

MULTIANNUAL MANAGEMENT PLAN FOR THE IBERIAN SARDINE (2021-2026)

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1. ON THE NEED OF THE 2021-2026 MULTI-ANNUAL MANAGEMENT PLAN

Sardine (*Sardina pilchardus*) is a resource of strategic interest for both Portugal and Spain. The management unit of the sardine in the Atlantic waters of the Iberian Peninsula, corresponds to the ICES stock in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters), has been conducted by Spain and Portugal. Both countries are committed to a science-based approach on the management decisions, in order to ensure fisheries sustainability, social and economic sustainability of the fishing sector, and to provide high quality and affordable fish food for consumers.

Sardina pilchardus is a pelagic specie with highly variable biomass. Biomass estimates of Iberian sardine are available since 1978. Biomass estimates (B_{1+} , Biomass of age 1 and older fish) time series show huge fluctuations between a maximum median of 1,164,890 t assessed by ICES reference model for year 1984 to a minimum median of 117,277 t assessed by the same model for the year 2015. Catches also changed during this period, because of the management decisions, from a maximum of 216,517 t in 1981, to the historical minimum of 13,760 t in 2019 (ICES,2020).

Since 2005, after a strong reduction of the sardine recruitment, a first Management Plan was adopted for the period 2012-2015. ICES based on three criteria: i) a very low probability (zero) of F in the plan exceeding F_{loss} ; ii) a low probability (13%) of $B_{1+} < B_{loss}$ ($B_{loss} = 306$ kt) iii) a high probability (93%) of recovery if B_{1+} declines below B_{loss} concluded that the plan was provisionally precautionary. This plan included a harvest control rule (HCR) which was assessed as precautionary by the International Council for the Exploration of the Sea.

The recovery of sardine stock started to be observed in 2016 and 2017 (an increase of circa 31,6% when compared to 2015) but a more consistent recovery and the need to ensure long term sustainability, was the result of the management plan established at the end of 2017 by the governments of Portugal and Spain, and presented to the European Commission.

The 2018-2023 management plan targeted the recovery of sardine biomass, reinforcing science-based management decisions in-line with the Common Fisheries Policy (CFP), and considering ecological, social and economic sustainability principles. The plan was based on the management reference points approved by ICES Report of the Benchmark Workshop on Pelagic Stock (ICES,2017), $B_{lim} = 337.448$ t, $B_{MSY} = B_{trigger} = B_{pa} = 446.331$ t and $F_{MSY} = 0,12$. Its main goal was to attain 80% of B_{lim} before the end of 2023, based on a minimum recovery of biomass at a rate equal to or higher than 10% and never below 5%, while keeping a fishing mortality between 0.09 and 0.10, in any case well below F_{MSY} (0.12) until B_{lim} would be reached.

The plan included also a set of strong fishing restrictions, namely annual closure of the fishery for a minimum of six months a year in both countries, and a better coordination between the Spanish and the Portuguese fishery management bodies was developed to closely follow the status of this resource.

On May 29, 2019, and in response to a Request from Portugal and Spain Administrations to evaluate the 2018-2023 management and recovery plan for the Iberian sardine stock, (ICES, 2019a), it was considered that the Iberian sardine stock has been in a state of low productivity since 2006. ICES has therefore recalculated the values of $B_{lim} = 196.334$ t $B_{MSY} = B_{trigger} = B_{pa} = 252.523$ t and F_{MSY} to 0.032, reflecting a short period of low recruitment levels for *Sardina pilchardus* in divisions 8.c and 9.a, between 2006 and 2017, and in spite of alternative views evaluated during the working group meeting that prepared the ICES advice.

On December 13, 2019, using the best available scientific information, it was possible to show that a fishing mortality up to $F=0.064$ was able to ensure long term sustainability of the stock (ICES, 2019b). This fishing mortality corresponds to the harvest control rule HCR12, which was

considered by ICES as a suitable candidate for a precautionary FMSY as it was precautionary in the long-term, i.e., the risk of $B_{1+} < B_{lim}$ was not higher than 5%. This conclusion was favorably reviewed by ICES as a precautionary approach, and it was used by both administrations as a basis for interim management.

The most recent ICES advise for this year (ICES, 2020), published on June 18, despite maintaining the scenario of low stock productivity, presents a wide set of indicators that show the strong recovery of the state of the Iberian sardine stock:

- Biomass B_{1+} in the total of 344,114 tons for 2020. This total is higher than the B_{lim} fixed in 2017 (337,448 tons) and is 36% higher than the $B_{MSY} = B_{trigger} = B_{PA}$ fixed in 2019 (252,523 tons)
- 2019 Recruitment is the highest since 2004 - 16,77 G;
- Fishing mortality is the lowest in the entire 1978-2019 time series;

Despite the difficulties inherent to the sustainable management of highly abundance variable pelagic resources, the recovery of the sardine biomass was observed since 2015, either by the direct assessment made by acoustic surveys or by model estimates fitting landings and biological observations, showing the benefits of the management plan. The B_{1+} (Biomass of age 1 and older fish, spawning biomass) increased to 344,114t, a much higher value than the target defined by the 2018-2023 management plan, and the stock is now considered by ICES to be above the $MSY B_{trigger}$, B_{lim} and B_{PA} , meaning full reproductive capacity.

These results can be interpreted as the consequence of the 2018-2023 management plan, which objectives were attained much earlier than predicted.

Latest stock assessment results (2020) emphasizes the recovery of the biomass in recent years and justify the decision of both countries in presenting a new plan for 2021-2026 instead of reviewing the 2018-2023 plan. This new plan is focused in the discussion of the value chain and the harvest control rules.

A **new management plan** is presented here. This new management plan follows the framework foreseen in EU Legislation for fisheries multiannual management plans, following art 9^o and art 10^o of EU Regulation n^o1380/2013 from the European Parliament and Council, and accounts for the management objectives and governance structure, already consolidated. The design of this new plan reflects the specificities of the purse seine sardine fisheries in Portugal and Spain and includes a set of conservation measures adopted to: i) avoid or reduce unwanted captures and ii) to minimize negative impacts of sardine purse seine fisheries in the marine ecosystems as well as other safeguarding measures.

The **new management plan** is designed in a flexible way to be able to incorporate the results of the scientific surveys that will be developed during its execution period, stock assessment carried out by the Spanish and Portuguese scientific research bodies and ICES as well as Spanish and Portuguese administrations management decisions.

2. THE SARDINE VALUE ADDED CHAIN

Ultimately, the objective of fishing management is to provide high quality marine protein at affordable prices to consumers, while preserving the good health marine environment and ensuring the economic sustainability of fishing communities, and of the whole production chain. To do so, it is advisable to set a desired target catch per year for consumption and canning. Management decisions, in the absence of major environmental changes, must be able to achieve this target on the long run.

In view of the fishing opportunities since 2015, most of the fishery targets fresh consumption and only marginally canning. Nevertheless, the full recovery of the stock must allow the possibility to address the needs of the two market segments, despite the different price targets and their effects on fair first-sale prices, to ensure the sustainability of the sector and the minimization of the environmental footprint.

The target for early summer fishing opportunities, between May and August, can be predicted mainly for fresh consumption, and, only as a reference, could be fixed around 18-22 kt for both countries. This amount is understood as an equilibrium between market demand and fair first-sale prices, in-line with the summer season, when sardine has higher commercial value.

In the case of canning and freezing, early fall fishing opportunities, between September and December, in principle would be more focused on that purpose, and, also as a reference, could be fixed around 22–26 kt, or the rest of available respective fishing opportunities from previous period. In this case, it is expected that first-sale prices are compatible with the needs of the industry, ensuring higher fat percentages, but avoiding unnecessary harm to the spawning season.

It is important to note that the targets above are sharply below the historical catches before 2014, thus contributing to the long-term stability of the stock and avoiding overfishing.

3. HARVEST CONTROL RULES, GOALS AND SAVEGUARDS

3.1 Modelling

The sardine southern stock (pil.27.8c9a) is assessed by ICES using an age-structured statistical model implemented with Stock Synthesis 3 version 3.24f (see bibliographic references in ICES documentation). The main assumptions of SS3 model used for this stock are: single stock area, single fishery, yearly season and sexes combined. Input data include catch (in biomass), age composition of the catch, total abundance (in numbers) and age composition from an annual acoustic survey and spawning–stock biomass (SSB) from a triennial Daily Egg Production Model survey.

For the annual pil.27.8c9a assessment held by ICES WGHANSA in May of each year (denoted as **y+1**), the model includes fishery data up to year **y** and acoustic data up to year **y+1**. Following ICES terminology, year **y** is the final year of the assessment and year **y+1** corresponds to the interim year.

Short term forecasts help projecting the stock to forecast the implications of different management choices over a limited number of years. The model adopted for this stock is Short Term Forecasting (STF). The projection predict abundances in the future by considering that the (i) initial stock size corresponds to the assessment estimates for ages 1–6+ at the final year of the assessment; (ii) the maturity ogive corresponds to the arithmetic mean of the last six years of the assessment; (iii) F and M before spawning are zero, which correspond to the beginning of the year when the SSB is estimated by the model; (iv) weight-at-age in the stock are the arithmetic mean value of the last six years of the assessment; (v) weight-at-age in the catch are the arithmetic mean value of the last three years of the assessment; and (vi) exploitation pattern is equal to the last year of the assessment.

3.2 Adaptation to recruitment variability

Given the historical periodic cycles on the abundance dynamics of the Iberian sardine it is advisable to adopt a management plan that adjusts fishing opportunities to higher and lower recruitments periods, i.e., up to the target catch during high sustainable recruitments and rapidly decreasing to lower catch during the low recruitments phases. An important tool for this adjustment is to use recruitment information given by the fall acoustic survey (now IBERAS) in

the model. This survey has been performed since 2018, and it is further considered that the survey data can be incorporated in the model during the 2021 assessment for sardine fishing opportunities in zones 27.8.c and 27.9.a.

3.3 New management plan - Harvest Control Rule

An adaptive harvest control rule (HCR) to the evolution of the stock is proposed. This HCR is built based on previous HCR test analyses that were undertaken both under “low recruitment” and “normal recruitment” situations. For the first situation “low recruitment” this new management plan adopts the HCR12, previously assessed by ICES as precautionary. For the second situation “normal recruitment” it is proposed to use the F_{MSY} as determine by ICES, 2017.

Harvest Control Rule (HCR):

i. In the case B_{1+} is estimated to be below or equal to B_{low} (117 277 t = B_{low} - lowest biomass estimated for the year 2015 (ICES, 2020)), the catch shall be zero which is consistent with a fishing mortality (F) equal to zero.

If $B_{1+} \leq B_{low}$ then $F = 0$

ii. In the case B_{1+} is estimated to be less than or equal to $MSY B_{trigger}$ (252 253 t, ICES 2019a) and larger than B_{low} , the catch shall be fixed at a value that is consistent with a fishing mortality (F) increasing linearly from $F=0$ to $F= 0.064$.

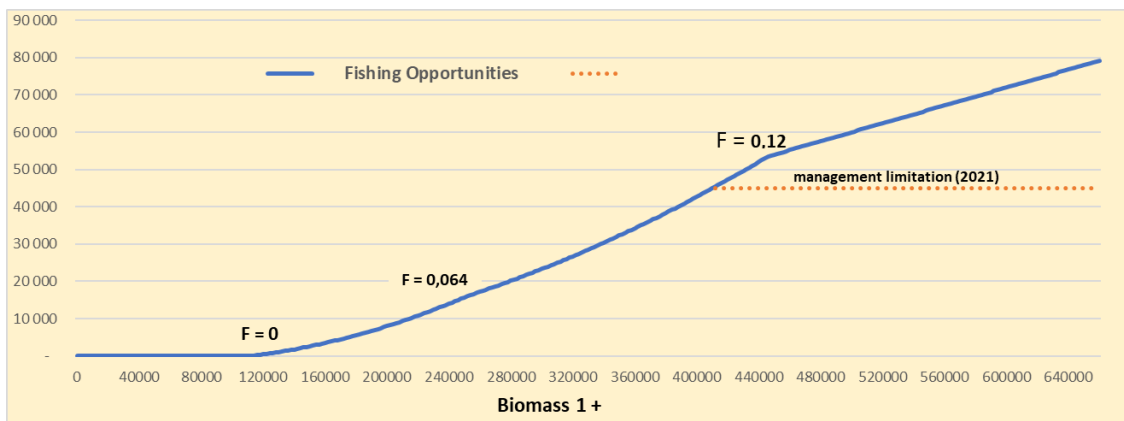
If $B_{low} < B_{1+} \leq MSY B_{trigger}$ then increasing F linearly from $F=0$ to $F= 0.064$

iii. In the case B_{1+} is estimated to be less than or equal to 446 331 t (ICES, 2017) and larger than $MSY B_{trigger}$, the catch shall be fixed at a value that is consistent with a fishing mortality (F) increasing linearly from $F=0.064$ to $F= 0.12$. B_{pa}

If $MSY B_{trigger} < B_{1+} \leq 446 331$ then increasing F linearly from $F=0.064$ to $F= 0.12$

iv. In the case B_{1+} is larger than 446 331 t, the catch shall be fixed at a value that is consistent with a fishing mortality (F) equal to 0.12.

If $B_{1+} > B_{pa}$ then $F= 0.12$



3.4 Assessments and Integration of Recruitment Surveys

The assessment of the Iberian sardine stock is based on information from landings, the annual spring acoustic surveys (PELAGO and PELACUS). Every three years a DEPM survey is also made, covering the whole areas 8.c and 9.a. An additional survey is made every fall to directly evaluate sardine recruitment, IBERAS, which is intended to be used in the near future in the assessment model.

Following the knowledge on the species temporal dynamics and experience on the management of this stock, we consider that ICES evaluate stock status by conducting two assessments one in June (after the acoustic surveys) and one in November (after the recruitment survey). The June assessment will analyze fishing opportunities for the next year using information only from the previous year and, if needed, revise the fishing opportunities for the current year. The November assessment will integrate recruitment information and tune, if needed, fishing opportunities for the next year.

4. ADDITIONAL FISHERY MANAGEMENT ACTIONS

Spain and Portugal have agreed in the following common measures to be apply during the period of the management plan:

- a) Maintenance of the purse-seine fleet, with a mid-term review taking into account the evolution of the stock.
- b) Daily catch limits by fleet with strict limits applied also to daily catches of juveniles.
- c) Complete interdiction of sardine landings for a common period, with a minimum of three consecutive months during the spawning season.
- d) Start of the directed fishery according to the evolution of the stock, with the reference of 1st of May every year.
- e) Adoption “No take zones” to protect highly sensitive recruitment areas. Real time closures will be decided by each of the administrations, whenever the concentration of juveniles is higher than 30% detected in catches, by observers or the masters of the vessels.
- f) Bycatch limits for other fisheries that do not target sardine.
- g) Control measures.
- h) For the year 2021 a maximum catch of 45,000 t is fixed, if the application of the Harvest Control Rule (HCR) points to higher levels of catch.
- i) This limit may be changed, according to the evolution of the scientific data.

During the plan, measures will be upgraded and tuned, and further technical measures may be fixed, for each country. This articulation between Spain and Portugal will ensure equity in the management approach of both countries therefore ensuring the coherence of preservation policies.

5. CO-MANAGEMENT AND COOPERATION WITH THE STAKEHOLDERS

The administrations will promote yearly evaluation of this plan, with the participation of fishery organizations, industry, and ONG's. Collaboration will also be promoted with the South Western Waters Advisory Council (CC Sul) in the implementation of the measures.

6. ADOPTION OF GOOD ENVIRONMENTAL PRACTICES

As already considered in the 2018-2023 Plan, Portuguese and Spanish Administration are reinforcing data collection and acoustic surveys, as well research on biological and ecological aspects in order to have a better picture of the resource assuring good practices and mitigation measures to avoid by-catches and mortality of marine mammals and seabirds.

The impact of purse seine fishing on habitats is limited given that it mainly operates in the water column. However, the remaining ecosystem impacts are not yet well known and the effects of depletion of the sardine on the other components of the pelagic communities will be more studied in-depth.

It is up to the masters of the vessels, on one hand, and producer's organizations, on the other to ensure a set of good practices resulting in a better use of all catches. The ship owners and masters, above all, to avoid fishing grounds in which the sardine presents sizes below or only slightly greater than the legal minimum size and avoid discards and minimize slipping. These practices are foreseen in the framework of the European regulations, in discards plan for small pelagic fisheries, approved by Commission Delegated Regulation (EU) 2020/2015 of 21 August 2020.

7. BILLATERAL COOPERATION

Portugal and Spain maintain regular contacts to ensure the exchange of relevant information to ensure a proper and effective regulation of the fishery as to accomplish the management objectives foreseen in the current plan. Fishing scientific bodies from both countries (IEO in Spain and IPMA in Portugal) maintain continuous cooperation and exchange.

Spain and Portugal, with the reference of their current shares, 33,5% and 66,5%, will agree annual fishing opportunities for both Member States, taking into account the evolution of the stock, to avoid overshooting of the total fishing opportunities defined by the harvest control rule.

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