

EU request to ICES on evaluation of the management plan for Iberian sardine

Advice summary

ICES advises that the harvest control rule (HCR) included in the long-term management plan for sardine in divisions 8.c and 9.a agreed between Portugal and Spain is not precautionary, in neither the short term or long term, based on the productivity regime observed since 1993. Consequently, the original request for an additional clause in the management plan when it resulted in catches of less than 50% of catches in the previous year is no longer considered relevant.

Request

In 2016, a request was received from the European Commission to evaluate a potential change to the management plan for sardine in divisions 8.c and 9.a.

In relation to ICES' advice of July 2013 on the management plan for sardine in Divisions VIIIc and IXa, could ICES advise whether by introducing the condition below the sardine plan remains precautionary?

"In cases where applying the plan results in catches of less than 50% of catches in the previous year, then ICES catch advice on a precautionary basis should apply."

Following discussion with the client, it was agreed to postpone answering the request until after the benchmark of sardine took place in 2017. As part of the benchmark process, ICES has evaluated whether the Portuguese-Spanish sardine fishery management plan remains precautionary taking into account the newly-agreed analytical assessment method and new biological reference points.

Elaboration on the advice

Biological reference points were estimated for this stock as part of the benchmark process that took place in 2017 (ICES, 2017). B_{lim} has been established at 337 448 tonnes based on the recruitment regime observed since 1993. It should be noted that B_{lim} for this stock refers to the biomass of age 1 and older (B_{1+}). According to the benchmark assessment, the B_{1+} in 2016 was assessed to be at about half of B_{lim} .

When a recruitment regime based on a stock recruitment relationship in the period 1993–2015 is assumed, fishing under the current HCR the probability of rebuilding the stock biomass in five years from the current low B_{1+} level to above B_{lim} is low (< 10%). In the long term, the probability that the stock is above B_{lim} will be considerably less than 95%. Therefore, the current sardine management plan cannot be considered precautionary.

Rebuilding the stock to above B_{lim} with high (> 95%) probability would take about 15 years with no fishing. However, if the recent regime of low recruitment levels (since 2006) continues in the future, B_{lim} cannot be reached even without any fishing.

The request included a proposal for applying the precautionary approach if the harvest rule gives a more than 50% reduction in TAC from the previous year. *"In cases where applying the plan results in catches of less than 50% of catches in the previous year, then ICES catch advice on a precautionary basis should apply."* Given that the management plan is no longer considered precautionary, this request is now outdated.

Basis of the advice

Background

The background for revisiting the HCR is twofold: a revised assessment following from the benchmark conducted in 2017 (ICES, 2017), and four years of experience with the plan, where the recruitment has been consistently lower (approximately half) than assumed when the plan was evaluated in 2013 (ICES, 2013). The recent revision of the assessment method does not lead to a substantial change in the perception of stock abundance or exploitation. However, recruitment has been low since 2005, and this has continued since the plan was introduced (Figure 1). This has led to a somewhat different perception of the relationship between spawning biomass and recruitment relative to the previous evaluation of the management plan in 2013. The evaluation this year uses the value of B_{lim} (337 448 t) set for this stock during the 2017 benchmark.

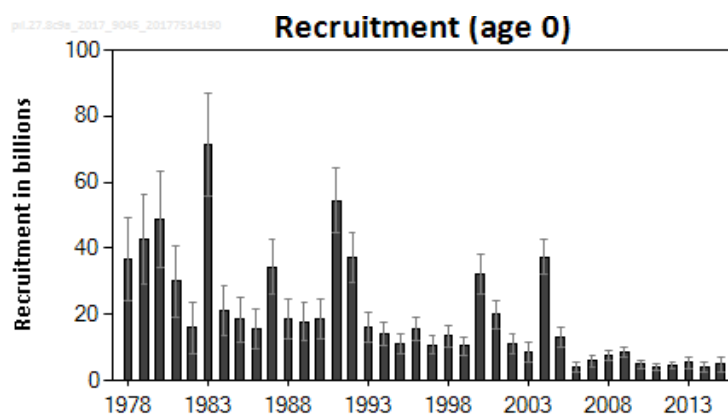


Figure 1 Time-series of recruitment estimates from the 2017 benchmark assessment (ICES, 2017)

Results and conclusions

When a recruitment regime based on a stock recruitment relationship in the period 1993–2015 is assumed, fishing under the current HCR the probability of rebuilding the stock biomass in 5 years from the current low B1+ level to above B_{lim} is low (< 10%; see Figure 2). In the long term the probability that the stock is above B_{lim} will be considerably less than 95% (about 50%; see Figure 2). However, this HCR leads to a high probability (> 95%) that the biomass increases from the recent low value (132 000 t) even at the most recent poor recruitment levels (2006–2015).

For the 1993–2015 productivity regime and with no fishing, rebuilding the stock to above B_{lim} with high (> 95%) probability would take about 15 years (Table 1). If, on the other hand, the lower recruitment levels observed since 2006 continue in the future, B_{lim} cannot be reached even without any fishing.

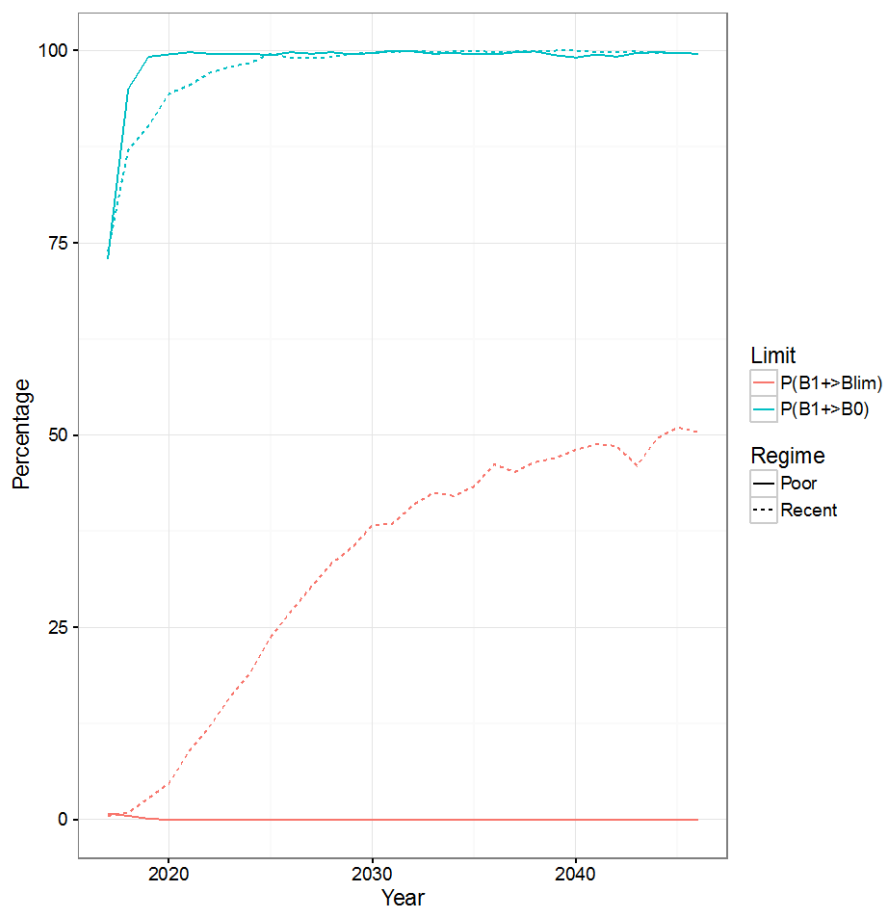


Figure 2 Probability that the stock is above B_{lim} (red lines) and above the recent low level of 132 000 t (blue lines) (geometric mean of biomass in 2012–2015) under the current HCR, for the two productivity scenarios (different line types). In the figure legend, 'Recent' refers to the 1993–2015 recruitment regime and 'Poor' to the 2006–2015 recruitment regime.

Some variants of the current HCR were tested regarding the target catch and the $B_{trigger}$ point in the HCR. For the 1993–2015 productivity regime, a decrease of the target catch in the HCR to no more than 25 800 tonnes results in a high probability (> 95%) that the biomass increases to above B_{lim} by 2037 (Table 1). For both recruitment scenarios (1993–2015 and 2006–2015), keeping the target catch at 86 000 t, none of the $B_{trigger}$ variants of the HCR will lead to a recovery of the biomass above B_{lim} with > 95% probability.

Table 1 Year in which the stock biomass is above B_{lim} with more than 50% (middle column) and 95% (right-most column) probability for target catch levels from 0 to 86 000 t in the HCR, under the 1993–2015 productivity regime. The “-” symbol in the right-most column means that the probability of reaching B_{lim} is less than 95% in any year of the simulation period (2017–2046).

Target catch (tonnes)	P ($B_{1+} > B_{lim}$) > 50%	P ($B_{1+} > B_{lim}$) > 95%
0	2024	2031
8600	2024	2032
17 200	2024	2033
25 800	2025	2037
34 400	2025	-
43 000	2026	-
51 600	2027	-
60 200	2028	-
68 800	2030	-
77 400	2033	-
86 000	2045	-

Methods

The performance of the current harvest control rule (HCR) and alternatives were tested by forward simulation of the population and fishery using the HCS program (Skagen, 2015). HCS is an age-disaggregated forward projecting population model, where year classes are reduced by exploitation according to the HCR being tested, and by the assumed natural mortality. Assessment error is included using random multipliers on the model stock abundance rather than by performing full assessments. The assessment noise was a combination of a year factor and an age factor, calibrated to reproduce the estimated coefficient of variation (CV) of the B_{1+} in the final year in the stock assessment by SS3. Weights at age and selectivity at age in the fishery were taken from the most recent period of the fishery (2010–2015). Results are presented for two recruitment scenarios: (a) a Hockey-stick stock–recruitment relationship fitted to the period 1993–2015 (the productivity regime used as base case for the evaluation), and (b) the mean and variance of the most recent period of consistently poor recruitment (2006–2015).

Sources and references

ICES. 2013. Report of the Workshop to Evaluate the Management Plan for Iberian Sardine (WKSardineMP), 4–7 June 2013, Lisbon, Portugal. ICES CM 2013/ACOM:62. 8468 pp.

ICES. 2017. Report of the Benchmark Workshop on Pelagic Stocks (WKPELA), 6–10 February 2017, Lisbon, Portugal. ICES CM 2017/ACOM:35. 294 pp.

Skagen, D. W. 2015. HCS program for simulating harvest control rules. Program description and instructions for users. Version HCS 15_1. August 2015. Obtainable at www.dwsk.net.