partial fishing mortality in ARS.1.891011 was highest at ages 3 and 4, mainly in GSAs 9 and 10, with OTB being the only gear exploiting this stock.

Parapenaeus longirostris - EMU_2 (GSA_8_9_10_11): **DPS.2.891011**

DPS.2.891011 was also harvested exclusively by OTB fleets, which generated the highest partial F at ages 1 to 3, primarily in GSA 9.

Mullus barbatus - EMU_2 (GSA_9): **MUT.2.9**

MUT.2.9 was targeted by OTB, GTR, and GNS gears; however, OTB accounted for most of the partial F, which peaked at ages 2 to 4. GNS showed higher partial F values at older ages (3–4).

Merluccius merluccius - EMU_2 (GSA_8_9_10_11): **HKE.2.891011**

In EMU 2, HKE_8_9_10_11 partial fishing mortality was mostly driven by OTB fleets, particularly in GSAs 9 and 11, and at ages 1 to 3.

6.2. (ToR 2a) Relationship between fishing effort and fishing mortality

In this section, for all the stocks, the partial F_{bar} by GSA and gear is plotted against the fishing effort in days.

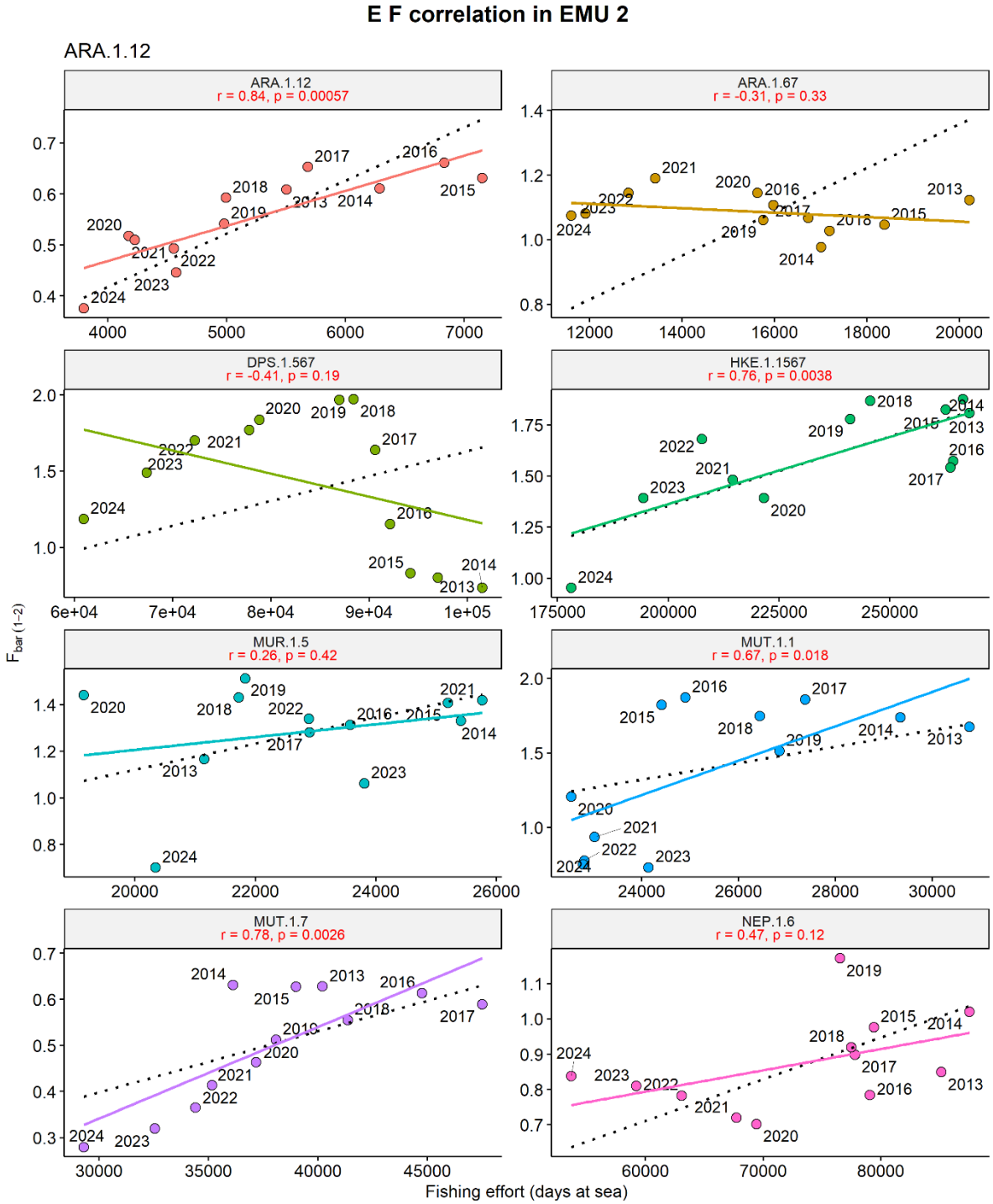
A linear relationship between fishing effort and partial F_{bar} is fitted, and the Pearson correlation coefficient is estimated.

In the figures the solid line represents the linear regression on the observed values, while the dashed line represents the linear regression forced to pass from the origin according to the assumption that F is null when no fishing effort is exerted on the stock.

6.2.1. Effort Management Unit EMU 1

For each stock, the relationship between fishing effort and F_{bar} was initially analyzed using the assessment results aggregated across all gears and fleets. The objective was to provide a comprehensive overview of the bivariate relationship among species within each EMU (Figure 6.2.1). Subsequently, a more detailed analysis was performed by considering the relationship based on the partial F_{bar} instead (Figures 6.2.2-6.2.18).

Figure 6.2.1- Partial Fbar by age as a function of fishing effort in days for EMU 1. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



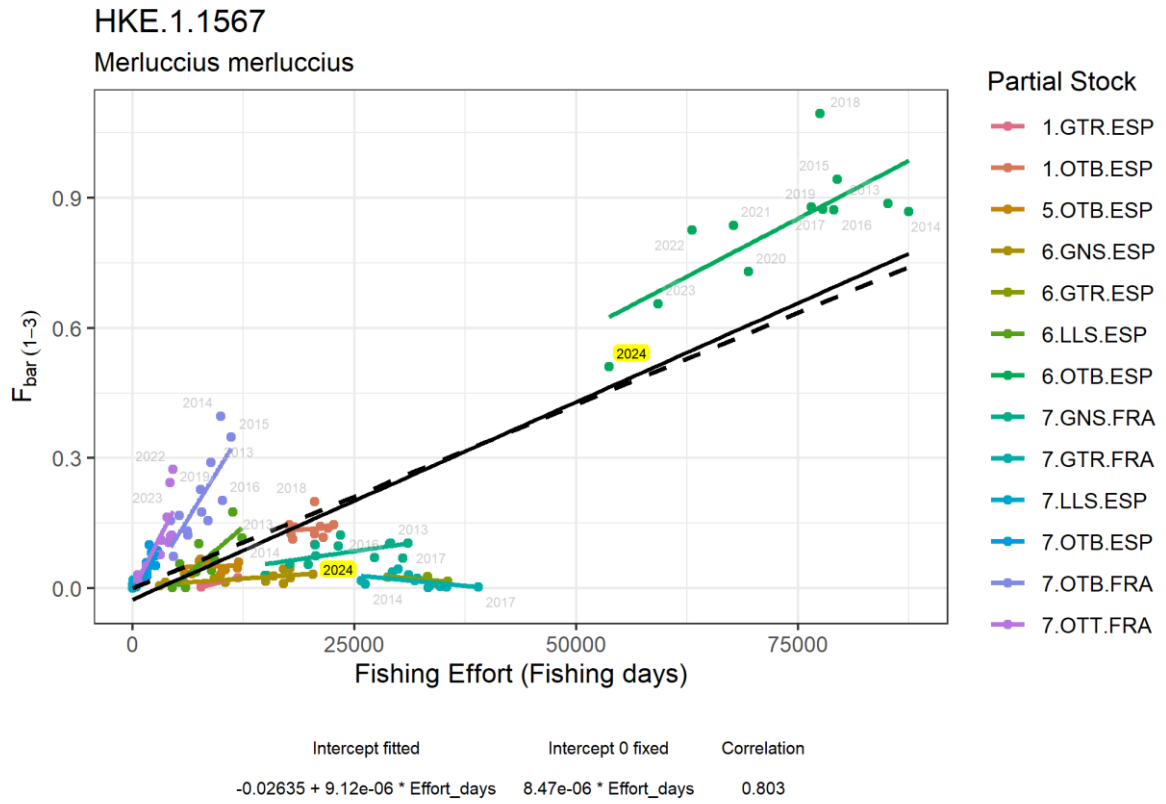
Source: Own elaboration.

6.2.1.1. Merluccius merluccius – EMU_1 (GSA 1–5–6–7): HKE.1.1567

When considering the 4 GSAs together with all gears, the relation between the partial F_{bar} and fishing effort of OTB in HKE.1.1567 rendered a high Pearson correlation coefficient (0.803), with a significant positive linear effect of fishing effort on partial F_{bar} (Figure 6.2.1.1).

However, separately by GSA the correlation was only high in GSA 7, and coefficients in the linear regression where even negative in GSAs 1 and 5 (Figure 6.2.2).

Figure 6.2.2 - Partial Fbar by age as a function of fishing effort in days for HKE.1.1567. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.

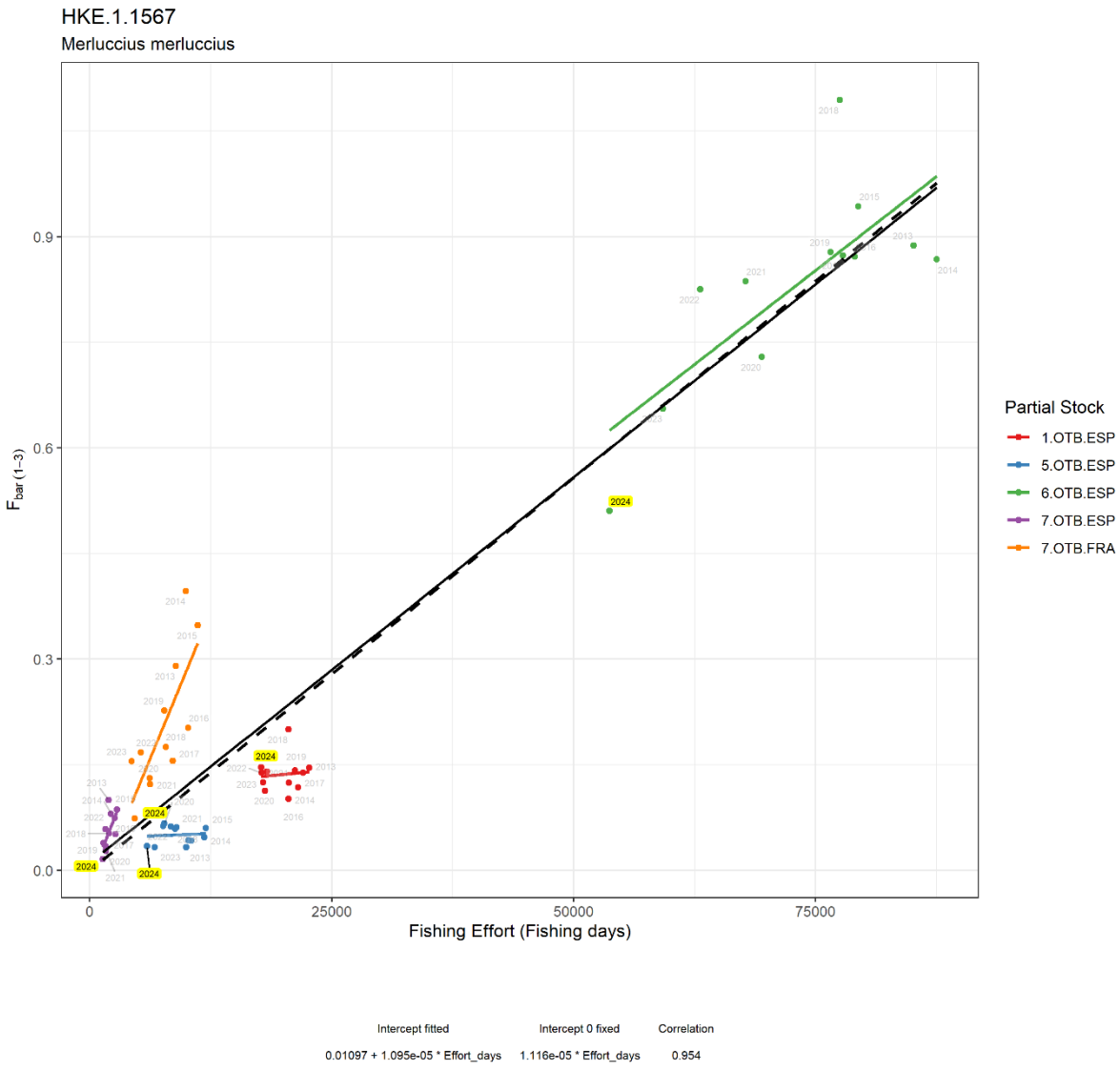


Source: Own elaboration.

The dataset for HKE.1.1567 shows a variable but generally positive relationship between fishing effort and partial fishing mortality (F_bar) across different gears and areas (GSA). Several gear types, including OTB and LLS, exhibit strong and statistically significant positive correlations, indicating that increased fishing effort is generally associated with higher F_bar values. For instance, HKE.1.6.LLS.ESP shows a correlation of 0.83 (p = 0.00088) and HKE.1.7.OTB.FRA shows 0.78 (p = 0.0027), reflecting a clear increase in fishing mortality with effort. Similarly, other gears such as HKE.1.7.OTB.ESP (r = 0.65, p = 0.0228) and HKE.1.6.OTB.ESP (r = 0.76, p = 0.00426) follow the same pattern. Conversely, some gears display weak or even negative correlations, though often non-significant. For example,

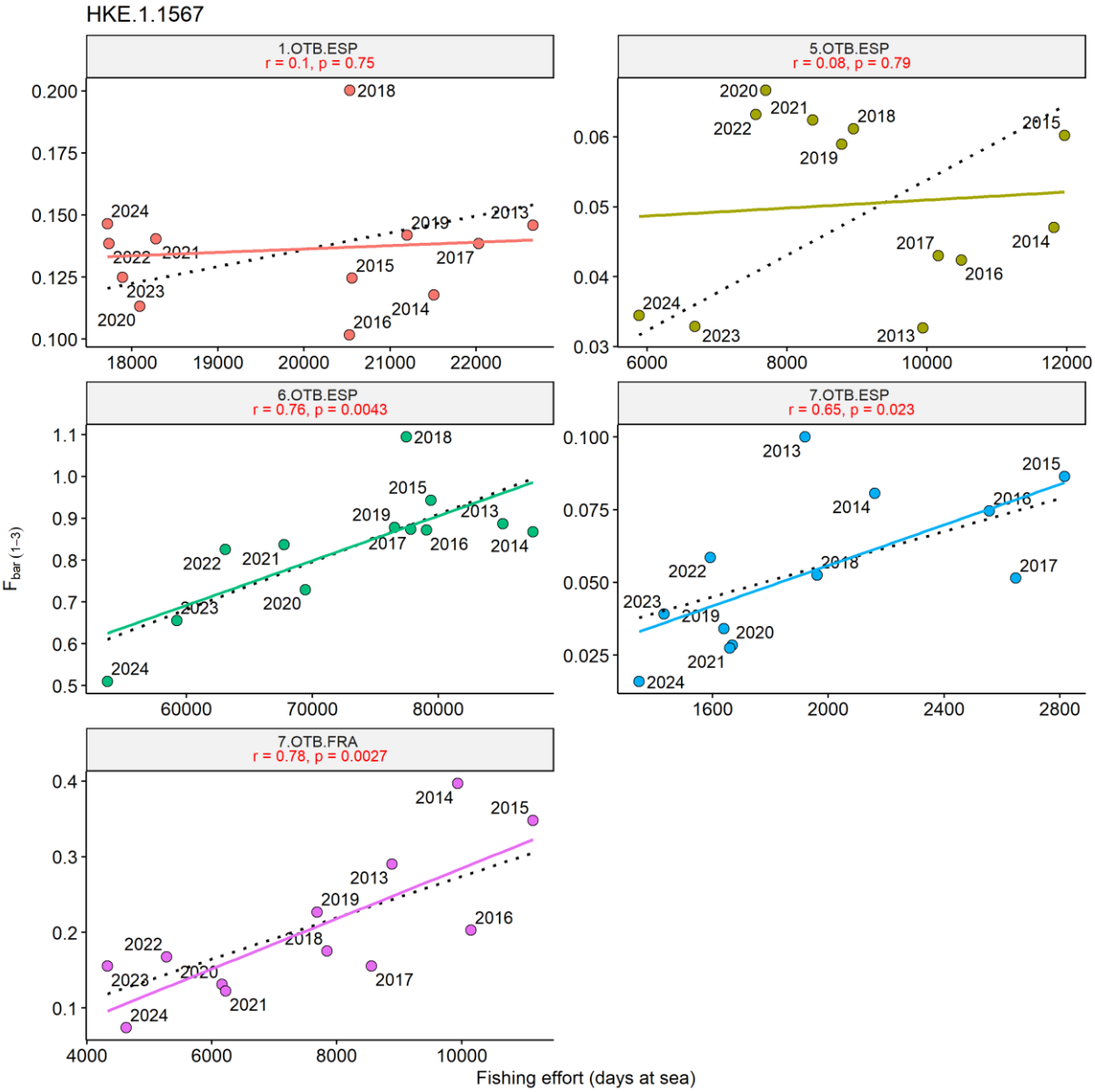
HKE.1.6.GTR.ESP shows a negative correlation of -0.62 (p = 0.267), and HKE.1.7.GTR.FRA has r = -0.50 (p = 0.102). These results suggest that the relationship between effort and fishing mortality can be gear- and area-specific, potentially reflecting differences in fishing selectivity, temporal effort distribution, or other local ecological conditions. Overall, the data suggest that for HKE.1.1567, fishing mortality tends to increase with fishing effort, particularly for OTB and LLS gears, highlighting the species' susceptibility to intensive exploitation. However, the variation among gears also indicates that other stock-specific factors, such as gear efficiency, spatial distribution, and biological characteristics, modulate the response to fishing pressure. The significant correlations for multiple gears underscore the importance of considering gear-specific effort in management strategies to prevent overexploitation.

Figure 6.2.3 - Partial Fbar by age as a function of fishing effort in days for HKE.1.1567_OTB. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



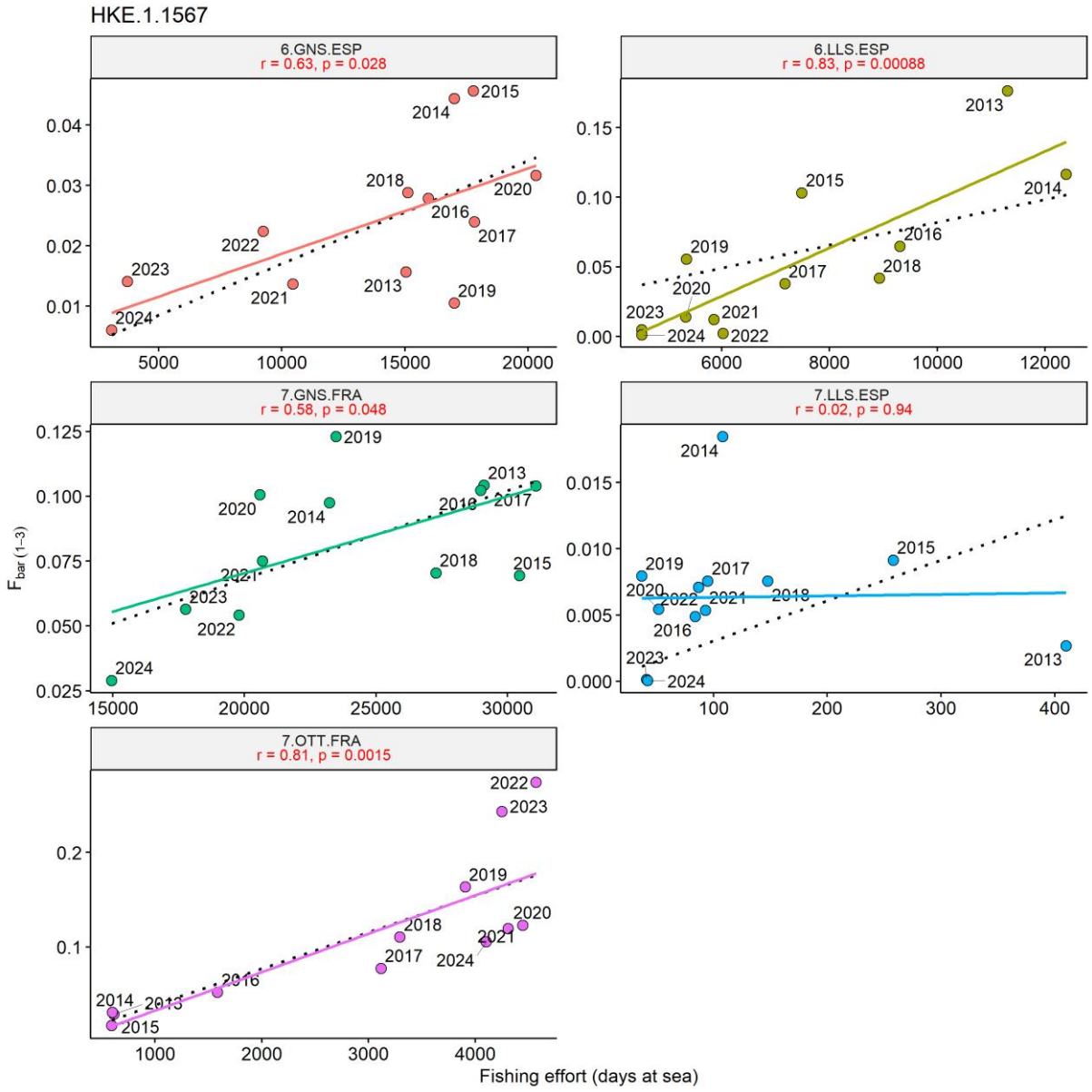
Source: Own elaboration.

Figure 6.2.4 - Partial Fbar by age as a function of fishing effort in days for HKE.1.1567_OTB. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



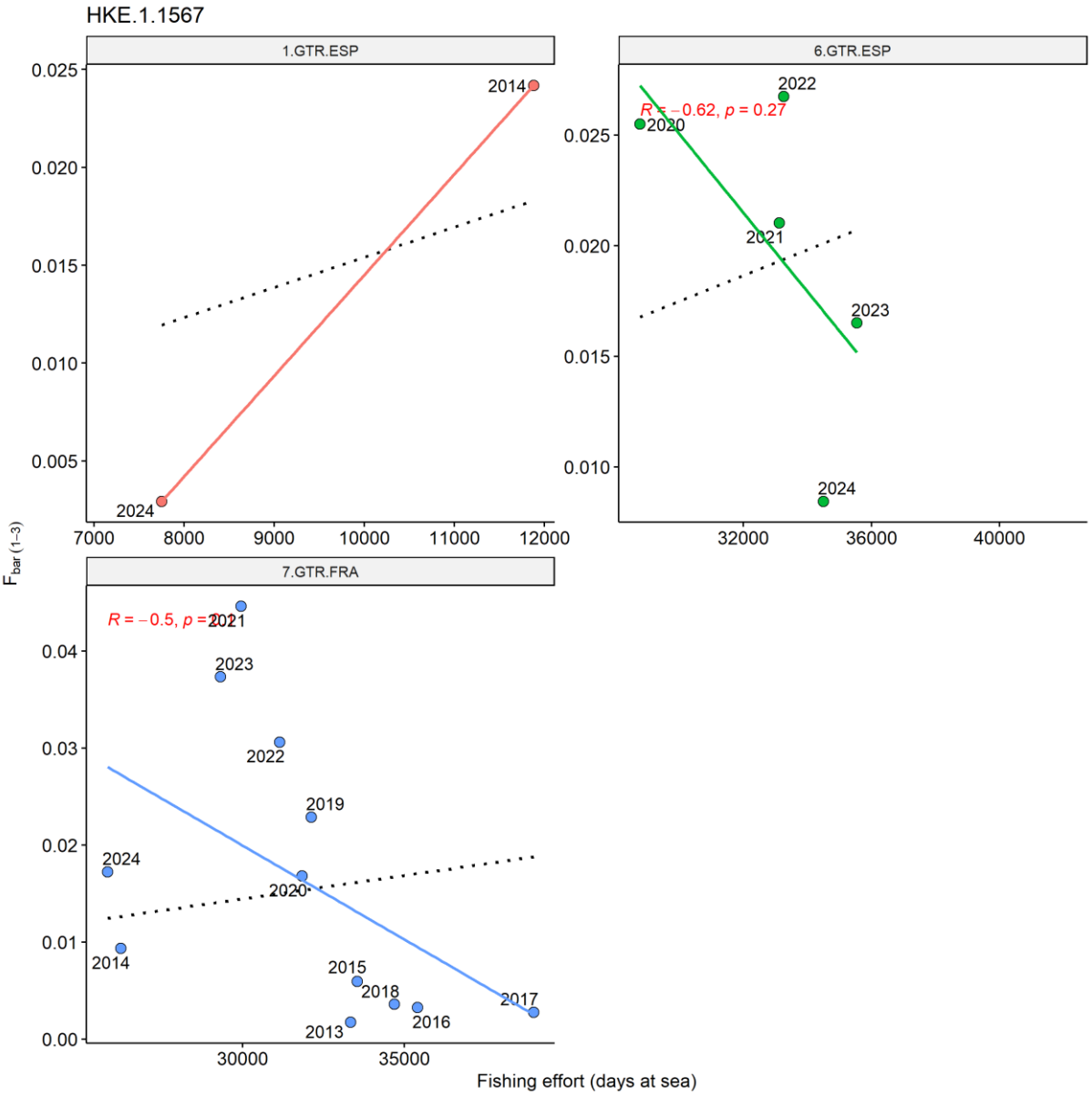
Source: Own elaboration.

Figure 6.2.5 - Partial Fbar by age as a function of fishing effort in days for HKE.1.1567_OTT_LLS_GNS. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

Figure 6.2.6 - Partial Fbar by age as a function of fishing effort in days for HKE.1.1567_GTR. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.

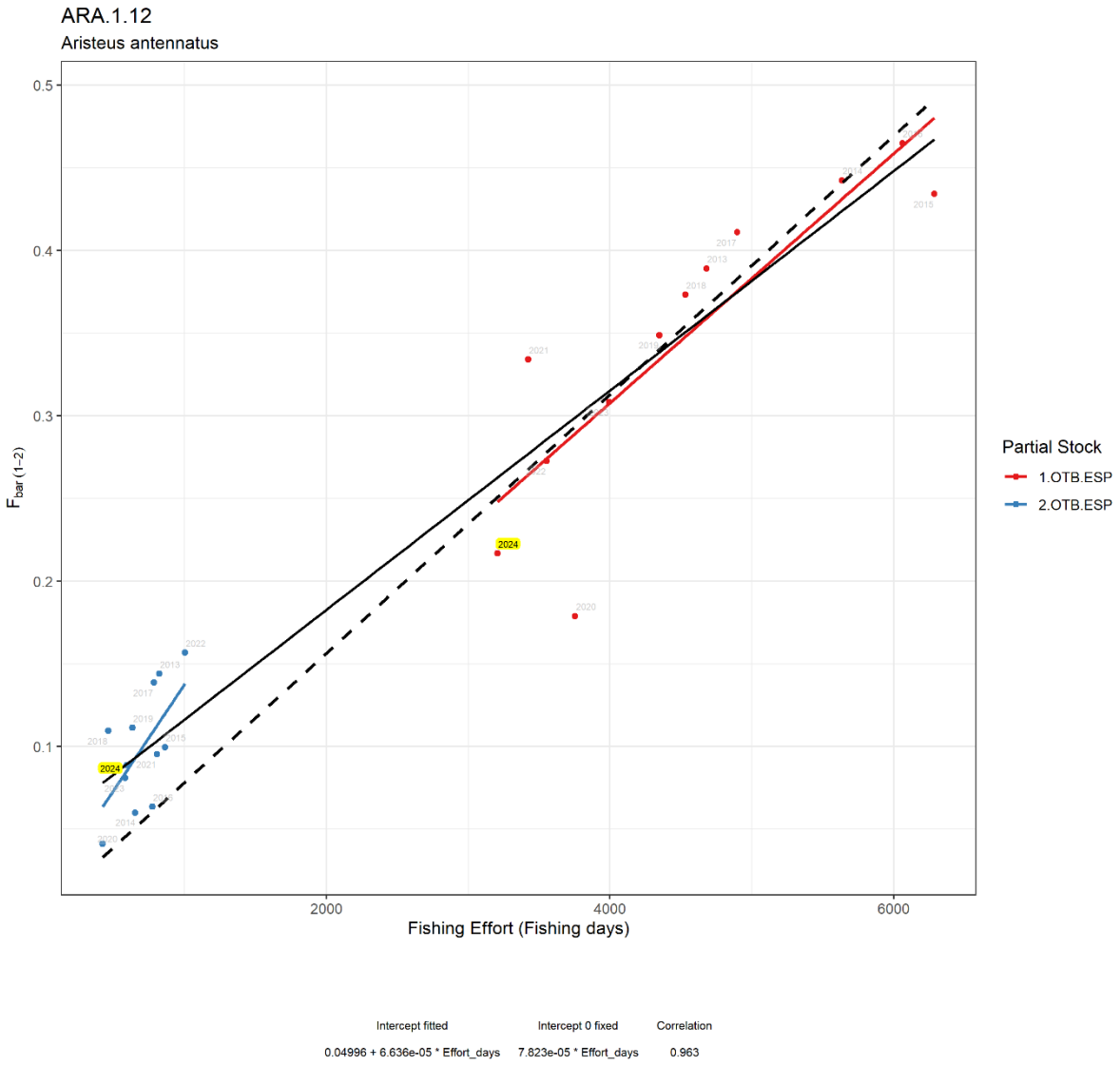


Source: Own elaboration.

6.2.1.2. Aristeus antennatus – EMU_1 (GSA 1–2): ARA.1.12

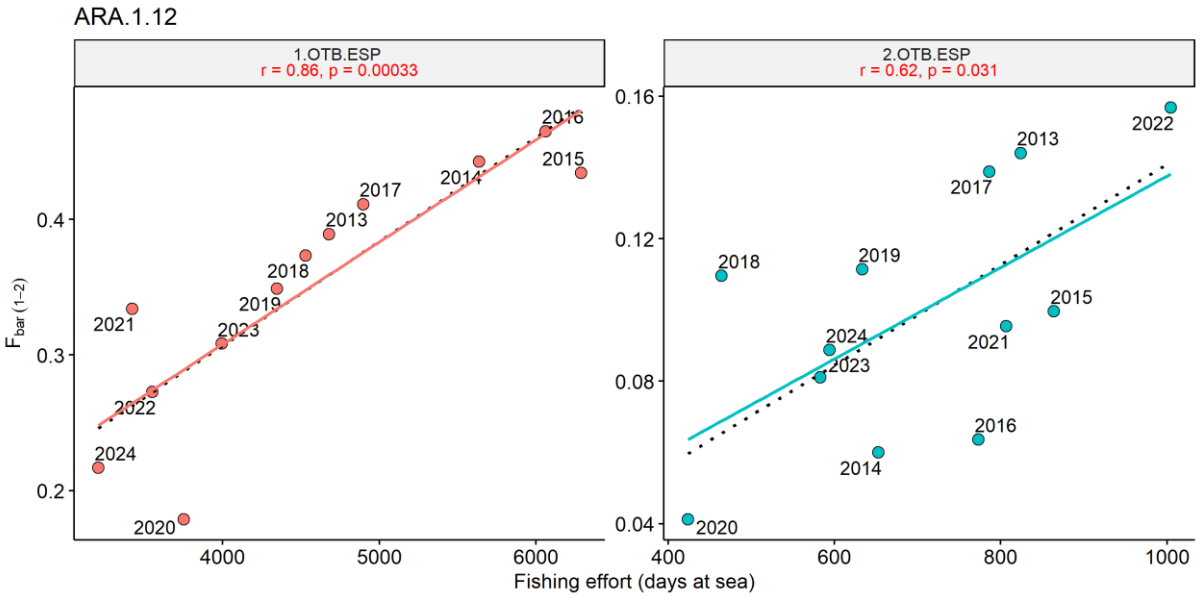
In the case of ARA.1.2, when considering both areas together the Pearson correlation coefficient was positive and very high (Figure 6.2.7). When analyzing the relationship for at GSA level, a higher Pearson correlation coefficient and significant positive effect was found in GSA1 (Figure 6.2.8).

Figure 6.2.7- Partial Fbar by age as a function of fishing effort in days for ARA.1.12. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

Figure 6.2.8 - Partial Fbar by age as a function of fishing effort in days for ARA.1.12 by gear. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.

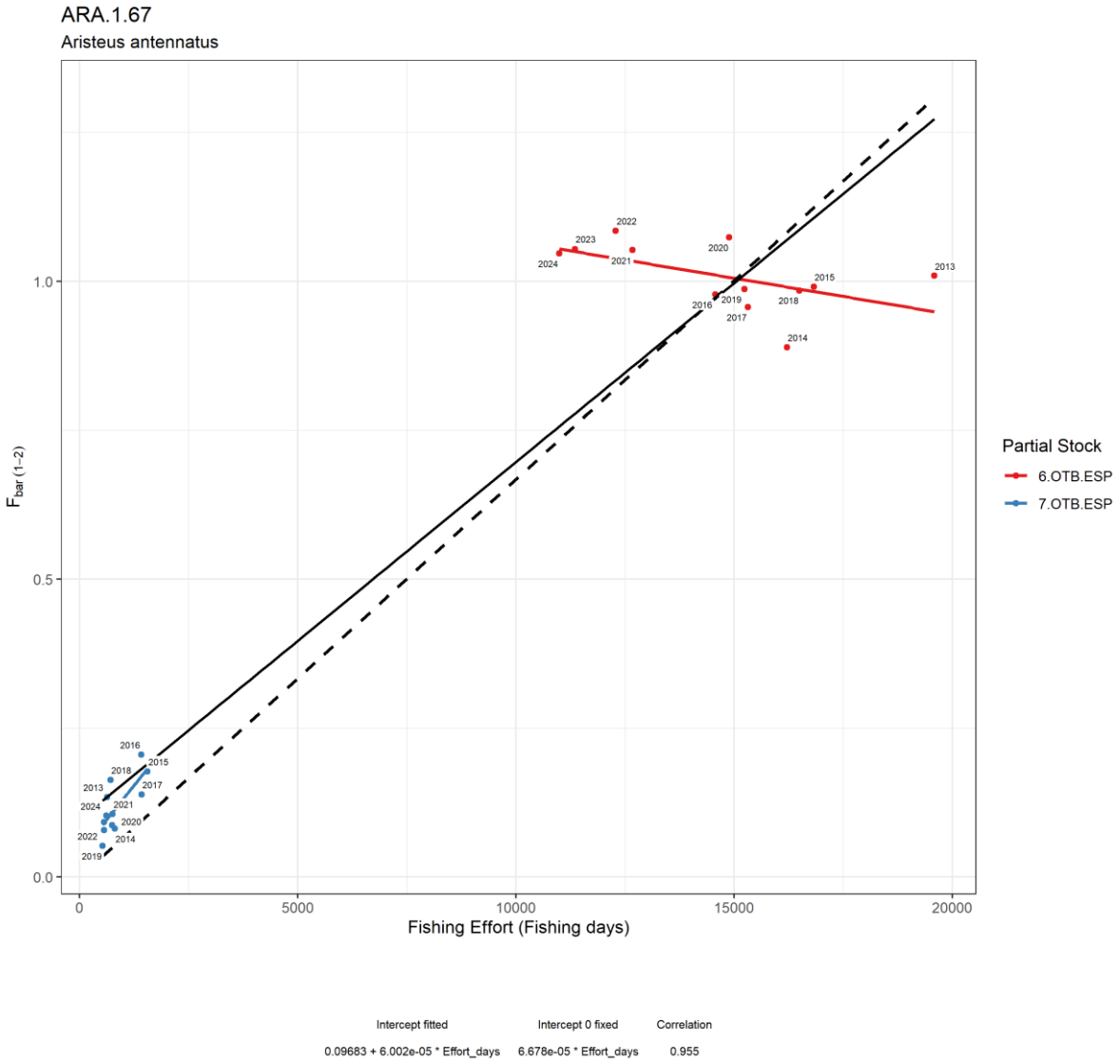


Source: Own elaboration

6.2.1.3. *Aristeus antennatus* – EMU_1 (GSA 6–7): ARA.1.67

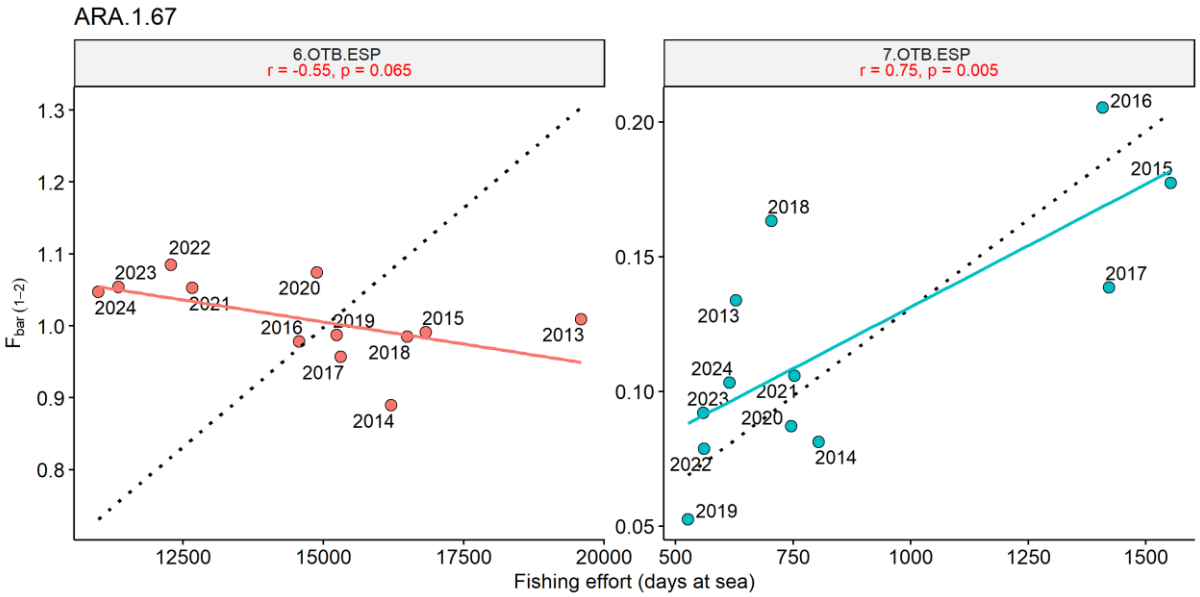
In the case of ARA.1.67, when considering both areas together the Pearson correlation coefficient was positive and very high (Figure 6.2.9). However, when the data are analysed separately by GSA, the linear regression showed a strong significant positive relationship between fishing effort and F_{bar} for GSA 7 (Figure 6.2.10), while the relationship was negative in gsa 6.

Figure 6.2.9. - Partial Fbar by age as a function of fishing effort in days for ARA.1.67. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

Figure 6.2.10- Partial Fbar by age as a function of fishing effort in days for ARA.1.67 by gear. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.

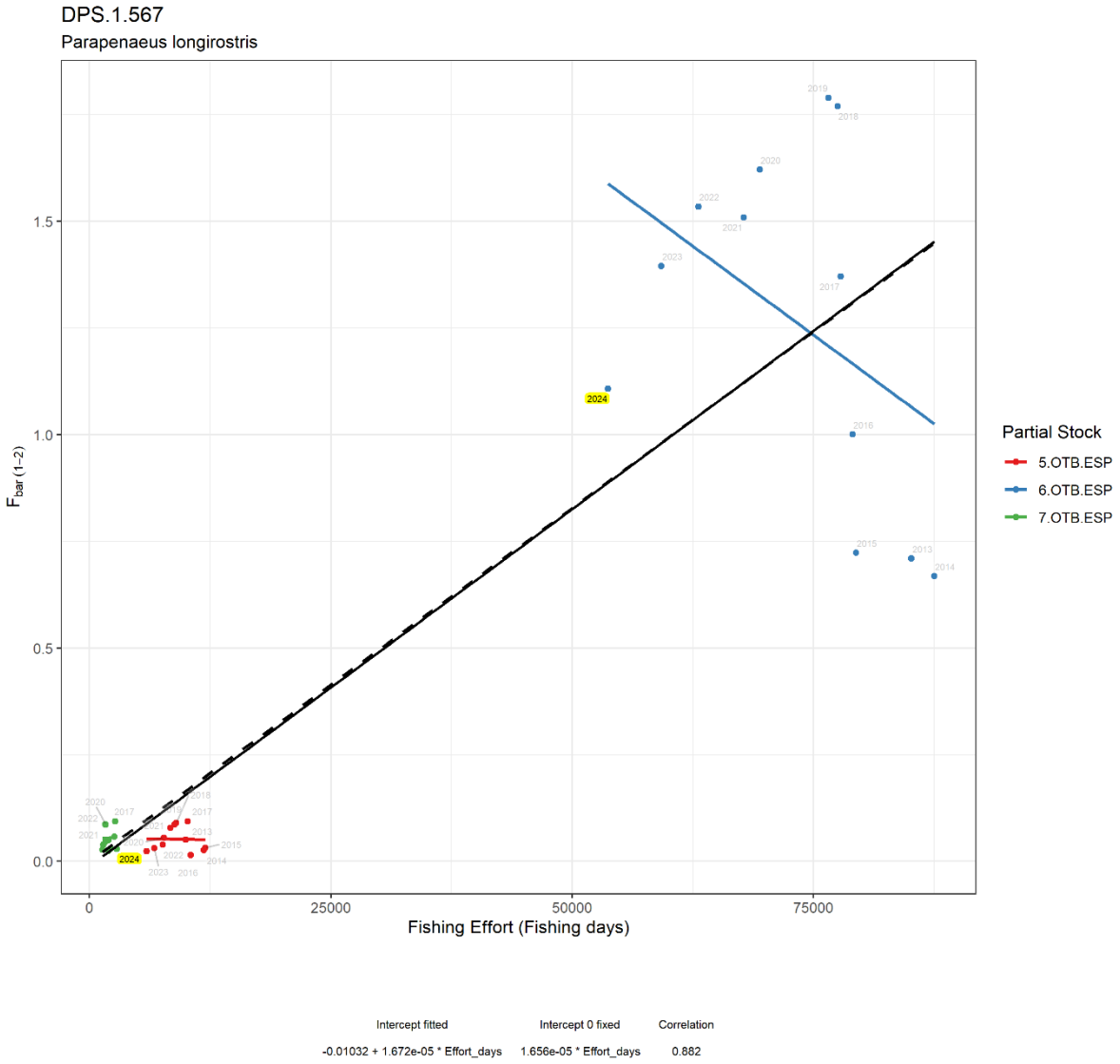


Source: Own elaboration.

6.2.1.4. Parapenaeus longirostris – EMU 1 (GSA 5–6–7): DPS.1.567

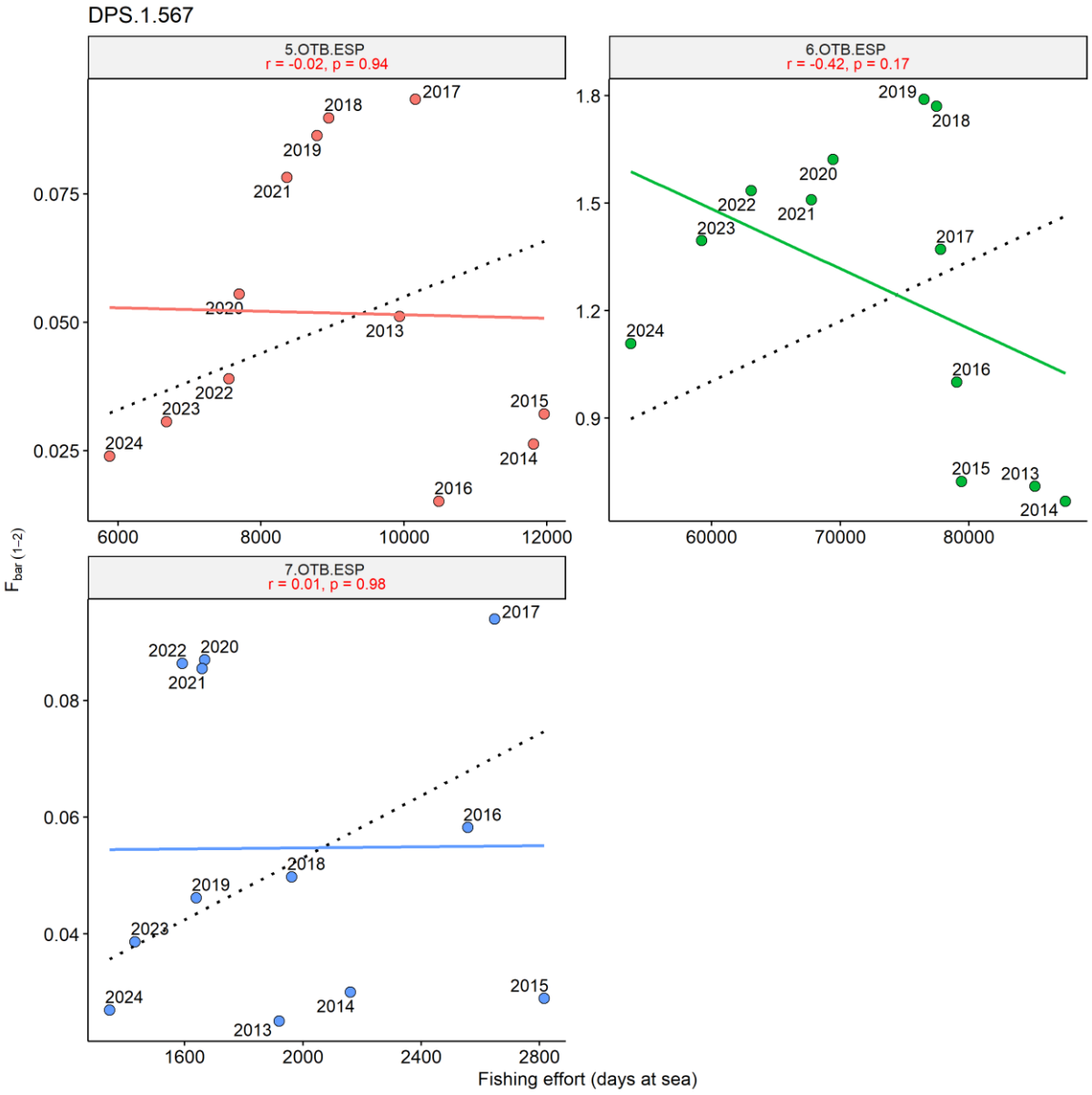
When all the GSA areas were considered together, the relation between effort from gear OTB and F_{bar} was strong and positive. However, when analyzed separately by GSA, the linear relation, like the previous EWG 24-12, was either negative (GSA 6) or non existent (GSA 5) (Figure 6.2.12).

Figure 6.2.11- Partial Fbar by age as a function of fishing effort in days for DPS.1.567. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration

Figure 6.2.12- Partial Fbar by age as a function of fishing effort in days for DPS.1.567 by gear. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.

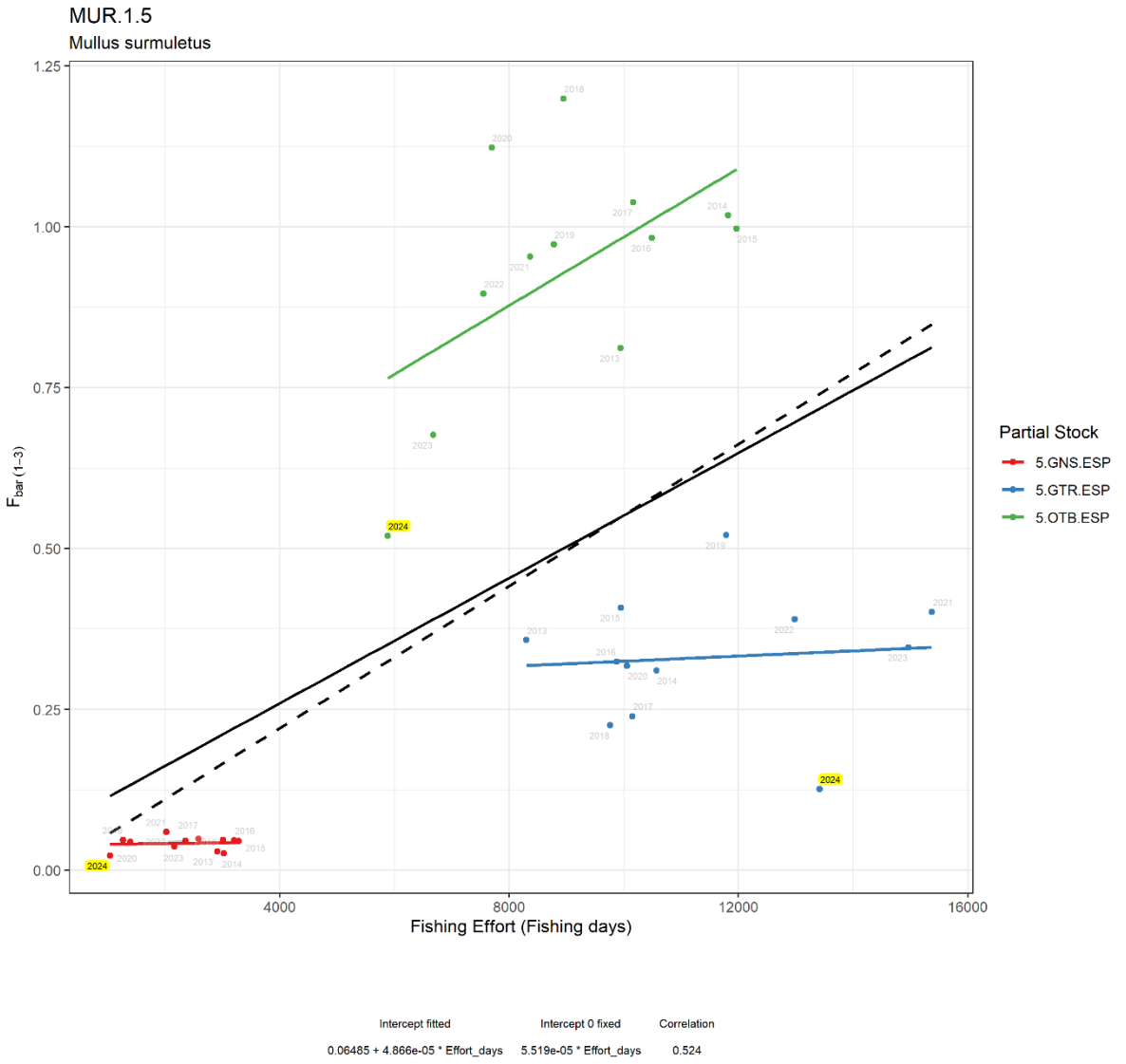


Source: Own elaboration.

1.1.1.1. Mullus surmuletus – EMU_1 (GSA 5): MUR.1.5

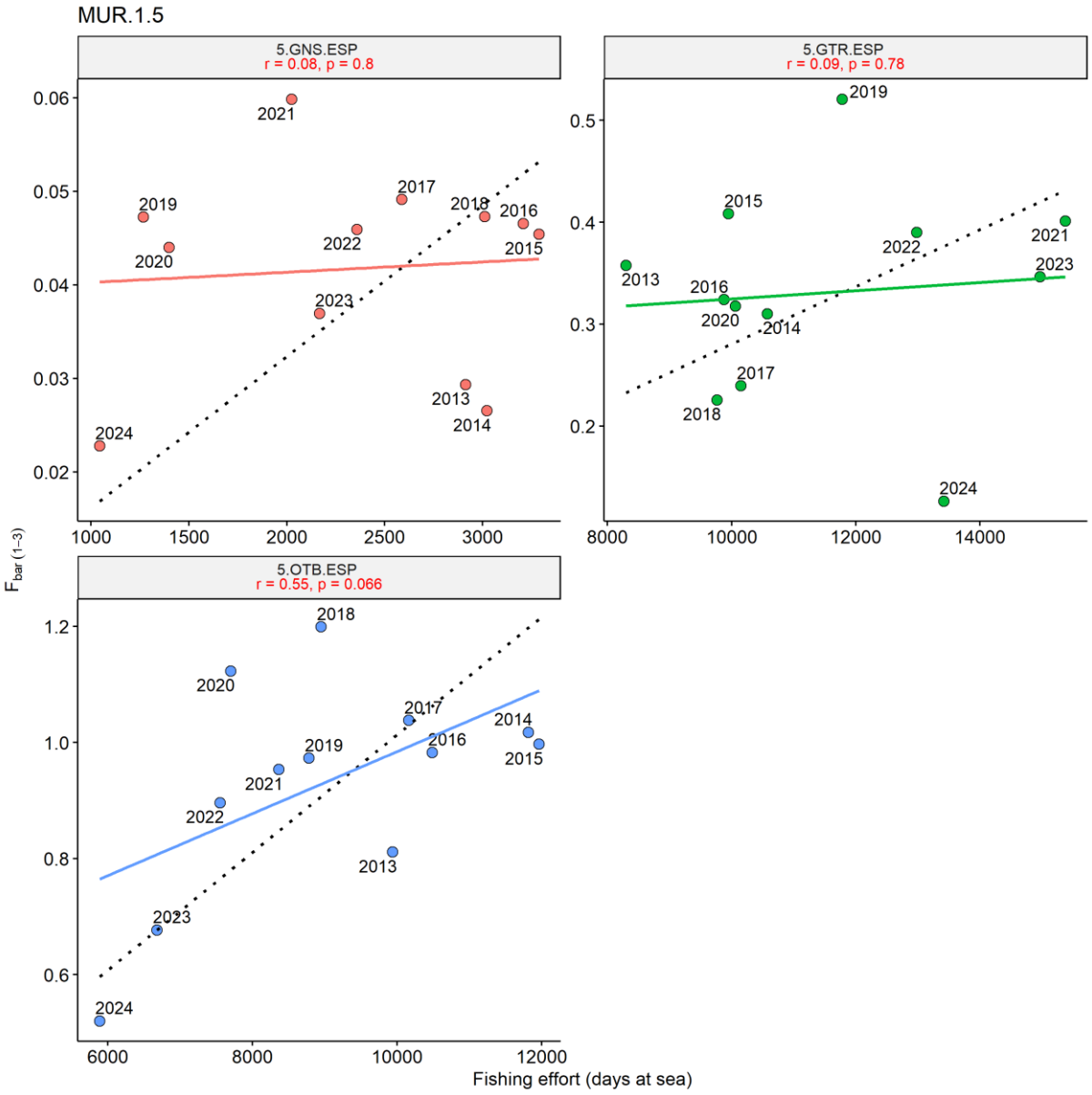
For *Mullus surmuletus* in GSA 5 overall the relationship between fishing effort and partial F_{bar} varies notably among gears and overall has a weak correlation (Figure 6.2.13). A moderate positive correlation is observed only for the Spanish trawl fleet (OTB.ESP) (r=0.55, p = 0.066). In contrast, for gillnets (GNS.ESP) and trammel nets (GTR.ESP), correlations are very weak (r<0.1r < 0.1r<0.1) and non-significant, indicating no clear linear relationship between effort and F_{bar} for these gears. These results suggest that, for this stock, trawl activity is the main driver of variations in fishing mortality, while passive gears have a limited or negligible effect.

Figure 6.2.13 - Partial Fbar by age as a function of fishing effort in days for MUR.1.5. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

Figure 6.2.14 - Partial Fbar by age as a function of fishing effort in days for MUR.1.5 by gear. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.

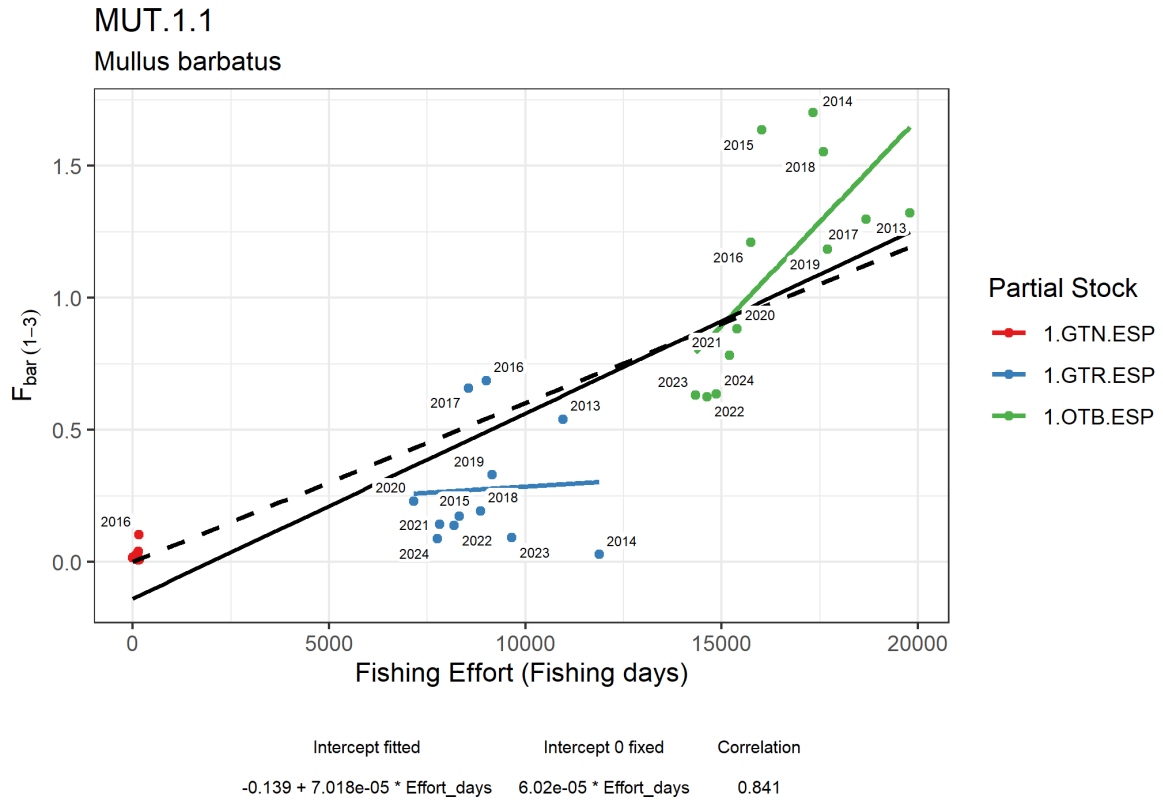


Source: Own elaboration.

6.2.1.5. Mullus barbatus – EMU_1 (GSA 1): MUT.1.1

In this stock and GSA 1 the relation between effort of OTB gear and fishing mortality was relatively strong and positive. However, the intercept was very negative, resulting in a prediction of a very low and unrealistic fishing mortality ($F_{bar} = -0.97$) when fishing effort was zero (Figures 6.2.15-16).

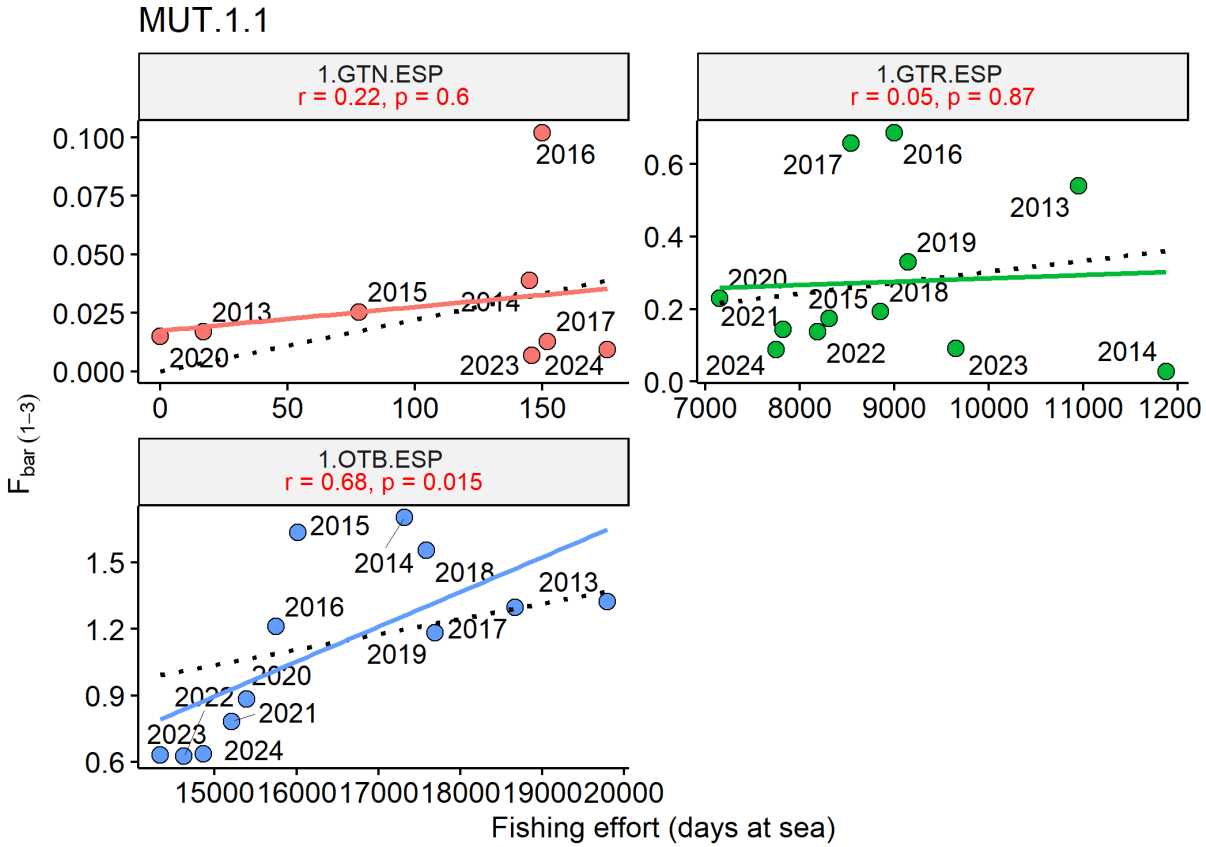
Figure 6.2.15 - Partial Fbar by age as a function of fishing effort in days for MUT.1.1. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Intercept fitted	Intercept 0 fixed	Correlation
-0.139 + 7.018e-05 * Effort_days	6.02e-05 * Effort_days	0.841

Source: Own elaboration.

Figure 6.2.16 - Partial Fbar by age as a function of fishing effort in days for MUT.1.1 by gear. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.

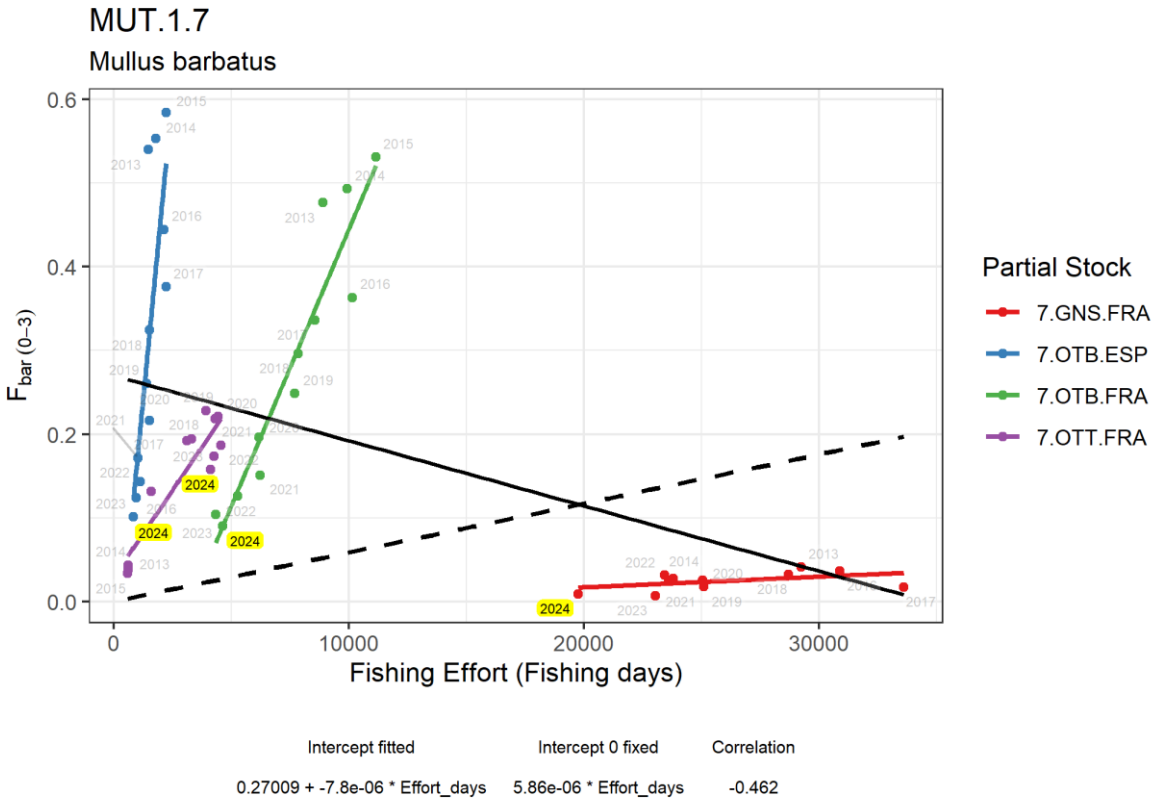


Source: Own elaboration

6.2.1.6. Mullus barbatus – EMU 1 (GSA 7): MUT.1.7

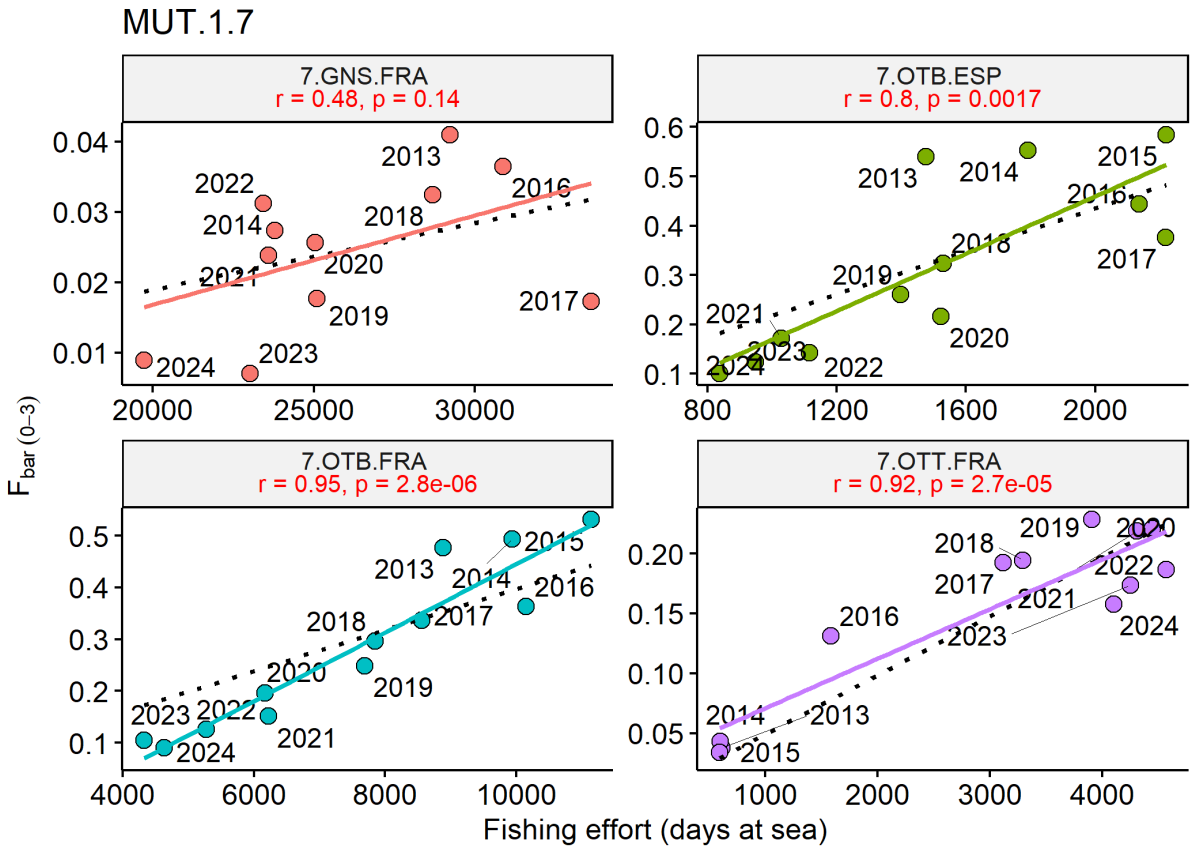
For MUT.1.7, the relationship between fishing effort and partial F_{bar} when all gears are mixed do not show high correlation. Howver, when all gears are considered separately, in each country trawlers (OTB and OTT) show consistently positive correlations across all gears, though with varying strengths. The strongest associations are observed for the French trawl fleets indicating a very strong linear relationship between fishing effort and fishing mortality, while the French gillnet fleet (GNS.FRA) displays a weak and non-significant correlation. The Spanish trawl fleet (OTB.ESP) also shows a significant and strong positive correlation (Figures 6.2.17-18).

Figure 6.2.17 - Partial Fbar by age as a function of fishing effort in days for MUT.1.7. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

Figure 6.2.18 - Partial Fbar by age as a function of fishing effort in days for MUT.1.7 by gear. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

6.2.2. Effort Management Unit EMU 2

In the EMU 2, the relationship between fishing effort and F_{bar} was poorer than in EMU 1.

The dataset for EMU 2 highlights variable relationships between fishing effort and partial fishing mortality (Fbar) across four stocks.

ARS.2.891011 shows a moderate positive correlation ($r = 0.60$, $R^2 = 0.36$, $p = 0.00011$), indicating that fishing mortality tends to increase with effort. The slope is positive (2.28×10^{-5}), and although the intercept is low (0.021), the relationship is statistically significant, suggesting that fishing effort is an important driver of mortality for this stock.

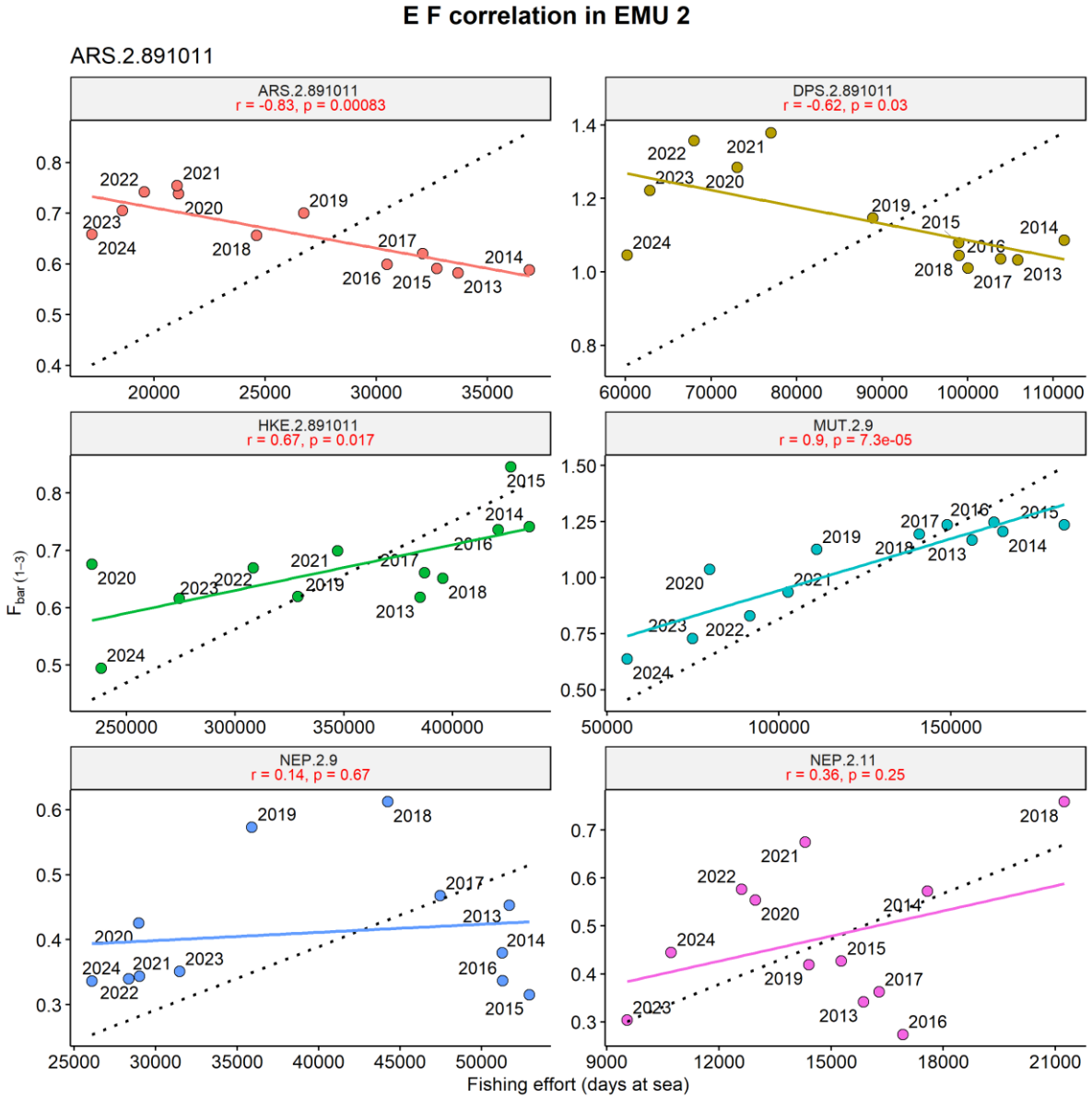
DPS.2.891011 exhibits a slightly stronger positive correlation ($r = 0.63$, $R^2 = 0.39$, $p = 0.00005$), despite a negative intercept (-0.104), which may reflect low baseline Fbar when fishing effort is minimal. The significant positive slope indicates that increases in effort lead to higher fishing mortality.

HKE.2.891011 has a very weak positive correlation ($r = 0.09$, $R^2 = 0.01$, $p = 0.410$), suggesting that fishing mortality for this stock is largely independent of recorded fishing effort. Both slope and intercept are extremely small, reinforcing that other factors beyond effort are likely influencing Fbar.

MUT.2.9 shows a weak negative correlation ($r = -0.15$, $R^2 = 0.02$, $p = 0.451$), indicating a slight tendency for fishing mortality to decrease with increased effort, though this trend is non-significant. This may reflect variability in stock distribution, gear selectivity, or environmental influences that obscure a direct effect of effort.

Overall, these results indicate that the relationship between fishing effort and fishing mortality is stock-specific within EMU 2. ARS.2.891011 and DPS.2.891011 show a positive association with fishing effort, whereas HKE.2.891011 and MUT.2.9 display little or no apparent response (Figure 6.2.19). This underscores the importance of accounting for stock-specific dynamics when evaluating fishing impacts and developing management strategies, as a uniform approach may not adequately protect vulnerable populations or promote sustainable exploitation.

Figure 6.2.19 - Partial Fbar by age as a function of fishing effort in days for EMU 2. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration

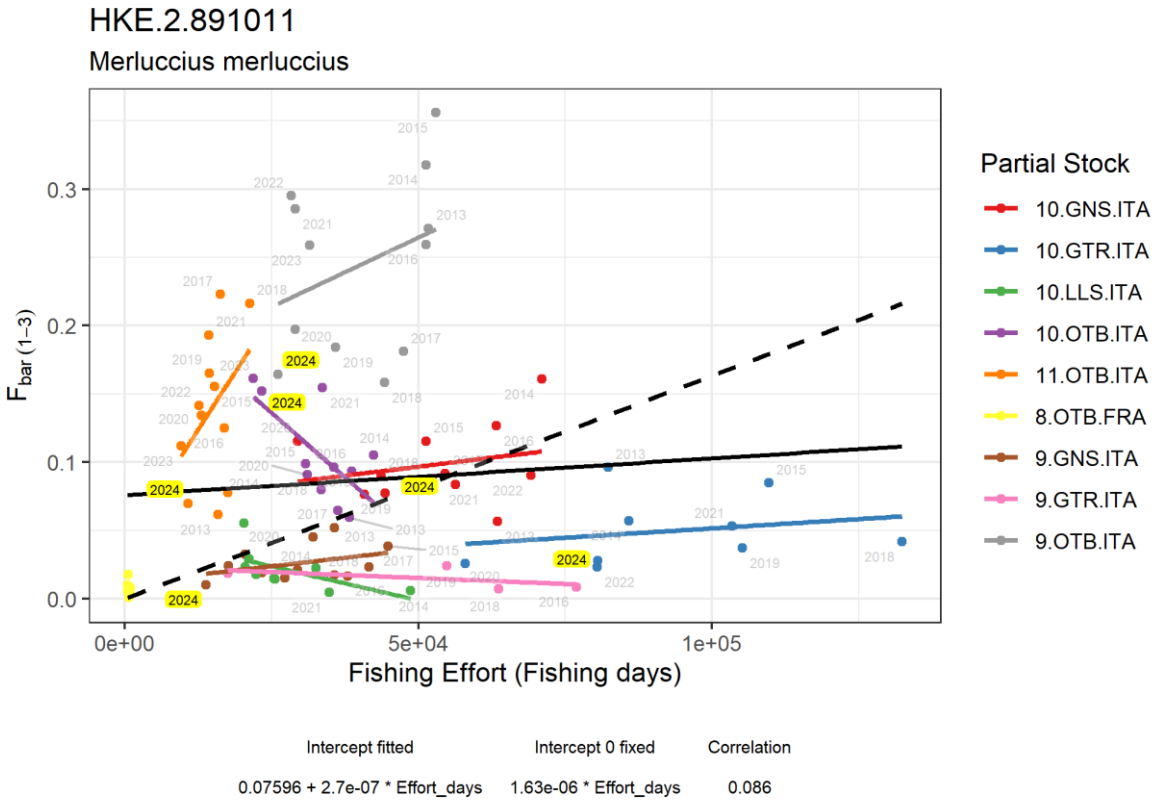
6.2.2.1. Merluccius merluccius - EMU_2 (GSA_8_9_10_11): HKE.2.891011

The HKE.2.891011 showed no linear relation between OTB fishing effort and F_{bar} when all the GSAs areas were considered together. By GSA area, the relation was only positive in GSA 9, In the other fishing gears the relation was variable: negative in LLS, non-existent in GTR, and slight positive relation in GNS. The dataset shows variable relationships between fishing effort and F_bar for HKE.2.891011 across

different gears and GSAs, suggesting that gear type and regional differences or other factors not considered here strongly influence fishing mortality patterns. Some combinations of gear and GSA exhibit moderate positive correlations, indicating that fishing mortality increases with effort. For example, OTB.ITA in GSA 11 ($r = 0.39$, $R^2 = 0.15$) and GNS.ITA in GSA 9 ($r = 0.37$, $R^2 = 0.14$) show positive slopes, although the correlations are not statistically significant ($p > 0.2$). These results suggest that fishing effort may contribute to increased mortality in these scenarios, but other factors may also play a role. Conversely, several gear-GSA combinations exhibit moderate to strong negative correlations. Notably, OTB.ITA in GSA 10 ($r = -0.67$, $R^2 = 0.44$, $p = 0.025$) and LLS.ITA in GSA 10 ($r = -0.62$, $R^2 = 0.39$, $p = 0.054$) show negative slopes, suggesting that higher effort is associated with lower estimated fishing mortality. These patterns may reflect differences in gear selectivity, spatial distribution of fishing effort, or local stock resilience. Many other combinations (e.g., OTB.FRA in GSA 8, $r = -0.15$; GTR.ITA in GSA 9, $r = -0.55$) show weak or non-significant correlations, indicating that for these regions and gears, fishing mortality is largely independent of recorded effort. Small R^2 values reinforce that factors beyond effort such as temporal variation, environmental conditions, or sampling variability likely influence F_{bar}.

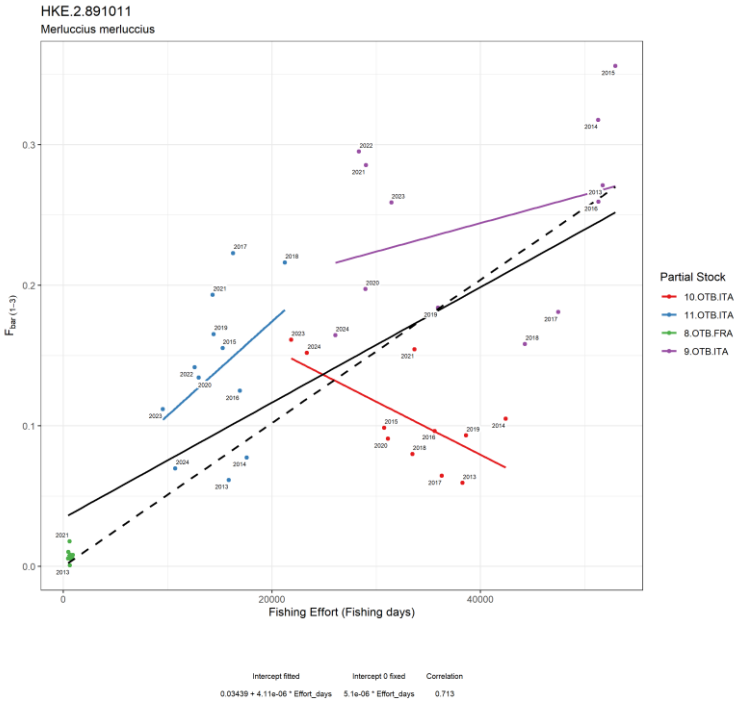
Overall, HKE.2.891011 demonstrates a heterogeneous response to fishing effort depending on gear type and region. Some gear-GSA combinations indicate sensitivity to effort, whereas others show little or inverse response. These findings highlight the importance of incorporating both gear-specific and spatially explicit information when assessing fishing mortality and designing management measures, as a uniform strategy may fail to account for local stock dynamics and gear selectivity.

Figure 6.2.20- Partial Fbar by age as a function of fishing effort in days for HKE.2.891011. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



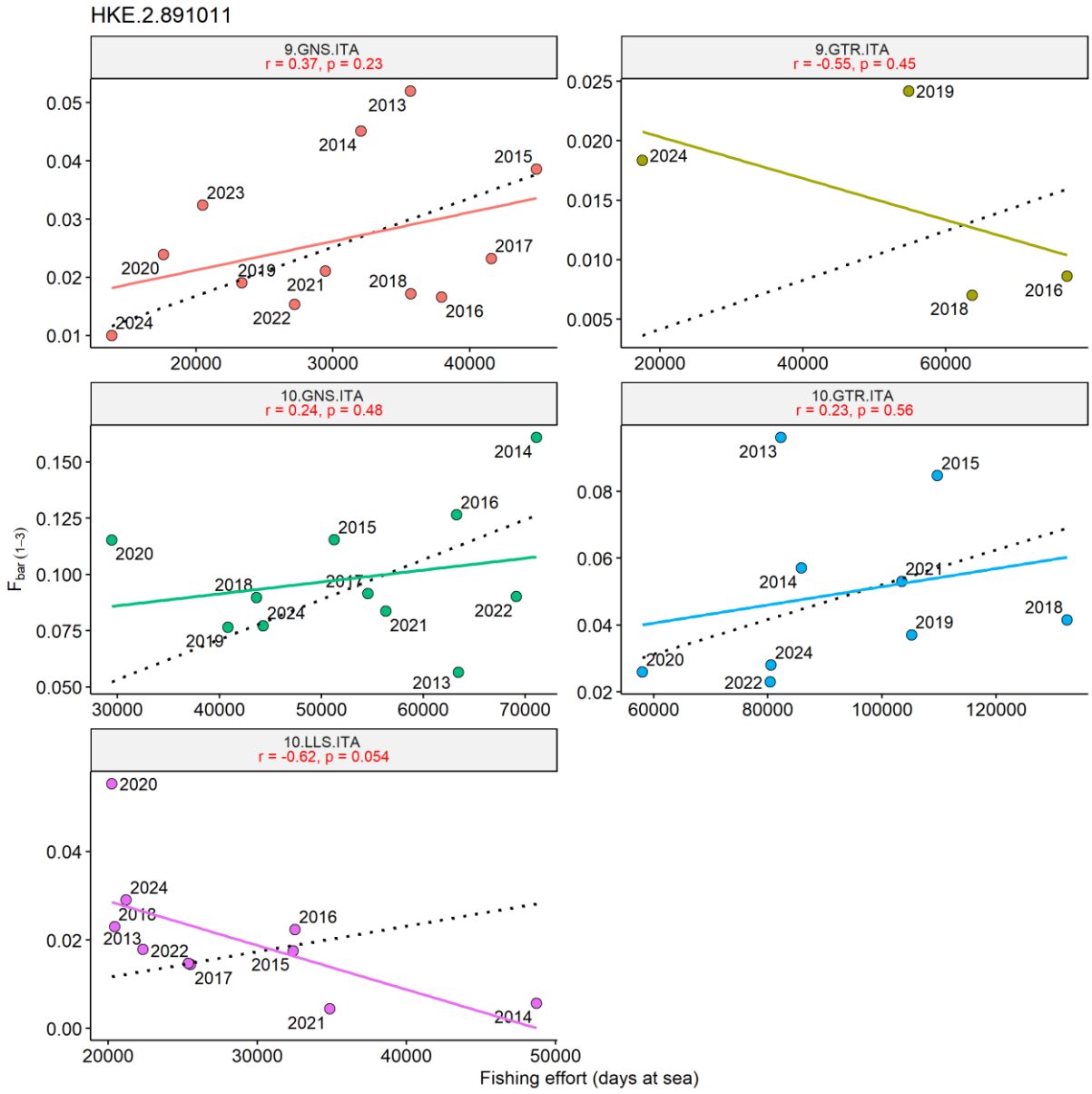
Source: Own elaboration.

Figure 6.2.21 - Partial Fbar by age as a function of fishing effort in days for HKE.2.891011_OTB. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

Figure 6.2.22 - Partial Fbar by age as a function of fishing effort in days for HKE.2.891011 by gear. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

6.2.2.2. Aristaeomorpha pholiacea - EMU_2 (GSA_8_9_10_11): ARS.2.891011

The dataset for ARS.2.891011 shows consistently weak relationships between fishing effort and F_{bar} across the examined GSAs with OTB gear (Figures 6.2.23-24). In GSA 10, a small positive correlation is observed (r = 0.23, R^2 = 0.05, p = 0.48) with a positive slope (3.25×10^{-6}), indicating a slight tendency for fishing mortality to increase with effort. However, the relationship is not statistically significant, suggesting minimal influence of fishing effort on F_bar in this region. GSA 11 shows virtually no correlation (r = 0.00, R^2 = 0.00, p = 0.989), and the slope is effectively zero, indicating that F_{bar} is independent of fishing effort.

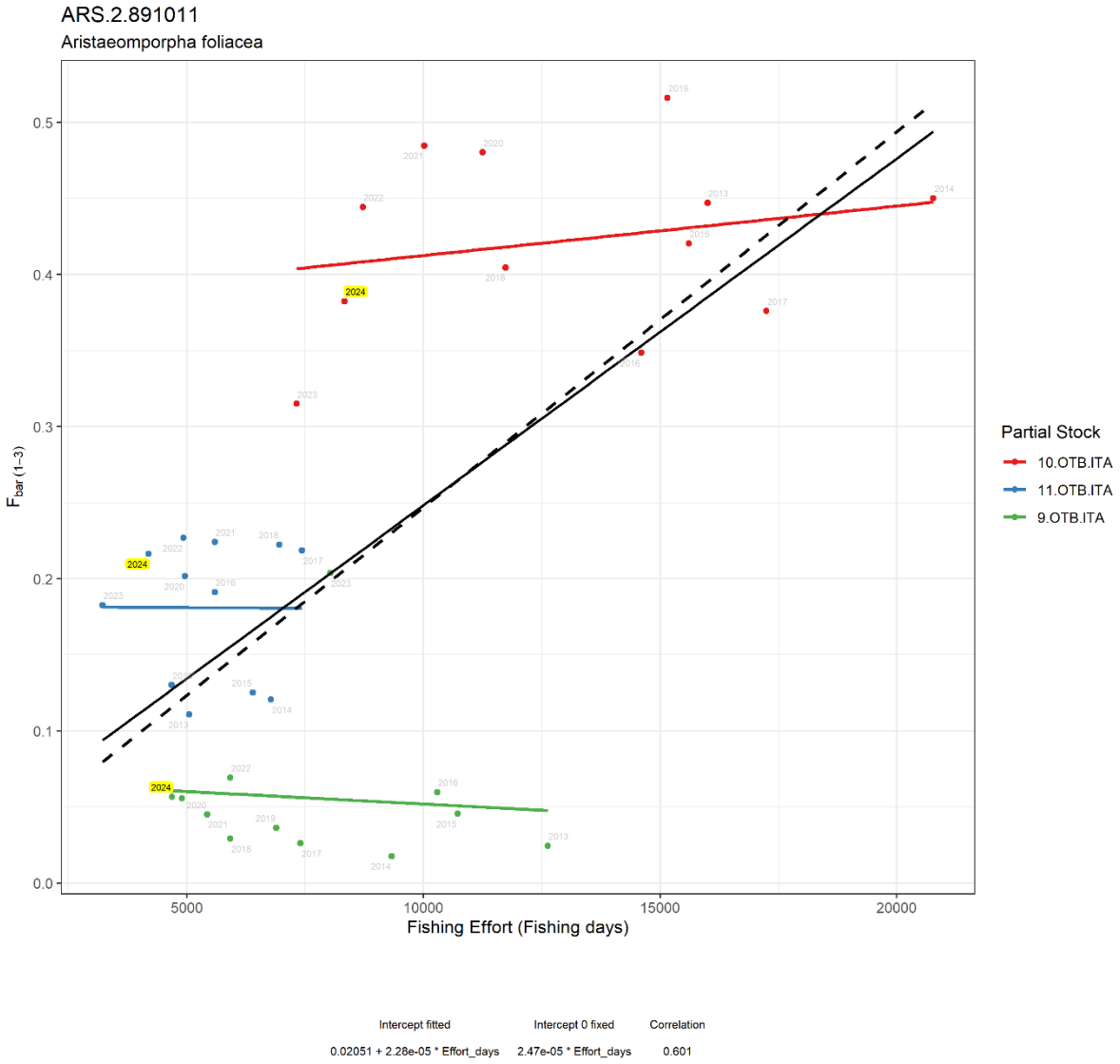
GSA 9 exhibits a weak negative correlation (r = -0.09, R^2 = 0.01, p = 0.79) with a very small negative slope, again reflecting no meaningful relationship between effort and fishing mortality.

Overall, ARS.2.891011 appears largely insensitive to variations in fishing effort across the analyzed GSAs for OTB gear. The consistently low R^2 values indicate that fishing effort explains very little of the observed variability in F_{bar}, suggesting that other factors, such as environmental conditions, spatial distribution, or stock biology likely play a more significant role in determining fishing mortality for this stock.

These findings imply that management strategies for ARS.2.891011 may need to consider factors beyond simply regulating effort, as effort alone does not strongly drive changes in fishing mortality.

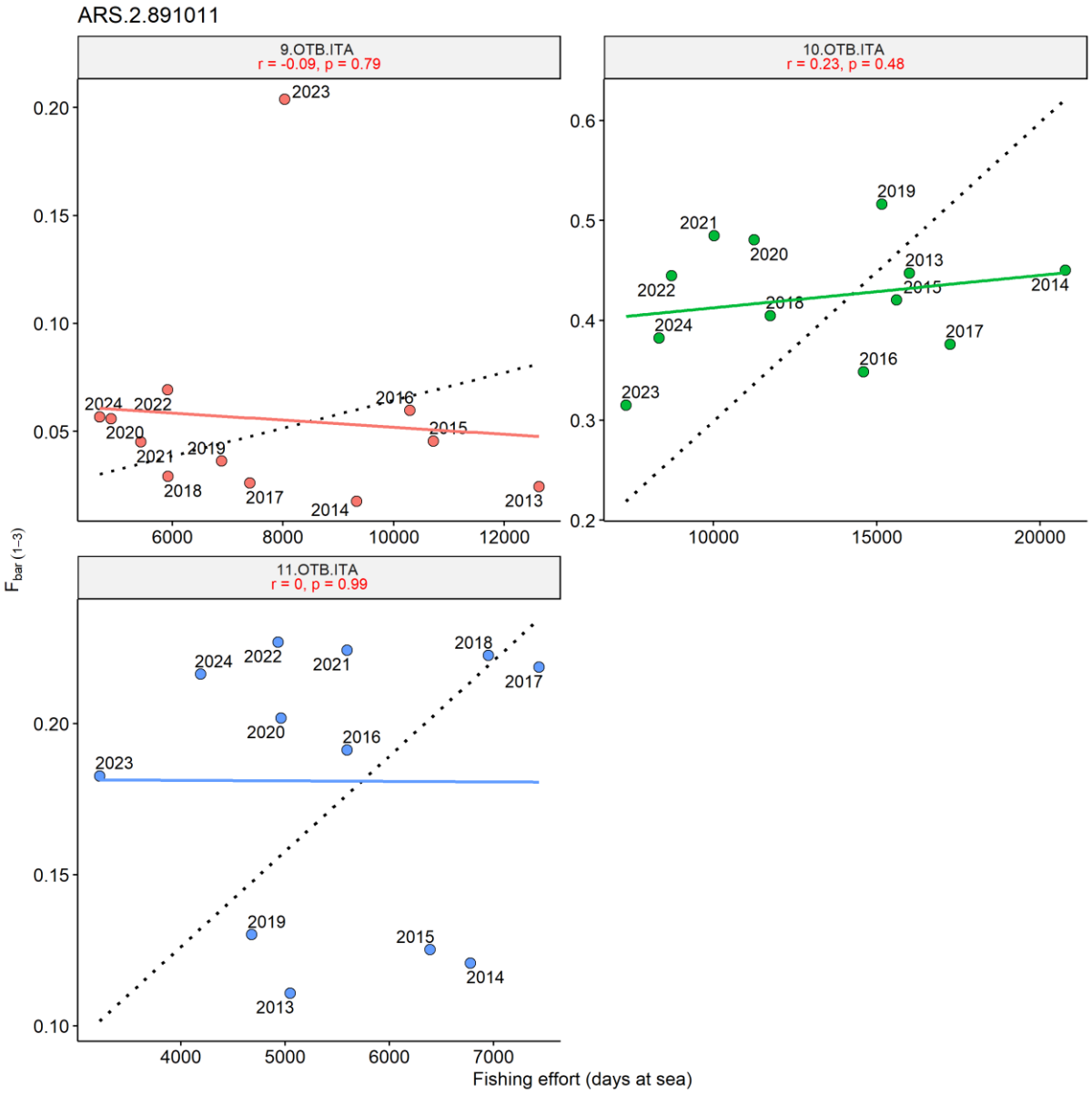
In the case of ARS_8_9_10_11 the relation between OTB fishing effort and F_{bar} was positive when all the GSAs were considered together. However, this relationship didn´t exist when the linear regression was fit separately by GSA.

Figure 6.2.23 - Partial Fbar by age as a function of fishing effort in days for ARS.2.891011. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

Figure 6.2.24 - Partial Fbar by age as a function of fishing effort in days for ARS.2.891011 by gear. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.

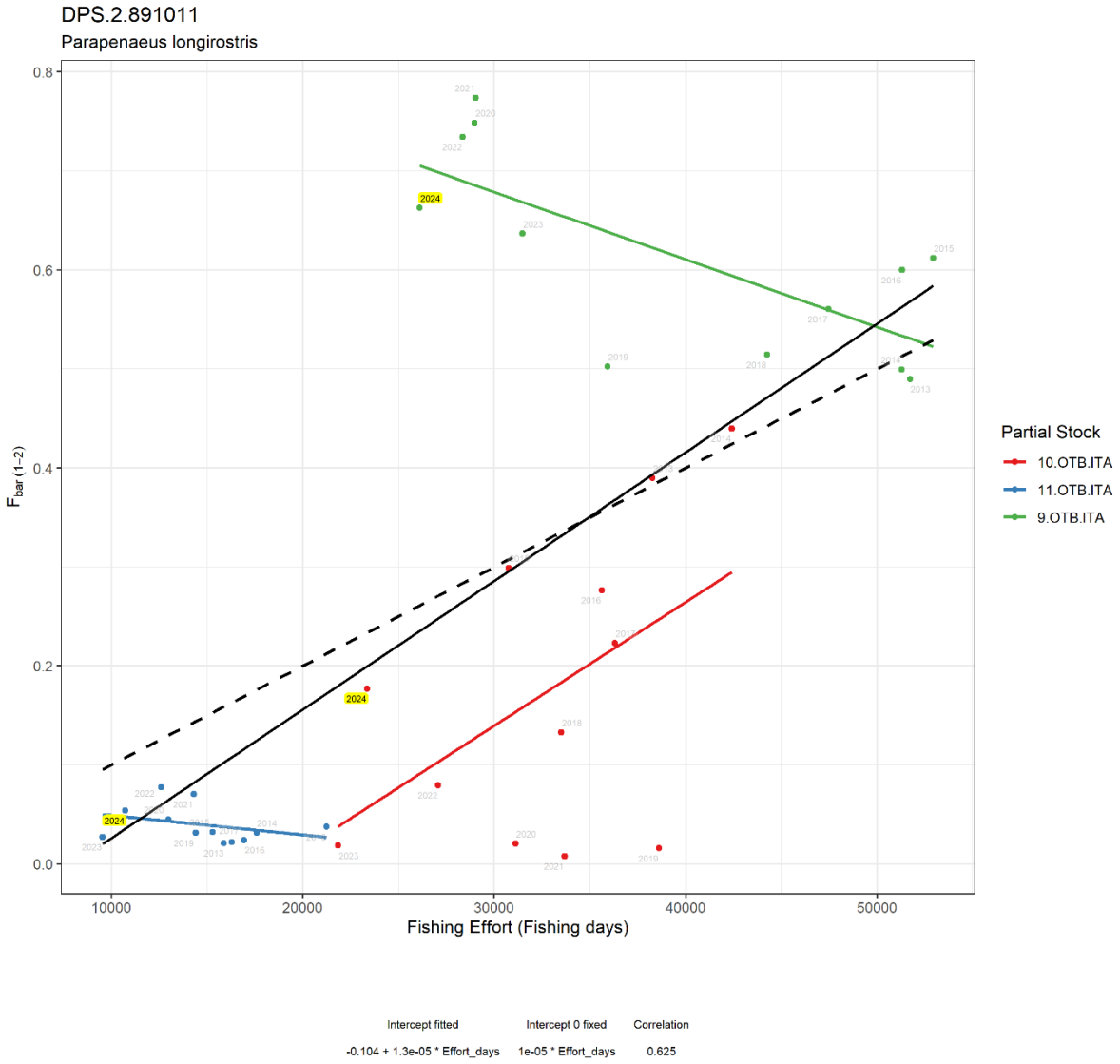


Source: Own elaboration.

6.2.2.3. Parapenaeus longirostris - EMU_2 (GSA_8_9_10_11): DPS.2.891011

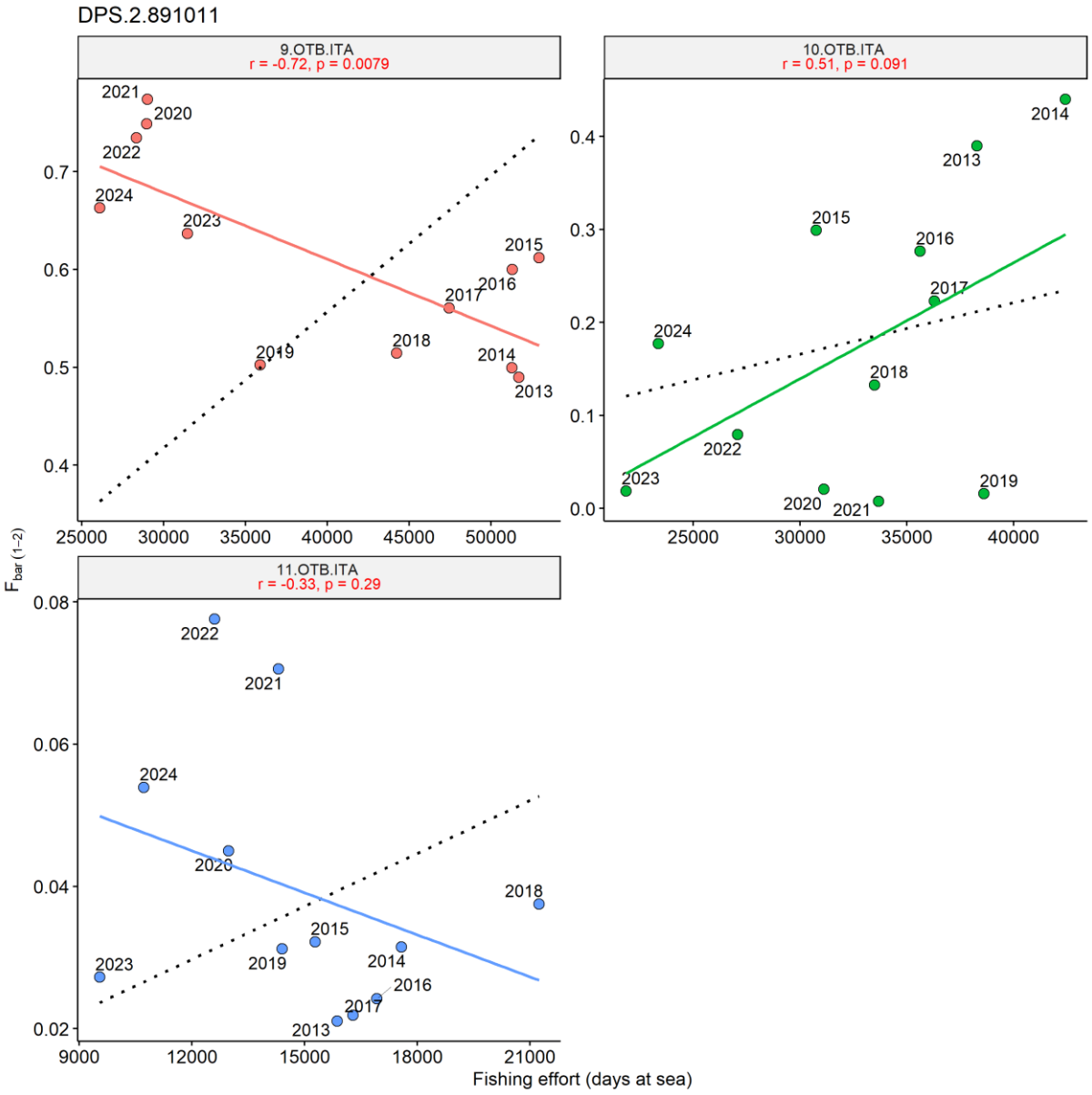
The EFFvsF dataset for DPS.2.891011 shows substantial variation in the relationship between fishing effort and F_bar across different GSAs using OTB gear, suggesting that local conditions or stock dynamics strongly influence fishing mortality. Considering separately all GSAs, While GSA 10 shows a weak positive trend, GSA 9 and GSA 11 exhibits a strong unreliable negative relationship.

Figure 6.2.25 - Partial Fbar by age as a function of fishing effort in days for DPS.2.891011. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

Figure 6.2.26 - Partial Fbar by age as a function of fishing effort in days for DPS.2.891011 by gear. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

6.2.2.4. Mullus barbatus - EMU_2 (GSA_9): MUT.2.9

The dataset for MUT.2.9 in GSA 9 shows consistently moderate to strong positive correlations between fishing effort and F_bar across all examined gears.

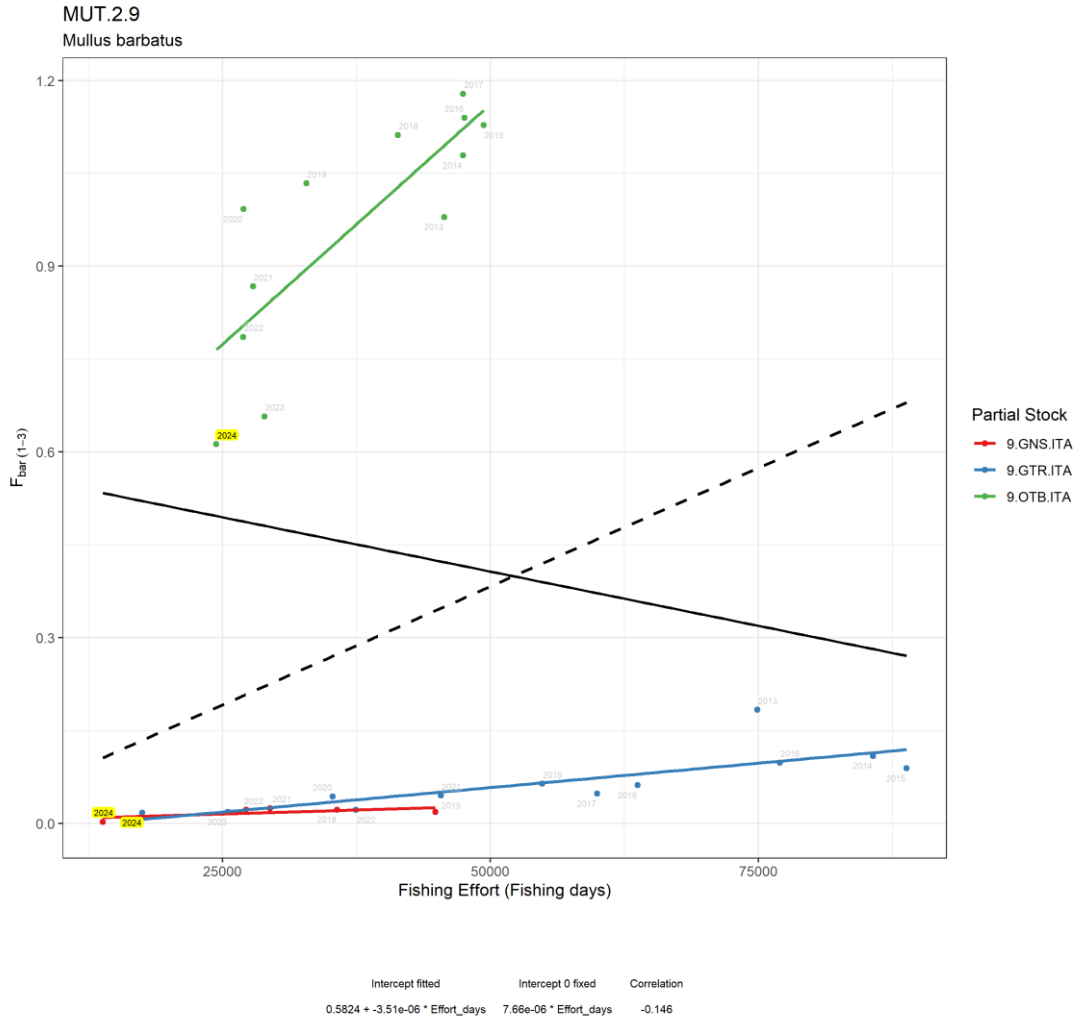
GNS.ITA: Correlation r = 0.66 (R^2 = 0.44, p = 0.225) indicates a moderate positive relationship, though not statistically significant, with a small positive slope (5.1×10^{-7}).

GTR.ITA: Strong positive correlation (r = 0.78, R^2 = 0.61, p = 0.00279) and positive slope (1.58×10^{-6}) demonstrate that fishing mortality increases with effort for this gear type.

OTB.ITA: Very strong correlation (r = 0.81, R^2 = 0.66, p = 0.00137) with a relatively high slope (1.55×10^{-5}) further confirms the strong sensitivity of F_bar to fishing effort.

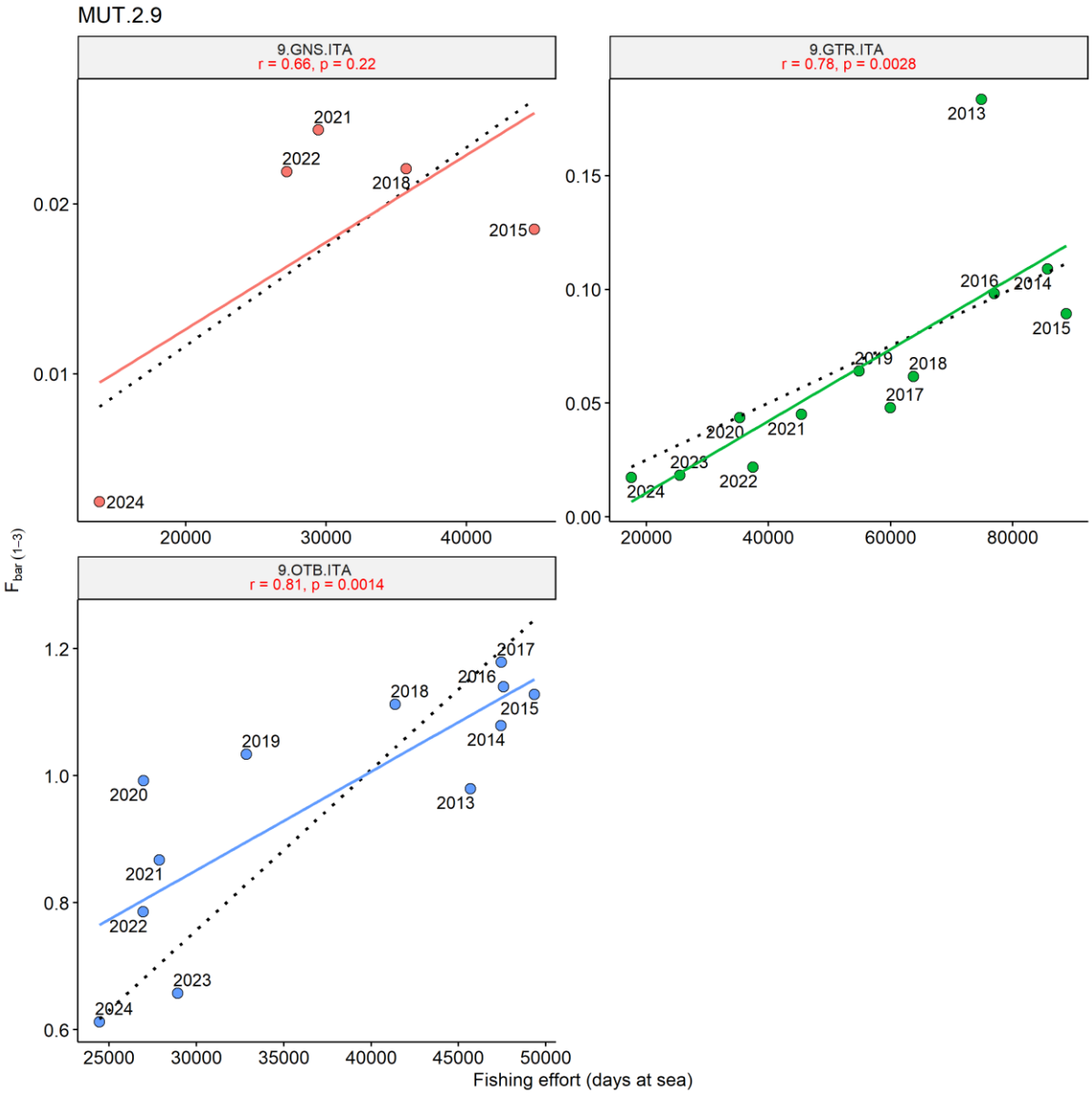
MUT.2.9 results indicate that this stock is highly sensitive to fishing pressure. Management should consider gear-specific effort limits to ensure sustainable exploitation.

Figure 6.2.27 - Partial Fbar by age as a function of fishing effort in days for DPS.2.9. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

Figure 6.2.28 - Partial Fbar by age as a function of fishing effort in days for MUT.2.9 by gear. The solid line shows the linear model with intercept fitted, while the slashed line depicts the linear model with the intercept fixed at y=0.



Source: Own elaboration.

Conclusions

- Across **EMU 1**, the analysis of **partial** F_{bar} reveals a consistent dominance of OTB fleets in both catches and fishing mortality across species. The spatial and age-specific patterns of partial F suggest that bottom trawling activities are the primary driver of fishing pressure, particularly in GSA 6 and GSA 7. Stocks such as *Merluccius merluccius* and *Aristeus antennatus* exhibit strong fishing mortality at younger ages, indicating potential recruitment vulnerability, while *Mullus* spp. show higher F at intermediate ages.
- Across EMU 2, **partial** F_{bar} patterns are largely driven by OTB fleets also, which represent the dominant source of both catches and fishing mortality for most species. The concentration of partial fishing mortality at younger ages (1–3) for *Parapenaeus longirostris* and *Merluccius merluccius* suggests that trawling exerts strong pressure on early life stages. Conversely, *Mullus barbatus* shows higher fishing mortality at intermediate to older ages (2–4), reflecting differences in selectivity and habitat distribution. Overall, the results highlight the central role of bottom trawl fisheries in shaping the exploitation patterns across GSAs 8–11, with limited contribution from other gears.
- The analysis of the relationship between fishing effort in days (fishing days) and the F_{bar} (all areas was considered together for each stock) across EMU 1 and EMU 2 shows a range of responses among stocks. In EMU 1, most stocks—including ARA.1.12, ARA.1.67, DPS.1.567, HKE.1.1567, and MUT.1.1—display strong positive correlations, indicating that partial F_{bar} increases with fishing effort. MUR.1.5 exhibits a moderate positive association, while MUT.1.7 shows a slight negative trend. In EMU 2, ARS.2.891011 and DPS.2.891011 demonstrate moderate, significant positive correlations, whereas HKE.2.891011 and MUT.2.9 show weak or negligible relationships, suggesting that fishing effort alone does not explain their variability in partial F_{bar}. Overall, some stocks appear resilient or are positively influenced by increased effort, whereas others show weak or unreliable negative relationships.
- When the analysis is performed at a finer gear/area-specific level, the relationship between fishing effort and **partial** F_{bar} becomes more variable. For EMU 1, stocks such as ARA.1.12 (ARA.1.1.OTB.ESP) and ARA.1.67 (ARA.1.7.OTB.ESP) maintain strong positive correlations, indicating a clear increase of partial F_{bar} with effort, whereas ARA.1.67 (ARA.1.6.OTB.ESP) shows a negative correlation, suggesting that other factors may modulate fishing mortality at this scale. Similarly, DPS.1.567 exhibits both weak negative and near-zero relationships depending on the gear and area considered. HKE.1.1567 shows substantial variation: some fleets such as HKE.1.6.LLS.ESP and HKE.1.6.OTB.ESP are strongly positively associated with effort, while others, like HKE.1.6.GTR.ESP, are negatively correlated. For MUR.1.5, only specific fleets (e.g., MUR.1.5.OTB.ESP) show a noticeable positive association. MUT.1.1 and MUT.1.7 display a mixture of positive correlations with certain gears, while some fleet-specific estimates are weak or negligible. In EMU 2, ARS.2.891011 and DPS.2.891011 also exhibit contrasting patterns: some fleets show moderate positive relationships,

whereas others have negligible or negative associations. MUT.2.9 demonstrates consistently positive correlations across gears, but the magnitude of the relationship differs between GTR, OTB, and GNS fleets.

- Overall, these results highlight that the partial F_{bar} responses to fishing effort are highly fleet- and area-specific. While some fleets show strong and consistent positive relationships, others are weakly related or even negatively associated with effort.

In conclusion, the relationship between fishing effort and F_{bar} or partial F_{bar} reflects species and fleet-specific dynamics, as well as ecological and management factors not considered here that are likely influencing fishing mortality. This variability underscores the role of species-specific biology, gear selectivity, spatial distribution of fishing effort, and other context-specific factors that may be masked when analysing stocks at an aggregate level.

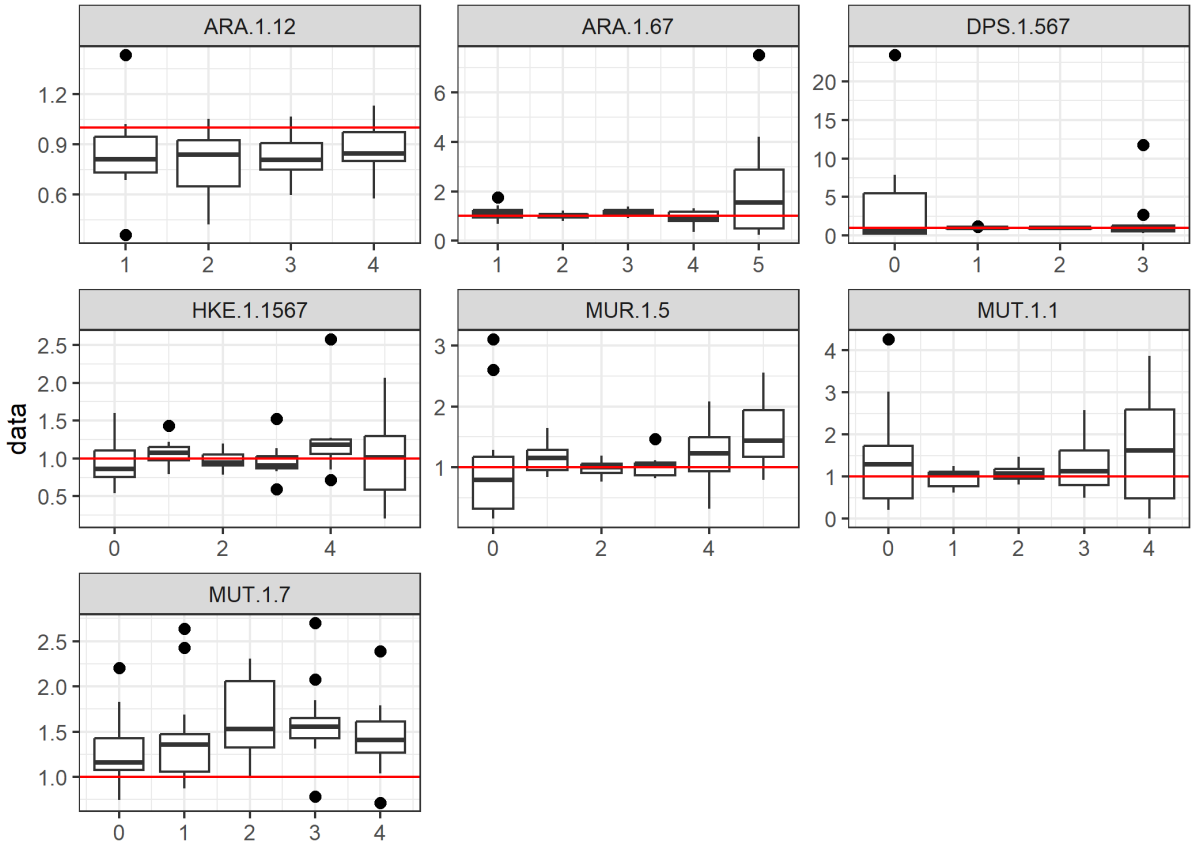
6.3. Validate the estimation of Partial catch at age

In order to check if the estimation of partial catch at age, and partial F at age is correct, the sum of the partial catch at age by year was compared to the official total catch by year by estimate the ratio between both values as:

$$ratioC_{a,y} = \frac{(\sum \text{partial catch by GSA and gear})_{a,y}}{\text{total catch}_{a,y}}$$

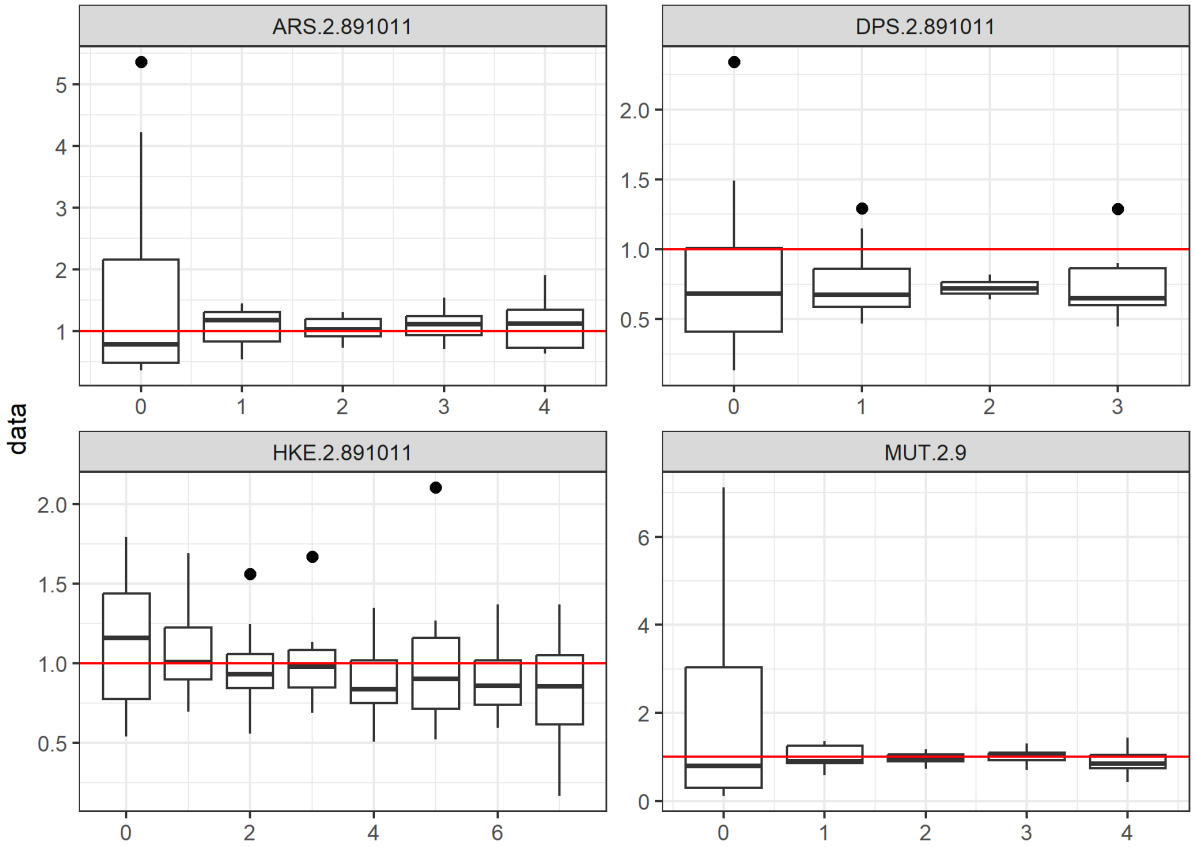
Plot considered only for species with different gear/GSA participation to total F, shows that in several stocks both in EMU 1 or EMU 2, the ratio is always different than 1 (which would indicate that estimation of partial catch by age adds to the same value as the total official catch). In addition, there seems to exist a trend to increase the value of the ratio with the lower and higher age (Figure 6.3.1-2).

Figure 6.3.1 - Ratio between the total catch and the partial catch at age by age in EMU 1stocks.



Source: Own elaboration.

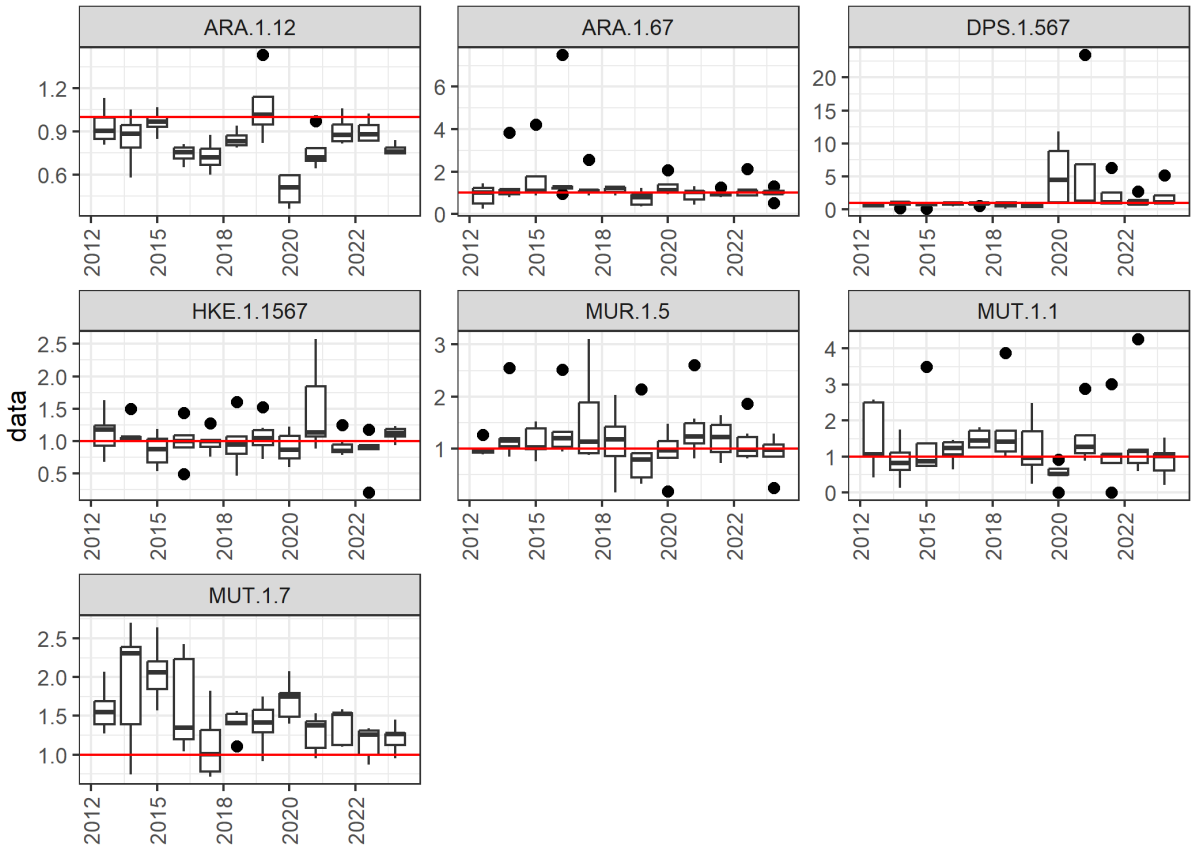
Figure 6.3.2 - Ratio between the total catch and the partial catch at age by age in EMU 2 stocks.



Source: Own elaboration.

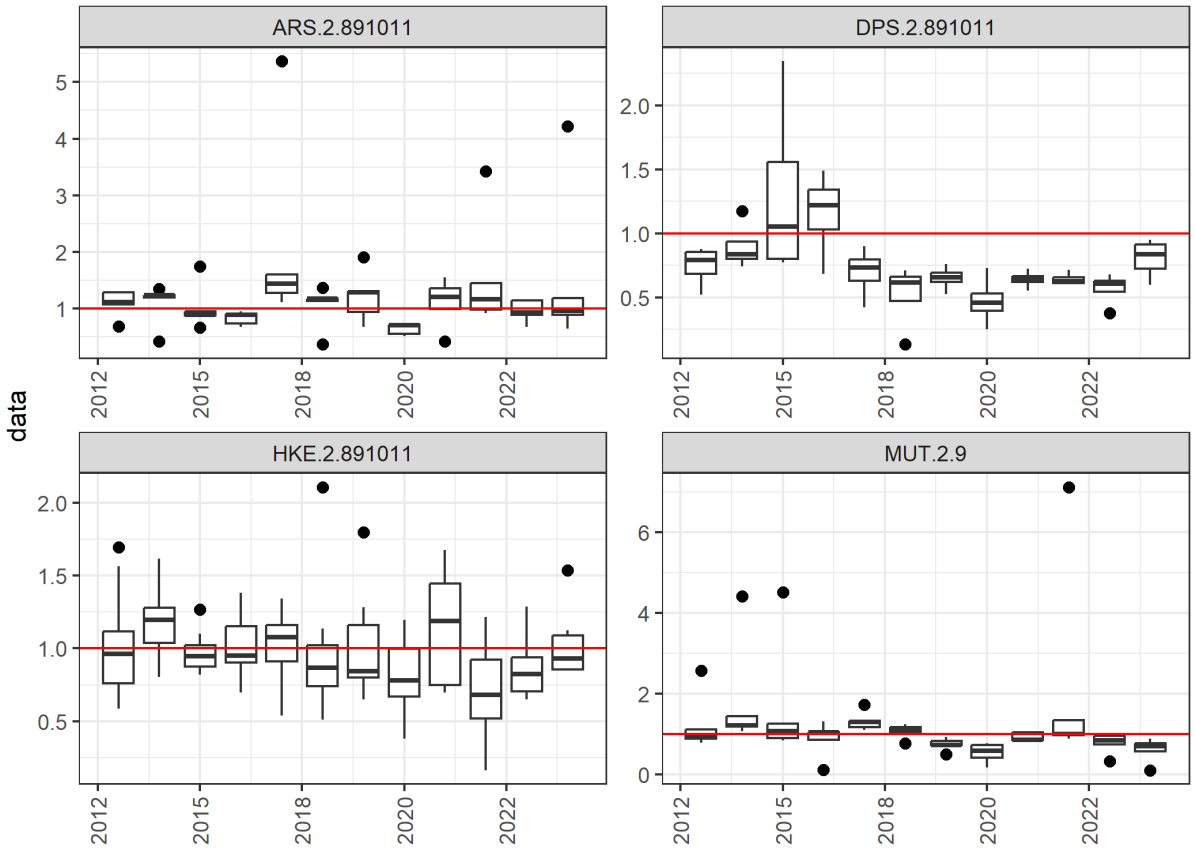
If the plot of the catch ratio by age is produced by year instead of stock, it is concluded that the difference in the estimation of partial catch compared to total catch, affects to all years over the historic period (Figures 6.3.3-4).

Figure 6.2.3 - Ratio between the total catch and the partial catch at age by year in EMU 1 stocks.



Source: Own elaboration.

Figure 6.2.34 - Ratio between the total catch and the partial catch at age by year in EMU 1 stocks.



Source: Own elaboration.

When the ratio is below 1, that is not necessarily a problem, but it might be the consequence of not having all the fishing gears in the estimation of the partial catch. Usually only the most important gears are taken in the calculations (OTB, OTT, GNS, LLS and GTR), and hence, there is a percentage of catches left out. However, when the catch ratio is above 1, this means that the estimated partial catch at age is higher than the total catch, and this should not occur. It seems that this overestimation occurs mostly at older ages, which are often out of the age range considered to estimate the partial F_{bar}. Still, the process to estimate total and partial catch at age by GSA and gear should be explored more, taking into account also the effect of reconstruct data when year or metier are missing.

6.4. (ToR 3a) Attempts to deduce next Effort 2026 levels from the F-E relationships

Hereafter estimate of Effort 2026 is provided corresponding to the reduction in fishing mortality advised by STECF EWG 25-09[3] and use it as the level of reduction used by this STECF EWG (25-11) to drive the fishing effort scenarios for each Member State fleets and achieve Fmsy for each single stock.

The objective was then to determine the next effort level for 2026 based on the F-E relationships for each stock and GSA. The formula to calculate the upcoming effort level that was attempted is provided below:

$$Effort_{y+1,stk} = \sum_{i}^{\blacksquare}\left(\frac{PartialF_{bar\ y-1(fl,GSA)i}}{\sum_{\blacksquare}^{\blacksquare} Partial_{Fbar\ y-1}} \times \frac{(Fmsy, stk-b)}{a_{(fl,GSA)i}^{\blacksquare}}\ x\ (\frac{Efforty-1}{ReestimatedEfforty-1})\right)$$

With

$$reestimatedEffort_{y-1,stk} = \sum_{i}^{\blacksquare}\left(\frac{PartialF_{bar\ y-1(fl,GSA)i}}{\sum_{\blacksquare}^{\blacksquare} Partial_{Fbar\ y-1}} \times \frac{(Fy-1, stk-b)}{a_{(fl,GSA)i}^{\blacksquare}}\right)$$

With a and b the slope and the intercept of the linear regression fit on the E-F observed data (i.e. model is F=a*E+b with E the days at sea).

We account for the uncertainty ranges in our calculations, including the mean value of parameter a, as well as the 97.5th and 2.5th percentiles of that parameter.

Alternative models, such as power models, could help capture a possible hyperstability effect (i.e., when F does not reduce proportionally to the effort), which modifies the equation for:

$$Effort_{y+1,stk} = \sum_{i}^{\blacksquare}\left(\frac{PartialF_{bar\ y-1(fl,GSA)i}}{\sum_{\blacksquare}^{\blacksquare} Partial_{Fbar\ y-1}} \times \frac{\exp(\log(Fmsy, stk)-\log(c))}{d_{(fl,GSA)i}^{\blacksquare}} - Bias\right)$$

With c and d the parameter of the power law non-linear regression fits on the E-F observed data (i.e. model is F=c*E^d).

No power model assuming hyper- (or hypo-stability), nor the linear model with fitted intercept, were found more significant than the linear regression passing by the origin (0,0) i.e. b=0. Then the estimates are based on such linear models passing by the origin. The estimated slope parameter *a* by stock, GSA and gear (percentile 2.5, 50 and 97.5), as well as the pvalue and the adjusted Rsquare are presented in Table 6.4.1.

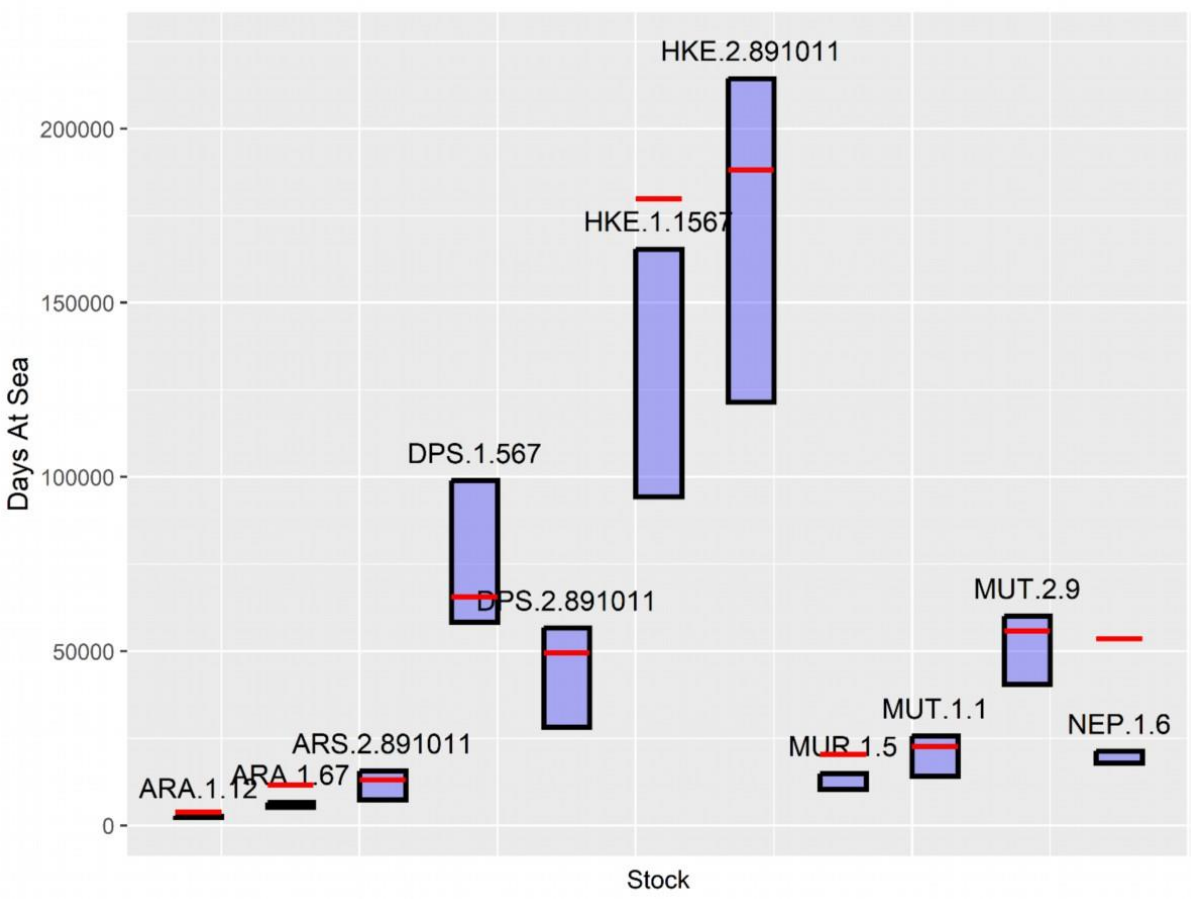
Effort level in 2026 that would be needed to achieve the FMSY are then computed by reading the value on the F-E relationships, accounting for partial F per gear and GSA, and further filtering out the few F-E which were found not significant.

In future investigation, the bioeconomic models deployed in Tor3b could use those effort levels to validate/see what happens.

Table 6.4.1.- Estimated slope parameter *a* by stock, GSA and gear (percentile 2.5, 50 and 97.5), as well as the associated pvalue and the adjusted Rsquare

stock	species	area	gear	par_a_p50	par_a_p2.5	par_a_p97.5	Rsq	pvalue
ARA.1.12	ARA	1	OTB	0.0000767	0.0000711	0.0000823	0.984	0.0000000
ARA.1.12	ARA	2	OTB	0.0001409	0.0001190	0.0001627	0.930	0.0000001
ARA.1.67	ARA	6	OTB	0.0000665	0.0000587	0.0000743	0.958	0.0000000
ARA.1.67	ARA	7	OTB	0.0001241	0.0001046	0.0001436	0.928	0.0000001
ARS.2.891011	ARS	9	OTB	0.0000064	0.0000027	0.0000102	0.459	0.0065266
ARS.2.891011	ARS	10	OTB	0.0000299	0.0000246	0.0000352	0.909	0.0000003
DPS.1.567	DPS	5	OTB	0.0000055	0.0000036	0.0000074	0.727	0.0001289
DPS.1.567	DPS	6	OTB	0.0000167	0.0000128	0.0000207	0.851	0.0000044
DPS.1.567	DPS	7	OTB	0.0000052	0.0000033	0.0000071	0.700	0.0002234
DPS.2.891011	DPS	9	OTB	0.0000139	0.0000106	0.0000172	0.846	0.0000053
DPS.2.891011	DPS	10	OTB	0.0000055	0.0000032	0.0000079	0.626	0.0007714
DPS.2.891011	DPS	11	OTB	0.0000017	-0.0000002	0.0000035	0.147	0.1072468
HKE.1.1567	HKE	6	GNS	0.0000017	0.0000013	0.0000021	0.860	0.0000031
HKE.1.1567	HKE	7	GNS	0.0000034	0.0000029	0.0000039	0.933	0.0000001
HKE.1.1567	HKE	1	GTR	0.0000015	0.0000001	0.0000030	0.610	0.2913508
HKE.1.1567	HKE	6	GTR	0.0000006	0.0000004	0.0000008	0.833	0.0069977
HKE.1.1567	HKE	7	GTR	0.0000005	0.0000002	0.0000008	0.470	0.0058138
HKE.1.1567	HKE	6	LLS	0.0000082	0.0000053	0.0000111	0.713	0.0001720
HKE.1.1567	HKE	7	LLS	0.0000015	0.0000009	0.0000020	0.673	0.0003610
HKE.1.1567	HKE	1	OTB	0.0000068	0.0000061	0.0000076	0.963	0.0000000
HKE.1.1567	HKE	5	OTB	0.0000054	0.0000044	0.0000064	0.905	0.0000004
HKE.1.1567	HKE	6	OTB	0.0000114	0.0000106	0.0000121	0.987	0.0000000
HKE.1.1567	HKE	7	OTB	0.0000138	0.0000100	0.0000176	0.677	0.0000003
HKE.1.1567	HKE	7	OTB	0.0000138	0.0000100	0.0000176	0.677	0.0000003
HKE.1.1567	HKE	7	OTT	0.0000385	0.0000303	0.0000467	0.875	0.0000016
HKE.2.891011	HKE	9	GNS	0.0000008	0.0000006	0.0000011	0.812	0.0000159
HKE.2.891011	HKE	10	GNS	0.0000018	0.0000014	0.0000021	0.898	0.0000017
HKE.2.891011	HKE	9	GTR	0.0000002	0.0000000	0.0000004	0.396	0.1531971
HKE.2.891011	HKE	10	GTR	0.0000005	0.0000003	0.0000007	0.780	0.0004321
HKE.2.891011	HKE	10	LLS	0.0000006	0.0000002	0.0000010	0.429	0.0170462
HKE.2.891011	HKE	8	OTB	0.0000033	0.0000006	0.0000060	0.287	0.0343102
HKE.2.891011	HKE	9	OTB	0.0000059	0.0000048	0.0000069	0.911	0.0000002
HKE.2.891011	HKE	10	OTB	0.0000029	0.0000021	0.0000038	0.792	0.0000643
HKE.2.891011	HKE	11	OTB	0.0000085	0.0000033	0.0000136	0.438	0.0081910
MUR.1.5	MUR	5	GNS	0.0000162	0.0000124	0.0000199	0.854	0.0000039
MUR.1.5	MUR	5	GTR	0.0000281	0.0000225	0.0000337	0.888	0.0000009
MUR.1.5	MUR	5	OTB	0.0001012	0.0000900	0.0001124	0.963	0.0000000
MUT.1.1	MUT	1	GTR	0.0000303	0.0000159	0.0000447	0.571	0.0017064
MUT.1.1	MUT	1	OTB	0.0000691	0.0000578	0.0000805	0.922	0.0000001
MUT.2.9	MUT	9	GNS	0.0000006	0.0000004	0.0000008	0.883	0.0034205
MUT.2.9	MUT	9	GTR	0.0000013	0.0000010	0.0000015	0.853	0.0000041
MUT.2.9	MUT	9	OTB	0.0000252	0.0000230	0.0000275	0.976	0.0000000
NEP.1.6	NEP	6	OTB	0.0000118	0.0000108	0.0000129	0.977	0.0000000
NEP.2.11	NEP	11	OTB	0.0000273	0.0000096	0.0000451	0.402	0.0117917

Figure 6.4.1. Days at sea plot and associated underlying data of (re-estimated) Effort 2024 (red) and Effort 2026 (blue ranges) assuming the FMSY individual to each stock is the target in 2026. For a given stock, the Effort 2026 range is estimated from the F-E relationships and partial F specific to that stock, and 5-95% confidence intervals around the linear regression parameters. Effort 2024 is re-estimated so that to correspond to the effort level that the linear relationship would predict for F 2024 assessed by the Stock Assessment EWG. A red bar above the blue range would mean that the Effort needed to achieve the FMSY for that stock in 2026 would reduce compared to 2024.



stock	eff2024	eff2024reestimated	eff2026	eff2026_cilow	eff2026_cihigh
ARA.1.12	3800	4298	2500	2738	2304
ARA.1.67	11671	15560	5835	6632	5210
ARS.2.891011	13019	43131	9497	15648	7314
DPS.1.567	65571	77805	73285	98984	58396
DPS.2.891011	49461	131793	37363	56697	28277
HKE.1.1567	179962	249530	115555	162973	94989
HKE.2.891011	188197	196581	154322	214432	121491
MUR.1.5	20345	11557	12207	14844	10398
MUT.1.1	22619	12524	17793	25626	14180
MUT.2.9	55827	42903	47976	60077	40574

6.5. (ToR 3a) Possibility for change in efficiency induced by the effort reduction - Spatial effort allocation analysis of the Spanish fleet in EMU1

As shown in the non-linear F-E relationships, effective effort can change in reaction to nominal effort reduction so that to compensate for such an effort reduction to keep the same return from fishing with less time allowed. For example, the nominal effort could change but the number of hauls or spatial effort pattern could change to compensate for the reduction in management effort.

However, fishing patterns in the area are also constrained by regulation on maximal hours per day. Vessels are limited to 12 hours of fishing each day and are required to land their catches daily at the auction. It is unclear if there are possibilities to increase effective effort by fishing differently within these 12 hours limit.

An ICATMAR study reports that the fleet is highly specialized, often focusing on a single fishing technique. The main targets include the European hake (*Merluccius merluccius*), found at depths of 50 to 200 meters; the Norway lobster (*Nephrops norvegicus*) from 200 to 500 meters; and the deep-sea blue and red shrimp (*Aristeus antennatus*) from 500 to 850 meters. Among these, the deep-sea shrimp is the most profitable species in the region, generating the majority of the revenue for the fishers' guilds in certain ports, such as Palamós and Blanes.

To further investigate the fishing patterns of the Spanish fleet in the EMU1 and the possibility for compensating effects, we analyzed the VMS data provided at the beginning of the EWG meeting. This analysis involved combining vessel positioning data with trip-based landing declarations to determine the effort and catch for hake and ARA per GSA for 2024. Additionally, we utilized 2021 data from previous “Effort” EWGs to compare with the 2024 data and evaluate any potential spatial changes in effort.

The analysis shows that the majority of days at sea are spent in GSA 6 (Table 6.5.1). However, if the nominal effort (i.e. days at sea) kept the same between 2021 and 2024, the contribution to the effective fishing time (deduced from the VMS) reduced in GSA 6, while increased in GSA1.

Table 6.5.1 Nominal and effective effort in 2021 vs 2024, and kg catch of hake and ARA. Coupling with 2021 landings was not done.

gsa_area	VMS fishing effort (hour)	Days at sea deduced from VMS	% VMS effort in GSA	% days in GSA	kg_hke	kg_ara	% kg_hke	% kg_ara
GSA 1	108645	29247	14.2	22.0	NA	NA	NA	NA
GSA 2	30132	1553	3.9	1.2	NA	NA	NA	NA
GSA 5	88712	10770	11.6	8.1	NA	NA	NA	NA
GSA 6	522091	89766	68.1	67.0	NA	NA	NA	NA
GSA 7	16807	1851	2.2	1.4	NA	NA	NA	NA

GSA 1	149777	17272	24.0	22.1	419915	128632	23.93	14.66
GSA 2	13252	818	2.1	1.0	277	69282	0.02	7.89
GSA 5	46962	5999	7.6	7.7	88506	176756	5.04	20.14
GSA 6	403764	52551	64.7	67.3	1213217	468598	69.14	53.40
GSA 7	10156	1406	1.6	1.8	32720	34297	1.86	3.91

The spatial analysis confirms a likely displacement of effort allocation towards more offshore areas, especially in GSA 1, either likely induced by smaller vessels being less active in 2024 than in 2021, or a less likely net effort displacement of all vessels toward more remote fishing grounds. A more thorough spatial analysis of individual active vessels behaviors would be required to confirm those trends.

Figure 6.5.1. Relative difference in spatial effort allocation of the Spanish fleet in EMU1 between the two years 2021 and 2024 expressed as a range between 0 and 1, where 0 means all effort from 2021, and 1 means all effort from 2024. Besides seasonal closures (in red) informed in Figure 6.5.2, spatial closures (in yellow) were issued from Spanish Order APA/423/2020 of 18 May establishing a management plan for the conservation of fishery resources demersal stocks in the Mediterranean Sea

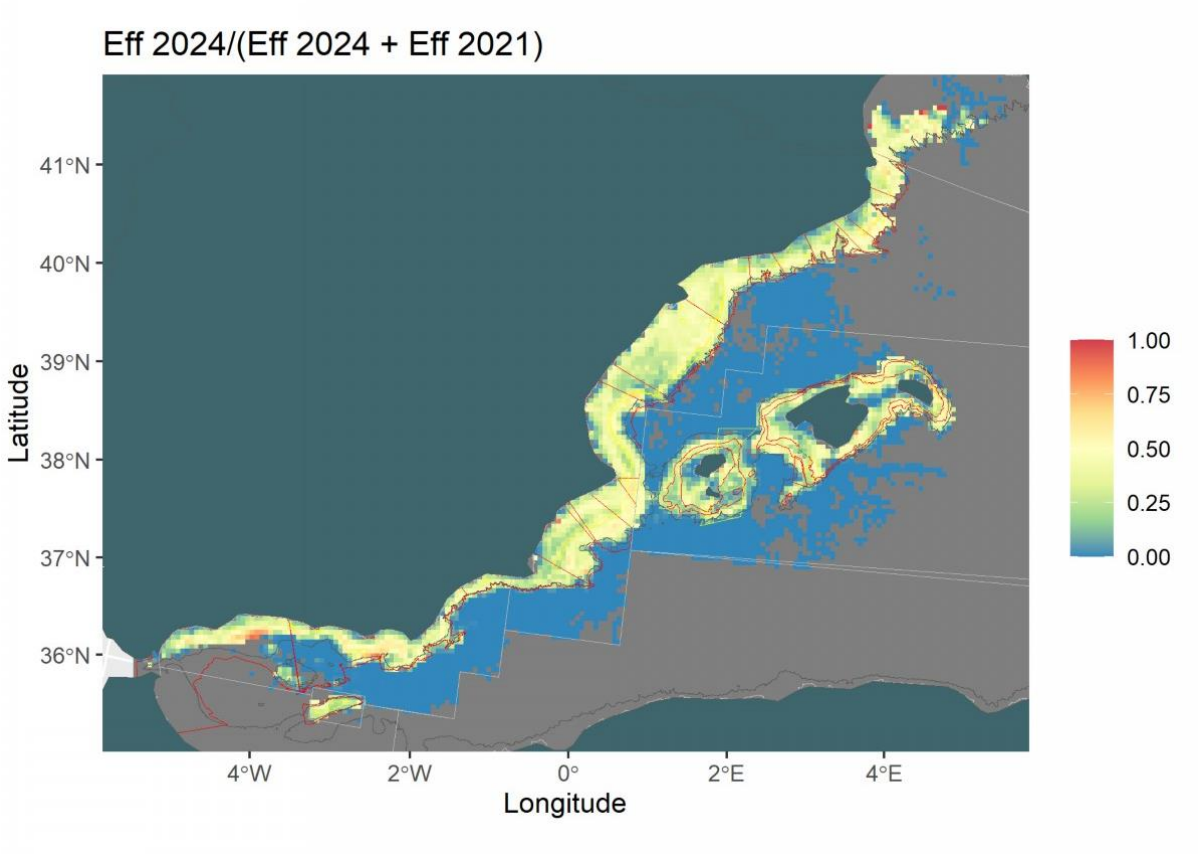
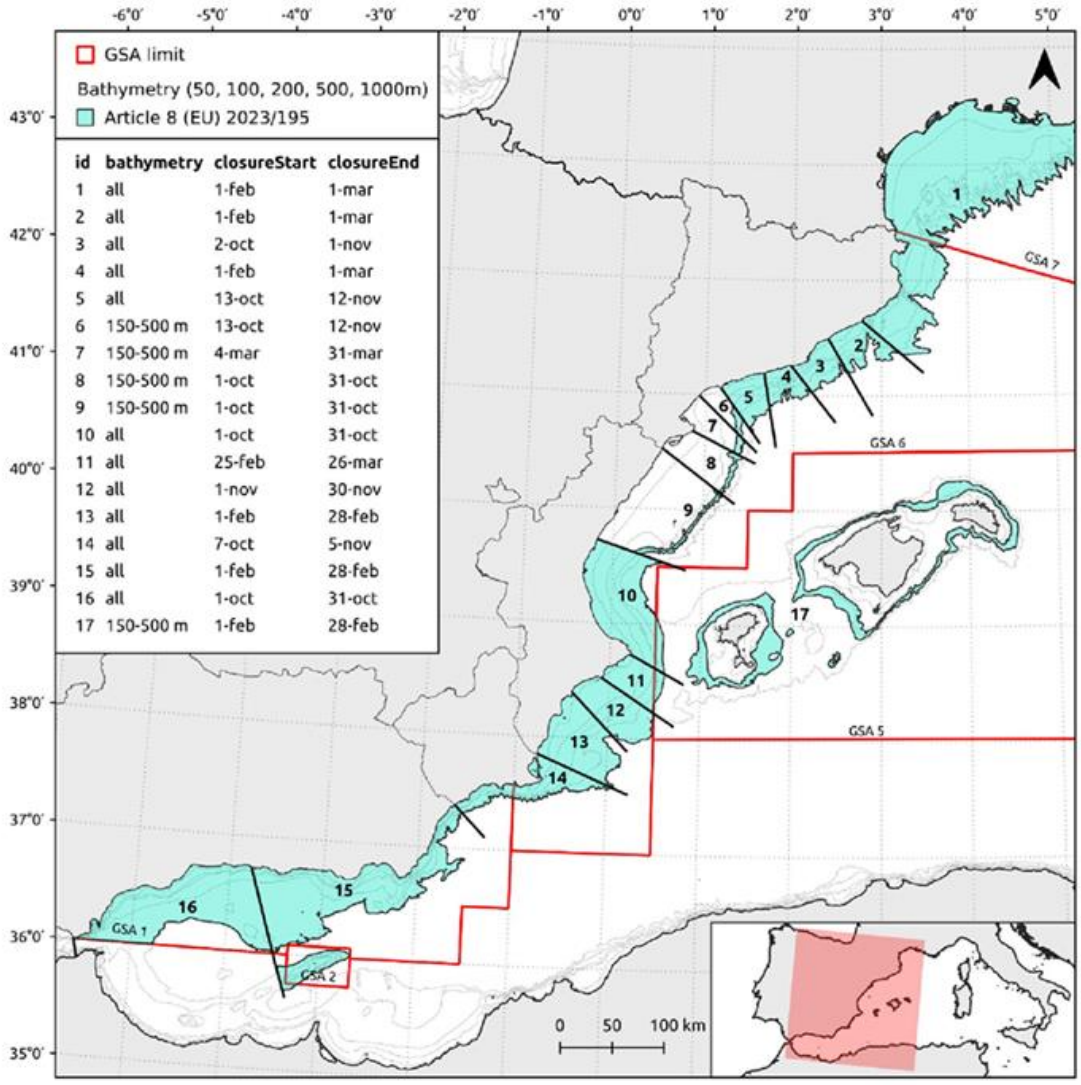


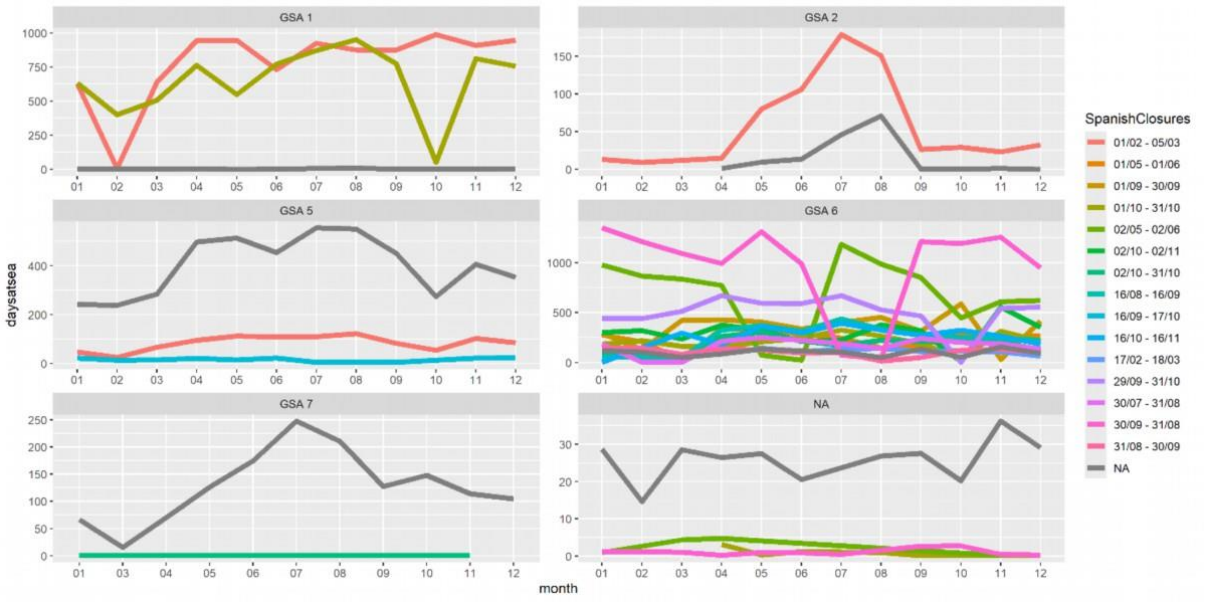
Figure 6.5.2. 2024 Spatiotemporal fishing closures established in the Spanish Mediterranean in response to Article 8 of the Council Regulation (EU) 2023/195 of the 30 January 2023. See the "consolidated" legal text with all the areas that are currently (and in 2024) established. https://www.boe.es/buscar/pdf/2020/BOE-A-2020-5163-consolidado.pdf



Derived from the establishment of WMMAP Spain has adopted a variety of fishing spatial management measures. First, permanent and seasonal closures were adopted in response to articles 11.2 and 11.3 of the WMMAP and published in APA 423/2020 Article 11 and Annex III. Second, the 800m trawling ban was adopted in APA 412/2024 and then derogated in APA/85/2025. Finally, there are seasonal closures in Spanish EMU1 areas (Figure 6.5.2) first established in APA/499/2024 and modified in APA/85/2025. Plotting the effort that occurs within the year 2024 (Figure 6.5.3) during that period closure (established in APA/499/2024), effort is not reduced in absolute but reallocated to still open areas, within GSAs and possibly across

GSAs. Hence, such closures would perform well only if spatial protection made more sense than seasonal protection.

Figure 6.5.3. Days at sea in 2024 (recalculated from the VMS data) within each polygon regulated by COUNCIL REGULATION (EU) 2024/259 (see also Figure 1 for these polygons in red), each of them implementing a seasonal closure during the year. See Figure 6.5.2.

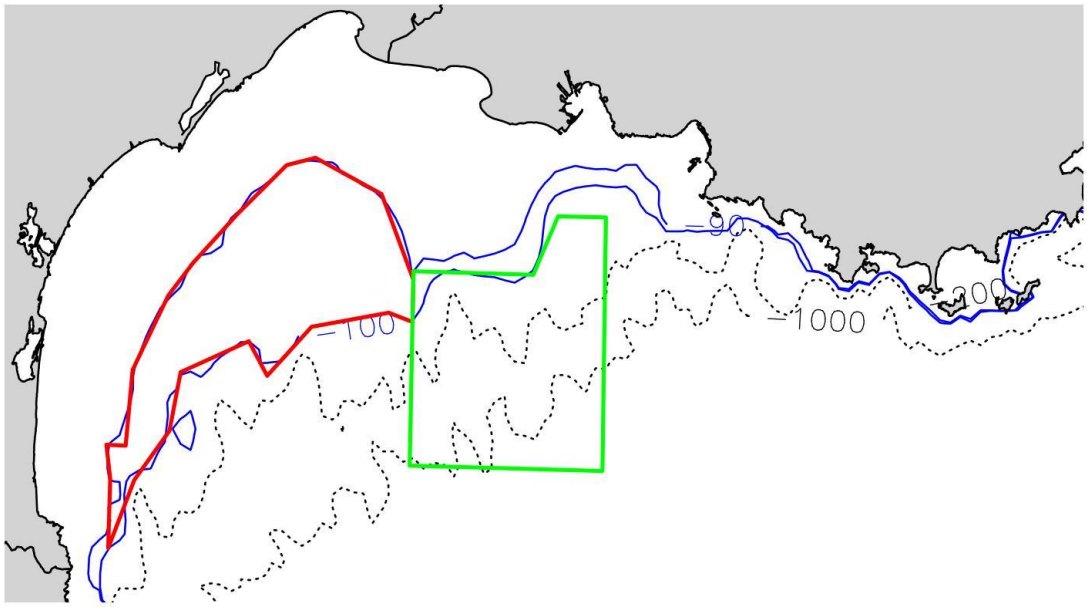


In conclusion, the management of the West MED fishery is based on gear and vessel size and not by GSA. As a result, if there are both high-density and low-density areas within a GSA, the fishery is likely to shift towards the high-density area in response to increasingly restricted effort (assuming there are no other drivers such as catches of other species accessibility issues, etc.) and therefore compensate for the reduction in effort for the stock. Such dynamics can obscure the relationships between fishing effort, catch rates, and fishing mortality, especially when measures like area closures, changes in mesh size, effort restrictions, and fleet restructuring are implemented. These factors all influence catch rates and present challenges for the analysis of the effects of the measures and changing patterns of the fleet

6.6. ToR 3a Possibility for change in efficiency induced by the effort reduction. How did the spatio-temporal closure established in 2020 in the Gulf of Lions affected fishing effort and CPUEs.

The European Hake (*Merluccius merluccius*) is a historically significant commercial stock in the Mediterranean, currently over-harvested. The recovery of hake stocks is a key goal of the WestMed management plan (WESTMED MAP), launched in 2020, which focuses on reducing fishing efforts and enhancing juvenile survival. A spatio-temporal closure to protect juvenile hake has been implemented in the Gulf of Lion since 2020 (GSA 7, Figure 6.6.1).

Figure 6.6.1. Map of the continental shelf of the Gulf of Lion (GSA7), showing the location of the spatio-temporal closure. Red polygon: “bathymetric” area, closed 8 months from September to April; green polygon: “extended GFCM” box, closed 6 months from November to April.



Source: own elaboration.

The closure is constituted of two areas, one (in red) defined between the 90 and 100m isobath, and closed during 8 months (from September to April); and another (in green) corresponding to the extended GFCM Fisheries Restricted Area, closed to all trawlers for 6 months (from November to April). Now that the MAP and the closure are in their fifth year of existence, it is possible to investigate the consequences of their joint implementation in GSA7. Hence, the sections below will use STECF data to

(i) Examine if the catch of juvenile hake has been reduced since 2020,

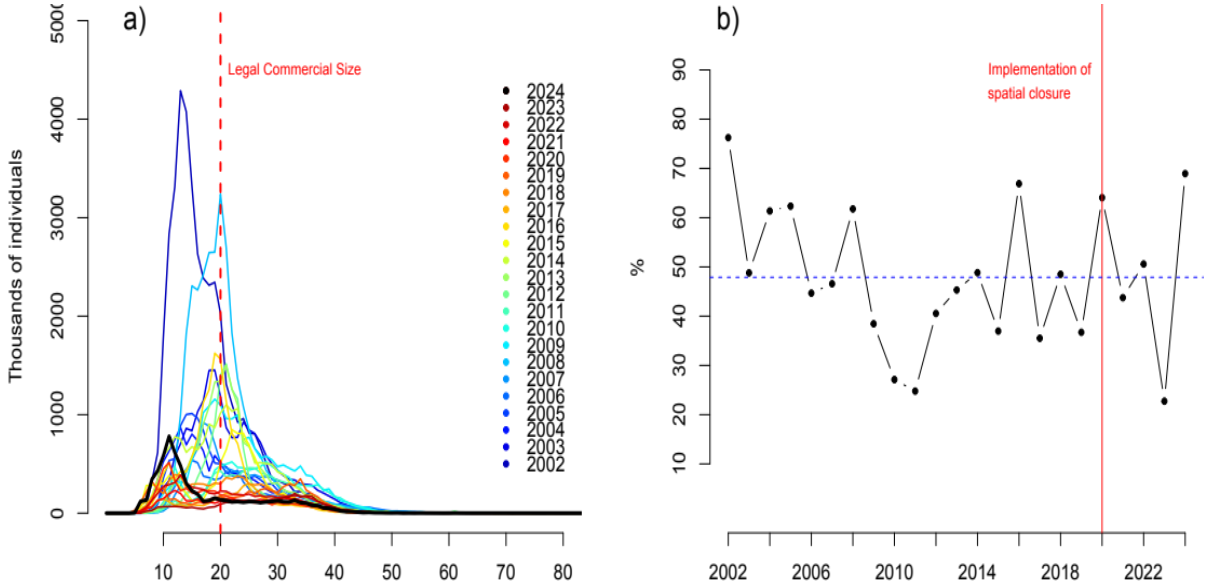
(ii) Characterize fishing effort redistribution within GSA 7 after the closure,

(iii) Analyze how CPUEs have evolved, both locally and globally.

6.7. The catch of Hake under legal commercial size (20cm)

The length frequency distribution of hake caught by demersal trawlers in GSA 7 has been reconstructed from STECF's landings and discards data available through the Med. and Black Sea data call (Figure 6.7.2a).

Figure 6.7.2. a) Catch length frequency distribution of Hake in GSA 7. The vertical red dashed line marks the legal commercial size (20cm). b) Black line: Proportion of Hake under the legal commercial size caught on board of trawlers in GSA 7 through the years. The red solid line marks the year of implementation of the spatial closure (2020). The vertical dashed blue line shows the average of the black line.



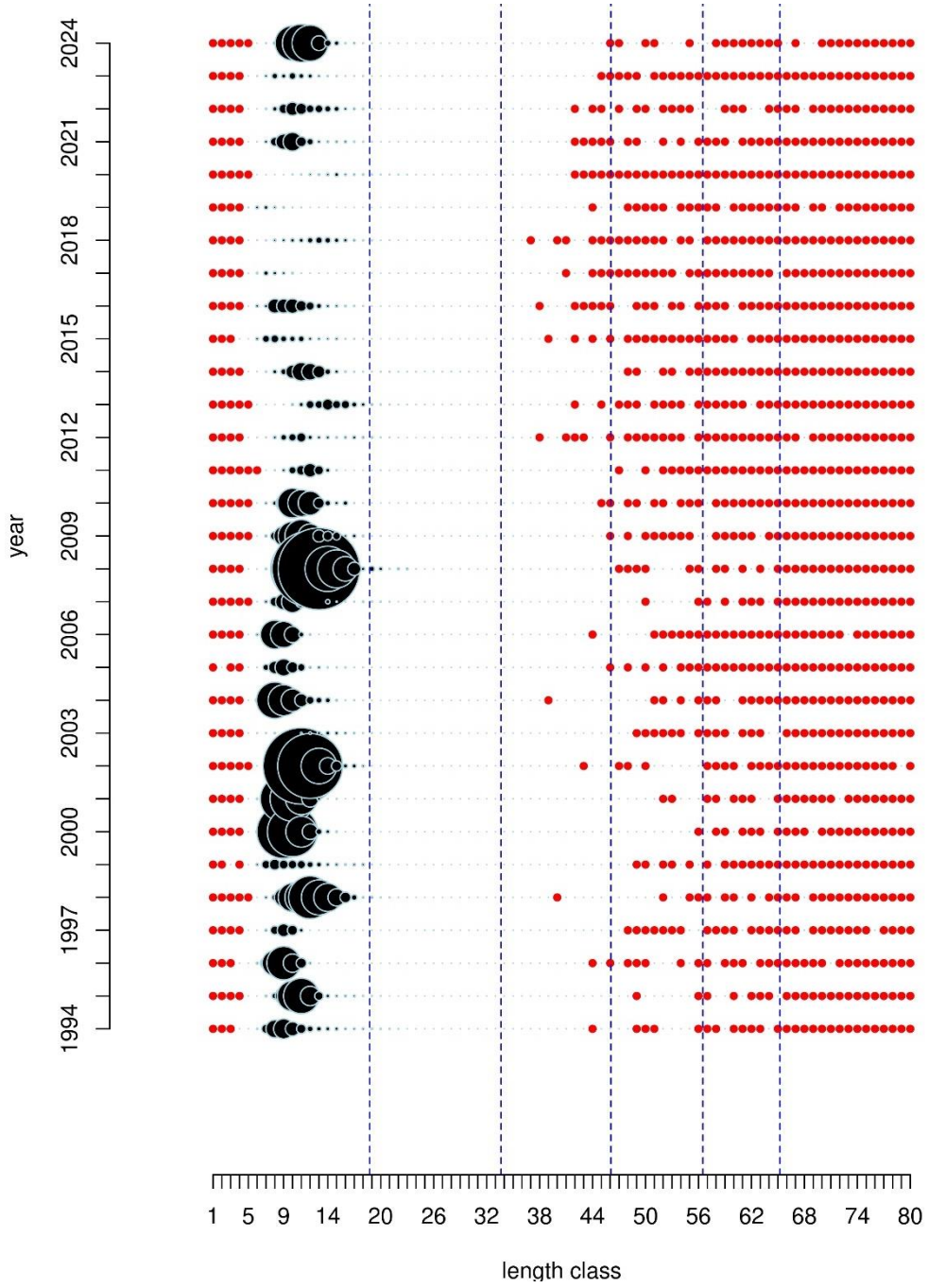
Source: own elaboration.

On average, almost one hake out of two caught on board of a demersal trawler in GSA 7 is under the legal commercial size of 20cm (Figure 6.7.2). Some annual variability around this number is observed, with low years around 25% and high years reaching up to 75%. These proportions are very high, considering that these individuals cannot be sold, hence do not participate in the economy of the fishery, and must be discarded, dead, at sea, without participating in the productivity of the stock.

The annual variability is well explained by the hake stock recruitment dynamics, captured by the MEDITS survey (Figure 6.7.3). Indeed, most of the years of highest proportion of individual under commercial size caught (2002, 2004, 2008, and 2024) corresponds to years of high recruitment, and a significant statistical relationship can be found between the proportion of HKE<20 cm caught during year Y and the relative

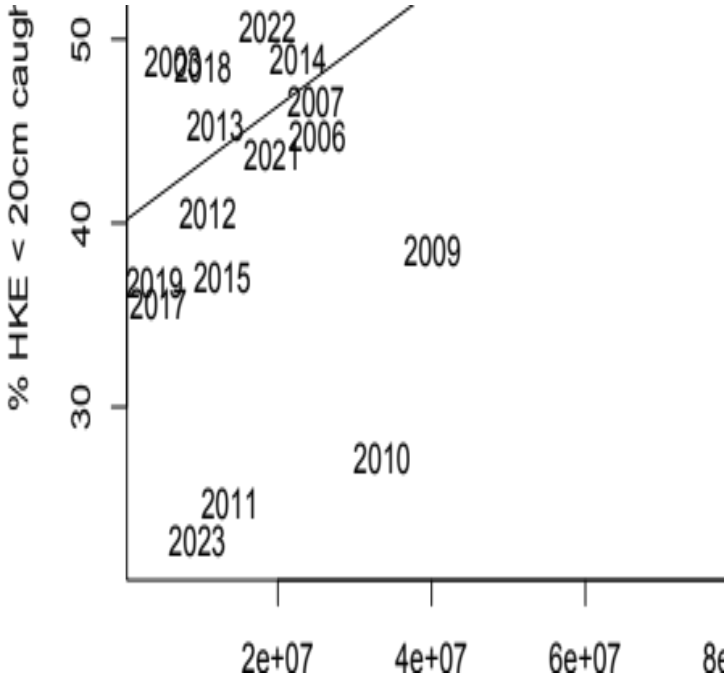
abundance of HKE<20cm estimated from MEDITS survey in June of year Y (Figure 6.7.4).

Figure 6.7.3. MEDITS abundances (black circles) at length (x-axis, cm) and through years (y-axis) of Hake in GSA 7.



Source: own elaboration.

Figure 6.7.4. y-axis: proportion of HKE<20 cm caught. x-axis: relative abundance of HKE<20cm estimated from MEDITS survey in June. Years are noted in the graph. Black solid line: significant regression between both (p = 0.014).



Source: own elaboration.

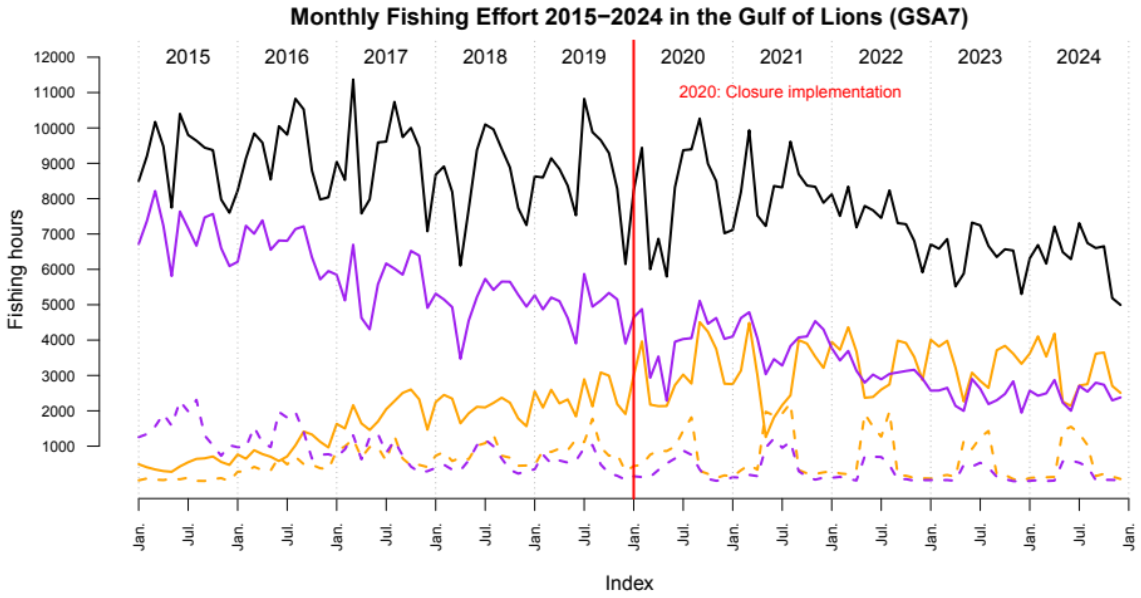
The proportion of hake under commercial size caught by trawlers in GSA 7 is very high (~50%) (Figure 6.7.4), most likely due to the weak selectivity of the gears widely used in the area (40mm square mesh in the codend). Also, the implementation of the spatial closure in 2020 has not reduced this number, which fluctuates according to hake recruitment dynamics, with years of high recruitment matching years of high proportions of hake under commercial size in the catch. Hence, high recruitment cannot propagate through higher age-class because of the high juvenile fishing mortality induced by the use of non-selective gears in GSA 7.

6.8. Effort redistribution in GSA 7 following spatio-temporal closure.

To study fishing effort redistribution following the establishment of the spatial closure, we rely on the estimation of fishing time and landings per statistical square provided by the ALGOPESCA algorithm (IFREMER, 2021) for the time period 2015-2024. These estimates are obtained through the daily positions recorded through the Vessel Monitoring System (VMS). The resulting data consists of estimates of fishing time, at the temporal resolution of the fishing trip and at the spatial resolution of 00° 03' 00". Only vessels operating demersal trawling gears (OTM and OTT) were considered.

First, a time series of total fishing hours per month in GSA7 was constituted (Figure 6.8.1) and was disaggregated amongst gears (OTB vs OTT) and spatial localization (within vs. outside the closure).

Figure 6.8.1. Number of fishing hours of French trawlers in GSA 7 per month. The black solid line is the total effort and corresponds to the sum of the 4 other coloured lines. Orange line: OTT only. Purple line: OTB only. Dashed line: Within the area concerned by the closure only. Coloured solid line: outside the area concerned by the closure only.

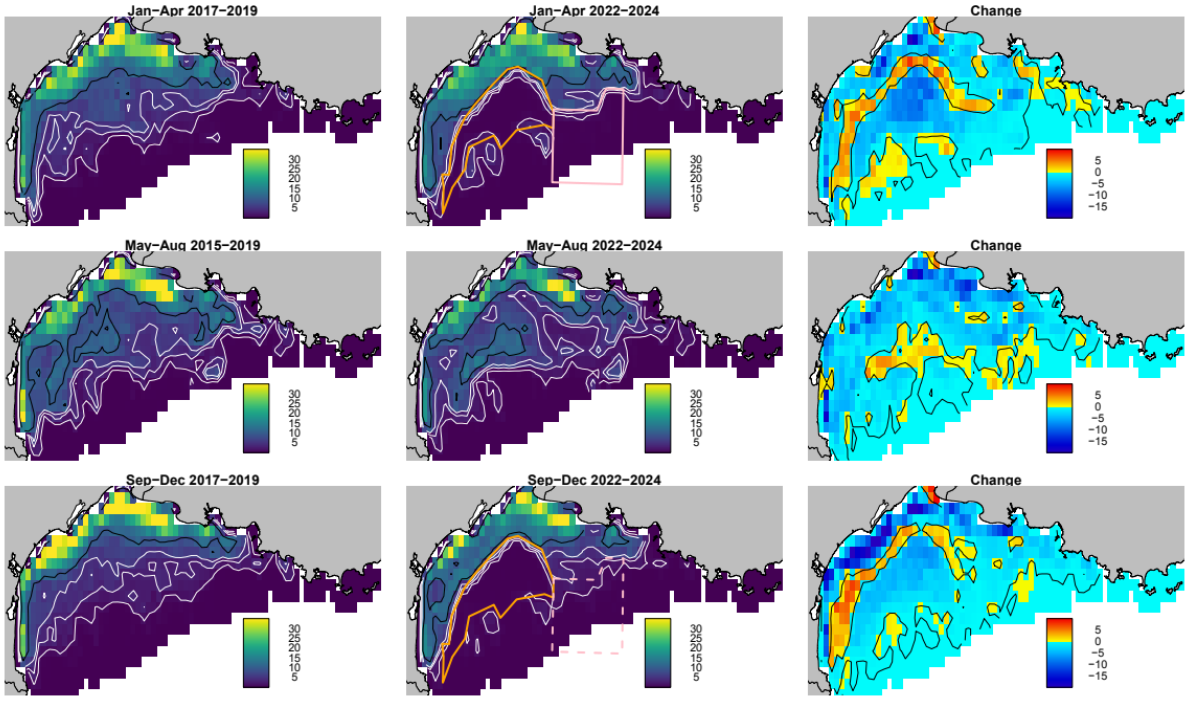


Source: own elaboration

In 2019, total fishing hours were 105182, while in 2024, fishing hours dropped to 76638, which amounts to a fishing effort reduction of 27.13% over the five years of the plan (Figure 6.8.5). The fishing effort within and outside the closure have been reshaped by the establishment of the spatio-temporal closure, with clear alternation after 2020 between winter period of rest (over 8 consecutive month) and summer period of activity (4 month, from May to August). OTT have been increasingly used by the French trawling fleet. Initially marginal in 2015, their use is on par with OTB in 2024.

The complex temporal pattern of total fishing hours in GSA 7 shown in Figure 6.8.5 must be kept in mind to properly interpret the spatial distribution and change of fishing effort in GSA 7 (Figure 6.8.6).

Figure 6.8.6. Left column: Maps of fishing hours per km2, averaged over three years before the spatio-temporal closure (2017-2019), and across three seasons (from top to bottom, January-April, May-August, September-December). White isoline corresponds to 1,3 and 5 fishing hours per km2, black isoline to 10. Central column: same as left column but averaged over three years after the spatio-temporal closure (2022-2024). The spatio-temporal closure is displayed at the time during which it is in force. For period Sep-Dec 2022-2024, the dashed line indicates area where the closure is in force only half of the time (from November to December). Right column: Effort change, in fishing hours per km2, between the two-time period considered (effort 2022-2024 minus effort 2017-2019). In the change maps, blues shades correspond to a decrease in fishing effort, while orange shades correspond to an increase in fishing effort.



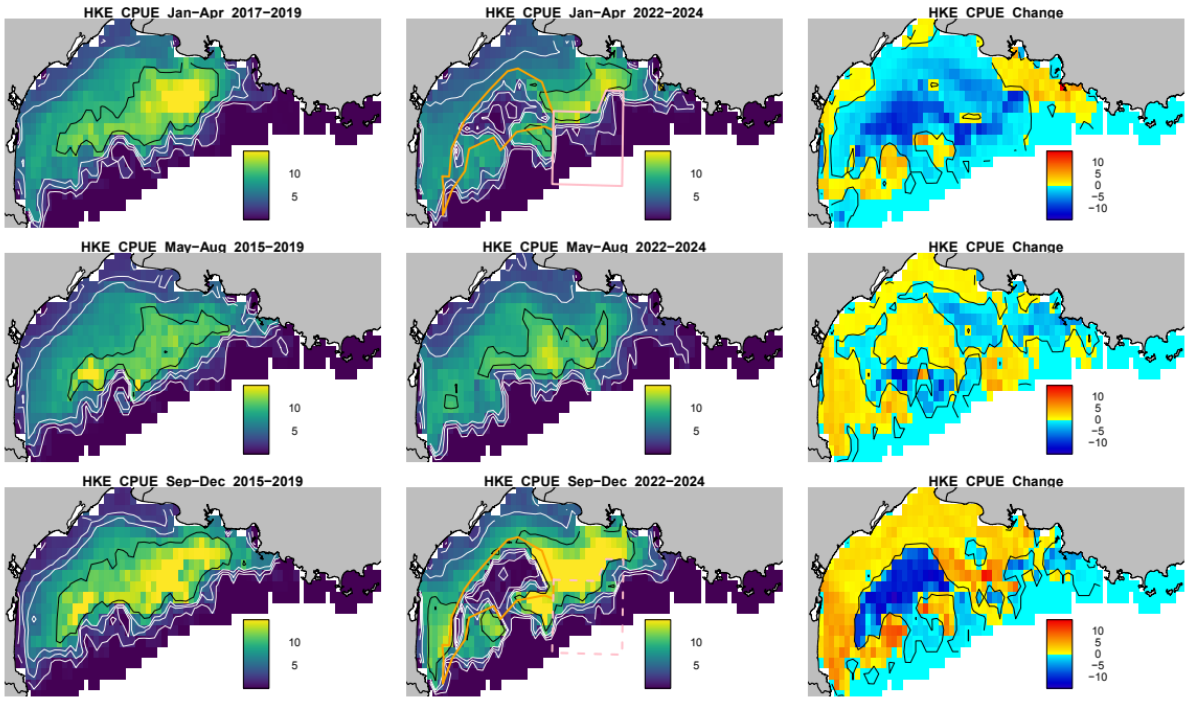
Source: own elaboration

The spatio-temporal closure is well respected by the fleet, with fishing hours per kilometer square dropping below 1 when the closure is in force (Figure 6.8.6). The trawling fleet has adapted to the closure: When in force, trawlers have increased their effort around the boundaries of the closure, mostly in the north but also in the south. When the closure opens, trawlers move to the central area, slightly increasing their effort there when compared to the past. There is a concomitant strong decrease in fishing effort in coastal areas, due to the displacement of effort along the boundaries of the closed area. A global decrease in fishing effort is not attributable to the spatio-temporal closure, but to the global effort reduction induced by the WESTMED management plan.

Catch per unit effort before and after closure

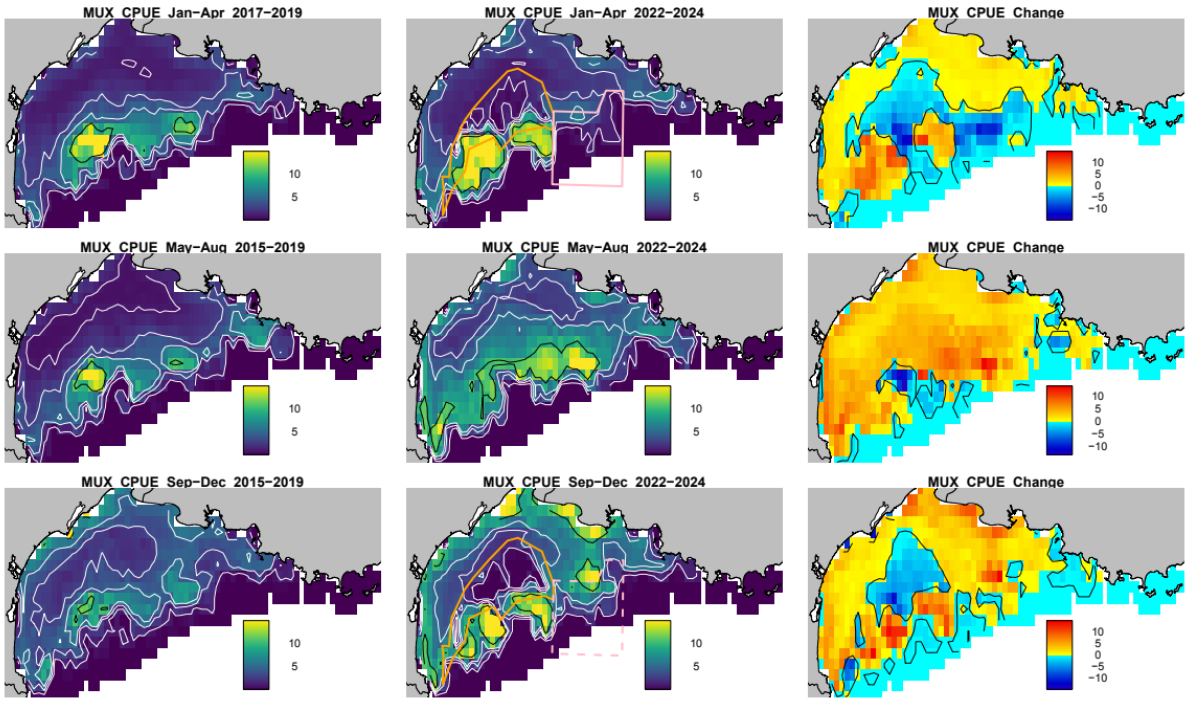
How CPUEs of hake and other species have evolved after the establishment of the closure, comparing CPUEs in kg per fished hour, are shown for hake (HKE, Figure 6.8.7), but also for other major stocks in the area, namely Red Mullet (MUX, Figure 6.7.8), Monkfish (MNZ, Figure 6.8.9), and Octopus (OCT, Figure 6.8.10). Lastly, we also computed CPUEs for all species together (TOT, Figure 6.8.11).

Figure 6.8.7. Left column: Hake CPUEs (Kg per fishing hour), averaged over three years before the spatio-temporal closure (2017-2019), and across three seasons (from top to bottom, January-April, May-August, September-December). White isoline corresponds to CPUEs of 1,3 and 5, black isoline to 10. Central column: same than left column but averaged over three years after the spatio-temporal closure (2022-2024). The spatio-temporal closure is displayed at the time during which it is in force. For time period Sep-Dec 2022-2024, the dashed line indicate area where the closure is in force only half of the time (from November to December). Right column: CPUE change between the two-time period considered (2022-2024 minus 2017-2019). In the change maps, blue shades correspond to a decrease in CPUE, while orange shades correspond to an increase.



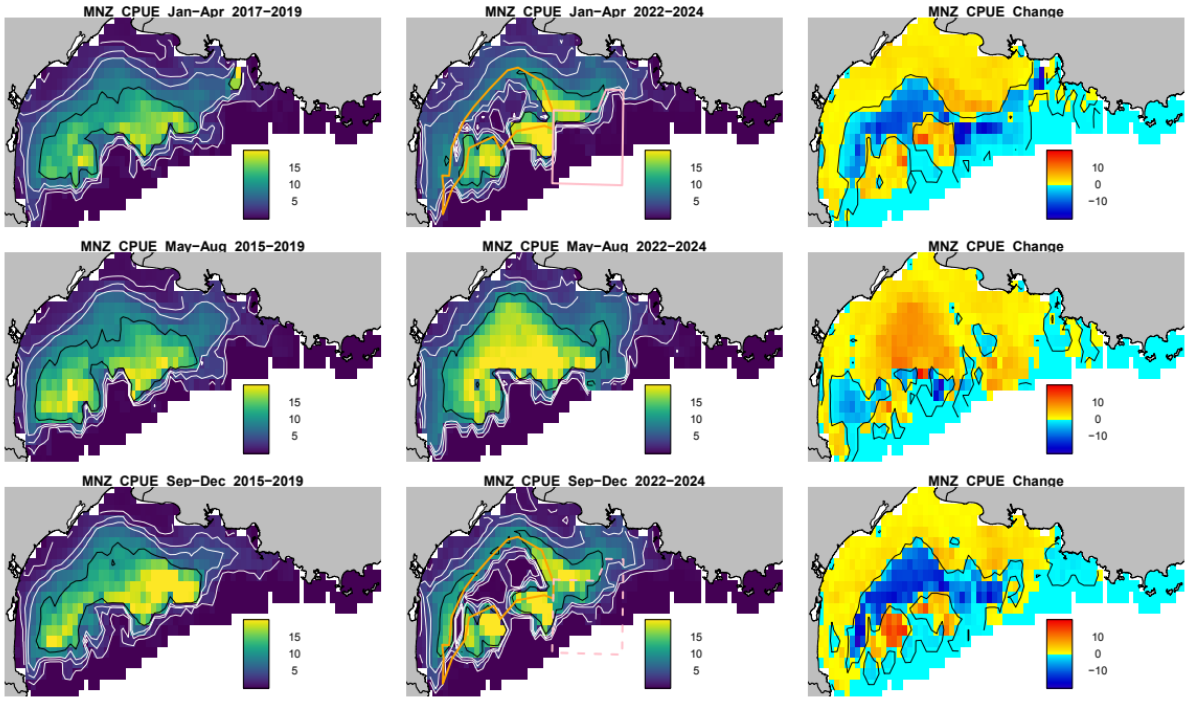
Source: own elaboration

Figure 6.8.8. MUX CPUEs and change.



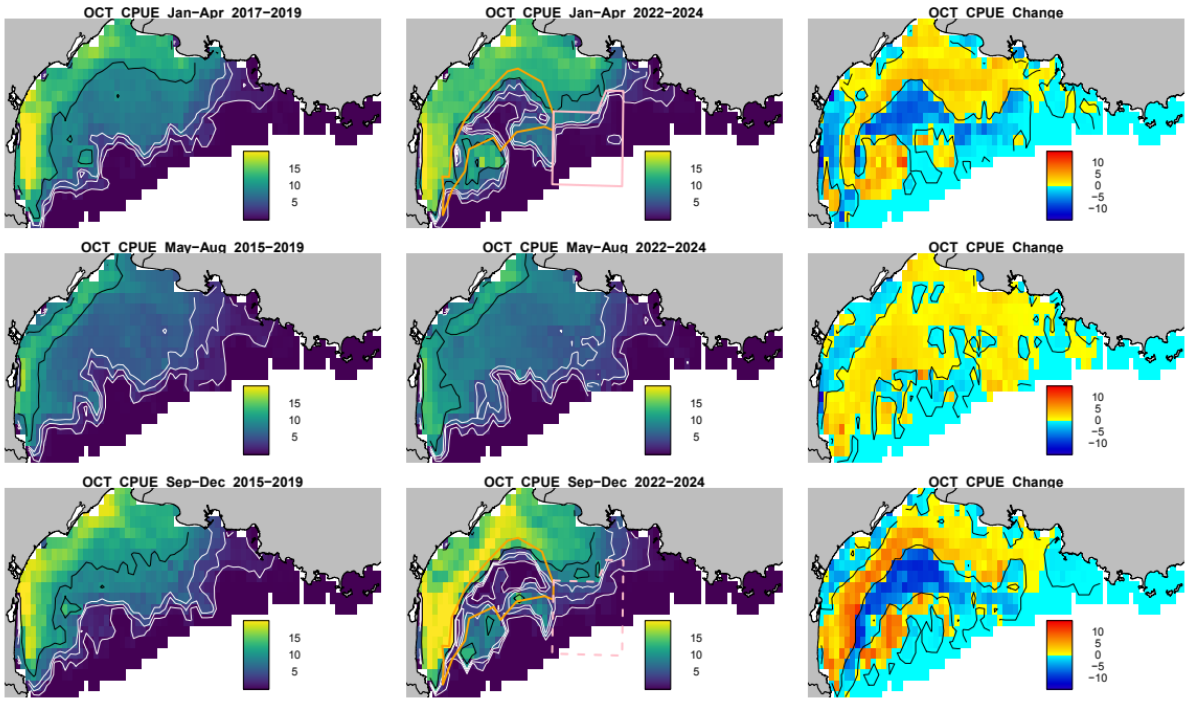
Source: own elaboration

Figure 6.8.9. MNZ CPUEs and change.



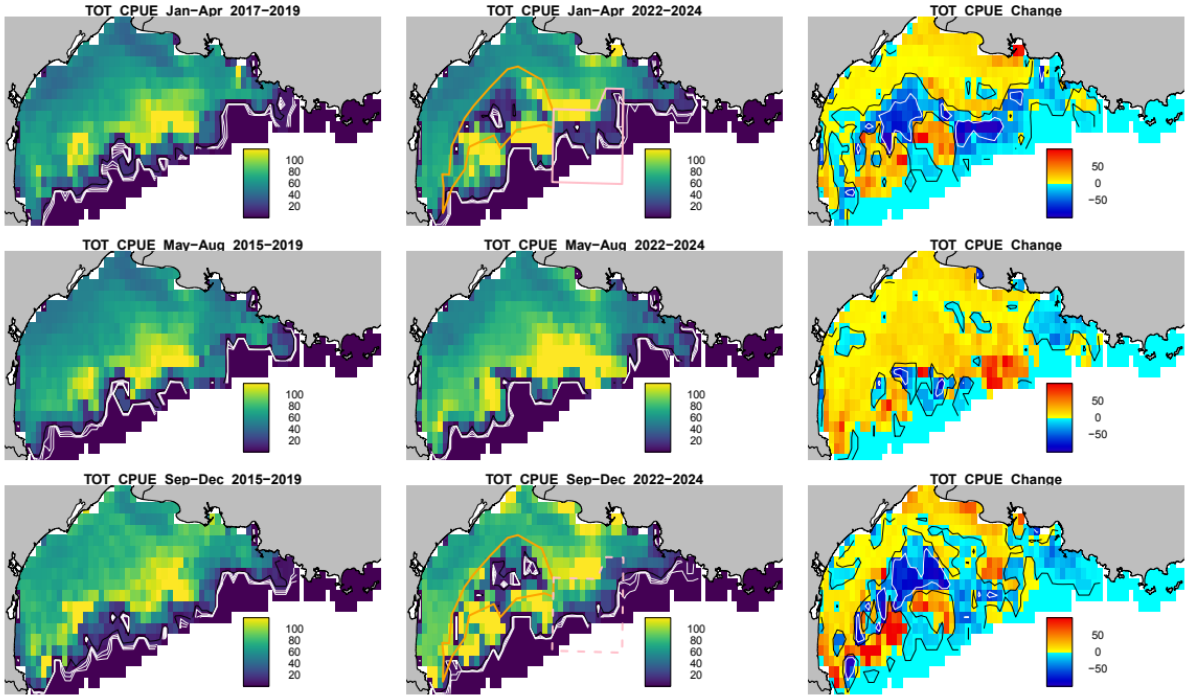
Source: own elaboration

Figure 6.8.10. OCT CPUEs and change.



Source: own elaboration

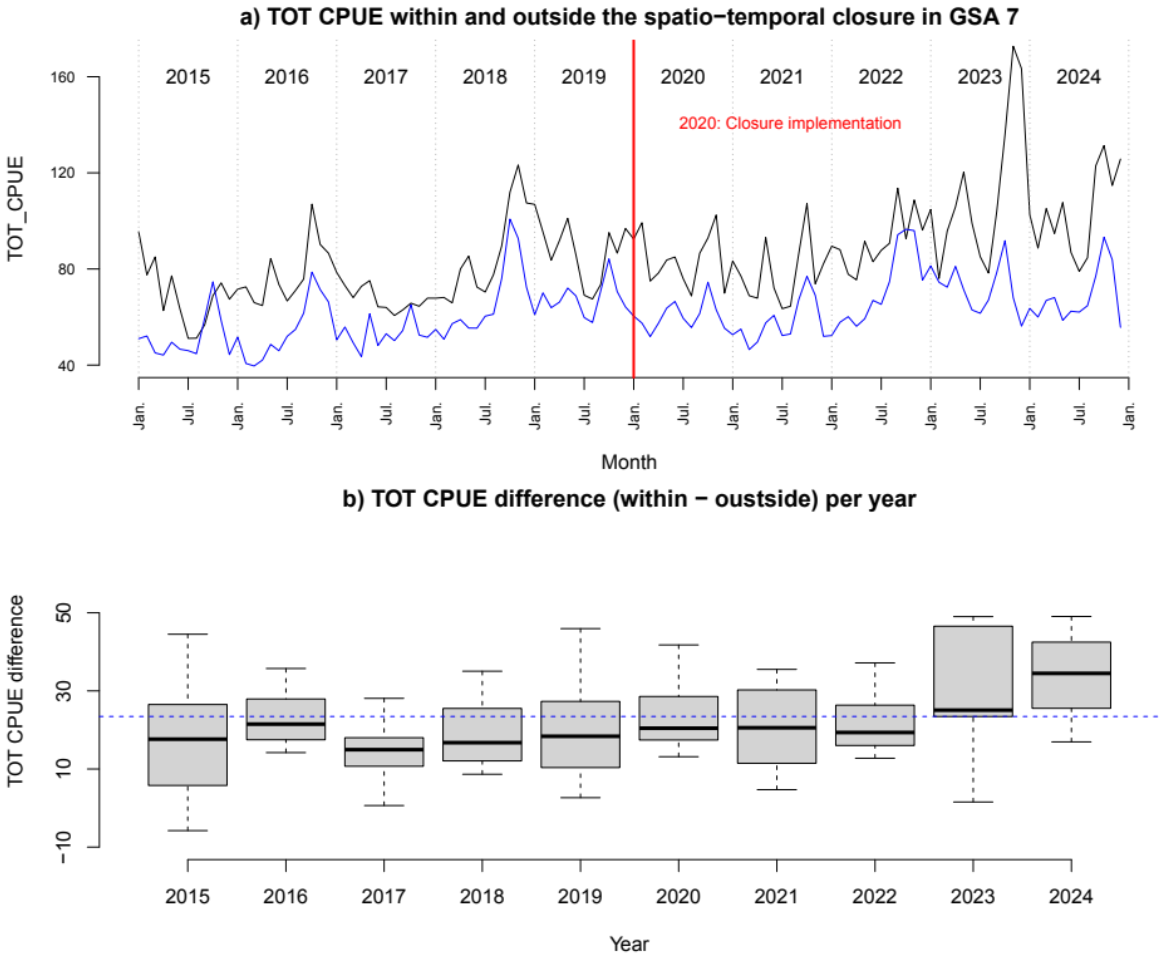
Figure 6.8.11. TOT CPUEs and change.



Source: own elaboration

The evolution of CPUEs before and after the closure all points towards a general pattern of CPUE increase in areas outside the closure, and within the closure when open. The strength of this general increase depends on species, it is stronger with MUX and MNZ (Figures Figure 6.8.8 and 6.8.9), and weaker with HKE and OCT (Figures 6.8.7 and 6.8.10). This increase is general and widespread, as illustrated when focusing on TOT PUEs (Figure 6.8.11). Such a general increase can be attributed first to the fishing effort reduction induced by the management plan. However, the systematic CPUE increase within the closure area when open in summer, observable in all species, is probably also the result of the 8-month resting period induced by the spatio-temporal closure. Disentangling both effects (WestMED effort reduction and spatio-temporal closure) is challenging, but to do so, we computed monthly time series of TOT CPUEs within and outside the closure (Figure 6.8.12a), together with boxplots, per year, of the monthly differences between TOT CPUEs within and outside the closure (Figure 6.8.12b).

Figure 6.8.12. a) time series of TOT (all species confounded) CPUEs within (black line) and outside (blue line) the area of the spatio-temporal closure in force since 2020. b) boxplots of the monthly differences between TOT CPUEs within and outside the closure. Positive values indicate higher TOT CPUEs within the area concerned by the closure. The blue dashed line marks the mean difference across all years.



Source: own elaboration.

It is apparent that TOT CPUEs was always higher within the closure when compared to outside (Figure 6.8.12a). The difference between both seems stable through time, until 2023 when it increases up to levels not seen earlier, indicating that for these two last years, TOT CPUEs is more improved within the closure than for previous year. This could be interpreted as an effect of the closure, and more specifically of the 8 consecutive resting months in winter. However, further data and analysis are required to confirm this interpretation.

In conclusion, this data-driven analysis, centered around the effect of the spatio-temporal closure in force in GSA7 since 2020, showed that juvenile catch per year was not reduced after the closure, despite the good compliance shown by the trawling fleet. The explanation for this lies in the poor selectivity of the gear used up to 2024, as was already noted in STECF EWG 24-12. Hence, the effort deployed during the 4 months of opening in summer within the area is enough to remove any benefit, in terms of juvenile survival, obtained from the 8 months closure.

The analysis showed how fishing effort was spatially affected by the closure, confirming early patterns revealed in STECF 23-01: During the closure month, effort is displaced at the boundaries of the closure, while during the summer opening, effort concentrates within the closure.

To further reduce hake juvenile mortality in the area, two management actions could be taken: either (1) closing permanently part of the area, or (2) improving significantly gear selectivity, for example by the use of 50mm square mesh in the codend, which is the only mesh size really preventing the catch of juvenile hake (See STECF 24-12).

A side-effect of the effort displacement is a moderate reduction of the coastal effort at all time periods. CPUE analysis illustrated a general increase in GSA 7, be it CPUE of particular important stocks (HKE, MUX, MNZ, OCT) or more generally, CPUE computed across all stocks (TOT). This general increase is mostly attributable to the fishing effort reduction carried out during the WESTMED MAP. However, our focus on the evolution of CPUE within and outside the closure area illustrated further increase in CPUE within the closure, which may be viewed as an additional positive effect of the closure in addition to the global fishing effort reductions of the WESTMED MAP.

Globally, this analysis also identified that in GSA 7, the effort reduction carried out during the WestMED management plan, legally expressed in terms of fishing day allocation, translated effectively into a 27% fishing effort reduction in terms of fishing hours over the five years of the plan (2020-2024). Even if further progress needs to be made to reduce juvenile hake fishing mortality, the analysis presented here clearly shows that both the spatio-temporal closure and the global fishing effort reduction contributed to improving exploitation status in GSA 7 for most stocks. However, this perception, mostly based on the CPUE analysis, needs to be further confirmed in the coming years through stock assessments.

7. (ToR 3) Progress in operational mixed-fisheries models

7.1. ISIS-Fish in EMU 1

7.1.1. Implementation progress in EWG 25-11

ISIS-Fish is a spatially explicit fishery dynamics simulation model (Mahévas et al. 2009). An ISIS- Fish application was first developed in the Gulf of Lion for EWG 21-13 and following groups (Leforestier et al. 2019). This application has been developed for the evaluation of the management measures in EMU1 on hake and fleets dynamics. Following EWG 22-01, it was agreed to expand it to EMU1. The EMU1 model was developed during 2022 and first used during EWG 23-11 to simulate the impact of several closures and maximum catch limits.

According to EWG 23-01 conclusions, a module was further developed to compute several economic indicators as outputs of ISIS-Fish simulations. The equations were borrowed from the IAM model and parameters estimated on both FDI (prices, value of non-modelled stocks) and AER data.

To improve the representation of fishing activity of French netters in GSA 7, a work was carried out in 2025 to segment vessels into fleets with homogeneous activity (see Annex).

The model for EWG 25-11 was conditioned with the 2024 FDI data.

For trawlers, VMS data were used to allocate the number of vessels within the different ports and the effort across the métier zones. The VMS data used to parameterize the activity of French trawlers cover the 2021–2023 period, whereas only 2019–2021 VMS data were used for Spanish trawlers. The French and Spanish VMS datasets up to 2024 became available too late for EWG 25-11, which prevented their inclusion within the time frame of that working group. As the effort patterns have changed for Spanish trawlers, the conditioning of the fishing activity for the Spanish fleets has been adjusted to align with the FDI data by target assemblages DWS, DEF, and MDD. As for EWG 24-12, only one strategy per fleet is considered.

For French netters, the data used to define fleets are based on re-evaluated SACROIS French database combined with activity calendars (see Annex) and cover the period 2021–2023. For 2024 onwards, FDI data provides information on effort and number of vessels by quarter, fishing technique, and vessel length class. These data were allocated to fleets, strategies, and métier zones using ratios calculated from the 2021–2023 averages.

The EMU1 ISIS-Fish model was calibrated on 2024 catches using a two-step Latin Hypercube Sampling (LHS) procedure: first, to reproduce age-specific catches of French OTB fleets, and second, to reproduce catches by gear and by country (see Annex).

7.1.2. Stocks and spatial distribution

The EMU1 ISIS-Fish model describes hake stock HKE_1567. The population dynamics model is like the assessment model with regard to population age structure and maturity assumption. It uses VBGF growth function from Mellon et al. (2008) and

length-weight relationship (STECF 21-11). Recruitment is forced to assessment results for the hindcasted period then equal to 2021-2023 average in projection. Hake enters the fishery at age 0, progressively along the year as defined in previous work (Q1: 16%, Q2: 42%, Q3: 33%, Q4: 9%) (Leforestier et al. 2019). Estimations of population spatial distribution over a 3' x 3' grid have been obtained at a monthly time step for the period 2018-2020 through a combination of commercial data and scientific survey data (EWG 22-01). The analysis was updated in 2023 to correct for an error in the data. Population zones have been defined for juveniles (<29cm or December age 1) and adults and the variability of the density was assessed and characterised. The method relied on clustering with continuity constraints of spatial cells applied simultaneously on all year x month maps. It resulted in a grouping of cells into clusters (per life stage) that share similar density and are close by. Clusters were relatively stable in time leading to the definition of populations zones (habitats) per life stage with constant boundaries, each cell belonged to the cluster to which it was the most frequently assigned by the clustering. The variations of fish biomass within each population zone were analysed to evidenced i) the share of population between French and Spanish coast, ii) the inter-annual variability of biomass per zone and iii) the seasonal variability of biomass per zone. No seasonality in distribution was evidenced and the average of the 2028-2020 period was used in projection. Calibration evidenced possible changes in the distribution of fish between the French and the Spanish coasts. MEDITS survey 2023 was therefore used to split the biomass among GSA 7 and GSAs 1,5, and 6.

The other stocks caught by the fleets are not explicitly modelled. To account for the effect of the management plan on the revenues generated by these species, values per unit of effort (VPUE) of the species other than hake were computed based on 2023 FDI data at the scale of the country, gear, GSA, vessel length and target assemblage (DEF/DWS). They were used to estimate the revenues associated to other species in the different scenarios accounting for changes in effort levels. It assumes that these species biomass and catchability remain constant during the time of the simulation. An implementation that uses VPUEs disaggregated in space is under development but requires fine scale data of effort and landings only available through VMS and logbooks.

7.1.3. Fishing fleets in ISIS-Fish

The EMU1 model comprises GSAs 1, 5, 6, and 7. It is spatially explicit and therefore the DCF FDI segmentation is further refined to consider home harbour and strategy (main métiers) of the vessel and to account for fishing zones (Table 7.1.1). Trawler fleets are defined by main gear, vessel length and home region (6 regions in France, 9 in Spain). Spanish netters and long-liners fleets are more roughly defined, by main gear and GSA and rather represent métiers than fleets. Indeed, they are parameterized by filtering FDI fleet segments HOK and DFN for respectively gear LLS and GNS and using the number of boats that practiced the métiers as number of boats in the fleet. It is equivalent to assume that the vessels that use GNS and LLS are not practicing other métiers. The economic results presented for these segments are therefore to be considered with caution. French netter fleets in GSA 7 are more finely parameterized, being defined by fishing technique, vessel length and maritime district (see Annex). According to this segmentation ISIS-Fish comprises 102 fleets in

total. Results are however reported at the scale of regulatory segments when possible, by country, main gear and length class otherwise.

For each trawler fleet, fishing zones for the main métiers (% of hake or red mullet above a threshold), have been identified and a core zone (where most of the effort concentrates) was distinguished from a secondary zone using clustering with continuity constraints. For netters and long-liners fleet, fishing zones were roughly defined along the coast of each GSA according to expert knowledge.

Two of the catchability coefficients, gear and fleet efficiency, were estimated outside the model by fitting a GLM model to CPUE computed on FDI data. Selectivity is approximated by a catch curve fitted on catch at length data per gear made available during EWG 22-11.

Table 7.1.1: List of fleets and fishing strategies considered in ISIS-Fish with the corresponding regulatory segment. « VL » stands for vessel length. Vessels are organised by home harbor indicated by a harbour code in the fleet names (ex. esTAR for Spanish fleets, frXST for French fleets).

country	length	segment	fleetISIS	Number of vessels in ISIS-Fish in 2024	Main métiers
ESP	VL0612	ESP_DEF_VL0612	esBAR_VL0612	15	DEF
			esLEI_VL0612		
			esRSA_VL0612		
			esTAR_VL0612		
			esVMG_VL0612		
	VL1218	ESP_DEF_VL1218	esBAR_VL1218	133	DEF MDD DWS
			esGAR_VL1218		
			esLEI_VL1218		
			esPMI_VL1218		
			esRSA_VL1218		
			esSCR_VL1218		
			esSPO_VL1218		
			esTAR_VL1218		
			esVMG_VL1218		
		ESP_DWS_VL1218	esBAR_VL1218		
			esGAR_VL1218		
			esPMI_VL1218		
			esRSA_VL1218		

			esSCR_VL1218		
			esVMG_VL1218		
	VL1824	ESP_DEF_VL1824	esBAR_VL1824	271	DEF MDD DWS
			esGAR_VL1824		
			esLEI_VL1824		
			esPMI_VL1824		
			esRSA_VL1824		
			esSCR_VL1824		
			esSPO_VL1824		
			esTAR_VL1824		
			esVMG_VL1824		
		ESP_DWS_VL1824	esBAR_VL1824		
			esGAR_VL1824		
			esLEI_VL1824		
			esPMI_VL1824		
			esRSA_VL1824		
			esSCR_VL1824		
			esSPO_VL1824		
			esTAR_VL1824		
			esVMG_VL1824		
	VL2440	ESP_DEF_VL2440	esBAR_VL2440	112	DEF MDD DWS
			esRSA_VL2440		
			esSCR_VL2440		
			esSPO_VL2440		
			esTAR_VL2440		
			esVMG_VL2440		
		ESP_DWS_VL2440	esBAR_VL2440		
			esGAR_VL2440		
			esLEI_VL2440		
			esPMI_VL2440		
			esRSA_VL2440		
			esSCR_VL2440		
			esSPO_VL2440		

			esTAR_VL2440		
	all	ESP_GNS_all	GNS_ESP_GSA1	79	FDI DFN filtered for net gears
			GNS_ESP_GSA5		
			GNS_ESP_GSA6		
	all	ESP_LLS_all	LLS_ESP_GSA1	43	FDI HOK filtered for gear != LLD
			LLS_ESP_GSA5		
			LLS_ESP_GSA6		
			LLS_ESP_GSA7		
FRA	VL1824	FRA_DEF_VL1824	frCMT_VL1824	20	OTB_MZZ OTB_OCT OTB_OTH OTT OTM
			frCST_VL1824		
			frGPV_VL1824		
			frGST_VL1824		
			frXMA_VL1824		
			frXST_VL1824		
	VL2440	FRA_DEF_VL2440	frCMT_VL2440	21	
			frCST_VL2440		
			frGPV_VL2440		
			frGST_VL2440		
			frXST_VL2440		
	VL0006	DFN_VL0006	DFN_0-6m_PV	119	Coastal nets Offshore nets Lagoon-sea nets
			DFN_0-6m_ST		
			DFN_0-6m_MT		
			DFN_0-6m_TL		
			DFN_0-6m_NI		
	VL0612	DFN_VL0612	DFN_6-12m_MA	386	
			DFN_6-12m_MT		
			DFN_6-12m_NI		
			DFN_6-12m_PV		
			DFN_6-12m_ST		
			DFN_6-12m_TL		
	VL1218	DFN_VL1218	DFN_12-18m_PV	2	
			DFN_12-18m_ST		
	VL0006	PGP_VL0006	PGP_0-6m_MT	17	

			PGP_0-6m_NI		
			PGP_0-6m_PV		
			PGP_0-6m_ST		
			PGP_0-6m_TL		
	VL0612	PGP_VL0612	PGP_6-12m_MA	62	
			PGP_6-12m_MT		
			PGP_6-12m_NI		
			PGP_6-12m_PV		
			PGP_6-12m_ST		
			PGP_6-12m_TL		
	VL1218	PGP_VL1218	PGP_12-18m_PV	1	
	VL0006	HOK_VL0006	HOK_0-6m_MA	19	
			HOK_0-6m_MT		
			HOK_0-6m_NI		
			HOK_0-6m_PV		
			HOK_0-6m_ST		
			HOK_0-6m_TL		
	VL0612	HOK_VL0612	HOK_6-12m_MA	72	
			HOK_6-12m_MT		
			HOK_6-12m_NI		
			HOK_6-12m_PV		
			HOK_6-12m_ST		
			HOK_6-12m_TL		
	VL1218	HOK_VL1218	HOK_12-18m_MT	11	
			HOK_12-18m_PV		
			HOK_12-18m_ST		
	VL0006	FPO_VL0006	FPO_0-6m_MT	67	
			FPO_0-6m_PV		
			FPO_0-6m_ST		
	VL0612	FPO_VL0612	FPO_6-12m_MA	88	
			FPO_6-12m_MT		
			FPO_6-12m_PV		
			FPO_6-12m_ST		

	VL1218	FPO_VL1218	FPO_12-18m_PV	1	

7.1.4. Economic indicators

Economic indicators were computed based on ISIS-Fish outputs: effort, landings of hake and landed values of other species. The equations were borrowed from the IAM model and recalled in EWG 23-01 report. The parameters are differentiated by fleet segments. Most were estimated from 2023 AER data at the scale of the country, length, fishing technic and main gear. Values in projection are assumed equal to 2025 values, and projections used for fuel price.

Hake prices at age for the French trawlers are derived from national data (SACROIS, SIH, 2022) by converting prices per commercial categories into prices at age using an age-commercial category key. Hake prices for the other fleets are not differentiated by age and were computed using FDI data, for 2024 at the scale of the country, sub_region, vessel length, fishing tech, and gear type. Since only hake is explicitly modelled in ISIS-Fish, revenues from other species needed to be approximated as a function of effort by fleet and value per unit of effort computed on FDI data for 2024.

7.1.5. Sources of data

The EMU1-ISIS-Fish model used for EWG 25-11 is conditioned based on a diversity of data sources:

- The 2025 FDI data provided total fishing effort (in fishing days) and the number of vessels per fleet segment, as well as VPUE for non-explicitly modelled species and prices of hake;
- Logbook and VMS data informed the spatial spread of trawler fishing effort among ISIS fleets (FDI cluster x home harbour) and métier zones, using 2023 VMS-logbook data for the French fleet and the 2021 for Spanish trawlers during EWG 24-12.
- The 2025 AER data informed economic indicators per vessel or unit of effort per fleet segments.

7.1.6. Management scenarios considered in ISIS-Fish

All runs reproduce the measures implemented since 2020 as part of the West Med map and maintain them over the simulation period: Spatial closures implemented in the Gulf of Lion since 2020 and on the Spanish coast since 2022 were carefully implemented accounting for their seasonal extent (France : FRA, box and permanent closures; Spain : temporary and permanent closures since 2022, 4 weeks closures since 2023 and fishing ban beyond 800m depth in 2024). For all closures, it is assumed that, if a métier zone overlaps the closed area, the effort is displaced towards the same métier zone which remains open. If it is fully covered the effort is reallocated to the métiers still allowed in proportion of the effort already allocated.

2025 measures were reproduced as closely as possible. Selectivity measures were simulated by applying conversion factors at length between the 40mm selectivity curve and the 45mm and 50mm curves to the selectivity curves used in ISIS-Fish for OTB gears. The partial implementation of the selectivity measures among French vessels was dealt with by creating average selectivity curves weighted by the number of vessels implementing each type of mesh within each fleet. Some vessels also quitted OTT which was simulated by reallocating their effort on the OTT métiers toward their remaining métiers in proportion of the effort already allocated. French vessels also implemented temporal closures at different time of the year. Activity patterns of fleets were modified to reduce activity in a given month in proportion of the number of vessels that stopped fishing. The new pattern was then scaled up uniformly along the year, so the total number of fishing days stays the same, assuming effort reallocation before and after the stops. Finally, since 2025, French vessels implemented a new spatial closure between 100m and 500m depth at two periods in the year that was reproduced with the same assumption of effort reallocation than for other closures.

Maximum catch limits of hake were implemented for netters from 2025 on. In ISIS-Fish, we assumed a collective quota and no change in the behavior of the fleets to anticipate quota consumption. Catch accumulate along the year and fishery chokes when hake quota is exhausted.

Six scenarios were considered for ISIS-Fish runs: status quo (SQ) and status quo 2024 (SQ2024), impose the effort level of the 2024 regulation from 2025 on, but respectively assume roll over of the selectivity conditions of 2025 and 2024. Their comparison informed on the effect of the selectivity measures adopted by fleets in 2025. A1 is similar to SQ with a cut in effort (due to a reduction of 50% of compensation). Scenario B is similar to SQ, but selectivity measures (and OTT ban) implemented in 2025 are canceled in 2027. On the contrary, in scenario C1, selectivity measures and OTT ban apply to the full French fleets from 2026 on. Scenario D evaluates the effect of adding a closure beyond 600m depth.

Modeling limitations need to be highlighted regarding the way scenarios were implemented. The model only simulates hake catches dynamically. Therefore, selectivity measures have no impact on revenues generated by other species nor on their population dynamics. It is worth noting that because ISIS-Fish uses a spatial square grid (resolution 0.05° or 3’), the shape of the closures is a little modified from reality. In addition, some areas smaller than half of a cell were not modelled.

Similarly, ISIS-Fish has a monthly resolution, while some closures apply for only part of a month. To account for temporal closures of more than 15 days, the full month was closed, when less than 15 days were closed, the full month was opened to fishing. Fuel costs are computed based on total effort of the vessels and are independent from effort spatial distribution (particularly distance from home harbour). Effort is forced by fleet, GSA and métier to the effort reported in FDI each year. It is further split spatially according to VMS-logbook data, but due to the late provision of data, 2021 spatial pattern was used for Spanish vessels and 2023 for French fleets.

The model is calibrated to fit catches at age per gear and country. Accessibility at age (a component of catchability) and gear standardization factors are tuned to reproduce observed catches (available in stock object and FDI data). Because of the calibration procedure and model complexity, the catches and the fishing mortality modelled in 2024 do not perfectly match the estimations. Therefore, the F values used in ISIS-Fish are scaled to compensate for the difference between assessed and modelled F values in 2024, so the effort reduction needed to reach Fmsy is in line with true values.

Simulations start in 2024 and stop in December 2030.

7.2. IAM in EMU 1

7.2.1. Recall on the main issues and conclusions from EWG 24-12

In EMU1, the implementation of the IAM model for GSAs 1-2-5-6-7 carried out during the STECF meeting is still in development. Since EWG 24-12, the inclusion of minimum wage rates by country has been implemented to enable more accurate salary estimations.

As pointed out in EWG 24-01 and EWG 24-12, further improvements to the IAM model would involve disaggregating the Spanish fleets at GSA level rather than EMU1 level only. This would ensure consistency with the BEMTOOL application in EMU2 and allow for more accurate reductions in fishing effort based on the specific status of each stock in each area. This would improve management of fishing pressure on stocks and better account for differences in fleet exploitation and cost structures between GSAs. However, this requires economic data at the GSA fleet segment level. Currently, the AER database only provides economic data at the 'MED' level, not at the GSA level.

7.2.2. Implementation progress in EWG 25-11

IAM (Impact Assessment Model), a bioeconomic mixed fishery simulation model, has been implemented in EMU1, building on the experiences from previous working groups (EWG 19-14, EWG 20-13, EWG 21-13, EWG 22-01, EWG 22-11, EWG 23-11, and EWG 24-12). The IAM model is fully documented and available online at: https://ifremer-iam.github.io/IAM/.

For the French and Spanish updates, the data sources used include FDI data, Annual Economic Report (AER) data, outputs from the EWG 25-09 groups on Mediterranean stock assessments, and French prices by commercial categories from Ifremer's Fishery Information System (SIH).

Spanish economic data at the GSA level was unavailable for the working group meeting. Furthermore, it was not possible to segment the Spanish fleets at the GSA level using only FDI data, which made it impossible to disaggregate them during the EWG 25-11 group.

7.2.3. Stocks in the IAM model

The stocks taken into consideration in IAM-Med simulations are those for which analytic stock assessment results from EWG 25-09 were available. These stocks are referred to as **'dynamic species/stocks'** and are as follows

- HKE1567: Hake (*Merluccius merluccius*) in GSAs 1-5-6-7,
- MUT1: Red mullet *(Mullus barbatus*) in GSA 1,
- MUT6: Red mullet (*Mullus barbatus*) in GSA 6,
- MUT7: Red mullet (*Mullus barbatus*) in GSA 7, (no advice)
- NEP6: Norway Lobster (*Nephrops norvegicus*) in GSA 6,
- ARA12: Blue and red shrimp (*Aristeus antennatus*) in GSAs 1-2,
- ARA67: Blue and red shrimp (*Aristeus antennatus*) in GSAs 6-7,
- DPS1: Deep-water rose shrimp (*Parapenaeus longirostris*) in GSA 1, (no advice)
- DPS567: Deep-water rose shrimp (*Parapenaeus longirostris*) in GSAs 5-6-7, (no advice)
- MUR5: Stripped red mullet (*Mullus surmuletus*) in GSA 5 (not in the MAP).

Since the dynamics of stripped red mullet in GSA 5 (MUR5), deep-water rose shrimp in GSA 1, deep-water rose shrimp in GSAs 5-6-7 and of red mullet in GSA 7 were provided by the stock assessment group EWG 25-09, these stocks are dynamically represented in the IAM model. These stocks either have no advice (e.g., MUT7, DPS1 and DPS567) or are not part of the management plan (e.g., MUR5). Therefore, the biological indicators related to them are not displayed here. Their dynamics are integrated into the IAM model to provide better revenue estimates from the landings of these stocks.

The simulations conducted within the IAM model run from 2024 to 2030. For the year 2024, recruitment values from the stock assessment group EWG 25-09 are used. From 2025 to 2030, stochastic recruitment is considered for the dynamic stocks, following the approach used in EWG 21-13, EWG 22-01, EWG 22-11, EWG 23-11, and EWG 24-12. To generate a random sequence of recruitments for the 2025-2030 projection period, seven years were randomly selected with replacement from the historical period ensuring the availability of recruitment data for all considered stocks (2009-2024). Each draw determines the annual recruitment combinations for each stock in the projection period. A total of 250 trajectories were simulated to build confidence intervals, with the same set of recruitment values applied across all assessed management scenarios. Additionally, a single trajectory assuming constant recruitment, equal to the geometric mean of the last three historical years, was run in line with the ISIS-Fish model approach.

Furthermore, catches of the following stocks included in the management plan are simulated in the IAM model, though their dynamics are not explicitly modelled due to the lack of analytical or accepted stock assessments. These species are referred to as **'static species/stocks'** and their catches are simulated as a linear function of fishing effort, assuming constant Landings Per Unit of Effort (LPUE). The LPUE values are based on 2023 FDI data. The static species include:

- Red mullet (*Mullus barbatus*) in GSA 5,
- Norway lobster (*Nephrops norvegicus*) in GSAs 1, 5 and 7.
- ARA5: Blue and red shrimp (*Aristeus antennatus*) in GSA 5

Other static species included in the model, but not part of the management plan, are: stripped red mullet (MUR), anchovy (ANE), sardine (PIL), Atlantic mackerel (MAC), monkfish (MNZ), Atlantic bluefin tuna (BFT), common octopus (OCC), octopuses (OCT), *Eledone sp.* (OCM) (regrouping *Eledone cirrhosa* (EOI), *Eledone moschata* (EDT) and *Eledone sp.* (OCM)), gilt-head bream (SBG) and 'ZZZ,' which represents all other remaining species caught by each fleet.

Table 7.2.1 Summary of the stocks in the Western Mediterranean management plan and how they are integrated in the IAM model in EWG 25-11.

Stocks in management plan	Dynamic or static in IAM	Comment
blue and red shrimp (*Aristeus antennatus*) in GFCM subareas 1, 2, 5, 6 and 7	Dynamic: stocks ARA12 (GSAs 1-2), and ARA67 (GSAs 6-7) Static: stock ARA 5 (GSA 5)	Compared to last year, the stock ARA5 is static (as no population dynamics was available from the stock assessments EWG25-09 for ARA5), while it was dynamic last year.
deep-water rose shrimp (*Parapenaeus longirostris*) in GFCM subareas 1, 5, 6 and 7	Dynamic: stocks DPS1 (GSA1), DPS567 (GSAs 5-6-7)	Change from last year: in stock assessments EWG 25-09, no advices were provided for DPS1 and DPS567. These stocks are therefore modelled in IAM, but do not appear in the result section.
European hake (*Merluccius merluccius*) in GFCM subareas 1-5-6-7	Dynamic: stock HKE1567 (GSAs 1-5-6-7)	
Norway lobster (*Nephrops*	Dynamic: stocks NEP6 (GSA6)	No population dynamics available from the stock

Stocks in management plan	Dynamic or static in IAM	Comment
norvegicus) in GFCM subareas 5 and 6	Static: stocks NEP1 (GSA1), NEP5 (GSA 5), and NEP7 (GSA7)	assessments for NEP1, NEP5 and NEP7.
red mullet (*Mullus barbatus*) in GFCM subareas 1, 5, 6 and 7	Dynamic: stocks MUT 1 (GSA 1), MUT 6 (GSA 6), and MUT 7 (GSA 7) Static: stock MUT 5 (GSA 5)	Stock assessment are not available for *Mullus barbatus* in GSA 5. Change from last year: in stock assessments EWG 25-09, no advices were provided for MUT7. This stock is therefore modelled in IAM, but does not appear in the result section.

7.2.4. Fishing fleets in the IAM model

The fleet typology used is based on the fleet segmentation of the Data Collection Framework (DCF), where a fleet segment represents a combination of a specific fishing technique and vessel length category. The Spanish and French fleet segments in EWG 25-11 are consistent with those used in the previous implementation in EWG 24-12, with the exception of four new fleet segments using set nets that were added: French vessels using polyvalent passive gears only (PGP) <6m and 6-12m and Spanish vessels using active and passive gears (PMP) <6m and 6-12m.

For the French fleet, seven segments are explicitly modeled: French demersal trawlers 18-24m, French demersal trawlers ≥24m, French netters <6m, French netters 6-12m, French vessels using polyvalent passive gears only <6m, French vessels using polyvalent passive gears only 6-12m, and French vessels using hooks 6-12m.

For the Spanish fleet, nine segments are considered: Spanish trawlers <12m, Spanish trawlers 12-18m, Spanish trawlers 18-24m, Spanish trawlers >24m, Spanish netters 6-12m, Spanish netters 12-18m, Spanish vessels using polyvalent passive gears <6m, Spanish vessels using polyvalent passive gears 6-12m, and Spanish vessels using hooks 6-12m.

Fishing efforts within IAM fleet segments are categorized by gear type (see Table 7.2.2 for details), in EWG 25-11, we added the gear type GNC (encircling gillnets) for netters and vessels using polyvalent passive and active gear. We also aggregated the gear types GNS (set gillnets) and GTR (Trammel net) to produce the gear type G as the regulation applies equally to both and they are not consistently distinguished in the declarations.

As in EWG 22-01, EWG 22-11, EWG 23-11 and EWG 24-12, the IAM model has been adjusted to distinguish coastal and deep-sea trawling. This applies to the three

Spanish fleet segments: Spanish trawlers 12-18m, Spanish trawlers 18-24m, and Spanish trawlers >24m. We are using the variable “Target-assemblage” to parametrize the model accordingly. For EWG 22-01, EWG 22-11, EWG 23-11 and EWG 24-12, we considered the entry “Target-assemblage=DWS” as deep-sea trawling and the other Target-assemblage as coastal trawling. As for EWG 25-11 we now consider “Target-assemblage=DWS & Target-assemblage=MDD” as deep-trawling and the rest as coastal trawling. The fishing effort is divided between DWS, MDD and coastal trawling.

Table 7.2.2. Modelled fleets in the IAM application in EMU1 and correspondence with FDI and AER fleets. DFN stands for Drift and/or fixed netters, DTS for Demersal trawlers and/or demersal seiners, HOK for Vessels using hooks, PMP for vessels using active and passive gears and PGP for vessels using polyvalent passive gears and DWS for deep water species, MDD for Mixed Deep-water species and Demersal. For the gear types OTB stands for Bottom otter trawl, OTT for Multi-rig otter trawl, OTM for Midwater otter trawl, GNS for Set gillnet, GTN for Combined gillnets-trammel nets, GTR for Trammel net, GNC for encircling gillnet, LLS for Set longlines and LLD for Drifting longlines.

**For each fleet, gears are listed by order of importance in terms of fishing days in 2024 (source: FDI)*

IAM Fleet segment names	Names in the report figures	Fleet segments in AER	Fishing techniques in FDI sub_region= GSA1, GSA2, GSA5 , GSA6 and GSA7	“Metier” or gear explicitly modelled *(if there is not a category « other », it means that no other gears than the one listed are used by the fleet)**
French demersal trawlers 18-24m	FR_DTS 1824m	fs_name => FRA MBS DTS1824 NGI* cluster_name=> MBS DTS VL1824	country_code =FRA fishing tech = DTS vessel_length = VL1824	OTB, OTT, OTM
French demersal trawlers 24-40m	FR_DTS >=24m	fs_name => FRA MBS DTS2440 NGI* cluster_name=> MBS DTS VL2440	country_code =FRA fishing tech = DTS vessel_length = VL2440	OTT, OTB, OTM, other

IAM Fleet segment names	Names in the report figures	Fleet segments in AER	Fishing techniques in FDI sub_region= GSA1, GSA2, GSA5 , GSA6 and GSA7	"Metier" or gear explicitly modelled *(if there is not a category « other », it means that no other gears than the one listed are used by the fleet)**
French netters <06m	FR_DFN < 6m	fs_name => FRA MBS DFN0006 NGI	country_code =FRA fishing tech = DFN vessel_length = VL0006	G (=GNS+GTR), GNC, other, GTN, LLS, LLD
French netters 06-12m	FR_DFN 0612m	fs_name => FRA MBS DFN0612 NGI	country_code =FRA fishing tech = DFN vessel_length = VL0612	G (=GNS+GTR), GNC, other, GTN, LLS, LLD
French vessels using hooks 06-12m	FR_HOK 0612m	fs_name => FRA MBS HOK0612 NGI	country_code =FRA fishing tech = HOK vessel_length = VL0612	LLS, LLD, other G (= GNS+GTR), GTN
French vessels using polyvalent passive gears only <06m	FR_PGP<6 m	fs_name => FRA MBS PGP00 06 NGI	country_code =FRA fishing tech = PGP vessel_length = VL0006	G(= GNS+GTR), other, LLS, GNC, GTN
French vessels using polyvalent passive	FR_PGP 0612m	fs_name => FRA MBS PGP06 12 NGI	country_code =FRA fishing tech = PGP vessel_length = VL0612	G(= GNS+GTR), other, GNC, LLD,LLS, GTN

IAM Fleet segment names	Names in the report figures	Fleet segments in AER	Fishing techniques in FDI sub_region= GSA1, GSA2, GSA5 , GSA6 and GSA7	"Metier" or gear explicitly modelled *(if there is not a category « other », it means that no other gears than the one listed are used by the fleet)**
gears only 06-12m				
Spanish trawlers < 12m	SP_DTS < 12m	fs_name => ESP MBS DTS0612 NGI	country_code =ESP fishing tech = DTS vessel_length = VL0006, and VL0612 target_assemblage ≠ DWS, MDD	OTB_other
			country_code =ESP fishing tech = DTS vessel_length = VL0006, and VL0612	other
Spanish trawlers 12-18m	SP_DTS 1218m	fs_name => ESP MBS DTS1218 NGI	fishing tech = DTS vessel_length = VL1218 target_assemblage ≠ DWS, MDD	OTB_other
			country_code =ESP fishing tech = DTS vessel_length = VL1218	OTB_DWS

IAM Fleet segment names	Names in the report figures	Fleet segments in AER	Fishing techniques in FDI sub_region= GSA1, GSA2, GSA5 , GSA6 and GSA7	"Metier" or gear explicitly modelled *(if there is not a category « other », it means that no other gears than the one listed are used by the fleet)**
			target_assemblage = DWS	
			country_code =ESP fishing tech = DTS vessel_length = VL1218 target_assemblage = MDD	OTB_MDD
			country_code =ESP fishing tech = DTS vessel_length = VL1218	other
Spanish trawlers 18-24m	SP_DTS 1824m	fs_name => ESP MBS DTS1824 NGI	fishing tech = DTS vessel_length = VL1824 target_assemblage ≠ DWS, MDD	OTB_other
			country_code =ESP fishing tech = DTS vessel_length = VL1824 target_assemblage = DWS	OTB_DWS
			country_code =ESP	OTB_MDD

IAM Fleet segment names	Names in the report figures	Fleet segments in AER	Fishing techniques in FDI sub_region= GSA1, GSA2, GSA5 , GSA6 and GSA7	"Metier" or gear explicitly modelled *(if there is not a category « other », it means that no other gears than the one listed are used by the fleet)**
			fishing tech = DTS vessel_length = VL1824 target_assemblage = MDD	
Spanish trawlers >=24m	SP_DTS >=24m	fs_name => ESP MBS DTS2440 NGI	fishing tech = DTS vessel_length = VL2440 target_assemblage ≠ DWS, MDD	OTB_other
			country_code =ESP fishing tech = DTS vessel_length = VL2440 target_assemblage = DWS	OTB_DWS
			country_code =ESP fishing tech = DTS vessel_length = VL2440 target_assemblage = MDD	OTB_MDD
			country_code =ESP fishing tech = DTS vessel_length = VL2440	Other

IAM Fleet segment names	Names in the report figures	Fleet segments in AER	Fishing techniques in FDI sub_region= GSA1, GSA2, GSA5 , GSA6 and GSA7	"Metier" or gear explicitly modelled *(if there is not a category « other », it means that no other gears than the one listed are used by the fleet)**
Spanish netters 06-12m	SP_DFN 0612m	fs_name => ESP MBS DFN0612 NGI	country_code =ESP fishing tech = DFN vessel_length = VL0612	G (=GNS+GTR), other, GTN, LLS
Spanish netters 12-18m	SP_DFN 1218m	fs_name => ESP MBS DFN1218 NGI	country_code =ESP fishing tech = DFN vessel_length = VL1218	G (=GNS+GTR), other, GTN, LLS
Spanish vessels using hooks 06-12m	SP_HOK 0612m	fs_name => ESP MBS HOK0612 NGI * cluster_name=> MBSHOKVL0612 NGI	country_code =ESP fishing tech = HOK vessel_length = VL0612	Other, LLS, G (= GNS+GTR), LLD
Spanish vessels using active and passive gears <6m	SP_PMP <6m	fs_name => ESP MBS PMP0006 NGI	country_code =ESP fishing tech = PMP vessel_length = VL0006	G(= GNS+GTR), other, GTN, LLS
Spanish vessels using active and passive	SP_PMP 0612m	fs_name => ESP MBS PMP0612 NGI	country_code =ESP fishing tech = PMP vessel_length = VL0612	G (= GNS+GTR), other, LLS, GTN, LLD

IAM Fleet segment names	Names in the report figures	Fleet segments in AER	Fishing techniques in FDI sub_region= GSA1, GSA2, GSA5 , GSA6 and GSA7	"Metier" or gear explicitly modelled *(if there is not a category « other », it means that no other gears than the one listed are used by the fleet)**
gears 06-12m				

Based on this segmentation, FDI data (Table A) were used to compare landings by gear by each IAM fleet segment, based on 2024 landings in weight (see Figure 7.2.1). The fishing gear classification follows the FAO classification, that can be consulted here: https://www.fao.org/cwp-on-fishery-statistics/handbook/capture-fisheries-statistics/fishing-gear-classification/en/. Figure 7.2.2 presents the proportion of the species of the plan per IAM fleet segment, in terms of landings in value. This provides insight into the economic dependence of each fleet segment on the species of the plan in 2024.

Figure 7.2.1. Landings (in tonnes) by gear (2024 landings issued from each gear, source: FDI) among current IAM fleet segments (in row). DTS stands for demersal trawlers and/or demersal seiners, DFN for drift and/or fixed netters, and HOK for vessels using hooks. For the gear types, DRB stands for boat dredge, FPO for pots and traps, FYK for fyke nets, GNC for Encircling gillnets, GNS for Set gillnet, GTN for Combined gillnets-trammel nets, GTR for Trammel net, LA for Lampara nets, LHP for Hand and Pole lines, LLD for Drifting longlines, LLS for Set longlines, OTB for Bottom otter trawl, OTT for Multi-rig otter trawl, OTM for Midwater otter trawl, PS for Purse seine, SV for Beach and boat seine, and NK and NO for unknown gear. Roughly, pink to purple colours corresponds to dredges and traps (DRB – FPO – FYK), darkblue to turquoise corresponds to various gillnets (GNC – GNS - GTN – GTR), green to yellow corresponds to longlines (LA -LHP – LLD – LLS), orange to light red corresponds to trawls (OTB– OTT– OTM), and red corresponds to seines (PS – SV).

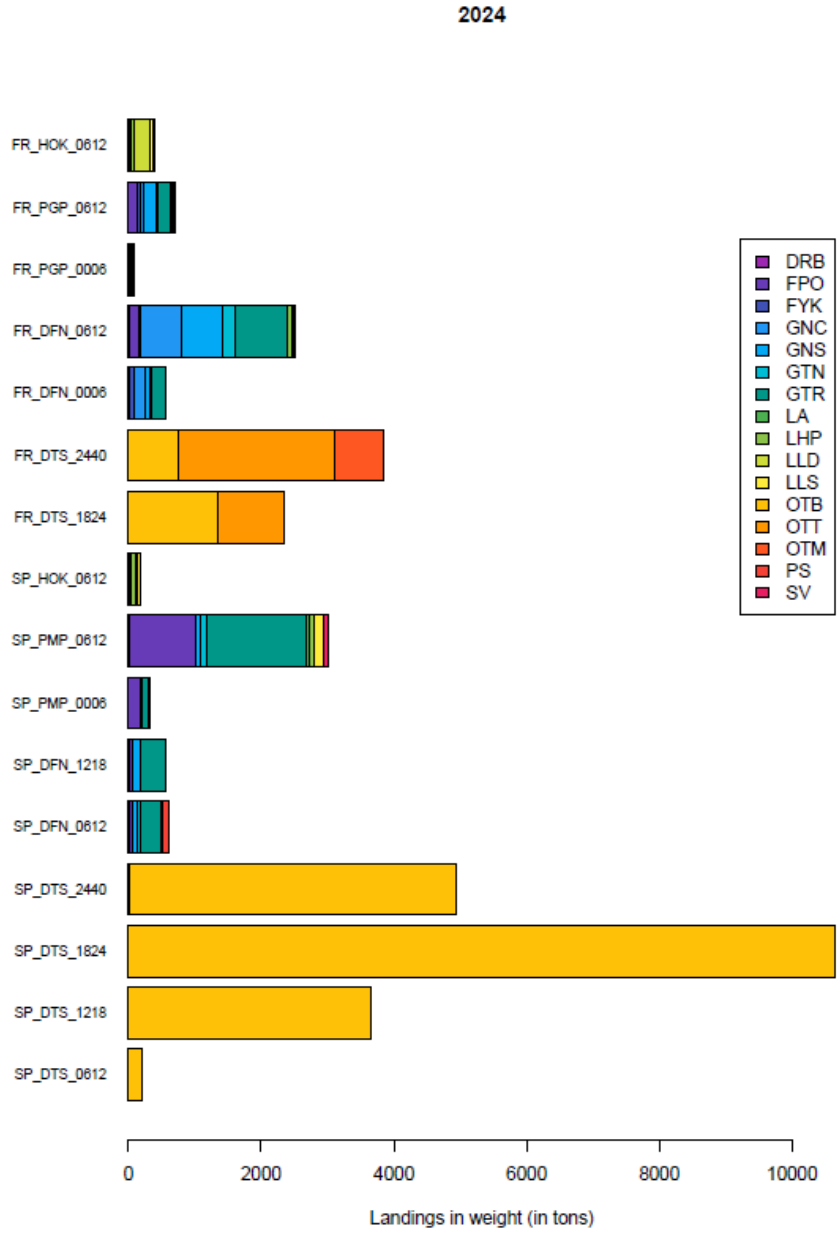


Figure 7.2.2. Proportion of species of the plan landed (landings in value) by IAM fleet segments (in row) based on 2024 FDI data. The “OUT” segment cumulates all fleet segments left out. DTS stands for demersal trawlers and/or demersal seiners, DFN for drift and/or fixed netters, and HOK for vessels using hooks, FR for French vessels, and SP for Spanish vessels. Coloured space represents species targeted by the westmed management plan (ARA: *Aristeus antennatus*, DPS: *Parapeneus longirostris*, HKE: *Merluccius merluccius*, MUT: *Mullus barbatus*, NEP: *Nephrops norvegicus*), and grey areas (OTH) represents all other species cumulated.

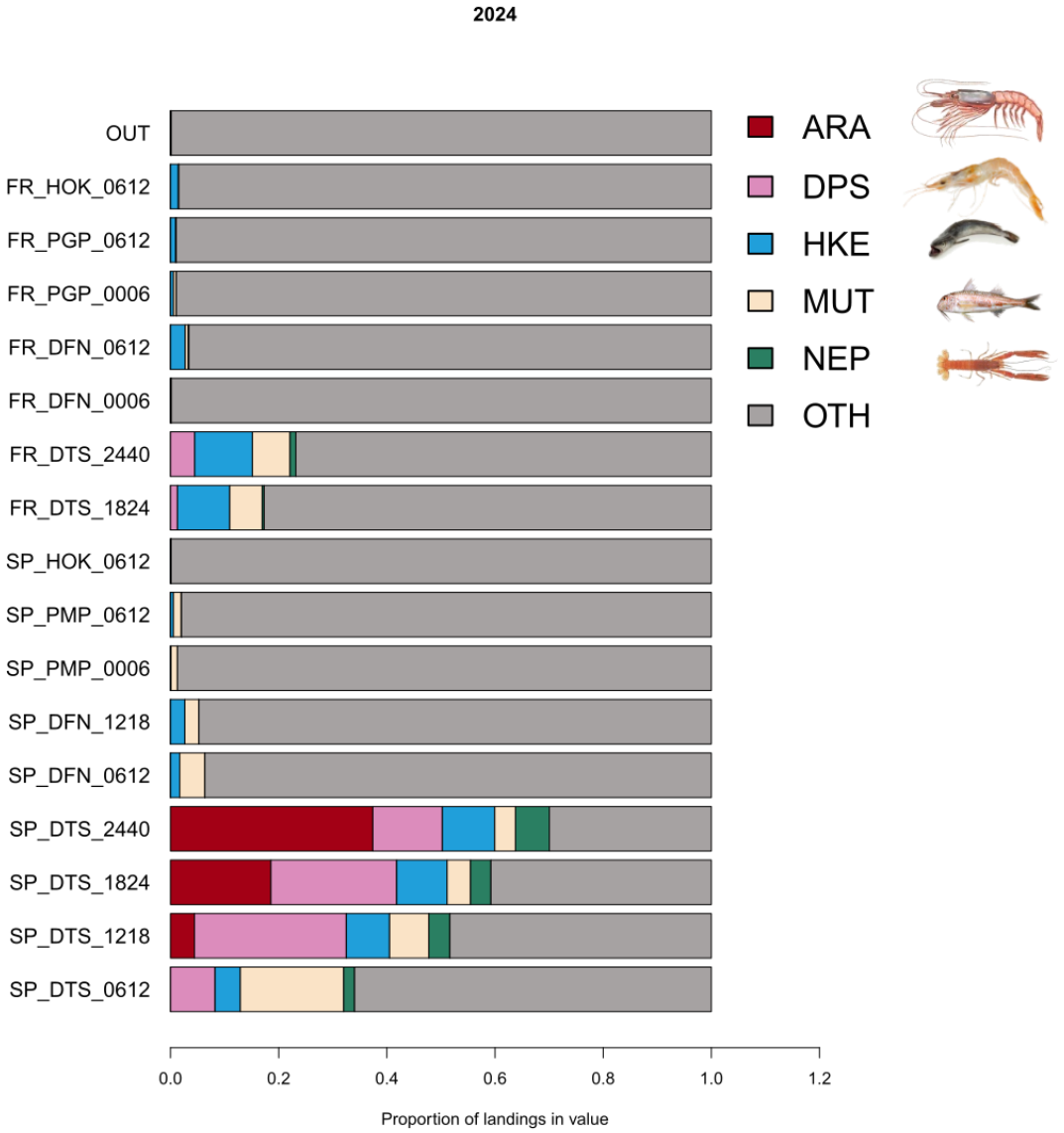
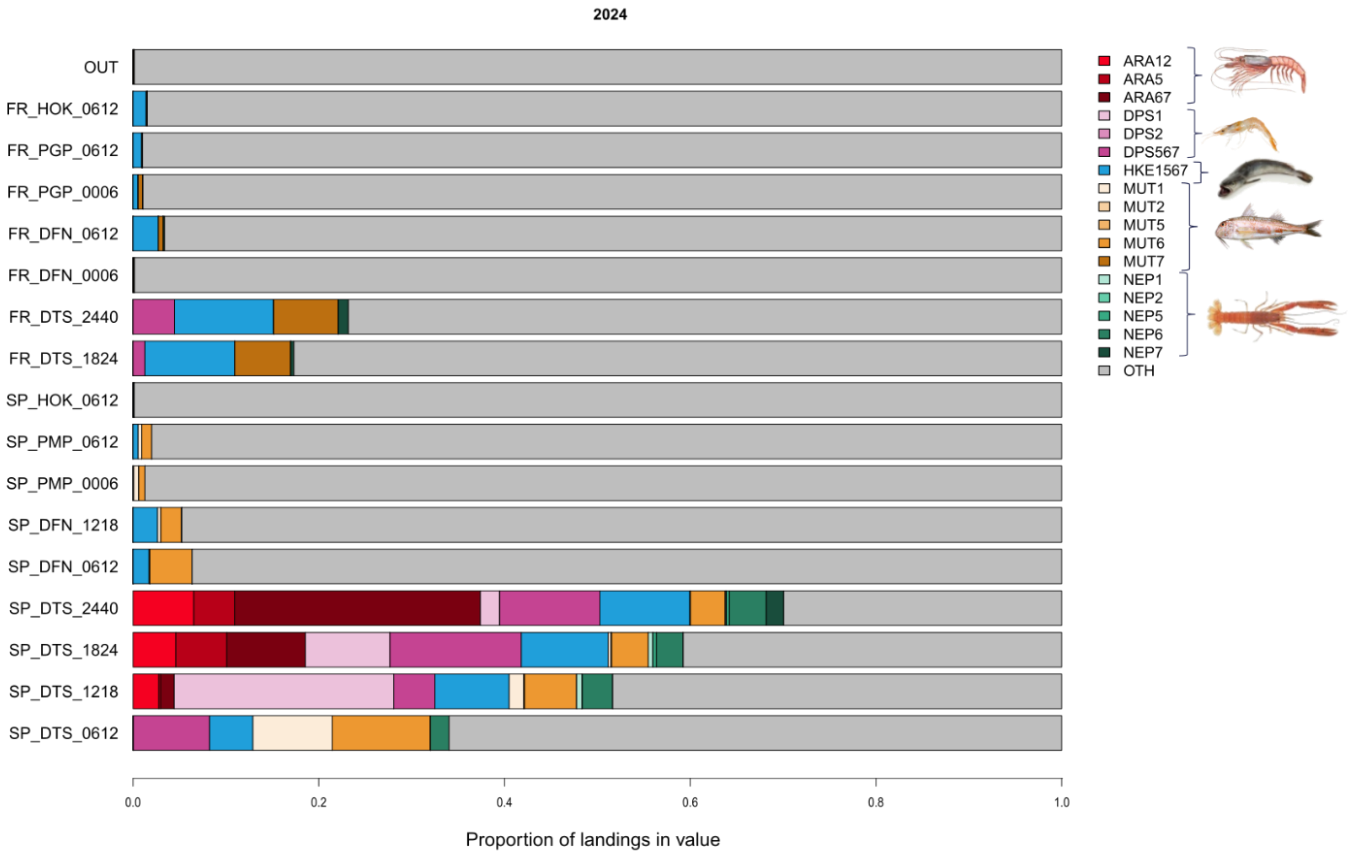


Figure 7.2.3 Proportion of stocks of the plan landed (landings in value) by IAM fleet segments (in row) based on 2024 FDI data. The “OUT” segment cumulates all fleet segments left out. DTS stands for demersal trawlers and/or demersal seiners, DFN for drift and/or fixed netters, and HOK for vessels using hooks, FR for French vessels, and SP for Spanish vessels. Coloured space represents stocks targeted by the westmed management plan (ARA: Aristeus antennatus, DPS: Parapeneus longirostris, HKE: Merluccius merluccius, MUT: Mullus barbatus, NEP: Nephrops norvegicus), and grey areas (OTH) represents all other species cumulated. The numbers next to the species name represent the GSA in which the stocks are represented.



While Figure 7.2.2 compares the economic dependencies of the various fleet segments on these species and Figure 7.2.3 on the stocks, Figure 7.2.4 highlights the contributions of the different fleet segments to the fishing mortality of the five species of the plan. Specifically, Figure 7.2.4 shows the proportion of landings (in weight) of the species of the plan by fleet segments, based on 2024 FDI data."

Figure 7.2.4 Proportion of landings (in weight) of the species of the plan by **IAM fleet segments** (in row) based on 2024 FDI data. The species targeted by the westmed management plan are in row: ARA: *Aristeus antennatus*, DPS: *Parapeneus longirostris*, HKE: *Merluccius merluccius*, MUT: *Mullus barbatus*, NEP: *Nephrops norvegicus*. Coloured space represents fleet segments. The “OUT” segment cumulates all fleet segments left out. DTS stands for demersal trawlers and/or demersal seiners, DFN for drift and/or fixed netters, and HOK for vessels using hooks, FR for French vessels, and SP for Spanish vessels.

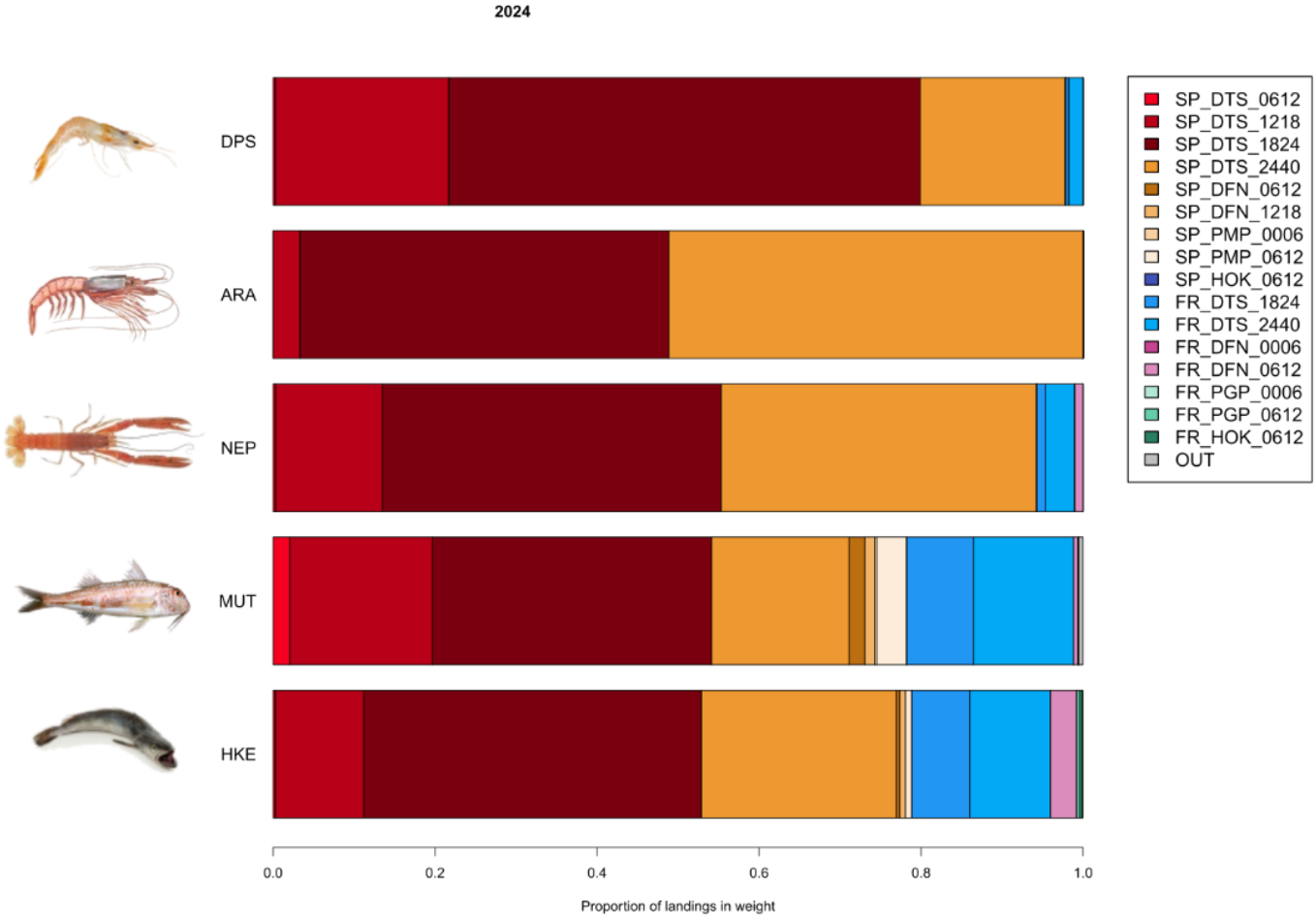


Figure 7.2.5. Landings (in tonnes) of the different stocks of the MAP by DTS fleet-metier based on 2024 FDI data**.** The figure distinguishes between deep-water trawling, targeting Deep Water Species (DWS) and Mixed Deep-water species and Demersal (MDD), and coastal trawling (OTH).

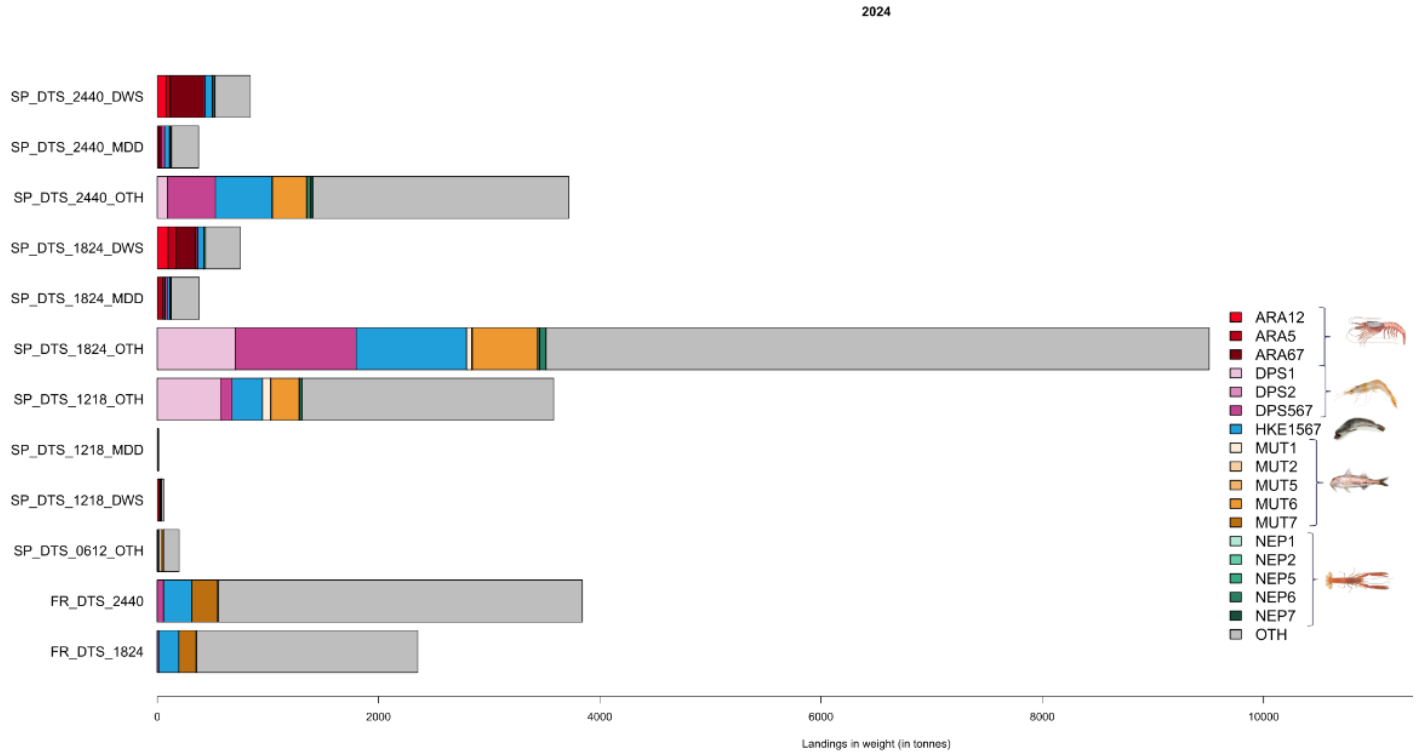
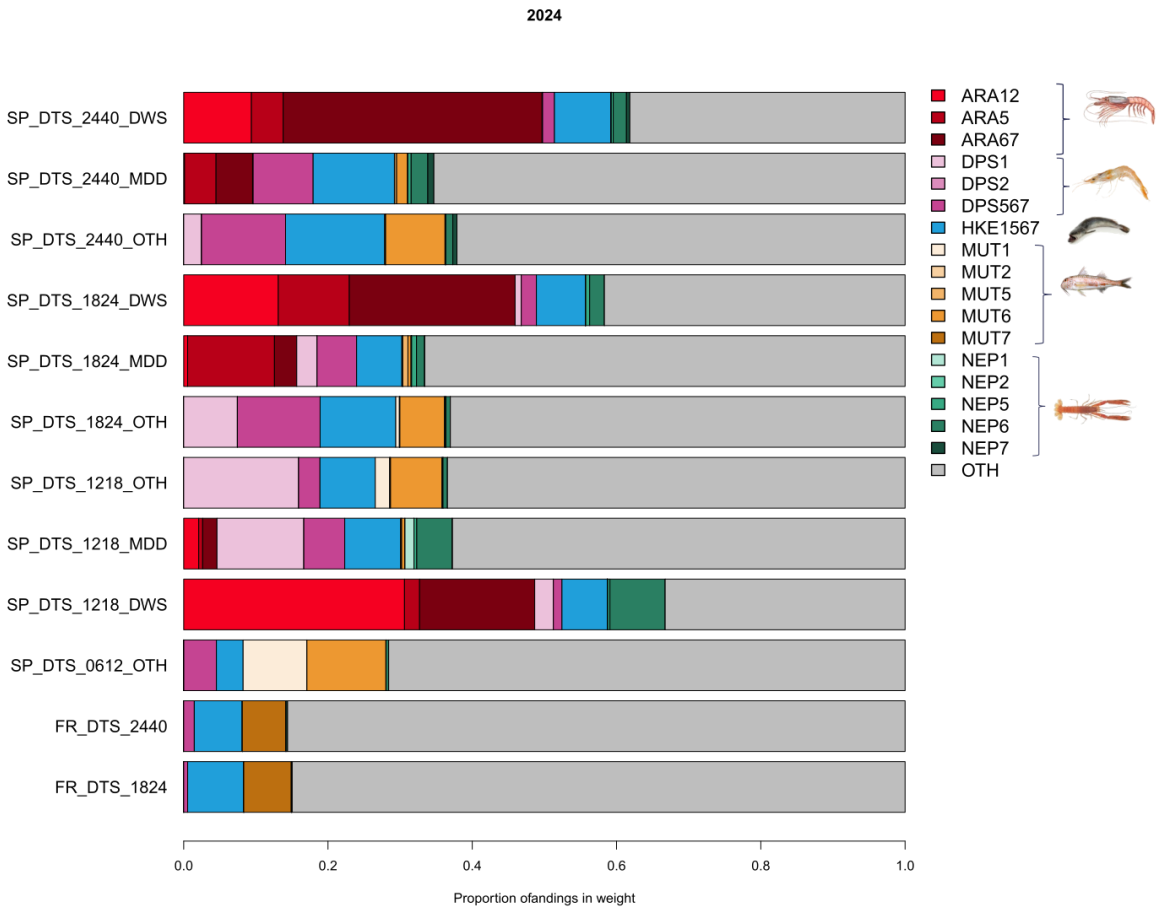


Figure 7.2.6. Proportion of landings (in weight) of the different stocks of the MAP by DTS fleet-metier based on 2024 FDI data**.** The figure distinguishes between deep-water trawling, targeting Deep Water Species (DWS) and Mixed Deep-water species and Demersal (MDD), and coastal trawling (OTH).



7.2.5. Economic indicators in IAM

Economic indicators are produced for the French and Spanish fleets, using the most recent AER data available (from 2023) to parameterize the model. The indicators produced include revenue per fleet (gross value of landings, GVL), gross value added (GVA) per fleet and per vessel, gross profit per fleet and per vessel, Full-Time Equivalent (FTE) per fleet and per vessel, and gross profit margin.

The gross value of landings (GVL) is calculated by multiplying estimated landings by market prices. Since landings are influenced by the biomass of the modeled stocks, any changes in stock biomass will impact landings and, consequently, fleet revenues. It is important to highlight that in this version of the IAM model, landings of "static" species are based on LPUEs, which are assumed to remain constant throughout the simulation. This assumption means that revenue from species not explicitly modeled in IAM is entirely dependent on fishing effort. Therefore, if fishing effort decreases, income from these species will decrease proportionally. The model does not account for a potential positive impact of reduced fishing effort on non-modeled species. As a

result, in scenarios where fishing effort is reduced and non-modeled stocks increase, the GVL may be underestimated.

Catches and landings are calculated as in equations (6.1.5.1) and (6.1.5.2):

$$C_{s,a,f,t} = \frac{F_{s,a,f,t}}{Z_{s,a,t}} * N_{s,a,t} * (1 - e^{-Z_{s,a,t}}) \quad (6.1.5.1)$$

with $Z_{s,a,t} = M_{s,a} + \sum_{f} F_{s,a,f,t}$

$C_{s,a,f,t}$ stands for the catches in abundance at time *t* of stock *s* at age *a* by fleet *f*; $N_{s,a,t}$ is the abundance of stock *s* at age *a* at time *t,* $F_{s,a,f,t}$ is the fishing mortality of stock *s* at age *a* at time *t* coming from fleet *f* (related to fishing effort of fleet *f* at time t), and $M_{s,a}$ is the natural mortality of stock *s* at age *a*.

The landings (in weight) of stock *s* at age *a* by fleet *f* at time *t* ($L_{s,a,f,t}$) is calculated from the catches, such as:

$$L_{s,a,f,t} = C_{s,a,f,t} * w_{s,a} - d_{s,a,f,t} \quad (6.1.5.2)$$

with $w_{s,a}$ the weight at age *a* of an individual of stock *s* and $d_{s,a,f,t}$ the discards in weight of stock *s* at age *a* by fleet *f* at time *t*.

Gross Value of Landings (GVL) by fleet corresponds to landings multiplied by market prices, such as in equation (6.1.5.3):

$$GVL_{f,t} = \sum_{s}\sum_{c} L_{s,c,f,t} p_{s,c,f} + \sum_{ss} LPUE_{ss,f} p_{ss,f} E_{f,t} \quad (6.1.5.3)$$

With $GVL_{f,t}$ the gross value of landings of fleet *f* at time *t*, $L_{s,c,f,t}$ the landings (in weight) of modelled stock *s* for commercial category *c* by fleet *f* at time *t*, $p_{s,c,f}$ the market price of stock *s* for commercial category *c* for fleet *f*, $LPUE_{ss,f}$ the landing per unit of effort of static species *ss* for fleet *f* (i.e. non explicitly modelled species, static species include all species caught by the fleet *f*), $p_{ss,f}$ the average market price of species *ss* for fleet *f*, and $E_{f,t}$ the fishing effort of fleet *f* at year *t*.

Landings per commercial category are estimated from landings per age-classes and using the commercial categories/ages matrices described in the EWG 20-13 report, with values updated with 2024 data.

Since data on additional incomes per vessel within a fleet segment were available in the AER data, these variables were included in the calculation of total annual revenues (Revenue), as shown in equation (6.1.5.4)

$$Revenue_{f,t} = GVL_{f,t} + otherIncome_{f,t} \quad (6.1.5.4)$$

with $otherIncome_{f,t}$ the other income per vessel reported in the AER.

Calculation of the gross value added (GVA) by fleet for year *t* is described in equation (6.1.5.5):

$$GVA_{f,t} = Revenue_{f,t} - \left(fuelv_f * fuelp_{f,t} + ovc_f\right)E_{f,t} - rep_f - Fixc_f \quad (6.1.5.5)$$

Where $fuelv_f$ is the fuel consumption (in litre) by unit of effort of fleet *f*, $\boldsymbol{fuelp_{f,t}}$ the **fuel price** per litre (in €/l) for fleet *f* at time *t*, ovc_f the other variable costs per unit of effort (including landing costs, oil, bait, gear, food and ice costs), $E_{f,t}$ the fishing effort of fleet *f* at time *t*, rep_f the reparations and maintenance costs and $Fixc_f$ the other annual fixed costs of fleet *f* (including costs related to equipment, insurance and management costs).

Fishing effort is expressed in fishing days.

Gross profit is calculated as Gross Value Added (GVA) minus crew costs. Crew costs are estimated as a percentage of the “what remains to be shared” (i.e., GVL minus exploitation costs). However, as discussed in EWG 22-11 and 23-01, in some simulations, certain fleet segments had a negative “what remains to be shared”, leading to inaccurate gross profit estimates. As a result, crew costs were extensively debated during EWG 23-01, EWG 23-11, and EWG 24-01. It was ultimately decided that crew costs would continue to be estimated as a percentage of the “what remains to be shared” but with a minimum set to the national minimum wage per FTE. As in EWG 24-12, the minimum wage per FTE was set in EWG 25-11 at 15876€ for Spanish fleets and 26355€ for French fleets."

Crew cost by fleet *f* at year *t* ($ccw_{f,t}$) is estimated as follow:

$$ccw_{f,t} = cshr_f\left(GVL_{f,t} - \left(fuelv_f * fuelp_f + ovc_f\right)E_{f,t}\right) \quad (6.1.5.6)$$

with $cshr_f$ the crew share by fleet.

In this application of IAM, by lack of other information, it is calculated based on AER last available, i.e. 2023 data, (EWG 24-07); with $cshr_f$ = *Personnel costs*$_{f,2023}$ / (*GVL*$_{f,2023}$ - *Energy costs*$_{f,2023}$ - *Other variable costs*$_{f,2023}$).

The values of the estimated $cshr_f$ are given by fleet segment in Table 7.2.2.

Table 7.2.3 Values of crew share by fleet (*cshr$_f$*) estimated from AER data, year 2023.

IAM Fleet segment names	Names in the figures and tables of the report	
French demersal trawlers 18-24m	FR_DTS 1824m	0.601
French demersal trawlers 24-40m	FR_DTS >=24m	0.661
French netters <06m	FR_DFN <6m	0.572
French netters 06-12m	FR_DFN 0612m	0.590
French vessels using polyvalent passive gears only <06m	FR_PGP<6m	0.554
French vessels using polyvalent passive gears only 06-12m	FR_PGP 0612m	0.597
French vessels using hooks 06-12m	FR_HOK 0612 m	0.498
Spanish trawlers <12m	SP_DTS < 12m	0.358
Spanish trawlers 12-18m	SP_DTS 1218m	0.526
Spanish trawlers 18-24m	SP_DTS 1824m	0.644
Spanish trawlers >=24m	SP_DTS >=24m	0.738
Spanish netters 06-12m	SP_DFN 0612m	0.336
Spanish netters 12-18m	SP_DFN 1218m	0.468
Spanish vessels using polyvalent passive gears <06m	SP_PMP<6m	0.143
Spanish vessels using polyvalent passive gears 06-12m	SP_PMP 0612m	0.408
Spanish vessels using hooks 06- 12m	SP_HOK 0612 m	0.594

Then Gross Profit by fleet *f* at time *t* (*GP$_{f,t}$*) is calculated as in equation (6.1.5.7):

$$GP_{f,t} = GVA_{f,t} - ccw_{f,t} \quad (6.1.5.7)$$

Gross Profit Margin per fleet segment ($GPmargin_f$) is calculated as in equation (6.1.5.8):

$$GPmargin_f = \frac{GP_f}{GVL_f} \quad (6.1.5.8)$$

As discussed during EWG 23-01, Full Time Equivalent (FTE) is used here as a proxy for employment. FTE is estimated using the same methodology than the one used in AER reports, meaning estimating an average FTE per day at sea by fleet and then multiplying this value with the total annual days at sea of the fleet. As IAM is parametrized using fishing days, instead of days at sea, as it was requested, estimates of FTE in IAM in EMU1 is described in equation (6.1.5.9):

$$FTE_{f,t} = \sum_m \frac{FTE_{ref,f,m}}{E_{ref,f,m}} * E_{f,m,t} \quad (6.1.5.9)$$

With $FTE_{f,t}$ the full time equivalent estimate of fleet *f* at time *t*, $FTE_{ref,\ f,m}$ the FTE of reference of metier *m* of fleet *f* (here FTE of the reference year 2023), $Eref_{f,m}$ the total fishing effort of metier *m* of fleet *f* of reference year – 2023- (in fishing days), and $E_{f,m,t}$ the total fishing effort of metier *m* of fleet *f* at time *t.*

Regarding the engaged crew per vessel, it is assumed constant through the simulation and equal to the values of engaged crew per vessel and per fleet segment from the AER data (last year available used, i.e., 2023). Therefore, the number of engaged crew for a fleet segment vary only if the number of vessels of the fleet segment vary.

For more details, see the IAM documentation, available here: https://ifremer-iam.github.io/IAM/.

6.1.6 Sources of data

The source of the data used to parameterize the IAM model during EWG 25-11 are summarized in Table 7.2.4.

Table 7.2.4 Variables type, data source and year period used to parameterise and calibrate the IAM model during EWG 25-11.

VARIABLES	DATA SOURCE	YEAR USED IN EWG 2412 IAM MODEL

Biological parameters for dynamic stocks; catches at age, by GSA, by gear	EWG 24-10	2024
Catches by species and fleet	FDI (EWG24-11)	2024
Effort by fleet-metier Number of vessels in 2023	FDI (EWG23-10)	2024
Cost parameters by fleet segment	AER (EWG 24-07)	2023
Fuel prices by fleet segment (€/l)	Projections from AER (EWG24-07)	Projections values for 2024 and 2025 (assumption: 2026-2030 equal to 2025)
Average prices by stock and fleet segments	FDI (EWG24-11)	2024
Prices by commercial categories for HKE1567 and MUT7 for French fleet segments	SIH, SACROIS, Ifremer	2024
Correspondence between commercial categories and age for HKE1536 and MUT7	SIH, SACROIS, Ifremer	2024

7.2.6. Management scenarios considered in IAM

The scenarios tested are based on the scenario table provided in the Terms of Reference (TORs). As the IAM model is not explicitly spatialised and operates on an annual basis, the simulated scenarios do not include spatio-temporal measures. For EWG 25-11, we tested the following scenarios from the ToRs: Status Quo, Scenario A1, Scenario B, Scenario C and Scenario F.

Additionally, following discussions within the group, we decided to run two further scenarios: A0 and C0.

For each scenario, the models are run with the management measures adopted at the EU and national levels in 2024 and earlier. These measures include both effort and catch management, which is reflected in the catchability and fishing effort used to parameterise the model (FDI and AER) in 2024. IAM simulations start in 2024 with

the FDI fishing effort and the number of vessels for that year. The scenarios then run until 2030, as requested in the Terms of Reference (ToRs). Table 7.2.5 shows the number of vessels in each fleet that are simulated in the IAM using FDI data from 2024. These numbers remain constant throughout the simulation.

Table 7.2.5 Number of vessels by fleet segments in the IAM simulations from FDI Data.

IAM Fleet segment names	Names in the report figures	
French demersal trawlers 18-24m	FR_DTS 1824m	20
French demersal trawlers 24-40m	FR_DTS >=24m	21
French netters < 06m	FR_DFN <6m	119
French netters 06-12m	FR_DFN 0612m	386
French vessels using polyvalent passive gears only <06m	FR_PGP<6m	17
French vessels using polyvalent passive gears only 06-12m	FR_PGP 0612m	62
French vessels using hooks 06-12m	FR_HOK 0612 m	72
Spanish trawlers < 12m	SP_DTS < 12m	15
Spanish trawlers 12-18m	SP_DTS 1218m	133
Spanish trawlers 18-24m	SP_DTS 1824m	274
Spanish trawlers >=24m	SP_DTS >=24m	122
Spanish netters 06-12m	SP_DFN 0612m	79

Spanish netters 12-18m	SP_DFN 1218m	59
Spanish vessels using polyvalent passive gears <06m	SP_PMP<6m	86
Spanish vessels using polyvalent passive gears 06-12m	SP_PMP 0612m	698
Spanish vessels using hooks 06- 12m	SP_HOK 0612 m	41

As discussed in the group, the fishing efforts for DTS fleet segments are set to the values in the 2024 regulation (hereafter referred to as FO2024) for the year 2025 in all scenarios. These values are displayed in Table 7.2.6.

Table 7.2.6. Maximum fishing effort per trawler fleet segment as outlined in the 2024 and 2025 regulations without compensations, the values of 2025 if we consider a 50% decrease in the compensations and the values of effort estimated for 2025 accounting for the compensation mechanisms. A distinction is made between deep-water trawling (DWS) and demersal trawling for the Spanish trawlers.

FLEET	**METIER**	**2024 regulation (FO2024)** *(in fishing days)*	**2025 regulation (FO2025)** *(in fishing days)*	**50% compensation: (FO2024-FO2025)/2** *(in fishing days)*	**IAM Effort 2025 for all scenarios** *(in fishing days)*
DTS_FRA_18-24m	all	3429	2023	2726	3429
DTS_FRA_sup24m	all	4173	2462	3317.5	4173
DTS_ESP_inf12m	OTB_other	1507	317	912	1507
DTS_ESP_12-18m	OTB_other	16189	3400	9794.5	16189
DTS_ESP_18-24m	OTB_other	30375	6379	18377	30375
DTS_ESP_sup24m	OTB_other	10698	2247	6472.5	10698
DTS_ESP_inf12m	OTB_DWS	0	0	0	0
DTS_ESP_12-18m	OTB_DWS	759	160	459.5	759
DTS_ESP_18-24m	OTB_DWS	7690	1615	4652.5	7690
DTS_ESP_sup24m	OTB_DWS	6173	1297	3735	6173

The selectivity measures implemented by the Spanish and French trawler fleets in 2025 are simulated for all scenarios in 2025. For the Spanish DTS fleets, we simulated the mandatory selectivity measures for the entire fleet: the use of trawl nets with a square mesh size of 45 mm in the codend for the coastal fishery, and the use of trawl nets with a square mesh size of 50 mm in the codend for the deep-sea fishery.

To recover fishing days, the French DTS fleet also adopted compensation measures. Some vessels opted to switch from 40 mm to 45 mm mesh sizes, some from 40 mm to 50 mm, and some decided to abandon the OTT in favour of the OTB. To simulate these choices, the French DTS fleets were divided within the IAM model to reflect them. Table 7.2.7 shows the number of vessels in each "sub-fleet" that were simulated in the IAM model from 2025; these numbers are based on the actual choices made by the fleet.

Table 7.2.7. Number of vessels by French DTS “sub-fleet”, according to the choices made in 2025 in terms of compensation measures.

Fleet	French DTS "sub-fleet"	Number of vessels in IAM
DTS_FRA_18-24m	no changes from 2024	1
	OTT removal	6
	change to 45mm mesh size	13
DTS_FRA_sup24m	no changes from 2024	2
	OTT removal	5
	change to 45mm mesh size	12
	change to 50mm mesh size	2

In order to simulate an increase in selectivity by changing the mesh size from 40 mm to 45 mm or changing the mesh size from 40 mm to 50 mm within the IAM model, we require an estimate of how the catchability of each stock would be affected by the change in selectivity. To achieve this, we use the vector of catchability ratios by age, as described in EWG 24-12, section 6.6. Tables 7.2.8 and 7.2.9 display these ratios for each species and for mesh sizes 45 and 50, respectively.

Table 7.2.8. Delta of selectivity by stock or species modelled in IAM used to simulate a change in mesh size from **40 mm to 45 mm**.

Age classe	Stock or species							
	HKE1567	ARA12	ARA67	NEP6	MUT	MUR	DPS1	DPS567
0	0.014				0.224	0.224	0.299	0.299
1	0.600	0.879	0.879	0.382	0.734	0.734	0.927	0.927
2	1	0.999	0.999	0.577	0.993	0.993	1	1
3	1	1	1	0.846	0.999	0.999	1	1
4	1	1	1	0.974	1.000	1.000	1	
5	1		1	0.997		1,00		
6				1				
7				1				
8				1				
9				1				

Table 7.2.9 Delta of selectivity by stock or species modelled in IAM used to simulate a change in mesh size from **40 mm to 50 mm**.

Age classe	Stock or species							
	HKE1567	ARA12	ARA67	NEP6	MUT	MUR	DPS1	DPS567
0	0.009				0.110	0.110	0.339	0.339
1	0.294	0.753	0.753	0.292	0.274	0.274	0.662	0.662
2	0.994	0.995	0.995	0.311	0.723	0.723	0.958	0.958
3	1	1	1	0.496	0.916	0.916	0.993	0.993
4	1	1	1	0.769	0.978	0.978	1	
5	1		1	0.936		1		
6				0.982				

7				0.994				
8				0.998				
9				1				

As discussed, and decided during the EWG 22-11 and EWG 23-11 groups, when a reduction in fishing effort of a gear within a fleet segment is simulated, there is no report of effort to other gears in the fleet segment, except when simulation of removal of OTT.

Fishing mortalities coming from the non-modelled fleets are estimated constant (and based on 2023 values). As shown in Figure 7.2.5, catches of the species of the plan by those non-modelled fleets is almost null, therefore they do not have an impact on the species of the plan, except for red mullet, but it still represents less than 1% of the landings.

For all scenarios, fuel prices are differentiated by fleet segment. AER fuel price projections for 2024 are used for the initial year of the simulation, 2024. AER projections for fuel price in 2025 are used in 2025 and onwards. Table 7.2.10 displays the values of these fuel prices per IAM fleet segment.

Table 7.2.10 Fuel prices (in €/l) per fleet segment in 2023 (AER data) and AER projections for 2023 and 2024. Source: AER data and projections.

IAM fleet	IAM fleet abbreviation	fs_name in AER	**Projection 2023**	**Projection 2024**	**Projection 2025-2030**
French demersal trawlers 18-24m	DTS_FRA_18-24m	FRA MBS DTS1824 NGI *	**0,81**	**0,78**	**0,66**
French demersal trawlers 24-40m	DTS_FRA_sup24m	FRA MBS DTS2440 NGI *	**0,81**	**0,72**	**0,61**
Spanish trawlers < 12m	DTS_ESP_inf12m	ESP MBS DTS0612 NGI	**0,80**	**0,73**	**0,64**
Spanish trawlers 12-18m	DTS_ESP_12-18m	ESP MBS DTS1218 NGI	**0,76**	**0,68**	**0,59**
Spanish trawlers 18-24m	DTS_ESP_18-24m	ESP MBS DTS1824 NGI	**0,77**	**0,68**	**0,59**
Spanish trawlers >=24m	DTS_ESP_sup24m	ESP MBS DTS2440 NGI	**0,78**	**0,71**	**0,62**
French netters < 06m	FR_DFN 0006m	FRA MBS DFN0006 NGI	**0,76**	**0,64**	**0,55**
French netters 06-12m	FR_DFN 0612m	FRA MBS DFN0612 NGI	**0,74**	**0,58**	**0,49**

French vessels using hooks 06-12m	FR_HOK 0612m	FRA MBS HOK0612 NGI	**0,77**	**0,63**	**0,54**
French vessels using polyvalent passive gears only <06m	FR_PGP_0006m	FRA MBS PGP0006 NGI	**0,76**	**0,61**	**0,52**
French vessels using polyvalent passive gears only 06-12m	FR_PGP_0612m	FRA MBS PGP0612 NGI	**0,75**	**0,59**	**0,50**
Spanish netters 06-12m	SP_DFN_0612m	ESP MBS DFN0612 NGI	**0,78**	**0,62**	**0,53**
Spanish netters 12-18m	SP_DFN 1218m	ESP MBS DFN1218 NGI	**0,79**	**0,72**	**0,63**
Spanish vessels using hooks 06-12m	SP_HOK 0612m	ESP MBS HOK0612 NGI	**0,76**	**0,60**	**0,52**
Spanish vessels using polyvalent passive gears <06m	SP_PMP_0006m	ESP MBS PMP0006 NGI	**0,88**	**0,78**	**0,68**
Spanish vessels using polyvalent passive gears 06-12m	SP_PMP_0612m	ESP MBS PMP0612 NGI	**0,80**	**0,63**	**0,55**

Implementations of the seven scenarios tested in IAM are detailed below.

Scenario SQ

Scenario	Conservation Measures (Selectivity)	Catch Limit level for ARA	Set nets (GNS&GTR) Catch Limit for HKE levels	Compensation Mechanism for trawlers	Trawler effort levels to achieve Fmsy of most vulnerable stock
SQ (what happened in 2025)	2025: What happened in 2025 (1)		2025: Levels of MCL Hake 2025 regulation (for gears G =GNS+GTR) (2)	2025: level of effort of 2024 regulation (=FO2024) (1)	

For SP DTS 06-12m => change in selectivity for OTB_other to simulate a change from 40mm to 45mm mesh size

For SP DTS 12-18m, SP DTS 28-24, and SP DTS >24m: change in selectivity
- delta selectivity 40 to 45mm for OTB_other
- delta selectivity 40 to 50mm for OTB_DWS and OTB_MDD

For FR DTS 18-24m, and FR DTS sup24m : no change in selectivity

For FR DTS 18-24m NoTwin, and FR DTS sup 24 NoTwin => effort of OTT =0, and report of effort toward OTB (i.e., OTT removal)

For FR DTS 18-24m mesh45, and FR DTS sup 24m mesh 45 : change in selectivity (delta selectivity 45mm for OTB and OTT)

For FR DTS sup24m mesh50 : change in selectivity (delta selectivity 50mm for OTB and OTT)

Maximum catch limit of Hake, only for the gears G (G=GNS + GTR) for the following fleets (i.e., the one catching more than 1 tonne of Hake in 2024, with gear G)

Regulation 2025

HKE maximum catch limit by static gears, 2025

	In tonnes
Spain	49,1
France	122,2

MCL Hake FOR GEAR G ONLY (G=GNS+GTR), by fleet	MCL 2025 level
ESP_DFN_06-12m	**9,55**
ESP_DFN_12-18m	**19,45**
ESP_PMP_06-12m	**20,09**
FRA_DFN_06-12m	**102,15**
FRA_HOK_06-12m	**9,18**
FRA_PGP_06-12m	**10,88**

Scenario status Quo (SQ) corresponds to a scenario where parameters are set constant through the simulation and where fishing efforts by fleet are set to the fishing effort from 2024 regulation, along with the constraints of a maximum catch limit (MCL) on HKE1567 for set nets (G= GNS+GTR), based on the value of the MCL of HKE1567 set for 2025.

Scenario A0

Scenario	Conservation Measures (Selectivity)	Catch Limit level for ARA	Set nets (GNS&GTR) Catch Limit for HKE levels	Compensation Mechanism for trawlers	Trawler effort levels to achieve Fmsy of most vulnerable stock
A0	2025: What happened in 2025 (same as described in scenario SQ)		2025: Levels of MCL Hake 2025 regulation (for gears G =GNS+GTR) (same as described in scenario SQ)	2025: level of effort of 2024 regulation (=FO2024)	
	2026-2030: What happened in 2025 (1)	2026-2030: 2025 level of MCL ARA (applied here to ARA12 and ARA67) (2)	2026-2030: Levels of MCL Hake 2025 regulation (3)		2026-2030: level of reduction that secures Fmsy in 2026 and beyond for all stocks (based on most vulnerable stock in each EMU) (4)

ARA maximum catch limit (MCL) – Regulation 2025

	In tonnes
Spain	708.3

Proportion of landings in 2024
ARA12 => 0.2219
ARA5 => 0.1967
ARA67 => 0.5815

MCL ARA by stock	(in tonnes)
ARA12	157.14
ARA67	411.84

Adjustment of effort of Spanish trawlers > 12m (OTB_DWS and OTB_MDD) to not exceed the values of:
MCL on ARA67 = MCL ARA * proportion ARA67 in 2024
MCL on ARA12 = MCL ARA * proportion ARA12 in 2024

Search of one coefficient

Homogeneous (same percentage of decrease between fleets)

=> Annual efforts of deep water trawls depend on the annual biomasses of ARA67 and ARA12

Step 1: Decrease of effort of OTB_other (~OTB_DEF) of **Spanish trawlers to be at Fmsy NEP6**

if need be

Step 2: Decrease of effort of OTB + OTT of **French trawlers to be at Fmsy HKE1567**

if need be

(Step 3: if reduction of French trawlers is superior than the one for NEP6 => same percentage of reduction of effort of OTB_other of Spanish trawlers than for French trawlers)

Scenario A1






Scenario	Conservation Measures (Selectivity)	Catch Limit level for ARA	Set nets (GNS&GTR) Catch Limit for HKE levels	Compensation Mechanism for trawlers	Trawler effort levels to achieve Fmsy of most vulnerable stock
A1	2025: What happened in 2025 2026-2030: What happened in 2025 same as described in scenario SQ 1		2025: Levels of MCL Hake 2025 regulation (for gears G =GNS+GTR) 2026-2030: Levels of MCL Hake 2025 regulation same as described in scenario SQ 2	2025: level of effort of 2024 regulation (=FO2024) 2026-2030: Level of effort **FO50%** (i.e, 50% of compensation gained in 2025 implementation) 1	

Scenario B

Scenario	Conservation Measures (Selectivity)	Catch Limit level for ARA	Set nets (GNS&GTR) Catch Limit for HKE levels	Compensation Mechanism for trawlers	Trawler effort levels to achieve Fmsy of most vulnerable stock
B (temporary selectivity)	2025: What happened in 2025 (cf SQ scenario)		2025: Levels of MCL Hake 2025 regulation (for gears G =GNS+GTR)	2025: level of effort of 2024 regulation (=FO2024)	
	2026: 45mm all FR Trawlers + keep OTT removal Spanish: 45mm coastal, 50mm deep		2026: Levels of MCL Hake 2025 regulation	2026: FO2024	
	2027-2030: back to 40mm all Trawlers (i.e., back to selectivity of 2024) + back to OTT		2027-2030: Levels of MCL Hake 2025 regulation	2027-2030: FO2024	

Scenario C0

Scenario	Conservation Measures (Selectivity)	Catch Limit level for ARA	Set nets (GNS&GTR) Catch Limit for HKE levels	Compensation Mechanism for trawlers	Trawler effort levels to achieve Fmsy of most vulnerable stock
C0	2025: What happened in 2025 (same as described in scenario SQ)		2025: Levels of MCL Hake 2025 regulation (for gears G =GNS+GTR) (same as described in scenario SQ)	2025: level of effort of 2024 regulation (=FO2024)	
	2026-2030: 45mm selectivity for all FR Trawlers – OTB+OTT gears) + keep OTT removal (as in 2025) Spanish trawlers: same as in 2025 (1)	2026-2030: 2025 level of MCL ARA (applied here to ARA12 and ARA67) (same as described in scenario A0) (2)	2026-2030: Levels of MCL Hake 2025 regulation (3)		2026-2030: level of reduction that secures Fmsy in 2026 and beyond for all stocks (based on most vulnerable stock in each EMU) (4)

Step 1: Decrease of effort of OTB_other (~OTB_DEF) of **Spanish trawlers to be at Fmsy NEP6**

if need be

Step 2: Decrease of effort of OTB + OTT of **French trawlers to be at Fmsy HKE1567**

if need be

(Step 3: if reduction of French trawlers is superior than the one for NEP6 => same percentage of reduction of effort of OTB_other of Spanish trawlers than for French trawlers)

Scenario C

Scenario	Conservation Measures (Selectivity)	Catch Limit level for ARA	Set nets (GNS&GTR) Catch Limit for HKE levels	Compensation Mechanism for trawlers	Trawler effort levels to achieve Fmsy of most vulnerable stock
C (permanent selectivity)	2025: What happened in 2025 (cf SQ scenario) *same as described in scenario SQ*		2025: Levels of MCL Hake 2025 regulation (for gears G =GNS+GTR)	2025: level of effort of 2024 regulation (=FO2024)	
	2026 -2030: 45mm selectivity for all FR Trawlers – OTB+OTT gears) + keep OTT removal (as in 2025) 45mm coastal trawl (OTB_other), and 50mm deep trawl (OTB_DWS + OTB_MDD) for all Spanish trawlers 1		2026-2030: Levels of MCL Hake 2025 regulation *same as described in scenario SQ* 2	2026-2030: FO2024 1	

Scenario F

Scenario	Conservation Measures (Selectivity)	Catch Limit level for ARA	Set nets (GNS&GTR) Catch Limit for HKE levels	Compensation Mechanism for trawlers	Trawler effort levels to achieve Fmsy of most vulnerable stock
F catch limits	2025: What happened in 2025 (same as described in scenario SQ)		2025: Levels of MCL Hake 2025 regulation (for gears G =GNS+GTR) (same as described in scenario SQ)	2025: level of effort of 2024 regulation (=FO2024)	
	2026-2030: What happened in 2025 (1)	2026-2030: level of reduction of effort of OTB_deep that secures Fmsy for ARA12 and for ARA67	2026-2030: Levels of MCL Hake = 25% reduction from 2024 level (FDI). For gears G (2)		2026-2030: level of reduction that secures Fmsy in 2026 and beyond for all stocks (based on most vulnerable stock in each EMU)

(4) Adjustment of effort of Spanish trawlers > 12m (deep water trawls = DWS + MDD) to be at:
Fmsy ARA67
Fmsy ARA12



Search of one coefficient

Homogeneous (same percentage of decrease between fleets)

=> Annual efforts of deep water trawls do NOT depend on the annual biomasses of ARA67 and ARA12

(3) Step 1: Decrease of effort of OTB_other (~OTB_DEF) of **Spanish trawlers to be at Fmsy NEP6**



if need be

(5) Step 2: Decrease of effort of OTB + OTT of **French trawlers to be at Fmsy HKE1567**



if need be

(Step 3: if reduction of French trawlers is superior than the one for NEP6 => same percentage of reduction of effort of OTB_other of Spanish trawlers than for French trawlers)

Maximum Catch Limit (MCL) is applied to HKE1567 for all seven simulated scenarios, for the modelled fleets using set gillnets (GNS) or trammel nets (GTR). The baseline for the MCL is the value set for 2025, except in scenario F, where the MCL values are set at a level equivalent to a 25% reduction in HKE1567 landings compared to those observed in 2024.

Scenarios A0 et C0 simulate the implementation of a maximum catch limit (MCL) on ARA from 2026 to 2030. It should be noted that the implementation of the MCL, and therefore the associated changes in fishing effort, only affects the trawler fleets catching ARA in the FDI database (i.e. Spanish trawlers of 12-18m, Spanish trawlers of 18-24m and Spanish trawlers of >24m). The efforts of the OTB_DWS and OTB_MDD of these fleets are adjusted homogeneously (i.e., same proportion of reduction for each fleet). In scenario F, the fishing effort of OTB_DWS and OTB MDD of those fleets is adjusted from 2026 to 2030, this time to reach F_{MSY} proxy of ARA12 and ARA67. In this case, adjustments in effort do not depend on the biomasses of ARA stocks (thus on recruitment).

In scenarios A0, C0 and F, coastal trawling fishing efforts of Spanish DTS are adjusted from 2026 to 2030 to reach F_{MSY} proxy for NEP6. As requested, efforts are adjusted homogeneously between fleets segments. Then, if F_{MSY} of Hake is still not reached, fishing effort of French DTS are adjusted to reach F_{MSY} of Hake.

7.3. BEMTOOL in EMU2

7.3.1. Recall on the main issues and conclusions from EWG 24-12

EWG 24-12 pointed out the lack for EMU2 of an updated stock assessment for red mullet in GSA 10 (reference year 2020) and of an analytical stock assessment for blue and red shrimp in GSAs 9-10-11. For both stocks the situation has not improved although EWG 25-09 was able to update the assessments to 2023 in the catch-based advice. In addition, for Norway lobster in GSA 9 the EWG 24-10 provided a catch-based advice, but this issue was fixed this year by the EWG 25-09, providing an analytical assessment.

During EWG 23-01 the harmonization of the socio-economic indicators provided by the different bio-economic models was discussed and a selection of indicators was commonly agreed to be provided by all the models. All selected indicators have been estimated by BEMTOOL.

Although some information on subsidies was collected by the ad hoc contracts, this information could not be integrated in the model, due to time constrains.

The EWG 24-12 assumed in the model, a linear relationship between FTE and total fishing days for simplicity. Nevertheless, this assumption needs still to be verified through a specific analysis on the historical data.

Finally, the EWG 24-12 underlined the need to explore the adaptation of the catch limit to the status of the stock (e.g. FMSY, SSB) that is expected to change during the application of management measures.

7.3.2. Implementation progress in EWG 25-11

BEMTOOL bio-economic simulation model was implemented for EMU2, following the experiences gained in the previous EWGs. DCF data (FDI and AER data on landings, discards, fishing effort and economic parameters) and results from the assessments carried out during the EWG 25-09 were analysed, to allow the parameterization of BEMTOOL during EWG 25-11. The model included the six species covered by the Multiannual Management Plan (MAP) in the EMU2 (GSAs 9-10-11).

For red mullet in GSA 10 a quantitative assessment was not performed during STECF EWG 25-09, thus, the assessment carried out in EWG 21-09 with reference year 2021 was used, as in the previous meetings.

For ARA9-10-11, for which an analytical stock assessment was not available as well, the stock was reconstructed in BEMTOOL through the calibration option using the MEDITS data until 2021 to extract a recruitment index by year and a total mortality by year (from catch curve method), as for EWG 24-10.

The extension of the model implemented during the EWG 24-12, differentiating the fishing activity of PGP in NETS and longlines and including also HOK (differentiated in NETS and longlines as well) was maintained in EWG 25-11.

Assessed fishing mortality, spawning stock biomass and the observed catches were compared with the simulated ones where possible, as made also in the previous EWGs.

7.3.3. Stocks in the BEMTOOL model

The stocks taken into consideration in BEMTOOL simulations are:

- European hake in GSAs 9, 10 and 11 (HKE);
- Red mullet in GSA9 (MUT9);
- Red mullet in GSA10 (MUT10) (updated to 2021);
- Deep-water rose shrimp in GSAs 9, 10 and 11 (DPS) (last year assessment);
- Giant red shrimp in GSAs 9, 10 and 11 (ARS);
- Norway lobster in GSA9 (NEP9);
- Norway lobster in GSA 11 (NEP11, added this year to the model);
- Blue and red shrimp GSA9, 10 and 11 (ARA) (MEDITS data used to reconstruct the stock in BEMTOOL, being missing a quantitative assessment).

For the 8 stocks the decisions made during the EWG 25-09 on recruitment to be used for the short term forecast have been followed for the scenarios. In particular, for all the stocks the same constant recruitment level of the short term forecasts carried out by EWG 25-09 was used for the projections (Table 7.3.1), perturbed with

a multiplicative lognormal error with mean 0 and standard deviation 0.3, as in the previous meetings.

Table 7.3.1. Recruitment used for the different stocks in the projections. The recruits are in thousands.

Area	Species	Recruits from 2024	Comments
8-9-10-11	Hake	191675.3	
9	Red Mullet	240178	
10	Red Mullet	151186	2021 value
8_9_10_11	Deep-water rose shrimp	3357265	2023 value
9	Norway lobster	26217	
8_9_10_11	Blue and red shrimp	26823.59	Rescaling according to the last MEDITS value of the recruitment vector from BEMTOOL (calibration)
9_10_11	Giant red shrimp	564557	
11	Norway lobster	4921	2024 value

Source: own elaborations.

The relevant results of the assessment for the model parameterization, i.e. the current fishing mortality (F_{curr}) and the reference point ($F_{0.1}$) are reported in the Table 7.3.2, including the needed reduction to reach $F_{0.1}$ for each stock.

Considering the ratio between the current fishing mortality and the reference point ($F_{curr}/F_{0.1}$), the stock more at risk is NEP11 (ratio=2.75) and NEP9 (ratio=2.37). In Table 7.3.2 are reported, when available the biomass reference points by stock.

Table 7.3.2. Results of the assessments from EWG 25-09 relevant for BEMTOOL parameterization.

Stock	F current	Fmsy	ratio F/Fmsy	B current	Bpa	Blim
HKE891011	0.49	0.41	1.195121951	4746	8604	4302
MUT10	Catch-based advice					
MUT9	0.64	0.55	1.163636364	1108	730	365
NEP9	0.336	0.142	2.366197183	343	486	243
NEP11	**0.44**	**0.16**	**2.75**	**49.4**	**80**	**40**
ARS91011	0.66	0.48	1.375	400.6	352	156
DPS891011	Catch-based advice					
ARA91011	Catch-based advice					

Source: own elaborations.

7.3.4. Fishing fleets in BEMTOOL

In the simulation and forecast scenarios 16 fleet segments have been analysed. Trawlers have been disaggregated by fishing activity at metier level (OTB_DEF, OTB_DWS and OTB_MDD) as shown in table 7.3.3. FDI data from 2013 to 2023 were used for the revenues by stock, number of vessels, the number of fishing days, GT and KW. STECF 18-07 EU Fleet Economic and Transversal data from 2008 to 2013 were used for the fishing effort by metier. All data include both active and passive demersal gears operated by fleet segments that rely on, and influence, some or all the stocks included in the MAP. AER data at GSA level (specifically required for the EWG) have been used for total landing and total revenues (target stocks and others).

Five fleets are allocated to GSA9, five to GSA11 and six fleets to GSA10, overall 12 fleets are trawlers and 4 fleets use passive gears (longlines, gillnets and trammel nets).

The fuel costs, the other variable costs and the labour costs have been disaggregated at metier level following the methodology to disaggregate economic variables by activity developed in SECFISH project (MARE/2016/22- SI2.768889, https://datacollection.jrc.ec.europa.eu/docs/regional-grants) and described in Bitetto et al. (2022), consistently with EWG 23-11. This methodology allows to take into account the difference in the variable costs associated to the activity of each metier (e.g. different distance of the fishing trips from the home port).

For 2024 the fishing effort was updated using the FDI data. For 2025 the fishing effort was set equal to the fishing opportunities, amended with the adjustment of fishing opportunities for certain fish stocks and groups of stocks applicable in the Western Mediterranean Sea (D.D. n. 0415115 del 05/09/2024). This adjustment allows to the trawlers operating in EMU2 a +18% of compensation in fishing days due to a fishing ban in October and to the closure of the fishing grounds deeper than 800 m.

Socio-economic data on costs and employment at GSA level requested by the EWG to the Italian Ministry until 2023 (nominal values).

The economic data from 2024 were estimated assuming:

1. Fuel costs linearly depending on the change in total fishing days and fuel price (projections from AER for Italy by fleet segment) by fleet segment and metier;

2. Other variable costs linearly depending on the change in total fishing days by fleet segment and metier;

3. Crew (employment) per vessel, fixed and capital costs linearly depending on change in number of vessels;

4. Labour costs estimated with the crew share ratio of 2023 on the estimated difference between total revenues and total variable costs;

5. FTE were assumed varying linearly on the total fishing days;

6. Fixed costs and maintenance costs have been associated to the vessels and, thus, were assumed depending on the modified total GT respect to the 2024 FDI data, following the Decree on total GT reduction on the permanent cessation of fishing activity in accordance with Article 20 of Regulation (EU) 2021/1139.

Table 7.3.3 Combinations fleet segments-metier included in the BEMTOOL simulations and forecast scenarios by GSA, gear type, including demersal trawlers (DTS), polyvalent passive gears (PGP) and hooks (HOK), and by vessel length (VL).

GSA	Fleet segment	Metier
10	DTS_VL0612	OTB_DEF
10	DTS_VL1218	OTB_DEF and OTB_DWS/MDD
10	DTS_VL1824	OTB_DEF and OTB_DWS/MDD
10	DTS_VL2440	OTB_DEF and OTB_DWS/MDD
10	PGP_VL0018	GNS-GTR
10	PGP_VL0018	LLS
10	HOK_VL0024	GNS-GTR
10	HOK_VL0024	LLS
11	DTS_VL0612	OTB_DEF
11	DTS_VL1218	OTB_DEF and OTB_DWS/MDD
11	DTS_VL1824	OTB_DEF and OTB_DWS/MDD
11	DTS_VL2440	OTB_DEF and OTB_DWS/MDD
11	PGP_VL0018	GNS-GTR
9	DTS_VL0612	OTB_DEF
9	DTS_VL1218	OTB_DEF and OTB_DWS/MDD
9	DTS_VL1824	OTB_DEF and OTB_DWS/MDD

9	DTS_VL2440	OTB_DEF and OTB_MDD
9	PGP_VL0018	GNS-GTR
9	PGP_VL0018	LLS

Source: own elaborations.

7.3.5. Economic indicators in BEMTOOL

The common list of the socio-economic indicators agreed during EWG 24-12 and confirmed during the EWG 25-11 was followed to provide the final outcomes of the simulations. The formulations of AER were used to estimate the indicators.

- Gross Value Added (GVA): Revenues-total var costs- repair costs-other fixed costs;
- Gross profit: Revenues-total var costs- repair costs-other fixed costs-labour costs;
- Gross profit margin: Gross profit/revenues;
- FTE.

7.3.6. Sources of data

The data used for the simulations were extracted from FDI data, the outcomes of EWG 25-11 (stock objects), and the socio-economic data obtained at the GSA level through an ad hoc request to the Italian Ministry from EWG 25-11.

7.3.7. Management scenarios considered in BEMTOOL

Compensation mechanism was applied by Italy in 2025 (+18%, due to closure of area deeper than 800 m and to the additional fishing ban in October), following the information provided by MARE during the meeting. The permanent spatial closure of 2020-2021 were applied and maintained in all the simulations.

As remedial measures, only the increase selectivity was considered because the model is not spatially explicit.

Five scenarios among the ones listed in the ToRs have been considered:

- **Scenario Status quo (SQ):** The effort of OTB_DWS/MDD metier is driven by the catch limit of ARA and ARS of fishing opportunities 2025 (from 2026 to 2030); once that the catch limit for one fleet segment is reached, the remaining effort of OTB_DWS/MDD is re-allocated to OTB_DEF. In 2026 it was assumed that the global effort of trawlers returns at 2024 level and remains the same onwards. Compensation mechanism applied only in 2025 (+18%).
- **Scenario B0:** As SQ, including increase in selectivity with mandatory square mesh size of 45 mm in cod-end for all trawlers in 2026. From 2027 the mesh size is again 40 mm.

- **Scenario B (temporary selectivity)**: As scenario B0, with OTB_DEF (operating in all GSA) reduced of -80% from 2026 to allow NEP11 to approach Fmsy. No Compensation mechanism applied.
- **Scenario F0:** The effort of OTB_DWS/MDD metier is driven by the Fmsy (catch limit) of ARS of 2025 and the FO 2025 for ARA (from 2026 to 2030); once that the catch limit for one fleet segment is reached, the remaining effort of OTB_DWS/MDD is re-allocated to OTB_DEF. In 2026 it was assumed that the global effort of trawlers returns at 2024 level and remains the same onwards. The effort of longlines is reduced of -25% from 2026 onward and the catch limit of nets (gillnets and trammel nets) is reduced of -25% from 2026 onward.
- **Scenario F**: As scenario F0, with OTB_DEF (operating in all GSA) reduced of -80% from 2026 to allow NEP11 to approach Fmsy. No Compensation mechanism applied.

The effort reductions by fishing technique is reported in table 7.3.4.

Table 7.3.4. effort reduction (in fishing days) per fishing technique by scenario in 2026 respect to 2025.

Scenarios	Effort reduction 2026-2025		
	DTS	HOK	PGP
SQ	28%	-1%	-15%
B0	28%	-1%	-15%
B	-54%	-1%	-15%
F0	28%	-26%	-36%
F	-54%	-26%	-36%

Source: own elaborations.

The catch limits of ARS and ARA have been split among the DTS fleet segments according to their proportion in the landing in the FDI data in 2023; similarly, the catch limit of European hake on NETS have been split among the PGP and HOK fleet segments according to their proportion in the landing in the FDI data in 2023. The catch limits for the stocks by year and scenario are reported in Table 7.3.5.

Table 7.3.5 Catch limits for HKE891011, ARS and ARA by scenario.* Value corresponding to F_{MSY} for ARS (EWG 25-09). F_{MSY} not available for ARA.

Scenario	HKE	ARS	ARA

	2025	2026 & onwards	2025	2026 & onwards	2025	2026 & onwards
SQ	261.5	261.5	323.4	323.4	221.9	221.9
B0	261.5	261.5	323.4	323.4	221.9	221.9
B	261.5	261.5	323.4	323.4	221.9	221.9
F0	261.5	196.1	323.4	340*	221.9	221.9
F	261.5	196.1	323.4	340*	221.9	221.9

Source: own elaborations.

For all scenarios the basis was given by the number of fishing days by fleet as the average in the period 2015-2017.

All scenarios were carried out with the hypothesis that the fleet stops fishing in the metier OTB_DWS and OTB_MDD when one of the two ARS and ARA catch limits are reached and the remaining effort is re-allocated on the metier OTB_DEF, increasing the pressure on the stocks targeted by this metier. When the catch limit regulating the activity of gillnets and trammel nets is reached, the fishing for both gears is stopped, without any effort reallocation.

The model works at monthly level, checking every month and for the relevant fleet if the catch limit is reached or not. The effort in the projections is assumed to be distributed among the months as in the last year of simulation; the monthly ratio between each fleet segment catch to the total catch (p coefficient, used to split the total F among the fleet segments in the BEMTOOL Z formulation) in the forecast is the same of the last year of simulation.

In all scenarios, except SQ, the change in selectivity from 40 mm to 45 mm of square mesh size has been applied, following the Bahamons et al. (2021), in line with EWG 24-11.

The scenarios were implemented on the basis of historical information on the stocks status (SSB, F, catch) mimicked in BEMTOOL model.

The performance of the scenarios was evaluated on the basis of spawning stock biomass, catch, F, revenues and gross value added.

8. (ToR4) Management scenarios and results

8.1. ISIS-Fish in EMU 1

8.1.1. ISIS-Fish simulation outcomes

The status quo (**SQ**) scenarios shows that the selectivity efforts made in 2025 significantly reduce hake fishing mortality (-20% from 2024 fishing mortality) and

bring it closer to Fmsy (+25%) with changes in effort levels compared to 2024 between +7% and -24% depending on the fleets (Fig).

The comparison with the same effort level without selectivity measures nor OTT ban (additional scenario **SQ2024**) clearly evidences the gain attributed to selectivity as the fishing mortality is only reduced by 3%. The impact on hake catches, is positive for all fleets with hake catches in 2025 higher than in 2024. This is partly due to the positive stock dynamics in 2025 (high recruitment 2024) as illustrated by the high catches in the scenario **SQ2024** as well. But **SQ** catch exceed **SQ2024** catch from 2027 on due to the rapid improvement in stock SSB brought by improved selectivity leading to catch values in 2030 5 to 27% higher than **SQ2024** (two times higher for Spanish liners). Spanish netters benefit from release competition and higher hake biomass but reach their MCL early in the year (activity stops) in all runs from 2025 on. It is important to mention, that the description of these segments is really rough in the model in the absence of accurate VMS-logbook data. We do not pretend that results are accurate, and they must at least be considered uncertain. However, the model behavior shed light on the risk of the MCL for netters to become limiting if the increase in hake biomass is not followed by increased MCL

Reducing the compensations to 50% of their 2025 level from 2026 on (scenario **A1**), brings fishing mortality below Fmsy (0.42) and SSB rises almost to Bmsy value. Results are contrasted regarding catches in **scenario A1**. The loss of catch due to decreased effort is rapidly compensated by increased biomass for French trawlers, and the smallest coastal Spanish trawlers, for which catches in 2030 in **A1** even exceed **SQ** values. On the contrary, the decrease in effort for Spanish offshore trawlers is greater and catches drop below 2024 level and stay low over the simulation. This scenario benefits to non trawler fleets (except Spanish netters).

Scenario A0 could not be run to assess the effort needed to reach Fmsy in 2026, but from the results obtained with SQ and A1, it can be roughly estimated that a reduction in compensation of 25% of their 2025 level should bring hake very close to Fmsy.

The selectivity improvement was not adopted by the whole French fleet in 2025. Around 3/4 of the vessels (25 vessels over 41) changed to 45mm, 2 changed to 50 mm and 11 quit OTT. Scenario **C1** evaluates the benefit of an adoption of the 45mm mesh and OTT ban by the whole French trawler fleet from 2026 on. Our modeling surprisingly predicts a slight increase in Fbar with this scenario. The reason is yet unclear, however, simulations clearly show a decrease in age 0 fishing mortality with **C1** compared to **SQ**, yet a slight increase in age 1+ fishing mortalities (NB: age1 to 3 are considered in Fbar calculation). The theoretical curves for 45mm indeed predict changes in retention probability compared to 40mm only for fish lengths below 19cm, which corresponds to age 0 fish. It is possible that the increase in older fish fishing mortality is due to the return to 45mm mesh by the two vessels that adopted 50mm mesh in 2025. This is consistent with a difference in catch that is small and mainly concerns larger French trawlers who reach higher catches in **C1** than in **SQ**. On the contrary, catches by French netters are slightly reduced.

Simulations demonstrate that selectivity improvements need to be maintained through time to allow lasting fishing mortality reduction. Scenario **B** shows the increase in fishing mortality in 2027 when selectivity measures are abandoned and

the almost immediate return to a fishing pressure equal to **SQ2024** level (a situation where no selectivity effort were made at all). Fishing mortality even exceeds **SQ2024** level in 2027-2029 due to the extra catches induced by the stock recovery over 2025-2026. Indeed, SSB drops back from 2028 on. Catches of French trawlers, netters and liners from both countries immediately drop in 2027 and stabilise at levels lower than in **SQ** (equivalent to **SQ2024**). For Spanish trawlers however, catches first rise in 2027 above **SQ** values before dropping to **SQ2024** values.

A number of spatial and spatio-seasonal closures have been implemented by both countries since 2020. They were all reproduced in simulations. In addition, a permanent closure of the fishing grounds below 600m depth is experimented in Scenario **D2**. It shows no extra reduction of the average fishing mortality compared to SQ. However, it slightly increases fishing mortality of age 0 hake, possibly because of effort reallocation to more coastal areas where juveniles concentrate. Changes induced in catches are very small.

Despite differences in hake catches between the scenarios, the differences in gross values added for trawlers in 2030 are small between scenarios **SQ, SQ2024, B, and C1**. A reason lies in the limited share of hake in landed values of trawlers. GVA is predicted to be higher in 2030 than in 2024 and 2025 for all trawler segments, and **SQ** provides higher added values that the other scenarios except for the larger French trawlers that benefit more from **C1** possibly due to higher catches of larger and more expensive hake. However, interpretation should be careful, because the selectivity measures adopted are assumed to only impact hake catches. It is difficult to foresee how they would impact other species catch in reality and if they would result in either a loss in landings due to higher escapement or a gain from higher stock protection in the long term. The lower effort and consequently reduced fuel costs in scenario **A1**, does not compensate for the lower landed value, particularly for Spanish fleets. As for French netters, GVA follows hake catches. As mentioned, due to early choke, the situation is more complicated for Spanish netters, and value added does not reflect landings.

Figure 8.1.1 ISIS-Fish EMU1. Gross profit and gross profit margin of the different trawler fleet segments under alternative management scenarios.(note, scenario D refers specifically to D2)

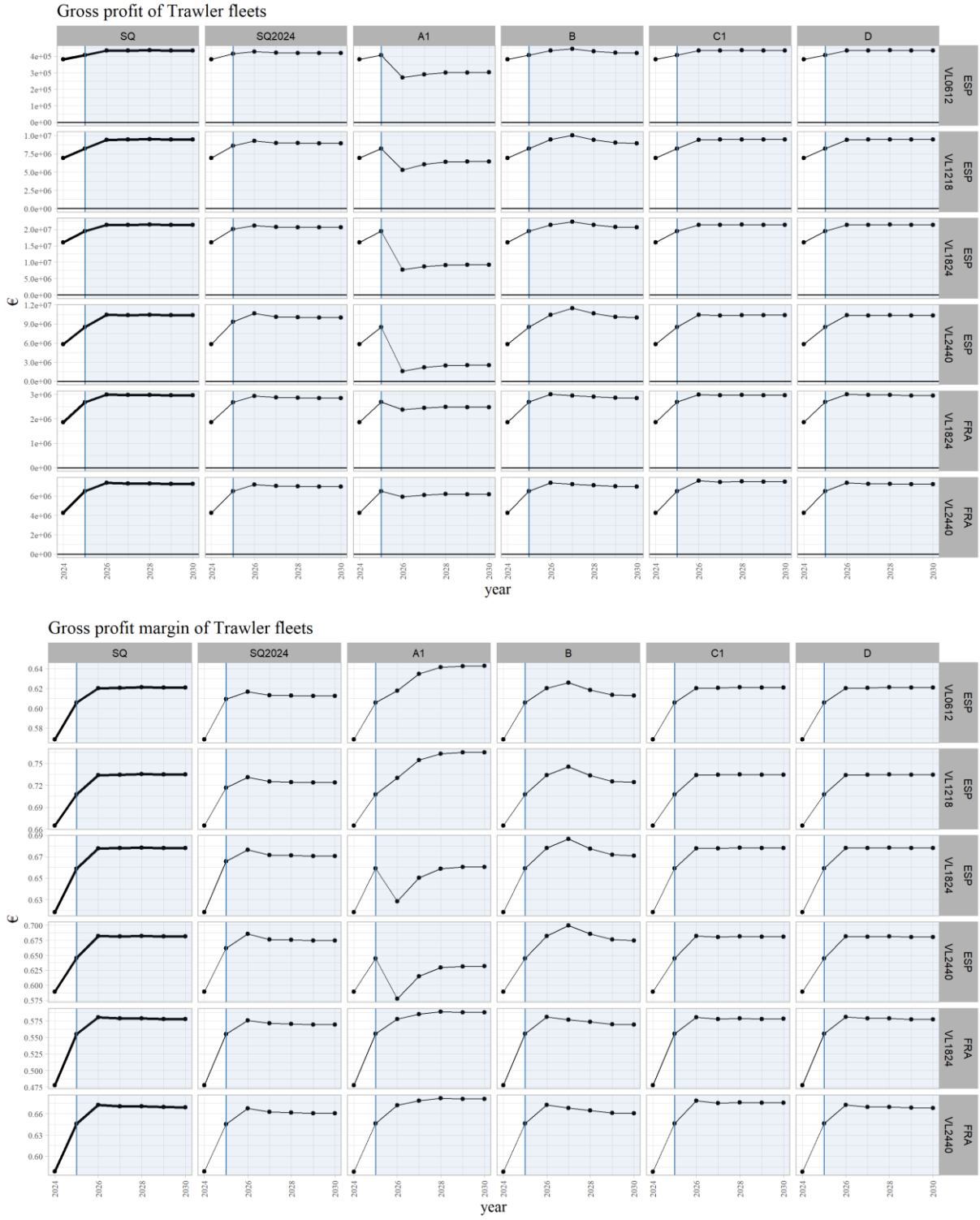


Table 8.1.1 EMU1 (ISIS-Fish model). Total catches by management scenarios for 2025 for single-stock advice (based on STECF 24-10 outputs) and scenarios.

Stock			Catches per scenario 2025 (in tons)								
	SQ	SQ_2024	A1	A2	B	C	D1	D2	E1	E2	F
HKE1567	3884	4510	3890	x	3890	3890		x3890	x	x	x

Stock			Catches per scenario 2027 (in tons)								
	SQ	SQ_2024	A1	A2	B	C	D1	D2	E1	E2	F
HKE1567	6052	5427	4931	x	6895	6063		6022x	x	x	x

Stock			Catches per scenario 2030 (in tons)								
	SQ	SQ_2024	A1	A2	B	C	D1	D2	E1	E2	F
HKE1567	6039	5297	5374	x	5320	6110		6001x	x	x	x

Table 8.1.2 EMU1 (ISIS-Fish model). Fishing mortality (F) by management scenarios for 2025 for single-stock advice (based on STECF 24-10 outputs) and scenarios.

Stock			F(2025) resulting from scenarios								
	SQ	SQ_2024	A1	A2	B	C1	D1	D2	E1	E2	F
HKE1567	0.756	0.922	0.755	x	0.755	0.755		0.755	x	x	x

Stock			F(2027) resulting from scenarios								
	SQ	SQ_2024	A1	A2	B	C1	D1	D2	E1	E2	F
HKE1567	0.782	0.930	0.423	x	0.967	0.802		0.781	x	x	x

Stock			F(2030) resulting from scenarios								
	SQ	SQ_2024	A1	A2	B	C1	D1	D2	E1	E2	F
HKE1567	0.784	0.930	0.424	x	0.930	0.801		0.783	x	x	x

Legend:

F2025 ≤ FMSY

F2025 > FMSY

Table 8.1.3 EMU1 (ISIS-Fish model). Spawning Stock Biomass (SSB) by management scenarios for 2025 for single-stock advice (based on STECF 24-10 outputs) and scenarios.

Stock			SSB(2025) resulting from scenarios								
	SQ	SQ_2024	A1	A2	B	C1	D1	D2	E1	E2	F
HKE1567	6147	6147	6147	x	6147	6147		6147x	x	x	x

Stock			SSB(2027) resulting from scenarios								
	SQ	SQ_2024	A1	A2	B	C1	D1	D2	E1	E2	F
HKE1567	13754	10619	18329	x	13700	13538		13719	x	x	x

Stock			SSB(2030) resulting from scenarios								
	SQ	SQ_2024	A1	A2	B	C1	D1	D2	E1	E2	F
HKE1567	15970	11277	29431	x	11674	15694		15870	x	x	x

Legend:

SSB2025 >Bpa

Blim < SSB2025 < Bpa

SSB2025 < Blim

Table 8.1.4 EMU1 (ISIS-Fish model). Percentage of change in total landings, gross value added and gross profit margin by fishing technique per scenario: between 2023 and 2025, between 2023 and 2027, and between 2023 and 2030.

			LANDINGS			GROSS VALUE ADDED			GROSS PROFIT MARGIN		
Scenarios	MS	Fishing technique	Estimated % variation of landings of hake 2024-2025	Estimated % variation of landings of hake 2024-2027	Estimated % variation of landings of hake 2024-2030	Estimated % variation of GVA 2024-2025	Estimated % variation of GVA 2024-2027	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2025	Estimated % variation of profitability (gross profit margin) 2024-2027	Estimated % variation of profitability (gross profit margin) 2024-2030
SQ	ESP	DTS	50.7	59.7	60.1	5.9	19.2	19.3	27.0	33.6	33.6
SQ	ESP	DFN	68.0	39.7	39.3	-59.7	-67.1	-67.2	-1.3	-2.1	-2.1
SQ	ESP	HOK	218.6	224.3	235.8	NA	NA	NA	NA	NA	NA
SQ	FRA	DTS	92.7	49.4	46.7	27.7	41.9	41.2	32.7	38.9	38.6
SQ	FRA	DFN	98.6	29.6	29.3	2.3	3.2	3.2	4.6	5.1	5.1
SQ	FRA	HOK	NA	NA	NA	NA	NA	NA	NA	NA	NA
SQ2024	ESP	DTS	84.6	17.3	14.6	10.9	15.6	14.9	29.5	31.7	31.4
SQ2024	ESP	DFN	78.9	14.7	14.3	-49.5	-58.4	-58.4	0.9	-0.3	-0.4
SQ2024	ESP	HOK	137.7	117.1	102.3	NA	NA	NA	NA	NA	NA
SQ2024	FRA	DTS	91.2	33.7	29.4	27.5	37.1	35.9	32.6	36.9	36.4
SQ2024	FRA	DFN	95.2	18.7	18.4	2.2	2.8	2.8	4.6	4.9	4.9
SQ2024	FRA	HOK	NA	NA	NA	NA	NA	NA	NA	NA	NA
A1	ESP	DTS	50.7	19.1	33.1	5.9	-44.9	-41.8	27.0	15.4	19.1

A1	**ESP**	**DFN**	67.7	37.1	39.8	-59.7	-76.6	-76.4	-1.3	-6.2	-6.0
A1	**ESP**	**HOK**	218.4	661.6	915.9	NA	NA	NA	NA	NA	NA
A1	**FRA**	**DTS**	94.3	45.4	50.6	27.9	19.3	20.8	32.8	38.9	39.6
A1	**FRA**	**DFN**	98.8	51.8	53.5	2.3	3.8	3.9	4.6	5.4	5.5
A1	**FRA**	**HOK**	NA	NA	NA	NA	NA	NA	NA	NA	NA
A2	**X**	**X**	X	X	X	X	X	X	X	X	X
B	**ESP**	**DTS**	50.7	91.6	41.1	5.9	26.3	15.1	27.0	36.6	31.4
B	**ESP**	**DFN**	67.7	28.8	21.7	-59.7	-67.8	-58.4	-1.3	-2.7	-0.4
B	**ESP**	**HOK**	218.4	163.4	55.2	NA	NA	NA	NA	NA	NA
B	**FRA**	**DTS**	94.3	43.4	27.8	27.9	40.5	36.0	32.8	38.3	36.4
B	**FRA**	**DFN**	98.8	25.8	16.2	2.3	3.0	2.8	4.6	5.0	4.9
B	**FRA**	**HOK**	NA	NA	NA	NA	NA	NA	NA	NA	NA
C1	**ESP**	**DTS**	50.7	58.7	59.7	5.9	19.0	19.2	27.0	33.5	33.6
C1	**ESP**	**DFN**	67.7	39.5	39.4	-59.7	-67.2	-67.2	-1.3	-2.1	-2.1
C1	**ESP**	**HOK**	218.4	223.8	235.4	NA	NA	NA	NA	NA	NA
C1	**FRA**	**DTS**	94.3	54.4	55.7	27.9	43.7	44.1	32.8	39.6	39.8
C1	**FRA**	**DFN**	98.8	23.1	27.8	2.3	3.0	3.1	4.6	5.0	5.1
C1	**FRA**	**HOK**	NA	NA	NA	NA	NA	NA	NA	NA	NA
D1	**X**	**X**	X	X	X	X	X	X	X	X	X
D2	**ESP**	**DTS**	50.7	59.1	59.3	5.9	19.1	19.1	27.0	33.5	33.6

D2	**ESP**	**DFN**	67.7	39.4	39.0	-59.7	-67.2	-67.2	-1.3	-2.1	-2.1
D2	**ESP**	**HOK**	218.4	223.7	235.2	NA	NA	NA	NA	NA	NA
D2	**FRA**	**DTS**	94.3	47.3	44.0	27.9	41.6	40.7	32.8	38.8	38.4
D2	**FRA**	**DFN**	98.8	27.3	27.0	2.3	3.1	3.1	4.6	5.1	5.1
D2	**FRA**	**HOK**	NA	NA	NA	NA	NA	NA	NA	NA	NA
E1	**X**	**X**	X	X	X	X	X	X	X	X	X
E2	**X**	**X**	X	X	X	X	X	X	X	X	X
F	**X**	**X**	X	X	X	X	X	X	X	X	X

Table 8.1.5 EMU1 (ISIS-Fish model). Percentage of change in total landings, gross value added and gross profit margin by segment per scenario: between 2023 and 2025, between 2023 and 2027, and between 2023 and 2030.

			LANDINGS			**GROSS VALUE ADDED**			**GROSS PROFIT MARGIN**		
Scenarios	**MS**	**Fleet segment**	**Estimated % variation of landings of hake**	**Estimated % variation of landings of hake**	**Estimated % variation of landings of hake**	**Estimated % variation of GVA**	**Estimated % variation of GVA**	**Estimated % variation of GVA**	**Estimated % variation of profitability (gross profit margin)**	**Estimated % variation of profitability (gross profit margin)**	**Estimated % variation of profitability (gross profit margin)**
			2024-2025	**2024-2027**	**2024-2030**	**2024-2025**	**2024-2027**	**2024-2030**	**2024-2025**	**2024-2027**	**2024-2030**
SQ	**ESP**	**ESP_DTS_VL0612**	63.2	163.0	164.7	2.8	9.5	9.6	10.7	13.6	13.6
SQ	**ESP**	**ESP_DTS_VL1218**	52.1	143.2	144.2	6.5	21.7	21.9	18.2	23.7	23.7
SQ	**ESP**	**ESP_DTS_VL1824**	53.3	146.7	147.7	3.7	13.0	13.1	24.3	29.2	29.2
SQ	**ESP**	**ESP_DTS_VL2440**	47.9	134.6	134.5	9.6	29.0	29.0	46.3	60.0	60.0
SQ	**ESP**	**ESP_GNS_all**	68.0	134.6	134.0	-59.6	-67.1	-67.1	-1.3	-2.1	-2.1
SQ	**ESP**	**ESP_LLS_all**	218.6	933.1	969.9	NA	NA	NA	NA	NA	NA
SQ	**FRA**	**FRA_DTS_VL1824**	84.5	176.6	171.5	26.0	39.0	38.3	32.5	39.4	39.0
SQ	**FRA**	**FRA_DTS_VL2440**	96.1	192.6	187.4	28.4	43.1	42.3	32.5	38.4	38.1
SQ	**FRA**	**FRA_GNS_VL0006**	105.4	162.2	161.6	0.5	0.5	0.5	2.7	2.7	2.7
SQ	**FRA**	**FRA_GNS_VL0612**	98.7	158.2	157.5	2.7	3.8	3.8	5.0	5.5	5.5

SQ	**FRA**	**FRA_GNS_VL1218**	95.2	99.9	99.6	NA	NA	NA	NA	NA	NA
SQ2024	**ESP**	**ESP_DTS_VL0612**	87.4	112.9	108.0	4.4	6.1	5.8	11.4	12.2	12.0
SQ2024	**ESP**	**ESP_DTS_VL1218**	81.8	109.6	104.8	11.4	16.1	15.3	20.1	21.8	21.5
SQ2024	**ESP**	**ESP_DTS_VL1824**	85.5	114.1	109.4	6.9	9.8	9.3	26.1	27.6	27.3
SQ2024	**ESP**	**ESP_DTS_VL2440**	85.3	121.8	116.4	18.0	26.2	25.0	52.6	58.2	57.4
SQ2024	**ESP**	**ESP_GNS_all**	78.9	105.2	104.5	-49.5	-58.3	-58.4	0.9	-0.3	-0.4
SQ2024	**ESP**	**ESP_LLS_all**	137.7	416.0	380.9	NA	NA	NA	NA	NA	NA
SQ2024	**FRA**	**FRA_DTS_VL1824**	84.5	146.2	138.1	26.0	34.7	33.6	32.5	37.2	36.6
SQ2024	**FRA**	**FRA_DTS_VL2440**	93.9	159.5	151.3	28.0	38.0	36.8	32.3	36.4	36.0
SQ2024	**FRA**	**FRA_GNS_VL0006**	96.8	130.6	129.9	0.5	0.5	0.5	2.7	2.7	2.7
SQ2024	**FRA**	**FRA_GNS_VL0612**	95.2	132.2	131.6	2.6	3.3	3.3	5.0	5.3	5.3
SQ2024	**FRA**	**FRA_GNS_VL1218**	90.5	80.8	80.5	NA	NA	NA	NA	NA	NA
A1	**ESP**	**ESP_DTS_VL0612**	63.1	208.4	248.5	2.8	-25.9	-23.2	10.7	14.8	16.4
A1	**ESP**	**ESP_DTS_VL1218**	52.0	137.3	166.2	6.5	-19.9	-15.1	18.2	23.6	25.9
A1	**ESP**	**ESP_DTS_VL1824**	53.3	101.4	125.7	3.7	-47.6	-45.2	24.3	8.3	11.3
A1	**ESP**	**ESP_DTS_VL2440**	47.9	33.7	48.1	9.6	-56.1	-52.9	46.3	-9.9	-1.7
A1	**ESP**	**ESP_GNS_all**	67.7	129.8	134.4	-59.7	-76.6	-76.4	-1.3	-6.2	-6.0
A1	**ESP**	**ESP_LLS_all**	218.4	2324.8	3134.6	NA	NA	NA	NA	NA	NA
A1	**FRA**	**FRA_DTS_VL1824**	87.5	172.1	182.2	26.4	16.0	17.4	32.8	38.7	39.6
A1	**FRA**	**FRA_DTS_VL2440**	97.1	186.7	196.9	28.5	20.6	22.2	32.5	38.6	39.3
A1	**FRA**	**FRA_GNS_VL0006**	105.7	218.6	222.2	0.5	0.5	0.5	2.7	2.7	2.7
A1	**FRA**	**FRA_GNS_VL0612**	98.8	202.4	205.9	2.7	4.6	4.7	5.0	5.9	5.9
A1	**FRA**	**FRA_GNS_VL1218**	95.5	136.0	137.8	NA	NA	NA	NA	NA	NA
A2	**X**	**X**	X	X	X	X	X	X	X	X	X
B	**ESP**	**ESP_DTS_VL0612**	63.1	198.9	109.4	2.8	11.9	5.9	10.7	14.6	12.1
B	**ESP**	**ESP_DTS_VL1218**	52.0	185.7	105.9	6.5	28.9	15.5	18.2	25.9	21.6
B	**ESP**	**ESP_DTS_VL1824**	53.3	193.1	110.5	3.7	17.7	9.4	24.3	31.4	27.4
B	**ESP**	**ESP_DTS_VL2440**	47.9	186.7	117.4	9.6	40.7	25.2	46.3	67.0	57.5
B	**ESP**	**ESP_GNS_all**	67.7	116.0	104.1	-59.7	-67.8	-58.4	-1.3	-2.7	-0.4
B	**ESP**	**ESP_LLS_all**	218.4	738.7	394.2	NA	NA	NA	NA	NA	NA
B	**FRA**	**FRA_DTS_VL1824**	87.5	168.4	139.0	26.4	37.8	33.7	32.8	38.8	36.7
B	**FRA**	**FRA_DTS_VL2440**	97.1	182.9	152.1	28.5	41.5	36.9	32.5	37.8	36.0
B	**FRA**	**FRA_GNS_VL0006**	105.7	148.9	129.9	0.5	0.5	0.5	2.7	2.7	2.7

B	**FRA**	**FRA_GNS_VL0612**	98.8	150.7	131.6	2.7	3.7	3.3	5.0	5.4	5.3
B	**FRA**	**FRA_GNS_VL1218**	95.5	92.5	80.5	NA	NA	NA	NA	NA	NA
C1	**ESP**	**ESP_DTS_VL0612**	63.1	162.8	164.5	2.8	9.5	9.6	10.7	13.6	13.6
C1	**ESP**	**ESP_DTS_VL1218**	52.0	142.3	143.6	6.5	21.6	21.8	18.2	23.6	23.7
C1	**ESP**	**ESP_DTS_VL1824**	53.3	146.0	147.4	3.7	12.9	13.1	24.3	29.2	29.2
C1	**ESP**	**ESP_DTS_VL2440**	47.9	132.0	133.6	9.6	28.4	28.8	46.3	59.7	59.9
C1	**ESP**	**ESP_GNS_all**	67.7	134.0	133.7	-59.7	-67.2	-67.2	-1.3	-2.1	-2.1
C1	**ESP**	**ESP_LLS_all**	218.4	930.9	967.8	NA	NA	NA	NA	NA	NA
C1	**FRA**	**FRA_DTS_VL1824**	87.5	171.4	173.3	26.4	38.3	38.5	32.8	39.0	39.2
C1	**FRA**	**FRA_DTS_VL2440**	97.1	211.9	214.5	28.5	46.0	46.4	32.5	39.4	39.6
C1	**FRA**	**FRA_GNS_VL0006**	105.7	147.1	156.3	0.5	0.5	0.5	2.7	2.7	2.7
C1	**FRA**	**FRA_GNS_VL0612**	98.8	145.3	154.8	2.7	3.6	3.7	5.0	5.4	5.5
C1	**FRA**	**FRA_GNS_VL1218**	95.5	91.7	96.0	NA	NA	NA	NA	NA	NA
D1	**X**	**X**	X	X	X	X	X	X	X	X	X
D2	**ESP**	**ESP_DTS_VL0612**	63.1	162.5	164.2	2.8	9.4	9.6	10.7	13.6	13.6
D2	**ESP**	**ESP_DTS_VL1218**	52.0	142.5	143.4	6.5	21.6	21.8	18.2	23.6	23.7
D2	**ESP**	**ESP_DTS_VL1824**	53.3	146.6	147.5	3.7	13.0	13.1	24.3	29.2	29.2
D2	**ESP**	**ESP_DTS_VL2440**	47.9	132.7	132.4	9.6	28.6	28.5	46.3	59.8	59.7
D2	**ESP**	**ESP_GNS_all**	67.7	133.7	133.1	-59.7	-67.2	-67.2	-1.3	-2.1	-2.1
D2	**ESP**	**ESP_LLS_all**	218.4	930.7	967.4	NA	NA	NA	NA	NA	NA
D2	**FRA**	**FRA_DTS_VL1824**	87.5	176.4	170.2	26.4	39.0	38.1	32.8	39.4	38.9
D2	**FRA**	**FRA_DTS_VL2440**	97.1	190.2	183.8	28.5	42.7	41.7	32.5	38.2	37.9
D2	**FRA**	**FRA_GNS_VL0006**	105.7	157.7	157.0	0.5	0.5	0.5	2.7	2.7	2.7
D2	**FRA**	**FRA_GNS_VL0612**	98.8	153.7	153.0	2.7	3.7	3.7	5.0	5.5	5.5
D2	**FRA**	**FRA_GNS_VL1218**	95.5	96.4	96.1	NA	NA	NA	NA	NA	NA
E1	**X**	**X**	X	X	X	X	X	X	X	X	X
E2	**X**	**X**	X	X	X	X	X	X	X	X	X
F	**X**	**X**	X	X	X	X	X	X	X	X	X

8.1.2. Discussion of the ISIS-Fish outcomes

In simulations, SSB of hake responded very quickly to effort reductions and selectivity changes. This is despite the pessimistic assumption of constant

recruitment scenario (average of the last 3 years), that is unlikely given the high variability of recruitment as estimated by the assessment model. Ideally, stochastic runs should be carried out, as in IAM, to assess the probability of success of management accounting for recruitment variability.

However, the modeled impact is likely very dependent on assumptions made regarding effort reallocation and fish movement across zones. Spatial closures are simulated under the assumption that effort is reallocated homogeneously across the remaining open cells. And no new fishing areas are visited. Analyses of VMS data for GSA7, show that effort is reallocated preferentially on the borders of the closed zone but this behaviour could not be modelled. In these scenarios neither fishing effort nor fuel costs are impacted although it is expected that i) travel time changed also affecting fishing time and ii) the change in the ratio of fishing time over travel time would affect fuel consumption in an unpredictable direction.

In 2025, NEP6 was limiting in Spanish waters. As the species is not dynamically modeled, the potential early stop of the hake fishery because Nephrops catch limit is reached could not be modeled.

Approximations needed to be made to reproduce individual measures in a fleet-based model. Fishing closures of 4 weeks in GSA7 in particular required assumptions on effort reallocation before and after the closure that cannot be verified until 2025 effort data are available. Identically the reduction in OTT effort induced by the partial ban was assumed proportional to the number of vessels in the fleet that stop using the gear although OTT practice was possibly not homogeneous among the vessels of a fleet. Theoretical selectivity curves were used to modify the catch curves for hake in ISIS-Fish, which is possibly optimistic with regard to the actual change in selectivity. It is important to recall that in the absence of other dynamically modelled species, changes in selectivity only affected hake catches, although it would likely impact other species catchability in reality. Finally, the individual measures were implemented progressively in course of 2025, but modelled as starting in May for simplification in ISIS-Fish.

The closure of the Spanish fishing grounds beyond 600m depth has low impact on hake. It is mainly meant at protecting deep water shrimps and would mainly affect catches of this species, not modeled in ISIS-Fish. It is also recognised that habitats for hake in these areas are probably roughly estimated given the low effort and fishing grounds of Spanish vessels were not updated since 2021. These results must therefore be considered uncertain. Further consideration of this scenario should bear in mind that, in areas where the blue and red shrimps support the trawling fishery, revenue losses could be severe (ICATMAR 23-02).

Limitations regarding economic evaluations for Spanish netters and long-liners have been mentioned above. The impact needs to be considered at the métier level for landed values. All other indicators assume that revenues for these boats are only coming from the modelled métiers (GNS and LLS) which is likely incorrect. In addition, the number of vessels is uncertain and probably overestimated leading to underestimated fixed costs.

The calibration of the EMU1 ISIS-Fish model was conducted on 2024 data. Calibrations for other years were also conducted conducting to quite different estimations providing the variability of hake accessibility in time. Ideally the scenarios

should be run for a range of alternative estimations to account for uncertainty in accessibility of the fleet to the stock.

In the EMU1 ISIS-Fish model, the initial stock numbers of hake by age class are directly derived from the stock assessment EWG 24-10. The hake distribution is based on data from 2018-2020, operating under the assumption that the distribution of hake across different population zones has not changed in recent years except for the share between GSA7 and GSAs 1, 5, and 6 that was updated using 2023 MEDITS data.

8.2. IAM in EMU1

8.2.1. IAM Simulation outcomes

The necessity of effort reduction to reach F_{MSY} objectives

The primary objective of the management plan is to achieve F_{MSY} for all stocks of the MAP. In 2025, selectivity measures for French and Spanish trawlers have been taken along with a reduction of fishing effort for the same fleets (compared to the actual fishing effort in 2024). The simulation results clearly demonstrate that the initial management actions taken in 2025, while positive, are insufficient to reach F_{MSY} for all stocks by 2026.

The implementation of selectivity improvements (mesh size increases) and a small effort reduction (due to FO2024) successfully contributed to a lowered fishing mortality across all modelled species in 2025. This impact was most pronounced on Hake (Fbar of HKE1567 moved from 1.56 to 1.15 F_{MSY}), validating the biological effectiveness of the selectivity changes.

However, scenarios SQ, B and C highlight the necessity of implementing additional management measures. These scenarios, which rely solely on the remedial actions implemented in 2025, fail indeed to meet the F_{MSY} objective, with Nephrops in GSA 6 (NEP6) proving to be the most restrictive stock, and ARA67, HKE1567, MUT1, and ARA12 still showing fishing mortalities above the F_{MSY} thresholds.

Scenario A1, which couples the selectivity measures from 2025 with a reduction in effort from 2026 onwards (i.e. a 50% decrease in the 2025 compensation in fishing days), is more successful. This scenario results in a fishing mortality closer to F_{MSY} for NEP6 and below F_{MSY} for all the other stocks.

Effectiveness and limits of selectivity measures

The comparison between scenario SQ (2025 selectivity maintained) and scenario B (return to 40mm mesh in 2026) offers critical insights into the biological effectiveness of the 2025 selectivity measures.

Scenario B simulates a return to previous catchability and demonstrates clear negative biological consequences for vulnerable stocks. The use of the smaller 40mm mesh size leads to a substantial increase in juvenile catches, specifically for age 0 and 1 Hake (HKE1567) and age 1 and 2 Nephrops (NEP6). While this causes a sharp, short-term increase in landings between 2026 and 2027, the landings quickly diminish, resulting in lower long-term yields (below SQ and C from 2029 onwards). This validates the positive biological effects of the 2025 selectivity measures and confirms that a reversal would be detrimental to stock recovery and long-term economic viability.

Returning to the 40mm mesh in scenario B leads to a sharp increase in landings between 2026 and 2027, but to a rapid diminution until having lower landings than with scenarios SQ and C from 2029 onwards. Economically, scenario B leads only to a slight and temporary economic improvement in 2027 before converging back to the levels of SQ and C by 2028.

The scenarios SQ and C are showing close to no differences, as the only difference between those scenarios is the fact that all French vessels are with 45mm mesh size, which concerns only a few vessels, as some already adopted this measure in 2025. Furthermore, among the dynamically modelled stocks with advice, they are only caught by the French trawlers and with a lower fishing pressure than Spanish vessels. There is nevertheless an increase in landings of Hake in scenario C in 2029 and 2030.

The Constraining role of Nephrops in GSA 6 (NEP6)

The most successful scenarios (A0, C0, and F) in terms of reaching the biological objectives require substantial reductions in Spanish trawler effort to achieve the F_{MSY} targets. This confirms that effort control is the necessary lever to meet the management plan's goals.

The simulations reveal that by reducing the coastal trawling effort of Spanish trawlers to meet the F_{MSY} for NEP6—the most vulnerable stock—, and adjusting the deep-water trawling effort based on constraint on ARA (either MCL on ARA, or reaching F_{MSY} of ARA), the fishing mortality for all other overexploited stocks (including HKE1567) is concurrently brought below their respective F_{MSY} levels. This is significant, as the hake stock was previously identified as the most vulnerable stock in EWG 24-12. The current results underscore the constraining role of NEP6 for the coastal trawl fleet segment, establishing it as the primary target for effective effort management.

Comparing management constraints: MCL versus F_{MSY}

The management measures for blue and red shrimp (ARA) presents a key comparison between Maximum Catch Limit (MCL) constraint (scenarios A0 and C0) and a direct F_{MSY} effort control (scenario F).

- MCL Constraint (A0/C0): the MCL mechanism is restrictive. As ARA biomass (particularly ARA67) increases, the limit on catch triggers a subsequent reduction in deep-water trawl effort among Spanish trawlers to not be above the MCL. This restrictive nature results in ARA12 and ARA67 landings being projected as constant and well below expected landings in other scenarios (like SQ and B) from 2026 to 2030.
- F_{MSY} Effort Control: by contrast, scenario F adjusts deep-water trawling effort directly to meet F_{MSY} for ARA12 and ARA67 stocks without a constant catch limit. This results in a less pronounced reduction in deep-water trawl effort (Tables 7.1.2.13 and 7.1.2.14) and allows ARA landings to trend upwards in the longer term, reflecting a gradual stock recovery.

This suggests that, while both approaches achieve F_{MSY}, the F_{MSY} effort control mechanism (scenario F) may provide a pathway for gradually increasing landings as stocks recover, potentially offering a better long-term economic outlook for the deep-water trawl fleet compared to the highly restrictive MCL constraint (if MCL level is constant over time).

Socio-economic impacts

While scenarios A0, C0, and F are biologically successful, they project severe, immediate, and enduring negative socio-economic impacts for the Spanish trawler fleet. The required effort reduction (30% to 76% in 2026, according to scenario and fleet-metier) causes a significant decline in Gross Value Added (GVA), Full-Time Equivalent (FTE) employment, and, most critically, Gross Profit (GP). The reduction in operating costs is insufficient to cover the significant income loss, especially as fixed costs remain unaffected, leading to a projected negative GP in both the short and long term.

Conversely, the reduction in Spanish trawler effort and the resultant stock recovery are expected to generate positive economic spillovers for other fleet segments. For instance, French and Spanish “hook” fleets (HOK 6-12m) and French trawlers are expected to benefit economically from the increases in exploited stock biomasses.

Implications for fleets using GNS and GTR

Maximum Catch Limit (MCL) is applied to HKE1567 for all seven simulated scenarios, for the modelled fleets using set gillnets (GNS) or trammel nets (GTR). The baseline for the MCL is the value set for 2025, except in scenario F, where the MCL values are set at a level equivalent to a 25% reduction in HKE1567 landings compared to those observed in 2024. The inclusion of an MCL on HKE1567 for those fleets using set nets results in complex economic repercussions for the DFN, PGP, PMP, and HOK fleets. The MCL acts as a limiting factor: as the Hake SSB increases, the MCL constraint becomes more restrictive, leading to a subsequent decrease in the effort of these fleets using set nets and subsequent negative economic consequences. Due to the confounding management actions in scenario F, the isolated biological impact of this specific Hake MCL measure on overall Hake fishing mortality cannot be definitively determined through comparison between scenario F (which has a reduced HKE MCL) and scenarios A0 and C0. Despite this difficulty in isolating indirect effects on other fleets, such as trawlers, the HKE MCL reduction demonstrably leads to notable negative economic repercussions for the DFN, PGP, PMP, and HOK fleets (see Supplementary Material 1, 2, and 3).

8.2.2. Detailed IAM outcomes

Simulations of the IAM model starts in 2024 and run to 2030 (the year 2025 is represented in a vertical black line in each figure).

For all scenarios, fishing mortalities and spawning stock biomasses (SSBs), the total annual fishing effort, and total Gross Value Added (GVA) for DTS fleet segments, are presented in Section 2.3. Total fishing effort and GVA per fleet segment for other fishing technique are presented in Supplementary material 1 to 8.

Other indicators, including, total landings of Hake in GSAs 1-5-6-7, blue and red shrimp in GSAs 1-2 and 6-7, Norway lobster in GSA6, red mullet in GSA1, GSA6, average fishing effort per vessel for DTS fleet segments, Gross Value of Landings (GVL) by DTS fleet segment are displayed in Figure 8.2.1-3.

Average fishing effort and GVL for other fishing techniques are presented in Supplementary material 9 to 16.

For each stock, Figures 8.2.4-9 compare the evolutions of their Fbar, SSB, and total landings according to the different scenarios.

Figures 8.2.10-13 present the landings at age for Hake (HKE1567), Nephrops in GSA 6 (NEP6), and blue and red shrimps in GSAs1-2 (ARA12) and in GSAs6-7 (ARA67) by trawler fleet segment across the scenarios.

Annual landing at age of HKE1567 by other fishing techniques are presented in supplementary material 17 to 20. And annual landings of MUT1 and MUT6 by DTS are presented in supplementary material 21 and 22.

Tables 8.2.1-10 compare the biological and socio-economic performance of each scenario, based on Fbar, SSB, total landings per stock, GVA, Gross Profit Margin, and FTE by fleet segment and fishing techniques.

Tables 8.2.10-13 compare variations of fishing effort by fleet segment and fishing techniques.

Figure 8.2.1 EMU1 (IAM model). Evolution of the **total annual landings** (in tonnes) of the modelled stocks under alternative scenarios up to 2030. Historical values of landings are given in the white areas and simulated values in the blue area. Vertical black lines indicate the year 2025. Scenarios are in column and stocks in row. The stocks are as follow (from top to bottom): hake GSAs1-5-6-7 (HKE1567), red mullet GSA1 (MUT1), red mullet GSA6 (MUT6), Norway lobster GSA6 (NEP6), blue and red shrimp GSAs1-2 (ARA12), blue and red shrimp GSAs6-7 (ARA67).

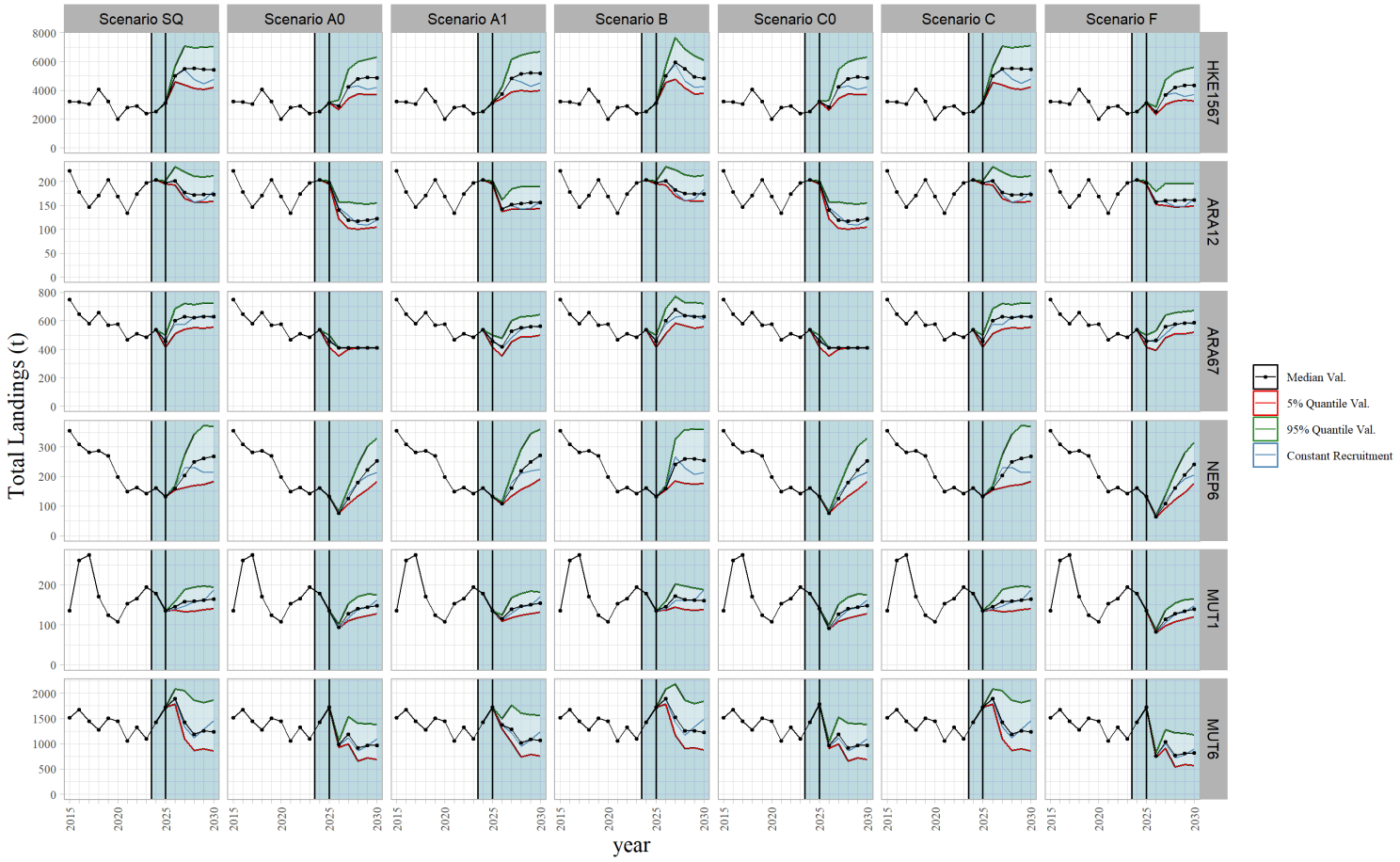


Figure 8.2.2 EMU1 (IAM model). Evolution of the **Average fishing effort per vessel** by trawler (**DTS**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French demersal trawlers 18-24m, French demersal trawlers >24m, Spanish trawlers < 12m, Spanish trawlers 12-18m, Spanish trawlers 18-24m, and Spanish trawlers >24m.

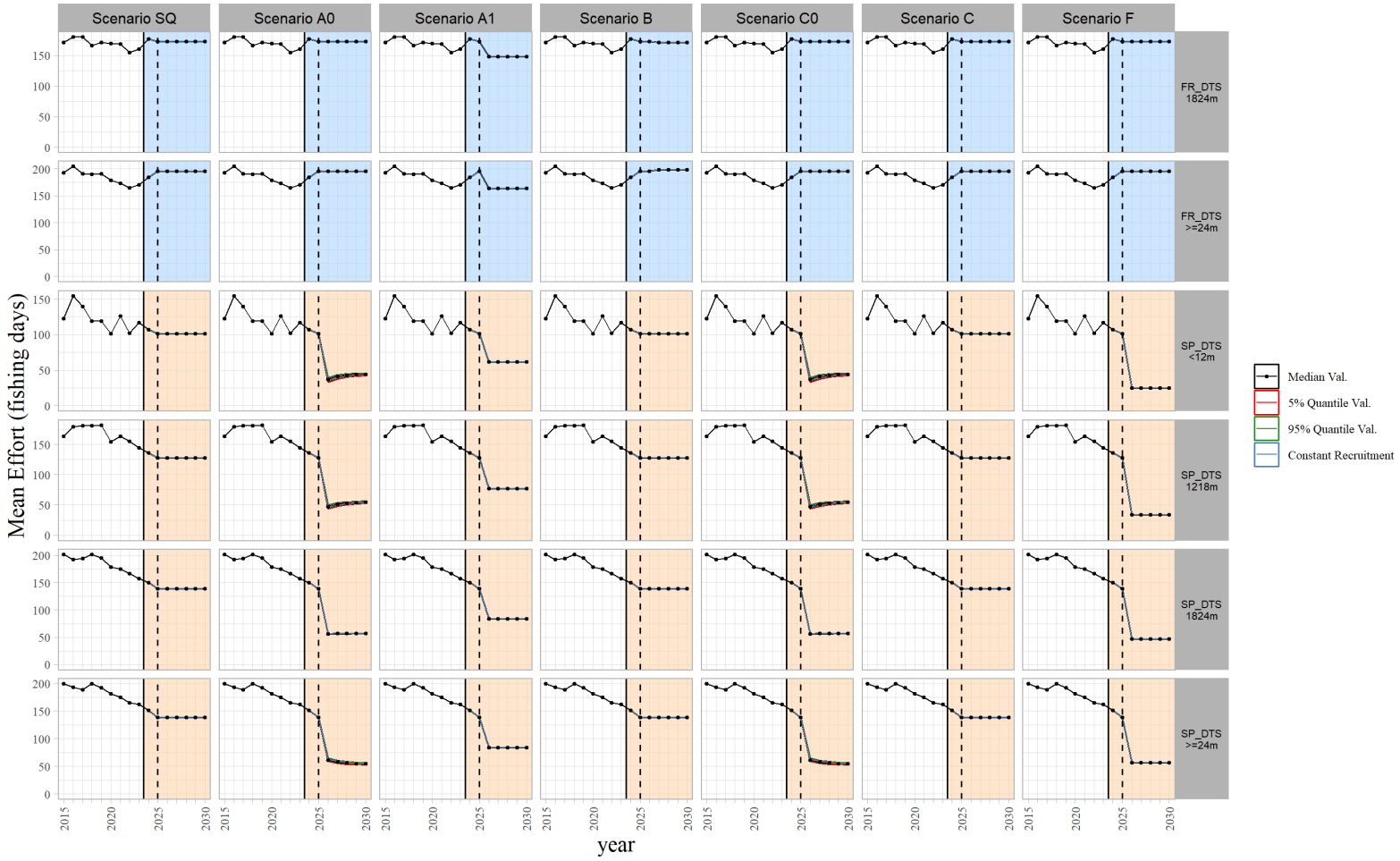


Figure 8.2.3 EMU1 (IAM model). Evolution of the **total Gross Value of Landings** (GVL, in K euros) by trawler (**DTS**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French demersal trawlers 18-24m, French demersal trawlers >24m, Spanish trawlers < 12m, Spanish trawlers 12-18m, Spanish trawlers 18-24m, and Spanish trawlers >24m.

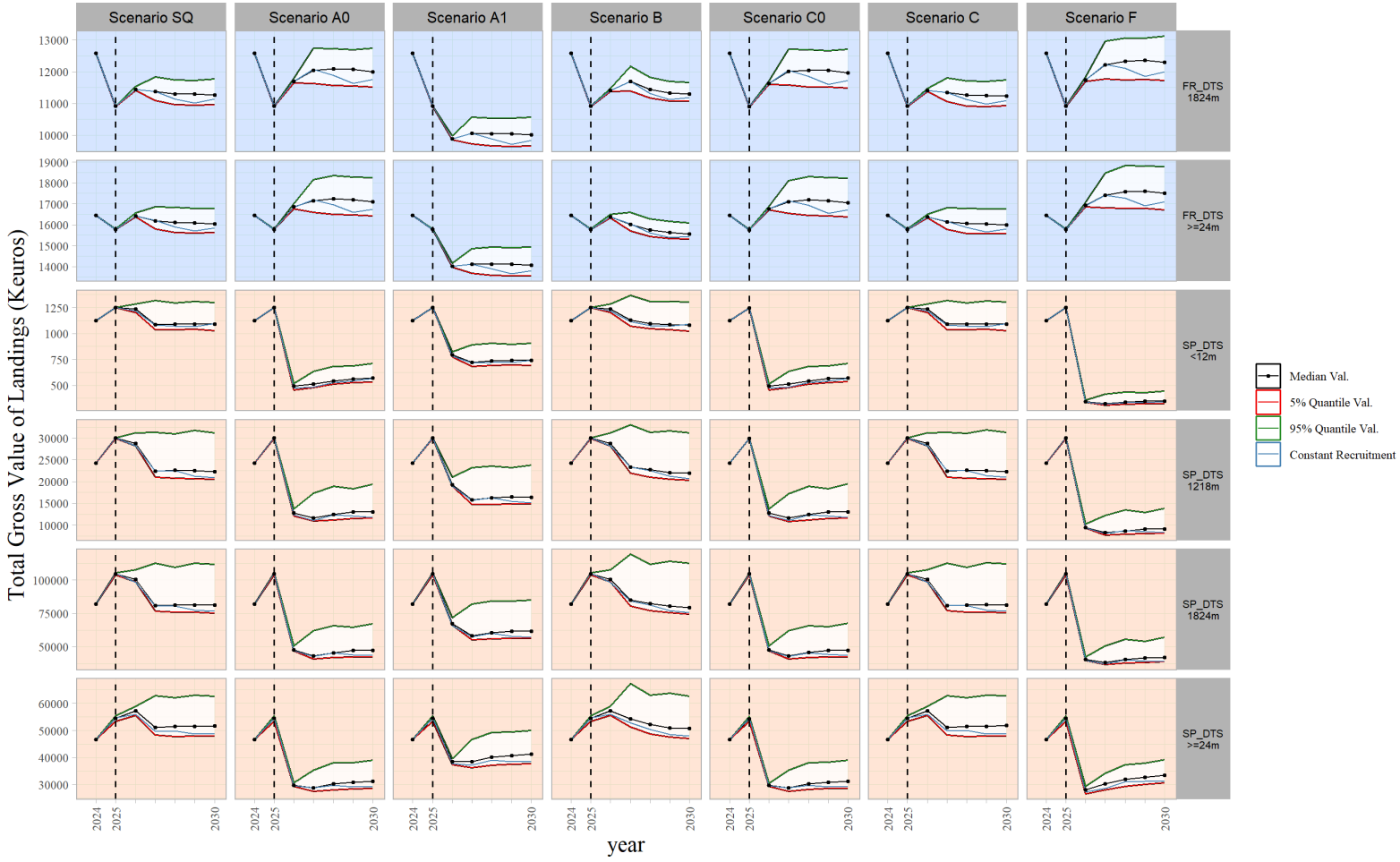


Figure 8.2.4 EMU1 (IAM model). Predicted median values for **Hake in GSAs 1-5-6-7 (HKE1567)** fishing mortality (left), SSB (middle) and total landings (right) under the eight alternative scenarios tested (in colours). Historical values are shown on the left of the first vertical black line, which indicates the year 2024, and the simulated values on the right of this first vertical line. The second vertical black line indicates the year 2025.

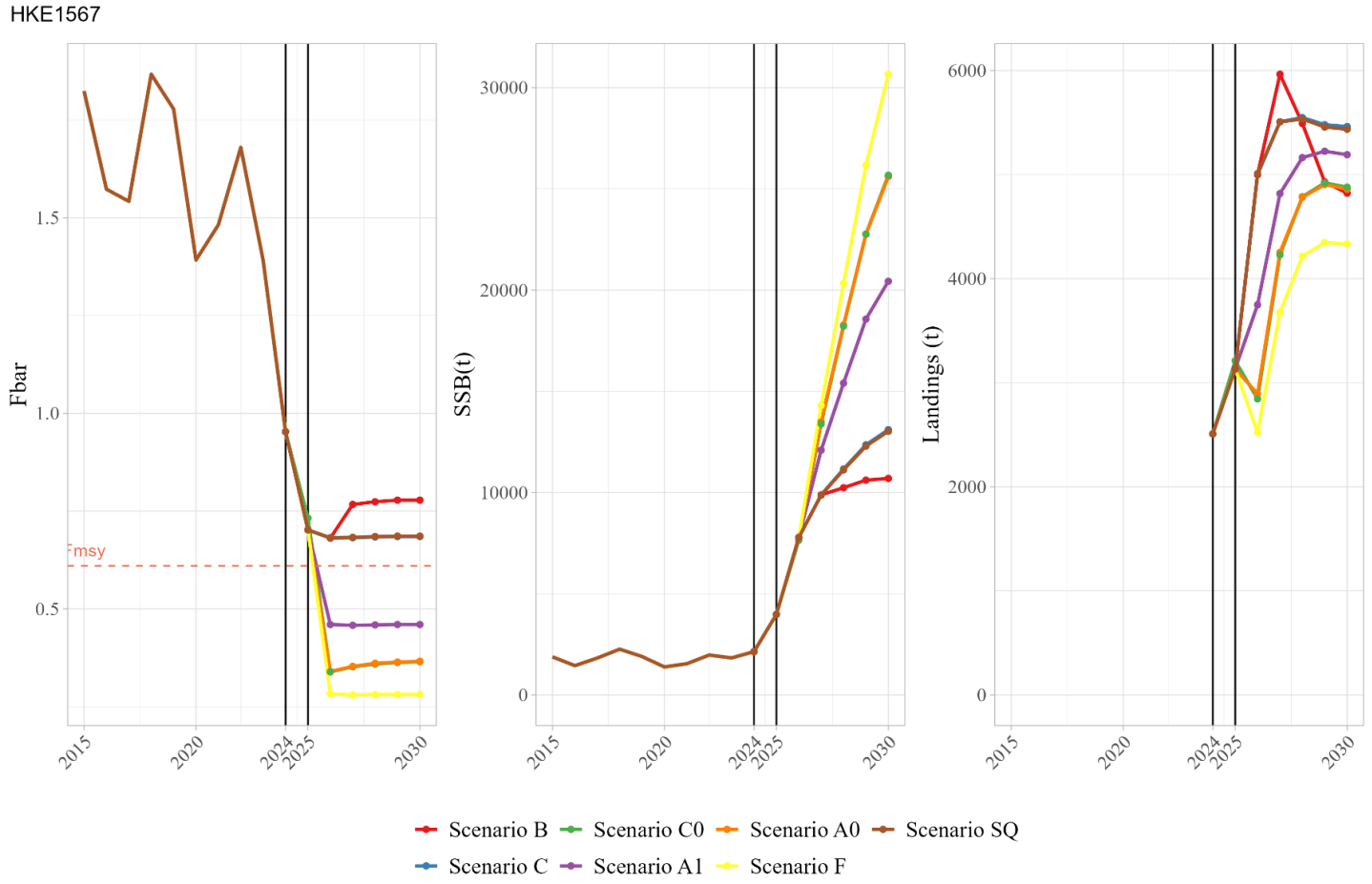


Figure 8.2.5 EMU1 (IAM model). Predicted median values for **red mullet GSA1 (MUT1)** fishing mortality (left), SSB (middle) and total landings (right) under the eight alternative scenarios tested (in colours). Historical values are shown on the left of the first vertical black line, which indicates the year 2024, and the simulated values on the right of this first vertical line. The second vertical black line indicates the year 2025.

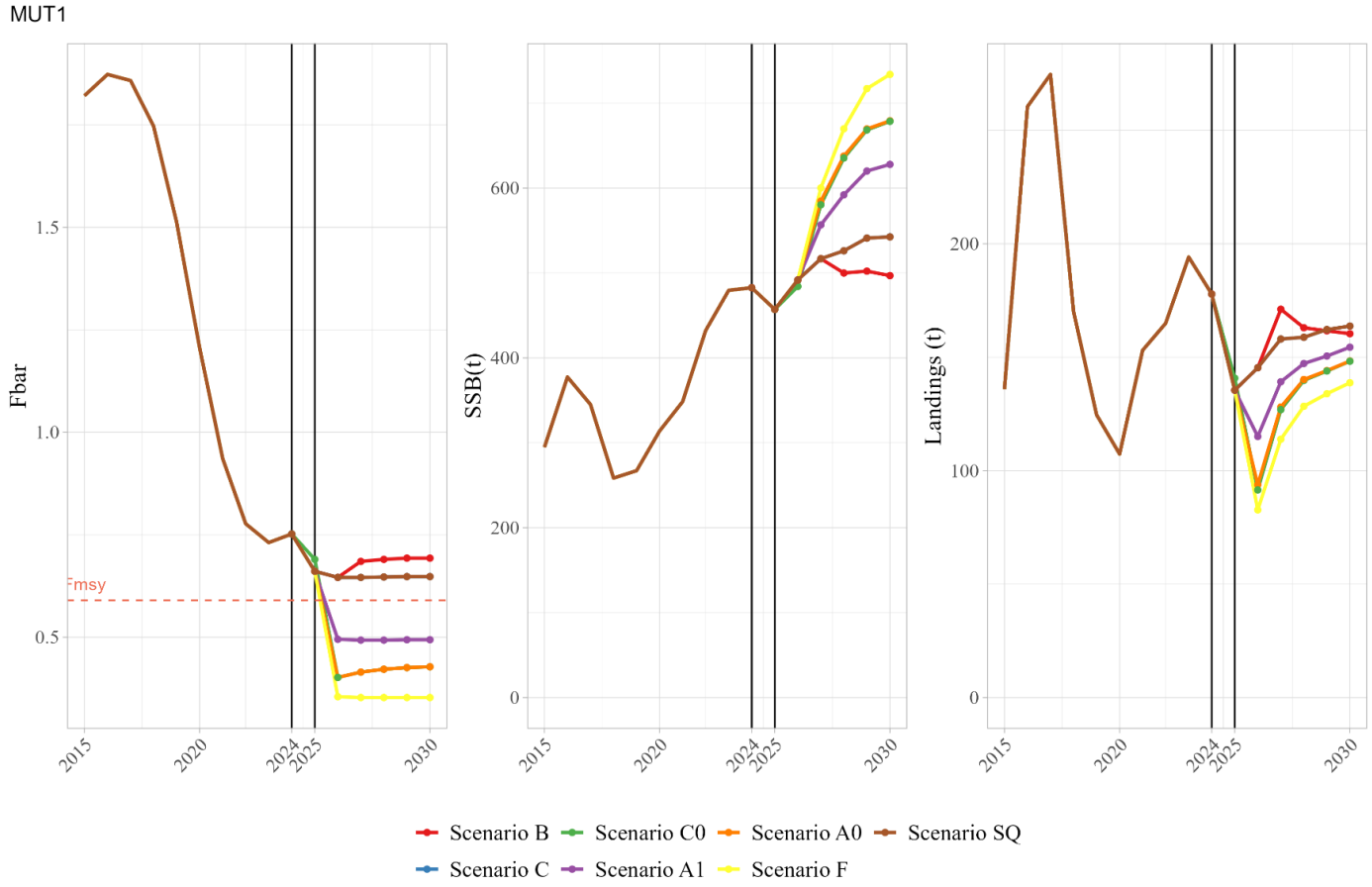


Figure 8.2.6 EMU1 (IAM model). Predicted median values for **red mullet GSA6 (MUT6)** fishing mortality (left), SSB (middle) and total landings (right) under the eight alternative scenarios tested (in colours). Historical values are shown on the left of the first vertical black line, which indicates the year 2024, and the simulated values on the right of this first vertical line. The second vertical black line indicates the year 2025.

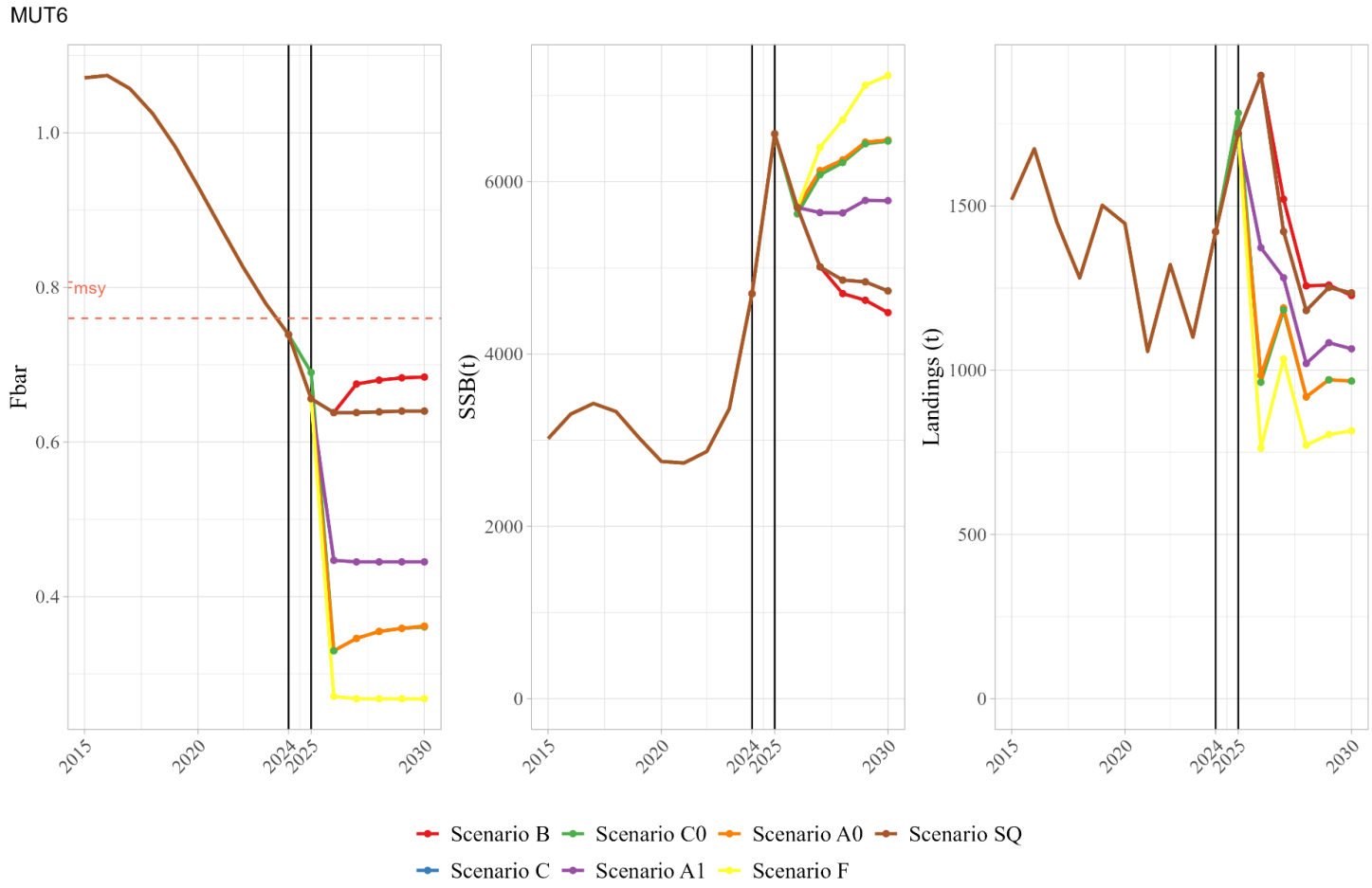


Figure 7.2.7 EMU1 (IAM model). Predicted median values for **Norway lobster GSA6 (NEP6)** fishing mortality (left), SSB (middle) and total landings (right) under the eight alternative scenarios tested (in colours). Historical values are shown on the left of the first vertical black line, which indicates the year 2024, and the simulated values on the right of this first vertical line. The second vertical black line indicates the year 2025.

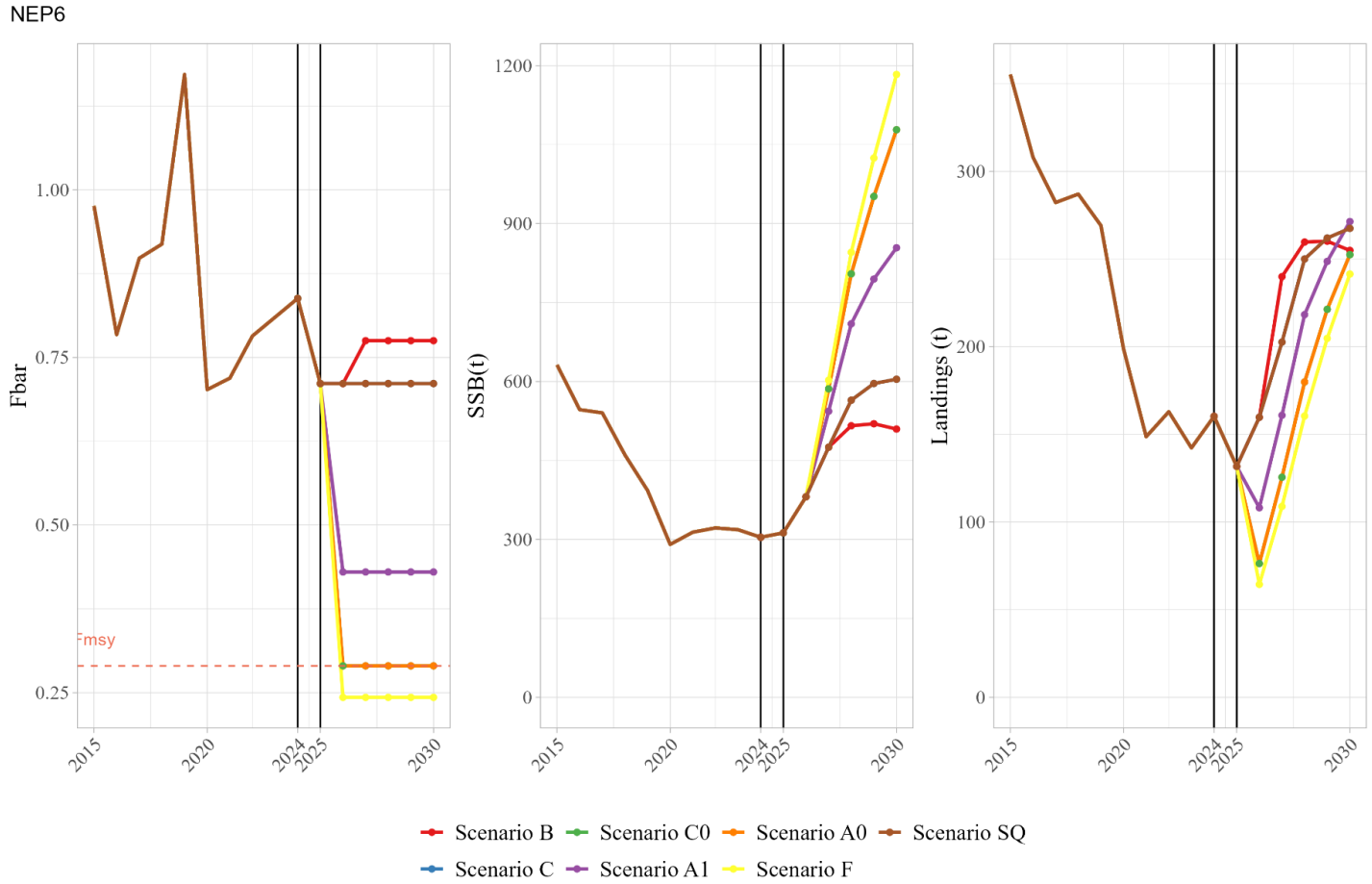


Figure 8.2.8 EMU1 (IAM model). Predicted median values for **blue and red shrimp GSAs1-2 (ARA12)** fishing mortality (left), SSB (middle) and total landings (right) under the eight alternative scenarios tested (in colours). Historical values are shown on the left of the first vertical black line, which indicates the year 2024, and the simulated values on the right of this first vertical line. The second vertical black line indicates the year 2025.

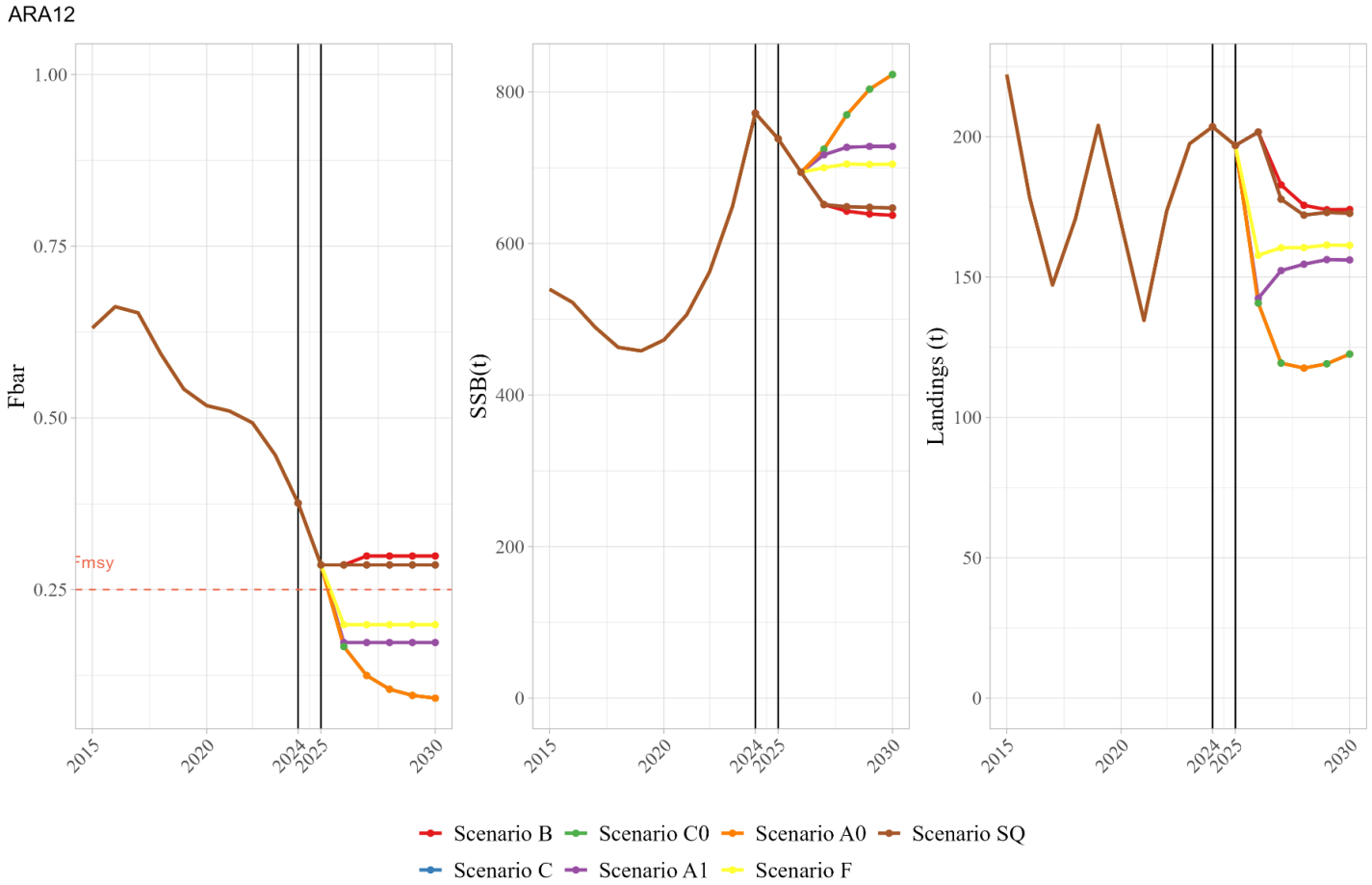


Figure 8.2.9 EMU1 (IAM model). Predicted median values for **blue and red shrimp GSAs6-7 (ARA67)** fishing mortality (left), SSB (middle) and total landings (right) under the eight alternative scenarios tested (in colours). SQrem corresponds to SQ_sel. Historical values are shown on the left of the first vertical black line, which indicates the year 2024, and the simulated values on the right of this first vertical line. The second vertical black line indicates the year 2025.

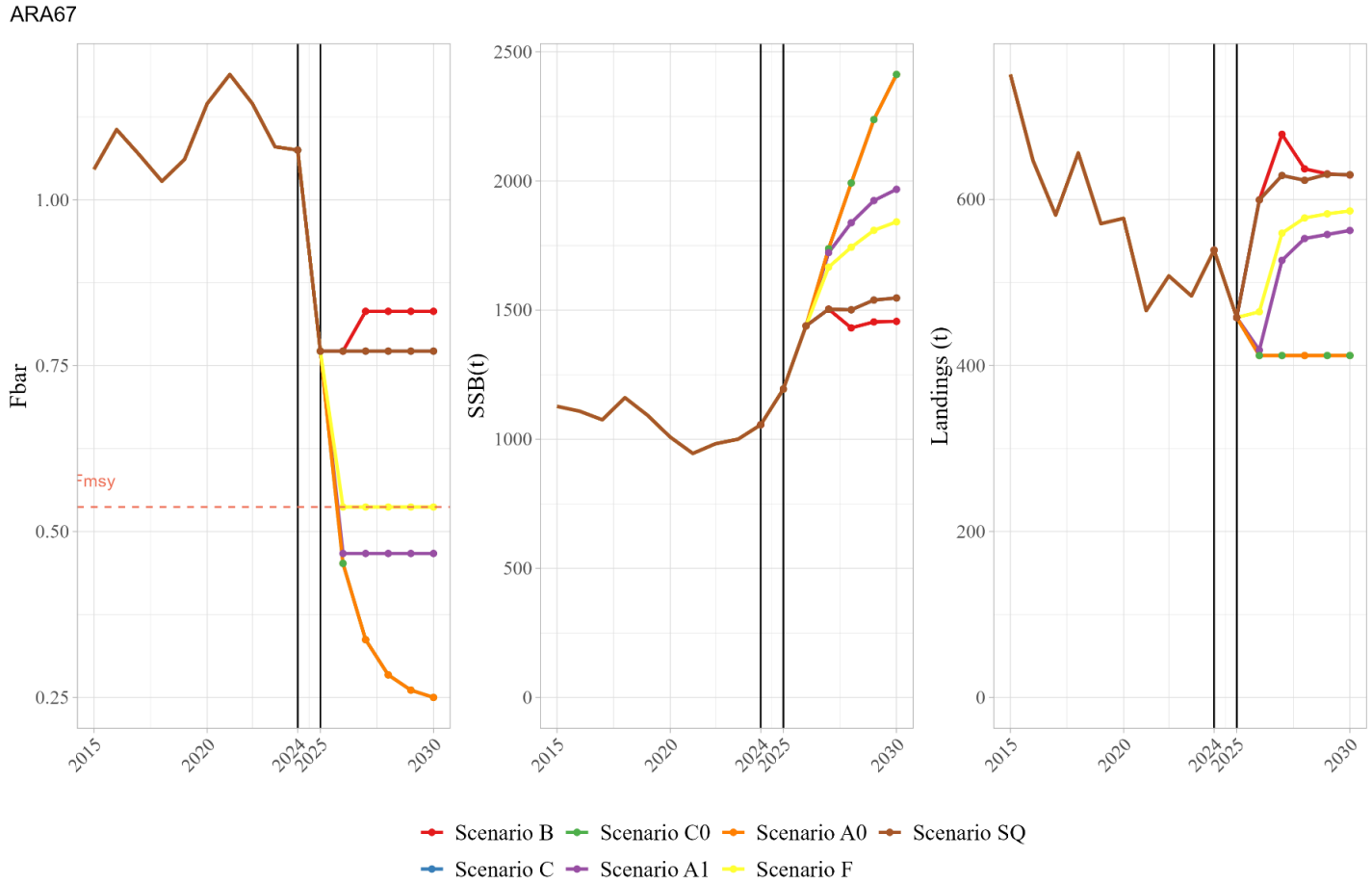


Figure 8.2.10 EMU1 (IAM model). Evolution of total **annual landings by age (in tonnes) of hake in GSAs1-5-6-7 (HKE1567)**, caught by French and Spanish trawlers (**DTS**), under various scenarios from 2024 to 2030. Scenarios are represented in columns, and ages in rows. The vertical black dotted lines mark the year 2025.

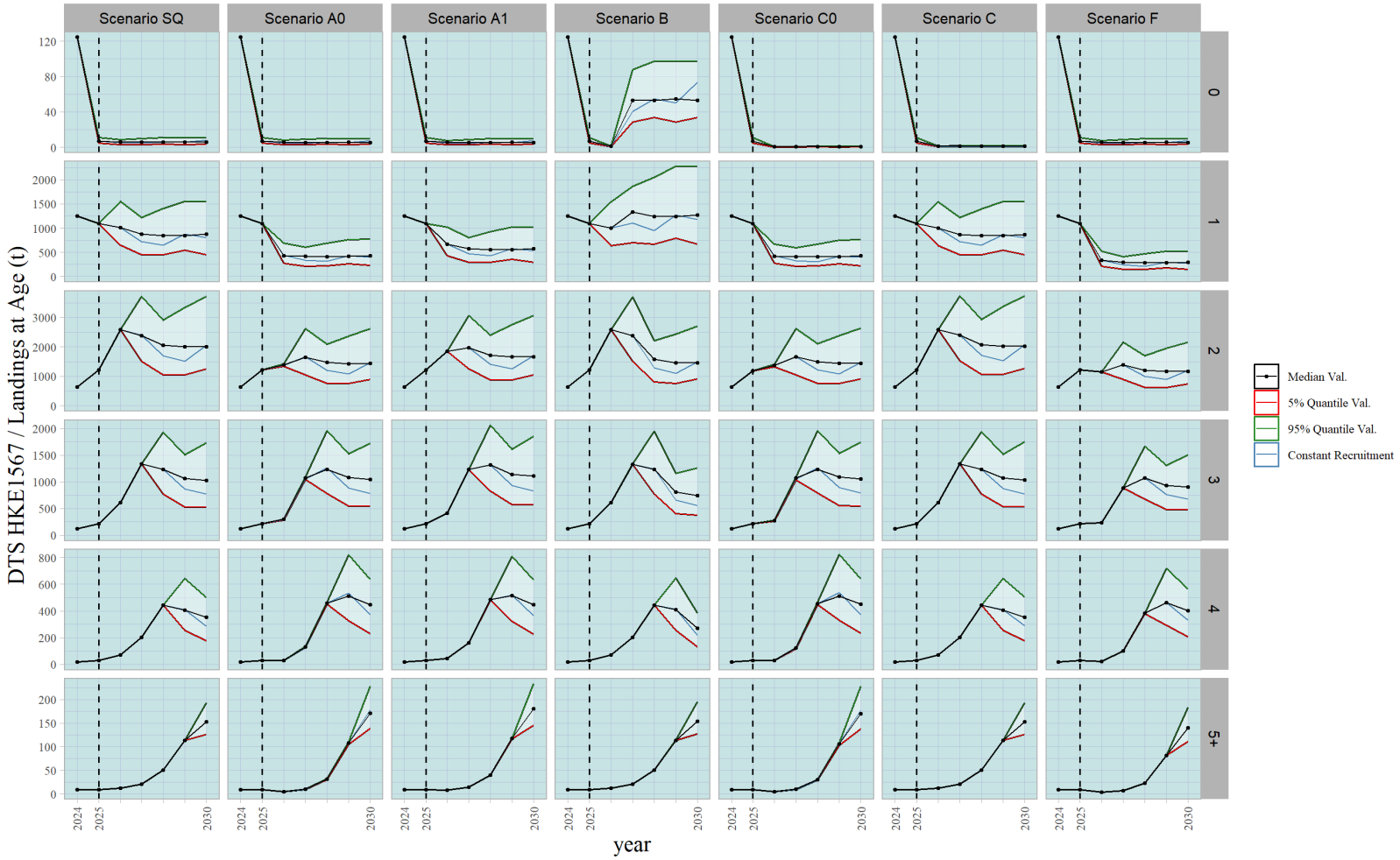


Figure 8.2.11 EMU1 (IAM model). Evolution of total **annual landings by age (in tonnes) of Nephrops in GSA6 (NEP6),** caught by French and Spanish trawlers (**DTS**), under various scenarios from 2024 to 2030. Scenarios are represented in columns, and ages in rows. The vertical black dotted lines mark the year 2025.

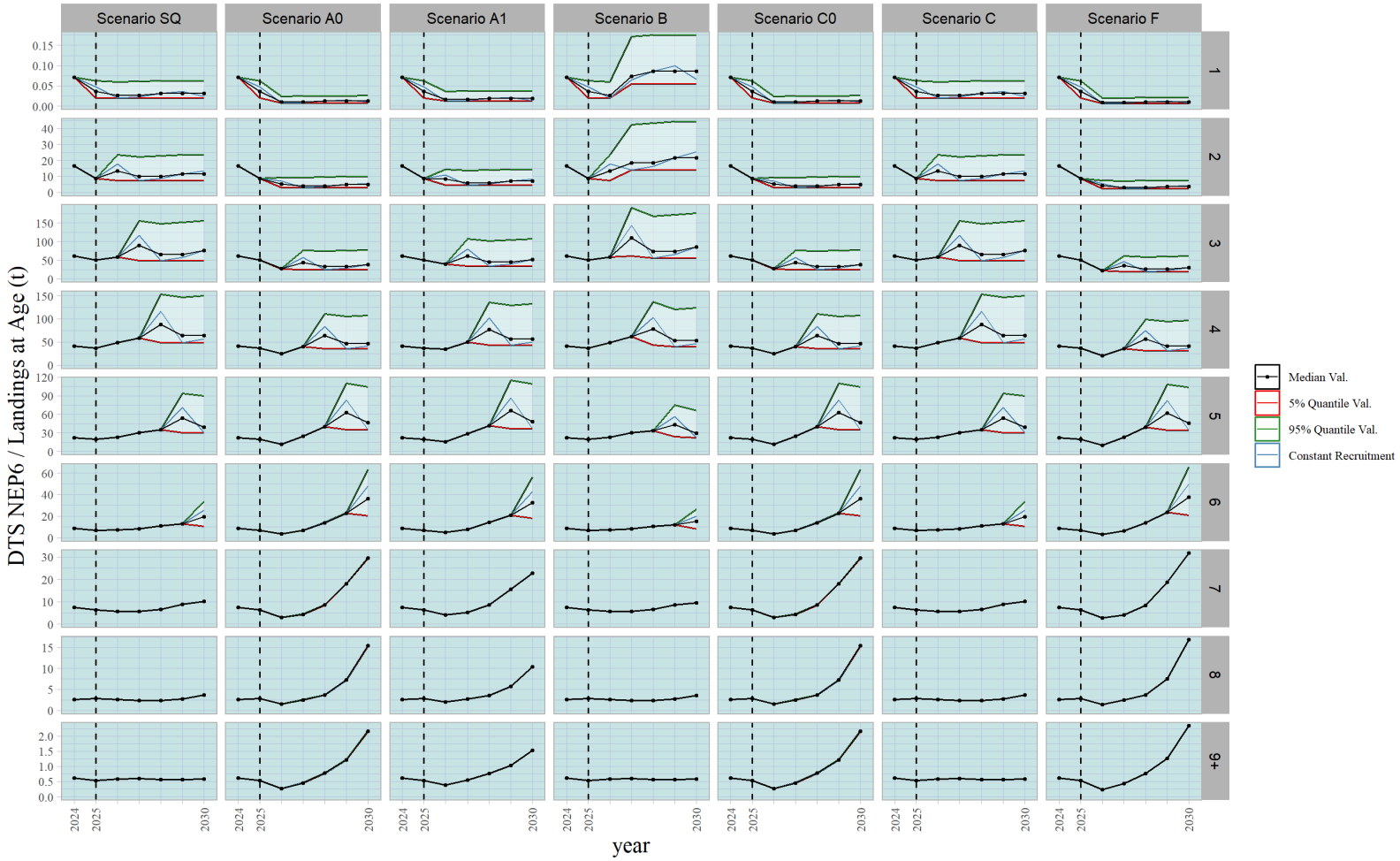


Figure 8.2.12 EMU1 (IAM model). Evolution of total **annual landings by age (in tonnes) of blue and red shrimps in GSAs1-2 (ARA12)**, caught by French and Spanish trawlers (**DTS**), under various scenarios from 2024 to 2030. Scenarios are represented in columns, and ages in rows. The vertical black dotted lines mark the year 2025.

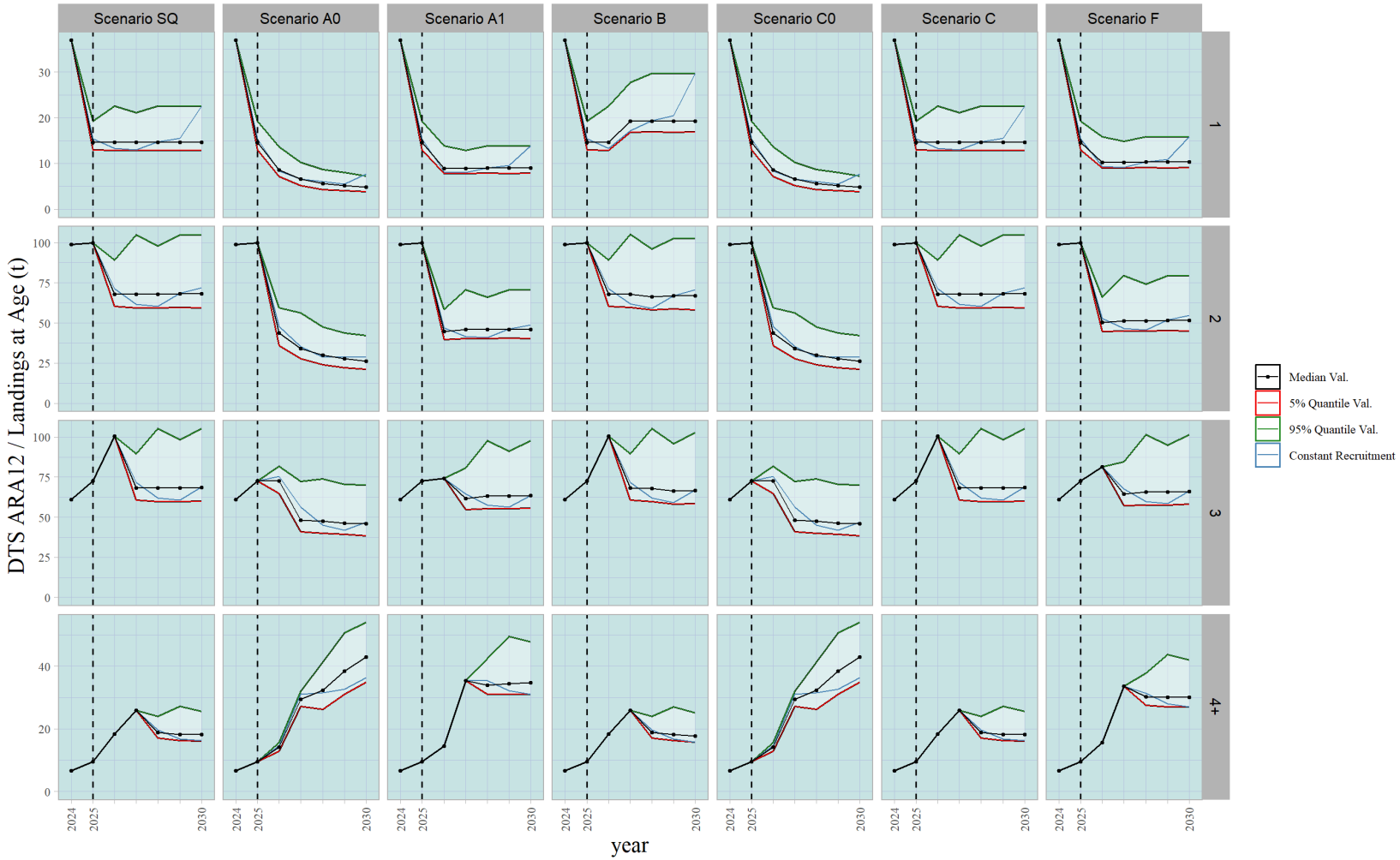


Figure 8.2.13 EMU1 (IAM model). Evolution of total **annual landings by age (in tonnes) of blue and red shrimps in GSAs6-7 (ARA67)**, caught by French and Spanish trawlers (**DTS**), under various scenarios from 2024 to 2030. Scenarios are represented in columns, and ages in rows. The vertical black dotted lines mark the year 2025.

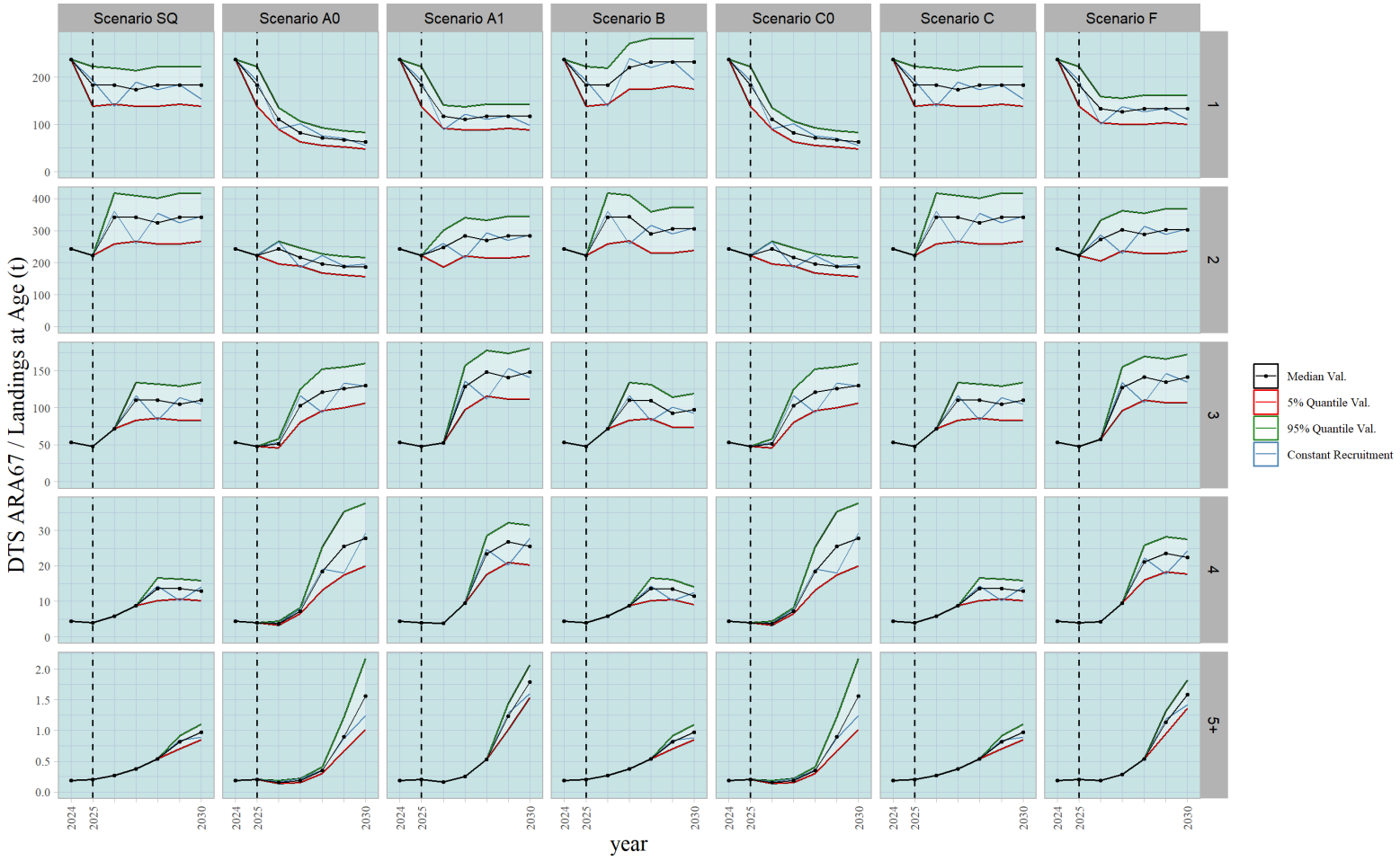


Table 8.2.1 EMU1 (IAM model). Estimated **total landings in 2026** (in tons) per stock by scenario. The median values are used. Single-stock catch advice for 2025 values are from EWG25-09.

Stock	Single-stock catch advice for 2026	Landings per scenario 2026 (in tons)						
		SQ	A0	A1	B	C0	C	F
HKE1567	3331.00	5009.2	2893.6	3748.7	4999.1	2844.6	4999.1	2521.8
ARA12	169.00	201.6	140.7	142.4	201.6	140.7	201.6	157.8
ARA67	384.00	599.4	411.9	418.3	599.4	411.9	599.4	464.5
NEP6	75.00	159.7	76.3	108.1	159.7	76.3	159.7	64.4
MUT1	136.00	145.4	93.8	115.1	145.4	91.5	145.4	82.7
MUT6	1949.00	1896.9	983.9	1372.8	1896.9	963.3	1896.9	762.8

Table 8.2.2 EMU1 (IAM model). Estimated **total landings in 2030** (in tons) per stock by scenario. The median values are used. Single-stock catch advice for 2025 values are from EWG25-09.

Stock	Single-stock catch advice for 2026	Landings per scenario 2030 (in tons)						
		SQ	A0	A1	B	C0	C	F
HKE1567	3331	5435.4	4860.8	5191.0	4821.1	4878.9	5461.5	4333.3

ARA12	169	172.7	122.6	156.1	174.1	122.6	172.7	161.3
ARA67	384	629.7	411.9	562.5	629.3	411.9	629.7	586.0
NEP6	75	267.5	252.5	271.4	254.9	252.5	267.5	241.4
MUT1	136	163.7	148.3	154.4	160.4	148.2	163.7	138.7
MUT6	1949	1235.4	967.0	1065.0	1227.4	966.7	1235.2	815.4

Table 8.2.3 EMU1 (IAM model). Estimated **Fbar in 2026** per stock by scenario. The median values are used. Single-stock advice F for 2025 values are from EWG25-09.

Stock	**Single-stock advice F for 2026**	**F(2026) resulting from scenario**						
		SQ	**A0**	**A1**	**B**	**C0**	**C**	**F**
HKE1567	0.61	0.68	0.34	0.46	0.68	0.34	0.68	0.28
ARA12	0.25	0.29	0.17	0.17	0.29	0.17	0.29	0.20
ARA67	0.54	0.77	0.45	0.47	0.77	0.45	0.77	0.54
NEP6	0.29	0.71	0.29	0.43	0.71	0.29	0.71	0.24
MUT1	0.59	0.65	0.40	0.49	0.65	0.40	0.65	0.36
MUT6	0.76	0.64	0.33	0.45	0.64	0.33	0.64	0.27
	F2026 <= Fmsy							
	Fmsy < F2026							

Table 8.2.4 EMU1 (IAM model). Estimated **Fbar in 2030** per stock by scenario. The median values are used. Single-stock advice F for 2025 values are from EWG25-09.

Stock	Single-stock advice F for 2026	F(2030) resulting from scenario						
		SQ	A0	A1	B	C0	C	F
HKE1567	0.61	0.69	0.37	0.46	0.78	0.36	0.68	0.28
ARA12	0.25	0.29	0.09	0.17	0.30	0.09	0.29	0.20
ARA67	0.54	0.77	0.25	0.47	0.83	0.25	0.77	0.54
NEP6	0.29	0.71	0.29	0.43	0.77	0.29	0.71	0.24
MUT1	0.59	0.65	0.43	0.49	0.69	0.43	0.65	0.35
MUT6	0.76	0.64	0.36	0.45	0.68	0.36	0.64	0.27
	F2030 < Fmsy							
	Fmsy < F2030							

Table 8.2.5 EMU1 (IAM model). Estimated **Spawning Stock Biomass (SSB) in 2026** (in tons) per stock by scenario. The median values are used. Single-stock advice SSB for 2026 values are from EWG25-09.

Stock	Single-stock advice SSB for 2026	SSB(2026) resulting from scenario						
		SQ	A0	A1	B	C0	C	F
HKE1567	29485	7780.4	7780.4	7780.4	7780.4	7643.6	7780.4	7780.4
ARA12	422	693.9	693.9	693.9	693.9	693.9	693.9	693.9
ARA67	1022	1438.5	1438.5	1438.5	1438.5	1438.5	1438.5	1438.5
NEP6	870	381.0	381.0	381.0	381.0	381.0	381.0	381.0
MUT1	301	491.8	491.8	491.8	491.8	484.1	491.8	491.8
MUT6	1926	5700.9	5700.9	5700.9	5700.9	5625.8	5700.9	5700.9

	SSB2026 >Bpa
	Blim < SSB2026 < Bpa
	SSB2026 < Blim

Table 8.2.6 EMU1 (IAM model). Estimated **Spawning Stock Biomass (SSB) in 2030** (in tons) per stock by scenario. The median values are used. Single-stock advice SSB for 2026 values are from EWG25-09.

Stock	Single-stock advice SSB for 2026	SSB(2030) resulting from scenario						
		SQ	A0	A1	B	C0	C	F
HKE1567	29485	13025.3	25603.3	20435.0	10697.4	25674.6	13103.7	30664.2
ARA12	422	646.8	822.8	728.1	637.2	822.9	646.8	704.7
ARA67	1022	1546.6	2412.1	1967.4	1456.0	2412.0	1546.7	1841.5
NEP6	870	604.3	1078.2	854.0	509.6	1078.1	604.3	1183.1
MUT1	301	542.5	679.2	627.9	496.9	678.6	542.6	733.8
MUT6	1926	4732.0	6483.5	5779.9	4480.9	6471.0	4732.5	7232.2

	SSB2030 >Bpa
	Blim < SSB2030 < Bpa
	SSB2030 < Blim

8.2.3. Socioeconomic indicators in IAM

IMPORTANT TO READ: please note that the important values, for some fleet segments, in terms of percentage of variation of landings of target species are primarily due to the relatively small initial landings of some species, especially hake (e.g., 0.24 tonnes for the Spanish HOK 06-12m in 2024, according to FDI data). As a result, while the percentage increase seems large, the actual change in the weight of landings is relatively minor in absolute terms. The same applies to variations in gross profit margin: when the initial value in 2024 is close to zero, a substantial increase or decrease results in a disproportionately high percentage change.

Table 8.2.7 EMU1 (IAM model). Socio-economic outputs **by fleet segments and country** and per scenarios in terms of estimated variations such as: percentage of change between 2024 and 2026, and between 2024 and 2030 of total landings of the target species (i.e., the five species of the plan), Gross Value Added, Gross Profit Margin, and Full Time Equivalent (FTE). The median values from simulations are used.

			LANDINGS		**GROSS VALUE ADDED**		**GROSS PROFIT MARGIN**		**FTE**	
Scenarios	**M S**	**Fleet segment**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
SQ	**ESP**	**DTS_ESP_inf12m**	29%	10%	37%	6%	461%	76%	0%	0%
		DTS_ESP_12-18m	59%	47%	43%	-6%	246%	-36%	0%	0%
		DTS_ESP_18-24m	68%	65%	54%	9%	740%	154%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fleet segment**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		DTS_ESP_sup24m	66%	66%	69%	41%	199%	129%	0%	0%
		DFN_ESP_6-12m	-27%	-42%	-61%	-62%	-1197%	-1218%	0%	0%
		DFN_ESP_12-18m	-16%	-27%	-63%	-61%	-1018%	-964%	0%	0%
		PMP_ESP_inf6m	71%	23%	3%	3%	12%	10%	0%	0%
		PMP_ESP_6-12m	-29%	-35%	-40%	-38%	-1683%	-1540%	0%	0%
		HOK_ESP_6-12m	377%	716%	2%	2%	3300%	4665%	0%	0%
	FRA	**DTS_FRA_18-24m**	-84%	-85%	-8%	-11%	-2%	-5%	-12%	-12%
		DTS_FRA_sup24m	-67%	-68%	7%	1%	634%	289%	-17%	-17%
		DFN_FRA_inf6m	380%	290%	1%	1%	6%	5%	0%	0%
		DFN_FRA_6-12m	70%	81%	-47%	-42%	-545%	-450%	0%	0%
		PGP_FRA_inf6m	384%	292%	5%	4%	20%	16%	0%	0%
		PGP_FRA_6-12m	63%	94%	-37%	-33%	-87%	-73%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fleet segment**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		HOK_FRA_6-12m	121%	289%	31%	103%	-2%	4%	0%	0%
A0	**ESP**	**DTS_ESP_inf12m**	-46%	-28%	-65%	-55%	-2100%	-1530%	0%	0%
		DTS_ESP_12-18m	-32%	4%	-43%	-44%	-500%	-512%	0%	0%
		DTS_ESP_18-24m	-24%	18%	-37%	-38%	-1001%	-1058%	0%	0%
		DTS_ESP_sup24m	-19%	16%	-29%	-18%	-202%	-137%	0%	0%
		DFN_ESP_6-12m	-17%	-32%	-62%	-68%	-1220%	-1489%	0%	0%
		DFN_ESP_12-18m	-7%	-21%	-63%	-69%	-1056%	-1283%	0%	0%
		PMP_ESP_inf6m	105%	74%	4%	4%	14%	13%	0%	0%
		PMP_ESP_6-12m	-21%	-20%	-41%	-42%	-1746%	-1847%	0%	0%
		HOK_ESP_6-12m	458%	1706%	2%	5%	3644%	9182%	0%	0%
	FRA	**DTS_FRA_18-24m**	-82%	-76%	-6%	-2%	1%	4%	-12%	-12%
		DTS_FRA_sup24m	-61%	-48%	14%	18%	973%	1167%	-17%	-17%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fleet segment**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		DFN_FRA_inf6m	475%	486%	1%	1%	6%	6%	0%	0%
		DFN_FRA_6-12m	62%	114%	-53%	-52%	-666%	-641%	0%	0%
		PGP_FRA_inf6m	480%	489%	6%	6%	23%	22%	0%	0%
		PGP_FRA_6-12m	53%	161%	-42%	-41%	-103%	-100%	0%	0%
		HOK_FRA_6-12m	127%	678%	28%	245%	-3%	15%	0%	0%
A1	**ESP**	**DTS_ESP_inf12m**	-13%	-12%	-22%	-33%	-458%	-722%	0%	0%
		DTS_ESP_12-18m	7%	25%	-7%	-29%	-34%	-257%	0%	0%
		DTS_ESP_18-24m	13%	42%	-2%	-15%	-18%	-318%	0%	0%
		DTS_ESP_sup24m	12%	44%	3%	17%	-8%	50%	0%	0%
		DFN_ESP_6-12m	-25%	-37%	-63%	-67%	-1276%	-1460%	0%	0%
		DFN_ESP_12-18m	-15%	-27%	-65%	-68%	-1107%	-1235%	0%	0%
		PMP_ESP_inf6m	90%	56%	4%	3%	14%	12%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fleet segment**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		PMP_ESP_6-12m	-28%	-28%	-42%	-42%	-1789%	-1814%	0%	0%
		HOK_ESP_6-12m	427%	1315%	2%	4%	3514%	7330%	0%	0%
	FRA	**DTS_FRA_18-24m**	-86%	-83%	-22%	-21%	-16%	-14%	-12%	-12%
		DTS_FRA_sup24m	-71%	-64%	-11%	-11%	-425%	-394%	-17%	-17%
		DFN_FRA_inf6m	440%	417%	1%	1%	6%	6%	0%	0%
		DFN_FRA_6-12m	74%	112%	-49%	-47%	-588%	-545%	0%	0%
		PGP_FRA_inf6m	445%	420%	6%	5%	22%	20%	0%	0%
		PGP_FRA_6-12m	66%	144%	-39%	-38%	-93%	-87%	0%	0%
		HOK_FRA_6-12m	132%	525%	32%	189%	-2%	11%	0%	0%
B	**ESP**	**DTS_ESP_inf12m**	29%	8%	37%	3%	461%	44%	0%	0%
		DTS_ESP_12-18m	59%	39%	43%	-9%	246%	-60%	0%	0%
		DTS_ESP_18-24m	68%	55%	54%	5%	740%	87%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fleet segment**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		DTS_ESP_sup24m	66%	57%	69%	36%	199%	115%	0%	0%
		DFN_ESP_6-12m	-27%	-40%	-61%	-55%	-1197%	-954%	0%	0%
		DFN_ESP_12-18m	-16%	-25%	-63%	-53%	-1018%	-706%	0%	0%
		PMP_ESP_inf6m	71%	8%	3%	2%	12%	9%	0%	0%
		PMP_ESP_6-12m	-29%	-32%	-40%	-32%	-1683%	-1196%	0%	0%
		HOK_ESP_6-12m	377%	519%	2%	2%	3300%	3943%	0%	0%
	FRA	**DTS_FRA_18-24m**	-86%	-88%	-9%	-10%	-3%	-7%	-12%	0%
		DTS_FRA_sup24m	-70%	-75%	6%	-10%	591%	-553%	-17%	0%
		DFN_FRA_inf6m	380%	188%	1%	1%	6%	5%	0%	0%
		DFN_FRA_6-12m	70%	70%	-47%	-33%	-545%	-318%	0%	0%
		PGP_FRA_inf6m	384%	189%	5%	3%	20%	13%	0%	0%
		PGP_FRA_6-12m	63%	81%	-37%	-26%	-87%	-53%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fleet segment**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		HOK_FRA_6-12m	121%	231%	31%	92%	-2%	4%	0%	0%
C0	**ESP**	**DTS_ESP_inf12m**	-46%	-28%	-65%	-55%	-2121%	-1525%	0%	0%
		DTS_ESP_12-18m	-33%	4%	-43%	-44%	-504%	-510%	0%	0%
		DTS_ESP_18-24m	-25%	18%	-37%	-38%	-1011%	-1050%	0%	0%
		DTS_ESP_sup24m	-20%	17%	-29%	-18%	-205%	-135%	0%	0%
		DFN_ESP_6-12m	-18%	-32%	-62%	-68%	-1217%	-1494%	0%	0%
		DFN_ESP_12-18m	-8%	-22%	-64%	-69%	-1057%	-1290%	0%	0%
		PMP_ESP_inf6m	102%	74%	4%	4%	14%	13%	0%	0%
		PMP_ESP_6-12m	-22%	-20%	-41%	-42%	-1754%	-1854%	0%	0%
		HOK_ESP_6-12m	435%	1719%	2%	5%	3554%	9225%	0%	0%
	FRA	**DTS_FRA_18-24m**	-83%	-77%	-6%	-2%	0%	4%	-12%	-12%
		DTS_FRA_sup24m	-65%	-51%	13%	17%	911%	1141%	-17%	-17%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fleet segment**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		DFN_FRA_inf6m	471%	491%	1%	1%	6%	6%	0%	0%
		DFN_FRA_6-12m	59%	114%	-53%	-52%	-673%	-643%	0%	0%
		PGP_FRA_inf6m	477%	494%	6%	6%	23%	23%	0%	0%
		PGP_FRA_6-12m	51%	162%	-42%	-41%	-103%	-100%	0%	0%
		HOK_FRA_6-12m	121%	681%	26%	246%	-3%	15%	0%	0%
C	**ESP**	**DTS_ESP_inf12m**	29%	11%	37%	6%	461%	79%	0%	0%
		DTS_ESP_12-18m	59%	48%	43%	-5%	246%	-34%	0%	0%
		DTS_ESP_18-24m	68%	66%	54%	9%	740%	159%	0%	0%
		DTS_ESP_sup24m	66%	66%	69%	42%	199%	130%	0%	0%
		DFN_ESP_6-12m	-27%	-42%	-61%	-62%	-1197%	-1225%	0%	0%
		DFN_ESP_12-18m	-16%	-28%	-63%	-61%	-1018%	-971%	0%	0%
		PMP_ESP_inf6m	71%	23%	3%	3%	12%	10%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fleet segment**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		PMP_ESP_6-12m	-29%	-35%	-40%	-38%	-1683%	-1549%	0%	0%
		HOK_ESP_6-12m	377%	723%	2%	2%	3300%	4687%	0%	0%
	FRA	**DTS_FRA_18-24m**	-86%	-86%	-9%	-11%	-3%	-5%	-12%	-12%
		DTS_FRA_sup24m	-70%	-70%	6%	0%	591%	250%	-17%	-17%
		DFN_FRA_inf6m	380%	293%	1%	1%	6%	5%	0%	0%
		DFN_FRA_6-12m	70%	82%	-47%	-42%	-545%	-453%	0%	0%
		PGP_FRA_inf6m	384%	295%	5%	4%	20%	16%	0%	0%
		PGP_FRA_6-12m	63%	95%	-37%	-33%	-87%	-73%	0%	0%
		HOK_FRA_6-12m	121%	291%	31%	104%	-2%	4%	0%	0%
F	**ESP**	**DTS_ESP_inf12m**	-61%	-54%	-86%	-86%	-3977%	-3928%	0%	0%
		DTS_ESP_12-18m	-50%	-27%	-62%	-65%	-992%	-1086%	0%	0%
		DTS_ESP_18-24m	-39%	-6%	-50%	-47%	-1638%	-1462%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fleet segment**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		DTS_ESP_sup24m	-29%	8%	-35%	-8%	-256%	-75%	0%	0%
		DFN_ESP_6-12m	-30%	-37%	-68%	-72%	-1486%	-1750%	0%	0%
		DFN_ESP_12-18m	-24%	-34%	-70%	-75%	-1346%	-1624%	0%	0%
		PMP_ESP_inf6m	111%	95%	4%	4%	15%	15%	0%	0%
		PMP_ESP_6-12m	-35%	-25%	-45%	-46%	-2029%	-2130%	0%	0%
		HOK_ESP_6-12m	473%	2127%	2%	6%	3709%	11046%	0%	0%
	FRA	**DTS_FRA_18-24m**	-81%	-72%	-5%	2%	1%	8%	-12%	-12%
		DTS_FRA_sup24m	-60%	-41%	15%	24%	1041%	1484%	-17%	-17%
		DFN_FRA_inf6m	495%	557%	1%	1%	6%	6%	0%	0%
		DFN_FRA_6-12m	38%	111%	-58%	-56%	-782%	-750%	0%	0%
		PGP_FRA_inf6m	501%	559%	6%	6%	24%	25%	0%	0%
		PGP_FRA_6-12m	29%	172%	-45%	-44%	-116%	-114%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fleet segment**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		HOK_FRA_6-12m	111%	831%	19%	302%	-4%	19%	0%	0%

Table 8.2.8 EMU1 (IAM model). Socio-economic outputs **by fishing techniques and country** and per scenarios in terms of estimated variations such as: percentage of change between 2024 and 2026, and between 2024 and 2030 of total landings of the target species (i.e., the five species of the plan), Gross Value Added, Gross Profit Margin, and Full Time Equivalent (FTE). The median values from simulations are used.

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fishing technique**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
SQ	**ESP**	**DTS**	62%	12%	56%	15%	1837%	577%	0%	0%
		DFN	-22%	-35%	-62%	-62%	-3883%	-3811%	0%	0%
		PMP	-25%	-33%	-37%	-35%	-2978%	-2739%	0%	0%
		HOK	377%	716%	2%	2%	3300%	4665%	0%	0%
	FRA	**DTS**	-8%	-15%	-2%	-6%	7%	-3%	-15%	-15%
		DFN	71%	82%	-38%	-34%	-373%	-313%	0%	0%
		PGP	78%	104%	-35%	-31%	-92%	-78%	0%	0%
		HOK	121%	289%	31%	103%	-2%	4%	0%	0%
A0	**ESP**	**DTS**	-22%	-20%	-36%	-34%	-2474%	-2324%	0%	0%
		DFN	-12%	-27%	-63%	-68%	-3994%	-4862%	0%	0%
		PMP	-15%	-16%	-38%	-39%	-3081%	-3255%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fishing technique**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		HOK	458%	1706%	2%	5%	3644%	9182%	0%	0%
	FRA	**DTS**	10%	39%	3%	6%	17%	25%	-15%	-15%
		DFN	64%	115%	-43%	-42%	-446%	-431%	0%	0%
		PGP	73%	176%	-39%	-38%	-109%	-106%	0%	0%
		HOK	127%	678%	28%	245%	-3%	15%	0%	0%
A1	**ESP**	**DTS**	13%	-3%	-1%	-9%	-94%	-497%	0%	0%
		DFN	-20%	-32%	-64%	-68%	-4180%	-4724%	0%	0%
		PMP	-23%	-25%	-39%	-39%	-3157%	-3202%	0%	0%
		HOK	427%	1315%	2%	4%	3514%	7330%	0%	0%
	FRA	**DTS**	-11%	3%	-17%	-16%	-29%	-26%	-15%	-15%
		DFN	76%	113%	-40%	-38%	-399%	-372%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fishing technique**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		PGP	84%	157%	-36%	-35%	-98%	-93%	0%	0%
		HOK	132%	524%	32%	189%	-2%	11%	0%	0%
B	**ESP**	**DTS**	62%	7%	56%	11%	1837%	422%	0%	0%
		DFN	-22%	-33%	-62%	-54%	-3883%	-2884%	0%	0%
		PMP	-25%	-30%	-37%	-29%	-2978%	-2143%	0%	0%
		HOK	377%	519%	2%	2%	3300%	3943%	0%	0%
	FRA	**DTS**	-10%	-41%	-2%	-10%	5%	-22%	-15%	0%
		DFN	71%	70%	-38%	-27%	-373%	-226%	0%	0%
		PGP	78%	86%	-35%	-24%	-92%	-57%	0%	0%
		HOK	121%	231%	31%	92%	-2%	4%	0%	0%
C0	**ESP**	**DTS**	-23%	-20%	-36%	-34%	-2499%	-2305%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**MS**	**Fishing technique**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		DFN	-13%	-27%	-63%	-68%	-3991%	-4883%	0%	0%
		PMP	-17%	-16%	-38%	-39%	-3094%	-3266%	0%	0%
		HOK	435%	1719%	2%	5%	3554%	9225%	0%	0%
	FRA	**DTS**	6%	36%	2%	6%	15%	24%	-15%	-15%
		DFN	61%	116%	-43%	-42%	-450%	-432%	0%	0%
		PGP	71%	177%	-39%	-38%	-108%	-106%	0%	0%
		HOK	121%	681%	26%	246%	-3%	15%	0%	0%
C	**ESP**	**DTS**	62%	12%	56%	15%	1837%	589%	0%	0%
		DFN	-22%	-35%	-62%	-62%	-3883%	-3835%	0%	0%
		PMP	-25%	-33%	-37%	-35%	-2978%	-2753%	0%	0%
		HOK	377%	723%	2%	2%	3300%	4687%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**M S**	**Fishing technique**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
	FRA	**DTS**	-10%	-17%	-2%	-6%	5%	-4%	-15%	-15%
		DFN	71%	82%	-38%	-34%	-373%	-315%	0%	0%
		PGP	78%	104%	-35%	-31%	-92%	-79%	0%	0%
		HOK	121%	291%	31%	104%	-2%	4%	0%	0%
F	**ESP**	**DTS**	-38%	-35%	-49%	-40%	-3880%	-2948%	0%	0%
		DFN	-27%	-35%	-69%	-74%	-4975%	-5927%	0%	0%
		PMP	-28%	-20%	-42%	-43%	-3559%	-3729%	0%	0%
		HOK	473%	2127%	2%	6%	3709%	11046%	0%	0%
	FRA	**DTS**	14%	59%	4%	11%	19%	35%	-15%	-15%
		DFN	40%	112%	-47%	-46%	-514%	-495%	0%	0%
		PGP	51%	190%	-42%	-41%	-122%	-119%	0%	0%

			LANDINGS		GROSS VALUE ADDED		GROSS PROFIT MARGIN		FTE	
Scenarios	**MS**	**Fishing technique**	Estimated % variation of landings of **target species** 2024-2026	Estimated % variation of landings of **target species** 2024-2030	Estimated % variation of GVA 2024-2026	Estimated % variation of GVA 2024-2030	Estimated % variation of profitability (gross profit margin) 2024-2026	Estimated % variation of profitability (gross profit margin) 2024-2030	Estimated % variation of FTE 2024-2026	Estimated % variation of FTE 2024-2030
		HOK	111%	831%	19%	302%	-4%	19%	0%	0%

Table 8.2.9 EMU1 (IAM model). Estimated number of fleet segments by fishing technique having an improved gross profit comparing the simulated gross profits in 2026 and in 2030 with the gross profits of 2024, or having **a positive gross profit** in 2026 and in 2030.

Scenarios	M S	Fishing technique	Estimated Number of fleet segments with IMPROVED GROSS PROFIT in 2026 compared to 2024	Estimated Number of fleet segments with IMPROVED GROSS PROFIT in 2030 compared to 2024	Estimated Number of fleet segments in green (POSITIVE GROSS PROFIT) in 2026	Estimated Number of fleet segments in green (POSITIVE GROSS PROFIT) in 2030	Total number of fleet segments considered in the model
SQ	ESP	DTS	4	3	4	3	4
		DFN	0	0	0	0	2
		PMP	1	1	1	1	2
		HOK	1	1	1	1	1
	FRA	DTS	1	1	2	2	2
		DFN	1	1	1	1	2
		PGP	1	1	1	1	2
		HOK	1	1	0	0	1
A0	ESP	DTS	0	0	0	0	4
		DFN	0	0	0	0	2
		PMP	1	1	1	1	2
		HOK	1	1	1	1	1

Scenarios	M S	Fishing technique	Estimated Number of fleet segments with IMPROVED GROSS PROFIT in 2026 compared to 2024	Estimated Number of fleet segments with IMPROVED GROSS PROFIT in 2030 compared to 2024	Estimated Number of fleet segments in green (POSITIVE GROSS PROFIT) in 2026	Estimated Number of fleet segments in green (POSITIVE GROSS PROFIT) in 2030	Total number of fleet segments considered in the model
	FRA	**DTS**	1	1	2	2	2
		DFN	1	1	1	1	2
		PGP	1	1	0	0	2
		HOK	1	1	0	0	1
A1	ESP	**DTS**	1	1	2	0	4
		DFN	0	0	0	0	2
		PMP	1	1	1	1	2
		HOK	1	1	1	1	1
	FRA	**DTS**	0	0	1	1	2
		DFN	1	1	1	1	2
		PGP	1	1	1	1	2
		HOK	1	1	0	0	1
B	ESP	**DTS**	4	3	4	3	4
		DFN	0	0	0	0	2

Scenarios	M S	Fishing technique	Estimated Number of fleet segments with IMPROVED GROSS PROFIT in 2026 compared to 2024	Estimated Number of fleet segments with IMPROVED GROSS PROFIT in 2030 compared to 2024	Estimated Number of fleet segments in green (POSITIVE GROSS PROFIT) in 2026	Estimated Number of fleet segments in green (POSITIVE GROSS PROFIT) in 2030	Total number of fleet segments considered in the model
		PMP	1	1	1	1	2
		HOK	1	1	1	1	1
	FRA	**DTS**	1	0	2	1	2
		DFN	1	1	1	1	2
		PGP	1	1	1	1	2
		HOK	1	1	0	0	1
C0	**ESP**	**DTS**	0	0	0	0	4
		DFN	0	0	0	0	2
		PMP	1	1	1	1	2
		HOK	1	1	1	1	1
	FRA	**DTS**	1	1	2	2	2
		DFN	1	1	1	1	2
		PGP	1	1	0	0	2
		HOK	1	1	0	0	1

Scenarios	M S	Fishing technique	Estimated Number of fleet segments with IMPROVED GROSS PROFIT in 2026 compared to 2024	Estimated Number of fleet segments with IMPROVED GROSS PROFIT in 2030 compared to 2024	Estimated Number of fleet segments in green (POSITIVE GROSS PROFIT) in 2026	Estimated Number of fleet segments in green (POSITIVE GROSS PROFIT) in 2030	Total number of fleet segments considered in the model
C	ESP	DTS	4	3	4	3	4
		DFN	0	0	0	0	2
		PMP	1	1	1	1	2
		HOK	1	1	1	1	1
	FRA	DTS	1	1	2	2	2
		DFN	1	1	1	1	2
		PGP	1	1	1	1	2
		HOK	1	1	0	0	1
F	ESP	DTS	0	0	0	0	4
		DFN	0	0	0	0	2
		PMP	1	1	1	1	2
		HOK	1	1	1	1	1
	FRA	DTS	1	2	2	2	2
		DFN	1	1	1	1	2

Scenarios	M S	Fishing technique	Estimated Number of fleet segments with IMPROVED GROSS PROFIT in 2026 compared to 2024	Estimated Number of fleet segments with IMPROVED GROSS PROFIT in 2030 compared to 2024	Estimated Number of fleet segments in green (POSITIVE GROSS PROFIT) in 2026	Estimated Number of fleet segments in green (POSITIVE GROSS PROFIT) in 2030	Total number of fleet segments considered in the model
		PGP	1	1	0	0	2
		HOK	1	1	0	0	1

The percentage of reduction of effort between 2024 (regulation + compensation mechanisms) and 2025 are presented in Table 8.2.10 and 8.2.13 by fishing techniques and country and by DTS fleet segment, respectively. For a comparison between the 2024 effort from regulation with the compensation mechanism (+4.5% of baseline), the 2024 fishing effort from regulation without the compensation mechanism (as specified in the regulation document), and the 2024 effort simulated in IAM (which applies the maximum effort allowed under regulation +4.5% of baseline while accounting for MCL on ARA for Spanish DTS), refer to Table 8.2.14.

Table 8.2.10 EMU1 (IAM model). Estimated percentage of reduction in fishing effort by fishing technique and country, comparing the simulated effort in **2026** with the 2024 efforts (from the FDI database). Median values (from 250 trajectories) are used for the 2026 fishing efforts.

Scenarios	Estimated percentage of reduction between IAM effort 2026 and real effort 2024 (FDI)							
	ESP				FRA			
	DTS	DFN	PMP	HOK	DTS	DFN	PGP	HOK
SQ	-7.50%	-59.97%	-40.69%	0.00%	2.07%	-39.43%	-37.95%	-7.41%
A0	-62.60%	-61.56%	-41.92%	0.00%	2.07%	-43.71%	-42.03%	-8.20%
A1	-44.00%	-62.11%	-42.30%	0.00%	-13.49%	-41.23%	-39.68%	-7.75%
B1	-7.50%	-59.97%	-40.69%	0.00%	2.07%	-39.43%	-37.95%	-7.41%
C0	-62.60%	-61.47%	-41.98%	0.00%	2.07%	-43.87%	-42.00%	-8.19%
C	-7.50%	-59.97%	-40.69%	0.00%	2.07%	-39.43%	-37.95%	-7.41%
F	-69.08%	-66.12%	-45.36%	0.00%	2.07%	-46.71%	-44.87%	-8.75%

Table 8.2.11 EMU1 (IAM model). Estimated percentage of reduction in fishing effort by fishing technique and country, comparing the simulated effort in **2030** with the 2024 efforts (from the FDI database). Median values (from 250 trajectories) are used for the 2030 fishing efforts.

Scenarios	Estimated percentage of reduction between IAM effort 2030 and real effort 2024 (FDI)							
	ESP				FRA			
	DTS	DFN	PMP	HOK	DTS	DFN	PGP	HOK
SQ	-7.50%	-58.62%	-38.51%	0.00%	2.07%	-35.56%	-34.28%	-6.70%
A0	-62.04%	-65.87%	-43.91%	0.00%	2.07%	-44.13%	-42.43%	-8.28%
A1	-44.00%	-64.68%	-43.03%	0.00%	-13.49%	-40.53%	-39.01%	-7.62%
B1	-7.50%	-51.13%	-32.70%	0.00%	2.52%	-28.38%	-27.44%	-5.37%
C0	-62.04%	-65.98%	-44.00%	0.00%	2.07%	-44.22%	-42.52%	-8.29%
C	-7.50%	-58.79%	-38.64%	0.00%	2.07%	-35.72%	-34.43%	-6.73%
F	-69.08%	-70.27%	-47.55%	0.00%	2.07%	-47.54%	-45.65%	-8.90%

Table 8.2.12 7.1.2.12 EMU1 (IAM model). Estimated percentage of reduction in fishing effort for DTS by country between the simulated effort in **2026 and the fishing effort from the regulation of 2024** (FO2024). Median values (from 250 trajectories) are used for the 2026 fishing efforts.

Scenarios	Estimated percentage of reduction between IAM effort 2026 and effort regulation 2024 (FO2024)	
	ESP	FRA
	DTS	DTS
SQ	0%	0%
A0	-59.53%	0%
A1	-39.41%	-15.61%
B1	0%	0%
C0	-59.53%	0%
C	0%	0%
F	-66.54%	0%

Table 8.2.13 7.1.2.13 EMU1 (IAM model). Estimated percentage of reduction in fishing effort for DTS fleets by country between the simulated effort in **2026** and the fishing effort from the regulation in 2024 (**FO2024**). Median values (from 250 trajectories) are used for the 2026 fishing efforts. The table distinguishes between deep-water trawling and demersal trawling for the Spanish DTS fleet segments, in line with the regulation table.

		Estimated percentage of reduction between IAM effort 2026 and effort 2024 regulation (F02024)						
		SQ	A0	A1	B	C0	C	F
DTS_FRA_18-24m		0%	0%	-13.29%	0%	0%	0%	0%
DTS_FRA_sup24m		0%	0%	-17.52%	0%	0%	0%	0%
DTS_ESP_inf12m		0%	-63.28%	-38.62%	0%	-63.28%	0%	-74.79%
DTS_ESP_12-18m	SP_OTB_OTH	0%	-64.14%	-39.50%	0%	-64.14%	0%	-75.65%
DTS_ESP_18-24m	SP_OTB_OTH	0%	-64.14%	-39.50%	0%	-64.14%	0%	-75.65%
DTS_ESP_sup24m	SP_OTB_OTH	0%	-64.14%	-39.50%	0%	-64.14%	0%	-75.65%
DTS_ESP_12-18m	SP_OTB_deep	0%	-41.43%	-39.46%	0%	-41.43%	0%	-30.39%
DTS_ESP_18-24m	SP_OTB_deep	0%	-41.43%	-39.50%	0%	-41.43%	0%	-30.39%
DTS_ESP_sup24m	SP_OTB_deep	0%	-41.43%	-39.49%	0%	-41.43%	0%	-30.39%

Table 8.2.14 7.1.2.14 EMU1 (IAM model). Estimated percentage of reduction in fishing effort for DTS by country between the simulated effort in **2030** and the fishing effort allowed from the regulation in 2024 (**FO2024**). Median values (from 250 trajectories) are used for the 2025 fishing efforts. The table distinguishes between deep-water trawling and demersal trawling for the Spanish DTS fleet segments, in line with the regulation table.

		Estimated percentage of reduction between IAM effort 2030 and effort 2024 regulation (FO2024)						
		SQ	A0	A1	B	C0	C	F
DTS_FRA_18-24m		0%	0%	-13%	0%	0%	0%	0%
DTS_FRA_sup24m		0%	0%	-18%	0%	0%	0%	0%
DTS_ESP_inf12m		0%	-56%	-38.62%	0%	-56%	0%	-74.79%
DTS_ESP_12-18m	SP_OTB_OTH	0%	-56.86%	-39.50%	0%	-56.86%	0%	-75.65%
DTS_ESP_18-24m	SP_OTB_OTH	0%	-56.86%	-39.50%	0%	-56.86%	0%	-75.65%
DTS_ESP_sup24m	SP_OTB_OTH	0%	-56.86%	-39.50%	0%	-56.86%	0%	-75.65%
DTS_ESP_12-18m	SP_OTB_deep	0%	-67.65%	-39.46%	0%	-67.65%	0%	-30.39%
DTS_ESP_18-24m	SP_OTB_deep	0%	-67.65%	-39.50%	0%	-67.65%	0%	-30.39%
DTS_ESP_sup24m	SP_OTB_deep	0%	-67.65%	-39.49%	0%	-67.65%	0%	-30.39%

8.2.4. General considerations using IAM in EMU1

Several general points when interpreting these results should be considered. As said in EWG 21-13, EWG 23-11 and EWG24-12, it is important to note that landings per unit of effort of other species (than the ones that are explicitly modelled) are assumed constant in time. Consequently, potential positive impacts of effort reduction on those other stock biomasses are not simulated and total landings might thus be underestimated. As the proportion of the landings of these other species are very high for most fleet segments, the negative economic impacts of the effort reduction management scenarios displayed might be overestimated in our simulations. This is true especially in the long run, as positive effect of effort reduction in stock biomasses are not instantaneous.

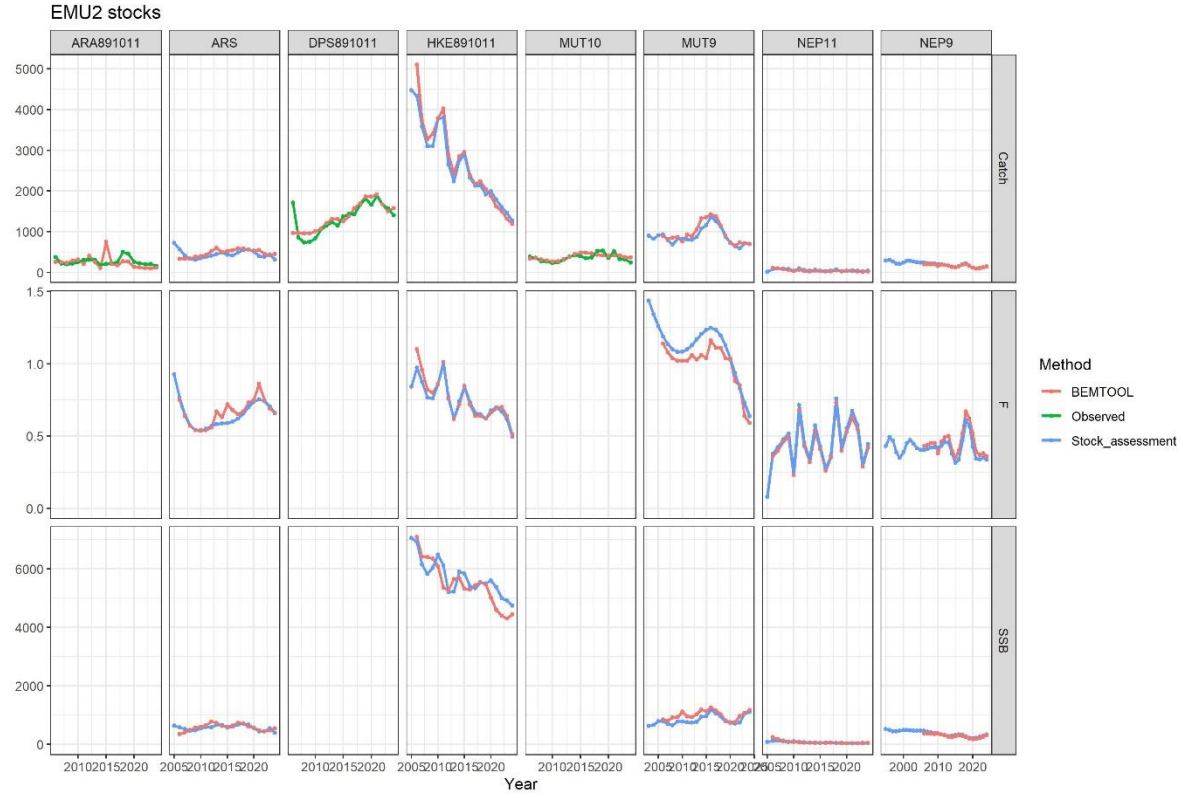
It is also important to note that estimates of crew costs are not completely satisfactory, due to lack of data and information, and doubts regarding the accuracy of crew share estimates by fleet segment. Crew costs are estimated as a share of "“what remains to be shared” (i.e., GVL less exploitation costs), with a minimum threshold based on national minimum wage information. These concerns regarding the estimations of crew costs are important to keep in mind when analysing outcomes such as Gross Profit and Gross Profit margin.

It is also important to note that the IAM model assumes an "average" vessel for each fleet segment, but in practice, there is considerable heterogeneity within these segments. Vessels within the same fleet segment do not have identical fishing patterns, gear usages, costs, or economic dependencies on specific stocks. As a result, the estimated impacts of management measures will not be uniformly distributed across vessels. Some vessels may experience stronger reductions in effort or revenues than the average estimates suggest, while others may be less affected. This can lead to an inaccurate representation of the impact of regulations, as not all vessels within a segment are equally affected.

8.3. BEMTOOL in EMU2

The results of the stock assessment for the 8 considered stocks have been replicated in BEMTOOL, considering the effort by metier for each fleet segment. The comparison of F, SSB and Catch showed a good level of agreement between BEMTOOL with the outcomes of the STECF EWG 25-09, where present (Figure 8.3.1).

Figure 8.3.1. Comparison between stock assessment results (turquoise lines) and BEMTOOL estimates (pink lines) on F, SSB and Catch for ARS 9-10-11, NEP9, NEP11, HKE 8-9-10-11 and MUT9. For MUT10, DPS8-9-10-11 and ARA9-10-11 the simulated and the observed landing is compared.



Source: own elaborations.

8.3.1. Stock status outcomes in BEMTOOL

The projections of spawning stock biomass (SSB) across scenarios are illustrated in Figure 8.3.2. For European hake, the results indicate that all scenarios, including the SQ allows to maintain an SSB level well above Blim, with scenarios B and F allowing to reach in 2-3 years the Bpa level.

For ARS and DPS, SSB levels exceed Bpa across all explored scenarios, being the stocks currently already within the biomass reference levels. For MUT9, MUT10 and NEP9, SSB is expected to rise steadily in scenarios B and F, whereas in SQ, B0, and F0 it stabilizes from 2026 onward because catch limits on ARS and ARA shift fishing effort from deep-water grounds toward coastal areas. For NEP11, under scenarios B and F the SSB rises steadily and reaches Bpa, while under SQ, B0, and F0 it is expected to decline gradually toward Blim from 2026 onward, as ARS and ARA catch limits shift effort from deep-water grounds to coastal areas. For exact values see electronic Appendix XXX.

In Figure 8.3.3 is shown the fishing mortality for each stock modelled for all scenarios with F target equal to F_{MSY}. The scenarios B and F are designed with the objective to reach F_{MSY} for Norway by 2026. For exact values see electronic Appendix XXX.

The projections of ARS and ARA fishing mortality, with catches regulated by the catch limits, show that maintaining the current catch limit constant since 2025 to 2028 would reduce the F below the Fmsy, highlighting the importance of updating and possibly increasing yearly the catch limit proportionally to the improvement in the stocks status. Figure 8.3.4 shows that the model underestimates ARA catches in recent years and therefore simulates catches at roughly half the catch limit, underscoring the need for an analytical assessment to better inform the model.

Moreover, the results of MUT9, MUT10 and DPS show that the underutilization of such stocks would be more evident for scenarios B and F respect to the other tested scenarios. Moreover, these two scenarios would determine an underutilization also of HKE. This is also shown in Figure 8.3.3, reporting the catch for each stock and scenario values are in Appendix XXX.

Figures 8.3.5 illustrates the total number of fishing days per fishing technique and GSA for scenarios SQ, B0,B,F0 and F0. In the SQ, B0 and F0 scenarios the trawlers are impacted by the catch limits of red shrimps that regulates the effort of OTB_DWS and OTB_MDD and the effort is set to a level similar to 2024, thus increased respect to 2025. The PGP and HOK are regulated through catch limits on nets and effort quotas for longlines, following the scenarios specification. The scenarios B and F importantly impacts on the OTB_DEF effort to reach the FMSY of Norway lobster, with a -80% of reduction in the fishing days. Scenarios B and B0 introduced a temporary (only in 2026) selectivity improvement (from 40 mm to 45 mm square mesh size). The total number of fishing days takes into account the reduction in the number of vessels foreseen by the scrapping regulation.

8.3.2. Socioeconomic outcomes in BEMTOOL

Figures 8.3.6 presents the total revenues (target stock + other species) by fishing technique and GSA across the scenarios. Across all GSAs, DTS revenues are projected to decline—especially in the short term—under scenarios B and F due to the reduction in fishing days, whereas PGP and HOK are expected to benefit from this trawler-specific measure.

Projections of Gross Value Added (GVA) show that, for DTS in GSAs 9 and 10, the status quo (SQ) scenario yields the highest values, followed by B0 and F0. In GSA 11, however, scenarios B and F perform better. For PGP and HOK across all sub-areas, scenario B—which imposes the largest reduction in trawler effort and a temporary improvement in selectivity—delivers the best outcomes (Figure 8.3.7). Gross Profit Margin (GPM) exhibits the same pattern (Figure 8.3.8).

Figures 8.3.9 shows the number of full-time equivalents (FTE) by GSA and fishing technique across the explored scenarios. The trends mirror those of the number of fishing days, reflecting the underlying assumption that FTE is dependent on fishing effort.

In Tables 8.3.1, 8.3.2 are reported the estimated variation of landings (target species), GVA GPM and FTE in 2026 and 2030 (respectively) respect to 2020.

For HOK, all scenarios show improvements across all socio-economic indicators in both 2026 and 2030. For DTS, the 2026 decline is smallest under status quo (SQ) (about −14% relative to 2020), while other scenarios see GVA drops of roughly

−45%. By 2030, the GVA reduction under SQ is almost fully absorbed (−2% respect to 2020), whereas other scenarios remain −20% to −30%, depending on the case.

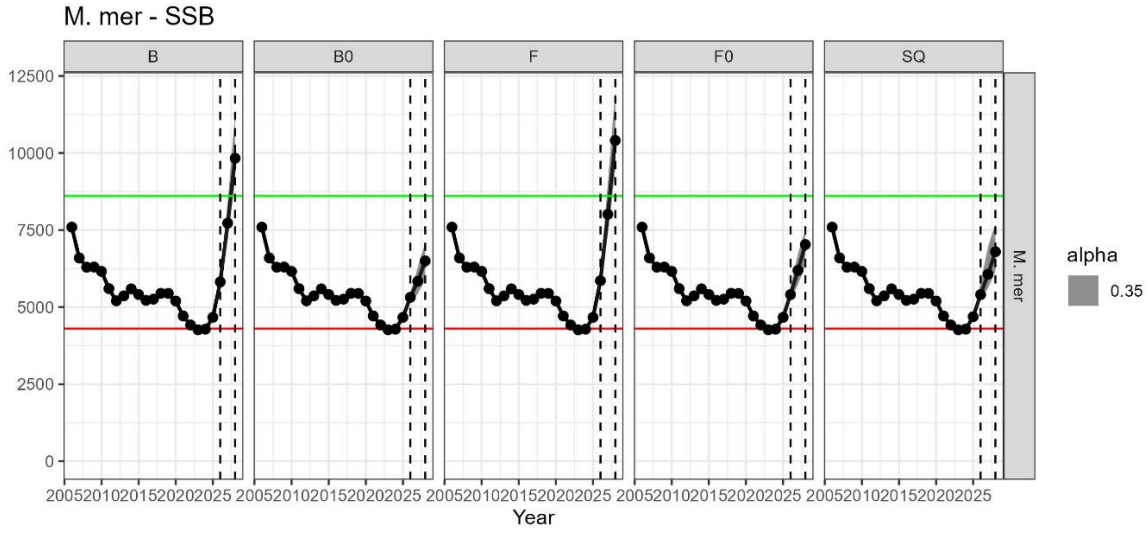
For PGP, in 2026 all scenarios except SQ reduce indicators by ~-50% relative to 2020; by 2030, GVA exceeds its 2020 level.

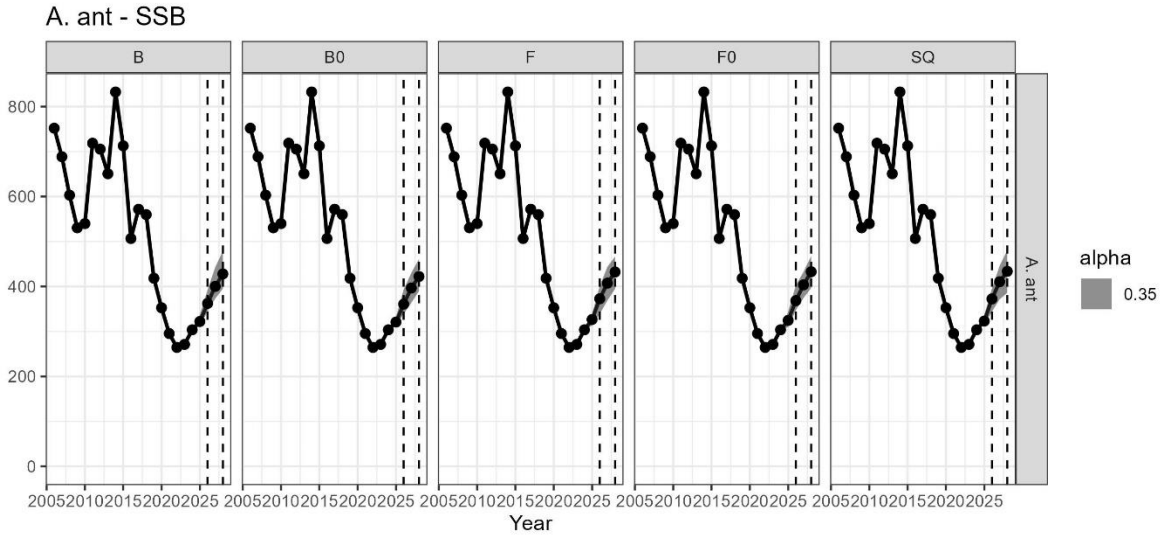
In Tables 8.3.3 and 8.3.4 is reported the estimated Number of fleet segments in green in terms of improved GP in 2026 and 2030 respect to 2020 and positive GP in 2026 and 2030.

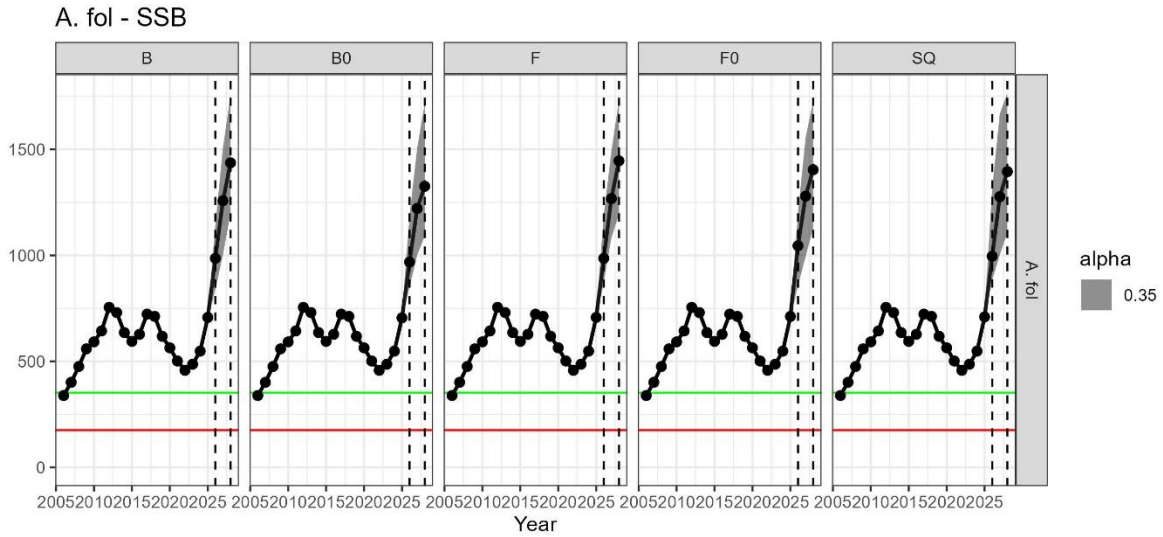
Only one DTS fleet segment (VL 06-12) shows a higher GP in 2026 and 2030 respect to 2020 in the explored scenario. HOK fleet segment results in green in all scenarios. Moreover, all DTS fleet segments show positive GP in 2026 and 2030 for scenarios SQ, B and F, while 2 out of 4 in scenario B0 and 3 out of 4 in scenario F0.

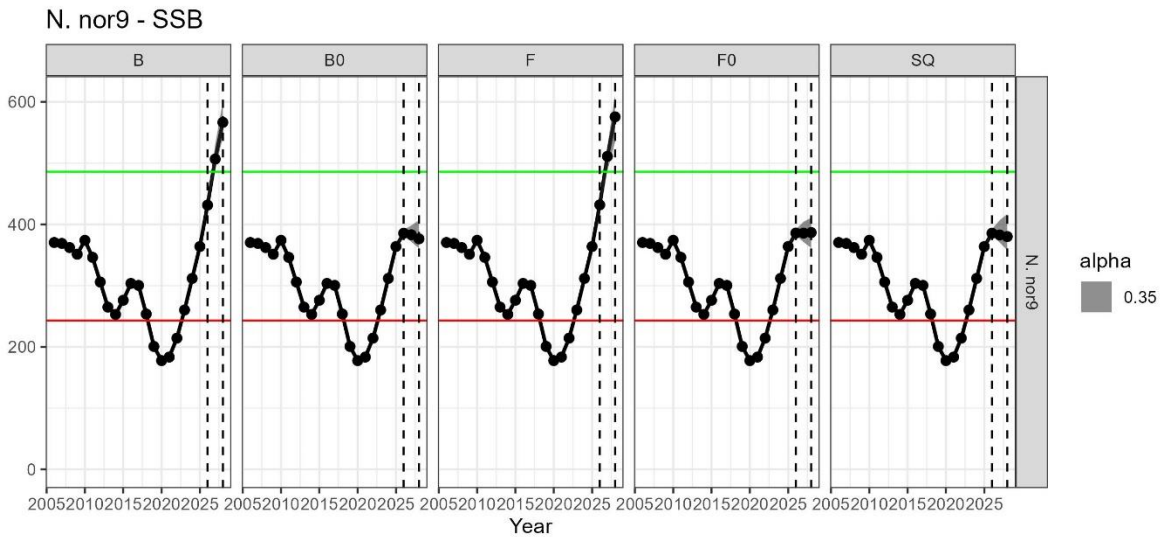
HOK and PGP fleet segments have positive GP both in 2026 and in 2030.

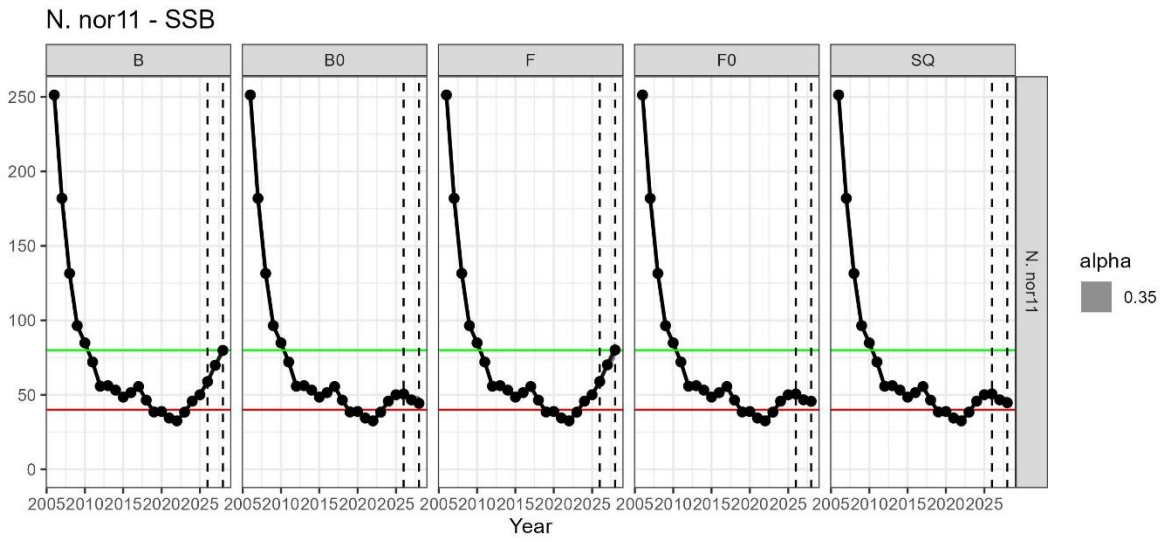
Figure 8.3.2. SSB projections of HKE, DPS, ARS, ARA, MUT9, MUT10, NEP11, NEP9 for scenarios SQ, B0, B, F0 and F. Bpa and Blim are indicated, when available, by the green and red horizontal lines respectively.

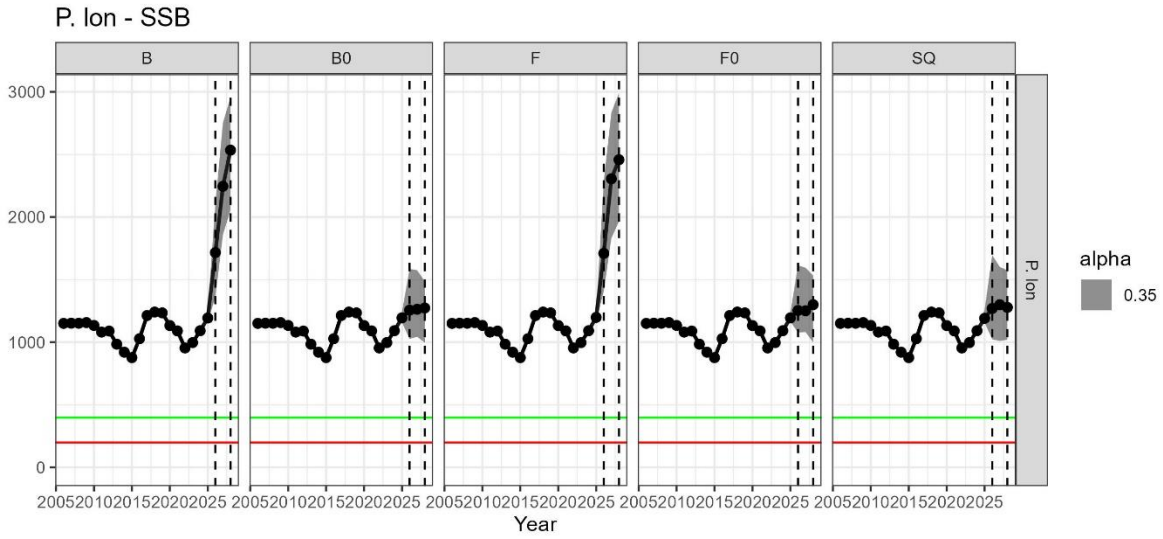


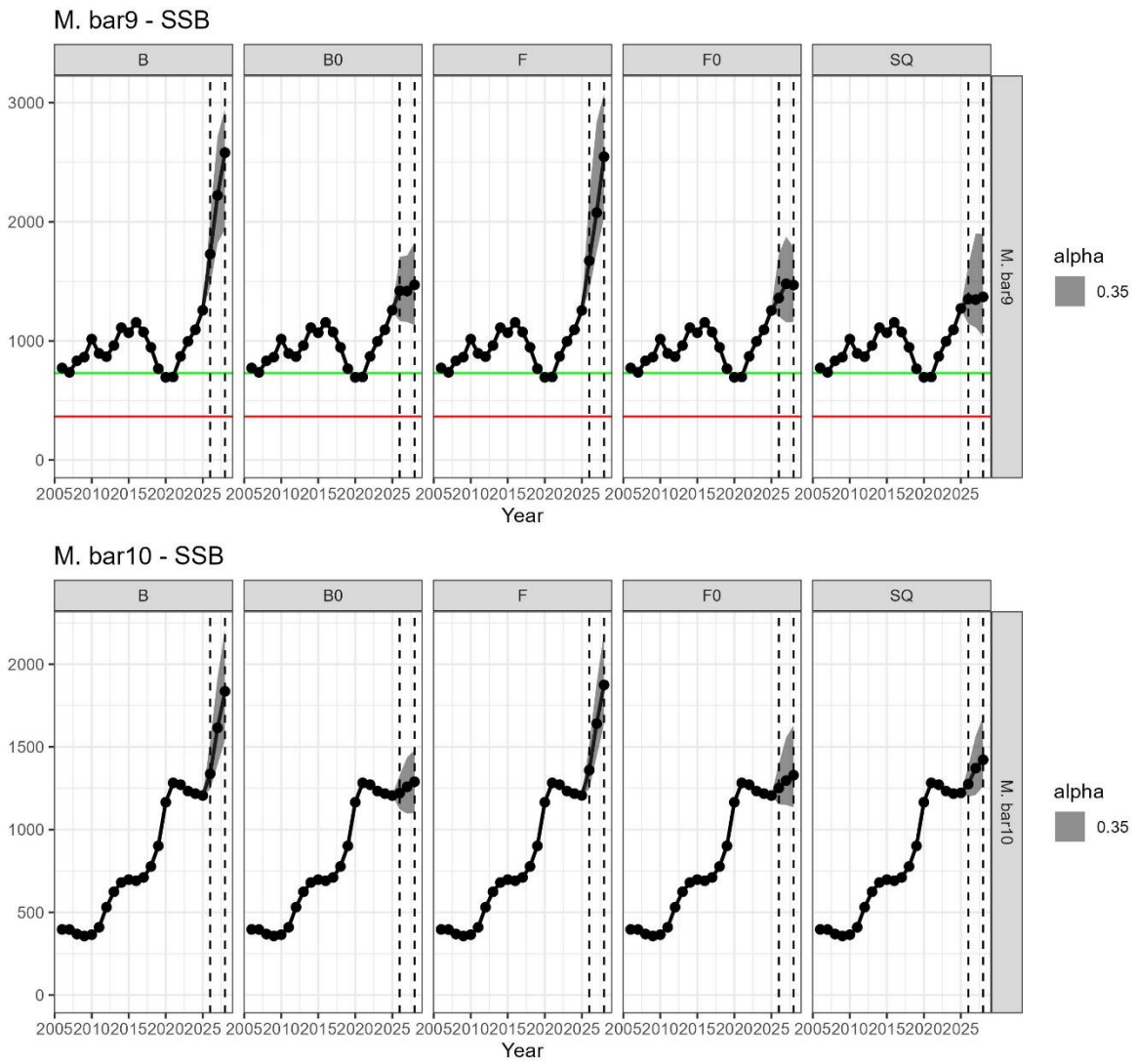

A. ant - SSB
B
B0
F
F0
SQ
800
600
400
200
0
2005201020152020202520052010201520202025200520102015202020252005201020152020202520052010201520202025
Year
A. ant
alpha
0.35


A. fol - SSB
B
B0
F
F0
SQ
1500
1000
500
0
2005201020152020202520052010201520202025200520102015202020252005201020152020202520052010201520202025
Year
A. fol
alpha
0.35


N. nor9 - SSB
B
B0
F
F0
SQ
600
400
200
0
2005201020152020202520052010201520202025200520102015202020252005201020152020202520052010201520202025
Year
N. nor9
alpha
0.35

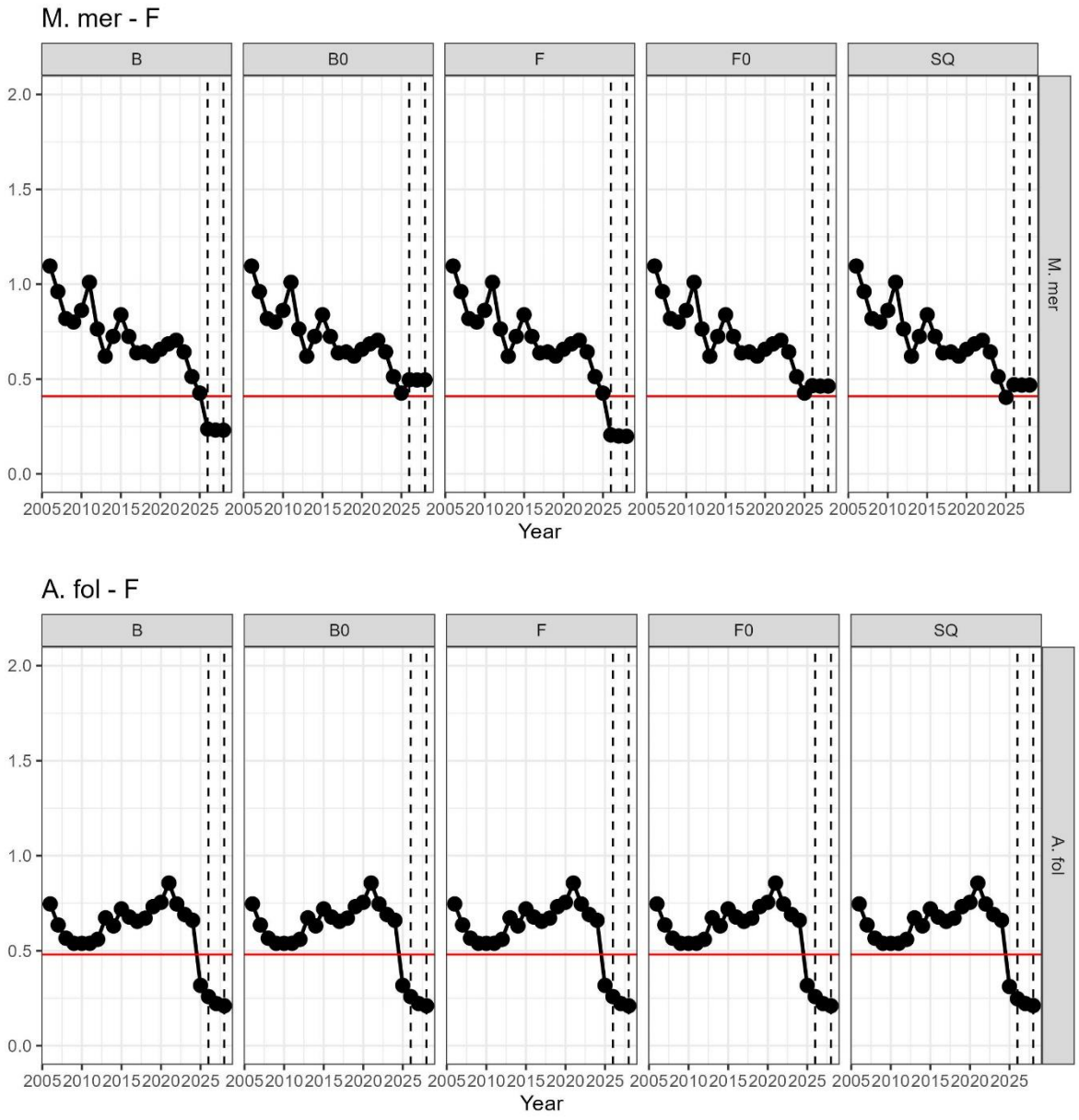

N. nor11 - SSB
B
B0
F
F0
SQ
250
200
150
100
50
0
2005201020152020202520052010201520202025200520102015202020252005201020152020202520052010201520202025
Year
N. nor11
alpha
0.35

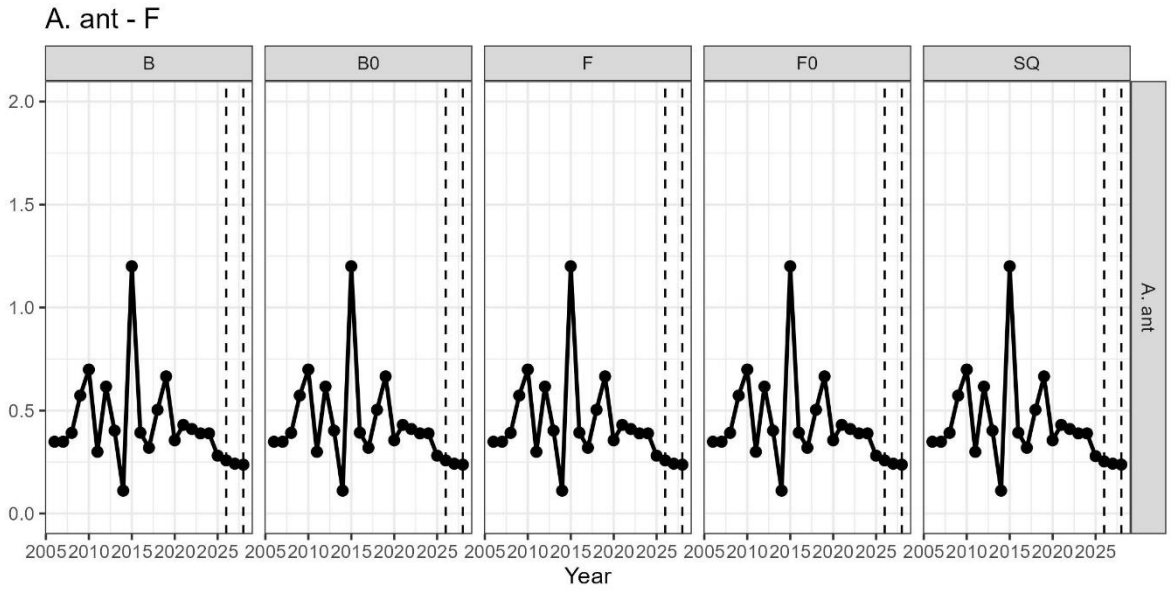

P. lon - SSB
B
B0
F
F0
SQ
3000
2000
1000
0
2005201020152020202520052010201520202025200520102015202020252005201020152020202520052010201520202025
Year
P. lon
alpha
0.35

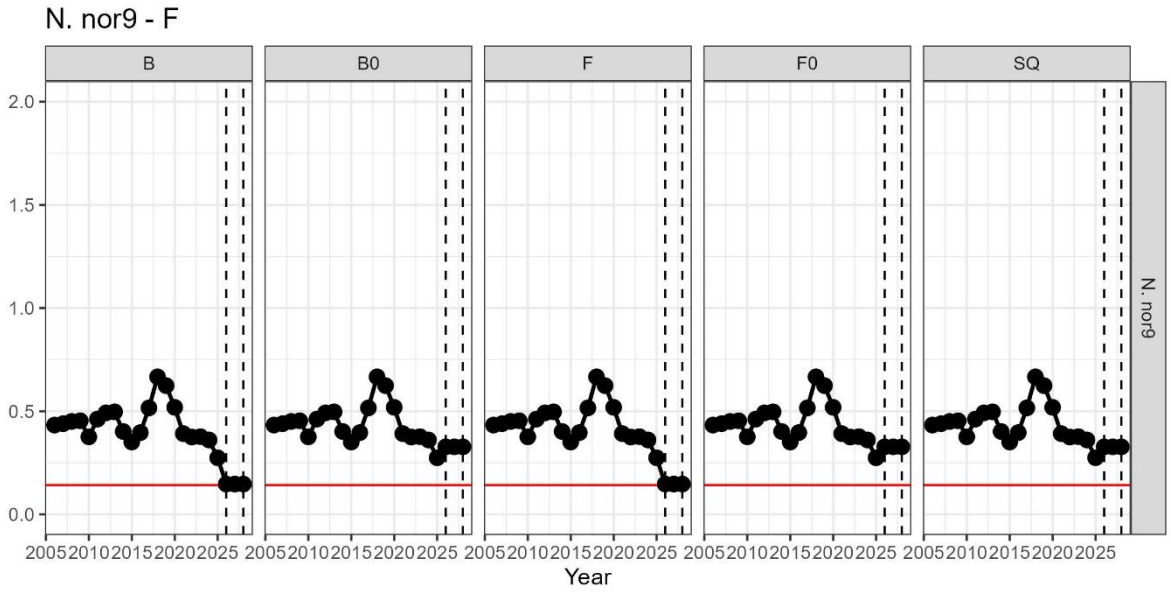


Source: own elaborations.

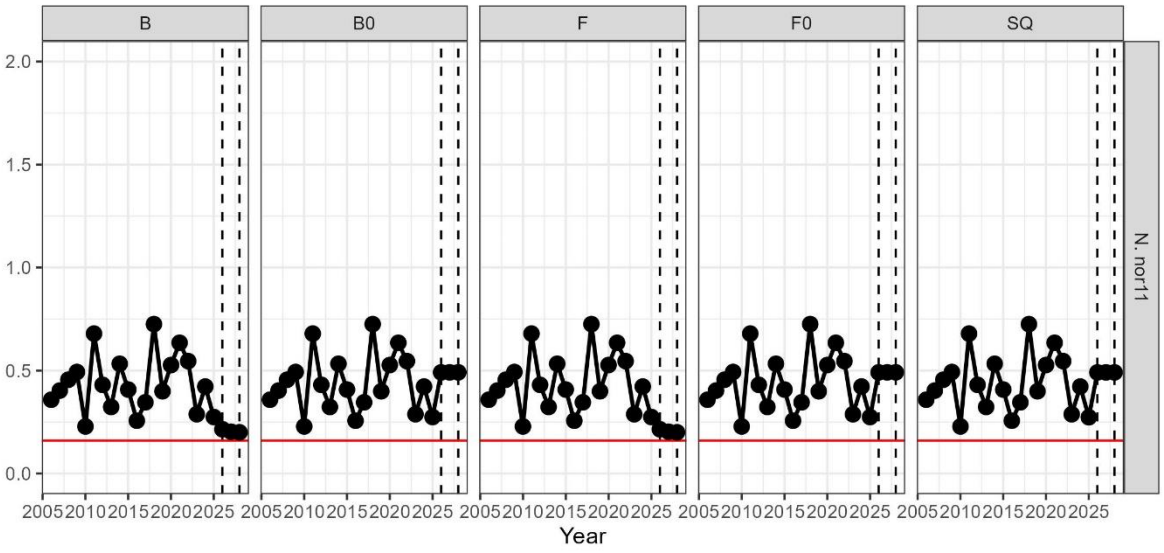
Figure 8.3.3. F projections of HKE, DPS, ARS, ARA, MUT9, MUT10, NEP11, NEP9 for scenarios SQ, B0, B, F0 and F.



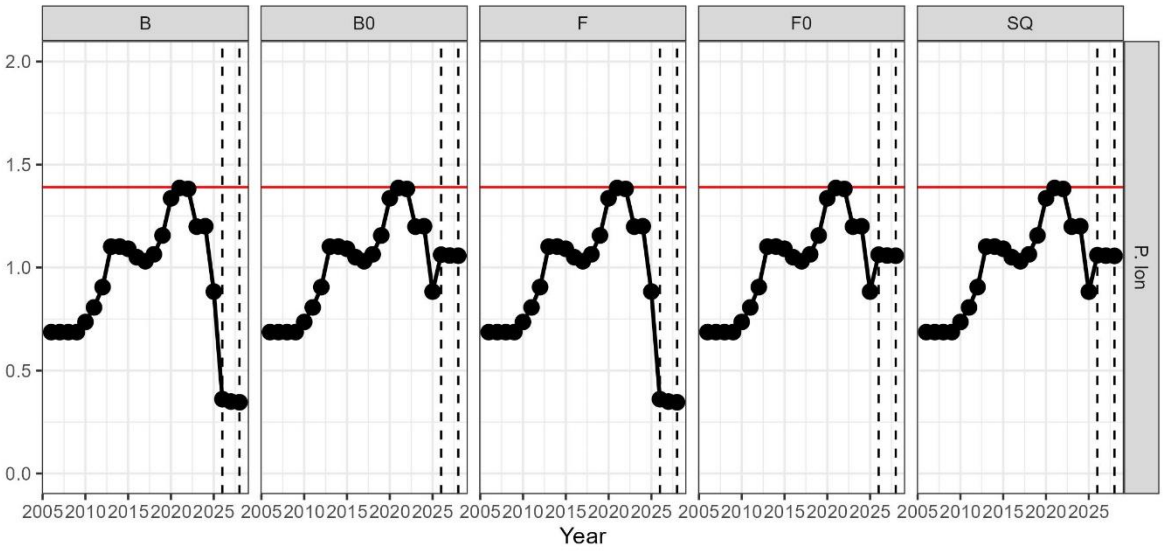

A. ant - F
B
B0
F
F0
SQ
A. ant
2.0
1.5
1.0
0.5
0.0
2005 2010 2015 2020 2025
Year

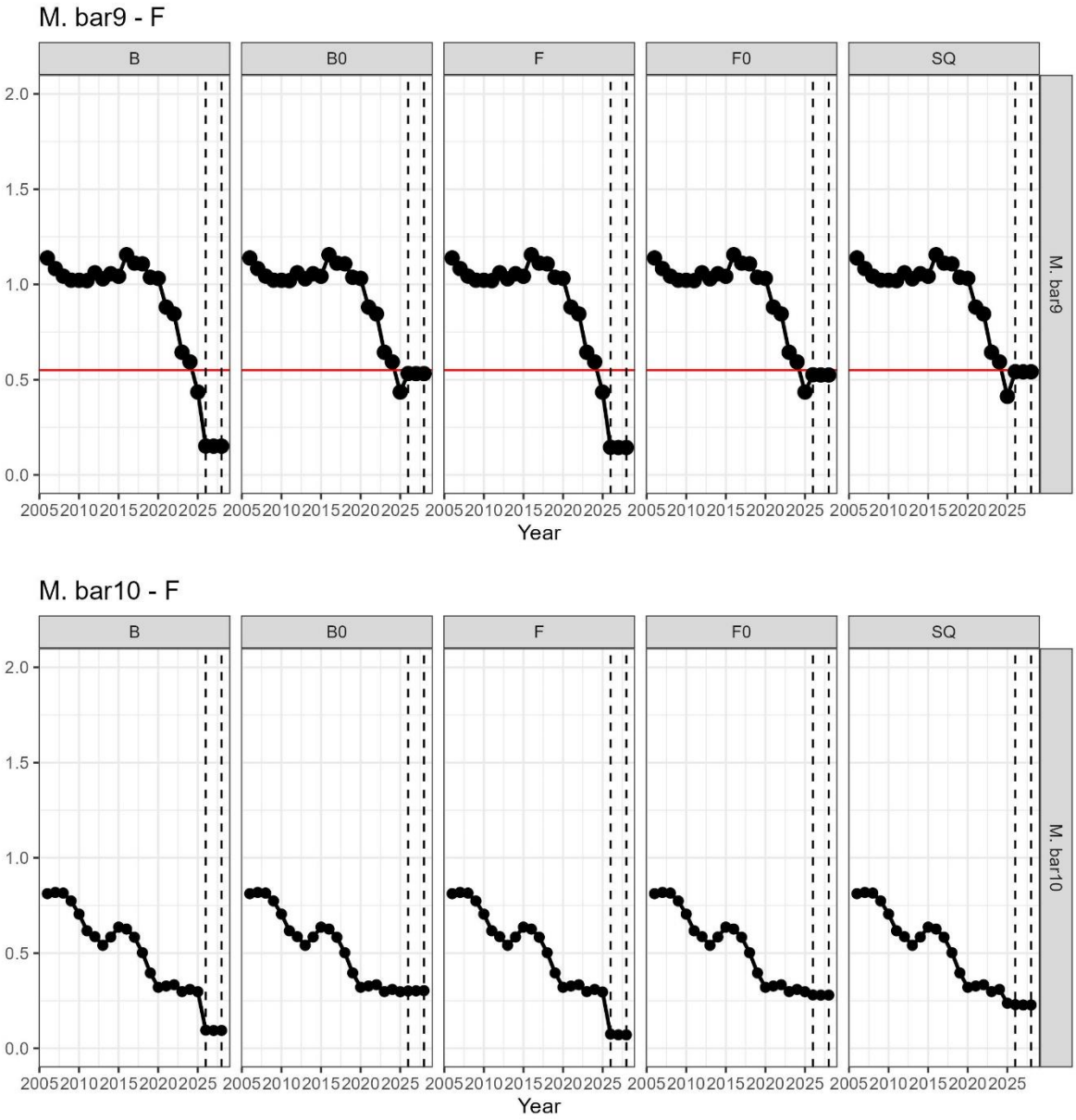

N. nor9 - F
B
B0
F
F0
SQ
N. nor9
2.0
1.5
1.0
0.5
0.0
2005 2010 2015 2020 2025
Year

N. nor11 - F



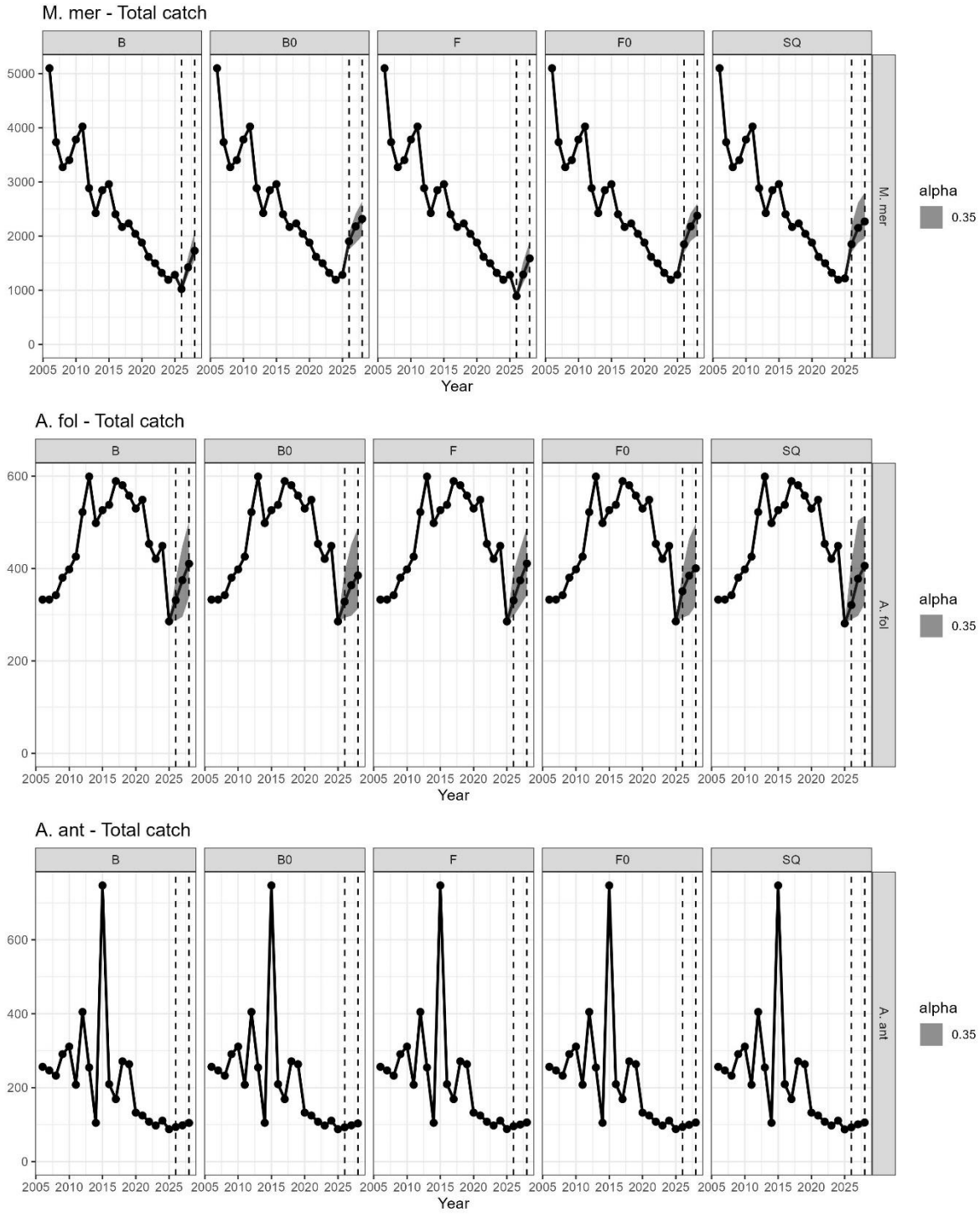
P. lon - F

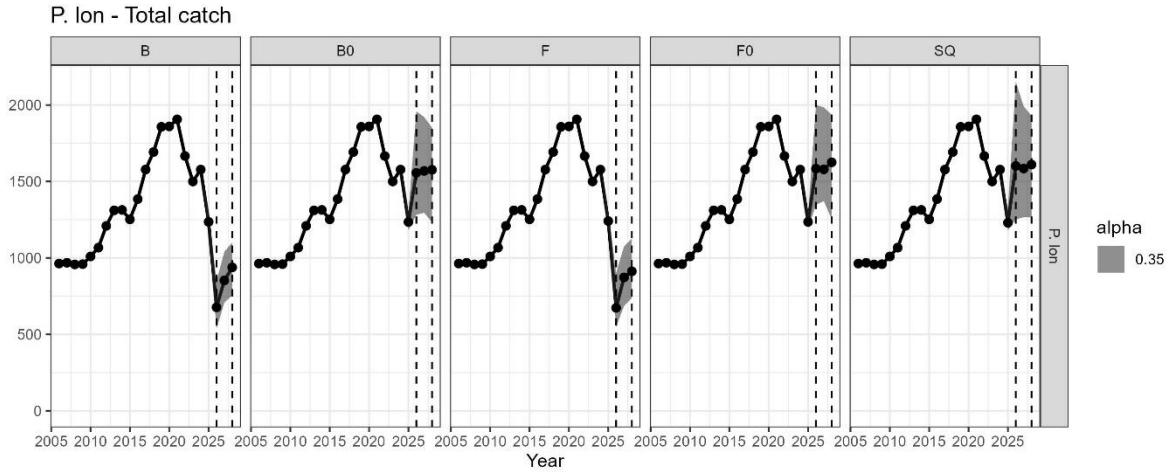


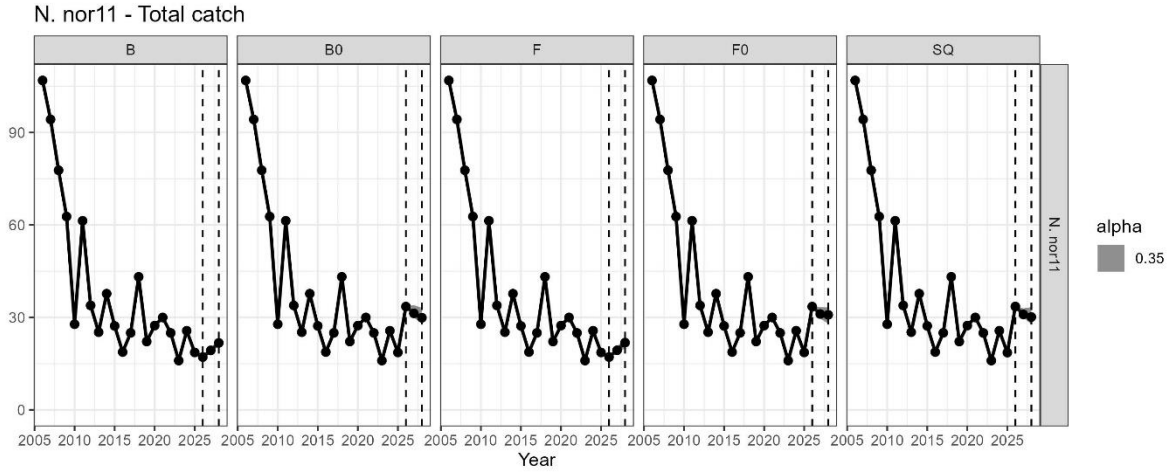


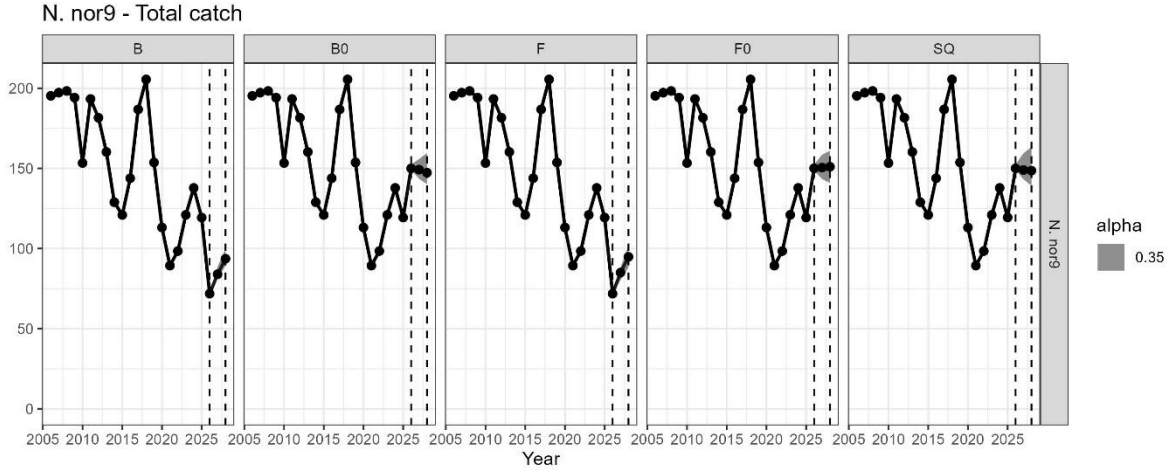
Source: own elaborations.

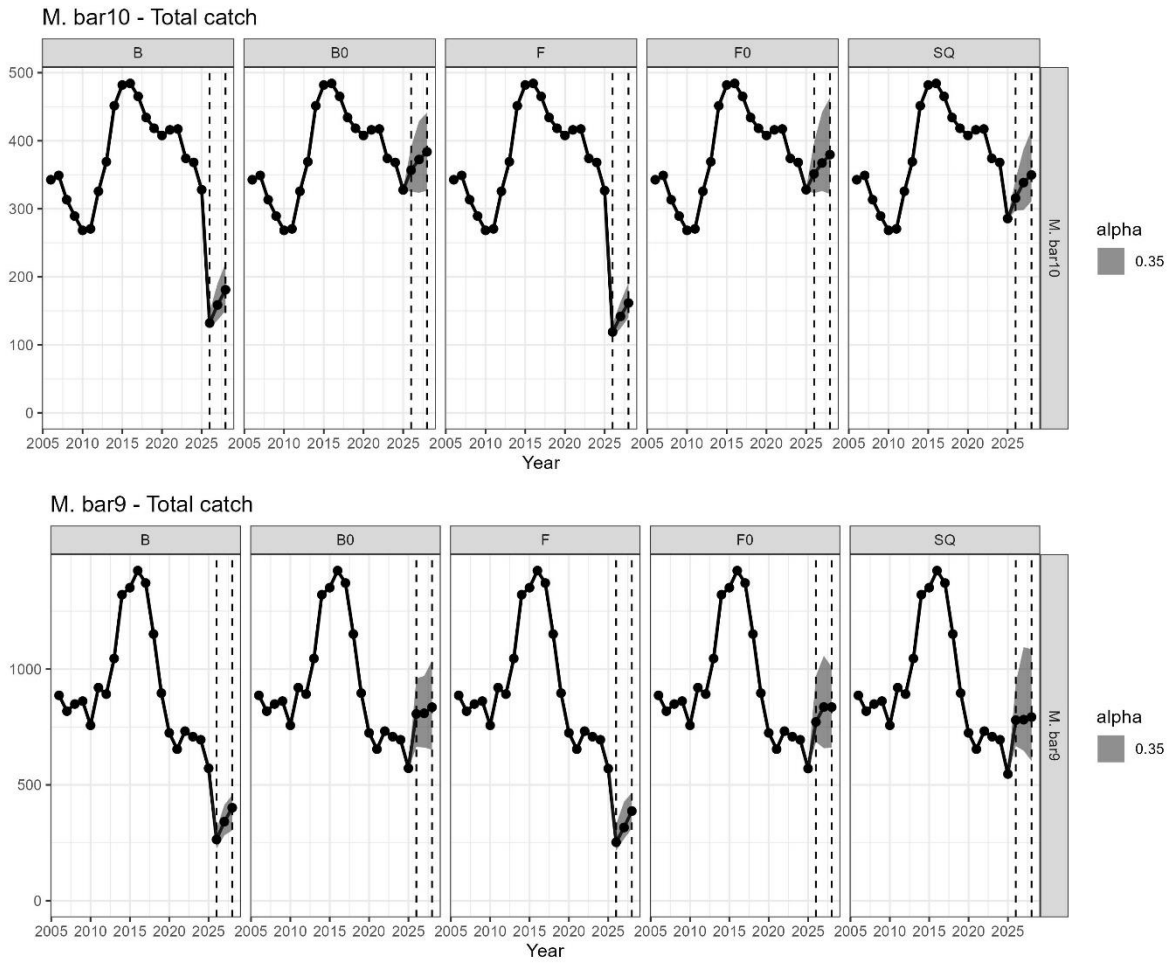
Figure 8.3.4. Total catch projections of HKE, DPS, ARS, ARA, MUT9, MUT10, NEP11, NEP9 for scenarios SQ, B0, B, F0 and F.




P. lon - Total catch
B
B0
F
F0
SQ
2000
1500
1000
500
0
2005 2010 2015 2020 2025
Year
P. lon
alpha
0.35

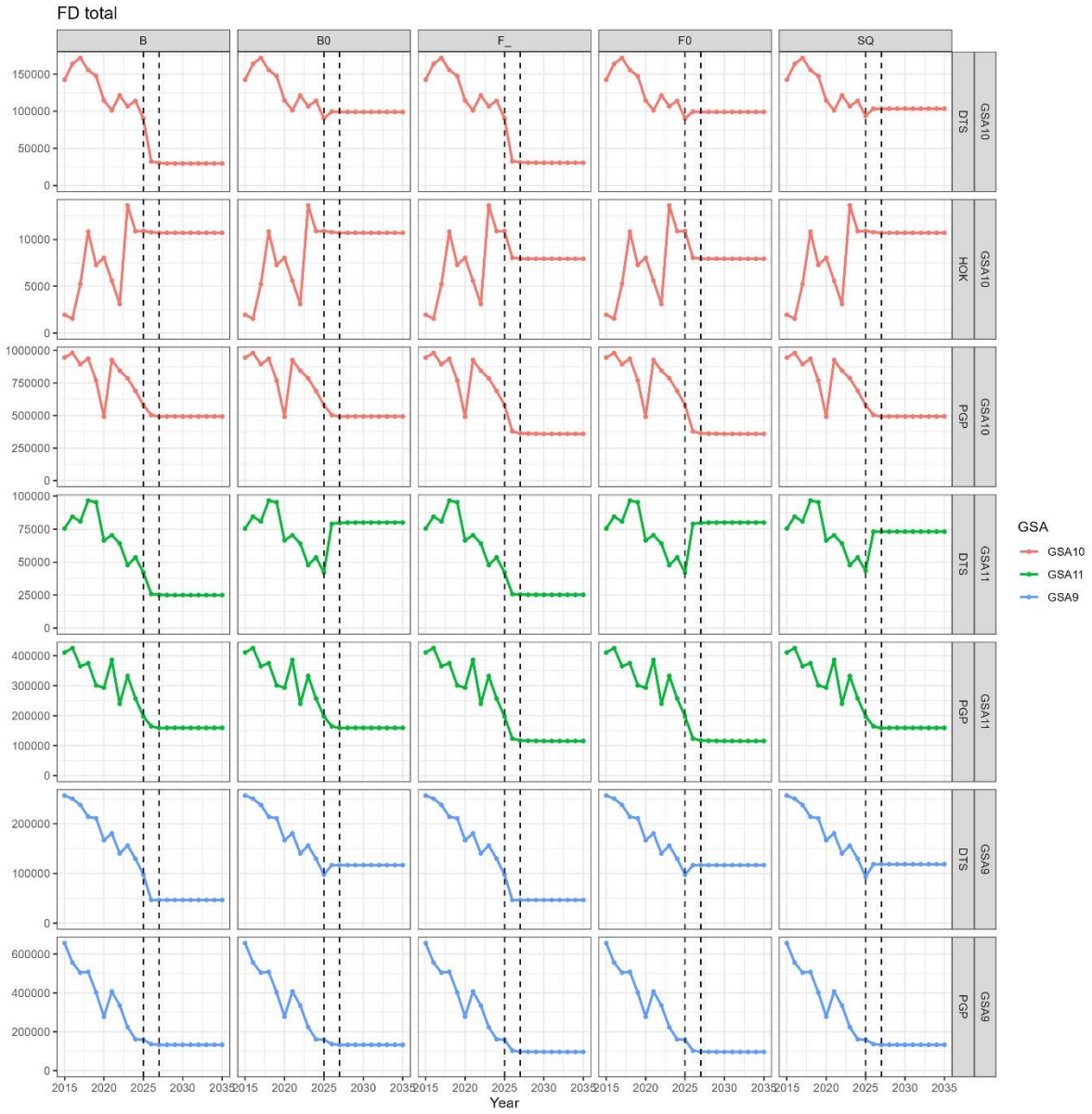

N. nor11 - Total catch
B
B0
F
F0
SQ
90
60
30
0
2005 2010 2015 2020 2025
Year
N. nor11
alpha
0.35


N. nor9 - Total catch
B
B0
F
F0
SQ
200
150
100
50
0
2005 2010 2015 2020 2025
Year
N. nor9
alpha
0.35



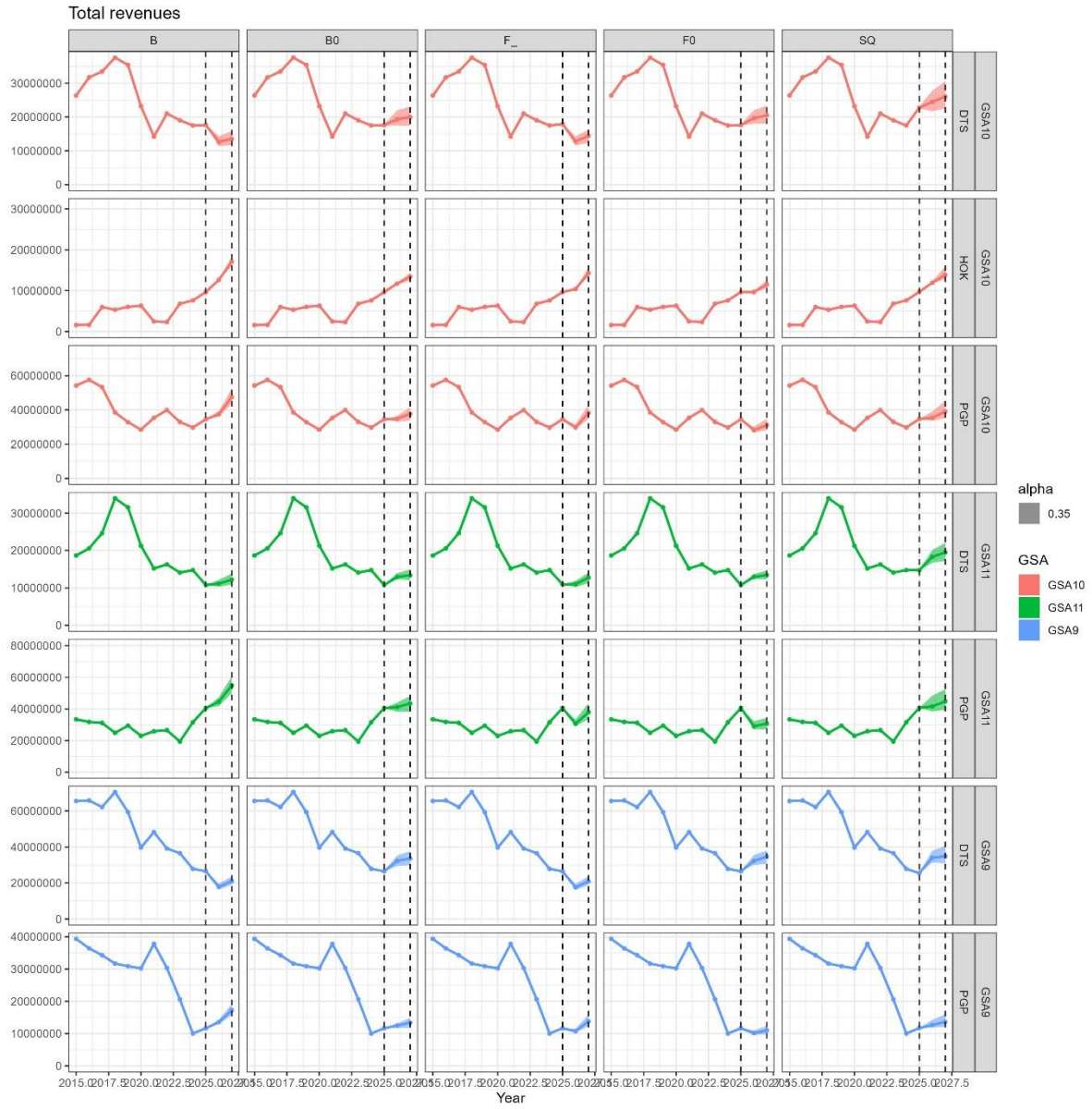
Source: own elaborations

Figure 8.3.5 Total fishing days per fishing technique by GSA for scenarios SQ, B0, B, F0 and F.



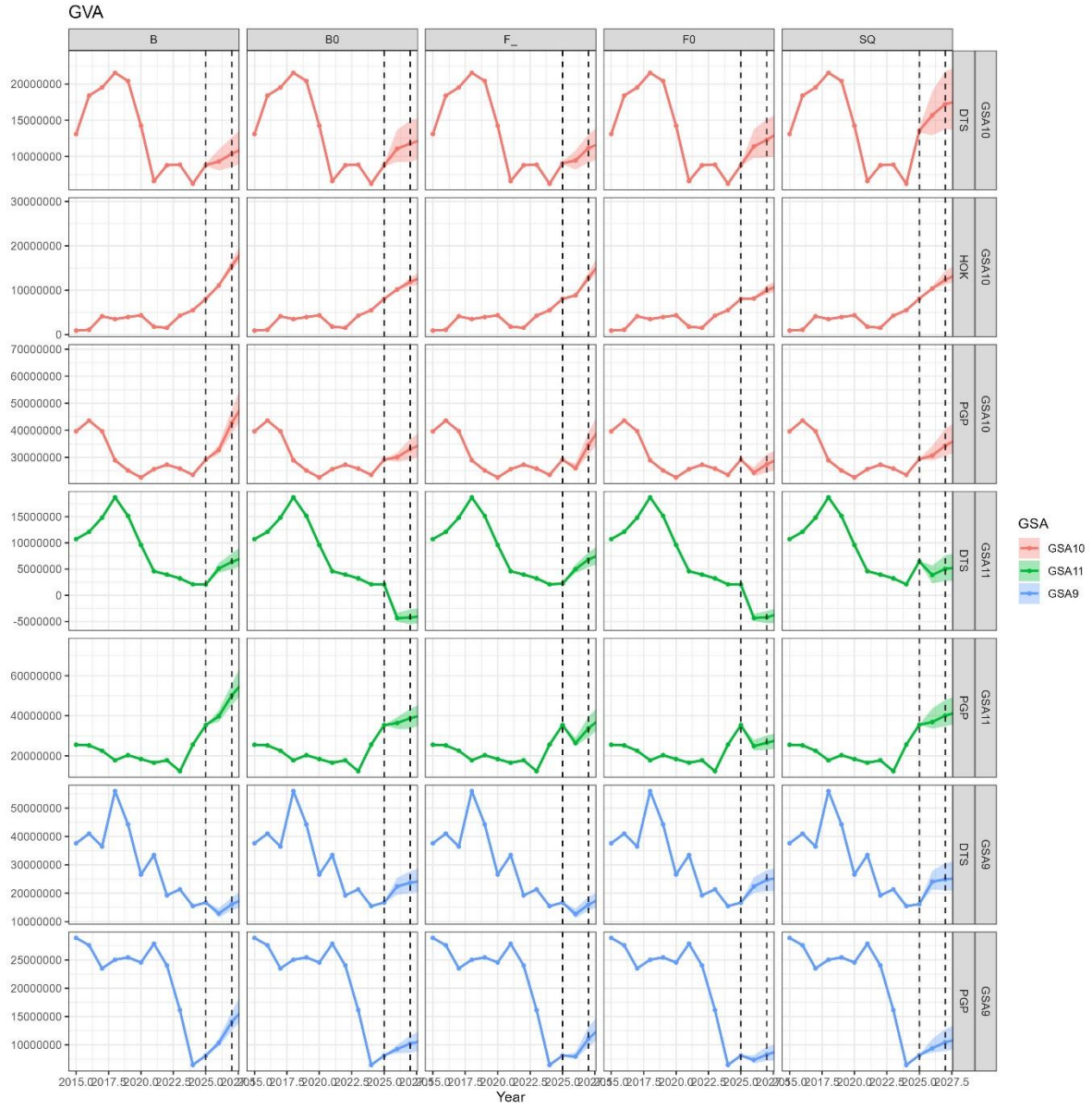
Source: own elaborations.

Figure 8.3.6. Total revenues (target+other species) per fishing technique by GSA for scenarios SQ, B0, B, F0 and F.



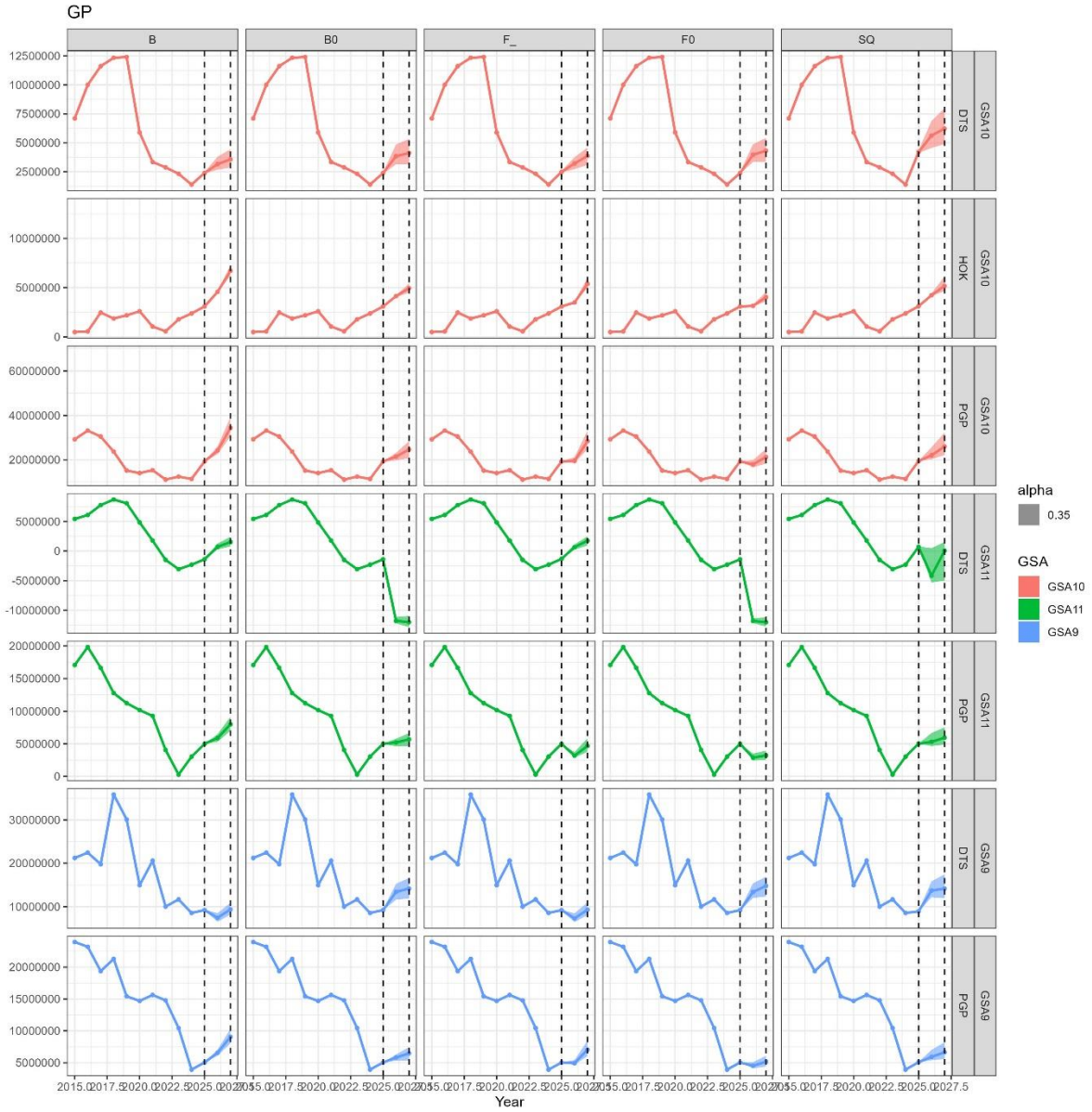
Source: own elaborations.

Figure 8.3.7. GVA per fishing technique by GSA for scenarios SQ, B0. B, F0 and F.



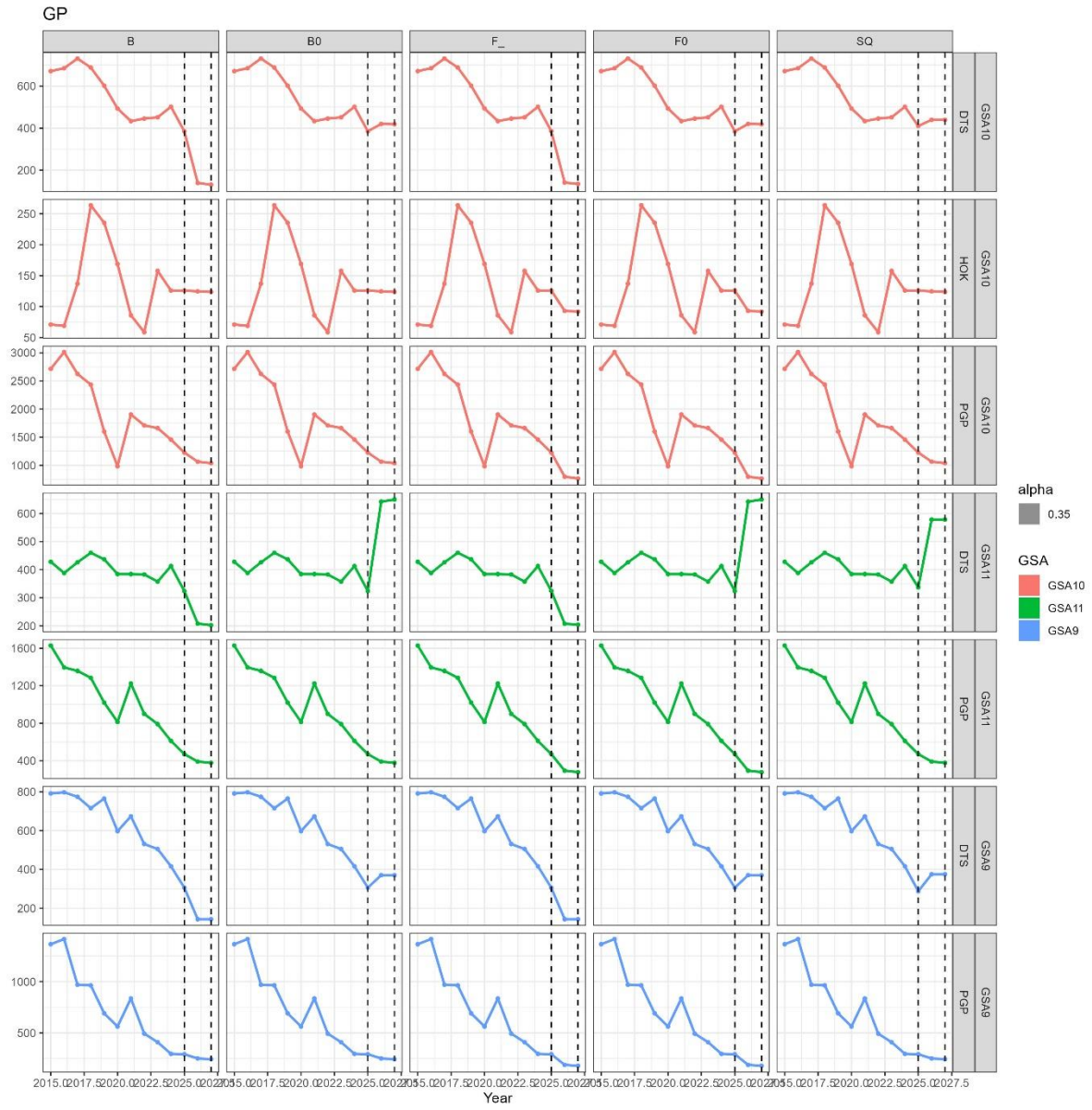
Source: own elaborations.

Figure 8.3.8 GPM per fishing technique by GSA for scenarios SQ, B0,, B, F0 and F.



Source: own elaborations.

Figure 8.3.9. FTE per fishing technique by GSA for scenarios SQ, B0, B, F0 and F.



Source: own elaborations.

Table 8.3.1. Socio-economic indicators for 2026 per fishing technique for scenarios SQ, B0, B, F0, F.

			LANDINGS	**GROSS VALUE ADDED**	**GROSS PROFIT MARGIN**	**FTE**
Scenarios	**MS**	**Fishing technique**	Estimated % variation of landings of **target species** 2020-2026	Estimated % variation of GVA 2020-2026	Estimated % variation of profitability (gross profit margin) 2020-2026	Estimated % variation of FTE 2020-2026
SQ	**I T**	**DTS**	20%	-14%	-11%	-6%
		HOK	354%	138%	-6%	-26%
		PGP	15%	17%	-11%	-28%
B0	**I T**	**DTS**	15%	-42%	-22%	-3%
		HOK	343%	134%	-6%	-26%
		PGP	-50%	16%	-11%	-28%
B	**I T**	**DTS**	-49%	-46%	-3%	-67%
		HOK	390%	155%	-5%	-26%
		PGP	-45%	26%	-9%	-28%
F0	**I T**	**DTS**	16%	-42%	-22%	-3%
		HOK	246%	87%	-9%	-45%
		PGP	-62%	-14%	-10%	-46%
F	**I T**	**DTS**	-50%	-46%	-4%	-67%
		HOK	275%	103%	-8%	-45%
		PGP	-59%	-8%	-9%	-46%

Source: own elaborations.

Table 8.3.2. Socio-economic indicators for 2030 per fishing technique for scenarios SQ, B0, B, F0, F.

			LANDINGS	**GROSS VALUE ADDED**	**GROSS PROFIT MARGIN**	**FTE**
Scenarios	**MS**	**Fishing technique**	Estimated % variation of landings of **target species** 2020-2030	Estimated % variation of GVA 2020-2030	Estimated % variation of profitability (gross profit margin) 2020-2030	Estimated % variation of FTE 2020-2030
SQ	**I T**	**DTS**	33%	-2%	-4%	-6%
		HOK	583%	246%	-2%	-27%
		PGP	28%	43%	-6%	-30%
B0	**I T**	**DTS**	28%	-31%	-19%	-2%
		HOK	533%	225%	-3%	-27%
		PGP	-38%	37%	-7%	-30%
B	**I T**	**DTS**	-24%	-21%	4%	-68%
		HOK	1148%	462%	1%	-27%
		PGP	11%	121%	0%	-30%
F0	**I T**	**DTS**	33%	-28%	-18%	-2%
		HOK	439%	182%	-4%	-46%
		PGP	-51%	5%	-4%	-49%
F	**I T**	**DTS**	-23%	-20%	4%	-68%
		HOK	924%	379%	0%	-46%
		PGP	-15%	63%	2%	-49%

Source: own elaborations.

Table 8.3.3. Estimated number of fleet segments with improved gross profit in 2026 respect to 2020 per fishing technique for scenarios SQ, B0, B, F0, F.

Scenarios	**MS**	**Fishing technique**	Estimated Number of fleet segments in green (**IMPROVED GROSS PROFIT**) in 2026/2020	Estimated Number of fleet segments in green (**POSITIVE GROSS PROFIT**) in 2026	Total of fleet segments considered in the model
SQ	**I T**	**DTS**	1	4	4
		HOK	1	1	1
		PGP	0	1	1
B0	**I T**	**DTS**	1	2	4
		HOK	1	1	1
		PGP	0	1	1
B	**I T**	**DTS**	1	4	4
		HOK	1	1	1
		PGP	0	1	1
F0	**I T**	**DTS**	1	2	4
		HOK	1	1	1
		PGP	0	1	1
F	**I T**	**DTS**	1	4	4
		HOK	1	1	1
		PGP	0	1	1

Source: own elaborations.

Table 8.3.4. Estimated number of fleet segments with improved gross profit in 2030 respect to 2020 per fishing technique for scenarios SQ, B0, B, F0, F.

Scenarios	**MS**	**Fishing technique**	Estimated Number of fleet segments in green (**IMPROVED GROSS PROFIT**) in 2030/2020	Estimated Number of fleet segments in green (**POSITIVE GROSS PROFIT**) in 2030	Total of fleet segments considered in the model
SQ	**I T**	**DTS**	1	4	4
		HOK	1	1	1
		PGP	1	1	1
B0	**I T**	**DTS**	1	2	4
		HOK	1	1	1
		PGP	1	1	1
B	**I T**	**DTS**	1	4	4
		HOK	1	1	1
		PGP	1	1	1
F0	**I T**	**DTS**	1	3	4
		HOK	1	1	1
		PGP	0	1	1
F	**I T**	**DTS**	1	4	4
		HOK	1	1	1
		PGP	1	1	1

Source: own elaborations.

9. REMAINING ISSUES AND FUTURE STEPS

The Issues important for the advice and the interpretation of results are discussed in the below section per model type and EMU.

9.1. ISIS-Fish in EMU 1

The ISIS-Fish model would benefit from a more accurate description of Spanish liners and netters fleets providing that spatial data are made available in due time before the EWG takes place. Other species of commercial interest would also be

needed so the income from landings could be more accurately modeled and account for the impact of effort redirection on other target species.

9.2. IAM in EMU 1

As indicated in section 7.1.3, the revenues, and consequently the Gross Value Added (GVA), and Gross Profits (GP) of the different fleet segments assessed in IAM are likely underestimated. This is because the revenues of the fleet segments from landings of species that are not modelled in IAM are based on landings per unit of effort (LPUE) parametrised using 2024 FDI data and these values are then constant throughout the simulations. Therefore, potential future increases in biomass of these non-dynamically modelled species/stocks are not reflected in fleet revenue estimates.

The percentage of revenue from non-dynamically modelled stocks is more or less important depending on the fleet segment. Figure 7.2.3 displays these shares per fleet segment. We can observe that around 65% of the revenues of Spanish trawlers above 24 meters are based on modelled species; hence, biomass changes are considered in the profit estimates, whereas for French trawlers, this proportion is below 25%. For netters and vessels using hooks, these proportions are very low (overall less than 10%), so their profits are most likely strongly underestimated. Profits (GVA and GP) may also be underestimated in the model compared to reality because their calculations do not include "other revenues" from the AER data or subsidies. These variables were excluded due to a lack of clear information regarding their exact nature and how they might relate to fishing effort.

Furthermore, the current implementations assume no reallocation of fishing effort toward other gears for the DFN, PGP, PMP, and HOK fleets is a strong and potentially unrealistic assumption. This leads to underestimate both the overall fishing effort and, consequently, the revenues generated. This could also impact on their Gross Value Added (GVA) and Gross Profit (GP), depending on the balance between revenues and costs. If vessels reallocate their effort to other gears or species, the actual revenues might be higher than what is simulated here.

The IAM model assumes an "average" vessel for each fleet segment, but in practice, there is considerable heterogeneity within these segments. Vessels within the same fleet segment do not have identical fishing patterns, gear usage, costs, or economic dependencies on specific stocks. As a result, the estimated impacts of management measures will not be uniformly distributed across vessels. Some vessels may experience stronger reductions in effort or revenues than the average estimates suggest, while others may be less affected. This can lead to an inaccurate representation of the impact of regulations, as not all vessels within a segment are equally affected. For example, measures applied to set nets (GNS and GTR) may disproportionately impact certain vessels within the diverse HOK, PGP, PMP, and DFN fleet segments.

Additionally, as pointed out in EWG24-12 there remain concerns around the accuracy of crew cost estimates, which directly affect the reliability of results related to Gross Profit and Gross Profit Margin.

Another key issue is the lack of disaggregation of the Spanish fleet by GSA. Having Spanish fleets by GSA would allow for more accurate effort reductions based on the specific stock status in each area. This would improve the management of fishing pressure on stocks and better account for differences in exploitation and costs structure of the fleets between GSAs. With GSA-level data, effort management could be more targeted and reflect the real conditions of the fleets.

9.3. BEMTOOL in EMU 2

The limitation due to not including the information on subsidies received by operators to face the recent fuel costs increase underlined by EWG 24-12 is still valid in EWG 25-11. This may have impacted negatively on the economic indicators, projecting a worse situation in comparison to the actual one (e.g. underestimating the GPM).

Moreover, the absence of an analytical assessment for key stocks (ARA, MUT10, and DSP) adds an additional source of uncertainty to the projections, even though a proxy was used in the model. This is particularly concerning for ARA, for which a catch-limit regulation is in force, and for DPS, a major resource in the area. The lack of up-to-date stock status information should be addressed by next year's stock assessment working group.

In the model, a linear relationship between FTE and total fishing days has been assumed for simplicity also in this EWG. Nevertheless, this assumption should be verified through a specific analysis on historical data.

The test of the adaptation of the catch limit to the status of the stock (e.g. F_{MSY}, SSB), that is expected to change during the application of management measures is a potential step to be investigated in the future.

10. REFERENCES

Bahamon, N., Recasens, L., Company, J.B. 2021. Improving the selectivity of trawl gears in the Mediterranean Sea to advance the sustainable exploitation pattern of trawl fisheries (IMPLEMED). Deliverable 1.1 - Summary of the technical characteristics and selectivity parameters of the devices. Framework Contract No EASME/EMFF/2016/032 - Specific Contract 04.

D'Andrea, L., Parisi, A., Fiorentino, F., Garofalo, G., Gristina, M., Russo, T., Cataudella, S., "smartR: a R package for spatial modelling of fisheries and simulation of effort management", Methods in Ecology and Evolution 00, 2020, pp. 01-10. DOI: 10.1111/2041-210X.13394

Henriques, N. S., Russo, T., Bentes, L., Monteiro, P., Parisi, A., Magno, R., Oliveira, F., Erzini, K., Goncalvese, J. M. S., "An approach to map and quantify the fishing effort of polyvalent passive gear fishing fleets using geospatial data", ICES Journal of Marine Science 0, 2023, pp. 1-12. DOI: 10.1093/icesjms/fsad092.

Leforestier, S., Lehuta, S., Mahevas, S., Jadaud, A., Vaz, S., Rapport du projet PECHALO (Pêche Chalutière Occitanie) : Etude de l'impact de l'adaptation des stratégies de pêche et des navires de la flottille chalutière occitane pour améliorer leur viabilité et la durabilité de l'activité, 2020, doi: 10.13155/73377.

Mellon-Duval, C., de Pontual, H., Metral, L., and Quemener, L., Growth of European hake (Merluccius merluccius) in the Gulf of Lions based on conventional tagging, ICES Journal of Marine Science, 67, 2010, pp: 62–70, doi: 10.1093/icesjms/fsp215.

Pelletier, D., Mahevas, S., Drouineau, H., Vermard, Y., Thebaud, O., Guyader, O., Poussind, B., Evaluation of the bioeconomic sustainability of multi-species multi-fleet fisheries under a wide range of policy options using ISIS-Fish, Ecological Modelling, 220(7), 2009, pp. 1013-1033. doi: 10.1016/j.ecolmodel.2009.01.007.

Russo, T., D'Andrea, L., Franceschini, S., Accadia, P., Cucco, A., Garofalo, G., Gristina, M., Parisi, A., Quattrocchi, G., Sabatella, R. F., Sinerchia, M., Canu, D. M., Cataudella, S. and Fiorentino, F., "Simulating the Effects of Alternative Management Measures of Trawl Fisheries in the Central Mediterranean Sea: Application of a Multi-Species Bio-economic Modeling Approach", Frontiers in Marine Science 6, 2019, p. 542. DOI: 10.3389/fmars.2019.00542.

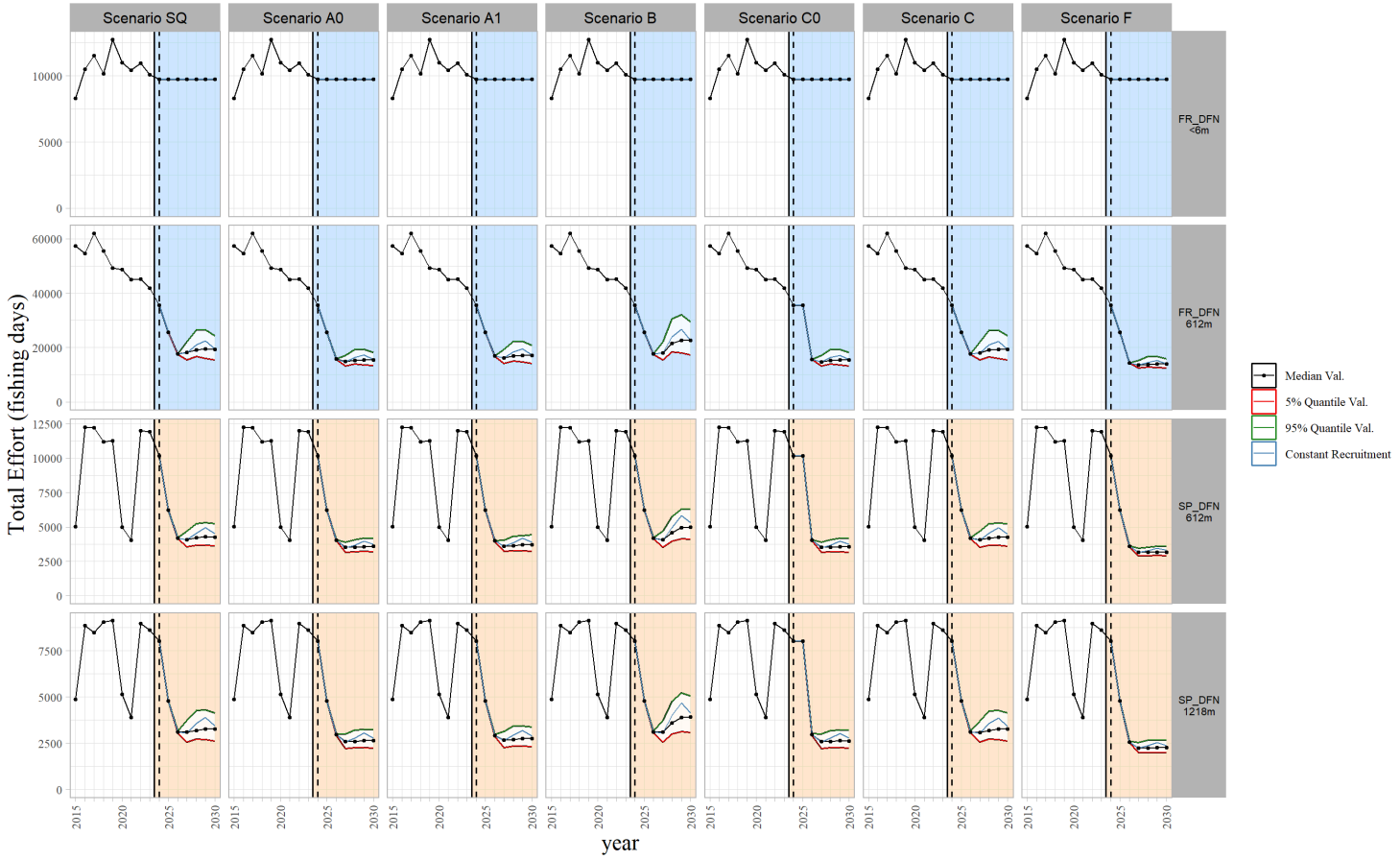
Russo, T., Morello, E. B., Parisi, A., Scarcella, G., Angelini, S., Labanchi, L., Martinelli, M., D'Andrea, L., Santojanni, A., Arneri, E., Cataudella, S., "A model combining landings and VMS data to estimate landings by fishing ground and harbor", Fisheries Research 199, 2018, pp. 218-230. DOI: 10.1016/j.fishres.2017.11.002

Russo, T., Parisi, A., Garofalo, G., Gristina, M., Cataudella, S., Fiorentino, F., "SMART: A Spatially Explicit Bio-Economic Model for Assessing and Managing Demersal Fisheries, with an Application to Italian Trawlers in the Strait of Sicily", PLoS ONE 9(1), 2014. DOI: 10.1371/journal.pone.0086222.

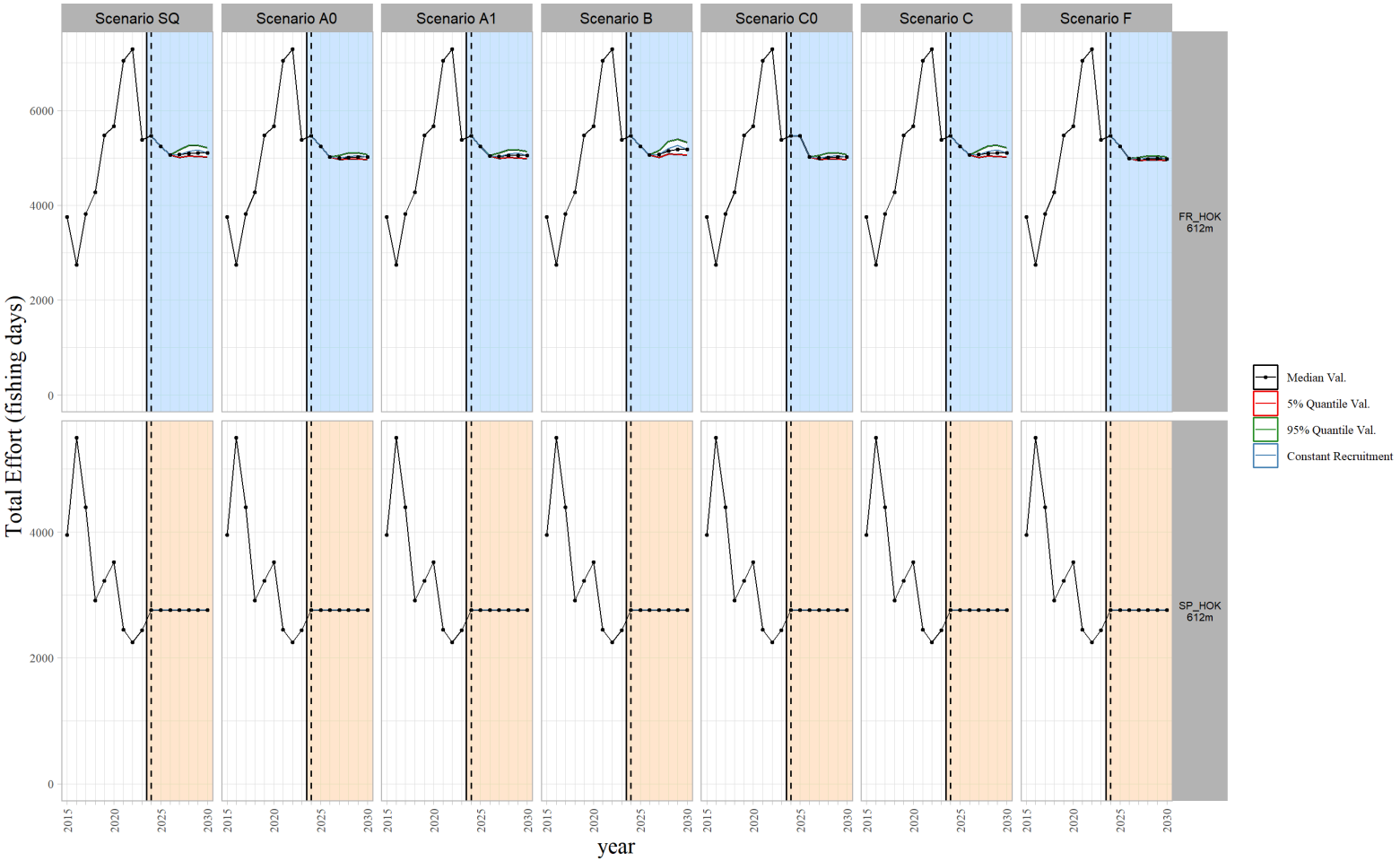
11. ANNEXES

ANNEX 1. SUPPLEMENTARY MATERIAL (EWG25-11 -EMU1- IAM – TOR 3B)

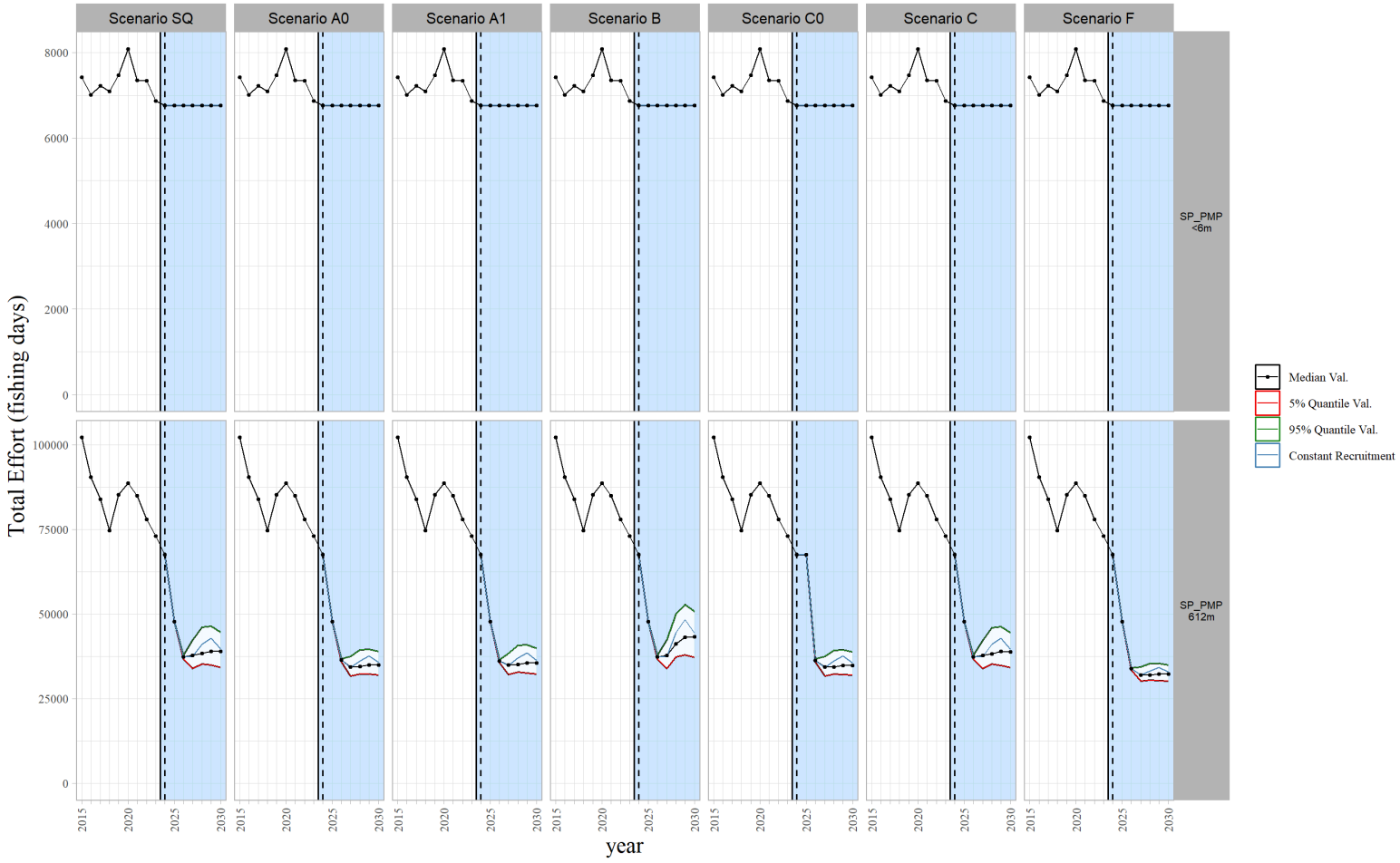
Supplementary material 1 EMU1 (IAM model). Evolution of the **total annual fishing effort** (in fishing days) by netter (**DFN**) fleet segments under alternative scenarios from 2024 to 2030. Historical values (source: FDI) are given in the white areas and simulated values in the coloured area. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French netters <06m and 06-12m, and Spanish netters 06-12m and 12-18m.



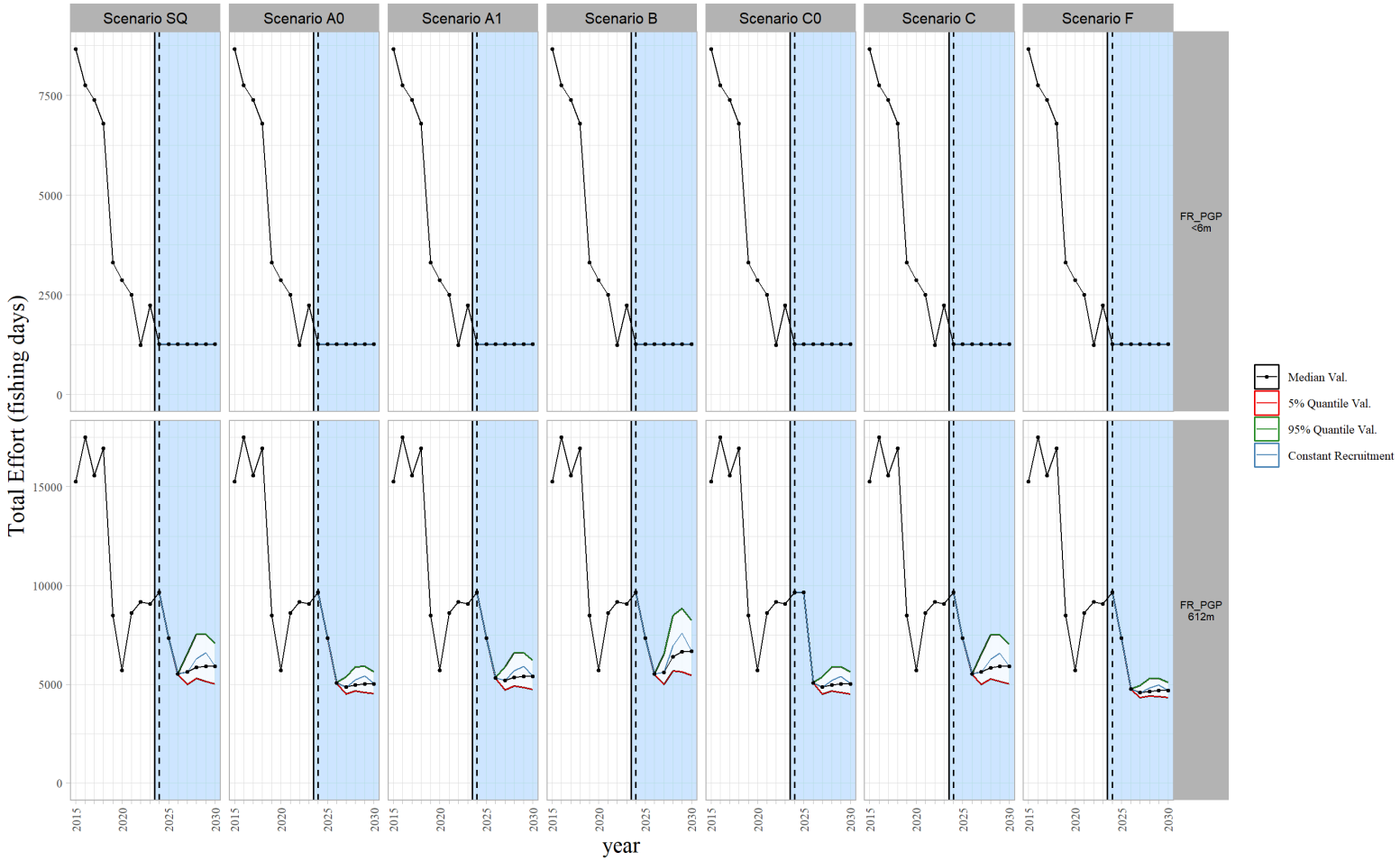
Supplementary material 2 EMU1 (IAM model). Evolution of the **total annual fishing effort** (in fishing days) by vessels using hooks (**HOK**) fleet segments under alternative scenarios from 2024 to 2030. Historical values (source: FDI) are given in the white areas and simulated values in the coloured area. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French vessels using hooks 06-12m and Spanish vessels using hooks 06-12m.



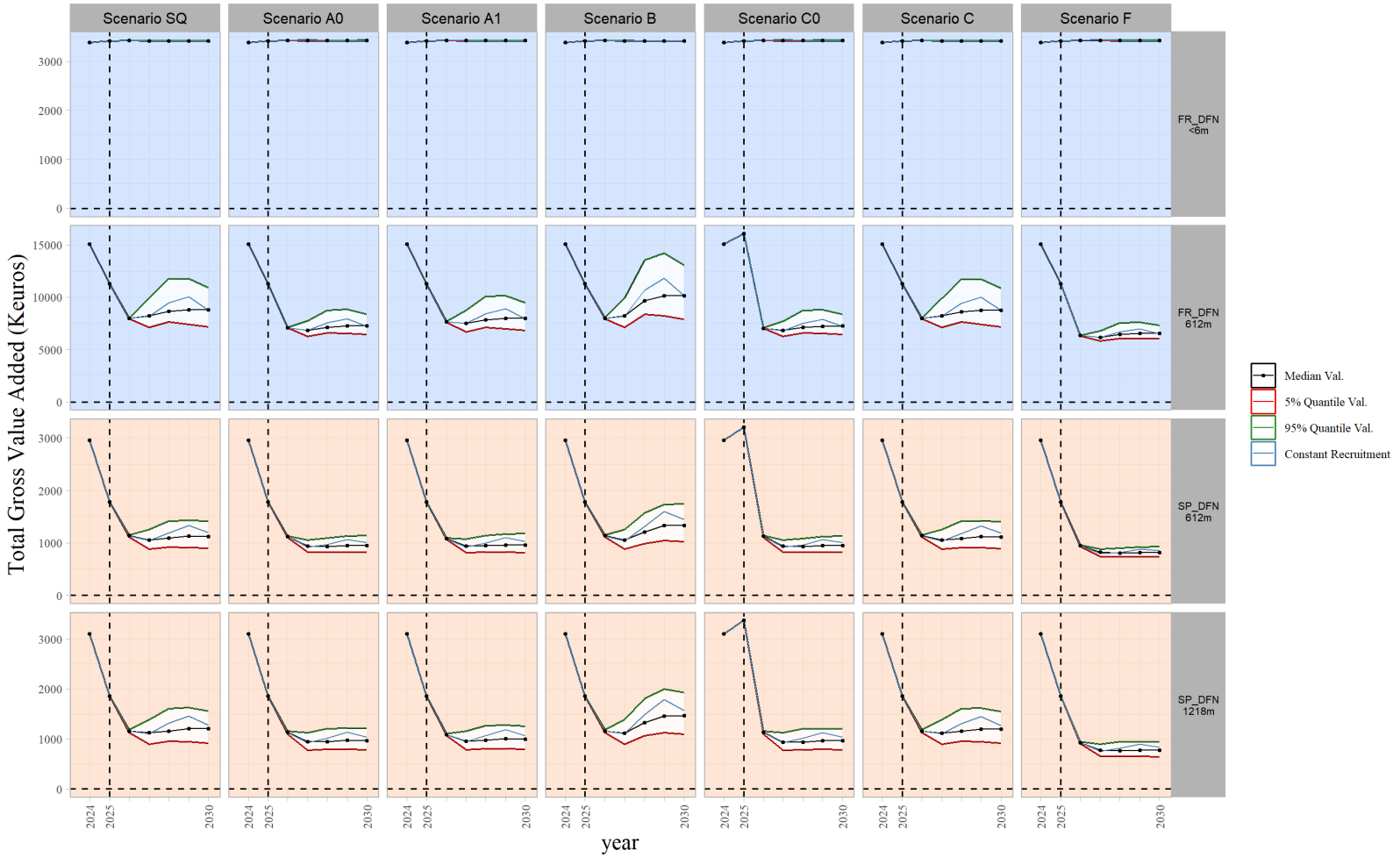
Supplementary material 3 EMU1 (IAM model). Evolution of the **total annual fishing effort** (in fishing days) by vessels using active and passive gear (**PMP**) fleet segments under alternative scenarios from 2024 to 2030. Historical values (source: FDI) are given in the white areas and simulated values in the coloured area. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): Spanish vessels using active and passive gear <06m and 06-12m.



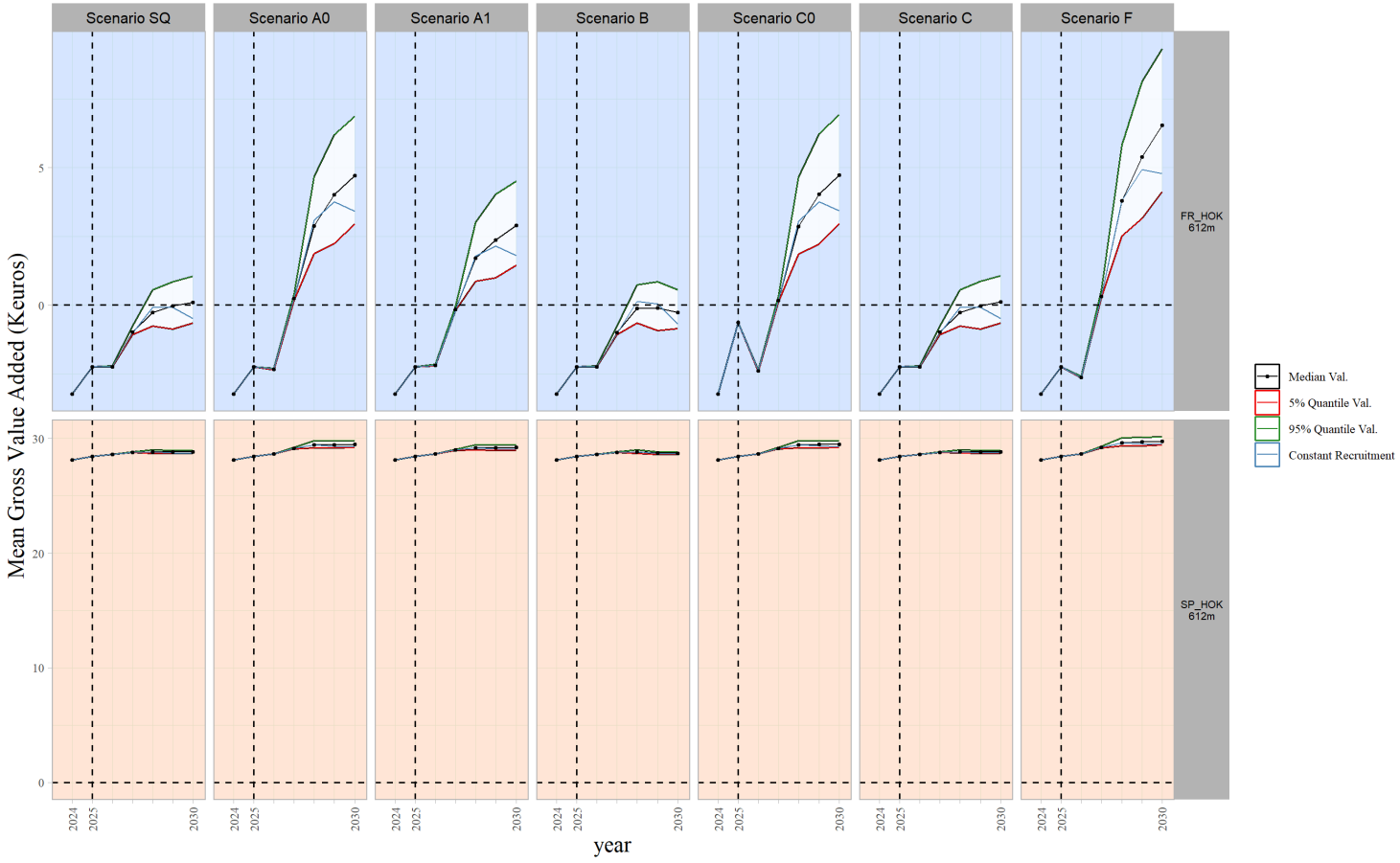
Supplementary material 4 EMU1 (IAM model). Evolution of the **total annual fishing effort** (in fishing days) by vessels using polyvalent passive gear only (**PGP**) fleet segments under alternative scenarios from 2024 to 2030. Historical values (source: FDI) are given in the white areas and simulated values in the coloured area. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French vessels using polyvalent passive gear only <06m and 06-12m.



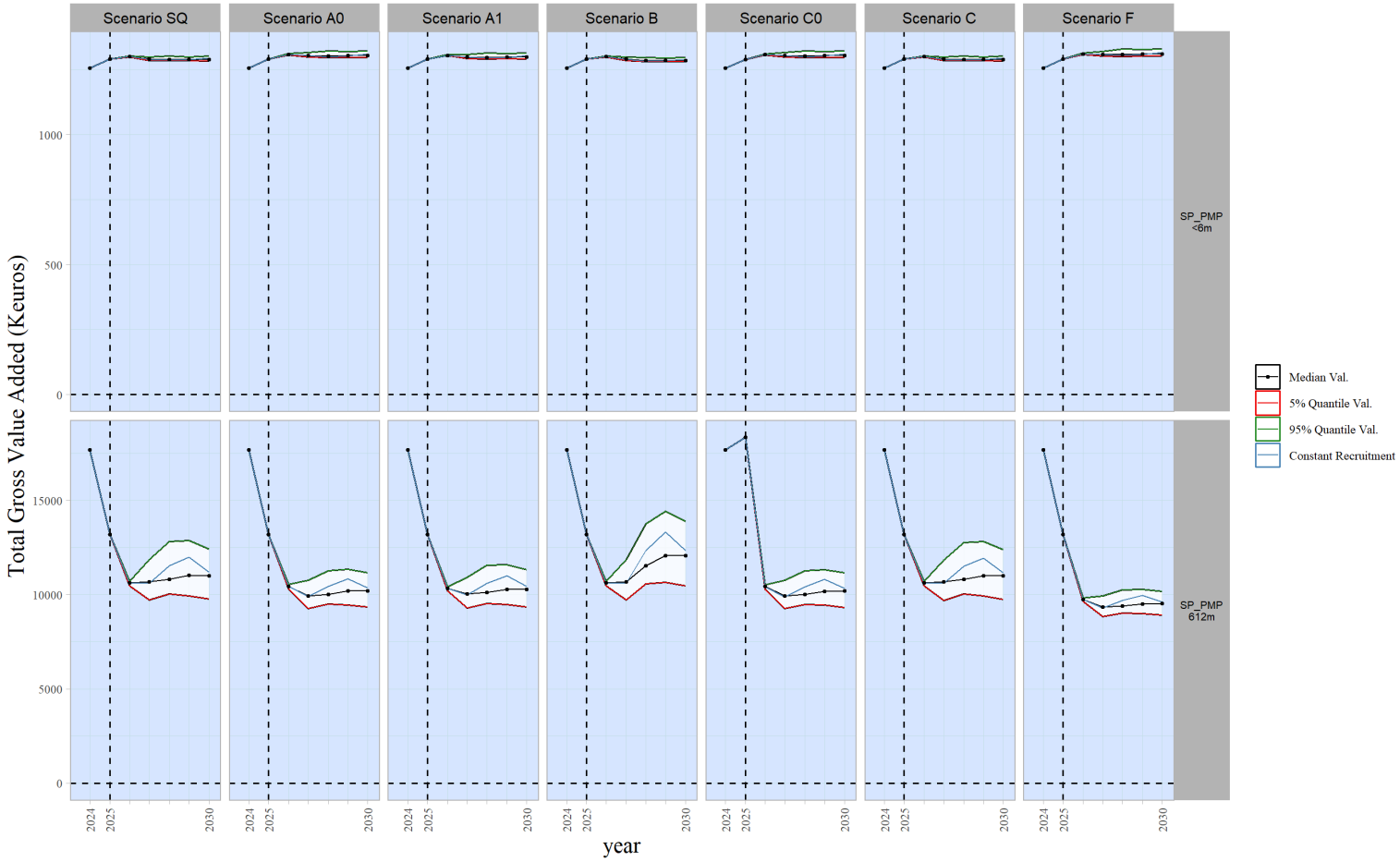
Supplementary material 5 EMU1 (IAM model). Evolution of the total Gross Value Added (**GVA**, in K euros) by netter (**DFN**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French netters <06m and 06-12m, and Spanish netters 06-12m and 12-18m.



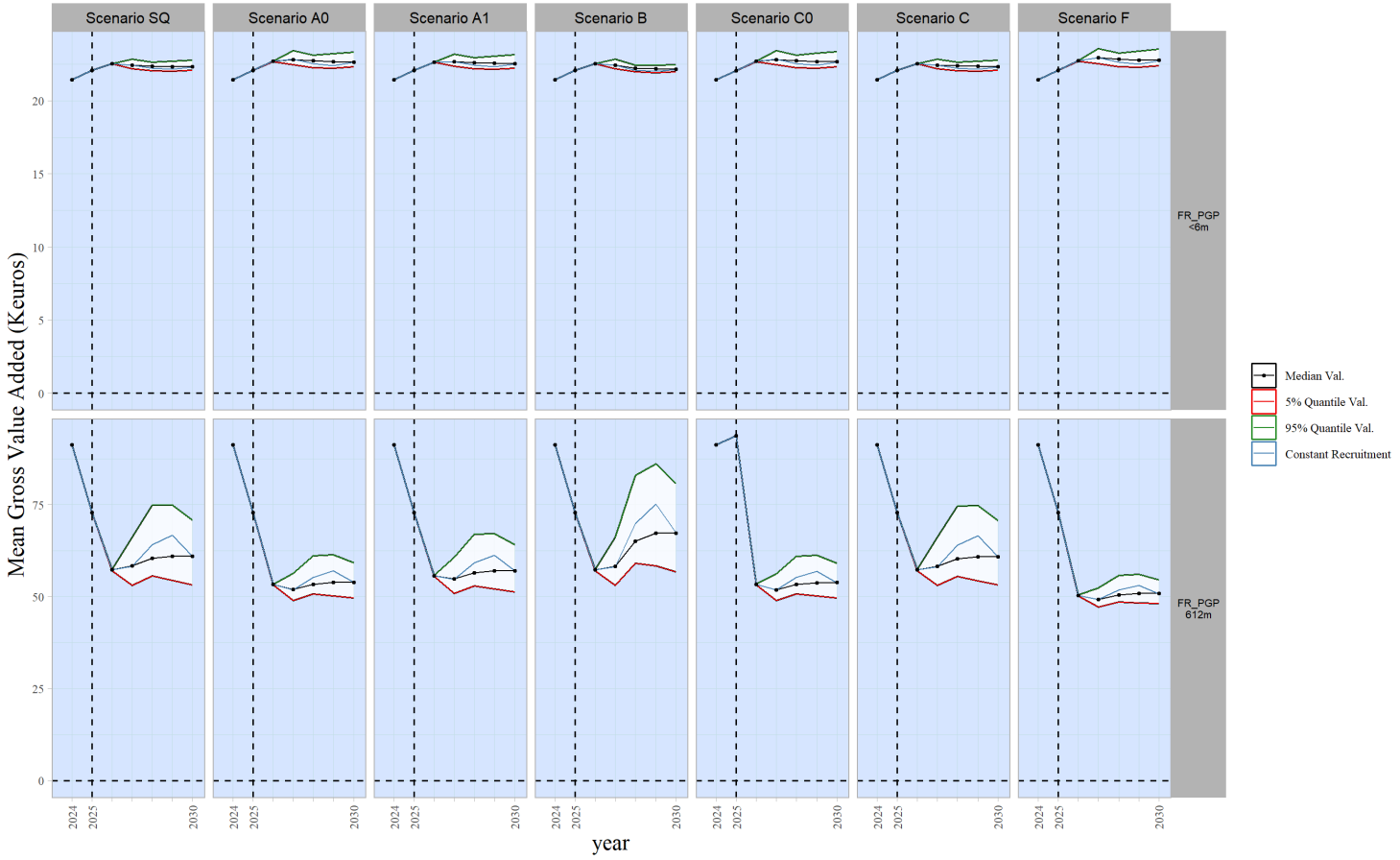
Supplementary material 6 EMU1 (IAM model). Evolution of the total Gross Value Added (**GVA**, in K euros) by vessels using hooks (**HOK**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French vessels using hooks 06-12m and Spanish vessels using hooks 06-12m.



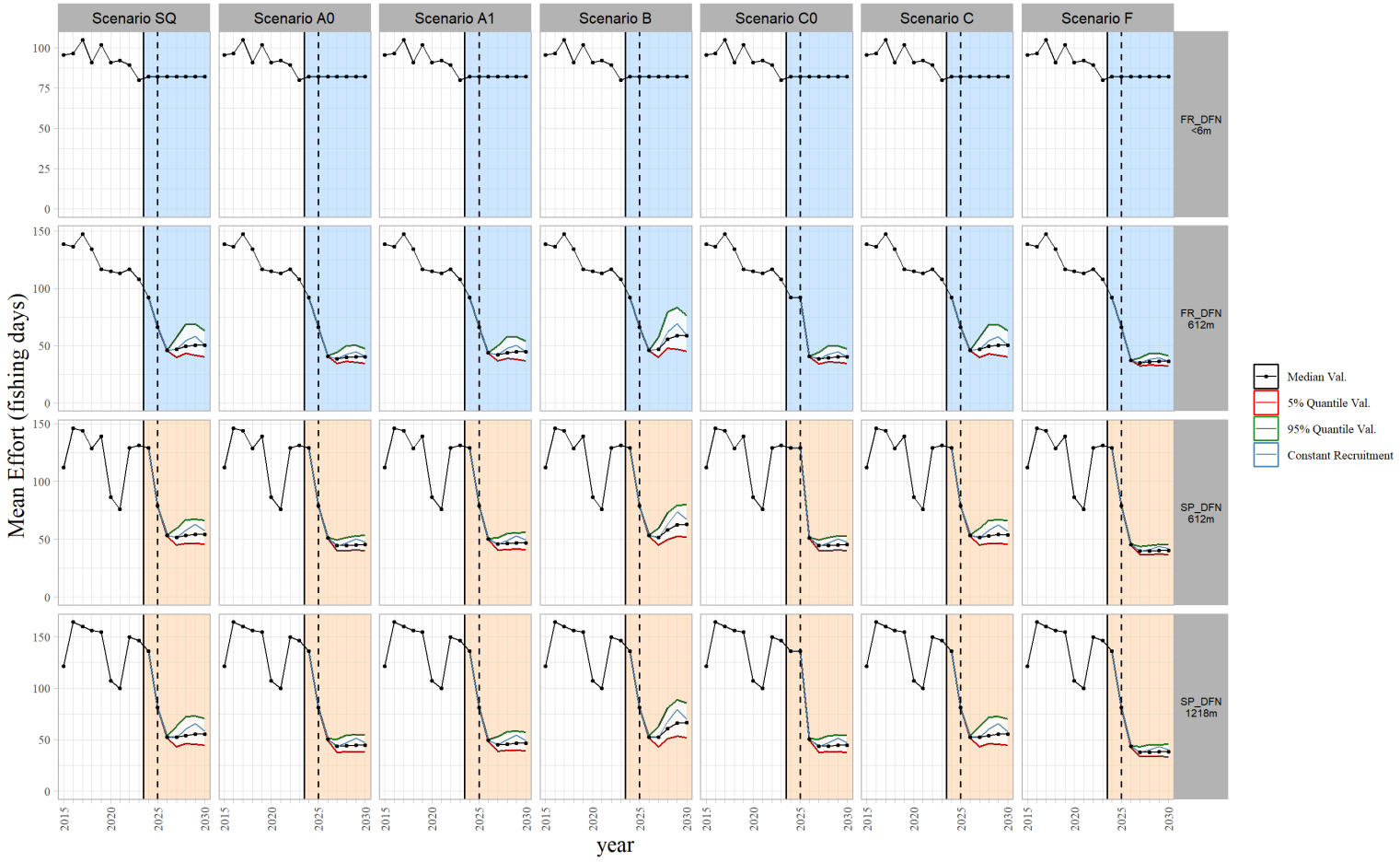
Supplementary material 7 EMU1 (IAM model). Evolution of the total Gross Value Added (**GVA**, in K euros) by vessels using active and passive gear (**PMP**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): Spanish vessels using active and passive gear <6m and 06-12m.



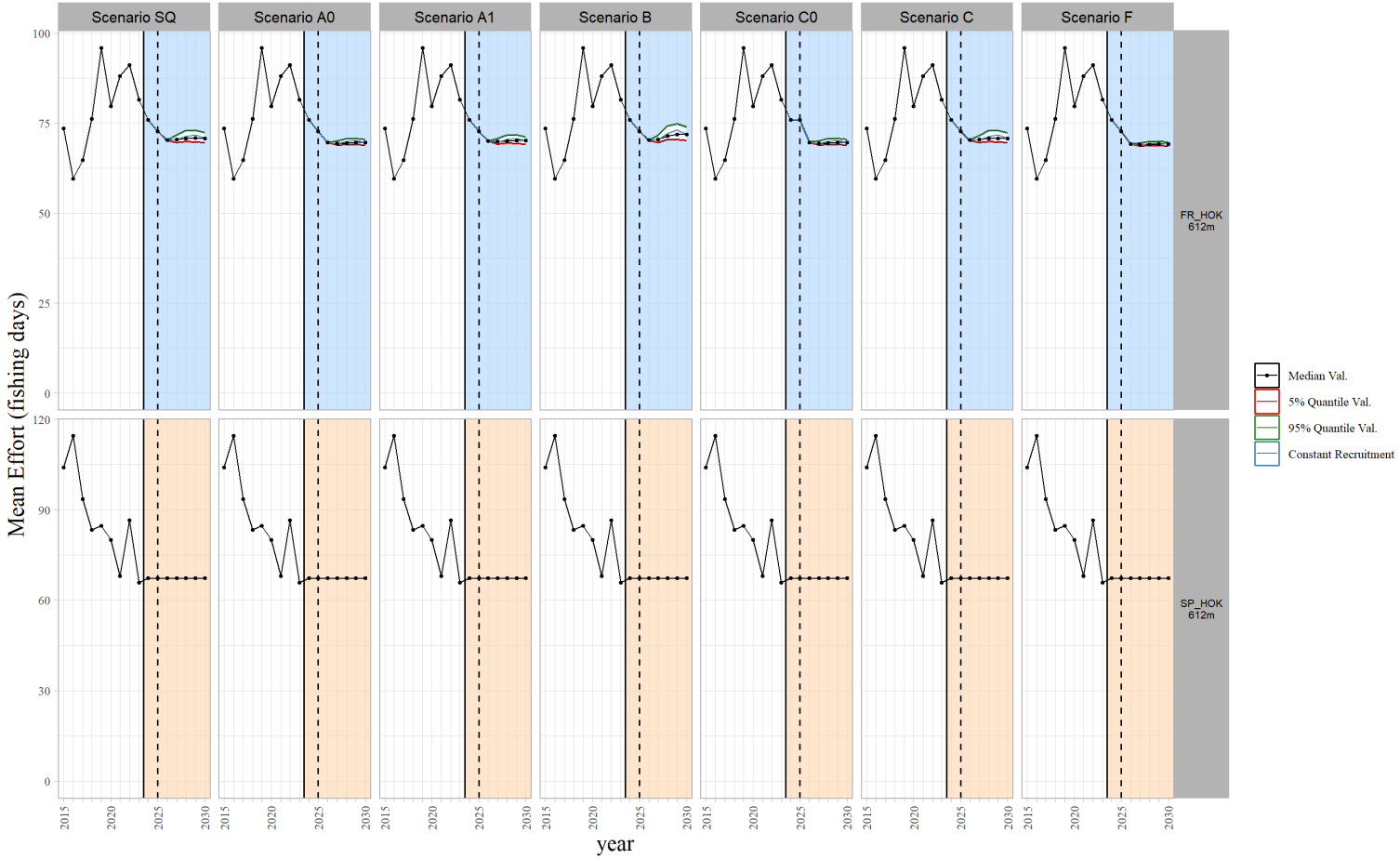
Supplementary material 8 EMU1 (IAM model). SCENARIOS SQ, B, A1, A0, F. Evolution of the total Gross Value Added (**GVA**, in K euros) by vessels using polyvalent passive gear only (**PGP**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French vessels using polyvalent passive gear only <6m and 06-12m.



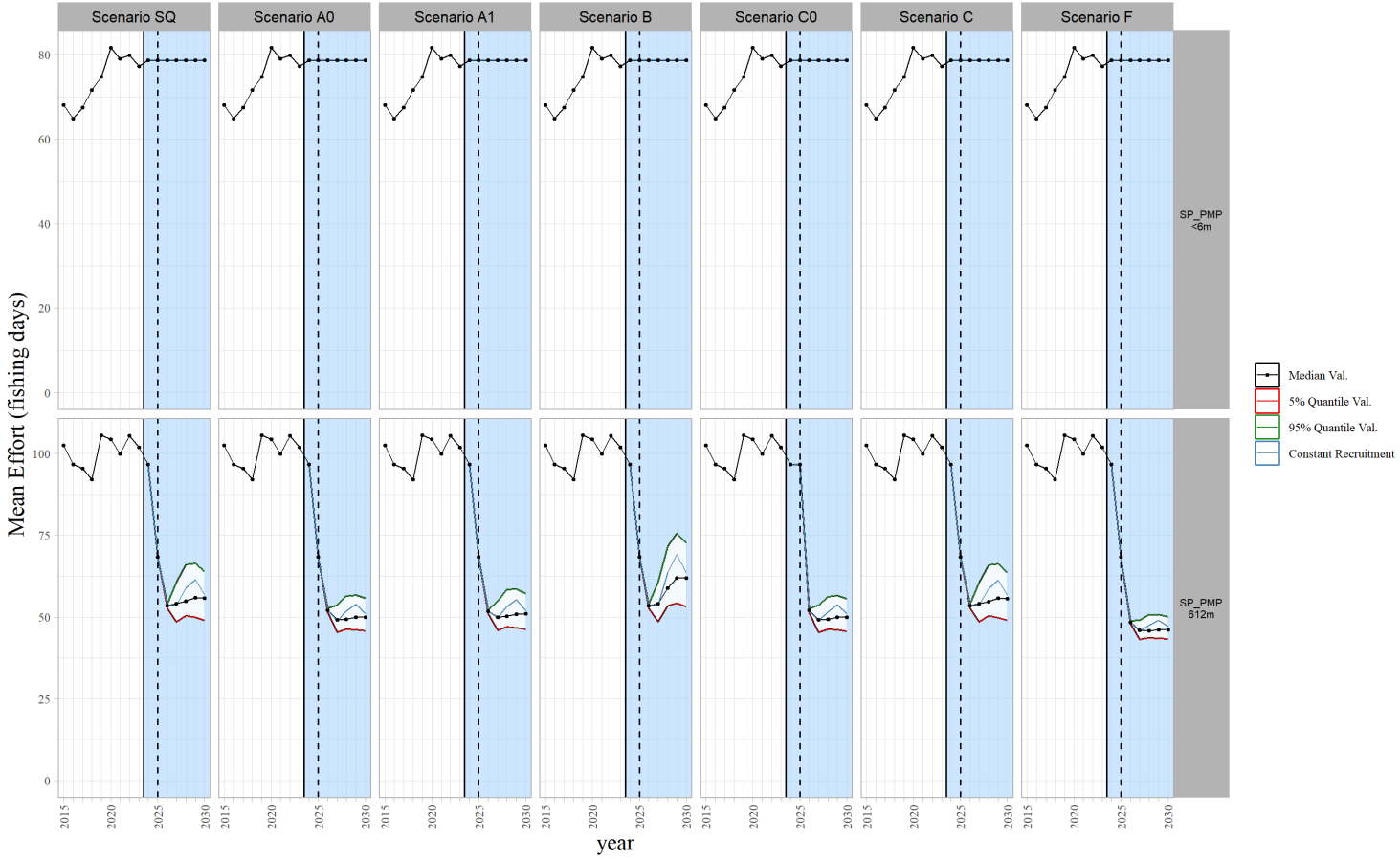
Supplementary material 9 EMU1 (IAM model). Evolution of the **Average fishing effort per vessel** by netter (**DFN**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French netters <06m and 06-12m, and Spanish netters 06-12m and 12-18m.



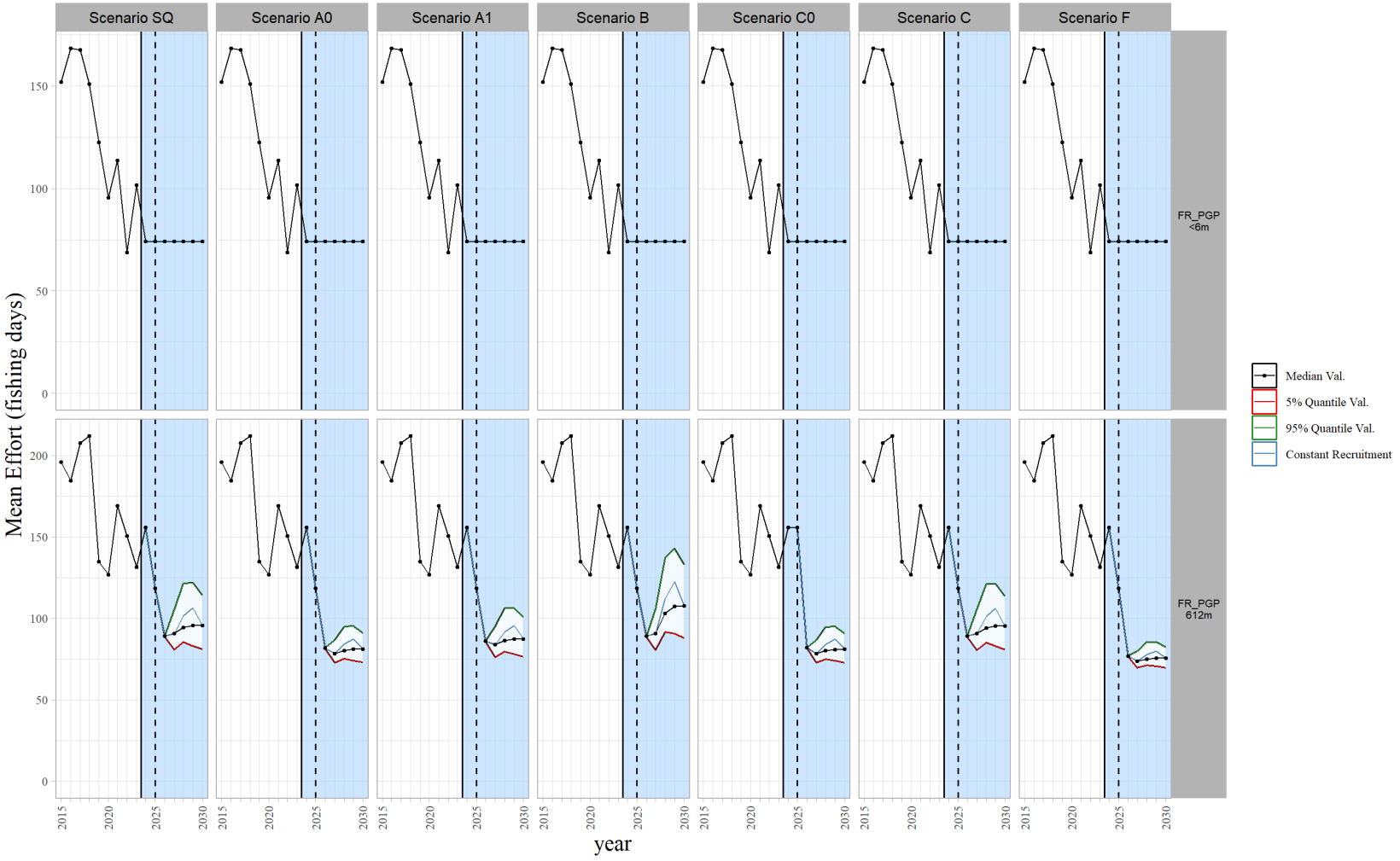
Supplementary material 10 EMU1 (IAM model). Evolution of the **Average fishing effort per vessel** by vessels using hooks (**HOK**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French vessels using hooks 06-12m and Spanish vessels using hooks 06-12m.



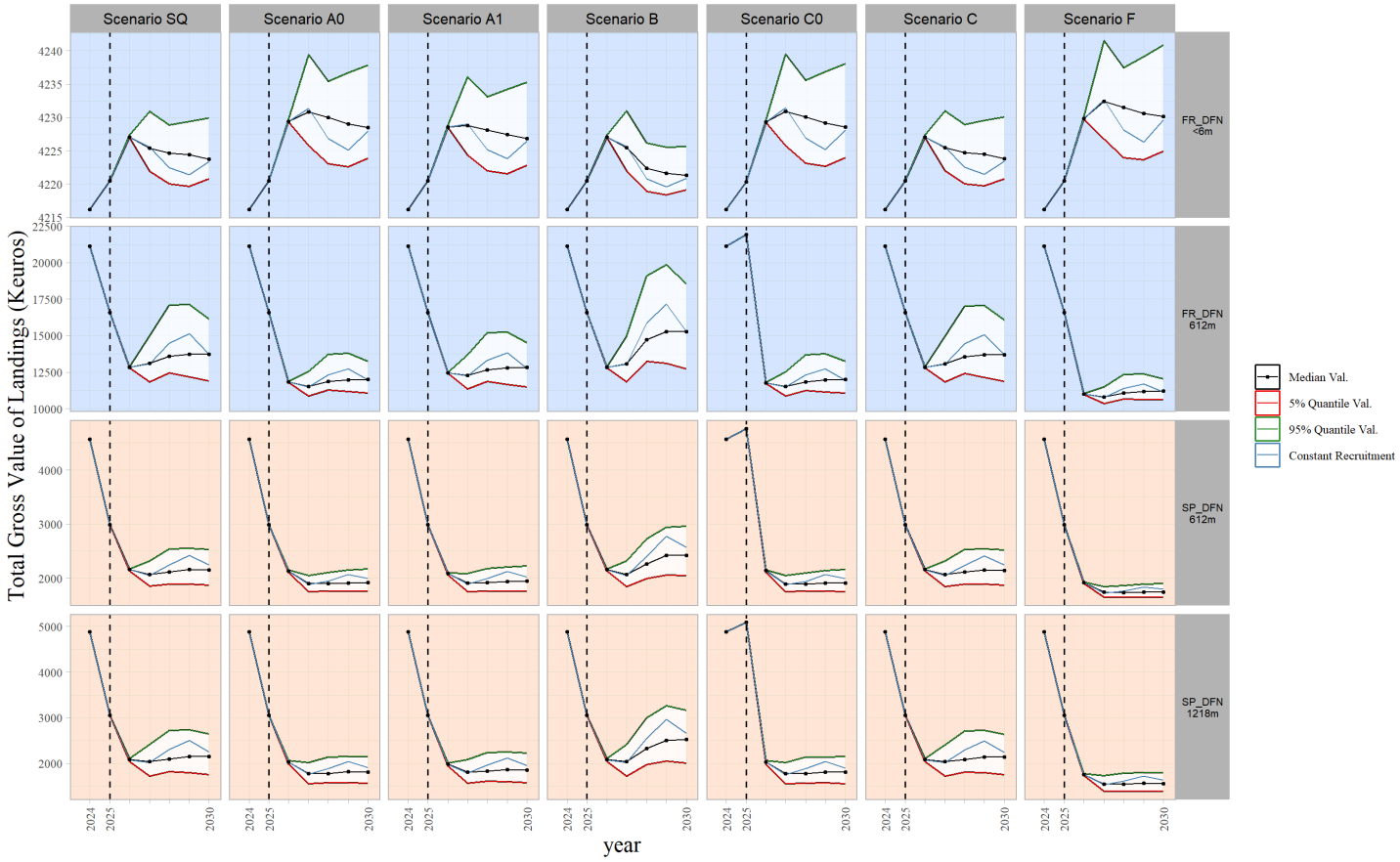
Supplementary material 11 EMU1 (IAM model). Evolution of **Average fishing effort per vessel** by vessels using active and passive gear (**PMP**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): Spanish vessels using active and passive gear <06m and 06-12m.



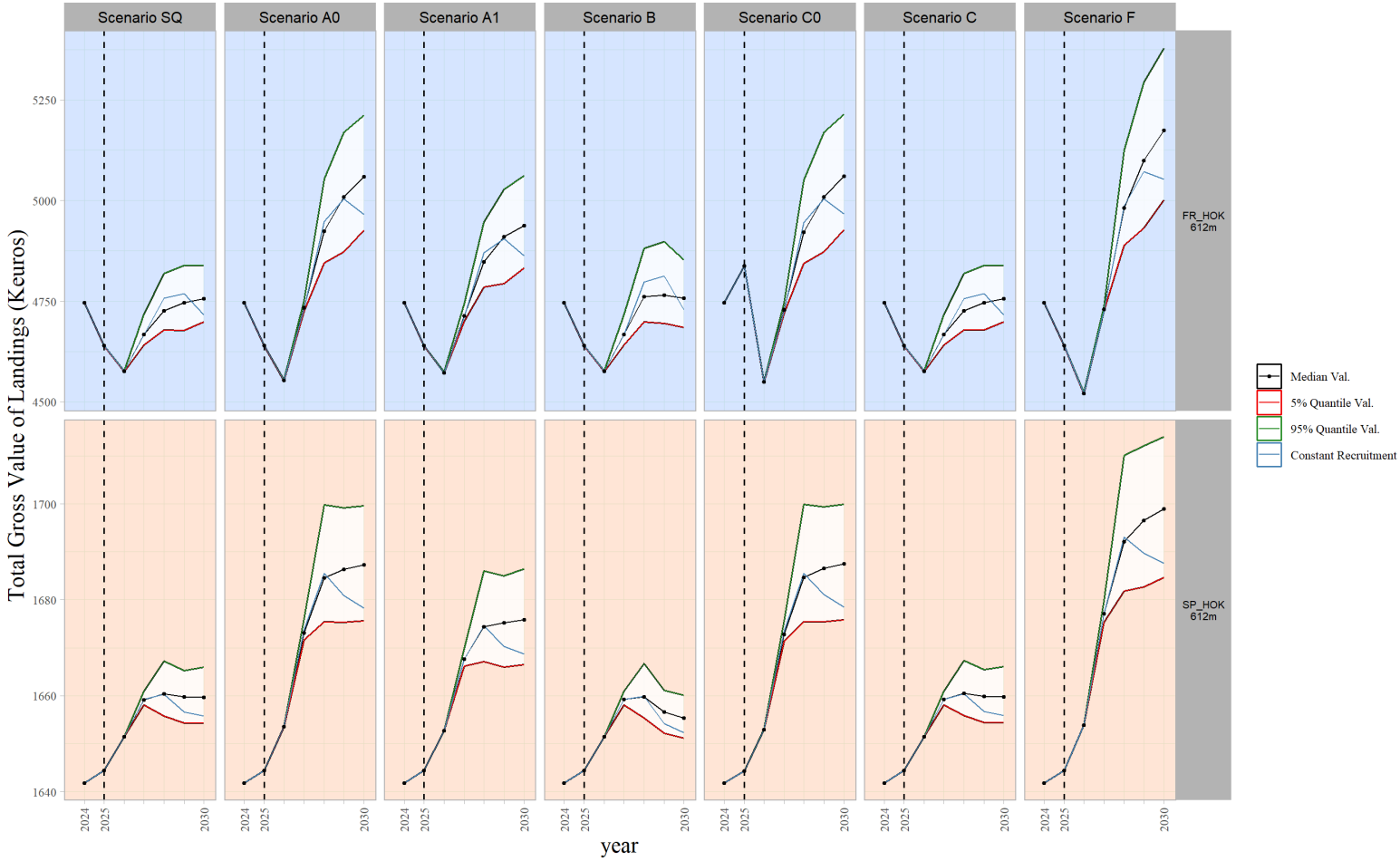
Supplementary material 12 EMU1 (IAM model). Evolution of the **Average fishing effort per vessel** by vessels using polyvalent passive gear only (**PGP**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): vessels using polyvalent passive gear only <06m and 06-12m.



Supplementary material 13 EMU1 (IAM model). Evolution of the **total Gross Value of Landings** (GVL, in K euros) by netter (**DFN**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French netters <06m and 06-12m, and Spanish netters 06-12m and 12-18m.

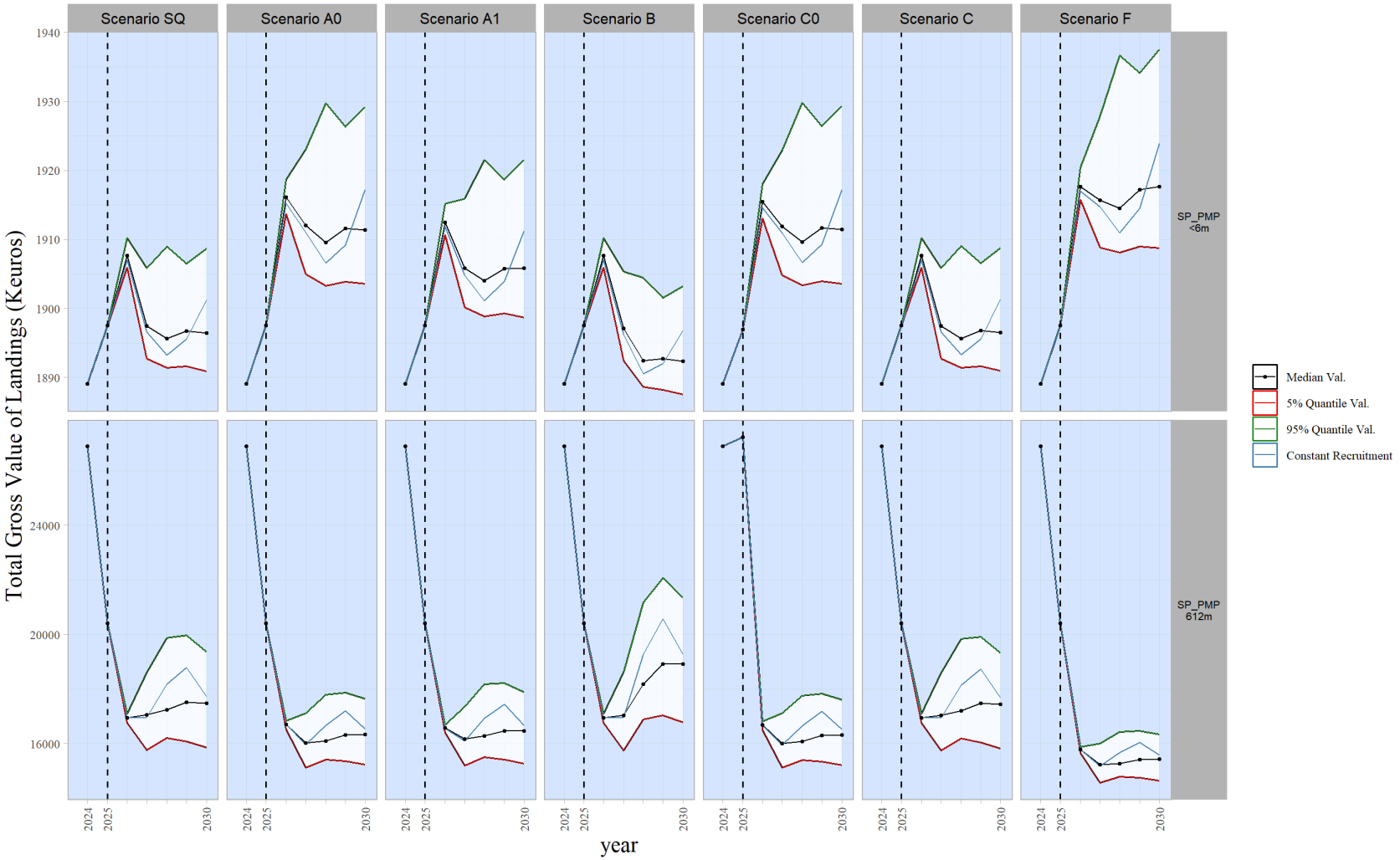


Supplementary material 14 EMU1 (IAM model). Evolution of the **total Gross Value of Landings** (GVL, in K euros) by vessels using hooks (**HOK**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): French vessels using hooks 06-12m and Spanish vessels using hooks 06-12m.

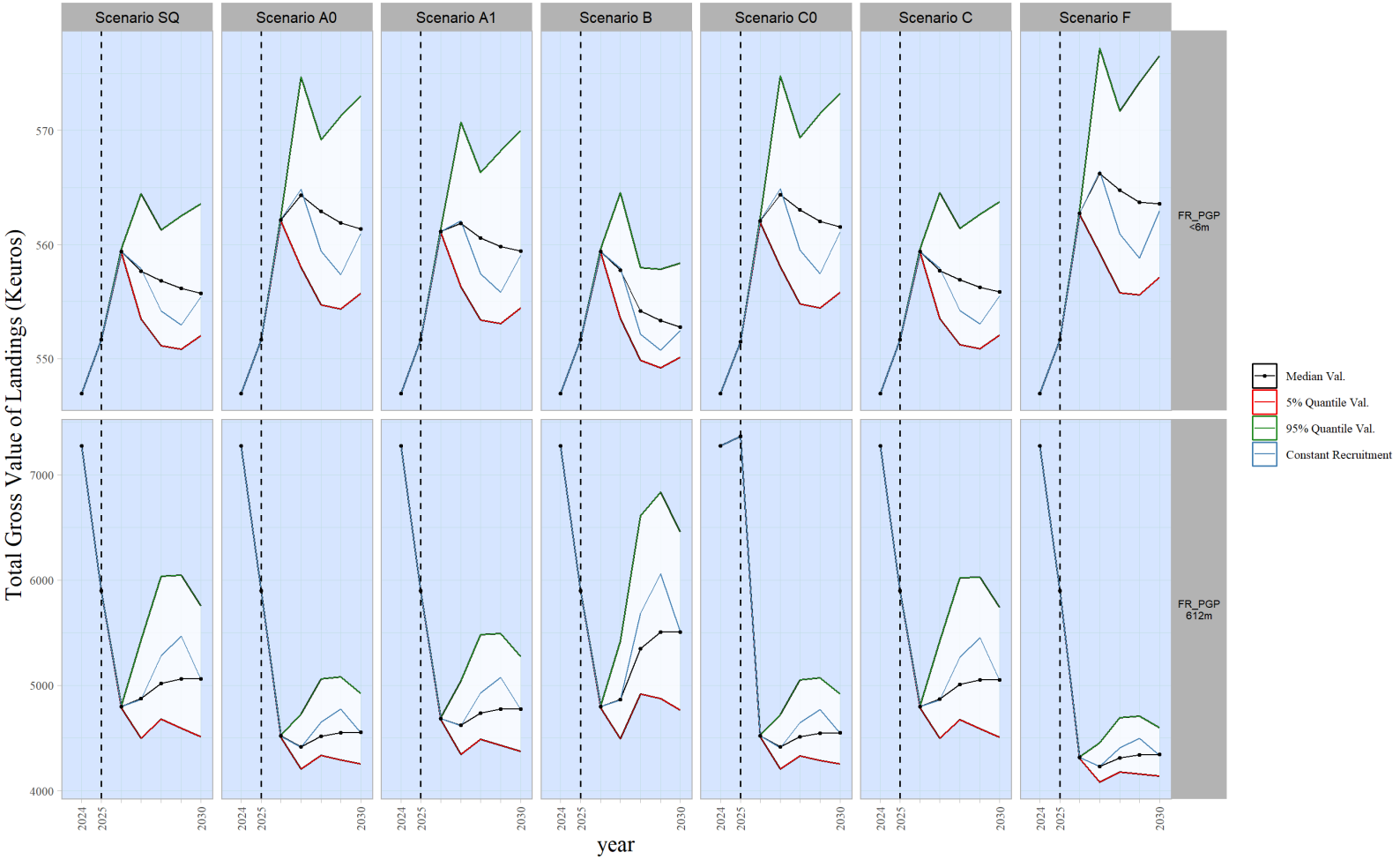


Supplementary material 15 EMU1 (IAM model). Evolution of the **total Gross Value of Landings** (GVL, in K euros) by vessels using active and passive gear (**PMP**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025.

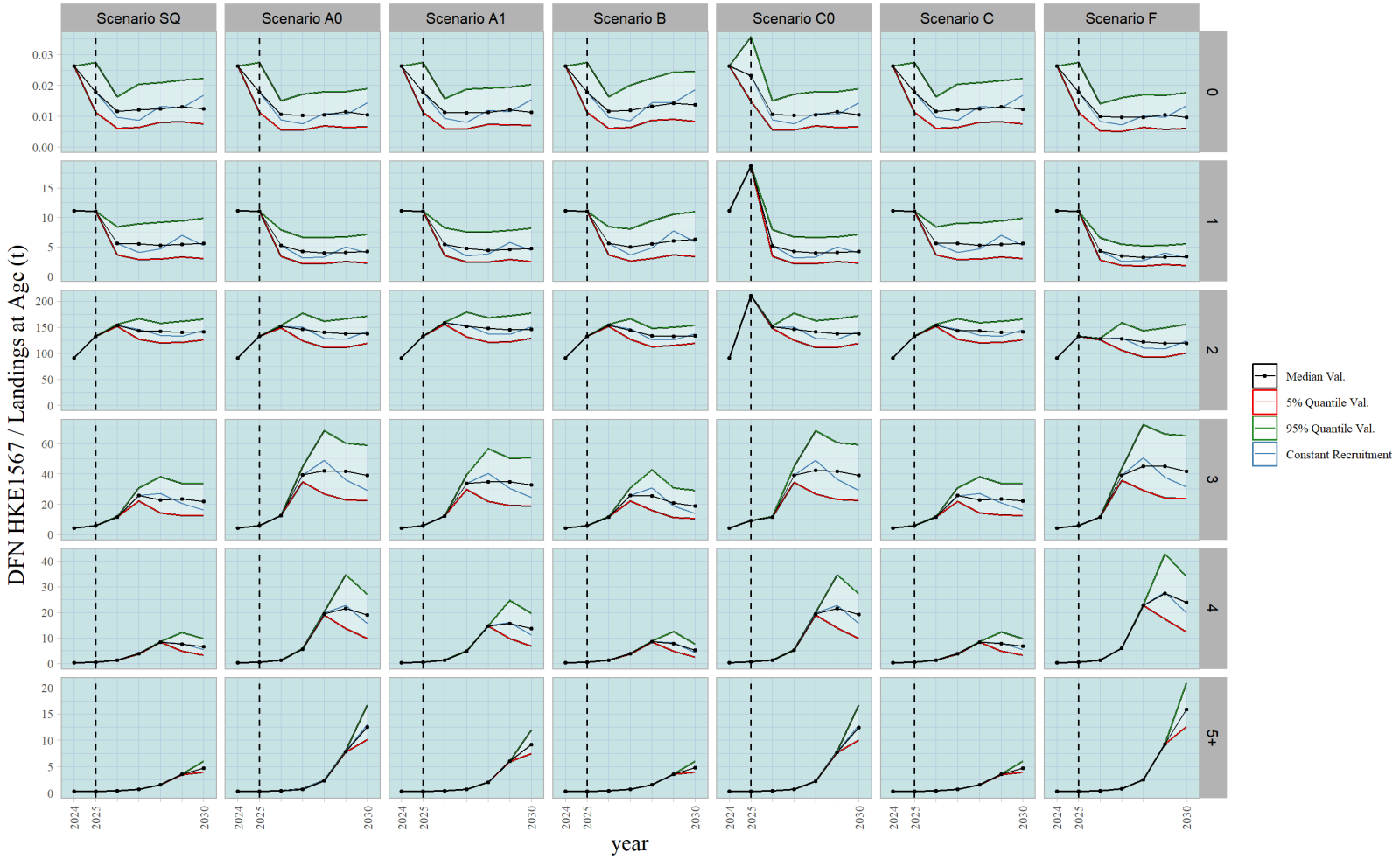
Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): Spanish vessels using active and passive gear <06m and 06-12m.



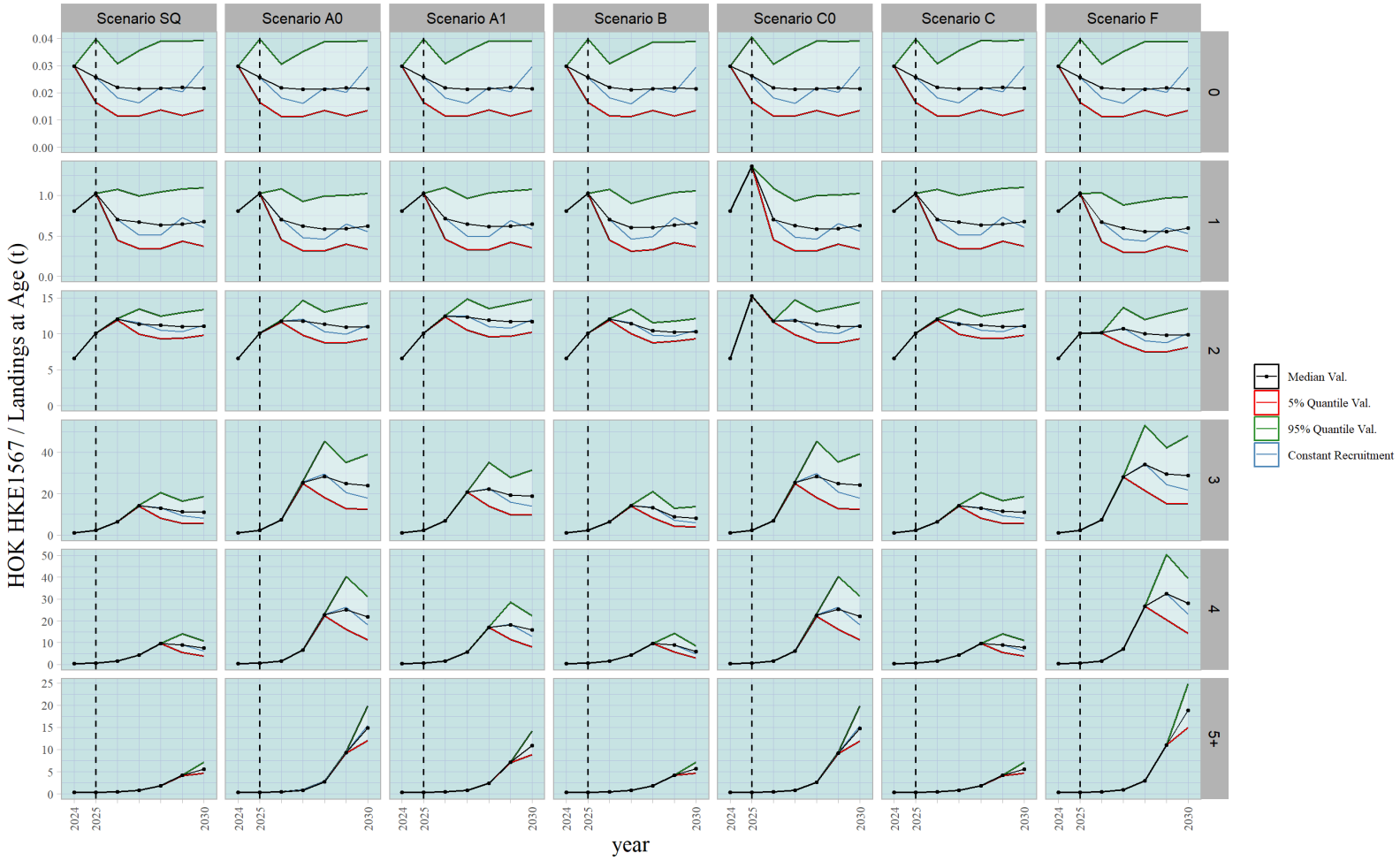
Supplementary material 16 EMU1 (IAM model). Evolution of the **total Gross Value of Landings** (GVL, in K euros) by vessels using polyvalent passive gear only (**PGP**) fleet segments under alternative scenarios from 2024 to 2030. Vertical black dotted lines indicate the year 2025. Scenarios are in column and fleet segments in row. The fleet segments are as follow (from top to bottom): vessels using polyvalent passive gear only <06m and 06-12m.



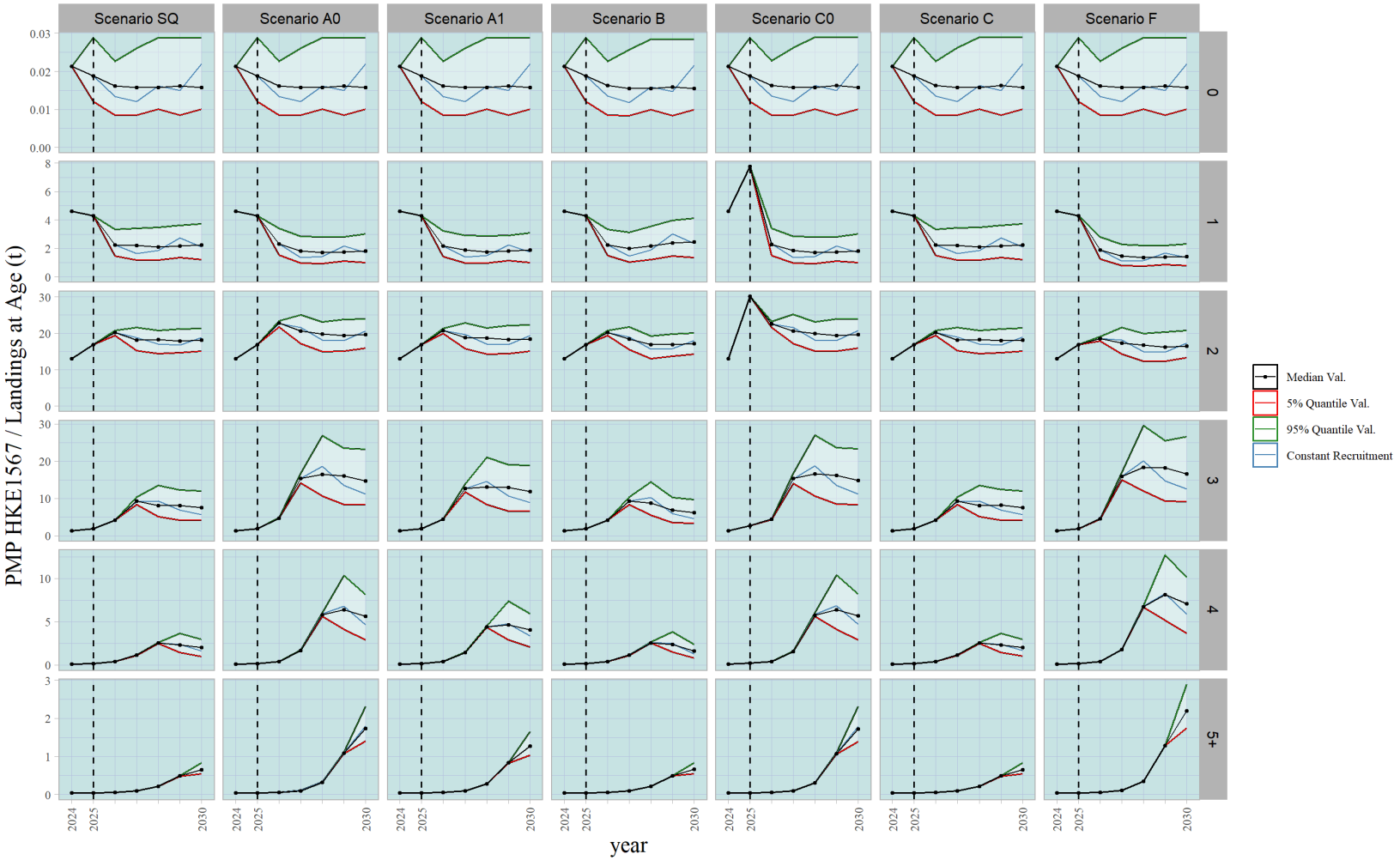
Supplementary material 17 EMU1 (IAM model). Evolution of total **annual landings by age (in tonnes) of hake in GSAs1-5-6-7 (HKE1567)**, caught by French and Spanish netters (**DFN**), under various scenarios from 2024 to 2030. Scenarios are represented in columns, and ages in rows. The vertical black dotted lines mark the year 2025.



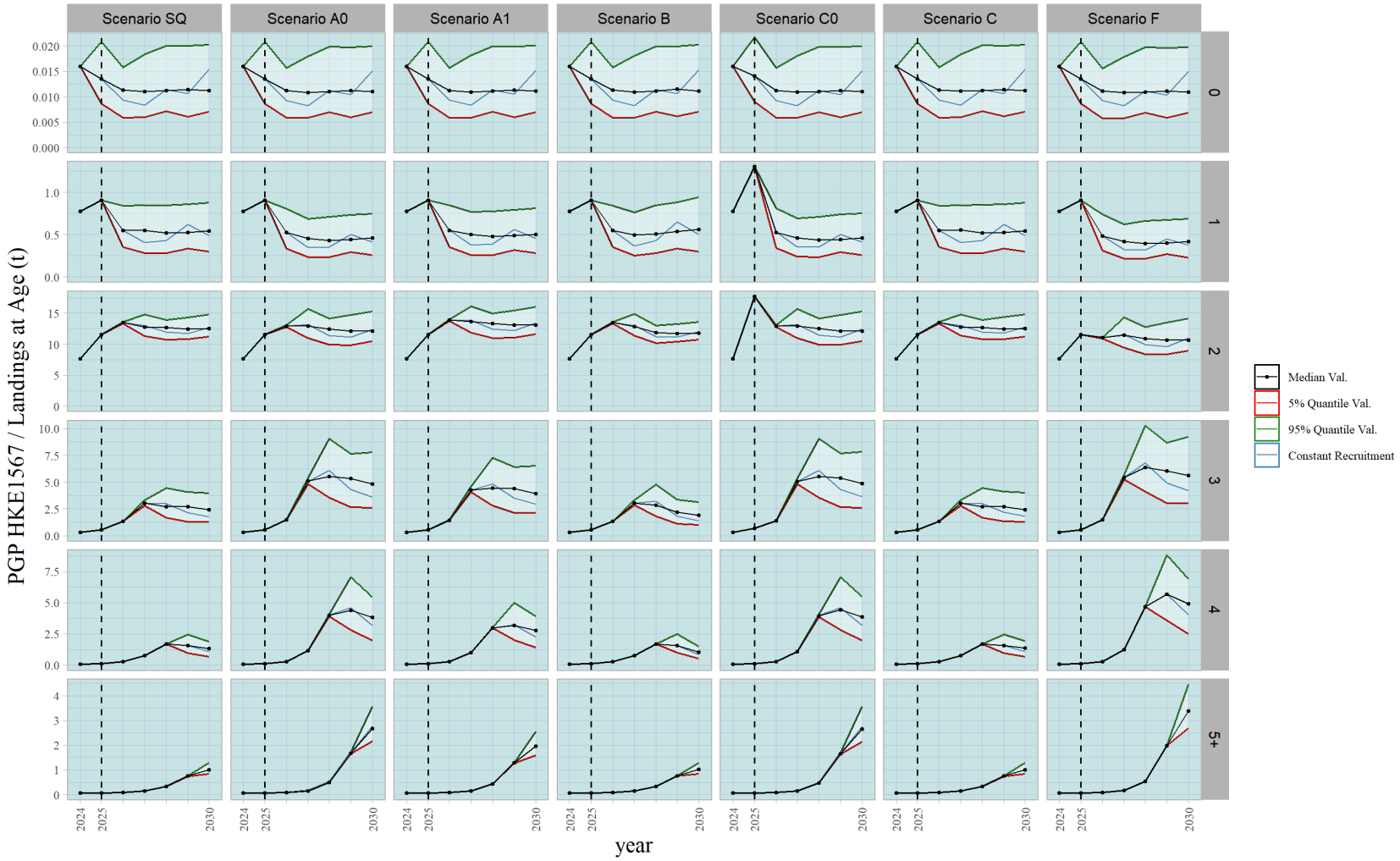
Supplementary material 18 EMU1 (IAM model). Evolution of total **annual landings by age (in tonnes) of hake in GSAs1-5-6-7 (HKE1567)**, caught by French and Spanish vessels using hooks (**HOK**), under various scenarios from 2024 to 2030. Scenarios are represented in columns, and ages in rows. The vertical black dotted lines mark the year 2025.



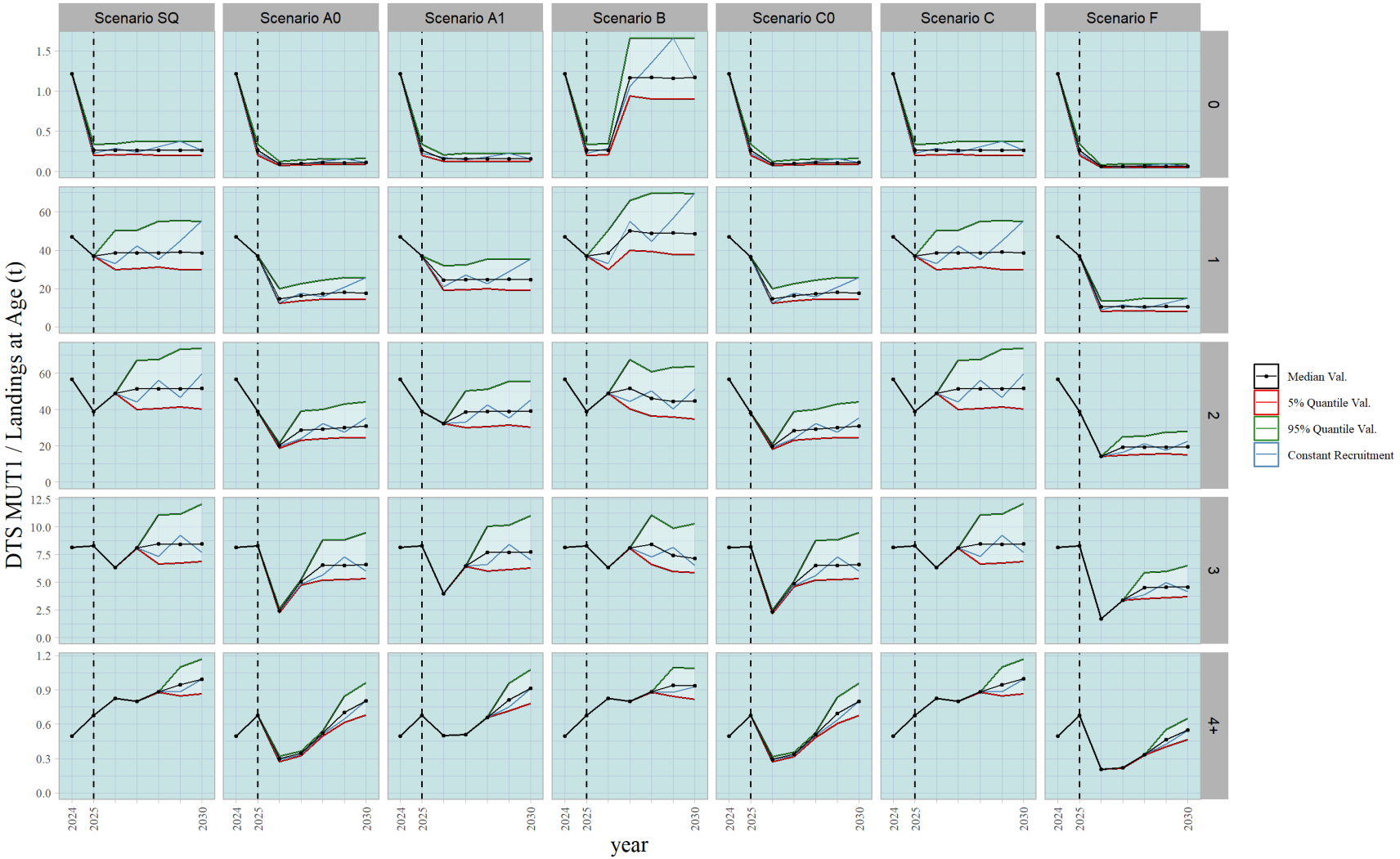
Supplementary material 19 EMU1 (IAM model). Evolution of total **annual landings by age (in tonnes) of hake in GSAs1-5-6-7 (HKE1567)**, caught by Spanish vessels using active and passive gear (**PMP**), under various scenarios from 2024 to 2030. Scenarios are represented in columns, and ages in rows. The vertical black dotted lines mark the year 2025.



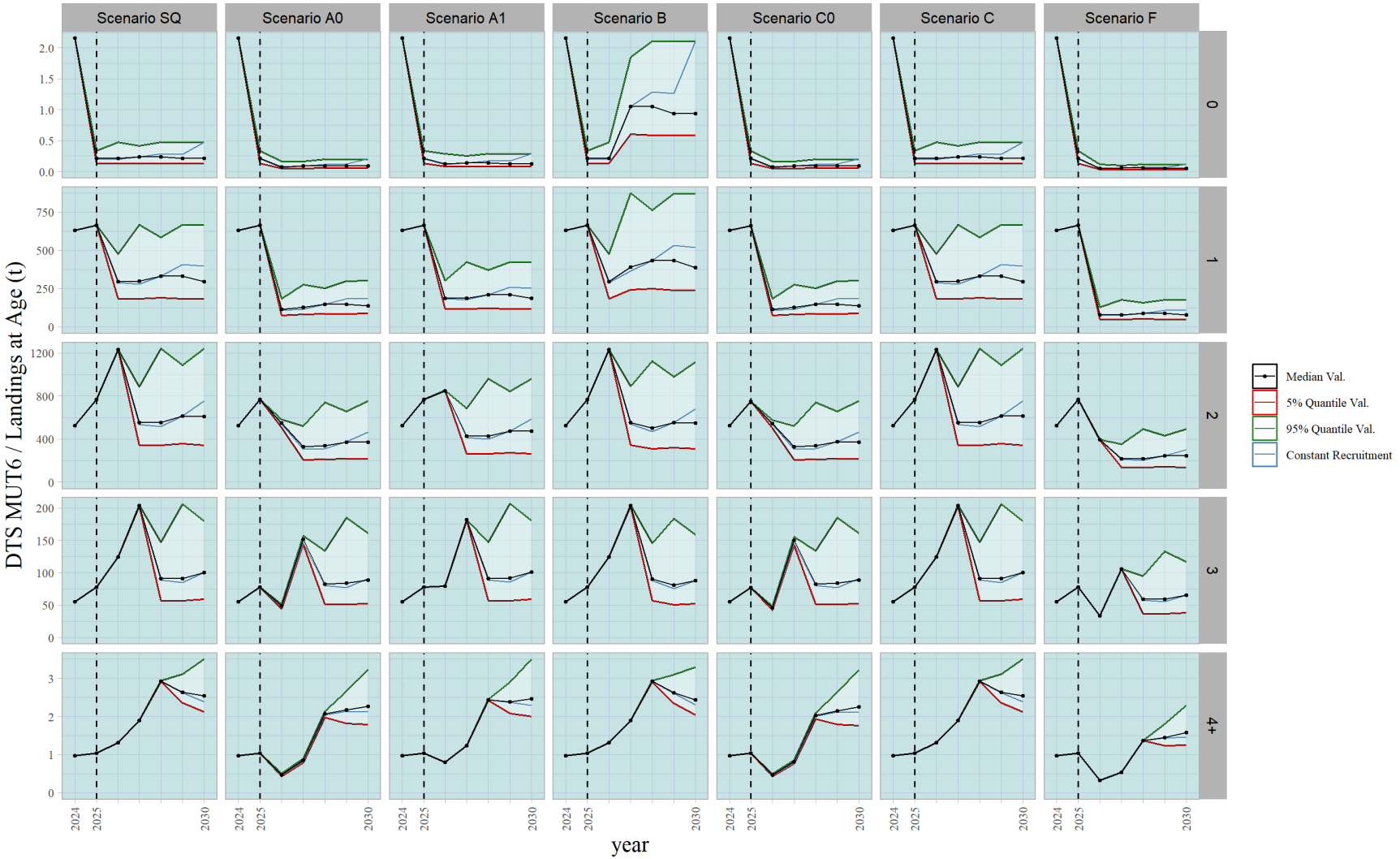
Supplementary material 20 EMU1 (IAM model). Evolution of total **annual landings by age (in tonnes) of hake in GSAs1-5-6-7 (HKE1567)**, caught by French vessels using polyvalent passive gear only (**PGP**), under various scenarios from 2024 to 2030. Scenarios are represented in columns, and ages in rows. The vertical black dotted lines mark the year 2025.



Supplementary material 21 EMU1 (IAM model). Evolution of total **annual landings by age (in tonnes) of ed mullet in GSA 1 (MUT1)**, caught by French and Spanish trawlers (**DTS**), under various scenarios from 2024 to 2030. Scenarios are represented in columns, and ages in rows. The vertical black dotted lines mark the year 2025.



Supplementary material 22 EMU1 (IAM model). Evolution of total **annual landings by age (in tonnes) of red mullet in GSA 6 (MUT6)**, caught by French and Spanish trawlers (**DTS**), under various scenarios from 2024 to 2030. Scenarios are represented in columns, and ages in rows. The vertical black dotted lines mark the year 2025.



ANNEX 2. CONTACT DETAILS OF EWG-25-11 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

STECF members		
Name	**Affiliation[1]**	**Email**
Bastardie, Francois	DTU	fba@aqua.dtu.dk
Döring, Ralf	Thuenen-Institute of Sea Fisheries	ralf.doering@thuenen.de
Sabatella, Evelina Carmen	CNR IRPPS	evelina.sabatella@cnr.it

Invited experts		
Name	**Affiliation[1]**	**Email**
Accadia, Paolo	Nisea Società Cooperativa	accadia@nisea.eu
Bitetto, Isabella	Fondazione COISPA ETS	bitetto@fondazionecoispa.org
Carreton, Marta	ICATMAR / ICM-CSIC	mcarreton@icm.csic.es
Certain, Gregoire	IFREMER	gregoire.certain@ifremer.fr
Couve, Pablo	ICATMAR (ICM-CSIC)	pablo.couve@gmail.com
Garriga Panisello, Mariona	ICATMAR - ICM (CSIC)	mariona.garripa@gmail.com
Genthon, Tanguy	Ifremer	tanguy.genthon@ifremer.fr
Gourguet, Sophie	Ifremer	sophie.gourguet@ifremer.fr
Leforestier, Sophie	OP SATHOAN	sophie.sathoan@gmail.com
Lehuta, Sigrid	ifremer	slehuta@ifremer.fr

Liontakis, Angelos	Agricultural University of Athens	aliontakis@agreri.gr
Merzéréaud, Mathieu	Ifremer	mathieu.merzereaud@ifremer.fr
Metz, Sebastien	Sakana Consultants	s_metz@sakana-consultants.com
Murenu, Matteo	University of Cagliari	mmurenu@unica.it
Perez-Rodriguez, Alfonso	Spanish Oceanographic Institute	alfonso.perez@ieo.csic.es
Sala-Coromina, Joan	Marine Science Institute (ICM-CSIC) / ICATMAR	jsala@icm.csic.es

European Commission		
Name	**Affiliation[1]**	**Email**
Dragon, Anne-Cecile	DG MARE	Anne-Cecile.DRAGON@ec.europa.eu
Kupschus, Sven	JRC, STECF secretariat	Jrc-stecf-secretariat@ec.europa.eu
Pierucci, Andrea	JRC, STECF secretariat	Jrc-stecf-secretariat@ec.europa.eu

Observers		
Name	**Affiliation[1]**	**Email**
Beaucher, StéPhan	MedReAct	beaucherstephan@gmail.com
Herrador, Ruth	Subdirección General de Investigación Pesquera y Recopilación de Datos. Ministerio de Agricultura, Pesca y Alimentación.	rherrador@mapa.es
Louis, Collin	DGAMPA	louis.collin@developpement-durable.gouv.fr
Piron, Marta	Mediterranean Advisory Council	segreteria@med-ac.eu
Álvarez, Helena	Oceana Europe	halvarez@oceana.org

12. List of electronic Annexes

List electronic annexes:

EWG-25-11 – Annex 1 - Partial fishing mortality (F_{part}) tables

Electronic Annexes are published on:

https://stecf.ec.europa.eu/document/32534030-de3c-4748-a28b-c2fce855c5ff

13. List of Background Documents

Background documents are published on:

https://stecf.ec.europa.eu/document/32534030-de3c-4748-a28b-c2fce855c5ff

List of background documents:

EWG-25-11 – Doc 1 - Declarations of invited and JRC experts (see also Annex1 of this report – List of participants)

Ad hoc contract report (STECF 25103): Fishing effort scenarios for demersal fisheries in the western Mediterranean Sea (EMU 2).

Ad hoc contract report (STECF 25105): Efficiency of permanent closure areas under 600m depth in the Western Mediterranean Sea.

Getting in touch with the EU

In person

All over the European Union there are hundreds of Europe Direct centres. You can find the address of the centre nearest you online (european-union.europa.eu/contact-eu/meet-us_en).

On the phone or in writing

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,

— via the following form: european-union.europa.eu/contact-eu/write-us_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 (european-union.europa.eu).

EU publications

You can view or order EU publications at op.europa.eu/en/publications. Multiple copies of free publications can be obtained by contacting Europe Direct or your local documentation centre (european-union.europa.eu/contact-eu/meet-us_en).

EU law and related documents

For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex (eur-lex.europa.eu).

EU open data

The portal data.europa.eu provides access to open datasets from the EU institutions, bodies and agencies. These can be downloaded and reused for free, for both commercial and non-commercial purposes. The portal also provides access to a wealth of datasets from European countries.

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.

Science for policy

The Joint Research Centre (JRC) provides independent, evidence-based knowledge and science, supporting EU policies to positively impact society

EU Science Hub
Joint-research-centre.ec.europa.eu

Publications Office
of the European Union