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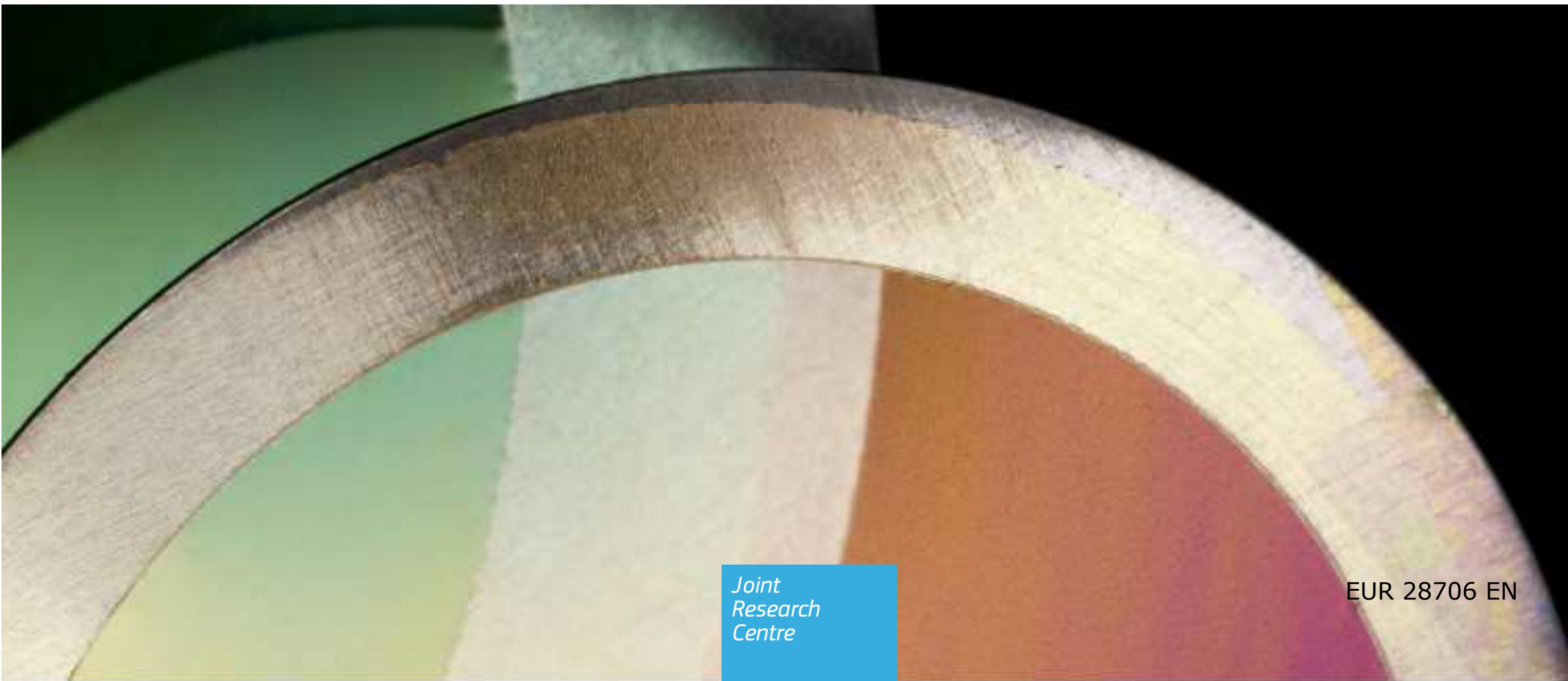
Ernesto Jardim, Finlay Scott



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Analysis of success of achieving fishing mortality levels for the Northwest Mediterranean Multi-annual plan.

Abstract
The analysis of the probability of reaching the fishing mortality tactical objectives was carried out. Contrary to the previous analysis the use of FMSY ranges performance is comparable with the traditional FMSY target.

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The authors would like to thank all authors involved in STECF (2016).

Abstract

The evaluation of multi-annual plans to manage demersal fisheries performed by STECF (2016) is revisited to calculate an additional indicator of fishing mortality that better captures the effect of using ranges. The results presented are more aligned with the recent multi-annual plans objectives of providing flexible tactics. The analysis is still not a mixed fisheries analysis, it is an alternative approach to the one used by STECF (2016) which increases the degree of comparability across the different options, in particular across single point target approaches and value-range approaches.

1. Introduction

STECF (2016) carried out the analysis of policy options for a future Multi-annual plan to manage demersal fisheries in the Northwest Mediterranean. The analysis was based on Management Strategies Evaluation (MSE). The results were summarized in several ways, including an indicator of fishing mortality reaching a band of 20% error around the tactical objective F_{MSY} (Beverton and Holt, 1957; Hilborn and Walters, 1992).

The demersal fisheries occurring in the study area are known to catch several species. However, the analysis carried out by STECF (2016) didn't take into account mixed fisheries interactions due to data limitations and the nonexistence of parametrized mixed-fisheries models for the area. Recent MAPs have been developed that take mixed-fisheries interactions into account by using ranges of F_{MSY} values instead of single points (ICES, 2014; STECF, 2015a,b). This option introduces a level of flexibility which will allow some stocks to be overexploited while others will be underexploited, reaching a balance across all stocks.

The work presented here develops an alternative indicator which better represents the effect of F_{MSY} ranges, although it is still limited by the fact that the underlying analysis is single species.

2. Methods

All options, scenarios and methodologies are those described in STECF (2016).
The indicator reflects the probability of reaching the tactical objective of exploiting the stock at F_{MSY}, by taking into account F_{MSY} ranges. Based on the predictive linear model fit used to estimate F_{MSY} ranges for these stocks, see annex 09 in STECF (2016), the indicator reported here shows the probability of being within a band of $[0.66, 1.35]$ of $\frac{F}{F_{MSY}}$.
All analysis were carried out with R (R Core Team, 2016), FLR (Kell et al., 2007) and a4a (Jardim et al., 2015).

3. Results

Table 1 and Figure 1 present the results of the analysis. When comparing with STECF (2016) it can be seen that the probabilities of Option 2 and Option 1 are more similar than before. In STECF (2016) the probabilities were computed based on a simetric interval of 20% around F_{MSY}, which disregarded the concept of providing management flexibility through the use of F_{MSY} ranges. The current analysis tries to mitigate this effect by using a non-simetric interval, which reflects the spread of the ranges around the objective.

year	Baseline	Opt01+5yr	Opt01	Opt02	Opt02:5yr	Opt02:5yr+tm	Opt02:tm	Opt02:tac+5yr+tm	Opt02:tac+tm	Opt02:tac+5yr	Opt02:tac
2016	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2017	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.06	0.06
2018	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.14	0.17	0.16	0.18
2019	0.00	0.06	0.11	0.24	0.07	0.07	0.25	0.31	0.39	0.25	0.32
2020	0.00	0.22	0.48	0.48	0.29	0.32	0.48	0.22	0.28	0.21	0.28
2025	0.00	0.28	0.48	0.46	0.36	0.36	0.48	0.20	0.33	0.18	0.38
2030	0.00	0.27	0.48	0.48	0.32	0.33	0.47	0.24	0.40	0.22	0.42
2035	0.00	0.33	0.50	0.48	0.34	0.36	0.46	0.22	0.36	0.22	0.40

Table 1: Median probability of fishing mortality to be within 0.66-1.35 Fmsy. Legend: 5yr = 5 years recovery period, tm = technical measures, tac = total allowable catch.

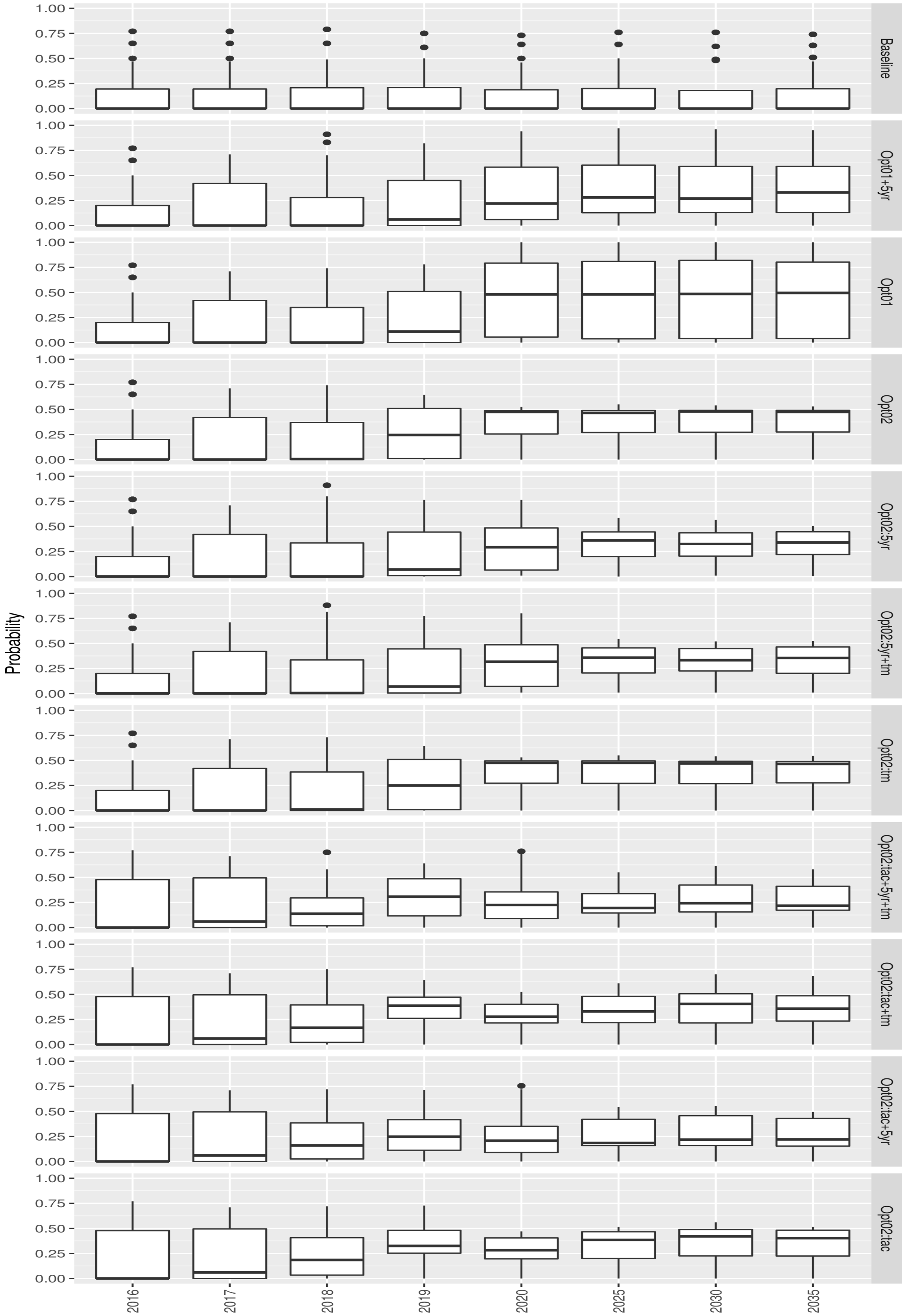

Figure 1: Probabilty of fishing mortality to be within 0.66-1.35 Fmsy (Baseline and Option 01) or Fmsy ranges (Option 02). Legend: 5yr = 5 years recovery period, tm = technical measures, tac = total allowable catch.

3.1 Degradation of management performance due to hyperstability

Hyperstability reflects a situation where the fleet is able to mantain a high fishing mortality while reducing fishing effort. It's created by the fleet capacity to concentrate their effort on areas of high productivity. Such situation constitutes the most important factor of uncertainty in an effort management system, as the relationship between effort (the control variable) and fishing mortality (the management objective) changes during the period. Table 2 shows the probability of success as defined above, in a scenario of hyperstability (defined in STECF (2016)), while Table 3 shows scenarios without hyperstability.

year	Opt01+5yr	Opt01	Opt02	Opt02:5yr	Opt02:5yr+tm	Opt02:tm
2016	0.00	0.00	0.00	0.00	0.00	0.00
2017	0.00	0.00	0.00	0.00	0.00	0.00
2018	0.00	0.00	0.00	0.00	0.00	0.00
2019	0.00	0.00	0.01	0.01	0.00	0.01
2020	0.08	0.05	0.24	0.19	0.18	0.26
2025	0.14	0.04	0.26	0.21	0.23	0.26
2030	0.13	0.04	0.26	0.21	0.24	0.26
2035	0.13	0.04	0.26	0.23	0.24	0.26

Table 2: Scenaior hyperstability: Median probability of fishing mortality to be within 0.66-1.35 Fmsy. Legend: 5yr = 5 years recovery period, tm = technical measures.

year	Opt01+5yr	Opt01	Opt02	Opt02:5yr	Opt02:5yr+tm	Opt02:tm
2016	0.00	0.00	0.00	0.00	0.00	0.00
2017	0.00	0.00	0.00	0.00	0.00	0.00
2018	0.00	0.00	0.02	0.01	0.01	0.01
2019	0.25	0.40	0.47	0.22	0.20	0.46
2020	0.40	0.80	0.48	0.32	0.36	0.50
2025	0.64	0.81	0.49	0.43	0.44	0.49
2030	0.59	0.82	0.49	0.42	0.44	0.49
2035	0.59	0.80	0.49	0.44	0.44	0.49

Table 3: Scenario no hyperstability: Median probability of fishing mortality to be within 0.66-1.35 Fmsy. Legend: 5yr = 5 years recovery period, tm = technical measures.

4. Conclusions

The results presented are more aligned with the recent multi-annual plans objectives of providing flexible tactics. The analysis is still not a mixed fisheries analysis, it is an alternative approach to the one used by STECF (2016) which increases the degree of comparability across the different options, in particular across single point target approaches and value-range approaches.

References

Beverton, R. and Holt, S., 'On the dynamics of exploitated fish populations', The Blackburn Press, 1957.

Hilborn, R. and Walters, C., 'Quantitative fisheries stock assessment. choice, dynamics & uncertainty.', Kluwer Academic Publishers, 1992.

ICES, 'Report of the joint ices-myfish workshop to consider the basis for fmsy ranges for all stocks (wkmsyref3). 17âĂŞ21 november 2014, charlottenlund, denmark.', Tech. Rep. ICES CM 2014/ACOM:64, 2014.

Jardim, E., Millar, C., Mosqueira, I., Scott, F., Osio, G., Ferretti, M., Alzorriz, N. and Orio, A., 'What if stock assessment is as simple as a linear model? The a4a initiative', *ICES J Mar Sci*, Vol. 72, No 1, 2015, pp. 232–236.

Kell, L. T., Mosqueira, I., Grosjean, P., Fromentin, J.-M., Garcia, D., Hillary, R., Jardim, E., Mardle, S., Pastoors, M. A., Poos, J. J., Scott, F. and Scott, R. D., 'Flr: an open-source framework for the evaluation and development of management strategies', *ICES J Mar Sci*, Vol. 64, No 4, 2007, pp. 640–646.

R Core Team, *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria, 2016. URL http://www.R-project.org/.

STECF, 'Evaluation of management plans: Evaluation of the multi-annual plan for the north sea demersal stocks (stecf-15-04)', EUR 27232 EN. Publications Office of the European Union, Luxembourg, 2015a. 152 pp.

STECF, 'Multiannual plan for demersal fisheries in the western mediterranean (stecf-16-21)multiannual management plans sww and nww (stecf-15-08)', EUR 27406 EN. Publications Office of the European Union, Luxembourg, 2015b. 84 pp.

STECF, 'Multiannual plan for demersal fisheries in the western mediterranean (stecf-16-21)', EUR 27758 EN. Publications Office of the European Union, Luxembourg, 2016. 130 pp.

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