

Annex 4: Review of ICES Scientific Report

Expert group Chair: Leire Ibaibarriaga

Secretariat representative: David Miller

WGHANSA I

1.1 Audit of Anchovy 9a (ane.27.9a)

Date: 30/05/2022

Auditor: Andrés Uriarte and Laura Wise

General

The stock of anchovy in 9a is divided in western and southern components following the 2018 benchmark. Each component is assessed separately. Both components are classified as ICES category 3 stocks and Catch advice is based on the recently approved by ACOM, guidelines for short lived species category 3 stocks, whereby catch advice is changed from year to year according to the 1-over-2 rule subject to an uncertainty cap of +/- 80% (maximum relative allowable change between years).

- For both components the stock annex has been followed as much as possible, i.e. except the non inclusion of the missing survey ECOCADIZ 2021 in the assessment model of the 9a South component program
- There is an increasing amount of auxiliary information which is not yet taken into account for the assessment.

In particular for anchovy in 9a South, information from the acoustic survey ECOCADIZ-Reclutas series and from the DEPM (carried out every three years) is not used. ECOCADIZ-Reclutas aims at assessing the strength of anchovy recruitment (juveniles); the series started in 2012 and nowadays there is a total of 9 surveys available to the group. The DEPM assesses the anchovy Spawning Biomass. The series started in 2005 and a total of 6 surveys have already been reported to the group.

Recommendation: The evaluation of the potential utility of these surveys to improve the assessment and provision of advice deserves a full benchmark and a recommendation was put forward for consideration of ACOM.

For the western component the information on recruits coming from IBERAS acoustic survey in autumn is not used, though preliminary analysis of its consistency vs. the PELAGO age 1 estimates in the following year, shows it yet to be weak.

- This year no major damage on data input arising from the COVID19 disruption has been reported.

- The major weakness has come from the lack of the summer ECOCADIZ acoustic survey in 9aSouth in 2021 whose continuity is not guaranteed.

A. Audit for Anchovy 9a South:

For the southern component of anchovy in 9a (distributed in 9a South) the stock size indicator is the SSB (that equals B1+) at the end of the second quarter, as estimated from the GADGET assessment model. This is the fifth year where advice following the precautionary approach will be provided and the fourth without the use of the 80% uncertainty cap.

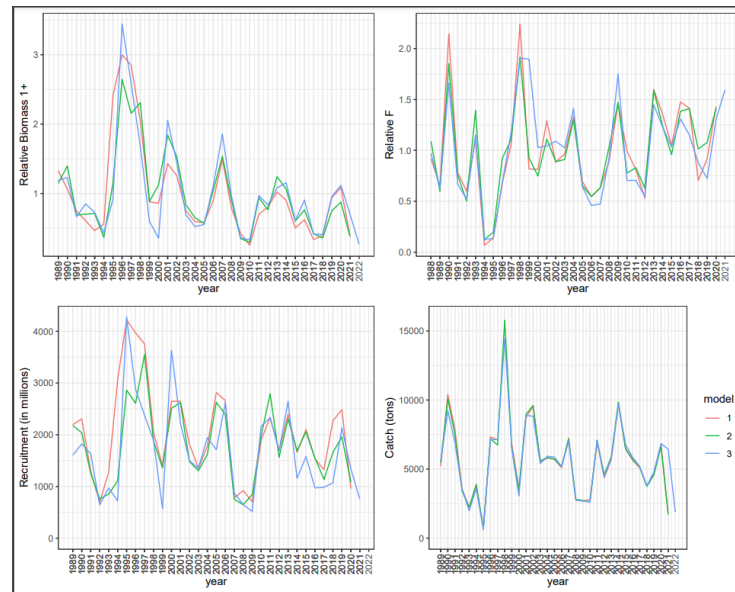
The assessment of Anchovy 9a South:

- It was carried out as expected, i.e. following the stock annex, by incorporating the new information from the acoustic survey PELAGO 2022, and commercial catch in the last year (2021) with their quarterly ALKs and finally the total catch for the first half of the year 2022 (assuming historical % of catches in June). However, the summer ECOCADIZ acoustic survey in 9a South in 2021 was not carried out due to technical problems and couldn't be used as input to the assessment. This survey will not be carried out in 2022 either and therefore its continuity is not guaranteed.

For single stock summary sheet advice:

- 1) **Assessment type:** update (last benchmarked in 2018)
- 2) **Assessment:** Analytical assessment accepted. Since this is a Category 3 stock, the analytical assessment is only used as a relative indicator of stock trends (not as absolute estimates). Outputs are rather consistent with past year.
- 3) **Forecast:** not required; The advice follows the catch advice Rule for category 3 short lived data-limited stocks.
- 4) **Assessment model:** Gadget in quarterly time-steps using catches by length and ALKs + 2 acoustic surveys (biomass index, length distribution and ALKs): PELAGO (Spring, 2022 index included) and ECOCADIZ (last index from Summer 2020 index already included in the assessment carried out in 2021).
- 5) **Consistency:** This new assessment was carried out accordingly to the stock annex but the ECOCADIZ survey estimate in 2021 was missing.

Compared to last year assessment, there is a global consistency, although there has been some revision of the series in absolute terms, whereby biomass has been rescaled globally slightly upward. These changes are somewhat expected with the addition of new data (catch and index information). In relative terms and from that point of view the assessment of the relative series of B1+ is not much changed compared to past assessment output year (blue line is the current assessment and the red line is the past assessment in the figure below). Nevertheless, the ratios between recent years of B1+ estimates have changed slightly and this affects the advice procedure which uses those ratios to correct the former catch advices (see technical comments at the end of this subsection on anchovy in 9a).



- 6) **Stock status:** Although the assessment of B1+ is not taken in absolute terms but as relative indicator of stock abundance, current B1+ is at the lowest level of the historical series, below B_{pa} and B_{lim} . B_{lim} is assumed as B_{loss} , excluding the last year of the assessment. B_{loss} corresponds to the estimated B1+ in 2010.
- 7) **Management Plan:** There is no management plan for this stock.
- 8) **Basis of the advice:** A trend based advice, following the “one-over-two” ratio of B1+ series from the Gadget assessment model, with an uncertainty cap of $\pm 80\%$, applied to the advised catch of the previous management season (from 1 July 2021 to 30 June 2022). This is like in-year advice as approved in the stock annex for this category 3 stock. Following the annex in WK LIFE X (ICES 2021) the rule has been implemented with a biomass safe guard reducing factor, because the current B1+ is estimated to be below B_{lim} , which is taken as $B_{trigger}$ for this assessment. For this reason the 1-over-2 ratio (0.294) was also multiplied by a biomass safe guard ratio of 0.803 ($B_{current}/B_{lim}$), which produced a combined relative change from previous advice of 0.236. This implied a catch advice for the 2022/2023 management period 76% lower than in 2021/2022.
- 9) **Data issues:** The biomass estimates from the spring PELAGO survey arrived during the Working Group and there were some unresolved issues with the data that require revision in the next future. Though the estimates were considered precise enough for the provision of advice, the definitive revised estimates will only be available in November 2022 for examination of ICES WGACEGG.

The summer ECOCADIZ acoustic survey in 9a South in 2021 was not carried out and could not be used as input to the assessment. This survey will not be carried out in 2022 either and therefore its continuity is not guaranteed. A recommendation is passed endorsing its continuity.

All available and inferred catch data as well as survey inputs were fully used for the assessment.

Some additional surveys (ECOCADIZ-Reclutas and Bocadeva) are available but aren't used in the assessment. This was agreed in the benchmark because at the time the time-series was considered too short (e.g. Bocadeva) or their performance was still in

evaluation (e.g. JUVESAR, ECOCADIZ-Reclutas). Its considered that the time has come to test for their reliability as to be used in future assessments.

General comments

The assessment was well documented and the stock annex was followed.

Technical comments

The group acknowledges that the estimated SSB (= B1+) time-series is being updated every year with the addition of new data. This causes some changes in the relative changes of B1+ estimates between the most recent years which affects the consistency of the ratios used for the provision of advice between updated assessments. Such inconsistencies affect the catch advice and can propagate to the following years.

This derives from the fact that the trend advisory rule (1-over-2) assumes implicitly that past advice is unbiased, but since every new assessment updates the whole time-series estimates of the indicator B1+, it is like saying that the trend based indicator for providing advice in previous years were partially biased (as far as the biomass series of B1+ estimates have changed). Therefore, the application of the rule is incorporating a catch advice for the previous year which is known to be inconsistent with what would have been advised in case of perceiving the population as in the current (most recent) assessment. This is probably a general problem which may affect others stock in category 3 with an indicator linked to an analytical assessment. However, this type of situation was not considered when putting forward the guidelines for category 3 short lived species. Certainly the stability/variability of the assessment producing the stock trend indicators is something that has to be incorporated when assessing the performance of these HCRs for category 3 stocks and it requires further investigations.

On the basis of the advice: ADVICE does not deviate from the standard ICES guidelines for category 3 short lived stocks

Conclusions

- The assessment has been performed correctly SALY.
- The southern component of the stock is assessed to be below the historical mean and below B_{lim} in 2022
- The revision of the estimates of B1+ in recent years, according to the updated assessment, would have induced some changes in the advice produced this year for 2022/2023.
- The advice does not deviates from the recently adopted standard ICES guidelines for category 3 stocks advice which allows a 80% uncertainty cap for short lived species and has by the first time included a biomass safe guard.

B. Anchovy 9a West:

For the western component of anchovy in 9a (distributed in 9a North, Central North and Central South) the stock size indicator is the combined acoustic biomass (B1+) estimated from PELAGO spring acoustic survey over the continental western shelf of Portugal (9a Central North + 9a Central South) and PELACUS in 9aN in spring as well. This is the fifth year where advice will be provided and the third subject to the 80% uncertainty cap (Advice of 2019, 2021 and the current 2022) .

The assessment of Anchovy 9a western:

- It was carried out as expected (SALY) incorporating the new information from PELAGO 2022 + PELACUS 2022, plus the commercial catch in the second half of year 2021 and the first half of the year 2022 catches (assuming catches in May and June). This is not an

analytical assessment and catches-at-age are not used for the assessment or provision of advice.

For single stock summary sheet advice (Western Component):

- 1) **Assessment type:** update (last benchmarked in 2018)
- 2) **Assessment:** Direct input from the combined spring acoustic survey covering subdivisions 9a North + 9a Central North + 9a Central South. Since this is a Category 3 stock, the analytical assessment is only used as a relative indicator of stock trends (not as absolute estimates).
- 3) **Forecast:** not required; The advice follows the catch advice Rule for category 3 short lived data-limited stocks.
- 4) **Assessment model:** Not applicable
- 5) **Consistency:** This new assessment was carried out according to the stock annex.

This year of 2022 the PELAGO+PELACUS spring acoustic estimates represents the highest survey index of the time-series, almost double of the former maximum observed in 2021.

- 6) **Stock status:** Although the assessment is not taken as absolute but as relative, current B1+ is around 112 000 t, the highest of the historical series. No B_{lim} or B_{trigger} have been defined for this western component.
- 7) **Management Plan:** There is no management plan
- 8) **Basis of the advice:** A trend based advice, following the “one-over-two” ratio of B1+ indexes from the combined acoustic estimate, with an uncertainty cap of +/- 80%, applied to the advised catch for the previous management season (from 1 July 2021 to 30 June 2022). This is like in-year advice as approved in the stock annex for this category 3 stock. The one-over-two ratio is 1.83 and therefore a maximum increase of up to 80% (the uncertainty cap) was applied. This implied a catch advice for the 2022/2023 management year of 14083 tonnes, corresponding to a Harvest rate of 0.126.
- 9) **Data issues:** The biomass estimates from the spring PELAGO survey arrived during the Working Group and there were some unresolved issues with the data that require revision in the next future. Though the estimates were considered precise enough for the provision of advice, the definitive revised estimates will only be available in November 2022 for examination of ICES WGACEGG.

Some additional surveys on recruits (Juvesar and/or IBERAS) are available but are not used in the assessment as agreed in the benchmark until proving a satisfactory performance in relation to the combined spring acoustic surveys.

General comments

In 2021, the acoustic index had reached its highest value (65683 t) very similar to the second highest (65096 tonnes record in 2018). The estimates in 2022 are again the highest in the series. In this period the harvest rate implied by the advice based on the 1 over 2 rule has been decreasing from 0.16 in 2020 to about 0.12 in 2021 and for the current 2022 advice.

Technical comments:

This year and in the previous year the expert group considered that the current advice procedure for short-lived species category 3 stocks, based on the 1-over-2 ratio with uncertainty cap of 80%, is still not flexible enough to adapt to the highly fluctuating nature of this stock component. The approach (1-over-2 with 80%UC) can only be taken as an interim approach while a better

formulation for providing advice can be established, either by allowing greater uncertainty caps (such as being capable of restoring catch levels when sharp increases of the population occurs) or simply by applying harvest rates to the most recent biomass estimates from surveys.

Further work is planned to be carried out to manage these highly fluctuating populations.

Current comments do also apply to the Anchovy southern component.

On the basis of the advice: ADVICE does not deviate from the standard ICES guidelines for category 3 short lived stocks.

Conclusions

- The assessment has been performed correctly SALY.
- The western component of the anchovy stock in 2022 is assessed to be well above historical mean value (it is at the highest biomass levels).
- The advice does not deviate from the recently adopted standard ICES guidelines for category 3 stocks advice which allows a 80% uncertainty cap for short lived species, though the group considers this as an interim approach until finding a better way to manage these oscillating anchovy resources.

1.2 Audit of Southern Horse Mackerel (hom.27.9a)

Date: 31/05/2022

Auditor: Leire Citores

General

The southern horse mackerel stock is analytically assessed every year using annual Spanish and Portuguese catch and survey data, for which some missing data were reported in years 2012, 2019 and 2020 due to technical/legal issues or Covid disruption in 2020. For 2021 no missing data were reported, and the assessment model fitting was carried out following the stock annex. As survey data from 2021 provided information on previous years' recruitment, the usual procedure detailed in the stock annex for the short-term forecast was recovered (in 2019 and 2020 some deviations were needed).

For single-stock summary sheet advice

- 1) Assessment type: update (SALY)
- 2) Assessment: accepted
- 3) Forecast: accepted
- 4) Assessment model: AMISH (Assessment Method for the Ibero-Atlantic Southern Horse mackerel)– as in stock annex – tuning by time-series of total catch, catch-at-age, biomass index of IBTS survey, abundance-at-age from IBTS survey and mean weight-at-age in the catch and stock.
- 5) Consistency: The assessment is consistent with last year assessment; Fishing mortality and SSB in 2020 remain basically the same as in the last assessment, no significant upward or downward revisions have been observed.
- 6) Stock status: $SSB \gg MSYB_{trigger}$; $F \ll F_{MSY}$; high uncertainty on last years' R.
- 7) Management plan: A management plan was proposed and evaluated as precautionary by ICES (ICES, 2018). However, ICES was requested by the EU to base its advice for 2023 on the ICES MSY approach and include the MP as a catch scenario.

General comments

The assessment was well documented, no deviations from the stock annex were needed. Input data for stock assessment and short-term forecast was checked by confronting the report tables and the input and output data files.

Technical comments

None

Conclusions

- The assessment has been performed correctly SALY.
- The update assessment gives a valid basis for advice.
- The perception is consistent with previous years with fishing mortalities below F_{MSY} and SSB above $MSYB_{trigger}$

- There is a concern about the assumptions on selectivity for catch-at-age on the last period of the assessment that may lead to a misestimation of the total biomass of the stock. It is noted that the possible violation of this assumptions needs immediate investigation.

WGHANSA II

1.3 Audit of Bay of Biscay anchovy stock (ane.27.8)

Reviewer: Maxime Olmos

Date: 30/11/2022

Expert group Chair: Leire Ibaibarriaga

Secretariat representative: David Miller

General

The Bay of Biscay anchovy stock assessment was benchmarked in February 2013 (ICES, 2013).

Model structure

The assessment for the Bay of Biscay anchovy population is a Bayesian two-stage biomass-based model (CBBM; Ibaibarriaga et al., 2011). In this model, the population dynamics are described in terms of biomass with two distinct age groups: (i) recruits (or fish aged 1 year) and (ii) fish that are 2 or more years old. The biomass changes exponentially with time according to intrinsic growth, natural mortality and fishing mortality rates.

Growth and natural mortality are separated processes that are assumed constant along time but distinct across age groups (recruits and older individuals). Fishing mortality is treated as a continuous process in time and separable into age and year effects.

Inputs data

- *Likelihoods*
 - Biomass from DEPM (BIOMAN) and acoustic survey (PELGAS) are log-normally distributed. Observed biomass are scaled to the true population biomass by the catchability coefficient defined for each survey.
 - Age 1 biomass proportion from the acoustics and DEPM surveys follow a beta distribution
 - Juvenile abundance index from the JUVENA surveys are log-normally distributed; where the abundance index observed in year (y-1) is related to the true recruitment (age 1 biomass in January of year y) by a power model, and the observed recruitment is scaled to the true recruitment by a catchability coefficient
 - Total fisheries catch by semester are log-normally distributed
 - Age 1 biomass proportion in the catch by semester follow a beta distribution
 - Growth rates by ages are normally distributed (where observed growth is the logarithm of the weights-at-age ratio estimated from surveys in consecutive year (Ibaibarriaga et al., 2011)).
- *Data from 2022 assessment and potential differences with 2021 assessment*
 - 2022 biomass from PELGAS, BIOMAN, JUVENA
 - 2022 age proportion from PELGAS and DEPM
 - Growth per age group from observed weights at age
 - Updated catch 2021 for France: no length sampling was available due to low total landings so the same age structure as AZTI catches in 8abd were used

- Preliminary catch 1st semester 2022 (total and age 1):
 - *Spanish catches preliminary (based on sales)*
 - *French catches in 1st sem same age structure as Basque catches in June*
- Preliminary total catch second semester 2022 under the assumption that:
 - *France and Spain: Nov-Dec catches are 2.4% of the total catch (average 2010-2021), i.e. Nov-Dec 612 tonnes.*
- Preliminary total catch Jan-Oct 2022: 24884 tons (264 Fr, 24619 Sp from which only 5340 landed in the Basque Country)

Parameters and inference

The unknown parameters are the initial biomass, the mean and the precision of the recruitment process in log scale, the acoustic and DEPM surveys catchabilities, the catchability and the power parameters of the JUVENA index, the precision of the survey and catch observation equations, the year and age components of the fishing mortality by semester, the annual intrinsic growth rates by age, the precision of the observation equations for growth. The natural mortality is fixed at the values agreed by the WG.

Bayesian posterior distributions were approximated using Monte Carlo Markov Chain (MCMC).

Deviation for the stock annex

For the 2021 assessment, biomass and age structure estimates in 2020 by the PELGAS survey were missing due to COVID.

For the 2022 assessment, there is no deviation in the assessment from the stock annex (no data missing), except how the age structure for French catch was defined due to low total landings and such a small deviation does not have a significant impact in the assessment estimates and in the catch advice for 2023 (French catches represent 0.02% of the total catch in 2021 ; totalCatch(2021) = 27982, frenchCatch (2021)=64 tons).

For single-stock summary sheet advice

- 8) Assessment type: update
- 9) Assessment: presented
- 10) Forecast: presented
- 11) Assessment model: Bayesian two-stage biomass dynamic model.
- 12) Consistency: The assessment is consistent with last year's assessment.
Recruitment (age 1) in 2021 was significantly revised upwards.
- 13) Stock status: $SSB > B_{lim}$ (21000t) since 2009. SSB has decreased compared to 2021 but still shows a very high value (B_{pa} , $MSY B_{trigger}$ and F_{MSY} not defined for this stock).
- 14) Management plan: harvest control rule evaluated as precautionary by ICES and agreed in 2016. According to this HCR, $TAC_{y+1}=0$ if the estimated $SSB_{y+1} \leq 24\,000$ tonnes, $TAC_{y+1} = -2600 + 0.4 * SSB_{y+1}$ if $24\,000 \leq SSB_{y+1} \leq 89\,000$ tonnes and $TAC_{y+1} = 33\,000$ tonnes if $SSB_{y+1} > 89\,000$ tonnes.

SSB for 2023 is defined as mid-May estimate, with 60% of the catch assumed to be taken in the first six months of the year. Because $SSB(2023) = 120428$, catches in 2023 should be no more than 33 000 tonnes

General comments

The assessment is well documented. The stock assessment input data and the assessment run code was available for the audit. Checking was performed by confronting the input data files for the assessment and for the short-term forecast.

In terms of outputs, historical trends in recruitment, SSB and harvest rate show consistent trends with previous assessments.

Potential typos

In the advice sheet, in Table 1, Recruitment = 82388 whereas in Table 9, Recruitment = 82389 (the advice sheet has been corrected changing the recruitment in Table 1 to 82389)

Technical comments

In Table 9 of the advice sheet, called "Assessment summary", I noticed that the catches column corresponds to the total catches and not the catches used in the assessment model (catches for age 1 and 2+). Because this Table 9 describe the summary of the assessment, may I suggest to provide the data (catches for age 1 and 2+) related to the assessment model and not the total catches.

Conclusions

The assessment and short-term forecast have been performed correctly, giving a valid basis for advice.

Ibaibarriaga, L., Fernandez, C., and Uriarte, A. 2011. Gaining information from commercial catch for a Bayesian two stage biomass dynamic model: application to Bay of Biscay anchovy. – ICES Journal of Marine Science, 68: 1435 –1446.

ICES. 2013. Report of the Benchmark Workshop on Pelagic Stocks (WKPELA 2013), 4–8 February 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:46. 483 pp

ICES. 2020. Working Group on Southern Horse Mackerel, Anchovy and Sardine (WGHANSA). ICES Scientific Reports. 2:41. 655 pp. <http://doi.org/10.17895/ices.pub.5977>.

1.4 Audit of Sardine (*Sardina pilchardus*) in divisions 8.a–b and 8.d (Bay of Biscay)

Reviewer: Hugo Mendes, 28/11/2022

Expert group Chair: Leire Ibaibarriaga

Secretariat representative: David Miller

General

The stock assessment is conducted using Stock Synthesis 3. The assessment is an age-based assessment assuming a single area, a single fishery, a yearly season and genders combined. Input data include catch (in biomass), age composition of the catch, total abundance (in numbers) and age composition from an annual acoustic survey (PELGAS), egg abundance (BIOMAN) and SSB from a triennial DEPM survey operating in the Bay of Biscay.

At the time of this audit the report section was not yet available but overall the available presentations in the sharepoint, advice sheet and documentation sent by the stock assessors was well explained and included the necessary generic information needed for an ICES category 1 assessment and advice sheet.

Data issues as the estimation of Q4 catches in the interim year are well explained and alternative hypothesis were also tested and discussed during the working group. In 2021, the majority of French catches originated from rectangles 25E5 and 25E4 in Subarea 7, catches from these areas are considered to be more closely associated with this stock and are included in this assessment.

The stock assessment and short term forecast followed the methodology described in the Stock annex. The stock annex was updated in 2019 following the interbenchmark, where the assessment was upgraded to ICES category 1. The changes made to the model settings included new assumptions on selectivity, maturity ogive and SR to reduce the previous retrospective pattern, but there is still a slight tendency to overestimate biomass (Mohn's $\rho = 0.350$, value mostly driven by the difference in 2017) and underestimate fishing mortality (Mohn's $\rho = -0.287$).

The spawning biomass shows a decreasing trend in the last years and was estimated to be the second lowest level of the time-series. In the last few years, there was also observed a decreasing trend in the weight-at-age and maturity-at-age. The impact of these decreasing trends in the SSB estimations was discussed during the working group. The spawning biomass is below $MSY_{B_{trigger}}$, B_{pa} , and only slightly above B_{lim} .

Fishing pressure on the stock is above F_{MSY} and below F_{lim} .

For single-stock summary sheet advice

Stock: Sardine in divisions 8.a–b and 8.d (Bay of Biscay)

- 1) **Assessment type:** Update
- 2) **Assessment:** Accepted
- 3) **Forecast:** Accepted
- 4) **Assessment model:** The model used is Stock Synthesis 3, version 3.24f. A description and discussion of the model can be found in Methot and Wetzel (2013). The sardine assessment is an age-based assessment assuming a single area, a single fishery, a yearly season and genders combined. Input data included updates from catch (in biomass), age composition of the catch, total abundance (in numbers) and age composition from the annual acoustic

survey (PELGAS), egg abundance from BIOMAN survey and SSB from a triennial DEPM survey (last update in 2020).

- 5) **Consistency:** There is still a slight tendency to overestimate biomass with a Mohn's $\rho = 0.350$, although the 5-yr retrospective pattern show that this somehow high value is mostly driven by the 2017 estimates and the recent values show a substantial improvement in the consistency. Concurrently, there is a tendency to underestimate fishing mortality (Mohn's $\rho = -0.287$). There is a slight overestimation of recruitment (Mohn's $\rho = 0.094$) that could be explained by large age 1 estimates in the PELGAS survey in 2018, 2019 and 2021 (no survey in 2020) that could not be tracked consistently in the age 2 estimates of the following year.
- 6) **Stock status:** Fishing mortality is above F_{MSY} and F_{pa} and below F_{lim} ; The spawning biomass is below $MSY B_{trigger}$, B_{pa} , and only slightly above B_{lim} . As the stock is below $MSY B_{trigger}$ and according to the ICES HCR the advised catch for 2023 is based on the deterministic projection (*fwd* function from FLR) with $F = F_{MSY} * SSB(2023) / MSY B_{trigger} = 0.40$. The advice for 2023 is 24% lower than the advice for 2022.
- 7) **Management plan:** No official TAC is set for this stock. ICES advice is based on the MSY approach.

General comments

At the time of this audit the report section was not yet available but the available presentations in the sharepoint, advice sheet and documentation sent by the stock assessors was well explained and documented. The assessment follows the agreed methodology after the 2019 interbenchmark and only minor updates are needed in the stock annex regarding the time range for the recruitment assumption in the short term forecast section and include some reference to the use of the BIOMAN egg count in the general description of the "model used of basis for advice"

Technical comments

None

Conclusions

The assessment and short-term forecast have been performed correctly according to the stock annex. Everything was well documented and included the necessary generic information needed for an ICES category 1 assessment and producing the advice sheet.

1.5 Audit of Sardine (*Sardina pilchardus*) in Subarea 7 (2021 ASSESSMENT)

Reviewers: Andrés Uriarte

Expert group Chair: Leire Ibaibarriaga

Secretariat representative: David Miller

General

The sardine stock in the southern Celtic Seas and the English Channel was benchmarked in 2021 (ICES, 2021) and was upgraded to category 3. A SPiCT model based on quarterly landing data and a biomass index derived from the acoustic survey PELTIC was developed, but as there is a high uncertainty of the MSY reference points of absolute biomass and fishing mortality the assessment was not considered reliable, and is not used for provision of advice. Therefore the advice is based on the ICES framework for category 3 short-lived stocks (ICES, 2020), making use of the 1-over-2 rule with an uncertainty cap of 80% and a biomass safeguard (ICES, 2020), taking as biomass indicator the estimates produced by the PELTIC acoustic survey, for which there used to be yearly estimates of sardine biomass for the total area since 2017 to present.

However in 2022 the PELTIC survey was severely reduced for technical reasons and the restricted covered area constitutes a bit less than 30% of the standard total area covered by this survey to produce the indicator for the assessment and advice. Thus an equivalent of the total area index of biomass was inferred from the proportions of biomass which in the past were observed within that restricted area covered in 2022, as explained below.

For single-stock summary sheet advice

- 1) Assessment type: benchmark 2021
- 2) Assessment: No assessment is carried out, other than taking the direct estimates from the autumn PELTIC acoustic survey as relative indicator of abundance trends. The equivalent of the total area index of biomass inferred from the restricted area covered in 2022 area suggest an increase of 20% over the mean of the previous two indexes.
- 3) Forecast: not presented (In-year advice using Catch Advice Rule for category 3 short lived data-limited stocks)
- 4) Assessment model: Direct estimates from the autumn PELTIC acoustic survey are used as stock indicator of trends, to apply the data-limited approach for small pelagic fishes, i.e.i.e. the 1 over two harvest control rule with 80% cap, based on survey trend
A preliminary SPICT was set at the benchmark as it is updated every year, but its results are not considered reliable yet. Furthermore in this year the indirectly inferred indicator for the total area covered was not used as input for the SPICT update.
- 5) Consistency: This new assessment is carried out accordingly to stock annex.
- 6) Stock status: The equivalent of the total area index of biomass inferred from the restricted area covered in 2022 area suggest an increase of 20% over the mean of the previous two indexes. The SPICT (partially updated during the WG) suggests Fishing pressure is below FMSY and stock size is

above MSY Btrigger, but these indications are not considered reliable yet.

- 7) Management plan: No management plan.

General comments

The ICES framework for category 3 short-lived stocks (ICES, 2020) used for the advice of this stock consists of multiplying the most recent advised catches by the ratio between the last biomass index value (index A) and the average of the two preceding biomass values (index B). This is the second year of implementing the 1o2 rule and the advised catch for 2022 is used to provide the advice for 2023 according to the former ratio of Index A/Index B. All calculations have been checked twice and are correct as collected in the report and in the draft of the summary sheet for advice.

The current advice relies on the rescaling of the PELTIC 2022 abundance estimate for the restricted area covered in 2022 to the Total area should have been covered to produce the abundance estimate to be used for the advice according to the stock annex. The procedure made the most of the available information from the past series of PELTIC, and the raising was made in two steps: First the restricted area estimate was raised to the Core area coverage by using the ratios of the Core/restricted abundance ratios in the two former years (2020 and 2021). Next the Core area 2022 inferred abundance was raised to the Total area by using the ratios of the TotalArea/CoreArea abundance estimates in the period 2017-2021, as explained in the report. This procedure was discussed and endorsed by the WG.

The raised to total area index of biomass for 2022 (336 306 t) resulted to be 20% over the mean of the previous two indexes (2020 & 2021) (279 607 t).

To produce the advice based on the 1 over 2 rule, the former advice (6906 t for 2022) was multiplied by the 1.2 which resulted in an advice for 2023 of 8306 t.

Technical comments

The expert group considers that this rule for short-lived species category 3 stocks, based on the 1over2 ratio with uncertainty cap of 80% can only be taken as an interim approach while a better formulation for providing advice can be established.

Conclusions

The assessment has been performed correctly, accounting for the restricted area covered by the PELTIC survey in 2022, therefore giving a valid basis for advice. Everything is well justified and documented in the report.

References

- ICES. 2020. Tenth Workshop on the Development of Quantitative Assessment Methodologies based on LIFE-history traits, exploitation characteristics, and other relevant parameters for data-limited stocks (WKLIFE X). ICES Scientific Reports. 2:98. 72 pp. <http://doi.org/10.17895/ices.pub.5985>
- ICES. 2021c. Benchmark Workshop on selected stocks in the Western Waters in 2021 (WKWEST). ICES Scientific Reports. 3:31. 504 pp. <https://doi.org/10.17895/ices.pub.8137>

1.6 Audit of Sardine (*Sardina pilchardus*) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)

Date: 07/12/2022

Auditor: Alfonso Pérez Rodríguez

Expert group Chair: Leire Ibaibarriaga

Secretariat representative: David Miller

General

Assessment made according to the benchmarked assessment procedure agreed in 2017 (WKPELA2017) and updated in 2021 (ICES WKIBIS being currently pending final publication) which accounts for the inclusion of a recruitment index during the interim year to inform on the strength of the age 1 in the management year. This has supposed a neat improvement in the forecast capability of the managed population.

In 2019, the stock was considered by ICES (ICES 2019) to be a low productivity regime which had started in 2006 when a series of poor recruitment began. The reference points were accordingly then updated (ICES 2019).

The cancellation of Spanish spring DEPM survey in 2020, due to Covid-19, led to a lack of sardine data for estimating the total stock SSB in 2020, with impact on the 2021 assessment. In 2021 and 2022 no problem has arisen in survey coverages due to the Covid-19 disruption.

The assessment of 2022 shows a poor fit to the 2022 point estimate of the spring acoustic survey index (PELAGO and PELACUS) (ICES, 2022a). The model has a tendency to underestimate abundance in years when the survey index is large. Also, the 2022 spring acoustic survey index estimated an increase of Age 1 individuals (cohort of 2021) compared to 2021 which is in disagreement with the decrease of the recruitment index (IBERAS 2021 for subdivision 9aCN).

In 2022, the IBERAS survey showed thick schools of juvenile sardine near surface, partially outside the echosounder detection area. For this reason, the recruitment index in 2022 may be underestimated.

For single-stock summary sheet advice

- 1) Assessment type: update
- 2) Assessment: accepted
- 3) Forecast: accepted
- 4) Assessment model: Stock Synthesis (SS3) V3.30.11.00. A description and discussion of the model can be found in Methot and Wetzel (2013). The assessment is age-based, assuming a single area, a single fishery, a yearly season and genders combined. The model is tuned by input data updates from the triennial Portuguese and Spanish DEPM surveys (PT-DEPM and SP-DEPM) and total abundance (numbers) and age structure from the Portuguese and Spanish spring acoustic surveys (PELAGO and PELACUS). In addition, according to the Inter-benchmark IBIS in October 2021, the recruitment index provided by IBERAS survey from area 9aCN was included in the assessment to allow the estimate of recruitment-at-age

- 0 in the last assessment year, and age 1 in the management year. Total catch and age proportions in the catch are used, including provisional estimates of the total catch in tonnes for 2021.
- 5) Consistency: In recent years, coincident with the increase of the stock size, the model has a tendency to underestimate the stock biomass (Biomass at age1+, Mohn's rho of -0.333) and recruitment (Mohn's rho of -0.139).
 - 6) Stock status: In 2022 $B_{1+} > B_{lim}$ and above B_{pa} reference points, while F is slightly above F_{pa} and F_{msy} , but lower than F_{lim} ; The high recruitment in 2019 has restored the population to higher levels than B_{pa} for the last two years, which had not been observed since 2009. In 2022, estimated recruitment is above the average since 2005. However, since recruitment in 2020 and 2021 were low, the scenario of low productivity of this stock was not revised.
 - 7) Management plan: Management plan for 2021–2026 evaluated and approved by ICES. It was concluded to be precautionary with maximum allowed catches between 30 000 and 50 000 tonnes (ICES, 2021a). For 2023, the European Commission requested ICES to provide advice based on the MSY approach and include the HCR in other catch scenarios.

General comments

The assessment is well documented. The stock assessment input data and the assessment run code was available for the audit. In terms of outputs, historical trends in recruitment, SSB and harvest rate show consistent trends with previous assessments.

Technical comments

None

Conclusions

The assessment and short-term forecast have been performed correctly according to the stock annex. Everything was well documented and included the necessary generic information needed for an ICES category 1 assessment and producing the advice sheet.

1.7 Audit of Blue jack mackerel (*Trachurus picturatus*) in Subdivision 10.a.2 (Azores grounds)

Reviewer: Susana Garrido, 06/12/2022

Expert group Chair: Leire Ibaibarriaga

Secretariat representative: David Miller

General

This is a category 5 stock for which there is no index available reflecting the development of the stock. Data available are official landings and ICES estimates of total catches including commercial landings from small purse-seiners (and other surrounding nets), landings from hooks and lines métiers, and unsold purse-seine landings withdrawn at the port (daily catch limits) and used as bait on longline and handline fisheries. Other catches include longline bait, tuna (live) bait, and recreational catches. In 2021 estimates of recreational catches are available for recreational boat fishing. Estimates for shore recreational anglers are unavailable.

Purse-seine fishery represents the majority of catches for this stock (85%) and lands mostly juveniles. For this métier, the number of fishing days and vessels decreased in the last decade and fishing days per year have been below the maximum allowed number of days (5000) since 2010, being below 4000 days.

Data issues, besides the absence of an index reflecting the development of the stock is that recreational catches do not include catches by anglers from the shore.

Given that there is no information on abundance or exploitation for this stock, the PA buffer was applied this year (it was not applied in 2018).

ICES cannot assess the stock and exploitation status relative to MSY and precautionary approach (PA) reference points because information to define reference points is not available.

For single-stock summary sheet advice

Stock: Blue jack mackerel in Subdivision 10.a.2 (Azores grounds)

- 1) **Assessment type:** Update
- 2) **Assessment:** none
- 3) **Forecast:** none
- 4) **Assessment model:** No assessment model
- 5) **Consistency:** NA
- 6) **Stock status:** There is no information on abundance or exploitation.
- 7) **Management plan:** ICES advice is based on the precautionary approach.

General comments

Technical comments

None

Conclusions

The advice was in line with the framework of category 5 stocks for which there is no information of stock abundance and exploitation and the PA buffer was applied given that there were no strong evidences that the current level of exploitation is appropriate for the stock, although the

number of purse-seine vessels and number of fishing days per year have been reducing in the last decade. Further analysis of the available data to try to derive a CPUE for this stock is commended. The assessment has been performed correctly, giving a valid basis for advice. Everything is well justified and documented in the report.