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Institut Català de Recerca per a la Governança del Mar

Commercial fisheries advisory report for the northern GSA 6

2024

Co-funded by the European Union
Generalitat de Catalunya
Departament d'Acció Climàtica, Alimentació i Agenda Rural
CSIC
Consejo Superior de Investigaciones Científicas
Institut de Ciències del Mar

This report conveys ICATMAR's considerations on fisheries management actions for 2024 supported by data from its monitoring program.

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How to cite this document
Institut Català de Recerca per a la Governança del Mar (ICATMAR). Commercial fisheries advisory report for the Northern GSA 6 2024 (ICATMAR, 24-07), 20 pp., Barcelona. DOI: 10.20350/digitalCSIC/16571

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The five-year transition period of the Western Mediterranean Multiannual Plan (WMMAP) for demersal fisheries will end in December 2024, and has resulted in an intricate regulation system that combines the core regulations, compensatory mechanisms, and remedial measures, which have different levels of enforceability and can be applied at different scales, be it Member States, regions, or even individual vessels. The measures are directed at a variety of aspects of the fishing activity including fishing effort, the characteristics of the gear, or the establishment of closures. Each layer of regulations adds complexity to the management of this fishery, while preserving the reduction in fishing days as a flagship measure to achieve MSY, despite its severe socioeconomic consequences. We here present our considerations on this framework, based on knowledge from our exhaustive monitoring program in the Northern GSA 6 (Figure 1) and other studies being developed.

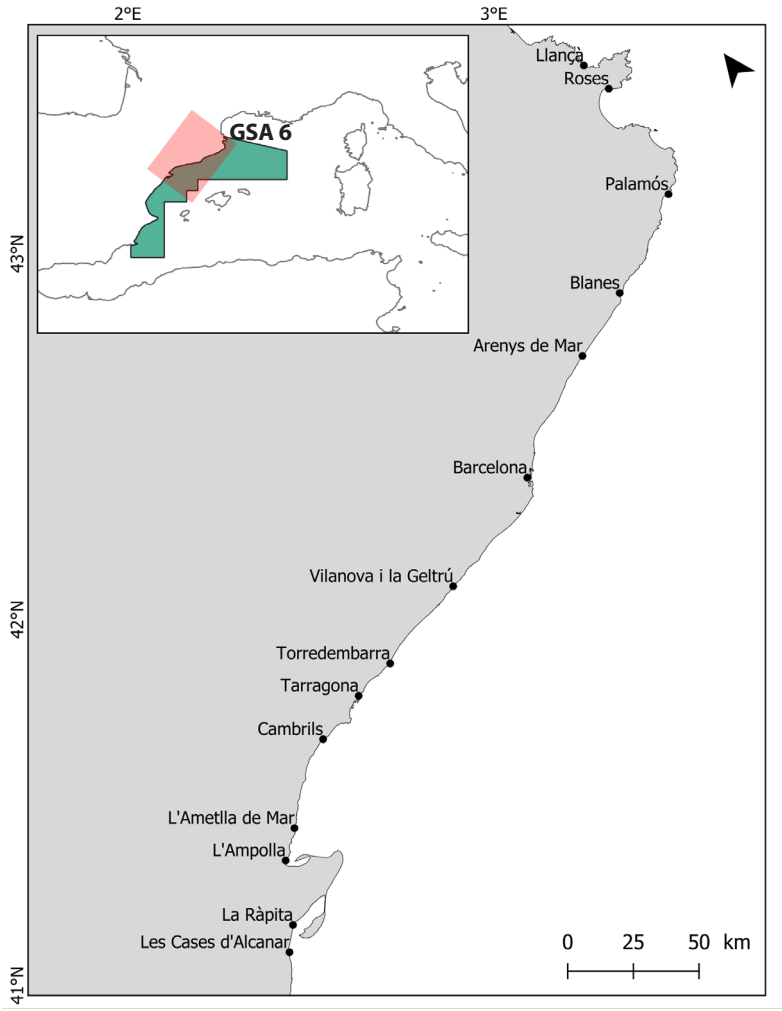

Figure 1. Study area and main fishing ports of ICATMAR fisheries monitoring program in the Northern GSA 6.

1

Advances in the sustainability of the bottom trawl fishery in the northern GSA 6

Improvements in gear selectivity and use of low-contact otter boards are currently an incentive to the fleet to receive compensations in additional fishing days. Each vessel must express the commitment to apply any of these measure at the beginning of each year in order to receive the additional fishing days. The information shown in this report comes from the official documents of the Spanish Secretariate-General of Fisheries, where all vessels that file for the compensation are registered (in draft form for 2024).

1. Improving gear selectivity

Vessels with fishing days assigned to coastal fisheries are encouraged to change from the legal minimum of 40 mm to 45 mm square mesh in exchange for additional fishing days, while vessels with fishing days assigned to deep-sea fisheries are asked to change to 50 mm square mesh. Some vessels have days assigned to both types of fisheries and may change both gears at once.

Overall, implementation of more selective gear in the bottom trawling fleet of the northern GSA 6 has shown an increase from 2023 to 2024 (12.5 to 16.7% of all vessels, respectively), with the addition of the port of Vilanova i la Geltrú in 2024, and a notable increase in Llançà (29 to 86% of vessels; Figure 2). However, only three ports north of Barcelona have over half of the fleet changing gears (Llançà, Palamós and Blanes), and no vessels have expressed any interest in the measure for the last two years in 10 of the 15 ports. It is also worth noting that the use of 50 mm square mesh has declined in Roses, after reportedly dissatisfactory results for 2 of the 4 vessels that used it in 2023. It seems clear that the addition of fishing days is not enough incentive to spur the changes needed, and this reality clashes with the proved effectiveness of gear selectivity for the restoration of exploited populations (e.g. Bahamon et al. 2024).

The potential effects of a compulsory change to more selective gear for all the bottom trawl fleet are being studied using data from the continuous onboard monitoring program carried out by ICATMAR. The length frequency distribution of the catch was analyzed for all métiers in the Northern GSA 6 for the current mesh size (40 mm square) and for two mesh sizes used in experimental selectivity studies (Bahamon et al. 2024), using data for the main species caught with each gear. For coastal fisheries, we estimated the length frequency distribution for European hake if the fleet used a 45 mm square mesh (Figure 3), and for deep-sea fisheries, we estimated the length frequency distribution for deep-sea blue and red shrimp if the fleet used a 50 mm square mesh (Figure 4). For hake, we calculated the proportion represented by the individuals discarded due to their size being under the Minimum Conservation Reference Size (MCRS) in weight using length-weight relationships, and in revenues using average sales price per kilo (Table 1). For blue and red shrimp, since MCRS is being discussed but is not yet generally enforced and all catch is still sold, we calculated the reduction in total catch in weight and in revenues (Table 2).

According to these data, the 45 mm square mesh would yield substantial reductions in the catches of individuals under MCRS and of general discards in the coastal métiers, while having a limited impact in the revenues of the sector. The impact of the 50 mm square mesh in the deep-sea métier is more limited, but would still ensure a notable reduction of juvenile catches while preserving the viability of the fishery.

2. Extending the use of low-contact otter boards

Similarly to improvements in gear selectivity, the general use of low-contact otter boards has increased from 2023 to 2024 (15.8 to 20.3% of all vessels, respectively), and two new ports have participated in the initiative in 2024 (Arenys de Mar and L'Ametlla de Mar, Figure 5). However, the vessels committed to this change in gear only represent over half of the fleet in one port (Palamós, 65.2% of the vessels, Figure 2), and there are still 5 ports where no vessels have expressed interest in this measure in the last two years. The progress on this measure is slow despite being heavily subsidized by the regional government, and its effectiveness in the restoration of marine habitats and populations could benefit from a stronger regulation.

3. Consolidating the fishing closures network

In May 2024, the Spanish government issued Orden APA/412/2024, which effectively banned all bottom trawling activity beyond 800 m along the Spanish Mediterranean coast, following an agreement taken at the sixth meeting of the Subregional Committee for the Western Mediterranean (SRC-WM) in April 2023. This was done as a means for the fleet to apply for compensation in additional fishing days, and so the text states that the ban will only be effective for as long as the EU regulations allow for this mechanism. It is worth noting that the approach in this case differs from that of the improvements in fishing gear, and is substantially more restrictive for the fleet. The character of this regulation is eminently precautionary, since its effects on the fleet are expected to be limited (ICATMAR 23-02).

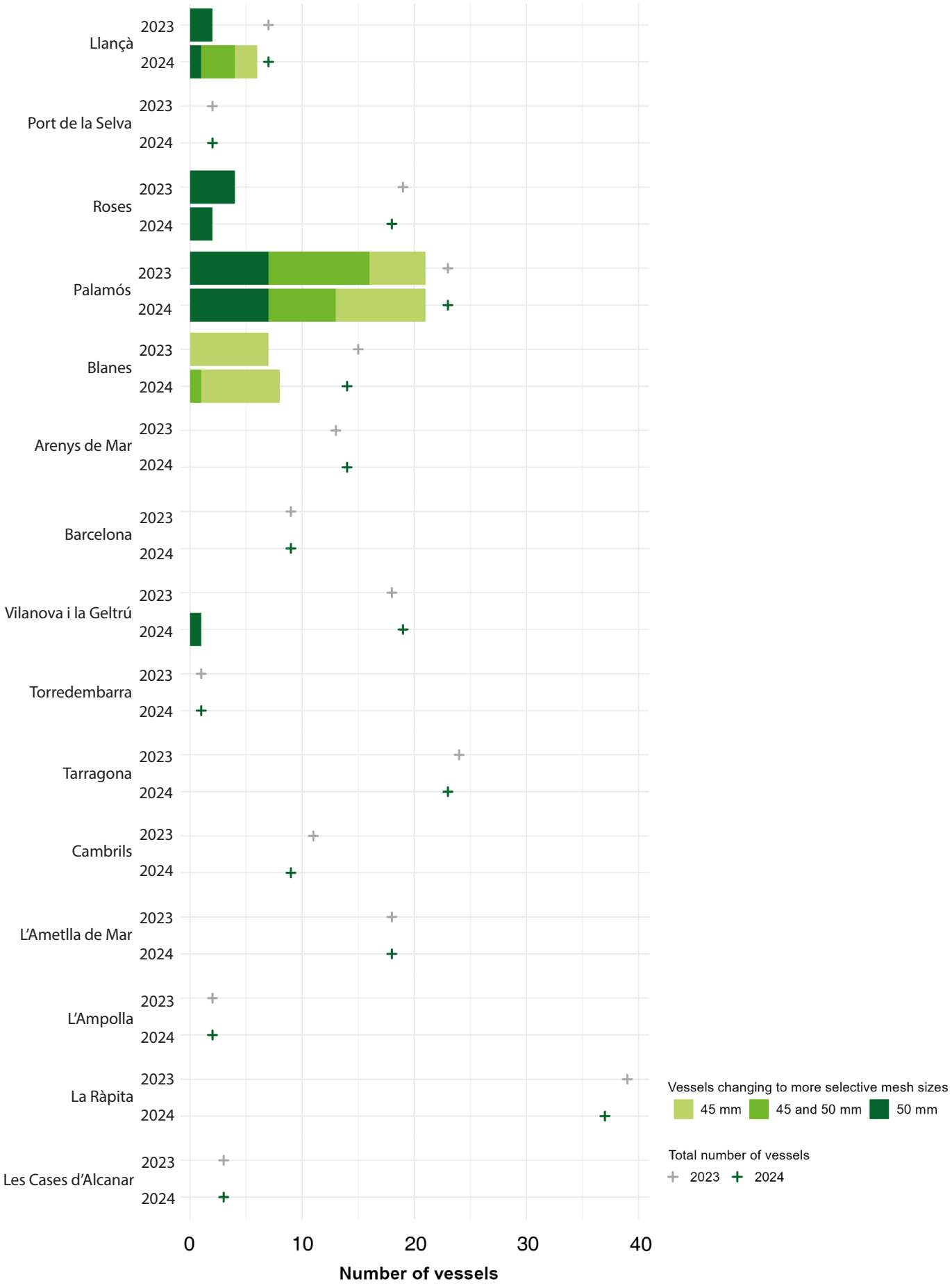

Figure 2. Number of vessels commited to changing to more selective gear (bars) and total number of vessels (crosses) by port in the northern GSA 6.

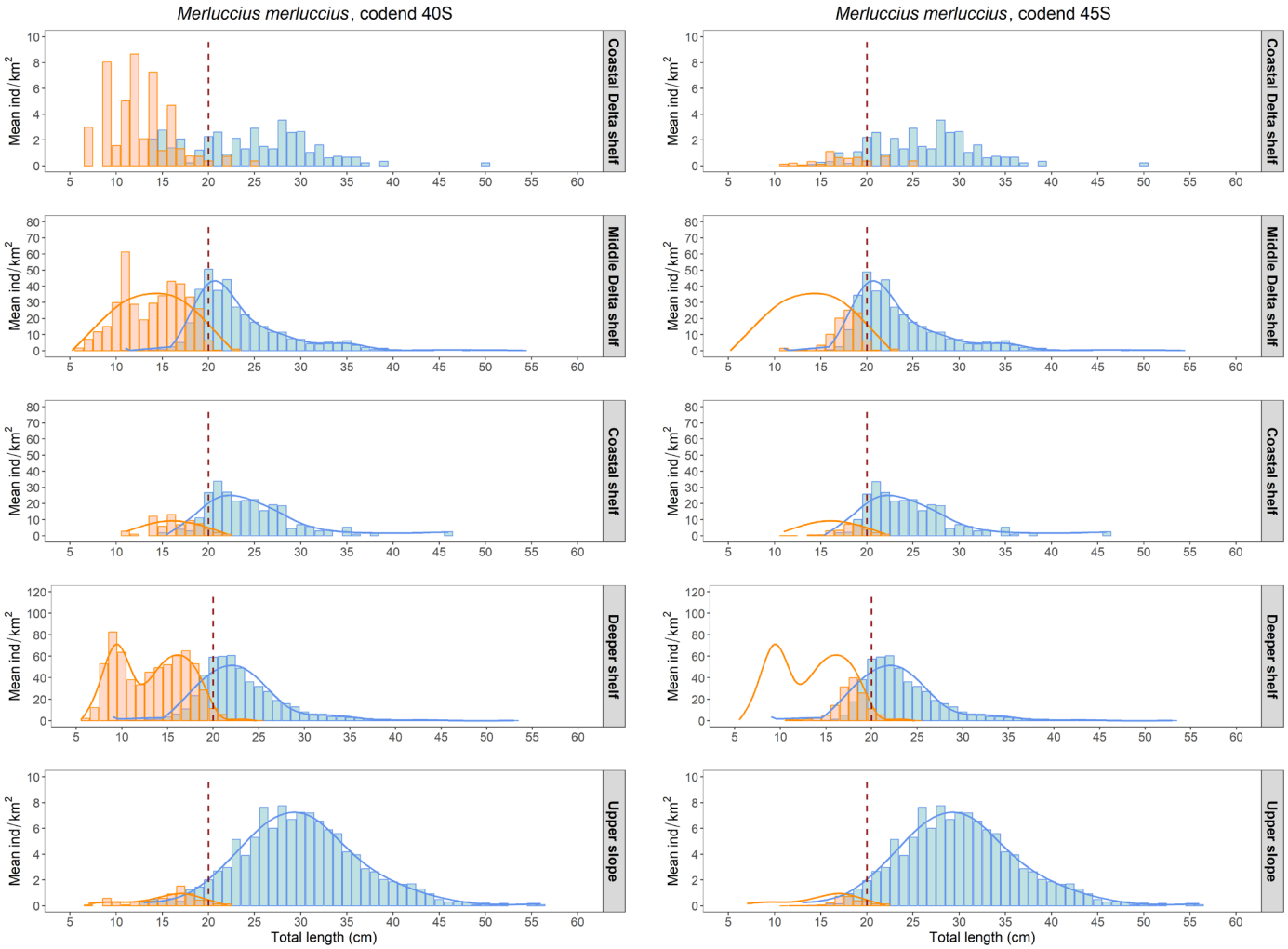

Figure 3. Length frequency distribution of landed (blue) and discarded (red) fractions of the catch for European hake in the northern GSA 6 in two different scenarios: the baseline current mesh size of 40 mm square (left), and the estimate applying a mesh size of 45 mm square (right). Orange and blue lines show the outline of the baseline length frequency distribution for reference. Red dotted line indicates MCRS. Length data from ICATMAR monitoring program for the years 2019 to 2023. Coastal Delta Shelf: 21 – 50 m; Middle Delta shelf: 40 – 80 m; Coastal shelf: 51 – 75 m; Deeper shelf: 76 – 200 m; Upper slope: 201 – 500 m.

Table 1. Estimated potential reduction in discards (% kg) and in total revenues (% €) when using a 45 mm square (45S) mesh size for European hake for the different coastal fisheries métiers present in the northern GSA 6.

	45S	
Métier	% reduction (kg)	% reduction (€)
Coastal Delta shelf	39.90	4.31
Middle Delta shelf	50.41	1.97
Coastal shelf	5.55	0.95
Deep shelf	53.14	2.68
Upper slope	1.42	0.32

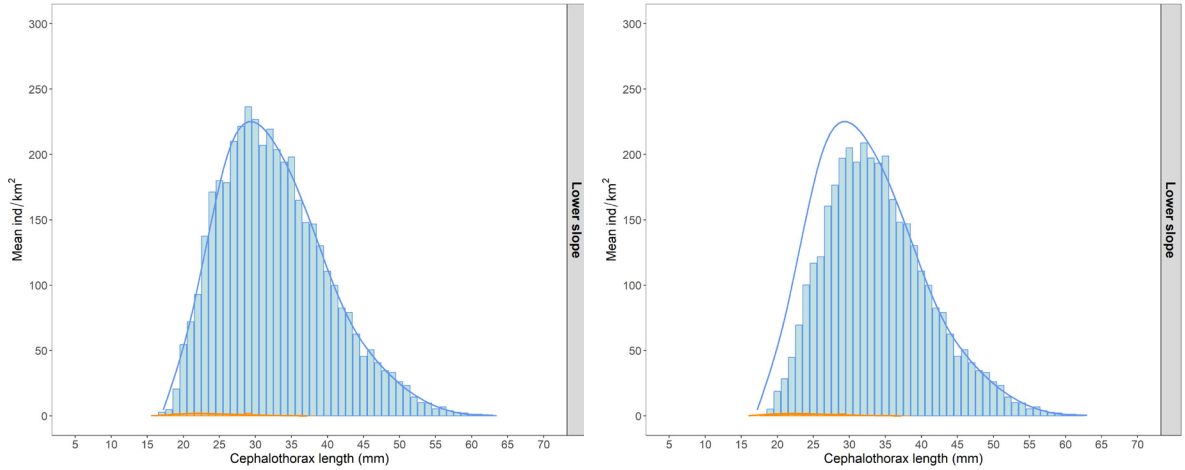

Figure 4. Length frequency distribution of landed (blue) and discarded (orange) fractions of the catch for blue and red shrimp in the northern GSA 6 in two different scenarios: the baseline current mesh size of 40 mm square (left), and the estimate applying a mesh size of 50 mm square (right). Orange and blue lines show the outline of the baseline length frequency distribution for reference. Length data from ICATMAR monitoring program for the years 2019 to 2023. Lower slope: 501 – 800 m.

Table 2. Estimated potential reduction in catch (% kg) and in total revenues (% €) when using a 50 mm square (50S) mesh size for deep-sea blue and red shrimp in the deep-sea métier (lower slope) of the northern GSA 6.

	50S	
Mëtier	% reduction (kg)	% reduction (€)
Lower slope	10.9	11.02

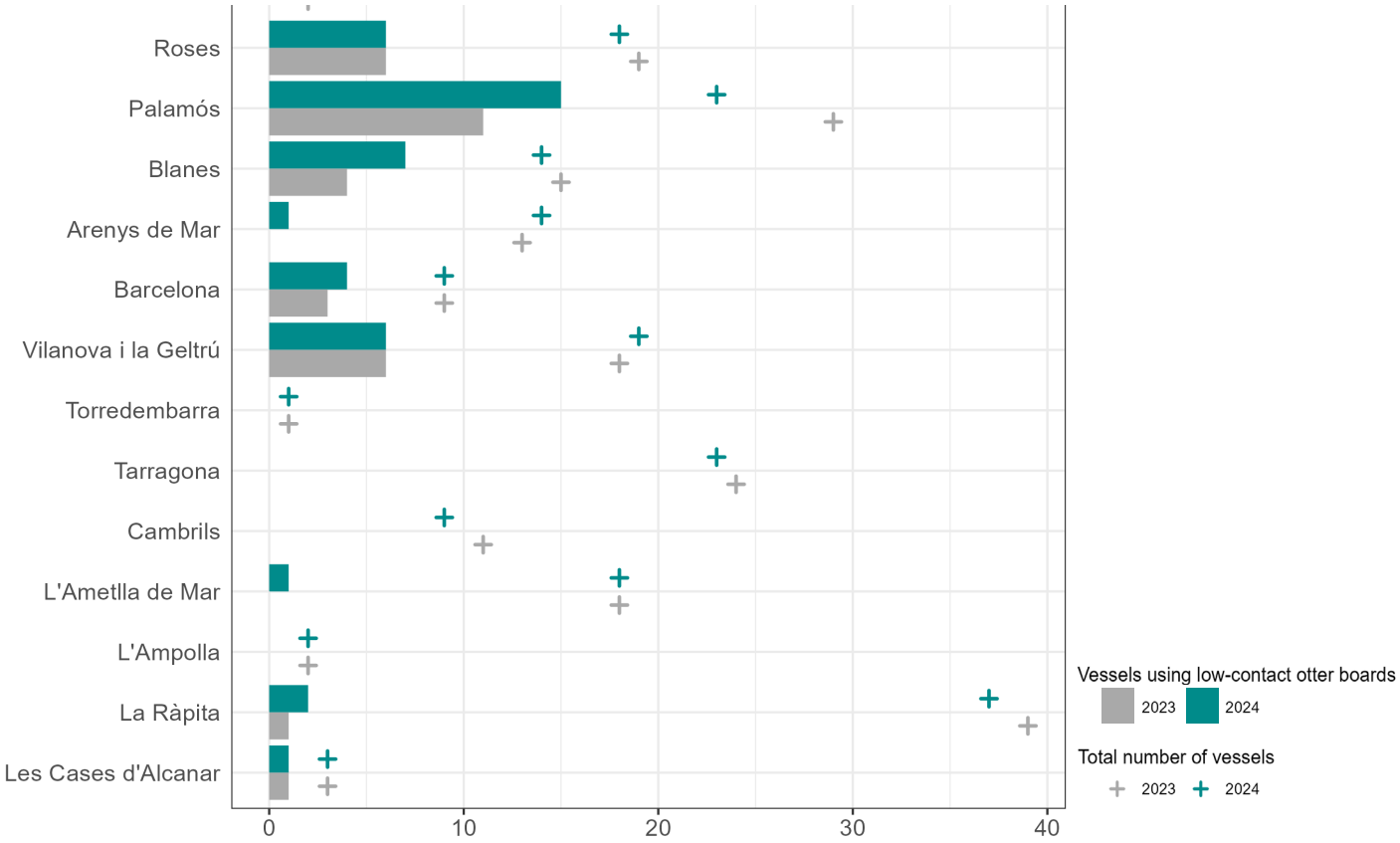

Figure 5. Number of vessels commited to changing to low-contact otter boards (bars) and total number of vessels (crosses) by port.

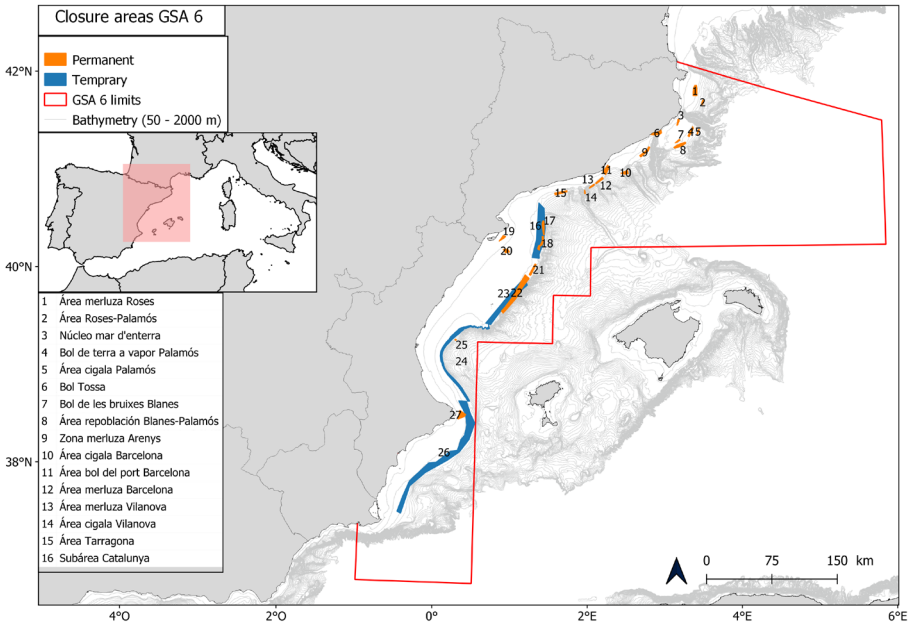

Figure 6. Closure areas along the Spanish Mediterranean coast.

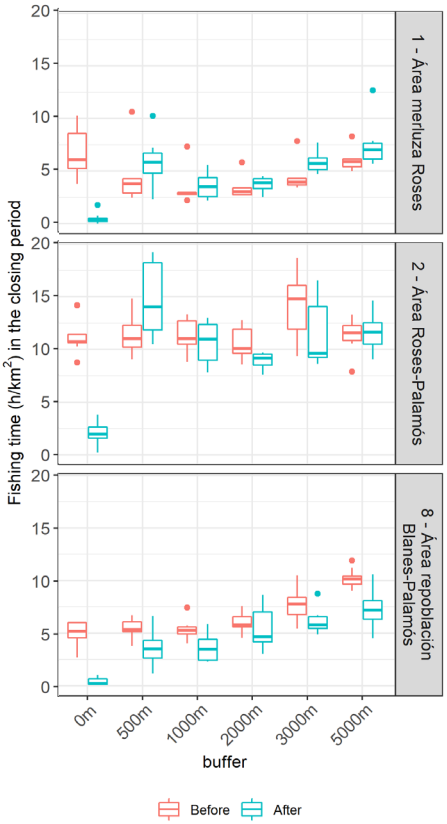

Figure 7. Fishing effort around three permanent closure areas at different distances from the border before (red) and after (blue) the declaration of the protection status. See ICATMAR 23-06 for details on methodology.

On the other hand, the closure areas of the northern GSA 6 resulting from the agreement of all fishing guilds, enforced between 2013 and 2022, currently amount to half the surface of all of Spain's fisheries protected areas ("*reservas marinas de interés pesquero*", Figure 6), or 3% of the entire fishable area in the Catalan coast. According to our data, there has been no effort redistribution in the areas adjacent to the closures in the cases where sufficient time has passed since the establishment of the measure and evaluation was possible (Figure 7). In some cases, effort increases within the 500 m buffer around the closure after protection, but this increase is clearly lower than the overall decrease in fishing effort gained with the closure. Spillover effects have also been reported for some species (ICATMAR 23-06), and the positive effects are an incentive to continue in the direction of achieving protection for 10% of the fishable area.

This initiative has not only set the base for a new line of management measures, but also reinforced the engagement of the fishing sector in the efforts for achieving sustainability of the fishing activity through consensus, both within the sector and with the rest of stakeholders. In the context of Mediterranean locally-based fisheries, measures must take into account not only the priority locations for protection, but also the equanimity of the effects on the fishing sector, at the risk of completely dismantling the activity in one area, while the rest of the territory remains unaffected. The current approach where every fishing guild is engaged in the decision-making process and contributes their local ecological knowledge regarding their adjacent waters is proving to encourage a sense of responsibility in the strategy to achieve sustainable fisheries, and stands the best chance to ensure its persistence over time. We propose that the work done so far be further encouraged by consolidating the existing network of permanent closure areas into a discontinuous Fisheries Restricted Area (FRA), a figure that would help in its acknowledgement and recognition by policy-makers at international institutions.

2

Highlights and considerations on the stock assessment in the Northern GSA 6

The following paragraphs present a brief summary of the stock assessment carried out with 2019-2023 data from ICATMAR (ICATMAR 24-06) and longer time series from EU-DCF, along with a discussion on our findings. For species targeted by the bottom trawl fleet, Length-Based Spawning Potential Ratio (LBSPR) and Stochastic Surplus Production in Continuous Time (SPiCT) models were applied to all species in the Western Mediterranean Multi-Annual Plan (WMMAP). For small pelagic fish (European sardine and anchovy), the same two models were applied, and in the case of SPiCT the analysis replicated the stock assessment carried out by the Working Group on Stock Assessment of Small Pelagic Species (WGSASP, 2023) with a shorter time series. For all species, different scenarios were considered, and in each case the best fit was selected to produce recommendations on the management of the stocks. Analyses with LBSPR are presented for the Northern GSA 6, and analyses with SPiCT are presented for the entire GSA 6. Details on methodology are available in ICATMAR 24-06.

1. Bottom trawl fleet: perspectives after the five-year transition period of the WMMAP

The trends for the period evaluated with the length-based model (LBSPR) are shown in Figure 8. The model estimates that SPR values for the red mullet, the European hake, and the deep-water blue and red shrimp have remained relatively stable below SPR_{lim} during the studied period. The deep-water rose shrimp improved its SPR from the previous years, achieving the highest value out of the five years evaluated. The Norway lobster SPR has been decreasing but it is relatively stable in the last three years.

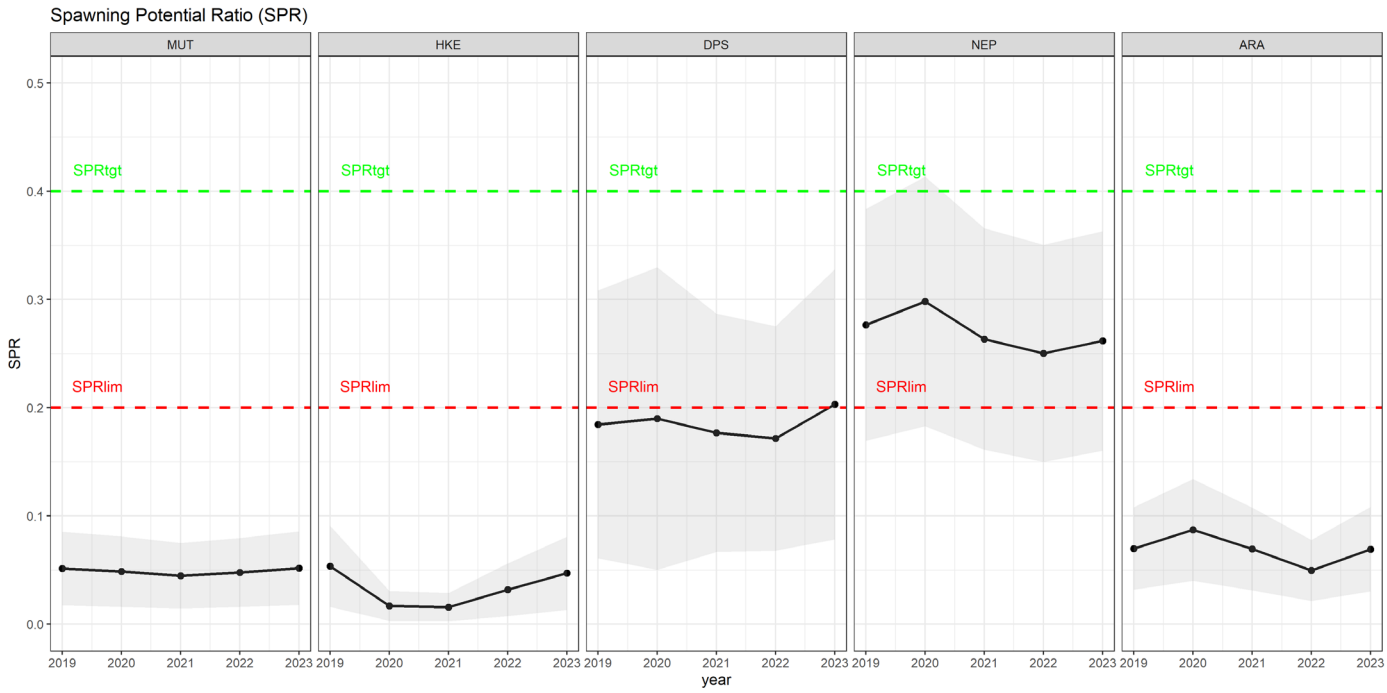

Figure 8. Spawning potential ratio (SPR) per year (2019, 2020, 2021, 2022 and 2023) for the five demersal stocks evaluated with LBSPR model. MUT: red mullet, HKE: European hake, DPS: deep-water rose shrimp, NEP: Norway lobster, ARA: blue and red shrimp, PIL: European sardine, ANE: anchovy, LBSPR: Length-Based Spawning Potential Ratio, SPR_{lim}: limit spawning potential ratio, SPR_{tgt}: target spawning potential ratio. The grey shade shows the standard deviation.

The performance of LBSPR in cases as contrasting as the European hake and the red mullet, yielding similar results, seems to indicate that this model is not ideal for datasets where the population appears truncated on either end of the length frequency. A sensitivity analysis is needed for all parameters fed to the analytical models, even in the cases where these may be complex to estimate, such as the natural mortality.

As for the evaluations with the production model (SPiCT; Figure 9), biomass for deep-water rose shrimp and blue and red shrimp are estimated above $B_{msy.}$ Biomass estimates for the red mullet, European hake, and Norway lobster are near B_{thr}, and trends are in general positive except for the case of the deepwater rose shrimp and the Norway lobster. Regarding fishing mortality, estimates for the red mullet, the deep-sea blue and red shrimp are below $F_{msy.}$, following generally decreasing trends. In the case of the Norway lobster, the estimated fishing mortality values consistently remain at $F_{msy.}$ throughout the time series, but the model struggles to accurately track this parameter. Estimates for the European hake and the deepwater rose shrimp are above $F_{msy.}$, with clear increasing trends in the case of both species.

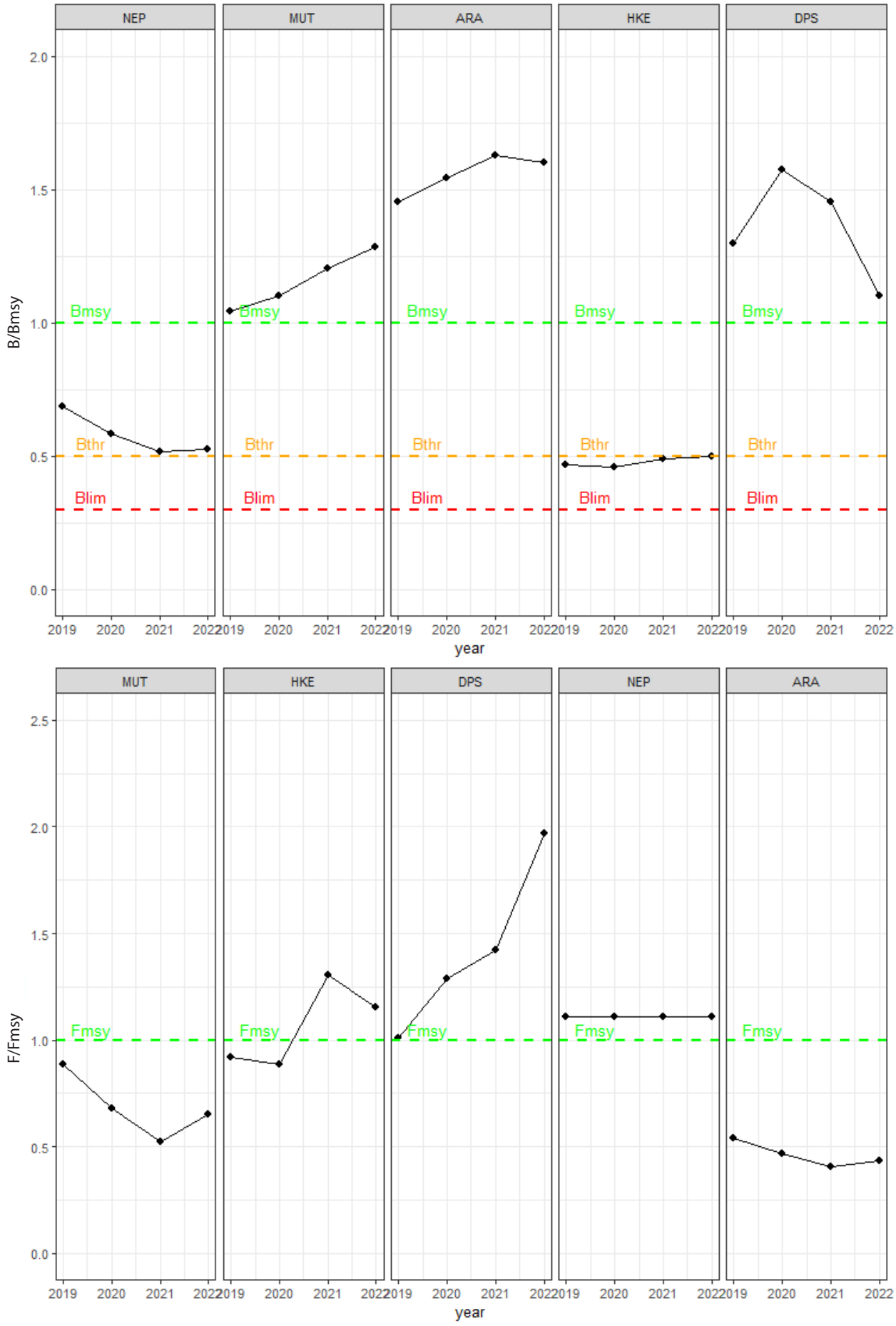

Figure 9. (top) Relative biomass (B_{curr}/B_{msy}) and (bottom) relative fishing mortality (F_{curr}/F_{msy}) per year (2019, 2020, 2021, 2022) for the five demersal stocks evaluated with SPiCT model. MUT: red mullet, HKE: hake, DPS: deep-water rose shrimp, NEP: Norway lobster, ARA: blue and red shrimp. SPiCT: Stochastic Production model in Continuous Time. F_{msy}: Fishing mortality at a maximum sustainable yield, B_{lim}: Biomass limit, B_{thr}: Biomass threshold, B_{msy}: Biomass target.

2. Purse seine fleet

Results from LBSPR show that the SPR estimates for European sardine and anchovy fluctuate within similar values with no clear trend, but the European sardine remains above SPR_{lim} while estimates for anchovy are closer to SPR_{tgt} (Figure 10).

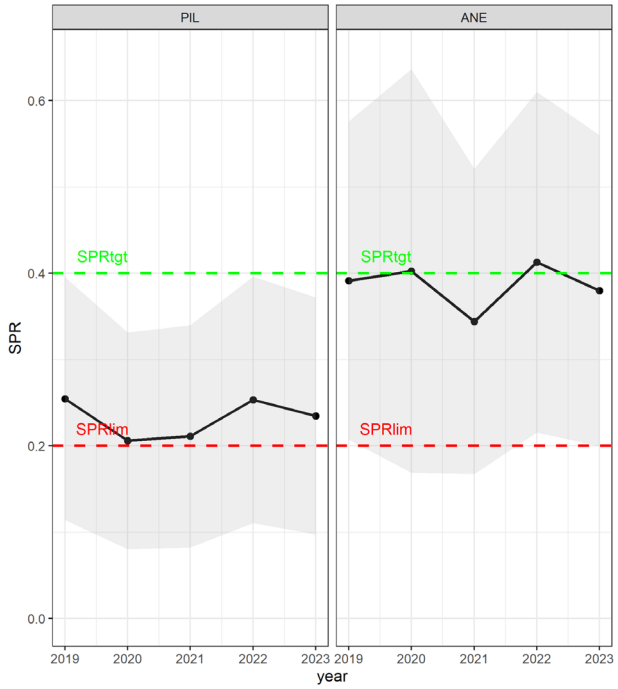

Figure 10. Spawning potential ratio (SPR) per year (2019, 2020, 2021, 2022 and 2023) for the two pelagic stocks evaluated with LBSPR model. PIL: European sardine, ANE: anchovy, LBSPR: Length-Based Spawning Potential Ratio, SPR_{lim}: limit spawning potential ratio, SPR_{tgt}: target spawning potential ratio. The grey shade shows the standard deviation.

For SPiCT, biomass estimates remain below B_{lim} for the European sardine, while they are well above B_{msy} and with a positive trend for anchovy (Figure 11). Fishing mortality estimates are also contrasting for the two species, with European sardine above F_{msy} and anchovy below this reference value.

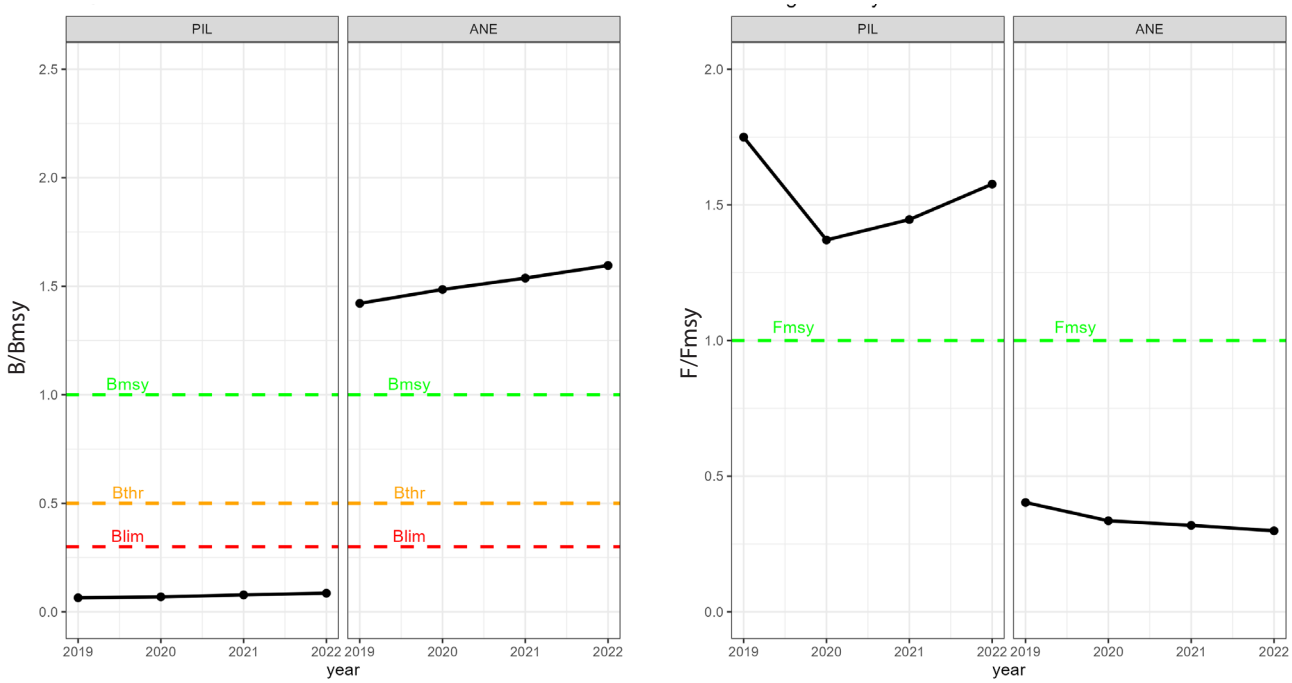

Figure 11. (left) Relative biomass (B_{curr}/B_{msy}) and (right) relative fishing mortality (F_{curr}/F_{msy}) per year (2019, 2020, 2021, 2022) for the two pelagic stocks evaluated with SPiCT model. PIL: European sardine, ANE: anchovy. SPiCT: Stochastic Production model in Continuous Time. F_{msy}: Fishing mortality at a maximum sustainable yield, B_{lim}: Biomass limit, B_{thr}: Biomass threshold, B_{msy}: Biomass target.

3. Discussion

In contrast with LBSPR, SPiCT incorporates data from longer time series and shows, in general, a more optimistic perspective. While LBSPR produces estimates that can be true to the reality of the stock when the meaning of its different parameters is carefully considered, it is less optimistic when looked at in absolute terms. It is important to bear in mind that, however convenient any model may be, it is only able to give a representation of reality, and is strongly influenced by its built-in processes, which may fit some populations, but not others. The stock assessment analysis in the northern GSA 6 concludes that there is a non-negligible discrepancy between the two models used, when the results were expected to be coherent. This serves as a reminder that the uncertainty of all estimates must be taken into account, especially when deriving widespread regulations with harsh socioeconomic consequences.

The main takeaway from our analysis is that it is most likely that the picture painted by the analytical models being currently used as a base for fisheries management decisions may not be the only possible interpretation of reality. The models do agree in showing generally positive trends of the stocks during the five-year transition period of the WMMAP (STECF 23-09), albeit with very dissimilar absolute values, but the diagnoses are substantially different, and so grounding decisions on only one model seems risky. The scientific community needs to address the uncertainties of the models and evaluate the effectiveness of their intrinsic methodology in a benchmark that calls into question all parameters and procedures used. The need for a benchmark in the case of the species of most concern, the European hake, is all the more urgent since it is being used as a driver for large-scale management decisions. The last revision of the methodology was held in 2019, and it is likely that it will benefit from the most recent approaches that use a variety of stock assessment models.

On the other hand, abundance and biomass data used as inputs for the models are drawn from fisheries-independent surveys that may be affected by seasonality. Since these surveys in the Mediterranean Sea are carried out annually over the spring-summer season, data for some species with marked reproductive periods throughout the year may be skewed. For instance, data on sardine reproductive individiduals, or anchovy and red mullet recruits are systematically missing, hindering the advances in population modelling for these species. A possible solution for this would be to replicate these surveys (bottom trawling for demersal species and acoustic for small pelagic fish) during the autumn-winter months.

3
Fisheries management advice

After the five-year transition period of the WWMAP, the focus on reducing the fishing effort has been transposed into a complex array of regulations that are not promoting the sustainabilty of the fishing activity in itself, essentially reducing it altogether instead. If maintained, the current regulations may manage to slowly improve the state of the stocks over time, but the question still stands as to whether the structure of the northwestern Mediterranean fishing sector, based on small, family-owned vessels, is able to withstand a further reduction of fishing days and still remain profitable and socio-economically appealing. The management of specific aspects of the fishing activity such as the changes in gear or the fostering of agreements for the establishment of protected areas are examples of direct action towards more sustainable practices. These measures still need time to be quantifiable at stock level, but their effects are proven, and their potential has yet to be maximized to act in the restoration of both habitats and exploited populations.

In the context of multispecific fisheries, the situation of the European hake stock in the GSA 6 as assessed by the official organisms would entail the application of measures targeted at the bottom trawling fishery as a whole, affecting the entire sector. Since Mediterranean fisheries have historically leaned on the success of recruitment processes, and rely heavily on the protection of reproductive individuals, it may be worth first considering measures specifically targeted to larger individuals, to mitigate the socioeconomic impact of the regulations. In the case of hake, these individuals are mainly targeted by small-scale fisheries, which could be approached either with closure periods during the reproductive season of the species, or with catch quotas.

On the other hand, a clear step is needed towards more robust stock assessment processes, in the form of a benchmark for the European hake where all inputs and methods are evaluated. In the meantime, we propose that no further reduction of fishing days be applied, in favor of the consolidation of alternative measures. Improvements in fishing gear through low-contact otter boards and more selective mesh sizes can be made compulsory to ensure a reduced impact in marine habitats and minimize unwanted catches. Additionally, the existing network of marine protected areas can be promoted to a higher legal status, creating the figure of a discontinuous FRA that incorporates all existing permanent closure areas along the Spanish Mediterranean coast.

Finally, to complete the current fisheries-independent dataset for its use in stock assessment, two additional annual surveys are needed to complement the ones already in place, i.e., a bottom-trawling survey for demersal species, and an acoustic survey for small pelagic fish, both during the autumn-winter season. The data gathered on these surveys would help bridge some of the knowledge gaps of the field, such as the juvenile and reproductive cohorts of species which are not caught in the current surveys.

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Co-funded by the European Union

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