WORKING GROUP ON BIOLOGICAL PARAMETERS (WGBIOP)

VOLUME 3 | ISSUE 112

ICES SCIENTIFIC REPORTS

RAPPORTS SCIENTIFIQUES DU CIEM

ICES INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA
CIEM CONSEIL INTERNATIONAL POUR L'EXPLORATION DE LA MER

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ISSN number: 2618-1371

ICES Scientific Reports

Volume 3 | Issue 112

WORKING GROUP ON BIOLOGICAL PARAMETERS (WGBIOP)

Recommended format for purpose of citation:

ICES. 2021. Working Group on Biological Parameters (WGBIOP).
ICES Scientific Reports. 3:112. 370 pp. https://doi.org/10.17895/ices.pub.9629

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i Executive summary

Working Group on Biological Parameters

The main objective of the Working Group on Biological Parameters (WGBIOP) is to review the status, issues, developments, and quality assurance of biological parameters used in assessment and management.

WGBIOP (1) plans workshops, exchanges, and validation studies on a range of biological variables to review the quality of information supplied for stock assessment and improve quality assurance and training; (2) investigates data availability and develops documentation and methods to improve communication between data collectors and end-users; (3) delivers new and improved functionality for the SmartDots platform.

Four otolith exchanges and two workshops were completed in 2020–2021 using SmartDots—eight further exchanges are ongoing. Proposed future exchanges and workshops were reviewed and approved. The development of the SmartDots platform proceeded with the inclusion of the maturity, eggs, atresia, fecundity, and larval identification modules into the software version. A live SmartDots tutorial for event coordinators was conducted. Work to further develop quality assurance guidelines—and review national applications of these—progressed. Age and maturity validation studies were reviewed and a new method for prioritizing future validation work was proposed. Progress with the Stock Identification Database (SID) was reviewed, and the potential for creating a WGBIOP library collection and active involvement of WGBIOP in updating FishBase.org data were evaluated. The importance of identifying and documenting links between all relevant databases and document repositories was identified, and a task to address this was initiated. Work on improving the feedback loop between data collectors and stock assessors on the usage and quality of biological parameters in stock assessment continued.

Moving forward, WGBIOP aims to continue collaboration with WGALES and WGSMART on the development of the SmartDots platform, encouraging cross-group sharing of skills and experience to optimize results. WGBIOP aims to improve accessibility to its outputs through updates to SID and FishBase.org, and the potential creation of a WGBIOP library collection. WGBIOP hopes to improve two-way communication between data collectors and end-users around the quality and utility of biological parameters used in assessment. WGBIOP also aims to amalgamate all validation activities into one coherent workstream.

ii Expert group information

Expert group name	Working Group on Biological Parameters (WGBIOP)
Expert group cycle	Multiannual fixed term
Year cycle started	2021
Reporting year in cycle	1/3
Chairs	Maria Cristina Follesa, Italy
	Annelie Hilvarsson, Sweden
	Sally Songer, United Kingdom
Meeting venue and dates	17 June 2021, online meeting,
	5–7 October 2021, online meeting, plenary (39 participants)
	29 October 2021, online meeting,

1 Introduction

The main objective of the Working Group on Biological Parameters (WGBIOP) is to review the status, issues, developments, and quality assurance of biological parameters used in assessment and management. In this first year of a new term, WGBIOP was held online due to the continuing challenge of COVID-19 measures. As with the 2020 meeting, online plenary and subgroup meetings were spread over the year, with additional intersessional work on deliverables as required.

WGBIOP reported on the exchanges and workshops which had been conducted in the year to date. All of these calibration exercises were coordinated using SmartDots, an online platform for sharing images and facilitating comparisons of interpretation and identification between readers and stagers. Work has continued to develop this platform, feedback from event coordinators has been compiled, and the effectiveness of YouTube video tutorials evaluated. A live tutorial for event coordinators was conducted during the WGBIOP meeting. Development of modal age calculation and SmartDots reporting is progressing and WGBIOP will continue to work closely with WGALES and WGSMART on the egg, atresia, fecundity, and larval identification modules.

WGBIOP reviewed and approved proposed new exchanges and workshops to be held in the coming months, the majority of which correspond to the benchmark list.

Continued low levels of agreement were reported for some stocks, so an in-depth review of validation work both for age and maturity was undertaken and a revised method for identifying and prioritizing new validation studies was proposed. A need for all validation-related tasks to be assigned to one Term of Reference for future meetings was recognized. A new schedule for the completion of the Cooperative Research Report (CRR) handbook on maturity was agreed with the aim of submission by the end of 2022. Guidelines for quality assurance were reviewed and their application in national laboratories was considered.

Future use of the ICES library was discussed, in terms of its potential to replace the data quality assurance repository. Creating a so-called 'collection' within the new library was considered to be a good option for published documents and data moving forward, and would lead to improved accessibility. The potential for shared ownership of a collection or collections with WGCATCH should be investigated further. A progress update for the Stock Identification Database (SID) and the Regional Database & Estimation System (RDBEs) was sought, including a discussion on the addition of biological parameter information. The importance of linking these with any library collection in future was recognized. With this in mind, a first draft was prepared of a table showing which biological parameters and quality indicators are collected in which databases and platforms. It was also agreed that WGBIOP should contribute updated biological information to FishBase.org.

To improve transparency between data collectors and stock assessors about which biological parameters are being used in stock assessment and how the quality of these data has been assured, work continued on the quality indicator table. Response rates to the questionnaire which requests data to populate this table was low, so ways to improve engagement will be a focus for WGBIOP going forward. The inclusion of an age-error matrix in stock assessment was considered, and the results from WKAMEMSA were presented and discussed. The importance of collaboration between stock assessors and event coordinators to ensure that workshops and exchanges provide results in an appropriate input format for these models was recognized. To facilitate the implementation of age-error information in assessments, WGBIOP created project call text for a tender project under the EC-EASME framework in 2020 and will continue to promote the inclusion of the project in the next work program.

2 Progress report on terms of reference (ToRs) and workplan

2.1 ToR a. Plan and prioritize validation studies, workshops and exchange schemes on stock-related biological variables, and review the results

2.1.1 Progress during WGBIOP 2021

This ToR is a generic ToR for the group and forms part of the WGBIOP remit. This year the subgroup working on this ToR worked on the following points:

- The interactive table of workshops and exchanges "WK, Ex, sg History Master Table" was updated for the current year (Data Quality Assurance Repository).
- The subgroup also reported results from workshops and exchanges which took place in 2020 and 2021—summaries of which are available in Annex 3:.
- Drafted resolutions for workshops and exchanges endorsed by WGBIOP, to be approved by ICES, for 2021 and beyond which can be found in Annex 3:.
- Discussed and further improved the criteria for the prioritization of validation studies in collaboration with other ToRs.
- The need for an update on the current status of the Data Quality Assurance Repository and Stock Information Database (SID) upgrades were both discussed in the plenary.

A full list of exchanges has been proposed this year for 2022 and beyond with associated coordinators. Several of these exchanges have a reporting deadline of the first week of October 2022, to ensure the results are available for the benchmark process. The length of time between the benchmark list release and the WGBIOP meeting that proposes specific exchanges and workshops has been discussed as, the current arrangement sometimes means there is not enough time to coordinate events effectively before the benchmark workshop is held. This issue was discussed in plenary, and it was agreed that to mitigate this, a small meeting dedicated to planning exchanges and workshops will be held in March 2022 shortly after the new list of stocks that will be benchmarked in 2023 is published. Exchanges for species that are not up for benchmark should be finished by the end of 2022. Coordinators will be contacted six months after WGBIOP to ensure that exchanges are progressing as scheduled. WGBIOP will receive reports on the progress and the outcomes of these exchanges before its 2022/2023 meetings so that a presentation including all exchanges can be compiled ahead of the WGBIOP meeting (and WGBIOP will critically assess any recommendation for further work at this time).

WGBIOP will also track the progress of proposed workshops, facilitating the agreement of chairs, dates and locations for workshops to convene. Results will be presented to the WGBIOP meeting in 2022/2023 for consideration.

2.1.1.1 Identify and prioritize the need for age validation studies.

The need for validation studies is stressed by the repeated low levels of agreement between readers of some stocks and recurring issues and recommendations to WGBIOP. During WGBIOP 2020 this work was a joint effort by ToR a, b and c—each one tackling the issue from a different perspective. However, the group realized that it was difficult to coordinate the work intersessionally among the three ToRs. Hence WGBIOP 2021 decided that this task is going to fall entirely under ToR a.

WGBIOP 2020 initiated this task starting from the compilation of 1) a table (Table 1, Annex 4) with the available state-of-the-art knowledge of validation studies, thus including all the species/stocks where a validation study is already available; 2) a table (Table 2, Annex 4) including a list of key species/stocks in need of an age validation study to which a priority level should be assigned.

WGBIOP 2020 started to compile table 1 using the information available in the Cooperative Research Report (CRR) on age published in 2019 (Vitale et al., 2019). WGBIOP 2021 continued the inclusion of validated species from the CRR and added some new studies carried out by national laboratories. The resulting table includes information on a stock basis about existing validation studies, the method applied, the complete reference and when publicly available, the link to the study. The idea behind this table is to produce a living document that is continually edited and updated by WGBIOP. The plan is to eventually incorporate this information into the Stock Information Database[1] (SID) to make it readily and widely available, or add it to the WGBIOP Library collection to make it more widely accessible.

Concerning the second table (Table 2) on species in need of age validation, WGBIOP 2021 continued the work initiated in 2020, using the issues list associated with each benchmark in the attempt to find recurring questions that could help when setting a priority level. The table includes the year of the planned benchmark, information about the last benchmark and the last calibration and potential identified issue/solutions.

The use of an age-based model in stock assessment was clearly the main criteria for selecting the species to be considered. The rationale behind the assignment of priority level was revisited by WGBIOP 2021 as follows:

1. If a stock has no age-based assessment it should be assigned a low priority.
2. If a stock has not been recently calibrated, the need of a calibration ahead of a validation should be assessed.
3. If the stock has been recently calibrated (from 2015 and onward) the level of priority is assigned based on the combination of Percent of agreement (PA), Coefficient of Variation (CV) and Average Percent Error (APE) values. Also, the report and recommendations from the WK/Ex will be scrutinized to ascertain if the causes behind potential discrepancies between readers have been identified.

WGBIOP members will be asked intersessionally to give feedback on the priority levels assigned for those stocks falling under their own competencies and expertise.

The dialogue with ICES SID developers to include workshop and validation study information in SID, and to make this information available to the wider ICES community, will also continue intersessionally.

2.1.1.2 Identify and prioritize the need for maturity validation studies

Following the new resolutions for WGBIOP 2021–2023, the necessity of identifying species in need of validation studies for both age and maturity was stressed.

This task in relation to age was initiated during WGBIOP 2020 (see WGBIOP 2020 report, Paragraph 4.2.1.5, Tor b) while, during the WGBIOP 2021 meeting, a subgroup of experts met in order to begin to define the steps to be followed for the maturity validation process. Consideration should be given to aligning this process with the process for age validation as much as possible.

[1] http://stockdatabase.ices.dk/default.aspx

First, before setting a priority level, species that would benefit from validation need to be identified among those that will be benchmarked in the near future (for the current WGBIOP term, between 2022–2024).

In order to assist with this, the need for a collaboration with the stock coordinators/assessors was deemed highly necessary, in order to acquire knowledge of:

a) Use of maturity data as input in stock assessment models. For this, ICES stock annexes as well as advice sheets will be reviewed.
b) If used, which type of maturity data are integrated in the model (% of mature per age, length or age maturity ogives, annual, fixed, average; survey, commercial catches; modelled, etc.).
c) Whether there are any issues with the maturity data used in the model.
d) Are the data validated and if yes which type of validation has been adopted?

If no validation has been implemented, then, the feasibility to do a calibration and validation study should be assessed. At this stage the list of issues for upcoming benchmarks, supplied by ToR C should also be checked for known issues with maturity data.

The group decided to test the steps for setting a priority level by starting with a case study and North Sea plaice (*Pleuronectes platessa*) was selected. This stock represented an ideal case study as it will be benchmarked in 2022 and a recent maturity exchange was carried out in 2020.

Information on quality assurance protocols of maturity data collected at national level for the species listed in the upcoming benchmarks and possible validation will be collated, aided by the output of the ToR b subgroup. In addition, these data have to be cross-checked with the results present in the master table of validation studies (Table 2, Annex 4:). Reports from previous ICES Workshops and Exchanges will also be consulted. The work will focus on scrutinizing results from previous maturity calibration exercises in order to detect gaps in the quality assurance of maturity parameters in stocks studies. Also, before deciding on the calibration/validation events to prioritize, check the species for which maturity validation studies/investigations are already currently being conducted, or if this work is being carried out for similar species to these being addressed.

Finally, a priority level (high/medium/low) for calibration/ validation studies should be assigned to the selected stocks. Following what has already been decided for age validation studies, the rationale behind the assignment of priority level should be in general as follows:

- If a stock has no maturity-based assessment, it should be assigned a low priority.
- If a stock has not been recently calibrated, the need of a calibration ahead of a validation should be assessed (no priority is assigned).
- If the maturity scale of the stock has been recently calibrated, the report and recommendations from the WK/Ex will be scrutinized in order to establish if the causes behind potential discrepancies between stagers have been identified. The stock will be assigned a priority accordingly.

Besides, setting the ground for future needs, these steps are deemed necessary in order to create awareness of the existence of a maturity data validation within the stock assessment process, and consequently, to advise stock assessors to take validation outcomes into consideration when assessing the different stocks.

2.1.1.3 The Future of the Data Quality Assurance Repository

Currently, the Data Quality Assurance Repository[2] contains details of the following:

- Guidelines for exchanges and workshops for both age and maturity.
- Exchange and workshop reports
- A very limited number of ageing and maturity manuals.
- Some relevant ICES expert group reports (such as WKPICS, TACADAR, WKFICON etc…)
- PGMED reports 2009 – 2012.
- And under the heading 'Others' e.g. Guidelines and Tools for Age Reading Comparisons, Eltink et al., October 2000 etc.

While the Repository houses some very important resources for colleagues engaged in ageing and maturity staging, and is publicly available it seems like it is not widely known and used and is therefore underutilized and considered not fit for purpose.

Consequently, the review of the Repository has several aims. First, to promote best practice approaches (through internationally agreed guidelines) to the organization, running and reporting of methodological workshops, using tools such as SmartDots. Second, the aim is to highlight the valuable outputs from these exchanges and workshops to potential end-users such as Stock Coordinators, so that they may be integrated into stock assessments, and data compilation workshops, and in turn influence both the assessment and benchmark processes.

A number of avenues are potentially available to do this. One such avenue is the ICES Stock Identification Database (SID) https://sid.ices.dk . This database holds Meta-information about every stock that ICES provides management advice for, and is currently under development. WGBIOP has been in contact to discuss the feasibility of incorporating details/links to the outputs from relevant age and maturity exchanges and workshops. It is currently not clear if the SID will house just the current years' exchange and workshop reports or whether it will also hold historic reports, however, it is hoped that progress may be made on this during 2022.

Another avenue to disseminate WGBIOP information is the new ICES Library, which is also currently in development. Within the new ICES library, it will be possible to create a collection, which has its own DOI which is searchable and where usage of the collection can be tracked. It will also be possible to 'Follow' a collection within the Library, to get notifications each time the collection is updated. Such a collection could hold links to WGBIOP reports, published exchange and workshop reports, WGBIOP Guidelines (which could be uploaded via the Library Github), and links to other ICES publications such as relevant CRR's, and Expert Group reports. The Collection could also highlight other relevant work, through links to publications by 3rd parties and online websites.

WGCATCH (Working Group on Commercial Catches) are also considering creating a collection within the new ICES Library, so it would be useful to discuss and decide with WGCATCH whether there should be two separate collections i.e. one based on biological parameters and a separate one for statistical approaches to sampling, or whether all aspects of sampling design and implementation could be incorporated into one collection, with outputs from both WBIOP and WGCATCH. This discussion can be held intersessionally during 2022, once developments with both the ICES Library and the Stock Information Database have progressed.

Both avenues will require that clear responsibility is assumed in terms of who is responsible for a collection and how it will be maintained, with an agreed timeline. A suggestion could be that this task is assumed within a WGBIOP subgroup and reports, links etc… are updated annually

[2] https://www.ices.dk/community/Pages/PGCCDBS-doc-repository.aspx

to coincide with the WGBIOP meeting each year, so that it becomes a rolling tasks on the WGBIOP agenda.

2.1.1.4 Stock Information Database – An update

Prior to the WGBIOP meeting, representatives from ToRs a and c met with Rui Catarino, one of the developers of the Stock Information Database (SID) to discuss including the workshop and validation study information from WGBIOP and making it available to the wider ICES community.

At the moment SID development is not ready but is expected to be complete in early 2022. WGBIOP will follow up on suggestions made from the group in 2019 to ensure that these are included.

In the meantime, the master table with the information on recent workshops and validation studies is being updated in readiness for this information to be available for inclusion in SID.

2.2 Workplan for 2022–2023

Due to the current COVID-19 pandemic, a few exchanges and workshops planned for 2020–2021 have been further delayed or postponed to a later date. The full list of exchanges and workshops for 2021–2022 can be found in Annex 3.

- The Validation Study task force will be coordinated by ToR a (workplan and deliverables) at the 2022 WGBIOP meeting,
- Organize an Exchange and Workshop planning meeting in March 2022 to correspond to the publication of the Benchmark list.
- There are a number of exchanges ongoing or pending analyses and WGBIOP will check on progress and encourage publishing the reports as soon as finished.
- For 2022, seven age calibration exchanges and one maturity staging exchange exercises are planned, see Annex 3 for details.
- There is one workshop planned for 2022 and one for the 2023 see Annex 3.
- Update and restructure the Data Quality Assurance Repository with ICES and WGQUALITY.
- Prepare a work plan for adding outcomes of workshops/exchanges and linking these to SID and/or SmartDots.
- Prepare a work plan for a calendar of planned workshops/exchanges in SmartDots to be provided to WGSMART.
- Work with ICES SID developers to link workshop and validation study information to SID, and to make this information available to the wider ICES community.

2.3 Deliverables for 2022–2023

- Identify priority species and stocks for validation studies.
- Update the annual prioritized overview of planned studies, workshops and exchanges.
- Update and restructure of Data Quality Assurance Repository with WGQUALITY.
- Adding outcomes of, and links to workshops/exchanges to SID and/or SmartDots.
- Prepare a calendar of planned workshops/exchanges in SmartDots to be provided to WGSMART.

2.4 ToR b. Improve training and quality assurance of age reading and maturity staging, and other biological parameters

During the period 2021–2023, the goal of ToR b will be to improve training and quality assurance of age reading and maturity staging, and other biological parameters.

It is important that the biological parameters used in stock assessment are of the highest quality. Concerning this, WGBIOP will gather all the information on quality assurance and accuracy estimates of biological parameter used in order to evaluate if improvements can be achieved.

From the previous WGBIOP exercises, the guidelines for international calibrations on age reading and maturity staging are available from the Data quality assurance repository (ices.dk) but methods, routines, and protocols for monitoring the quality of age and maturity on a national level need to be standardized. Besides, targets of PA and CV by stock or species group for validation and accuracy of delivered biological data that are input data for assessments need to be set.

2.4.1 Progress during WGBIOP 2021

2.4.1.1 Review the current national procedures for quality assurance (with ToR c)

Quality assurances tables for both age reading (Annex 5, table 3) and maturity staging (Annex 5, table 4) were updated. A new column was added to the table asking for the implementation of age quality scores (AQ1, AQ2, AQ3) (https://vocab.ices.dk/?ref=1395) in national laboratories for routine age reading. It was also asked that information about the handling of AQ2 and AQ3 readings. In the case of maturity staging, as there is not a standardized maturity scores vocabulary, it was requested that information on any grading systems to evaluate maturity certainty used in national laboratories and how it is implemented be shared.

The QA files have been sent to national age and maturity coordinators for distribution to laboratories. The feedback from the laboratories will be used to develop the guidelines on quality assurance procedures through WGBIOP 2021–2023 period. They will also be used by ToR a and ToR c for selecting future validations studies.

2.4.1.2 Outline best practice guidelines in cooperation with the RCG

The Regional Data Base and Estimation System (RDBES) already allows quality assurance data to be input for the age biological variable as provided for in the ICES vocabulary (https://vocab.ices.dk/?ref=1395).

2.4.1.3 Prepare guidelines for the standardization and implementation in cooperation with WGSMART and continue the monitoring of them (with ToR f)

The goal is to investigate the age reading methods (e.g. whole vs. sectioned otoliths, from the same fish or not) used within an exchange or workshop event to date and come up with a suggestion on which is the best statistical method, then interact with WGSMART to implement it in SmartDots.

During WGBIOP 2021, a revision work on the different preparation methods used in age exchanges was started. Available reports on these exchanges were collected and the information extracted was selected and collated into a table. This is work in progress and will continue next year. Particular progress was made with gathering information on the statistical analysis used in exchanges and this started to be comprehensively collected together with useful data (i.e. the species, the fish length range, date of birth, readers number involved and their experience), for a further development of the best practice guidelines in cooperation with WGSMART to be completed in the WGBIOP 2022–2023 period.

The same process for the development of guidelines for maturity has to be implemented.

2.4.1.4 Identify stocks specific targets for validations and accuracy of biological parameters achieved from exchanges and workshops (with ToR a and c)

It is required to define some threshold values for the validation and accuracy of biological parameters of a stock or group of species coming from WK/Ex results in order to consider them as acceptable or identify the need for improvement.

The work of this task is overlapping with tasks of other ToRs, i.e. tasks 2 and 3 in ToR a and ToR c respectively. Consequently the three ToRs together with ToR d met during WGBIOP 2021 to further define which tasks each ToR is responsible for. It was agreed that it is necessary to update the validation master table with the several statistical estimators that can be used in order to filter stock/species that need validation. This task was carried out by ToR d.

2.4.2 Workplan for 2022–2023

- To standardize all the different national QA procedures in use and decide the best practices in both age reading and maturity assignment.
- To get the list of all the different statistical analysis used to date in age reading method comparison exchanges.
- To compile the statistics of age reading and maturity staging WK/Ex results by stock or group of species.

2.4.3 Deliverables for 2022–2023

- Formalize guidelines to establish age reading and maturity staging QA procedures in national laboratories.
- Suggest any QA improvement detected to be implemented by the RCG.
- A sound statistical comparison on age reading methods implemented in SmartDots.
- Establish target value for high priority stocks.

2.5 ToR c. Evaluate the quality of biological parameters: Issues and review of quality of biological parameters used in assessments

2.5.1 Progress during WGBIOP 2021

The essence of this ToR is the link between WGBIOP and the stock assessment EGs. Annually the issue lists put forward for benchmark assessments are evaluated and, where necessary, action is undertaken by WGBIOP.

In 2021, ToR c prepared various deliverables:

- Compiled responses to the issue lists of stocks that are proposed for a benchmark assessment in 2022 (Annex 6; Table 5)
- Compiled information on each stock to be benchmarked detailing existing age/maturity exchanges/workshops (Annex 6; Table 5);

- E-mailed chairs of WGs dealing with stocks to be benchmarked to inform them about the WGBIOP responses to the issue lists, the results of previous age/maturity exchanges/workshops, and the planned exchanges and workshops.
- Reviewed the use of the Stock information database (SID) in delivering issues for upcoming benchmarks and provision of WGBIOP information to the assessment groups
- • Collated and summarized the responses from Stock Coordinators who filled in the Quality Indicator Table for their stocks (Annex 6; Table 7).

2.5.1.1 Biological parameters of stocks up for benchmark in 2022–2023

The issues put forward by the assessment WG's for the upcoming (2022 and some in 2023) benchmark stocks were collated mainly from SID and the issues were discussed. If no issue list was available, biological parameters issues were sought in the Stock Annex. Moreover, the subgroup scrutinized results from previous age and maturity calibration exercises for those stocks. Any necessary response from WGBIOP was recorded in a table (Annex 6; Table 5). Stocks using age or maturity in the assessment, for which age/maturity haven't been recently calibrated, were put as candidates for an age/maturity exchange. This information was shared with the ToR a subgroup dealing with new upcoming workshops and exchanges.

The goal was to inform the WG's chairs and stock coordinators about the outcome of the most recent age and maturity exchanges and workshops, and to detect gaps in the quality assurance of biological parameters. Thus the available information was communicated to stock coordinators via e-mail and also added as a comment to the Stock Rolling Issue Lists on SID. In most cases e-mails were sent to stock coordinators. Only if the SC e-mail address was not accessible (or not valid), chairs of the respective working group were asked to forward the information to their stock coordinators.

Responses from Stock Coordinators received as feedback on WGBIOP 2020 comments to issue lists were followed-up (Annex 6; Table 6).

2.5.1.2 Review of SID

ICES Stock Information Database (SID) holds annual information for all ICES stocks, and is currently under development. Rolling Issues List is one of its modules, which is designed to store all the known issues for each of the stocks in one place. This module is particularly important to ToR C, as it makes all issue lists easy to find and accessible. However, it still needs some improvement, as issue lists are available only for some stocks. Stock coordinators should be strongly encouraged to add issue lists for their stocks to that module. This is particularly important for stocks, which are going to be benchmarked.

Another useful feature of SID Rolling Issues List is the possibility to leave a comment addressed to a stock coordinator under each issue. WGBIOP started to use this function last year (in 2020). Comments were added under respective stocks in SID, as well as sent to the stock coordinator via e-mail. All responses to those comments were received by WGBIOP with an e-mail. There is no evidence that stock coordinators were reading the comments left in SID by WGBIOP, as none of the stock coordinators added their comment on SID. Therefore, a notification for stock coordinators once a comment is added to SID would be beneficial. If the system could send such notifications, e-mail communication with the stock coordinators could be replaced with communication via SID. The main advantage of this solution is that everyone using SID could follow the discussion.

WGBIOP would also benefit from a link to recent age and maturity exchange/workshops being added to SID under each stock. This was discussed with ToR A.

2.5.1.3 Quality Indicator Table

Concerning the task of evaluating the quality indicators of the biological parameters, the Quality Indicator Table questionnaire (41 questions concerning 237 stocks), covering the entire workflow from the data collection to the stock assessment model runs, has been made available on Google Drive. The link to this table has been sent out to chairs of most of ICES stock assessment Working Groups, who were asked to distribute it among the corresponding Stock Coordinators. During WGBIOP 2021 meeting it occurred that stocks assessed by two Working Groups (HAWG and AFWG) and two *Pandalus* stocks (NIPAG) were unintentionally omitted. The missing stocks have now been added. The updated table with a complete list of 264 ICES stocks (double checked with the list on SID) is going to be sent out once more before WGBIOP 2022 to all Working Groups' chairs in order to collect the information for the missing stocks.

In 2021 WGBIOP received responses for 73 out of 237 stocks enquired. All of them were summed up and a qualitative evaluation of biological parameters for available stocks was performed (for details see Annex 6; Table 7.

However, for some stocks, not all questions were answered, as the stock coordinators did not have a comprehensive knowledge of input data for their stocks. It was suggested that some of the questions should be addressed to national data submitters. Not all stocks coordinators who answered the questions were aware of calibration exercises carried out for their stocks.

Although only 31% of the stocks asked were answered, those answers given are useful to have a valuable first approach on the quality indicators of the biological parameters used in the stock assessment process. The answers obtained for the 41 questions (in number and %) and a brief summary, showing the most frequent answers are shown in Annex 6; Table 7.

2.3.1.4 Validation studies

Further work on a list of stocks in need of validation studies (initiated during WGBIOP 2020) was carried out together with ToR a and b. Because it was difficult to coordinate the work intersessionally, during WGBIOP 2021 meeting, it was decided that next year all validation tasks will be moved under one ToR. More details concerning validation can be found in chapters 2.1.1.1 and 2.1.1.2.

2.5.2 Workplan for 2022–2023

- Continue the work with the issue lists on an annual basis and consider the feedback from stock assessment EGs;
- Communication with stock coordinators of stocks up for benchmark in 2023–2024 regarding the results from the latest exchanges/workshops available for their stocks.
- Keep reviewing the use of Stock Information Database (SID).
- Create an overview of quality and accuracy estimates of biological parameters currently used in assessments. A reminder with the Quality Indicator Table is going to be sent out to Working Group chairs in order to collect the information for the missing stocks.

2.5.3 Deliverables for 2022–2023

- Annual review of the benchmark issue lists
- Responses from Stock Coordinators
- Further analysis of the responses from the Quality Indicator Table.

2.6 ToR d. Investigate and develop data availability, documentation and methods to improve identified biological parameter estimates, as input to assessment models

2.6.1 Progress during WGBIOP 2021

2.6.1.1 Implementing age error information in assessments

WKAMEMSA

Progress towards implementing age error information in assessments was the focus of the Workshop on use of Ageing and Maturity Staging Error Matrices in Stock Assessment (WKAMEMSA) held just before WGBIOP, on 27–29 September 2021, and chaired by WGBIOP members.

Model developers described how several modern stock assessment methods can model the effects of ageing errors. Therefore, stock assessors should consider models with ageing error as part of sensitivity analyses. The details of implementing ageing errors depends on the model, this is an established feature of stock synthesis (SS) and a recent feature in SAM (state space model). In SAM, ageing error can be fitted within the model or an external estimate of the ageing error matrix used. If error is estimated within-model, the model requires raw ageing data from exchange events as input. The development version of Gadget (v3) has a proposal for transformation functions to apply the effects of age and maturity errors. A review found more evidence available on the effects of ageing errors than maturity staging errors, and maturity staging is not directly included as a process in SS and SAM.

We emphasize the importance of stock assessors and co-ordinators of ageing and maturity staging events collaborating to design age reading events as stock-specific regions and larger sample sizes may be needed to create appropriate inputs to models.

The WKAMEMSA report will propose a list of potential case studies based on the assessment model used and ageing information available, the WGBIOP table of ageing events has been used during WKAMEMSA as a source of this information.

EASME call text

To facilitate the implementation of age error information in assessments, after WGBIOP 2020 the group created project call text for a Tender project under the EC EASME framework. The objectives of the proposed project are:

1. Support the development of stock assessment models SAM to be able to incorporate age error information
2. Compile data from historic calibration exchanges
3. Adaptation of SmartDots
4. Workshops to discuss best practice procedures, test beta versions and train end-users

This project call text was presented to DG Mare in late 2020, too late to be included in the work program for 2021. The group is continuing to promote the inclusion of the project in the next work program through various channels and is monitoring relevant call advertisement sites.

2.6.1.2 Roadmap for WGBIOP to work with FishBase

As the result of a gap analysis highlighting missing information, contact has been made with the hosts of FishBase.org in the Philippines, and the potential for collaboration with this Group in order to keep stock information updated was discussed and agreed. The intention is to, where possible, identify colleagues from WGBIOP to take responsibility for updating information by region e.g. Baltic Sea, North Sea, North Atlantic and Eastern Arctic, Bay of Biscay, Mediterranean and Black Sea. The responsible person once identified will be tasked with collecting peer-review literature and data from other relevant sources to update information stored on FishBase.org and fill gaps on biological parameters, for example maturity, fecundity, L50, max Lt, VBL growth parameters, and maximum age. They may need to translate or highlight key information. The responsible person would also be tasked with acting as a bridge between FishBase.org and scientists providing a route for questions and clarifications to flow in both directions. FishBase.org already harvests biological data from ICES Databases. This is done using WORMS (http://marinespecies.org/) or ICES OBIS service (e.g. https://data.ices.dk/obisdata/getOBISDATA/0/1000/3) and is based on the biological presence of records.

2.6.1.3 Overview of quality assurance for stomach sampling

WGBIOP discussed progress in the coordinated collection of stomach samples to provide predator–prey relationship data. We understand that a North Sea case study is being planned, with data collection on the North Sea International Bottom Trawl Surveys (NS IBTS). A rolling sampling scheme for this work is being defined through the Regional Coordination Group for North Atlantic, North Sea and Eastern Arctic's (RCG NANSEA) intersessional study group (ISSG) on stomach sampling (https://www.fisheries-rcg.eu/rcg-nansea/#structure). The next meeting date of this ISSG is to be decided as part of the annual cycle for RCGs.

WGBIOP previously proposed the ICES Workshop on Operational Implementation of Stomach Sampling (WKOISS). This had been postponed because of travel restrictions and unavailability of suitable chairs. The need for WKOISS was discussed in view of the work now progressing on the North Sea case study. WKOISS was still considered important, particularly for the Mediterranean and Black Sea regions. For these regions, the STREAM2 project is now running (STREAM = STrengthening REgional cooperation in the Area of fisheries biological data collection in the Mediterranean and Black Sea, MARE/2016/22), which includes a specific task on stomach sampling. WKOISS will provide a common forum, rather than also running the previously discussed Workshop on Stomach Contents 2 (WKSTCON2). Therefore, a useful focus of WKOISS will be reviewing and agreeing data storage and index calculation protocols.

2.6.1.4 Assessment information sheets for ageing events

As referred previously in the group, the collaboration between stock assessors/coordinators and the chairs of ageing/maturity staging events is mutually beneficial, and ought to be promoted. On one side, the issues related to sampling problems and/or uncertainty in the biological data are commonly evaluated and discussed, and recommendations are made, during the calibration exchanges and workshops. Ideally, the events outcomes should subsequently be made available to the stock assessors/coordinators and/or assessment expert working groups. On the other side, the coordinators of calibration events may not be aware of which data (and their format) are required and/or are used in the assessment models or how much effect the uncertainty of the age and maturity data can have in the models fitting and forecasts. Moreover, the acknowledge of these assessment specific information can be a valuable input to assist the events coordinators designing and organizing the samples to be included in the workshops/events (number of samples, period of sampling, fish size/age range, sexes separated or not, etc). A "maturity information sheet" had been proposed by WGBIOP in 2019 (ICES, 2019). During the meeting, the group discussed the possibility of a "species stock assessment information sheet" being elaborated, providing basic information from stock assessment for ageing event coordinators.

The proposed ageing events planned for 2022 can be seen in Annex 3.

The Baltic sprat stock was considered as an example to produce such "SPECIES STOCK ASSESSMENT Information sheet" (see below). To compile this information, the following documents/links were consulted: i) ICES Stock Information Database (SID) (https://sid.ices.dk/Default.aspx), ii) the corresponding assessment WG reports and stock annex (SA) (cf. links in the sheet below). Difficulties were felt, however, in obtaining information about the current stock coordinator and assessor, and some of the information listed in the table, which could not be found in the aforementioned sources; the former was obtained by e-mail with the help of colleagues members of the WGBIOP and could also possibly be provided contacting the ICES Secretariat staff; the missing information was subsequently completed with the aid of the stock assessor/coordinator, both contacted by e-mail for this purpose. It was not fully established during the meeting whom will be responsible for elaborating/updating these sheets to be shared with the ageing events coordinators, this question being important to bring to the table during the next meeting.

Example:

SPECIES STOCK ASSESSMENT Information sheet	
Species Common Name	Sprat
Species Scientific Name	*Sprattus sprattus*
Stock Key Description	Sprat (*Sprattus sprattus*) in subdivisions 22–32 (Baltic Sea)
Ecoregion(s)	Baltic Sea Ecoregion
Stock Key Label	spr.27.22-32
Assessment Expert Group	Baltic Fisheries Assessment Working Group (WGBFAS)
Stock coordinator (2021)	Olavi Kaljuste (Sweden)
Stock assessor (2021)	Jan Horbowy (Poland)
ICES Stock category	1
Assessment model	Age-based analytical assessment, XSA (ICES 2021) that uses catches in the model and in the forecast
Last assessment	2021 (ICES Advice sheet)
Last benchmark assessment	Benchmark WKBALT 2013 (ICES 2013); Interbenchmark in March 2020 (ICES 2020)
Can the assessment model accept AEMs?	??; present assessment does not incorporate AEMs
Age (+) group?	8 years-old
Origin of age data for ALK:	
Catches/survey samples	Catches, per quarter and subdivision Surveys: Baltic International Acoustic Survey (BIAS) in autumn in 1991–2020, International Baltic Acoustic Spring Survey (BASS) in May in 2001–2020
Period of sampling	Per quarter

SPECIES STOCK ASSESSMENT Information sheet	
Countries providing age data	Denmark, Estonia Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden
ALK included in the model (fixed, annual, multiannual) (include reference)	ALKs are produced every year, generally per quarter, as quarter age distribution is needed for multispecies assessment (now with SMS)

2.6.1.5 Links to WKBIOPTIM

WGBIOP briefly considered the report of Workshop on Optimization of Biological Sampling (WKBIOPTIM 3)(ICES, 2019b). Although the names of these groups are similar they have distinct areas of work and complementary skill sets. WKBIOPTIM's focus is on sampling levels for biological parameters, and WGBIOP's on the quality of the processes producing biological parameters. WKBIOPTIM is developing and testing R tools for exploring and optimizing fisheries sampling for biological parameters. Section 4.1 of the WKBIOPTIM3 report is a useful summary of which parameters each tool addresses (from the list of mean length, length distribution, mean age at length, age distribution, sex ratio, and maturity-at-age), how stratification and concurrent sampling are included, the input data and outputs produced. The majority of methods use simulation, they subsample from the observed data to assess if parameter estimates or their precision would have been very different with less sampling.

No recommendations to WKBIOPTIM were proposed by WGBIOP. Questions raised at WGBIOP on the effects of ageing error and the number of samples required for ageing and maturity staging events could be areas for future development though. As WKBIOPTIM4 will take place after WGBIOP (15–19 November 2021, ICES resolution 2019/2/EOSG13), WGBIOP proposed inviting the chairs of WKBIOPTIM4 to present a summary of the latest progress at the next WGBIOP meeting to disseminate the work.

2.7 Workplan for 2022–2023

For the following workplan and deliverables we note that work under several of WGBIOP's ToRs can converge and overlap. Therefore, the tasks, workplan and deliverables will be reviewed intersessionally.

- SmartDots reporting: SmartDots is providing a key resource for exchange events, however currently only very few people are familiar with the code used to run the analyses and provide output reports of SmartDots events. This leaves the system somewhat vulnerable. To ameliorate this, a group of people from ToRs d and f, together with ICES representatives will collaborate to scrutinize and streamline the coding where possible/necessary.
- Implementing age error information in assessments: WGBIOP will provide information that it holds about age reading exchanges, to any case studies proposed by WKAMEMSA. WGBIOP will also support and monitor the EASME call text proposal on this topic.
- Roadmap for WGBIOP to work with FishBase.org: WGBIOP will trial collecting peer-review literature and data from other relevant sources to update information stored on FishBase.org and fill gaps on biological parameters. WGBIOP members have volunteered to act as contacts with FishBase for the Baltic Sea and Mediterranean Sea, so additional volunteers are required for other regions.
- Overview of quality assurance for stomach sampling: Cristina Follesa and Pierluigi Carbonara of WGBIOP will contact the chairs of the ISSG on stomach sampling, Matthias Bernreuther and Pierre Cresson (copying in secretariat@fisheries-rcg.eu) regarding

WKOISS. The aim is to resolve if suitable chairs, date and location can be found for the workshop. Also related to the overview of QA for stomach sampling, ToR d will follow the progress of the FishPi2 follow-up project proposal, and update WGBIOP on it.
- WGBIOP will share the example information sheet for ageing events on Baltic sprat with the event co-ordinator, review the usefulness of this information and the best way to compile this for the other events scheduled.
- WGBIOP will consider the outputs of WKBIOPTIM4 and any implications and recommendations for WGBIOP. We will invite the chairs of WKBIOPTIM4 to present the group's work to the next WGBIOP meeting.

2.8 Deliverables for 2022–2023

WGBIOP ToR d) will continue to investigate and develop data availability, documentation and methods to improve identified biological parameter estimates, as input to assessment models.

First, WGBIOP will seek a full list of stock co-ordinators and stock assessors for the next meeting, as the deliverables across several WGBIOP ToRs involve cooperation with stock coordinators and stock assessors.

Specific deliverables may be updated intersessionally depending on the review of ToRs and tasks, but proposed outputs are:

- Scrutiny and streamlining, where possible, of SmartDots reporting code.
- Updates on progress towards implementing age error information in assessments.
- Trial of collecting and providing information on biological parameters to FishBase.org
- Example information sheet for ageing events provided for Baltic sprat.
- Continued overview of quality assurance for stomach sampling, in particular resolving if and how WKOISS will take place.

2.9 ToR e. Across database developments combining biological parameter data collection and quality assurance of these data. Address requests for technical and statistical recommendations/advice related to biological parameters and indicators

2.9.1 Progress during WGBIOP 2021

During the meeting it was discussed with the chairs how to deal with the recommendations that were sent to WGBIOP. As the chairs get the information from EG's that send recommendations to WGBIOP, it was agreed that it will be easier for the chairs to deal with the requests rather than the ToR E subgroup going forward.

Details of recent or recommendations received and responses agreed can be seen in annex 6.

During 2021 a first draft was prepared of a table showing which biological parameters and quality indicators are collected in which database and platform. Some issues arose while working on this:

- In 2019 WGBIOP had contact with the Stock Information Database (SID) developer at ICES and recommended to add biological parameter information to SID (see chapter 2.5.1 WGBIOP 2019 report) For the overview it is necessary to have these parameters added to SID.

- At the moment the RDBES is still under development and catch data for assessments is still retrieved from the Intercatch database. For the time-being it is assumed that the same biological parameters will be stored in RDBES as are currently in Intercatch.

2.9.2 Workplan for 2022–2023

- Contact RCG's to get information on the status of Intercatch and development of RDBES, including when RDBES will be in use.
- Provide overview where biological parameters data and quality indicators from SmartDots and RDBES(Intercatch)/TAF/DATRAS/SID can be combined.
- Overview of which institute provides which data in the various databases.
- Provide overview of data and outputs from SmartDots and RDBES(Intercatch)/TAF/DATRAS/SID to WGQUALITY, DIG, DSTSG and RCGs and cooperate with these groups to prepare a workplan to implement connection possibilities between these databases and platforms.
- Inform stock coordinators and assessors of the available biological parameter data, quality indicators and outputs from the various databases and platforms and where they link.

2.9.3 Deliverables for 2022–2023

- Diagram of where biological parameters data, quality indictors and outputs from SmartDots and RDBES(Intercatch)/TAF/DATRAS/SID can be linked.
- Develop workplan with WGQUALITY, DIG, DSTSG and RCGs to implement connection possibilities between SmartDots and RDBES(Intercatch)/TAF/DATRAS/SID were necessary.

2.10 ToR f. Provide feedback and guidance on updating and development of tools for exchanges and workshops on biological parameters

Under this ToR WGBIOP is focusing on the development of the SmartDots platform http://ices.dk/data/tools/Pages/smartdots.aspx to make it suitable for both age reading, maturity staging, egg and larvae identification and fecundity exchanges and workshops. In cooperation with the Working Group on SmartDots Governance (WGSMART) feedback from the users (mostly members of WGBIOP) are received, reviewed and prioritized to continuously improve and develop the platform. Funding opportunities for development of SmartDots and the development of the reporting module was also part of our focus.

2.10.1 Progress during WGBIOP 2021

During WGBIOP 2021 the subgroup has focused on:

- Compiling comments and feedback from WGBIOP exchanges and workshops and list requirements for the coming years.
- Providing feedback for WGSMART.
- A new release of SmartDots came in March 2021 and was presented at WGBIOP 2021.
- Evaluation of the tutorial videos on the SmartDots YouTube channel
- Running a live tutorial for event coordinators at WGBIOP 2021

- Modal age calculation and SmartDots reporting. Delivery of feedback on the multistage approach to WGSMART and cooperation with WGSMART on the implementation of the R-script.
- Funding request to support development of maturity, egg and larval modules in the web application of SmartDots.

2.10.1.1 Compile comments and feedback from WGBIOP workshop and exchanges and provide feedback for WGSMART

For the period September 2020 – September 2021 23 age reading events, 3 larvae events and 1 maturity event took place in SmartDots (see https://smartdots.ices.dk/ViewListEvents) with 6 published.

A request was sent out to coordinators of exchanges and workshops since the last WGBIOP asking for feedback on the use of SmartDots by the users and for workshop purposes. Issues reported to WGSMART through the feedback website (https://smartdots.ices.dk/Userfeedback) were included in WGSMART GitHub (https://github.com/ices-eg/SmartDots/issues), for evaluation by WGSMART. The input was categorized into general feedback, where coordinator and users participating in the exchange prior to WKAMDEEP3 addressed issues specific to long-lived species. Feedback from both the co-ordinator and participants of the WKIDCLUP2 (The ICES Workshop 2 on the Identification of Clupeid Larvae) were also received and included in the WGSMART GitHub.

General feedback

It was commented that for several species, image quality is crucial. All parts of the otoliths need to be clear. For long lived species (exchange prior to WKARDEEP3) the resolution was often not good enough and including several images caused other problems. Uploading high resolution images takes time, and it would be time efficient if the event manager could start adding reading lines before all images are uploaded. There was also a wish to be able to download preliminary results before a workshop/exchange is completed. Because of the difficulties reading the age of some long-lived species from images, there was a desire to have a sheet for ageing results when using a combination of a stereomicroscope with the image.

Other general issues were to a large extent caused by readers not being aware of the functions already existing and event coordinators not providing information to the readers before the exchange or workshop (or the reader not reading the information). It is evident that clear and event-specific instructions to participants are needed, for example; regarding what should be annotated (should non-counting marks be used and how), why a reading line is included, etc. In connection to the communication, it was requested to provide an interface in languages other than English.

Feedback from WKIDCLUP2 (Workshop 2 on the Identification of Clupeid Larvae)

WKIDCLUP took place online due to Covid-19, and a SmartDots module was developed in order to see this workshop through. All participants were pleased with the application and based on their feedback, SmartDots was further developed and adapted for larvae identification events.

Apart from the mandatory naming of the species in the annotation window, all participants were able to measure different features, such as total and standard lengths of the larvae, as well as counting myotomes. The annotations, in particular those for counting myotomes, were subsequently used for identifying sources of identification errors. Particularly after the first round, inspection of the downloaded myotome counts by species helped to analyse these counts as the major source of error in discriminating between sprat and sardine.

The feedback from the participants was generally good, but the module does not have all the features available in the software-based age reading module. Several participants were missing relevant features, such as being able to remove and easily reorder annotations plus the ability to measure with precision. Developmental suggestions included an automated calculation of the relationship between head length and body length plus the addition of a quality assurance score. Technical issues were quickly solved by ICES during the workshop.

Feedback on SmartDots maturity module

The first SmartDots maturity exchange was successfully run in the SmartDots Web application in 2020 (Event no. 282) generating results to develop a code to handle data, calculate statistics and producing a standardized SmartDots report template for maturity workshops and exchanges.

Two approaches were used in the analysis of data; the standard traditional approach used in age reading analysis and a multistage approach. The former posed some challenges compared with age reading exchange reporting in that histological samples verifying sex and maturity of individual fish may be available in the output dataset thus making the calculation of the modal maturity non-essential. The latter approach requires a weighting of the stagers based on their experience, and deciding on which approach is the more useful for future reporting requires several more maturity exchanges before any conclusive answer can be given. Maturity calibration exercises to further test these approaches will take place in November 2021 and spring 2022 using elasmobranch spp. and North Sea sole respectively, as case studies. The maturity reporting module is to be integrated into the SmartDots platform in 2022.

Feedback from the first maturity exchange has been placed on the SmartDots GitHub site (https://github.com/ices-eg/SmartDots/issues). One of the general observations from the exchange was poor image quality. In the past, images of fresh gonads across institutes have generally only been taken for workshop calibration exercises on few species and therefore particular effort is needed to improve image quality for future maturity events on SmartDots.

To better identify macroscopic stages in an exchange the maturity sampling guidelines have been updated (http://ices.dk/community/Pages/PGCCDBS-doc-repository.aspx). Two SmartDots maturity manuals have been developed for readers and coordinators, respectively (https://www.ices.dk/publications/library/Pages/default.aspx?#k=Title%3Asmartdots%2C%20owstaxIdPublicationType%3AUser%20handbooks) as well as a tutorial video on maturity on the SmartDots You Tube channel (https://www.youtube.com/channel/UCa4bjXo-eBDfW0cm1oElWeQ).

2.10.1.2 Annual presentation of the new SmartDots release

A new SmartDots software version (v2.3) was released in March of 2021. This new version had one new functionality: an extra setting 'RequireAQForApproval' was integrated into the SmartDots software. If this setting is set to 'true', annotations can only be approved if an AQ-code is assigned to them. This setting can be defined through the Web API, the setting is 'false' by default. More info at: https://github.com/ices-eg/SmartDots/issues/170

The SmartDots web application has been further expanded for the management of the maturity, egg, larvae and fecundity events. The management of the reader expertise data has been extended for maturity readers.

2.10.1.3 Evaluation of the tutorial videos on the SmartDots YouTube channel

In 2020, 16 tutorial/training videos were created an added to the SmartDots YouTube channel (https://www.youtube.com/channel/UCa4bjXo-eBDfW0cm1oElWeQ). There are 11 videos about the SmartDots software, 3 videos about the SmartDots web application and 1 video about maturity staging.

The SmartDots channel is definitely not the most popular YouTube channel but the target group is of course very specific. During the last 365 days we had in total 506 views, for a total watch time of almost 9 hours. It certainly makes sense that "Download SmartDots application from the website" and "SmartDots Software Setup" are the most popular videos.

2.10.1.4 Running a live tutorial for event coordinators at WGBIOP 2021

Following WGBIOP 2020 a request was made to WGSMART to provide further training for event coordinators in the form of a workshop or online training events. After an evaluation of the request and looking into the various approaches that could be taken in consideration of both COVID-19 and practicalities, WGSMART decided that online tutorials were the best approach and that these tutorials could be made available on the SmartDots YouTube channel. Many age and maturity stager national coordinators attend WGBIOP and thus a tutorial session was planned for the WGBIOP 2021 online meeting, where all national coordinators (including non WGBIOP members) were invited to attend. The tutorial covered 3 themes; set up an event, report on an event and an explanation of the report. Steps outlined included; how to download the handbook, propose an event, complete and verify the sample upload file, upload samples and images, add readers, set image scale, defining what properties should be shown in the software, defining strata and readers for the report, report extraction and how to publish an event. The report content and relevant statistics were explained in detail. The tutorial was recorded via Microsoft Teams, will be edited to ensure all GDPR regulations are followed and will be posted on the SmartDots YouTube channel. A link will be sent to all age and maturity stager national coordinators listed in the SmartDots database and feedback will be requested via the feedback website.

2.10.1.5 Modal age calculation and SmartDots reporting. Delivery of feedback on the multistage approach to WGSMART and cooperation with WGSMART in the implementation on the R-script

During the WGBIOP meeting in 2019 a solution to the problem of multiple modal ages was proposed. This approach is called multistage approach for the definition of the modal age, and follows a three steps process, where the expertise of the age readers is used for those otoliths for which, when using the standard approach to define the modal age, multiple modes are identified. The implementation of this approach required 1) the definition of a protocol to rank the readers by their experience, and 2) introducing the necessary changes in the SmartDots reporting R code. The first task was accomplished via a series of meetings with event coordinator experts in ageing otoliths and maturity staging, where a set of variables to inform on the reader´s experience were identified based on a trade-off between the information contained on those variables and the difficulty to collect that information for each reader participating in the exchange event. An excel table with the algorithms to combine the values of those variables and assign an experience rank number to each reader was created. The second task was accomplished by modifying different R files necessary to produce the reports of the exchange event, while maintaining the TAF format. This resulted in the capacity of producing reports without multiple modes cases. In addition, the new reporting code was modified to correct some errors in the calculation of the CV, allowing a more detailed analysis of results by strata and comparisons and several other corrections and modifications. The new R code has not yet been updated in the ices-taf/SmartDotsReport_template GitHub repository since it was agreed that this code would go through a testing period. During this period the code has been tested with a number of exchange events, and multiple small corrections have been implemented.

2.10.1.6 Funding WGSMART

The SmartDots software supports the age reading module which facilitates age reading based on otolith images. The software allows the age readers to participate in ICES age reading workshops and exchanges by annotating a set of otolith images within an event, annotations and final age estimations can be compared to other readers in other laboratories, either remotely or in a workshop setting. The web application allows the workshop or exchange manager to manage all users and meta data related to the SmartDots events.

In 2019, a web application module for maturity staging was initiated and test events were organized for three stocks. In 2020, a larvae identification module was developed, also in the web application. In 2021, the development of an egg identification module was initiated, also in the web application. Major short-comings exist by these three modules not being available in the software and will continue to lead to a waste of valuable resources, will slow down development progress and detract from the user friendliness of the tool.

WGSMART are in the process of establishing contact with EU (DGMARE) and selected Member Countries outside EU (Norway, Iceland, UK) to get support for development of:

- Software module for maturity.
- Software module for egg identification.
- Software module for larvae identification.
- Offline version of SmartDots.
- Training sessions for users.

2.10.2 Workplan for 2022–2023

- Compile comments and feedback from WGBIOP exchanges and workshops and list requirements for the coming years.
- Provide feedback for WGSMART.
- Delivery of feedback on the multimodal age approach to WGSMART.
- Development of the SmartDots reporting module in cooperation with Tor D and implementation of the R-script in cooperation with WGSMART.
- Based on an evaluation of the tutorial videos on the SmartDots YouTube channel a live tutorial for maturity event coordinators at WGBIOP 2022 will be considered.
- The support required for development of software-based maturity and ichthyoplankton modules depends on the success of the current funding request. Tasks to be planned accordingly.

2.10.3 Deliverables for 2022–2023

- List of requirements for the coming year will be evaluated and provided to WGSMART.
- An annual presentation of the new SmartDots release.
- Delivery of feedback on the reporting module to WGSMART.
- Evaluation of the tutorial videos on the SmartDots YouTube channel. Based on this evaluation, future training requirements to be proposed.

2.11 Other achievements

2.11.1 ICES library

A brief live demonstration of the 'collections' planned for the new ICES library was given by ICES. The particular relevance of this development to WGBIOP is described in more detail above in paragraph 2.1.1.3. When the new library is ready for launch further information will be made available and colleagues will be invited to join more in-depth presentations and demonstrations of its full functionality.

2.11.2 Update from RCGs

In 2020/21 the RCGs supported development of the new EU-MAP and Work Plans (incl. templates) 2022pp. (incl. FISHN'CO project).

'Other data collection activities' have been inserted into the template for the new work plans, to make sure these activities are captured if they are not covered by ICES.

RCG Intersessional Subgroups (ISSGs) are productive and generating output for example

- Support of ICES work (e.g. WGBFAS).
- Draft Regional Work Plans (e.g. Regional Sampling Plan for small pelagics in the Baltic).

Collaboration between RCGs and end-user (ICES) was very productive, there was also direct contact between the ISSG chair and the ICES WGs.

RCGs support the development of SmartDots however for funding this will need to go through DGMARE.

With regard to stomach sampling – ISSG support a case study which will begin on the North Sea IBTS survey

An RCG secretariat is being formed and this and the website (SECWEB project) have showed added value. The secretariat will be a more structured way of getting participants, with clear questions and requirements and the ability to allocate relevant experts.

RBD catch, effort and sampling overviews are displaying and analysing national fisheries census data and offer valuable information for ICES WGs and the ICES annual fisheries overview. The overviews have been updated and adjusted according to the feedback of RCGs and end-users. Work has been reviewed by SCRDB. Three separate overviews produced for Baltic, NANSEA, they are Multiannual overviews: HTML format, R script for automatic generation of the overviews prepared.

2.11.3 CRR Handbook on maturity staging of marine species

During the WGBIOP 2021 the latest overview of the CRR: Handbook on maturity staging of marine species was presented by the editors. The re-submission of the new resolutions for the CRR as well as the drafting of the different chapters were delayed due to the COVID-19 situation. Therefore, it was decided to focus mainly on those species that are assessed within ICES and/or FAO GFCM framework.

A plan for 2021–2022 was presented in order to finalize and submit the CRR by the end of 2022 as follows:

- 30th November 2021: First draft from chapter leaders to editors
- Editors submit resolution to SCICOM

- Editors compile and review species covered
- 31st Mar 2022: Editors return comments to co-authors
- 30th June 2022: Co-authors submit revisions
- Further discussions between editors, chapter leaders and authors
- October 2022: Final full draft
- Present final full draft for WGBIOP comments
- November 2022: Address WGBIOP comments and final submission to ICES

2.11.4 Scientific presentation

A scientific presentation about innovative techniques, using Fourier transform near infrared spectroscopy (FT-NIRS) to age fish, was given by Thomas Helser (NOAA). The presentation included background information about the technology and how it works and also examples of applications. It was appreciated by the attendees of the meeting and it raised a lot of questions and discussion. This type of technology has the potential to have a big effect on age estimation in future although it is currently under development. It is important that WGBIOP keeps up to date with progress in this field and contributes where possible by lending skills and experience to ensure that any data used to train the software is as accurate and representative as possible. We will have an important role in further development of new methods with machine learning and artificial intelligence.

2.11.5 New modules in SmartDots

WGSMART has received a request to accommodate three new types of events: Eggs identification, larvae identification, fecundity and atresia identification. The new modules were presented during WGBIOP 2021. Three larvae events have already been run in SmartDots and it has worked well during WKIDCLUP2 The egg identification module has been used during WKMACHIS. Both these modules are planned to move into the software, once the funds are available. The fecundity and atresia identification modules are still under development but will be ready for use during the WKEPM2.

2.11.6 Cooperation with other working groups

There has been a meeting between the chairs of WGBIOP, WGSMART and WGALES to discuss future collaboration. This collaboration may lead to some members of WGALES joining WGBIOP to increase the number of members working with ichthyoplankton with the aim of strengthening our knowledge in this field to be able to improve the quality assurance. Members from WGALES will be invited to WGBIOP 2022 to present their work and the work of WGBIOP will be presented at WGALES 2022.

3 Next WGBIOP meeting

The next full WGBIOP meeting will be held in the w/c October 3rd 2022 in Gothenburg, Sweden. The intention is that this will be a hybrid meeting.

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Annex 1: List of participants

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Annex 2: Resolutions

2020/FT/DSTSG10 The **Working Group on Biological Parameters** (WGBIOP), chaired by Annelie Hilvarsson, Sweden, Maria Cristina Follesa, Italy, and Sally Songer, United Kingdom, will work on the ToRs and generate deliverables as listed in the tables below.

	Meeting dates	Venue	Reporting details	Comments (change in chair, etc.)
Year 2021	5–7 October	Online meeting	Interim report by 15 November to DSTSG	Was turned into online meetings divided over the year with intersessional work sessions and meeting by subgroups to complete the work for WGBIOP 2021.
Year 2022	3–7 October	Gothenburg, Sweden	Interim report by TBD to DSTSG	
Year 2023	To be determined	To be determined	Final report by TBD to DSTSG	

ToR descriptors

ToR	Description	Background	Science plan codes	Duration	Expected deliverables
a	Plan and prioritize validation studies, workshops, and exchange schemes on stock-related biological variables, and review the results.	Reviewing and prioritization of the many incoming suggestions for workshops and exchanges from EGs, WKs, and other ICES related groups (e.g. planned benchmarks). It is essential to streamline this work with the ICES benchmark schedule.	3.1 and 3.2	Generic	Annual prioritized overview of planned studies, workshops, and exchanges. Update and restructure the Data Quality Assurance Repository (with ICES and WGQUALITY). Work with SID (Stock Information Database) developers to include workshop and validation study information in SID, to make this information available to the wider ICES community.
b	Improve training and quality assurance of age reading and maturity staging, and other biological parameters.	Guidelines for international calibrations are available, but methods, routines, and protocols for monitoring the	3.1 and 3.2	Generic	Review the current national procedures for quality assurance.

ToR	Description	Background	[Science plan codes](#)	Duration	Expected deliverables
		quality of age and maturity on national levels needs to be standardized. International agreed to advice on targets (by stock) for accuracy of delivered biological data as input for assessments. If target is not met, validation should be prioritized.			Outline best practice guidelines in cooperation with the RCGs. Preparing guidelines for method standardization and implementation in cooperation with WGSMART. Continuous monitoring of the implemented standardized guidelines. Stock-specific targets for validation and accuracy of biological parameters achieved from exchanges and workshops. Liaise with WGALES on requirements for egg and larvae quality assurance.
c	Evaluate the quality of biological parameters: Issues and review of quality of biological parameters used in assessments.	It is essential that the time-series of biological parameters used in stock assessments are of the highest quality. Guidelines for quality assurance of biological parameters have been developed in WGBIOP's previous terms. WGBIOP will collate information on quality assurance and accuracy estimates of biological parameters used, to evaluate if improvements can be achieved.	3.1, 3.2, and 5.1	3 years	Evaluation of issues put forward by the assessment WGs for benchmark species in 2021–2023. Review use of SID in delivering issue lists for upcoming benchmarks and provision of WGBIOP information to the assessment groups. Interactive quality indicator form for biological parameters used in assessments. Evaluate quality and accuracy estimates of biological parameters currently used in assessments.
d	Investigate and develop data availability, documentation, and methods to improve identified biological parameter estimates as input to assessment models.	Life-history parameters are required by expert groups on assessment, multispecies modelling, ecosystem modelling, and data-limited stocks. Therefore, recent data from quality assured sources is essential.	3.1, 5.2, and 6.6	3 years	Document current sources of life-history parameter estimates identified by ICES/GFCM expert groups as critical components relevant to the improvement of

ToR	Description	Background	[Science plan codes]()	Duration	Expected deliverables
		WGBIOP provides guidelines for collecting high-quality data and provides links between data providers and end-users. There is a need to assess the availability and use of biological parameters, and to support incorporating age error matrices and other biological parameter quality information into assessments.			assessment for ICES/GFCM stocks. Identify where biological information can be updated, provide input for improving reference points. Overview of quality assurance for stomach sampling. Facilitate closer links between data providers and end-users. Liaise with WGQUALITY, benchmark groups, and developers on providing and implementing age error information in assessments.
e	Across database developments combining biological parameter data collection and quality assurance of these data. Address requests for technical and statistical recommendations/advice related to biological parameters and indicators.	WGBIOP regularly receives requests related to (quality of) biological parameters from EGs and other related groups. Filled templates for requests sent to WGBIOP before a specified deadline will be the basis for this ToR. Requests often deal with provision of information or data on the quality of biological parameters which are not easily accessible. To improve the accessibility of the data and the efficiency of the quality assurance processes, cross-database developments are essential. This will allow for combining data from different sources, facilitating the work of WGBIOP and also supporting the ICES quality management system	3.1, 3.2, and 3.3	Generic	Each received request for technical and statistical recommendations related to biological parameters and indicators will be addressed and included in the WGBIOP work plan where appropriate. Provide input for current and developing data storage and tools. Provide a flow diagram, combining outputs from SmartDots and RDBES/TAF/DATRAS to WGQUALITY, DIG and DSTSG. This will give an overview of countries/institutes collecting biological parameter data as input for quality assurance of biological parameters.
f	Provide feedback and guidance on updating	Based on feedback from users of these tools and	3.1 and 4.1	Generic	Annual updates and developments of tools will

ToR	Description	Background	[Science plan codes](#)	Duration	Expected deliverables
	and developing tools for exchanges and workshops on biological parameters.	end-users of results of workshops and exchanges, improvements and alterations will be suggested and evaluated.			be evaluated based on end-user needs. Annual overview of suggested improvements based on the needs of users will be provided to governance groups (e.g. WGSMART).

Summary of the work plan

Year 1	Investigation of data availability and quality of life-history parameters and providing links between data providers and end-users. Evaluating the quality of biological parameters used in assessments. Improving quality assurance of biological parameters provided for assessments and management processes. Providing feedback and guidance on the development of tools for calibration workshops of biological parameters. Scheduling of exchanges, workshops, and validation studies aligned with the benchmark cycle.
Year 2	Investigation of data availability and quality of life-history parameters and providing links between data providers and end-users. Evaluating the quality of biological parameters used in assessments. Improving quality assurance of biological parameters provided for assessments and management processes. Providing feedback and guidance on the development of tools for calibration workshops of biological parameters. Scheduling of exchanges, workshops, and validation studies aligned with the benchmark cycle.
Year 3	Reviewing the status of issues, achievements, and developments concerning biological parameters and quality assurance of life-history parameters provided for assessment and management processes. Reviewing tools and database developments for providing and accessing biological parameters information. Identify future needs in line with ICES objectives, the ICES Science Plan, and the wider marine environmental monitoring and management within Europe, and propose a future/alternative work plan improving quality assurance of biological parameters.

Supporting information

Priority	The main objective of WGBIOP is to support the development and quality assurance of regional and national provision of biological parameters as reliable input data to integrated ecosystem stock assessment and advice, while making the most efficient use of expert resources. As biological parameters are among the main input data for most stock assessments and mixed fishery modelling, these activities are considered to have very high priority.
Resource requirements	None.
Participants	All National Age Reader/Maturity Stager Coordinators (ICES and GFCM) will be invited. Experts relevant to the current benchmarks of the year of WGBIOP will be invited as well as relevant external experts such as statisticians or specific EG members.
Secretariat facilities	None.

Financial	No financial implications.
Linkages to advisory and science committees	WGBIOP supports ACOM and SCICOM by promoting improvements in the quality of biological parameters from fishery and survey data underpinning the integrated ecosystem assessment approach.
Linkages to other groups	WGBIOP links with the SCICOM/ACOM Steering Groups: Data Science and Technology Steering Group (DSTSG) and Ecosystem Observation Steering Group (EOSG), and the Working Group on the Governance of Quality Management of Data and Advice (WGQuality). It links to stock assessment EGs and benchmark assessment groups by providing input on the data quality. WGBIOP also has links to the Regional Database Steering Group (SCRDB). WGBIOP also has links with WGSMART for the development of SmartDots and WGALES for quality assurance of ichthyoplankton parameters.
Linkages to other organizations	Regional Coordination Groups (RCGs).

Annex 3: Exchanges and workshops (ToR a)

Exchanges completed in 2020–2021

Western Baltic Cod cod.27.22-24 (*Gadus morhua*) otolith exchange (SmartDots events: 292 and 294)

The 2020 Western Baltic cod (cod.27.22-24) exchange was held via the ICES SmartDots platform https://www.ices.dk/data/tools/Pages/smartdots.aspx (ID no.'s 292 and 294). Nine readers from Denmark, Germany and Sweden took part; reading otoliths from 186 fish collected from ICES SD's 22 and 23 on the 2017, 2018 and 2019 Danish BITS Q1 and Q4 surveys, aged 1 – 6 years. Otoliths were selected after WGBFAS 2020 identified mismatches in age–length compositions. From each fish, a photograph of a broken and sectioned otolith were provided for reader annotation as not all labs follow the same routine procedures for Western Baltic cod otolith preparation.

For broken otoliths, an overall weighted average percentage agreement of 84% was reached with a weighted average CV of 22% based on all seven readers, and an overall weighted average percentage agreement of 88% with a weighted average CV of 18% based on three advanced readers. For the sectioned otoliths, an overall weighted average percentage agreement of 83% was reached with a weighted average CV of 22% based on all seven readers, and an overall weighted average percentage agreement of 91% with a weighted average CV of 17% based on four advanced readers. In addition, a comparison of the modal ages for each fish and each method (broken vs. sectioned) was included and this resulted in agreement on 87% of the samples with a CV of 8.5%.

The age reading issues apparent are consistent with previous exchanges, namely the inclusion of a translucent zone at the edge in the later part of the year, leading to overestimation of age. In addition, the correct identification of the first TZ is problematic for some readers, mostly with the broken otoliths and inexperienced readers. For Western Baltic cod (age 0 to 3), recent age validation studies using tetracycline marked recaptures showed that the translucent zones are formed during summer, contrary to the assumption that TZ's are formed during winter (McQueen et al., 2019, Krumme et al., 2020, Plonus et al. 2021). This means that readers need to adjust their interpretations of the TZ's for this stock. An age reader guide (ages 0 to 3) with image examples was compiled in 2019 and readers are strongly advised to follow this when reading, especially for training purposes.

A comparison of the weighed modal age from the sectioned otoliths (determined by the advanced readers) to the original age estimations in DATRAS showed the discrepancies reflected the reader bias observed in this exchange. Close cooperation between age reading labs, stock assessor and coordinator in recent years has resulted in an overall improvement in the age data quality. Ages were corrected in DATRAS, thus improving the cod.27.22-24 stock assessment.

2021 NEA mackerel (Scomber scombrus) otolith exchange (SmartDots event: 280)

An otolith exchange on age reading of mackerel took place in the 1st half of 2021 with 37 readers from 13 laboratories (12 countries) coordinated by Charo Navarro (IEO Spain) and Jens Ulleweit (TI-SF Germany).

The exchange of otoliths took place online via SmartDots (Event 280). The overall result of the exchange shows an agreement between readers of 64.7% (34.3% CV), and for the advanced readers 67.8% (24.1% CV). Therefore, the percentage of agreement is slightly lower than in the previous workshop (2018) and exchange (2014). This is discussed in connection to the increased overall number of readers and especially with regards to the inclusions of 10 new (basic) readers.

The problem of previous WKs and Exs persists: Agreement for otoliths with modal age 6 and older remains quite low. The solution for this issue remains difficult. A new workshop which was already recommended by WKARMAC2 2018 and should be scheduled for late 2022/early 2023.

Megrim 8.c, 9.a exchange (SmartDots event: 277)

An otolith exchange (EX) from the Iberian Atlantic stock (Div. 8.c, 9.a) of megrim was performed for **the first time**. A total of 120 whole otoliths and images were analysed, representative of the whole range of specimens commercially captured. The "multistage modal age approach" was used, and the percentage of multiple mode cases was reduced from 14% (traditional approach) to 0% (multistage approach).

For **all readers**, the overall agreement (PA) was 68%, CV was 14%, APE was 9% and relative bias (RB) was -0.07. For the **readers involved in the assessment** of this stock, better results were obtained: overall PA of 82%, CV of 11%, APE of 6% and RB of -0.10. Strata semester was analysed showing better results for all readers in the first semester compared to the second one: PA (74% vs. 62%), CV (12% vs. 16%), RB (-0.02 vs. -0.12). As usual, the overall PA decreases with increasing age (from age 5) but the overall CV was stable with age (from age 3). RB increases from age 7 (ages with low samples and low landings). Three readers (basic-intermediate experience) showed higher RB and lower PA, mainly in ages ≥ 6.

No noticeable general concerns related to the age estimation in that stock were found, except the usual increasing difficulty of interpretation in older megrim due to increased otolith opacity. Similar or better results in present EX than in previous megrim EXs and WKs (almost all based on stock 7.b-k, 8.abd). A reference collection, training in older ages and continue calibration EXs for all readers are recommended. Considering the good results of the readers providing readings for stock assessment, no specific recommendation are suggested for them. Coordinator: Jorge Landa (Spain). The report is in preparation and will be uploaded to SmartDots when finished.

Baltic sprat (S*prattus sprattus balticus*) otolith exchange (SmartDots event: 323)

An otolith exchange on age reading of Baltic sprat was held during late 2020- early 2021. This was the first Baltic sprat exchange since 2004–2005 and the latest workshop was held in 2008. Eleven readers from eight countries participated. A total of 122 whole otoliths from three different subdivisions (SDs 25–27) in the Baltic Sea were used.

The average percent agreement (PA) for all readers was 59% with a coefficient of variance (CV) of 32% and average percentage error (APE) of 23%. When only including advanced readers in the analysis the results improved to a PA of 67% with a CV of 26% and an APE of 15%.

There were some differences between the different subdivisions with the highest agreement in SD 27, this was probably due to the quality of the photos rather than different difficulty between SDs. Because only transmitted light was used when taking photos it was a problem for some readers (who are used to reflected light) to read the age. The PA was similar to the PA from the exchange in 2004–2005. Compared to the results from the workshop in 2008 the PA decreased from 76% to 59%.

There is a plan to organize a new exchange in 2022. Photos of otoliths both with transmitted and reflected light will be used and photos of otoliths will be provided by almost all readers. The sampled area will be bigger, and otoliths will be from ICES SDs 24–29 (28.1 excluded).

Coordinators: Julita Gutkowska (Poland) and Annelie Hilvarsson (Sweden). The report is in preparation and will be uploaded to SmartDots when finished.

Workshops completed in 2020–—2021

WKARBLUE3 Blue Whiting Age Reading WK

The workshop on age reading of Blue whiting (WKARBLUE3) took place online from the 31st of May to the 4th of June 2021. The meeting was chaired by Patrícia Gonçalves (IPMA) and Jane A Godiksen (IMR) and included 23 readers from 10 institutes.

This workshop was proceeded by an otolith exchange, which was undertaken using SmartDots in the year prior to the workshop. Only images were used in the exchange. The exchanged otolith collection included 407 images. 17 advanced and 10 basic readers participated in the pre-workshop exchange. The overall agreement with modal age of the pre-workshop exercise was 66% for all readers and 70% for advanced readers. During the workshop, the results interpretation of the zones was discussed, and the guidelines evaluated and improved.

Blue whiting has a wide spatial distribution and growth structure varies between areas (north or south of the British Iles). The northern component of the stock has a slower growth than the more southern component. Readers of one component are prone to be off in interpreting the age of the other component compared to the readers normally reading this part of the stock. It was clear that future exchanges should be divided into the two different components, and readers shall only read otoliths of the component they are used to read.

The main issues during this workshop were identification of the position of the first annual growth ring, false/double rings and interpretation of the edge. These issues are the same as has been mentioned in previous reports, and thus a reoccurring problem among age readers. Reoccurring exchanges and workshops are important to ensure uniform interpretation of the growth zones.

Workshop on Age reading of Sea bass (Dicentrarchus labrax) 2 (WKARDL2)

The Workshop on Age reading of Sea bass (*Dicentrarchus labrax*) 2 (WKARDL2) focused on ageing criteria for this species after the first meeting in 2015 (WKARDL). Ten scientists from Cefas, ILVO and Ifremer institutes, participated in this workshop. The aim of the workshop was to collate information on existing ageing protocols and the used calcified pieces to better standardize the interpretation of annual growth rings and then the ageing of sea bass. The first step was to review information on sea bass age estimations, otolith exchanges, workshops and validation work done so far. For sea bass, the used calcified structures was not always the same; there are scale, whole otolith and stained section of otolith. During the last exchange in 2020 (100 images from Eastern English Channel; 27.7d), the results showed some differences between scales and sectioned and stained otolith. From the discussion around the interpreted images, the guidelines for scale and stained otolith interpretation and common issues were realized. After several discussion around the ageing criteria on both calcified structures, the new ageing exercise was achieved on 42 images using the SmartDots platform. For the scales, the average percentage agreement (PA) was 80% with an average Coefficient of Variation (CV) of 7%. For sectioned and stained otoliths, the average percentage agreement (PA) was 88% with an average Coefficient of Variation (CV) of 6%. The results of the workshop showed that stained otoliths give a better agreement between readers than scales but scales are much easier to sample than the otoliths for various reasons. Consequently, this group recommended that the ageing of sea bass in routine will be carried out from the scales and where possible, otoliths could be collected to help determine the age.

Ongoing Work in 2021 Q4

- The Second Workshop on Age Reading of North Sea Plaice (*Pleuronectes platessa*) (WKARP2) chaired by Ulrika Beier, the Netherlands and Julie Coad Davies, Denmark, will meet online, 6–10 December 2021.

- Horse Mackerel, Mediterranean Horse Mackerel and Blue Jack Mackerel (*T. Trachurus, T. mediterraneus* and *T. picturatus*) otolith exchange. Coordinators: Andrea Massaro (Italy) and Alba Jurado-Ruzafa (Spain). The events (ID 362, 387 and 388) are ongoing.
- Megrim (*Lepidorhombus whiffiagonis*) Areas 7.b-k, 8.a,b,d otolith exchange. Coordinator: Jorge Landa (Spain) The event (ID 355) started in 2021 and will be finished in 2022 and presented at WGBIOP 2022.
- Golden Redfish (*Sebastes norvegicus*), area 27.1–2 and 27.561214 otolith exchange.
- Coordinator: Lise Heggebakken (Norway). The event (ID 296) is ongoing, delayed due to COVID-19.
- Beaked Redfish (*Sebastes mentella*), area 21 and 27 otolith exchange. Coordinator: Lise
- Heggebakken (Norway). The event (ID 298) is ongoing, delayed due to COVID-19.
- Baltic Salmon (*Salmo salar*) scale exchange. Coordinator: Zuzanna Mirny and Adam Lejk
- (Poland). The event (ID 357) is ongoing.
- Deep water spp. otolith exchanges. Coordinator: Torfinn Erling Larsen and Lise Heggebakken (Norway). The events (ID 315-321) are ongoing but delayed.
- Raja spp Maturity staging exchange. Coordinators: Maria Cristina Follesa (Italy) and Karen Baekert (Belgium). This exchange will follow up on recommendations by WKMSEL. The event (ID 398) is ongoing.
- Red mullet and striped red mullet (*Mullus barbatus* and *Mullus surmuletus*) otolith exchange. Coordinator: Pierluigi Carbonara (Italy). The events will start during 2021 Q4.

Exchanges planned for 2022 onwards

- Chub Mackerel (*Scomber colias*) Otolith Exchange will take place in 2022. Coordinators: Carmen Hernández (Spain) and Andreia V. Silva (Portugal).
- Baltic Sprat (*Sprattus sprattus*) Otolith exchange from Baltic Sea (SD 24–29, 28.1 excluded) Coordinators: Julita Gutkowska (Poland) and Stefanie Haase (Germany).
- Central Baltic Herring (*Clupea harengus*) Otolith exchange from Central Baltic Sea (SD 25–29, 28.1 excluded) Coordinators: Julie Coad Davies (Denmark) and TBD.
- Cod (*Gadus morhua*) Otolith exchange from North Sea (Subarea 4), eastern English Channel (7d) and Skagerrak (3a.20) Coordinators: Valerio Visconti (UK) and TBD.
- Norwegian Spring-spawning Herring (*Clupea harengus*) Otolith exchange Coordinator: Florian Berg (Norway).
- Four spotted megrim (*Lepidorhombus boscii*) Otolith exchange Areas 7.b-k, 8.a,b,d Coordinator: Jorge Landa (Spain).
- Sole maturity staging exchange. Area North Sea. Coordinators: Karen Bekaert (Belgium) and Maria Krüger Johnson (Denmark). Postponed from 2021.
- Elasmobranch vertebrae exchange in Mediterranean and Atlantic. Coordinators: Karen Bekaert (Belgium) and Kelig Mahe (France). Postponed from 2021.
- Sole (*Solea solea*) otolith exchange, in subdivisions 20–24 (Skagerrak and Kattegat, western Baltic Sea). Coordinator: Julie Coad Davies (Denmark). The basis for this exchange is Danish EMFF project "Improvement of the biological advice for Common Sole in Danish Waters", to be expanded upon to include addition samples sol.27.20–24. This event has been postponed because of the benchmark being postponed and will take place once the benchmark year is decided.

Workshops planned for 2022 onwards

- Workshop on Age reading of Norwegian Spring-spawning Herring (*Clupea harengus*) (WKARNSSH) – Chaired by Florian Berg, Norway, will be established and will meet at the Institute of Marine Research, Bergen, Norway, 17–21 April 2023. A pre-workshop exchange needed.

Draft resolution for Workshop on Age reading of Norwegian Spring-spawning Herring (Clupea harengus) (WKARNSSH)

2022/ WKARNNSH/DSTSGXX The **Workshop on Age reading of Norwegian Spring Spawing Herring (*Clupea harengus*)** (WKARNSSH**),** chaired by Florian Berg, Norway, will be established and will meet at the Institute of Marine Research, Bergen, Norway, 17–21 April 2023.

a) Present and analyse issues described by WGWIDE;

b) Analyse the problematic structures (otoliths/scales) from the IESNS-surveys (May-surveys) described by WGWIDE;

c) Clarify the interpretation of annual growth rings using otoliths and scales from the same fish (Science Plan codes: 3.1, 3.2 and 5.2);

d) Improve the protocol of the guideline on age estimation and the applied structure (otolith or scale) (Science Plan codes: 3.1, 3.2 and 5.2);

e) Develop existing reference collections of otoliths/scales and improve the existing database of scales images (Science Plan codes: 3.1, 3.2 and 5.2);

f) Address the generic ToRs adopted for workshops on age calibration (see 'WGBIOP 2019 Guidelines for Exchanges And Workshops on Age Reading') (Science Plan codes: 3.1, 3.2 and 5.2).

WKARNNSH will report by date for the attention of WGWIDE, WGIPS, ACOM.

Supporting information

Priority	Age determination is an essential feature in fish stock assessment to estimate the rates of moralities and growth. In order to arrive at appropriate management advice ageing procedures must be reliable. Otolith/scale processing methods and age reading methods might differ considerably between countries. Therefore, otolith/scale exchanges should be carried out on a regular basis, and if serious problems exist age reading workshops should be organized to solve these problems.
Scientific justification	The aim of the mini-workshop is to review the technical problems regarding age-reading of Norwegian Spring-spawning herring between Denmark, Norway, Iceland and Faroe Islands regarding the extra growth added in May-samples. Otoliths and scales from the May-July surveys will be brought to the WK and discussed.
Resource requirements	No specific resource requirements beyond the need for members to prepare for and participate in the meeting.
Participants	In view of its relevance to the EU Data Collection Framework (DCF), the Workshop is expected to attract interest from ICES Member States.
Secretariat facilities	None
Financial	Additional funding will be required for facilitate the attendance of the scientists and technicians.
Linkages to advisory committees	ACOM
Linkages to other committees or groups	WGBIOP, WGWIDE, ACOM, RCM, all WKACs (Age Calibration Workshops)
Linkages to other organizatior	There is a direct link with the EU DCMAP

Workshops planned for 2023 onwards

- **Workshop on Age reading of Chub Mackerel (*Scomber Colias*)**(WKARCM2), chaired by Andreia Silva, Portugal, and Carmen Hernández, Spain, will be held in June 2023 (Venue: TBD).

Draft resolution for Workshop on Age reading of Chub Mackerel (Scomber Colias) (WKARCM2)

2023/WKARCM2 Workshop on Age reading of Chub Mackerel (*Scomber Colias*) [WKARCM2], chaired by Andreia Silva, Portugal, and Carmen Hernández, Spain, will be held in June 2023 (Venue: TBD), to:

a) Review information on age determination, otolith exchanges and validation techniques on this species

b) Estimate (relative) accuracy and precision of chub mackerel age determination in the main fishing areas.

c) Identify causes of age determination error and provide specific guidelines for the improvement of precision and reduction of bias between readers and laboratories.

d) Elaborate an age reading protocol.

e) Create a reference collection of otoliths and a database of images of otoliths.

f) Address the generic ToR's adopted for workshops on age calibration (see 'WGBIOP Guidelines for Workshops on Age Calibration').

WKARCM2 will report by 2023 for the attention of WGBIOP and ACOM

Supporting information

Priority	Accurate age determination is an essential feature in fish stock assessment to estimate the rates of mortality and growth. Age data are provided by different countries and are estimated using international ageing criteria which have not been fully validated for Chub Mackerel (*Scomber colias*). There is a great necessity to continue clarifying this guideline of age interpretation for the species. Therefore, an appropriate otolith exchange programme will be carried out in September 2022 for the purpose of inter-calibration between ageing labs. The results of this otolith exchange will subsequently be discussed during the WKARCM2.
Scientific justification	Atlantic chub mackerel (*Scomber colias*) is a middle-size fish species important in the pelagic ecosystem. Landings have increased exponentially in the last 10–15 years in most of its Atlantic distribution, and in ICES area, mainly in Iberia Peninsula, where a couple of decades years ago it was considered as a bycatch. Catches, mainly from the purse-seine fleet, are not limited, and no formal assessment and fishing management advice has been requested in ICES area so far, the species being assessed as a single-stock in FAO/CECAF region. There is, however, concern on the stock status and exploitation levels, particularly in European waters, and a great uncertainty and lack of information concerning stock identity, dynamics and connectivity, and its biology. Though currently age information is not used for stock status evaluation in European waters, long historical series of age data are available in several of the institutes sampling the species that could potentially be used for advice. Preliminary analysis of the species available data have suggested geographical differences for most of its life-history parameters, and also in growth pattern, that may be reflected in the otoliths annual rings deposition among regions (WKCOLIAS2). Also, though a recent study has corroborated *S. colias* ages in Iberian waters (Navarro et al. 2021), previous age calibration exercises have identified reading issues that need to be further identified and addressed (WKARCM 2015, WGBIOP 2018). The aim of the workshop is to identify the current ageing problems between readers and standardize the age reading procedures in order to improve the accuracy and precision in the age reading of this species.
Resource requirements	No particular resource requirements will be necessary, except for the required conditions by each member to prepare the biological material for, and to carry on, the exchange.

Participants	Considering the importance of the species in Atlantic European waters, from the Mediterranean Sea region and in Northwest Africa, the Exchange is expected to be of interest for ICES, GFCM and FAO/CECAF Member States
Secretariat facilities	None
Financial	No finantial resources needed
Linkages to advisory committees	ACOM
Linkages to other committees or groups	WGBIOP, WKCOLIAS, SCICOM
Linkages to other organizations	RCGs, EU DG-MARE, EU Data Collection Framework

Annex 4: Validation tables (ToR a)

Annex 4-Table 1. Overview existing validations[3].

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Clupea harengus	her.27.30 and her.27.31	27.30 & 27.31	Gulf of Bothnia	126417	WGBFAS	5	N	2021	75%	Y		ICES. 2020. ICES Workshop on age validation studies of small pelagic species (WKVALPEL). ICES Scientific Reports. 2:15. 76 pp. http://doi.org/10.17895/ices.pub.5966	ICES Workshop on Age Validation Studies of Small Pelagic Species (WKVALPEL)
Gadus morhua	cod.27.47d20	27.3-7	North Sea	126436	WGNSSK	1	Y	2021		Y		ICES. 2013. Report of the Workshop on Age Validation Studies of Gadoids (WKAVSG), 6 - 10 May 2013, IMEDEA, Mallorca. ICES CM 2013/ACOM:50. 33 pp.	Report of the Workshop on Age Validation Studies of Gadoids (WKAVSG)

[3] Note: Table has been slightly modified to fit into the WGBIOP 2021 report. Full table will be available to download as an .xlsx file from the WGBIOP community page.

[4] BK: benchmark; Subject to Benchmark review - When?

[5] Age: % agreement from age readers, reading for assessment from most recent EX/WK.

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Gadus morhua	cod.27.1-2	27.1-2	Barents Sea, Norwegian Sea	126436	AFWG	1	Y	2021		Y		ICES. 2013. Report of the Workshop on Age Validation Studies of Gadoids (WKAVSG), 6 - 10 May 2013, IMEDEA, Mallorca. ICES CM 2013/ACOM:50. 33 pp.	Report of the Workshop on Age Validation Studies of Gadoids (WKAVSG)
Engraulis encrasicolus	ane.27.8	27.8	Bay of Biscay	126426	WGHANSA	1	Y	2019	Bay of Biscay = 91%, Strait of Sicily = 86%	Y		Uriarte *et al.*, 2016	Validation of age determination using otoliths of the European anchovy (Engraulis encrasicolus L.) in the Bay of Biscay
Engraulis encrasicolus	ane.27.9a	27.9	Atlantic Iberian waters	126426	WGHANSA	3	Y	2020	Bay of Biscay = 91%, Strait of Sicily = 86%	Y		Uriarte *et al.*, 2016	Validation of age determination using otoliths of the European anchovy (Engraulis encrasicolus L.) in the Bay of Biscay

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Trachurus trachurus	hom.27.2a4a5b6a7a-ce-k8	Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a-c,e-k	North-east Atlantic	126822	WGWIDE	1	Y	2019	55.80%	Y		Waldron, M. E., and Kerstan, M. 2001	Age validation in horse mackerel (Trachurus trachurus) otoliths
Pleuronectes platessa			North Sea							Y	Released marked fish	Etherton (2015)	https://www.researchgate.net/publication/277726542_European_plaice_Pleuronectes_platessa_and_sole_Solea_solea_indirect_age_validation_using_otoliths_from_mark-recapture_experiments_from_the_North_Sea

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Solea solea			North Sea							Y	Released marked fish	Etherton (2015)	https://www.researchgate.net/publication/277726542_European_plaice_Pleuronectes_platessa_and_sole_Solea_solea_indirect_age_validation_using_otoliths_from_mark-recapture_experiments_from_the_North_Sea
eleven species of *Lutjanus*			central Great Barrier Reef							Y	Mark–recapture chemically tagged fish	Cappo, M., Eden, P., Newman, S. J., & Robertson, S. (2000). A new approach to validation of periodicity and timing of opaque zone formation in the otoliths of eleven species of Lutjanus from the central Great Barrier Reef(*). Fishery Bulletin, 98(3), 474.	https://go.gale.com/ps/anonymous?id=GALE%7CA64909346&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=00900656&p=AONE&sw=w
Engraulis encrasicolus			Bay of Biscay							Y	marginal increment analysis (MIA)	Uriarte et al. (2016)	https://doi.org/10.1071/mf15092

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
			Galician waters (Division 9.a N)							Y	marginal increment analysis (MIA)	ICES (2016c)	
			Gulf of Cadiz							Y	marginal increment analysis (MIA)	ICES (2010d)	
			Alboran Sea							Y	marginal increment analysis (MIA)	ICES (2010d)	
			Northern Adriatic Sea							Y	marginal increment analysis (MIA)	ICES (2010d)	
Sardina pilchardus			Bay of Biscay							Y	marginal increment analysis (MIA)	ICES (2011d)	
			Atlantic Iberian waters							Y	marginal increment analysis (MIA)	Alvarez and Porteiro (1981); Porteiro and Alvarez (1983); Jorge and Costa Monteiro (1980)	
Sprattus sprattus			Skagerrak and Kattegat							Y	marginal increment analysis (MIA)	Torstensen et al. (2004)	

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Scomber scombrus			Portuguese coast							Y	marginal increment analysis (MIA)	Gordo et al. (1982)	
			North and north-west of the Iberian Peninsula							Y	marginal increment analysis (MIA)	Villamor et al. (2018)	
Scomber colias			North and north-west of the Iberian Peninsula							Y	marginal increment analysis (MIA)	ICES (2016a); Navarro et al. (2018)	
			Portuguese coast							Y	marginal increment analysis (MIA)	Martins et al. (1983)	
			Azores Islands							Y	marginal increment analysis (MIA)	Carvalho et al. (2002)	
			Madeira Islands							Y	marginal increment	Vasconcelos et al. (2011); Vasconcelos (2006)	

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
											analysis (MIA)		
			Gulf of Cadiz							Y	marginal increment analysis (MIA)	Rodriguez-Roda (1982)	
			Canary Islands							Y	marginal increment analysis (MIA)	Lorenzo et al. (1995)	
			South-western Mediterranean (Alboran Sea)							Y	marginal increment analysis (MIA)	Velasco et al. (2011)	
			North-western Mediterranean (Catalan coast)							Y	marginal increment analysis (MIA)	Perrota et al. (2005)	
			Eastern Mediterranean (Hellenic seas)							Y	marginal increment analysis (MIA)	Kiparissis et al. (2000)	

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Trachurus trachurus			North-east Atlantic							Y	marginal increment analysis (MIA)	Kerstan (1985); Waldron and Kerstan (2001)	
			Eastern Mediterranean (Hellenic seas)							Y	marginal increment analysis (MIA)	Karlou-Riga and Sinis (1997)	
			Southern Adriatic Sea							Y	marginal increment analysis (MIA)	Carbonara and Casciaro (2018)	https://www.ices.dk/sites/pub/Publication%20Reports/Forms/DispForm.aspx?ID=35090
Trachurus mediterraneus			Eastern Mediterranean (Hellenic seas)							Y	marginal increment analysis (MIA)	Karlou-Riga (2000)	
Trachurus picturatus			Azores Islands							Y	marginal increment analysis (MIA)	García et al. (2015)	
			Madeira Islands							Y	marginal increment analysis (MIA)	Vasconcelos et al. (2006)	
			Canary Islands							Y	marginal increment	Jurado-Ruzafa and Santamaría (2018)	

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
											analysis (MIA)		
Engraulis encrasicolus			North-western Mediterranean Sea							Y	length frequency analysis	Pertierra (1987); Morales-Nin and Pertierra (1990)	
Sardina pilchardus			North-western Mediterranean Sea							Y	length frequency analysis	Pertierra and Morales-Nin (1989); Morales-Nin and Pertierra (1990)	
			Central Mediterranean Sea (Gulf of Salerno – west of Italy)							Y	length frequency analysis	Romanelli et al. (2002)	
Scomber colias			Madeira Islands							Y	length frequency analysis	Vasconcelos (2006)	
			North and north-west of the Iberian Peninsula							Y	length frequency analysis	Navarro et al. (2018)	

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Trachurus trachurus			North-east Atlantic							Y	length frequency analysis	Letaconnoux (1951); Ramalho and Pinto (1956); Barraca (1964); Macer (1977)	
			Hellenic seas							Y	length frequency analysis	Karlou-Riga and Sinis (1997)	
			Adriatic Sea							Y	length frequency analysis	Alegria Hernandez (1984)	
Trachurus mediterraneus			Adriatic Sea							Y	length frequency analysis	Arneri and Tange- rini (1984)	
			Southern Adriatic Sea							Y	length frequency analysis	Carbonara and Casciaro (2018)	
Engraulis encrasicolus			Bay of Biscay							Y	progression of strong year classes	Uriarte and Astudillo (1987); Uriarte et al. (2002); Uriarte et al. (2016)	
Trachurus trachurus			North-east Atlantic							Y	progression of strong year classes	Eltink and Kuiter (1989); Abaunza et al. (2003)	
Engraulis encrasicolus			Bay of Biscay							Y	Daily increments between annuli	Aldanondo et al. (2013); Hernández et al. (2013)	

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Sardina pilchardus			Atlantic Iberian waters							Y	Daily increments between annuli	ICES (2011d); Silva et al. (2012)	
			Northern Adriatic Sea							Y	Daily increments between annuli	ICES (2013b)	
Engraulis encrasicolus			Strait of Sicily							Y	back-calculated length analysis	Basilone et al. (2004)	https://doi.org/10.1038/s41598-020-58174-5
Sardina pilchardus			Atlantic Iberian waters							Y	back-calculated length analysis	Costa Monteiro and Jorge (1982); Porteiro and Alvarez (1983)	
Scomber colias			Canary Islands							Y	back-calculated length analysis	Lorenzo et al. (1995)	
			Madeira Islands							Y	back-calculated length analysis	Vasconcelos (2006)	
			Gulf of Cadiz							Y	back-calculated length analysis	Rodriguez–Roda (1982)	

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Trachurus trachurus			Hellenic seas							Y	back-calculated length analysis	Karlou–Riga and Sinis (1997)	
			Southern Adriatic Sea							Y	back-calculated length analysis	Carbonara and Casciaro (2018)	
Gadus morhua	cod.27.22-24	27.22-24	Western Baltic Sea	126436	WGBFAS	1	Y	2021	87	Y	tag/recapture; length frequency progression	Krumme et al. 2020; McQueen et al 2019	https://www.int-res.com/abstracts/meps/v645/p141-158/; https://academic.oup.com/icesjms/article/76/2/430/5211109?login=true
Gadus morhua	cod.27.24-32	27.24-32	Eastern Baltic Sea	126436	WGBFAS	1	Y/N	2020	52	new ageing method validated	seasonal patterns in otolith microchemistry	Heimbrand et al. 2020; Hüssy et al. 2021	https://onlinelibrary.wiley.com/doi/full/10.1111/jfb.14422; https://cdnsciencepub.com/doi/full/10.1139/cjfas-2020-0388
Gadus macrocephalus	NA	NA	Gulf of Alaska, Aleutian Islands, and eastern Bering Sea	254538	North Pacific Groundfish Stock Assessments	NA	Y	NA	NA	Y	oxygen isotopes	Kastelle et al 2017	https://www.sciencedirect.com/science/article/pii/S0165783616303174

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Microstomus kitt)	lem.27.3a47d		North Sea, English Channel, and Celtic Sea			3.2	Y/N	2018		Y	Marginal increment analyses	Smith (2014)	https://doi.org/10.1016/j.fishres.2014.03.011
Pleuronectes platessa	ple.27.420	27.4.20	North Sea		WGNSSK	1	Y	2022		Y	Released marked fish	Etherton (2015)	https://doi.org/10.1016/j.fishres.2015.05.009
	ple.27.421	27.4.21	North Sea		WGNSSK	2	Y	2023		Y	Micromilling	Geffen (2012)	https://doi.org/10.1007/s10641-012-0033-2
Solea solea	sol.27.4	27.4	North Sea		WGNSSK	1	Y	2020			Released marked fish	Etherton (2015)	https://doi.org/10.1016/j.fishres.2015.05.009
							Y				Daily increment analyses	Lagardere and Troadec (1997)	https://doi.org/10.3354/meps155223
							Y				Radiochemical dating	Kalish (1993)	https://doi.org/10.1016/0012-821x(93)90082-k
Limanda ferruginea							Y				Captive rearing from batch	Dwyer et al. (2003)	https://doi.org/10.1016/s1054-3139(03)00125-5
											MLA	Dwyer et al. (2003)	https://doi.org/10.1016/s1054-3139(03)00125-5

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Halibut							Y				Radiochemical dating	Kalish (1993)	https://doi.org/10.1016/0012-821x(93)90082-k
Mullus Barbatus	GSA18	GSA18	South Adriatic		STECF - WGSAD	1		2022		Y	strong mode tracking	Carbonara et al., 2018	https://doi.org/10.1038/s41598-018-30872-1
Raja clavata	GSA18	GSA18	South Adriatic			1				Y	Recapture/chemical tagging	Carbonara et al., 2020	https://doi.org/10.3389/fmars.2020.586094
Reinhardtius hippoglossoides	ghl.27.561214	27.5-14	East of Greenland to West of Scotland	127144	NWWG	1	N	2022		Y	Bomb radiocarbon analysis	Treble et al., 2008; Dwyer et al., 2016; Brogan et al., 2021	https://doi.org/10.1016/j.fishres.2016.01.016; https://doi.org/10.1139/F08-030; https://doi.org/10.1016/j.fishres.2021.106000
	ghl.27.1-2	27.1-2	Barents Sea, Norwegian Sea		AFWG	1.2	Y	2022		Y	Bomb radiocarbon analysis	Treble et al., 2008; Dwyer et al., 2016; Brogan et al., 2021	https://doi.org/10.1016/j.fishres.2016.01.016; https://doi.org/10.1139/F08-030; https://doi.org/10.1016/j.fishres.2021.106000
Sebastes norvegicus (previously S. marinus)	reg.27.561214	27.5-14	Iceland, Faroe, Rockall, West of Scotland	151324	NWWG	1	Y			Y	Radiometric analysis	Stransky et al. 2005	https://doi.org/10.1016/j.fishres.2005.03.003

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Sebastes mentella	reb.27.1-2	27.1-2	Barents Sea, Norwegian Sea	127254	AFWG	1	Y			Y	Radiometric analysis	Campana et al., 1990; Stransky et al. 2005	https://doi.org/10.1139/f90-017; https://doi.org/10.1016/j.fishres.2005.03.003
	reb.27.5a14	27.5 and 27.14	Greenland and Iceland		NWWG	3.2	N	2022		Y	Radiometric analysis	Campana et al., 1990; Stransky et al. 2005	https://doi.org/10.1139/f90-017; https://doi.org/10.1016/j.fishres.2005.03.003
	reb.2127.dp	21.1-2 and 27.5-14	Greenland, Iceland, Faroe, Northeast Atlantic		NWWG		Y			Y	Radiometric analysis	Campana et al., 1990; Stransky et al. 2005	https://doi.org/10.1139/f90-017; https://doi.org/10.1016/j.fishres.2005.03.003
	reb.27.14b	27.14	Southeast Greenland		NWWG	3.2	N			Y	Radiometric analysis	Campana et al., 1990; Stransky et al. 2005	https://doi.org/10.1139/f90-017; https://doi.org/10.1016/j.fishres.2005.03.003
	reb.2127.sp	21.1-2 and 27.5-14	Greenland, Iceland, Faroe, Northeast Atlantic		NWWG		N			Y	Radiometric analysis	Campana et al., 1990; Stransky et al. 2005	https://doi.org/10.1139/f90-017; https://doi.org/10.1016/j.fishres.2005.03.003

Species	Stock	Statistical area	Area description	AphiaID	Assessment working group	Stock category	Age-based assessment?	When subject to BK review?[4]	% agreement from age readers[5]	Age validated?	Method	Reference	Links to validation reports/doi
Lophius piscatorius	mon.27.78abd	27.7 and 27.8	Celtic Sea and Bay of Biscay	126555	WGBIE	1	Y	2022		Y	Micro-chemistry analysis	Brophy et al., 2019; Brophy et al., 2021	https://doi.org/10.2826/748632; https://doi.org/10.1016/j.ecss.2021.107557

Annex 4-Table 2. Overview validation priority[6].

YEAR (issue list)	STOCK	LAST BENCH-MARK	IDENTIFIED ISSUE (Benchmark)	PROPOSED SOLUTION (Benchmark)	LAST WK/EX	IDENTIFIED ISSUE (WK/EX)	WG comments	As-sess-ment	Last ex-change/WK agreement	PRIORITY (suggested)
2016	NSS herring	WKPELA 2016	Ageing differences using different techniques.	_	Otolith and Scale Exchange Norwegian Spring-Spawning Herring: Coordinator: Jane A. Godiksen. (Initiated in 2016, reported in WGBIOP 2018, Annex 3, p 46.)	The main issue is not yet identified. IMR (Norway) will do some analysis to verify if the disagreement is due to the structure. Before this there is no need for another calibration.	WGWIDE 2020: For some years there have been issues with age reading of herring. These issues were raised around 2010, and since then two scale/otolith exchanges and a workshop have been held; and a final work-shop was planned after the second exchange. There were, however, concerns with the second scale/otolith exchange and the final workshop was postponed indefinitely. It is therefore recommended to organize a new scale/otolith exchange and a follow up workshop. age-error matrices are needed as input to the stock-assessment, to evaluate sensitivity to ageing errors, and such age-error matrices are an output of age-reading inter-calibrations.	age based model		Low

[6] Note: Table has been slightly modified to fit into the WGBIOP 2021 report. Full table will be available to download as an .xlsx file from the WGBIOP community page.

YEAR (issue list)	STOCK	LAST BENCH-MARK	IDENTIFIED ISSUE (Benchmark)	PROPOSED SOLUTION (Benchmark)	LAST WK/EX	IDENTIFIED ISSUE (WK/EX)	WG comments	As-sess-ment	Last ex-change/WK agreement	PRIORITY (suggested)
2016	dab-nsea	WKNSEA 2016	Ageing differ-ences using dif-ferent tech-niques.	_	Otolith Exchange Dab (Limanda li-manda) North Sea Coordinator: Loes Bolle. SmartDots event 244 (2019)	No report available	WGNSSK 2020. Only the beam trawl surveys provide data on age and weight for dab. No problem with age are mentioned in the re-port	age-based survey index		Low
2016	witch	WKNSEA 2018	Ageing differ-ences using dif-ferent tech-niques.	Inter-calibra-tion among read-ers	None	_	WGNSSK 2020. No is-sues highlighted	age based model		Low
2016	had-rock	WKROCK 2019	Low degree of age-reading agreement by in-ternational ex-perts. Ageing dif-ferences using different tech-niques. Results of age-reading of the identical oto-liths differ.	Standardiza-tion of meth-ods	Otolith Exchange Haddock (Mela-nogrammus ae-glefinus) Barents Sea, Rockall and North Sea Coordi-nator: Mandy Gault	ongoing	WGCSE 2020: No issues highlighted	age based model		Low
2016	Whiting 3a	WKDEM 2020: the stock was raised from category 5 to category 3.	Inconsistencies in survey indices. split rings/Humphry shadow’			WKARWHG2 2016 proposed an otolith chemistry study to validate the true dep-osition of opaque and translucent material throughout the otolith	WGNSSK 2020: It is stated that there are no biological data for this stock but this is no true as IBTSQ1 and Q3 includes biological data. Make aware stock coordinator/as-sessor (Alex Kokkalis) on the existence of these data.	age based model		High

YEAR (issue list)	STOCK	LAST BENCH-MARK	IDENTIFIED ISSUE (Benchmark)	PROPOSED SOLUTION (Benchmark)	LAST WK/EX	IDENTIFIED ISSUE (WK/EX)	WG comments	As-sess-ment	Last ex-change/WK agreement	PRIORITY (suggested)
2017	sol.27.20-24	Inter-benchmark 2015 (poorly defined growth from age readings)	Inconsistency among readers			Improvement of ageing by means of otolith calibration between readers and otolith structure to validate age. An age reading exchange occurred in 2015 (outside WGBIOP, no report found) and the PA was 90%. A validation does not seem to be necessary.	WGBFAS 2020: DTU Aqua finalized a project in 2018 which has been extended, mainly for stock structure (Ask Julie)	age based model		Medium/ High
2021	meg.27.8c.9a						WGBIE	fixed ogive (BIOSDEF 1998)	Workshop on Megrim Otolith Age Reading (Egan et al., 2004)	Medium/ High
2021	her.27.30 and her.27.31						WGBFAS			High
2021	cod.27.1-2						AFWG			
2021	cod.27.47d20						WGNSSK		Exchange in 2008	High
2021	sol.27.7d						WGNSSK			
2021	ple.27.7h-k						WGCSE			
2021	san.sa.1r						HAWG		National Institute of Aquatic Resources, 2019	

YEAR (issue list)	STOCK	LAST BENCH-MARK	IDENTIFIED ISSUE (Benchmark)	PROPOSED SOLUTION (Benchmark)	LAST WK/EX	IDENTIFIED ISSUE (WK/EX)	WG comments	As-sess-ment	Last ex-change/WK agreement	PRIORITY (suggested)
2021	san.sa.2r						HAWG			Low
2021	san.sa.3r						HAWG		National Insti-tute of Aquatic Resources, 2019	
2021	san.sa.4						HAWG			Low

Benchmark species 2021 need to be included and a priority given (Carine & Angela)						
2018/2019	hke.27.8c9a	Low agreement among readers	WKAEH 2009	Exchange and validation ongoing outside WGBIOP within EASME/EMFF/2016/1.3. 2.7/SI2.762036. (Kelig)		Low?
2018/2020	ank.27.78abd	No agreed method for ageing	WKANGLER 2018	Exchange and validation ongoing outside WGBIOP within EASME/EMFF/2016/1.3. 2.7/SI2.762036. (Kelig)		
2018/2021	ank.27.8c9a	No agreed method for ageing	WKANGLER 2019	Exchange and validation ongoing outside WGBIOP within EASME/EMFF/2016/1.3. 2.7/SI2.762036. (Kelig)	Length-based or produc-tion assessment models are considered	

Benchmark species 2021 need to be included and a priority given (Carine & Angela)						
2018/2022	mon.27.78ab	No agreed method for ageing	WKANGLER 2020	Exchange and validation ongoing outside WGBIOP within EASME/EMFF/2016/1.3. 2.7/SI2.762036. (Kelig)		
2018/2023	mon.27.8c9a	No agreed method for ageing	WKANGLER 2021	Exchange and validation ongoing outside WGBIOP within EASME/EMFF/2016/1.3. 2.7/SI2.762036. (Kelig)	Length-based or production assessment models are considered	

Annex 5: Quality status tables (ToR b)

Annex 5-Table 3. (Part 1) Quality status of age reading at institutes[7]. Part 1: Internal Quality Management.

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
Belgium	ILVO, Belgium		All species are read by 2 readers which control all readings from each other. If disagreement, the otoliths are discussed. In case a reader is absent during a long time, we work with blind doubles (the reader receives some samples which he read before and ages are compared and discussed in case a different age was given). We also use samples from reference collections once a month to see if all readers still agree between each other with the model age.	Yes, AQ2 and AQ3 readings are not uploaded to international databases	Before upload to international databases simple plots of age vs. length are produced and checked for outliers. Outliers are identified and checked in the lab. Age readings with readability score AQ2 and AQ3 are not uploaded to international databases.	Beproevingsprocedure OTL001 Werkvoorschrift WV OTL001 001 sections Werkvoorschrift WV OTL001 002 stained sections Werkvoorschrift WV OTL001 003 whole	Yes, ISO 17025
Cyprus	Department of Fisheries and Marine Research (DFMR), Cyprus	At the moment there is 1 age reader per species. Using the image analysis program perform a blind first reading (only information on the date of capture).		No	Review of produced age–length keys for possible identification of outliers.	1. For the age estimation of Mullus species, the guidelines agreed during the Workshop on age reading of Mullus (WKACM, 2009) are followed, as well as the 2017 WKVALMU	No Quality Plan in place.

[7] Note: Table has been slightly modified to fit into the WGBIOP 2021 report. Full table will be available to download as an .xlsx file from the WGBIOP community page.

[8] If Quality Control is Managed by an Individual Age Reader how are the QC checks carried out? Please provide details on the number of samples included, what analysis is used, frequency, image based or not.

[9] If Quality Control is Managed by a Group of Age Readers how are the QC checks carried out? Please provide details on the number read and samples included, what analysis is used, frequency, image based or not.

[10] Did you implement the age quality scores (AQ1, AQ2, AQ3) (https://vocab.ices.dk/?ref=1395) in your laboratory for routine age reading? If so, how do you handle AQ2 and AQ3 readings?

[11] If you conduct routine QC checks on your data before it is uploaded to the international databases please provide some details.

[12] If Quality Management is Carried Out in Accordance with a Quality Plan please provide details.

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
		Perform a second reading, considering information from the sample, biological information, results of the first reading, back-calculation and the growth increment between consecutive rings (which should be decreasing). Store age estimates in image analysis programme and database. Number of samples per species is about 300 from commercial fisheries.				Recommendation on following the new ageing scheme in the Mediterranean sea is followed. 2. Carbonara, P., Follesa M.C. eds. 2018. Handbook on fish age determination: a Mediterranean experience. Studies and Reviews n. 98. General Fisheries Commission for the Mediterranean. Rome. Pp 197	
Denmark	DTU Aqua, Denmark		We have 2 readers per species, some of them carry out self checks once a year on a set of physical otoliths (1 sample per area of approximately 50 otoliths. If time allows this is done per quarter also). All readers are trained to use SmartDots and the aim is to have all readers either complete an international exchange OR an internal check (with the second reader of that stock/species) once per year, these checks should include samples from all age groups and quarters. The SmartDots report is used when there are more than 2 readers. The Cefas ATAQCS excel book is used if there are only 2 readers. All otoliths where there is disagreement are discussed between readers.	Yes we do. We have made a conversion from our internal QC scale to the AQ scale. AQ3 readings are not uploaded to ICES databases and used for assessment purposes. There are very few of these otoliths.	Before upload to international databases simple plots of age vs. length and weight are produced and checked for outliers. Outliers are identified and checked in the lab. Age readings with readability score of D (equivalent to AQ3) are not uploaded to international databases.	Manual for age determinations; holds a 1-2 page description for the majority of the species aged in the laboratory (12 species) International protocols produced at workshops are the ones we follow. We have a danish version of the SmartDots software manual.	

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
Estonia	Estonian Marine institute, University of Tartu	We have 1 age reader per species, for herring we have 2 age readers. Age reading is performed following instructions in relevant manuals and recommendations from relevant ICES workshops. The quality is assured by age reader.	For herring we have 2 readers who carrie out self checks at least once a year. All otholiths where disagreement exists are discussed between readers.	No			
Faroe Islands	Faroe Marine Research Institute (FaMRI), Tórshavn, Faroe Islands		When the age reader is in doubt the other age readers are consulted. The age–length relationship is investigated for all samples. Outliers are identified visually and re-read if necessary.			Internal data quality handling book where the general otolith preparation and age reading is described (in Faroese).	
Finland	Natural Resources Institute Finland (Luke)	Direct or indirect validation or precision : 1) The use of tagged individuals to identify real and false annuli (usually small numbers, from a few to dozens), 2) The examination of different calcified structures from the same individuals side by side, especially a bone or scales along with mostly stained otoliths (dozens or more, 3) The environmental fit, i.e. warm and cold growing seasons affect fish recruitment and growth: do we see these effects in our fish populations when using age data (from dozens to thousands)?	Exchange of hard structures or images between readers, age readings of some samples with different methods as well, intention to have at least two specialists in age determination per species. All parts of the previous column.		Outliers, e.g.: Age and size in pivot table (all specimens): are there outliers, and if there are, rechecking of them.	Raitaniemi, J., Nyberg, K. & Torvi, I. 2000. Age and growth determination of fish (In Finnish). Finnish Game and Fisheries Research Institute, Helsinki. pp. 232. Maturity of herring: The Danish manual	New age readers practice with more experienced ones and use suitable quality control methods (column C) before they start routine age determinations

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
France	IFERMER, France	There are 2 readers by species but for the first reader, he identifies the age a first time during image acquisition and then checks a second time during image interpretation. This process is applied on all calcified pieces	Each year, a blind reading is organized both two readers who are identifie for each species. This excercise takes place once a year with 200 images for each species covering all sampling quarters for each main area (or stock), A report with R script applied on the data are produced,	We will start our work with Smartdots with age quality score software in 2022 to replace TNPC	Age Length Key tools are used to control among quarters of the year and with the historic database	The preparation, age estimation, data storage and sample storage are described in detail in the following document: Mahé, K., Bellail, R., Dufour, J.L., Boiron-Leroy, A., Diméet, J., Duhamel, E., Elleboode, R., Félix, J., Grellier, P., Huet, J., Labastie, J., Le Roy, D., Lizaud, O., Manten, M.L., Martin, S., Metral, L., Nédelec, D., Vérin, Y., Badts, V., 2009. French summary of age estimation procedures. http://archimer.ifremer.fr/doc/00000/7294/	All species have two readers. Quality control check are carried out annually on all species with two or more readers. New readers have to reach specific targets in terms of % agreement before they become a primary reader.
Germany	Thünen Institute of Baltic Sea Fisheries (OF), Rostock	not relevant	We aim to have at least 2 readers for each species. Regular calibration exercises are carried out between these readers.	Yes. Q2: age is used, Q3: no age is assigned/no age information is used	databases use standard consistency checks (e.g. outliers); analysis of length-age diagnostics to check consistency of the age-at-length distribution, comparison of age distributions with previous surveys, years etc.	We have a manual for herring and sprat, flatfish and cod. Additionally, we have a manual for our techniques of age reading and otolith processing. Chemically age-validated otoliths from wild Western Baltic cod are available; see McQueen et al. 2018. Age validation of juvenile cod in the Western Baltic Sea. ICES Journal of Marine Science, doi:10.1093/icesjms/fsy175. Krumme et al. 2020. Age validation of age 0-3 wild cod (Gadus morhua) in the western Baltic Sea through mark-recapture	When two age readers for a stock are available, they control a selection of readings from each other regularly. If only one age reader is available, the preformance is compared to

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
						and tetracycline marking of otoliths. Marine Ecology Progress Series 645:141-158, DOI:10.3354/meps13380. An "Age reading guide for Western Baltic" was recently compiled and forwarded to DTU-Aqua in Denmark and SLU in Sweden.	reference material and images from the manuals.
Germany	Germany Johann Heinrich von Thünen Institute (vTI), Institute of Sea Fisheries (SF)					WKARNSC 2008 document Sampling manual for commercial observers in German	reference collections for most stocks
Greenland	Pinngortitaleriffik, Greenland Institute of Natural Resources, Greenland		We have 2 readers per species (cod, mackerel, Greenland halibut and capelin) who carry out self checks twice a year on a set of otoliths. All otoliths where there is disagreement are discussed between readers. We use "Templates for Calculating Ageing Precision" by NOAA	AQ2 readings are used in assesment AQ3 have no age		None, but in progress.	
Greece	HCMR, Institute of Marine Biological Resources and Inland Waters, Greece	We have 1 -2 readers per species. Age reading is based on otolith digital images. Readings are controlled by age reader coordinators with check of age–length key and otolith radius -length relationship for outliers. Unreadable otoliths are rejected. In some cases we have used daly rings for the identification	We have 1-2 readers per species.Age reading is based on otolith digital images. Readings are controlled by age reader coordinators following reccommendations of several workshops. In some cases we have used daly rings for the identification of the first annulus. Moreover, a machine-learning approach has also been developed for the age reading of otoliths.	Yes. AQ3: not used because the otoliths are unreadable. AQ2: readings of the otoliths of this category are conducted by two readers, and if needed by the age reader coordinators	First, data are checked for ourliers in our database for the length and the age of each species. Then, based on the age readings, an age-laght key is used for outliers as well the von Bertalanffy model and the R2 of the model.	ICES Workshops, our internal manuals, Carbonara et al., 2019 (HANDBOOK ON FISH AGE DETERMINATION a Mediterranean experience) as well any related published information for each species.	We are planning to perform quality control on a subsample of each species yearly. Furthermore, we are investigating the potential

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
		of the first annulus. Moreover, a machine-learning approach has also been developed for the age reading of otoliths. Furthermore, SmartDots tool was also used in several WKs.	Furthermore, SmartDots tool was also used in several WKs.				automatic otolith reading using machine learning for further control.
Greece	Fisheries Research Institute, FRI-ELGO, Greece: Eel	Not an Individual Age Reader	The age reading for the European Eel is performed by two different operators. External operators from Ireland and Sweden are assisting in the procedure since the methodology used is a modification of the Crack and Burn methodology described in WKAREA.	Yes, the age quality scores (AQ1, AQ2, AQ3) are implemented in our laboratory for routine age reading. The AQ2 otoliths are included in ageing estimations, while the AQ3 otoliths are excluded.	The age reading for the European Eel is performed by two different operators. External operators from Ireland and Sweden are assisting in the procedure since the methodology used is a modification of the Crack and Burn methodology described in WKAREA	The age reading for the European Eel is performed in accordance to: Workshop On Age Reading Of European And American Eel (WKAREA), Bordeaux, France. 20-24 April, 2009. Workshop On Age Reading Of European And American Eel (WKAREA2), Bordeaux, France 22-24 March 2011.	Yes. (document not specified)
Greece	Fisheries Research Institute, FRI-ELGO, Greece: Small pelagics and Demersal species	Not an Individual Age Reader	The age reading is performed at least by 2 readers per species. When there is disagreement in age estimation between the two readers, a third reader gets called. More often, those readings (that need a third reading) are rejected. Unreadable otoliths are rejected too. An image photo is taken for every otolith sample. At first, a draft estimation is carried out during the shooting while the actual sample is tempered with under light and contrast adjustments. After that, image-based readings occur. Some readers have already	Yes, the age quality scores (AQ1, AQ2, AQ3) are implemented in our laboratory for routine age reading. The AQ2 otoliths are included in ageing estimations, while the AQ3 otoliths are excluded.	The first QC check is the cross-validation of the estimated age by a second reader for each sample. After that, data are uploaded on a local database and some automatic checks are performed (for example, an age-at-length test). Afterwards, additional quality checks are performed with dedicated scripts written in r language.	Carbonara, Pierluigi & Follesa, Maria & Bellodi, Andrea & Bitetto, Isabella & Capoccioni, Fabrizio & Carpentieri, Paolo & Casciaro, Loredana & Cau, Alessandro & Colella, Sabrina & Donato, Fortunata & Garibaldi, Fulvio & Lanteri, Luca & Leone, Chiara & Ligas, Alessandro & Mannini, Alessandro & Massaro, Andrea & Mulas, Antonello & Palmisano, Michele & Panfili, Monica & Spedicato, Maria Teresa. (2019). HANDBOOK ON FISH AGE DETERMINATION a Mediterranean experience /	Yes. (document not specified)

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
			used SmartDots for several exchanges and we are planning to train all readers and ultimately use SmartDots as our tool for age determination in general.			Chub mackerel workshop Final Report (2019).	
Ireland	Marine Institute, Ireland		For every species we have at least 2 age readers and for some we are training a third reader For every sample we collect either from the commercial, unwanted catch and survey, 20% of the sample is taken for QC purposes. These inter reader checks can either be on the actual samples but in 2020 we have moved toward using SmartDots for our internal QC process. As well as the 20% of every sample if necessary age readers will review other 'difficult ' otoliths		Screening of all data are carried out before being released for stock assessment purposes, this includes, length weight regression checks for outliers, generating Age length keys and comparing against historic ALKs for the same stock.	Manuals for age determination are held for , Haddock, Whiting Plaice, Megrim, Mackerel, Blue whiting. Other manuals are in progress	Yes all species have two readers, quality control check are carried out on about 20% of all species. New readers have to reach specific targets in terms of % agreement before they become a primary readers as defined by SOP -018 Age Reading Quality Control Quality
Italy	Italy Large Pelagics: UNIMAR, Rome Italy					Carbonara, P., Follesa M.C. eds. 2018. Handbook on fish age determination: a Mediterranean experience. Studies and Reviews n. 98. General Fisheries	

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
						Commission for the Mediterranean. Rome. Pp 197	
Italy	Italy Demersal and small pelagic: CNR - National Research Council – IAMC, Mazara del Vallo, CNR - National Research Council – IAMC, Capo Gratinola CNR - National Research Council – IAMC, Messina CNR - National Research Council – ISMAR, Ancona, Department of Life and Environmental Sciences University of Cagliari, Cagliari, Italy Centro Interuniversitario Di Biologia Marina Ed Ecologia Applicata CIBM "G. Bacci", Livorno, Italy COISPA - Stazione Sperimentale per lo Studio delle	YES by validation study at level of lab. For Example: Carbonara et al. 2018 A holistic approach to the age validation of Mullus barbatus L., 1758 in the Southern Adriatic Sea (Central Mediterranean). Scientific Reports volume 8, Article number: 13219.	YES - DCF Italian Age Working Group is ongoing to organize workshop and exchange: For example: Workshop on Age estimation of European anchovy (Engraulis encrasicolus) 19-21 November 2019 Capo Granitola, Italy Moreover for the establish the sample size were used the method implemented in MAREA project (Facchini M.T., Bitetto I., Spedicato M.T. and Kavadas S., 2019 Upgrade the methodological framework and tools for sampling optimization, implement and report case studies. Deliverable 3.3 - STREAM project), in ICES 2017 (Report of the Workshop on Optimization of Biological Sampling at Sample Level WKBIOPTIM, 20-22 June 2017, Lisbon, Portugal. ICES CM 2017/SSGIEOM:32. 150 pp) and in ICES 2019 (Report of the Workshop on Optimization of Biological Sampling WKBIOPTIM2, 29–31 May 2018. Nantes, France. ICES CM 2018/EOSG:23. 172 pp).			Carbonara, P., Follesa M.C. eds. 2018. Handbook on fish age determination: a Mediterranean experience. Studies and Reviews n. 98. General Fisheries Commission for the Mediterranean. Rome. Pp 197	Not yet, DCF Italian Age Working Group start to implement this activity. Anyway in general at lab levell each hard structur (e.g. otolith, spines, vertebra) is read by two readers and the results were evaluted in term of precision.

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
	Risorse del Mare, Bari Italy. Department of Zoology - University of Bari, Bari, Italy						
Italy	Italy European Eel: Laboratory of Experimental Ecology and Aquaculture , Department of Biology, University of Rome "Tor Vergata", Italy		Readings were repeated at least three times with a reasonable time lapse by 2 or 3 different operators. (Multiple readings of the same operator after 2 or 3 weeks, and multiple readers).			Carbonara, P., Follesa M.C. eds. 2018. Handbook on fish age determination: a Mediterranean experience. Studies and Reviews n. 98. General Fisheries Commission for the Mediterranean. Rome. Pp 197	
Poland	National Marine Fisheries Research Institute (NMFRI), Poland	We have 1 or 2 age readers per species. Age reading is performed following recommendations from relevant workshops. The quality is assured by age reader himself or crosschecked by the former reader; sporadically at the fish ageing dedicated international WK's.	If age reading is performed by 2 age readers per species, quality is assured by crosscheck - simultaneously reading by the second reader; sporadically at the fish ageing dedicated international WK's.	Not currently used - under preparation		1) Report of the 2nd Workshop on Age Reading of Flounder (WKARFLO),6/4/2013 2) Manual for the ageing of Atlantic eel, Produced by the participants of the ICES Workshop on Age Reading for European and American Eel, 2011. 3) ICES Report of the Workshop on Age Reading on Baltic Sprat (WKARBS), ICES CM 2008/ACOM:37. 4) Aps, R., L. Ustinova, B. Gentzen, W. Grygiel, A. Paat, Y.-O., Uder 1992. 4) Guide for the use of Baltic sprat otoliths in fisheries studies. Part I. [w:] Guide for the use of 5) Baltic sprat and herring otoliths in fisheries studies. Fischerei-Forsch., Sonderheft,	

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
						Wissen. Zeit. des IfH Rostock-Marienehe: 3-17; part I.	
Portugal	Portuguese Institute for Sea and Atmosphere, I. P. (IPMA)	Atlantic horse mackerel: Individual reader for HOM,Age reading is performed following instructions in relevant manuals and recommendations from relevant workshops. The quality is assured by age reader himself. Blackspot sea bream: One individual reader. Age readings are performed following the recommendations from WKAMDEEP 2.	Exchange of hard structures or images between readers. Two specialist age readers per species in most species. Periodic internal age calibration exercises.	American plaice and cod: age quality scores not implement; AQ2 is normally accepted - AQ3 rejected. Blue whiting the AQ scores classification have been implemented. The age readings from the otoliths assign as AQ3 are not considered for the construction of the ALKs to be applied to the stock assessment data. Blackspot sea bream: The AQ scores classification has been implemented;, following the recommendations from WKAMDEEP 2.		Preparation protocols of different calcified structures for age estimation are described in detail in the following document (in Portuguese): FARIAS, I.; SOARES, E.; MORENO, A.; FERREIRA, A.L.; SILVA, A.; SERRA-PEREIRA, B.; DINIS, D.; MORAIS, D.; SILVA, D.; SANTOS, E.; MENESES, I.; FERREIRA, M.J.; LAGARTO, N.; GONÇALVES, P.; ALPOIM, R.; DORES, S.; GARRIDO, S.; MOURA, T.; AZEVEDO, M.M.; FIGUEIREDO, I., 2018. O Laboratório de Esclerocronologia e os Estudos de Idade e Crescimento dos Recursos da Pesca. Relat. Cient. Téc. IPMA, nº 22 51 pp.	No Quality Plan. Quality control checks between readers are carried out periodically on assesment species. For blue whiting, during the anual internal age calibration exercise the precision on age classifications is determined.
Portugal	University of the Azores / Department of Oceanography and Fisheries, Portugal						
Spain	Spain: Instituto Español de	We have 1 reader per species doing two separate	Not applicable	Not implemented.	Not applicable	The preparation, age estimation, data storage and sample	N o

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
	Oceanografía, C.O. of Malaga, Murcia and Baleares - Mediterranean area.	readings and if they do not match they are discarded. Then the readings are checked by age reader coordinators with the age–length for outliers. Then associated otoliths are checked again and discarded.				storage are described in detail inin several documents and deposited in the IEO repository. • Applying a sampling protocol for each species where the methodologies used in sampling, the storage and processing of data, and the processing and observation of skeletal parts (EP) for the allocation of age are described.: (http://www.repositorio.ieo.es/e-ieo/handle/10508/1755; http://www.repositorio.ieo.es/e-ieo/handle/10508/10536; (http://www.repositorio.ieo.es/e-ieo/handle/10508/1755; http://www.repositorio.ieo.es/e-ieo/handle/10508/10536; http://www.repositorio.ieo.es/e-ieo/handle/10508/9859; http://www.repositorio.ieo.es/e-ieo/handle/10508/10536;). • Standardization of the common criteria in assigning age of each species, in order to improve the accuracy in readings: (http://www.repositorio.ieo.es/e-ieo/handle/10508/10162; http://www.repositorio.ieo.es/e-ieo/handle/10508/11122;	

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
						http://www.repositorio.ieo.es/e-ieo/handle/10508/10176; http://www.repositorio.ieo.es/e-ieo/handle/10508/10177; http://www.repositorio.ieo.es/e-ieo/handle/10508/10163; http://www.repositorio.ieo.es/e-ieo/handle/10508/10178) Manual: FAO. 2002. Report of the sardine (Sardina pilchardus) otolith workshop. Kaliningrad, Russian Federation, 28–31 August 2001. Rome. 49 pp.	
Spain	AZTI	Individual reader for the case of COD, HOM and grenadier (up to 2009). No internal quality control.	2 readers for: ANE-PIL-MAC-MEG-ELE. Discrepancies are discussed for a final agreeded age.	Not implemented.	Age–length relationship	Not internal manuals, readings based on: Age reading exchange of otolith images 2018 report (SmartDots event 160) (MEG); Report of cod otolith exchange, 1999; WKARA2 2016 (ANE); WKARHOM 2018 (HOM); WKARMAC2 2018 (MAC); WKARAS2 2019 (PIL); WKAREA3 2019, SUDOANG 2019 (EEL)	No
Spain	Instituto Español de Oceanografía (IEO), Centro Oceanográfico de Santander, Coruña, Vigo y Cádiz. ICES area and Long Distance areas// //		In general, the age estimation of all species are made by two readers, or for some species by a single experienced reader. In this case, the reader performs two separate readings. In any case, the final age will be accepted when both readings coincide. In the case of discrepancy, a third age reading is made.	AQ2. Otoliths that are difficult to read, whose interpretation is doubtful on a 1st reading and that must be examined again. If the estimated age in the 2nd reading is the same as in the		The preparation, age estimation, data storage and sample storage are described in detail inin several documents and deposited in the IEO repository. • Applying a sampling protocol for each species where the methodologies used in sampling, the storage and processing of data, and the	Yes, we do periodically intercalibration exercises between readers. So far we have used the Eltink sheet,

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
	Centro Oceanográfico de Canarias and Cadiz CECAF area		Those otoliths that are unreadable are rejected. In addition to the age estimation, the reader assigns a value for the quality of the reading done in accordance with the "3 point classification system" recommended by WKNARC-1 and WKNARC-2 (ICES, 2011a; 2013a).	1st, this age is assigned as the final age of the individual. If doubts persist between the two ages, it is read a 3rd time, assigning the most frequent age of the three or leaving the age with two values (e.g. 5/4). With regard to the elaboration of the length-age keys, these otoliths whose interpretation presents doubts between two ages, are assigned as belonging to the age that presents a certain greater confidence (which is the value located in the first place of the two, ex. 5 for age 5/4);• AQ3. Otoliths whose interpretation is practically impossible or very difficult, with doubts between 3 ages or more. These otoliths are excluded from further analysis.		processing and observation of skeletal parts (EP) for the allocation of age are described: (http://www.repositorio.ieo.es/e-ieo/handle/10508/1755; http:// www.repositorio.ieo.es/e-ieo/handle/10508/1755; http:// www.repositorio.ieo.es/e-ieo/handle/10508/10536; http:// www.repositorio.ieo.es/e-ieo/handle/10508/9858; http:// www.repositorio.ieo.es/e-ieo/handle/10508/9859; http:// www.repositorio.ieo.es/e-ieo/handle/10508/9864) • Standardization of the common criteria in assigning age of each species, in order to improve the accuracy in readings: (http://www.repositorio.ieo.es/e-ieo/handle/10508/12528; http:// www.repositorio.ieo.es/e-ieo/handle/10508/12529; http:// www.repositorio.ieo.es/e-ieo/handle/10508/11122; http://www.repositorio.ieo.es/e-ieo/handle/10508/12530; http:// www.repositorio.ieo.es/e-ieo/handle/10508/12531; http://www.repositorio.ieo.es/e-ieo/handle/10508/12532; http://www.repositorio.ieo.es/e-ieo/handle/10508/12533)	2001. From this year we will use the SmartDots

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
						Manual: FAO. 2002. Report of the sardine (Sardina pilchardus) otolith workshop. Kaliningrad, Russian Federation, 28–31 August 2001. Rome. 49 pp.	
Sweden	Swedish University of Agricultural Sciences, Department of Aquatic Resources, Institute of Coastal Research		Exchange of hard structures between readers, two specialists in age determination per species.			Manuals for most species are available (in Swedish and/or English) decribing sampling, preparation and age analysis. Routines and manuals for data storage and archives for otoliths are also available.	All species have at least two readers. Quality control check are carried out annually on assesment species and every other year on other species. New readers have to reach specific targets in terms of % agreement before they become a primary reader.
Sweden	Swedish University of Agricultural Science, Department of Aquatic Resources,		Exchange between readers. Aiming for two experts in age determination per species, but is not there yet for every species.Common documents with comments for each lake/river/sea area and species, and these are updated after every age determination of			Manual for preparation and age determination: ""Metodhandbok för åldersbestämning av fisk". Age estimation: Shearer. 1992. Atlantic salmon scale reading. Report of the Atlantic salmon scale reading workshop. Internal documents.	Most species have at least two age readers. Intercalibration anually for eel, and salmon.

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
	Institute of Freshwater Research		samples from that lake/river/sea area.			Data storage: Database (access). Internal document / guide about how to input data.	Intercalibration for other species every two or three years. New readers have to reach specific targets in terms of % agreement before they become a primary reader.
Sweden	Swedish University of Agricultural Sciences, Department of Aquatic Resources, Institute of Marine Research		An internal quality control program is in place (manual in Swedish) with the main objectives of evaluating how consistent the age readers are and to identify any problems that may affect the accuracy of data delivered.			Manuals for most species are available (in Swedish and/or English) decribing sampling, preparation and age analysis. Routines and manuals for data storage and archives for otoliths are also available.	Almost all species have two readers. Quality control check are carried out annually on all species with two or more readers. New readers have to reach specific targets in terms of % agreement before they become a primary reader.

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
UK (England)	UK (England) Cefas	Follow manuals and record confidence in reading age.	We have at least two readers for each species , approximately 20 readers. Qc is carried out for each reader every year and we are UKAS accredited.	All reader are quality checked by another experience reaer in their stock. A random sample of 150 otoliths from that years sample, quarter 2 - 3 are chosen and reread blind by another expert reader. Any readers that fall under the required agreemet are investigated and supported to understand the root cause of the agreement rate.		Many documents stored in documents database. We have a manual for every species. We also have a manual for our techniques of age reading and otolith processing. We will also be creating age reading manuals for our tropical species	Yes (document not specified)
UK (Scotland)	Scotland Marine Science Scotland	use	We use only hard otoliths for QC and where possible we have 2 readers per species. A sample of approximately 70 otoliths per species/per month . These are taken from market collection samples and are read blind by each reader. Analysis is done using R script and a report is issued for each quarter of the year. For species with a single reader where posible we collaborate with other institues.			We hold manuals for herring, mackerel, anglerfish megrim and our 4 main gadiods; cod, haddock, whiting and saithe. Also in house training documentation on collection, preparation and analysis. We also hold a reference collection for our gadoid species.	Readers are expected to maintain a specific percentage agreement for each species. Feedback from the quarterly reports idenifies if there is issues.
Malta	Agriculture and Fisheries						

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
Slovenia	Fisheries Research Institute of Slovenia (FRIS), Slovenia						
Norway	Institute of Marine Research, Bergen, Norway		All species are age-read by several readers, varying from 3-12 readers per species. At the IMR internal age-readings are conducted annual or biannual. All readers of the species are participating at these events. For these age-readings at least 150 indiviudal from the same year over several season are read by all readers and results are compared.	No		Gjøsæter, H. 1999. Procedure for selection and preparation of age material of pelagic fish. Gjøsæter, H. 1999. Procedure for age determination of Mallotus villosus. Gjøsæter, H. 1999. Procedure for age determination of Clupea harengus. Gjøsæter, H. 1999. Procedure for age determination of Boreogadus saida. Gjøsæter, H. 2000. Procedure for age determination of Micromesistius poutassou. Gjøsæter, H. 2000. Procedure for age determination of Scomber scombrus and Tra-churus trachurus. Mjanger, H., Nedreaas, K., Senneset, H. and Ågotnes, P. 2000. Procedure for age de-termination of Gadus morhua, Melanogrammus aeglefinus and Pollachius virens (in Norwegian).	Gjøsæter, H. and Nedreaas, K. 1999. Procedure for quality assurance of age determination of fish. Høie. H. 2009. Procedure for quality assurance of age determination of Gadus morhua, Melanogrammus aeglefinus and Pollachius virens at the Institute of Marine Research (in Norwegian).
Ireland, UK	Agri-Food & Biosciences Institute, Belfast,		There are two readers for most species. We plan to implement a quality system in the next year that will use otolith images and a quality manual. A first 'blind'			Sampling at sea aboard RV Corystes: pelagic fish, demersal fish, Nephrops, Scallops Sampling Nephrops & discards from commercial vessels	

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
	Northern Ireland, UK		reading with only information on area and date of capture is made . The biological data are then revealed and doubtful ages are checked. If the number of ages that need to be corrected exceeds 2-10 per 100 (depending on species), the whole sample is re-read. Portions of some samples are also re-read at a later date.			The production of slide mounted pelagic fish otoliths for fish ageing Age determination of Irish Sea demersal fish Age determination of Scallops Age determination of Irish Sea herring Otolin System for the Embedding Sectioning and Slide Mounting of Demersal Fish Otoliths. Sampling the N. Ireland landings of demersal fish Scale Reading: Salmonids. Freshwater Fish Processing Age Assessment of Coarse Fish by Scale Reading Ageing of Coarse Fish by Bone Reading	
Iceland	The Marine and Freshwater Research Institute (MFRI), Iceland		Yes we have an internal quality control – 1 times pr. year and use the Eltink spreadsheet.				We have quality management on local Quality handbook.
Latvia	Institute of Food Safety, Animal Health and Environment “BIOR”, Latvia					We have started to prepare written procedures for age estimation for all the species for which we determine the age.	
Lithuania	Klaipeda University Marine Research Institute, Lithuania	We have 1 age reader per species. Age reading is performed following instructions in relevant manuals and recommendations from		Not everyone is using this scale. AQ2 types take more time to evaluate. AQ3 are not	We do the age–length key check for illogical imputs and/or typos		

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
		relevant workshops. The quality is assured by age reader himself		counted at all, because it's unreadable.			
Netherlands	Wageningen Marine Research, the Netherlands	--	Yes. We aim to have at least 2 readers for each species. Regular calibration exercises are carried out between these readers. At the moment we are carrying out software development to be able to do yearly routine checks applying SmartDots@WMR, for each species at least three testsets which shall be (randomly) rotated among years.	Registering age readings in SmartDots@WMR is coupled to WMR databases. The AQ code is mandatory to be entered when reading the age sample. The AQ codes are defined as follows: AQ1 = Rings can be counted with certainty - age is assigned AQ2 = Rings can be counted with difficulty and some doubt - age is assigned AQ3 = Rings cannot be counted, the calcified structure is considered unreadable - points and age are removed so that age is not registered in the database, no age is assigned	Routine checks have been developed for internal data control. Data are checked according to these controls, and if there are issues, the people responsible for the particular sampling are contacted and asked to check and if needed correct the data. The checked and corrected data are imported into the national database at WMR. From that database, extractions are made for import primarily to DATRAS, usually after the completion of large surveys or combinations of surveys within the same season. In case problems with data are discovered, people responsible for data quality see to that routines for data validation and re-import according to internal protocols are followed, on a more or less continuous	Fish ageing: Bolle, L.J. et al. (2020) Handboek leeftijdsbepalingen (versie 3.0). CVO rapport 20.012. 119 pp. Fish sampling: van Damme, C. et al. (2021) CVO Handboek en protocollen voor bestandsopnamen en routinematige bemonsteringen op zee en in estuaria (Versie 15) CVO rapport 21.008. 294 pp.	Yes. The Centre for Fisheries Research (CVO), an organization stucture formed within but being independent of WMR, are responsible for carrying out data collection on commission by the government. CVO has an ISO 9001:2015 certified quality management system (certificate number: 268632-2018-AQ-NLD-RvA). Quality management and quality plans, describing

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
					basis. (See also reply to question "If Quality Management is Carried Out in Accordance with a Quality Plan...".)		quality control and responsibilities at each step in the data collection and data management, are described in the following internal documents. Ageing: Bolle, L.J. et al. (2020) Handboek leeftijdsbepalingen (versie 3.0). CVO rapport 20.012. 119 pp. Data collection (surveys): van Damme, C. et al. (2021) CVO Handboek en protocollen voor bestandsopnamen en routinematige bemonsteringen op zee en in estuaria (Versie

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
							15) CVO rapport 21.008. 294 pp. General quality management: CVO. (2020) Kwaliteitshandboek CVO (versie 11), document nummer 2.17.2.001. 33 pp.
Romania	National Institute for Marine Research and Development "Grigore Antipa", Constanta, Romania					Scales: preparation & reading Otoliths (whole and sectioned): preparation &reading//Carbonara, P., Follesa M.C. eds. 2018. Handbook on fish age determination: a Mediterranean experience. Studies and Reviews n. 98. General Fisheries Commission for the Mediterranean. Rome. Pp 197	not yet
Sweden	Swedish University of Agricultural Sciences, Department of Aquatic Resources, Institute of Coastal Research		Exchange of hard structures between readers, two specialists in age determination per species.			Sampling - Internationally assessed species, Non internationally assessed species, Coastal sampling as part of the national and regional monitoring programmes. Preparation and age estimation: Eel - otoliths mounted, ground, stained; Eelpout - otoliths mounted & Ground; Flounder, Herring and Turbot - Sectioned otoliths, stained & mounted on	All species have at least two readers. Quality control check are carried out annually on assesment species and every other year on

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
						custom microscope slides; Perch, Pikeperch, Vendace and Whitefish otoliths - burned & broken; Perch - operculum bone whole, Pike - wing bone whole.	other species. New readers have to reach specific targets in terms of % agreement before they become a primary reader.
Greenland	Pinngortitaleriffik, Greenland Institute of Natural Resources, Greenland		We have 2 readers per species (cod, mackerel and capelin) who carry out self checks twice a year on a set of otoliths. All otoliths where there is disagreement are discussed between readers. We use "Templates for Calculating Ageing Precision" by NOAA			None, but in progress.	
Russia	Atlantic Research Institute of Fisheries and Oceanography (AtlantNIRO), Russia	Separate readings by two persons				1) Report of the sardine (Sardine pilchardus) otolith workshop. FAO Fisheries Report No. 685. 2) Age Reading Manual of blue whiting. ICES (2005). Report of the Blue Whiting Otolith Ageing Workshop. 3) Kuderskaya R., 2007, On the Age Determinination Method for Younger Age Groups of West African Horse Mackerel (Trachurus trecae) from the Central Eastern Atlantic. 4) Kuderskaya R., 2007, Peculiarities of the Annual Growth Rings Formation in Otoliths of the Younger Age	

Country	MS institute	Individual[8]	Group[9]	Age quality scores[10]	QC checks[11]	Institute-specific manuals	Quality plan[12]
						Groups of Eastern Mackerel (Scomber japonicus) in the Canary Upwelling Area. 5) Kuderskaya R., 2004, Age determination of horse mackerel Trachurus trachurus Linnarus in the Central Eastern Atlantic.	
Russia	PINRO (Polar Branch of the Russian Federal Research Institute of Fisheries and Oceanography), Murmansk, Russia					1) Mankevich EM. 1966. Methods of taking and reading the age samples of cod. Materialy rybokhozjaistvennikh issledovanij Severnogo basseina, Murmansk 7:53-56 (in Russian). 2) Yaragina NA, Nedreaas KH, Koloskova VP, Mjanger H, Senneset H, Zuykova NV Ågotnes P. 2009. Fifteen years of annual Norwegian–Russian cod comparative age readings. Marine Biology Research 5: 54-65. 3) Prokhorova T.A. 2010. Features of winter ring formation on otoliths of the Atlanto-Scandian (Norwegian Spring-Spawning) herring (Clupea harengus harengus L.). Rybnoe Khoziaystvo № 2: 52-56 (in russian)	

Annex 5-Table 3. (Part 2) Quality status of age reading at institutes. Part 2: Evaluation of Internal Quality Management.

Country	MS institute	Satisfaction[13]	Challenges[14]	Improvements[15]	Ongoing validation or methodological studies in your lab[16]
Belgium	ILVO, Belgium	2			None
Cyprus	Department of Fisheries and Marine Research (DFMR), Cyprus	Our level of satisfaction is 1, since we consider there is much room for improvement. We consider there should be at least 2 age readers involved per species, and we have not yet started using the benefits of SmartDots on quality evaluation.	Lack of human resources for age reading has been the biggest challenge so far.	By increasing the personnel (and/or time) involved in age reading.	None
Denmark	DTU Aqua, Denmark	2. There is room for improvement because it is often difficult for the readers to find the time to read the QC samples. We have readers in 2 different locations so it can be difficult to check across labs when using physical samples. we also only have 1 lab with a sectioning machine. In 2022 we will have our own internal version of SmartDots and an associated otolith database.	First, time constraints and second, implementing the best methods for reading	With an internal version of SmartDots that we will adapt to our QA and data needs. This will also help us to organize our collection of otolith images and associated data. We will implement scripts for our own reporting needs.	1. A study comparing the sectioned and broken method for age reading cod https://smartdots.ices.dk/ViewEvent?key=269 and https://smartdots.ices.dk/ViewEvent?key=270 We have changed to the sectioned method for the western Baltic cod and hope to implement this for the Kattegat and North Sea stocks in future. 2. Hüssy, K., Casini, M., Haase, S., Hilvarsson, A., Horbowy, J., Krüger-Johnsen, M., Krumme, U., Limburg, K. E., McQueen, K., Mion, M., Olesen, H. J., & Radtke, K. (2020b). Tagging Baltic Cod – TABACOD. Eastern Baltic cod: Solving the ageing and stock assessment problems with combined state-of-the-art tagging methods. DTU Aqua Report no. 368-2020. National Institute of Aquatic Resources, Technical University of Denmark. 64 pp. ISBN:978-87-7481-290-6. We are co-chairing a NorthSea plaice workshop (under WGBIOP) with the aim to define reader guidelines for identification of the first wr and argreement on the best reading method.

[13] Please indicate your level of satisfaction with your Internal Quality Management and reasons for this. 1=not satisfied, much room for improvement; 2=satisfied but some room for improvement; 3=satisfied.

[14] What are the biggest challenges you have with your Internal Quality Management?

[15] How do you think you could improve your Internal Quality Management?

[16] Please provide any information on ongoing validation or method comparison studies in your lab.

Country	MS institute	Satisfaction[13]	Challenges[14]	Improvements[15]	Ongoing validation or methodological studies in your lab[16]
Estonia	Estonian Marine institute, University of Tartu	2	Develop internal age reading manuals. Moving towards having two experts for all species.	Develop internal age reading manuals. Moving towards having two experts for all spcecies.	None
Faroe Islands	Faroe Marine Research Institute (FaMRI), Tórshavn, Faroe Islands				
Finland	Natural Resources Institute Finland (Luke)	2	Passing knowledge and skills when the readers change, new fish species or populations		Continuous comparisons of bones and otoliths of perch (e.g.. 100 specimens), continuous comparisons of scales and otoliths of zander and whitefish (Coregonus), calibration of herring age readings between Luke (FI) and SLU (Swe).
France	IFERMER, France	2=satisfied but some room for improvement			some studies on the daily increment and on the marginal increment analyses are realized
Germany	Thünen Institute of Baltic Sea Fisheries (OF), Rostock	2 Once the ageing of flatfish is validated, the internal and international readers´ performance can be properly assessed. Traditional ageing of Eastern Baltic cod is still a challenge.	At present there are no big challenges for internal quality management.	Age validated material from flatfish and Eastern Baltic cod	validation of ring pattern formation on Eastern Baltic cod; age validation of Baltic plaice, flounder, turbot and dab
Germany	Germany Johann Heinrich von Thünen Institute (vTI), Institute of Sea Fisheries (SF)				
Greenland	Pinngortitaleriffik, Greenland Institute of	2	lack of experience	courses for age readers	

Country	MS institute	Satisfaction[13]	Challenges[14]	Improvements[15]	Ongoing validation or methodological studies in your lab[16]
	Natural Resources, Greenland				
Greece	HCMR, Institute of Marine Biological Resources and Inland Waters, Greece	2	we are investigating the potential automatic otolith reading using machine learning for further control. .	We are planning to perform quality control on a subsample of each species yearly. Furthermore, we are investigating the potential automatic otolith reading using machine learning for further control. Train more staff on various technics	daily rings have been used for the validation of the first annulus for some species and machine-learning approach has been developed for some species
Greece	Fisheries Research Institute, FRI-ELGO, Greece: Eel	2=satisfied but some room for improvement, due to the complex life history of the species, it is quite challenging to perform age determination and to apply certain protocols.			
Greece	Fisheries Research Institute, FRI-ELGO, Greece: Small pelagics and Demersal species	2=satisfied but some room for improvement A number of QC checks are performed, though, we would like to establish a more specified plan.	The lack of protocols and validation studies specified for the Mediterranean stocks (since there are a lot of differences with the Atlantic ones), and the lack of human resources.	Run validation studies, enrich staff.	There are no ongoing studies at the moment.
Ireland	Marine Institute, Ireland	3	As we move over to SmartDots for more training and internal QC we have to update our SOPS and this is work in progress We are also critically looking at the % agreement thresholds for the		None

Country	MS institute	Satisfaction[13]	Challenges[14]	Improvements[15]	Ongoing validation or methodological studies in your lab[16]
			different stocks to decide which is the best level to have as an internal flag to indicate if there is an issues with our ageing between readers		
Italy	Italy Large Pelagics: UNIMAR, Rome Italy				
Italy	Italy Demersal and small pelagic: CNR - National Research Council – IAMC, Mazara del Vallo, CNR - National Research Council – IAMC, Capo Gratinola CNR - National Research Council – IAMC, Messina CNR - National Research Council – ISMAR, Ancona, Department of Life and Environmental Sciences University of Cagliari, Cagliari, Italy Centro Interuniversitario Di Biologia Marina	1	There are several Institute/readers involved in the fish age analysis and it is difficult to harmonize the age scheme, age criteria, preparation methods	Organization of workshop on the species and/or group of species at level of Italian National Coordinator	Carbonara et al. 2018 A holistic approach to the age validation of Mullus barbatus L., 1758 in the Southern Adriatic Sea (Central Mediterranean). Scientific Reports vol. 8, Article number: 13219. Basilone et al. 2020. First annulus formation in the European anchovy; a two-stage approach for robust validation. Scientific Reports vol. 10 Article number: 1079.

Country	MS institute	Satisfaction[13]	Challenges[14]	Improvements[15]	Ongoing validation or methodological studies in your lab[16]
	Ed Ecologia Applicata CIBM "G. Bacci", Livorno, Italy COISPA - Stazione Sperimentale per lo Studio delle Risorse del Mare, Bari Italy. Department of Zoology - University of Bari, Bari, Italy				
Italy	Italy European Eel: Laboratory of Experimental Ecology and Aquaculture , Department of Biology, University of Rome "Tor Vergata", Italy				
Poland	National Matine Fisheries Research Institute (NMFRI), Poland	2	Lack of the second reader for some species.	Training new readers.	
Portugal	Portuguese Institute for Sea and Atmosphere, I. P. (IPMA)				Engraulis encrasicolus, European anchovy (daily rings); Sardina pilchardus, sardine (daily rings); Micromesistius poutassou, blue whiting (otolith morphometric relationships); Scomber colias, Atlantic chub mackerel (edge type analysis, coorte analysis); Scomber scombrus, Atlantic mackerel (edge type analysis, marginal increment analysis)

Country	MS institute	Satisfaction[13]	Challenges[14]	Improvements[15]	Ongoing validation or methodological studies in your lab[16]
Portugal	University of the Azores / Department of Oceanography and Fisheries, Portugal				
Spain	Spain: Instituto Español de Oceanografía, C.O. of Malaga, Murcia and Baleares - Mediterranean area.	1-	Not enough staff working on age readings		No
Spain	AZTI	2. Monitoring of agreement percentaje through time	Developing internal age reading manuals.	Developing internal age reading manuals.	None.
Spain	Instituto Español de Oceanografía (IEO), Centro Oceanográfico de Santander, Coruña, Vigo y Cádiz. ICES area and Long Distance areas// // Centro Oceanográfico de Canarias and Cadiz CECAF area	2			Daily increment studies and analyses of the marginal increment.
Sweden	Swedish University of Agricultural Sciences, Department of Aquatic Resources,				

Country	MS institute	Satisfaction[13]	Challenges[14]	Improvements[15]	Ongoing validation or methodological studies in your lab[16]
	Institute of Coastal Research				
Sweden	Swedish University of Agricultural Science, Department of Aquatic Resources, Institute of Freshwater Research				
Sweden	Swedish University of Agricultural Sciences, Department of Aquatic Resources, Institute of Marine Research				
UK (England)	UK (England) Cefas				
UK (Scotland)	Scotland Marine Science Scotland	Satisfaction = 3	Time issues: Our readers have many other tasks associated with data collection therefore getting the quartrly internal exchanges completed in a timely fashion and reports produced is always cahllenging. Losing experienced readers who are difficult to replace.		

Country	MS institute	Satisfaction[13]	Challenges[14]	Improvements[15]	Ongoing validation or methodological studies in your lab[16]
Malta	Agriculture and Fisheries Regulation Division, Malta				
Slovenia	Fisheries Research Institute of Slovenia (FRIS), Slovenia				
Norway	Institute of Marine Research, Bergen, Norway	3	Differences between experienced and new readers		No studies planned
Ireland, UK	Agri-Food & Biosciences Institute, Belfast, Northern Ireland, UK				
Iceland	The Marine and Freshwater Research Institute (MFRI), Iceland				
Latvia	Institute of Food Safety, Animal Health and Environment “BIOR”, Latvia				
Lithuania	Klaipeda University Marine Research Institute, Lithuania	3	So far so good		

Country	MS institute	Satisfaction[13]	Challenges[14]	Improvements[15]	Ongoing validation or methodological studies in your lab[16]
Nether-lands	Wageningen Marine Research, the Netherlands	3	The biggest challenge is to allow enough resources (time, money) for personnel involved in data collection to take part in Internal Quality Management.	By following the age reading handbook (Bolle et al. 2020) as well as recommendations coming from for example ICES Working Groups, and taking new issues and findings into account to improve data quality. It is often when data are used in specific studies that new questions arise, or problems with data quality are noticed. Providing channels for feedback, to check data and if relevant to improve methods etc., is essential.	None at present, except for freshwater fish species. For pikeperch (Sander lucioperca) and bream (Abramis brama), pilot projects are ongoing, also in collaboration with institutes abroad, e.g. SLU-Aqua, to compare age readings using traditional methods (scales) with otoliths.
Romania	National Institute for Marine Research and Development “Grigore Antipa”, Constanta, Romania				
Sweden	Swedish University of Agricultural Sciences, Department of Aquatic Resources, Institute of Coastal Research				
Green-land	Pinngortitaleriffik, Greenland Institute of				

Country	MS institute	Satisfaction[13]	Challenges[14]	Improvements[15]	Ongoing validation or methodological studies in your lab[16]
	Natural Resources, Greenland				
Russia	Atlantic Research Institute of Fisheries and Oceanography (AtlantNIRO), Russia				
Russia	PINRO (Polar Branch of the Russian Federal Research Institute of Fisheries and Oceanography), Murmansk, Russia				

Annex 5-Table 4. (Part 1) Quality status of maturity reading at institutes[17]. Part 1: Internal Quality Management.

Country	MS institute	Individual[18]	Group[19]	QC checks[20]	Grading system[21]	Institute-specific manuals	Quality plan[22]
Spain	IEO-Project BIODEMER //Macroscopic maturity //Species: European hake (M. merluccius); Ling (M. molva); Pouting (T. luscus); John dory (Z. faber); red striped mullet (M. Surmuletus); greater forkbeard (P. blennoides); blackbelly rosefish (H. dactylopterus). Microscopic maturity: european conger eel (C. conger)	No	Macroscopic maturity stages are read by experts technicians as part of biological sampling	Images of the different stages of maturity are being taken as part of tasks in routine biological sampling in order to have visual maturity keys for all species that will help in the correct assignment of maturity stages		European hake, Greater forkbeard, Pouting and Ling (WKMSGAD, 2013); John dory and Striped red mullet (BIOSDEF project); Blackbelly rosefish (Mendoça *et al.,* 2006); European conger eel (we can identify two main groups: inmature or mature)	
Spain	Instituto Español de Oceanografía (IEO), Atlantic demersal sps	No	Maturity reading are made by two people				

[17] Note: Table has been slightly modified to fit into the WGBIOP 2021 report. Full table will be available to download as an .xlsx file from the WGBIOP community page.

[18] If Quality Control is Managed by an Individual Maturity Reader how are the QC checks carried out ? Please provide details on the number of samples included, what analysis is used, frequency, image based or not.

[19] If Quality Control is Managed by a Group of Maturity Reader how are the QC checks carried out? Please provide details on the number read and samples included, what analysis is used, frequency, image based or not.

[20] If you conduct routine QC checks on your data before it is uploaded to the international databases please provide some details.

[21] Are you using any kind of grading system to evaluate the certainty of the given reproductive organs stage or to evaluate the mature or immature state of a fish? If so, which grading system do you use and how?

[22] If Quality Management is Carried Out in Accordance with a Quality Plan please provide details.

Country	MS institute	Individual[18]	Group[19]	QC checks[20]	Grading system[21]	Institute-specific manuals	Quality plan[22]
	Spain: Instituto Español de Oceanografía, C.O. of Malaga, Murcia and Baleares - Mediterranean area.	We have 1 readers per species . Then the readings are checked by the coordinators for outliers. Then associated individuals are checked again and discarded.	Not applicable	Not applicable	No grading system	We follow the manuals produced by the different WKs by species	
Spain	IEO project BIOPEL macroscopic maturity pelagic species: Anchovy, sardine, mackerel, chub mackerel, horse mackerel, blue waiting.		The maturity states are assigned in the biological samples from the fleet that are carried out in different IEO laboratories and also in the surveys. Therefore they are managed by a group of readers.	No	We are not using any kind of grading system	The preparation, mature stage asignation, data storage and sample storage are described in detail inin several documents and deposited in the IEO repository.	
Spain	Instituto Español de Oceanografía (IEO), Centro Oceanográfico de Cádiz. ICES area Ixa	In general, for all species (Nephrops, Cephalopods (Loligo vulgaris, Sepia officinalis, Octopus vulgaris), Anchovy, Sardine, Scomber colias, Pagellus bogaraveo) , the maturity estimation is performed by an individual reader				The manuals for maturity scales can be find in: Anchovy/ Sardine/ Mackerel: Workshop for small pelagic maturity (WKSPMAT2009), Nephrops: Report of the Workshop on crustaceans maturity stages (WKMSC2009), Loligo/Octopus/ Sepia: Report of the Workshop on Sexual Maturity Staging of Cephalopods (WKMSCEPH2010), Pagellus bogaraveo:	

Country	MS institute	Individual[18]	Group[19]	QC checks[20]	Grading system[21]	Institute-specific manuals	Quality plan[22]
						Holden & Rett , adapted to hermaphrodite species (Holden, M.J. and D.F.S. Raitt. – 1974. Manual of fisheries science. Part 2. Methods of resource investigation and their application. FAO Fish. Tech. Rep., (115): Rev. 1, 214 pp.)	
Spain	IEO_ EREME project (Coruna, Vigo and Santander institutes). EREME project collaborates with other projects such as BIOPEL and BIOPESLE to improve data quality. We work with macro and microscopic maturity in ICES area : mackerel, horse mackerel, sardine, Lepidorhombus boscii, L. wiffiagonis, Micromessistius potassou, anchovy and chub mackerel and in NAFO area: greenland halibut, cod, american plaice and Macrourus berglax.		A maturity workshop is held annually before the surveys in NAFO to review the maturity stages and to emphasize the peculiarities of each species in that area and time of the year. This is not quality control, but it helps to impprove the quality of maturity data.			EREME provide photographic maturity manuals and based on the ICES maturity workshop reports. Pictures are taken in the area and time when sampling is carried out. The macroscopic maturity stages are validated with histology. For those species (such as halibut or cod) that have a wide size range, each maturity stage is illustrated with different sized females. Those manuals are distributed to homogenize readers. EREME have also protocols for histological slide readings for cod , greenland halibut, Macrourus	The EREME project plans to provide histologically validated photographic maturity manuals for all ICES and NAFO species and to hold a maturity workshop before the PELACUS survey (pelagic fish) and the DEMERSALES survey (demersal fish) in which the maturity stages of each species and their particularities will be recalled.

Country	MS institute	Individual[18]	Group[19]	QC checks[20]	Grading system[21]	Institute-specific manuals	Quality plan[22]
						berglax's and mackerel to homogenize different readers.	
Spain	AZTI	No	Percentage of agreement amount all readers on samples of 50 individuals.A species per year.	GSI plot	No grading system.	Not internal manuals, staging based on: WALSH 1990; BIOSDEFF 1998; WKMSHM 2007; WKSPMAT 2008; WKMSGAD 2013;	No
Germany	Thünen Institute of Baltic Sea Fisheries (Rostock)	not relevant	At least 2 readers per species or species group. We use macroscopic staging only. No specific number of samples; mutual comparisons using processing of fresh fish in the lab and at sea	databases use standard consistency checks	no grading system in place. Maturity determination follows the scales given in the relevant ICES reports and manuals (e.g. Manual for the BITS, BASS, BIAS etc)	Image collections, peer-reviewed publications on maturity of fish from the Baltic Sea, ICES reports	A "quality plan" is not used.
Germany	Thünen Institute of Sea Fisheries (Bremerhaven)	not relevant	only macroscopic staging, depending on species 2 -5 staging personell, mutual comparisons are done during processing	databases use standard consistency checks	no grading system in place. Maturity determination follows the scales given in the relevant ICES reports and manuals (e.g. Manual for the IBTS, MEGS etc)	Image collections, ICES reports, peer-reviewed publications	A "quality plan" is not used.
Latvia	Institute of Food Safety, Animal Health and Environment “BIOR”, Latvia	Maturity staging is performed following instructions in relevant national manuals. The quality is assured by responsible researcher of given	Yes. We have at least 1-2 perons involved in maturuty staging of every species			All national manuals are besed on Kisilevich 6 grade scale	

Country	MS institute	Individual[18]	Group[19]	QC checks[20]	Grading system[21]	Institute-specific manuals	Quality plan[22]
		species. Maturity is done for cod, herring, sprat, flounder, turbot, perch and round goby.					
Estonia	Estonian Marine Institute, University of Tartu		1-2 maturity readers per species, depends if commercial sample or survey. Using macroscopic staging only.	No	No	Using Kiselevich 6-grade scale (e.g. shown in BITS manual).	None
France	Ifremer	Internal Quality Management	One group at National level	No	no grading system to evaluate the quality of maturity data	Manuals of IBTS, EVHOE and MEDITS surveys	
Faroe Islands	Faroe Marine Research Institute (FaMRI), Tórshavn, Faroe Islands	In general, for all species , the maturity estimation (macroscopic) is performed by an individual reader following national manuals/protocols. For pelagic species a group of four skilled persons discuss internally once or twice a year, to intercalibrate the staging procedures					
Cyprus	Department of Fisheries and Marine Research (DFMR), Cyprus		Maturity staging is performed usually by 1-2 persons for every species, macroscopically, based on instruction manuals used. From commercial fisheries,	No	No	Medits Instruction Manuals; Follesa, M.C., Carbonara, P., eds. 2019. Atlas of the maturity stages of Mediterranean fishery resources. Studies and Reviews	A "quality plan" is not used.

Country	MS institute	Individual[18]	Group[19]	QC checks[20]	Grading system[21]	Institute-specific manuals	Quality plan[22]
			maturity staging involves 5 demersal and 3 large pelagic species (all bony fish); samples collected per demersal species are around 300. In total, 6 persons are involved in maturity reading, but are not dedicated to this activity.			n. 99. Rome, FAO. 268 pp.; ICCAT manual (https://www.iccat.int/Documents/SCRS/Manual/CH4/CH4_8-ENG.pdf)	
Ireland	Marine Institute, Ireland	QC checks by individual collecting the data when an individual fish processed, again at the end of a sample. Additional QC checks by Chief scientist.	NA	Any maturity stages that are not recognized by datras are removed. Maturity stage is plotted against length, outliers are investigated		Institute-specific, not published.	NA
Poland	National Marine Fisheries Research Institute	Maturity staging of different fish species is determined by different readers who are in fact technicians attending onboard observer trips. Observers are not selected due to target fish species to be exploited in a given fishing trip. To be flexible in choosing observers (their availability) all technicians were trained by experienced staff to	Not carried out so far	No	Not currently used - under preparation	BITS Manuals; Guidebook for Baltic cod (Gadus morhua callarias L, 1758) gonad's maturity determination according to modified Maier's 8-stage scale. Working Paper on the ICES Workshop on Maturity Ogive estimation for Stock Assessment [WKMOG] in Lizbon,;Portugal, 3-6 June 2008. Guidebook for the Baltic sprat (Sprattus	Not carried out

Country	MS institute	Individual[18]	Group[19]	QC checks[20]	Grading system[21]	Institute-specific manuals	Quality plan[22]
		estimate maturity of all possible fish species.				sprattus balticus, Schneider, 1904) gonad's maturity determination according to modified Maier's 8-stage scale. Working Paper on the ICES Workshop on Maturity Ogive estimation for Stock Assessment [WKMOG] in Lizbon,;Portugal, 3-6 June 2008.	
Belgium	ILVO		No QC in place on a routine basis, but participation in maturity workshops and exchanges when appropriate	No	Not yet but we are planning to do so.	ICES reports are used	No
Portugal	IPMA - Portuguese Institute Sea Atmosphere	In general, macroscopic maturity assignation is carried out by a single reader (usually an experienced one), but several readers perform maturity assignation for the same species (e.g. at different geographical locations in Portugal). Internal training and/or calibration exercises take place periodically. Microscopic maturity estimation is performed by an	No QC checks are carried out by a group of readers	Maturity data from individuals sampled from commercial fleet (i.e. at-market and at-sea sampling) goes through QC checks after being registered in the national database (e.g. scale used for species*sex, length-maturity stage plots). Maturity data from Portuguese bottom-trawl surveys (PT-IBTS) are checked by each species coordinator.	No grading system is being used till present to evaluate the certainty of a given reproductive organs stage	All manuals for sexual maturity assignation used have been compiled in the WKASMSF 2018 report. A manual including all maturity scales in usage at IPMA is currently being elaborated. An internal manual for histology processing is avaliable at IPMA.	No Quality Plan exists.

Country	MS institute	Individual[18]	Group[19]	QC checks[20]	Grading system[21]	Institute-specific manuals	Quality plan[22]
		individual reader for all species. Loliginidae and Ommastrephidae: no microscopic evaluation is performed.					
UK	Cefas, Uk	No	We don't have a specific team dedicated to this but we have training in place and carry out QC during every survey.			Use national mauals, descriptions and keys	
Italy	University of Cagliari; COISPA	Maturity staging is performed following instructions in Follesa, M.C., Carbonara, P., eds. 2019. Atlas of the maturity stages of Mediterranean fishery resources. Studies and Reviews n. 99. Rome, FAO. 268 pp. The quality is assured by responsible researcher of given species. Maturity is done for a lot of bony fish, elasmobranchs, Crustaceans and Cephaolopods.	yes			Follesa, M.C., Carbonara, P., eds. 2019. Atlas of the maturity stages of Mediterranean fishery resources. Studies and Reviews n. 99. Rome, FAO. 268 pp.	
Greece	Institute of Marine Biological Resources and Inland Waters (HCMR)	No	Maturity stages are assissegned in the biological samples carried out in the Laboratories and also on	We conduct random microscopic checks on a number of maturity samples to verify the maturity	No	ICES maturity scales from various reports, MEDITS protocols, Folessa et al 2019 (ATLAS ON THE	Microscopic examination of gonads is used as well Length at maturiry curve is checked for outliers

Country	MS institute	Individual[18]	Group[19]	QC checks[20]	Grading system[21]	Institute-specific manuals	Quality plan[22]
			board. Although there is a group of people involved in maturity staging, some of them are specialst to different species or taxa.	staging. This procedure is also applied if the identification of the maturity stage is uncertain.		MATURITY STAGES OF MEDITERRANEAN FISHERY RESOURCES), and Nikolsky maturity scale.	
Greece	Fisheries Research Institute, FRI-ELGO, Greece	Not an Individual Maturity Stager.	For every biological sample there are at least 2 Maturity Stagers.	First, QC check is performed by cross-checking the two (at least) Maturity Stagings. Since maturity is evaluated macroscopically in our lab, we conduct random microscopic checks on a number of maturity samples to verify the accuracy of the maturity staging. After that, data are uploaded on a local database and some automatic checks are performed. Finally, quality assessment is conducted.	No grading system has been used till present to evaluate the certainty of the given reproductive organs stage or to evaluate the mature or immature state of a fish.	Follesa, Maria & Carbonara, Pierluigi & Agus, Blondine & Basilone, Gualtiero & Bellodi, Andrea & Bottari, Teresa & Cannas, Rita & Capezzuto, Francesca & Carpentieri, Paolo & Cau, Alessandro & Colella, Sabrina & Casciaro, Loredana & Cuccu, Danila & Donnaloia, Marilena & Gancitano, Vita & Gaudio, Palma & Maiorano, Porzia & Mancusi, Cecilia & Mannini, Alessandro & Lanteri, Luca. (2019). ATLAS ON THE MATURITY STAGES OF MEDITERRANEAN FISHERY RESOURCES.	We always use the same macroscopic scale for staging (Nicolsky 1976 for Bony fish, ICCAT scale for Big pelagic, Buellens et al. 1977 for European eel, WKMSCEPH 2010 for Cephalopods, WKMSC for crustaceans and MEDITS scale for survey samples). We use an agreed reference manual per species. There are at least two stagers for every sample. Random microscopic checks are performed. A posteriori quality assessment is conducted, based on the analysis of the relevant data (regression model on maturity data to calculate Lm).
Netherlands	Wageningen Marine Research	No	We have multiple readers by species,		No	Internal handbooks for surveys, discards and commercial	Not yet, in 2021 we are running a project to prepare an

Country	MS institute	Individual[18]	Group[19]	QC checks[20]	Grading system[21]	Institute-specific manuals	Quality plan[22]
			but there is no QA workplan			sampling contain information on how to assess maturity; ICES reports	internal handbook for QA of maturity
Finland	Natural Research Institute Finland (Luke)	With herring, a manual with photographs (DTU Aqua, Denmark) is used	In the surveys, different maturity readers have the chance to discuss about their interpretations. Some workshops between readers have taken place (not recently, though).			Herring manual by DTU Aqua, Denmark. With other species, national short manuals with text only.	
Denmark	Technical University of Denmark, Institute for Aquatic Resources (DTU AQUA)	In general, for all species , the maturity estimation (macroscopic and microscopic) is performed by an individual reader following national manuals/protocols.	No			All maturity manuals for gadoids, flatfish, pelagics are being updated in 2019/2020 to follow the new revised WKMATCH maturity scale. Stages verified histologically. Protocols for reading histological sections are available for cod and herring (mackerel under prep.)	None
Sweden	SLU Aqua Institute of Marine Research	No QC in place on a routine basis but Inter-calibration workshop in spring each year with fresh and frozen gonads including all maturity stagers. Whole mount is used sometimes to				Modified danish manual (gadoids and pelagics), WKMSSPDF Manual (Flatfish). Manuals will be updated to follow the new SMSF maturity scale	None

Country	MS institute	Individual[18]	Group[19]	QC checks[20]	Grading system[21]	Institute-specific manuals	Quality plan[22]
		validate the stages but only in the lab not surveys.					
Sweden	SLU Aqua Intitute of Coastal Research						
Norway	Institute of Marine Research	In general, for all species , the maturity estimation (macroscopic and microscopic) is performed by an individual reader following national manuals/protocols.	No		No	All maturity manuals for gadoids, flatfish, pelagics are being updated in 2019/2020 to follow the new revised WKMATCH maturity scale. Stages verified histologically. Protocols for reading histological sections are available for cod and herring (mackerel under prep.); Mjanger et al., 2019. Handbook for sampling fish, crustaceans and other invertebrates	None

Annex 5-Table 5. (Part 2) Quality status of maturity reading at institutes. Part 2: Evaluation of Internal Quality Management.

Country	MS institute	Satisfaction[23]	Challenges[24]	Improvements[25]	Ongoing validation or methodological studies in your lab[26]
Spain	IEO-Project BIODEMER //Macroscopic maturity //Species: European hake (M. merluccius); Ling (M. molva); Pouting (T. luscus); John dory (Z. faber); red striped mullet (M. Surmuletus); greater forkbeard (P. blennoides); blackbelly rosefish (H. dactylopterus). Microscopic maturity: european conger eel (C. conger)	2		Continue to take pictures of different states of maturity in biological samplings. Build a complete manual with images of the entire maturation process by species	
Spain	Instituto Español de Oceanografía (IEO), Atlantic demersal sps				
Spain	Spain: Instituto Español de Oceanografía, C.O. of Malaga, Murcia and Baleares - Mediterranean area.	3 - Not enough staff working on maturity readings			
Spain	IEO project BIOPEL macroscopic maturity pelagic species: Anchovy, sardine, mackerel, chub mackerel, horse mackerel, blue waiting.	2		Microscopic and macroscopic validation would be very useful, but currently we do not have sufficient technical means or personnel	

[23] Please indicate your level of satisfaction with your Internal Quality Management and reasons for this. 1=not satisfied, much room for improvement; 2=satisfied but some room for improvement; 3=satisfied.

[24] What are the biggest challenges you have with your Internal Quality Management?

[25] How do you think you could improve your Internal Quality Management?

[26] Please provide any information on ongoing validation or methodological studies in your lab

Country	MS institute	Satisfaction[23]	Challenges[24]	Improvements[25]	Ongoing validation or methodological studies in your lab[26]
Spain	Instituto Español de Oceanografía (IEO), Centro Oceanográfico de Cádiz. ICES area Ixa				
Spain	IEO_ EREME project (Coruna, Vigo and Santander institutes). EREME project collaborates with other projects such as BIOPEL and BIOPESLE to improve data quality. We work with macro and microscopic maturity in ICES area : mackerel, horse mackerel, sardine, Lepidorhombus boscii, L. wiffiagonis, Micromessistius potassou, anchovy and chub mackerel and in NAFO area: greenland halibut, cod, american plaice and Macrourus berglax.	2.	In ICES area, one species maturity data are taken in different laboratories located along the Galician and Cantabrian coasts. It is important to provide protocols and manuals to help homogenize the collection of maturity data of all species.	Working on completing the existing maturity manuals as there are maturity stages for which we have not yet obtained samples. On the other hand, to elaborate maturity manuals for all species.	
Spain	AZTI	2: Monitoring of agreement percentaje through time	be up to date with decisions and changes made at species level understand the reproductive cycle of each species	Developing maturity reading refence catalog along with histologycla validation.	Internal maturity staging excercise on Horse Mackerel during november 2020
Germany	Thünen Institute of Baltic Sea Fisheries (Rostock)	3 Reason: consistent results and relatively high internal agreement between readers	At present there are no big challenges.	possibly increase standardization of internal comparisons; ensure clearer and more transparent in-house documention of procedures and documentation/presentation of the outcomes to the staff; develop R routines to compare readers performance on a routine basis	no ongoing studies in the field of maturity research
Germany	Thünen Institute of Sea Fisheries (Bremerhaven)	3 Reason: consistent results and relatively high internal agreement between readers	At present there are no big challenges.	possibly increase standardization of internal comparisons; ensure clearer and more transparent in-house documention of procedures and documentation/presentation of the outcomes to the staff; develop R	no ongoing studies in the field of maturity research

Country	MS institute	Satisfaction[23]	Challenges[24]	Improvements[25]	Ongoing validation or methodological studies in your lab[26]
				routines to compare readers performance on a routine basis	
Latvia	Institute of Food Safety, Animal Health and Environment "BIOR", Latvia				
Estonia	Estonian Marine Institute, University of Tartu	2	With ICES assessed stocks no big challaneges. Readers are able to to discuss and compare their estimates in the surveys where they participate together annually. Would benefit from specific manuals for other species (e.g. pikeperch)	Set up maturity events on SmartDots to inter- and intracalibrate (ICES stocks). Develop manuals for regionally important stocks.	None
France	Ifremer	1	to qualify the data	develop the histological approach to better qualify the macroscopic approach	a PhD thesis started in September 2020 on the histological approach applied to 4 species (striped red mullet, blue withing and 2 species of megrim, this work follows that already carried out on plaice
Faroe Islands	Faroe Marine Research Institute (FaMRI), Tórshavn, Faroe Islands	2	Maturity stages for mackerel can be problematic during the spawning season, difficult to determine between prespawning and spawning (the gonad can be pre in the front and spawning in the rear end)		
Cyprus	Department of Fisheries and Marine Research (DFMR), Cyprus	Our level of satisfaction with our Internal Quality Management is 2. There is room for improvement, e.g. Establishment of routine exercises among maturity readers for evaluating the agreement among them and	We do not validate maturity stages assigned macroscopically with histology. We do not perform exercises for evaluating agreement among maturity readers.	Routinely take pictures of different maturity stages by species sampled covering the whole sampling period, and identify cases with no clear (macroscopically) maturity staging. Histological validation would improve our internal Quality Management, but at	None.

Country	MS institute	Satisfaction[23]	Challenges[24]	Improvements[25]	Ongoing validation or methodological studies in your lab[26]
		identifying possible quality issues.		the moment there are limitations for developing this approach.	
Ireland	Marine Institute, Ireland	2	We do not routinely validate maturity stages assigned by eye (macroscopically) with histology	Histological validation would be useful but this requires a lot of resources, which we currently allocate to more high-priority work.	None
Poland	National Marine Fisheries Research Institute	1	at sea sampling mainly on fishing boats/cutters	establishing a dedicated maturity determination group, more samples elaborated in the Lab	no studies performed
Belgium	ILVO	1	Lack of time to check each other scores. Lots of samples have to be processed in the lab, so the scoring process is rather fast. No ability to check afterwards the given score again.	It will be good to have some ideas on how other labs handle this :-).	none
Portugal	IPMA - Portuguese Institute Sea Atmosphere	2=satisfied but some room for improvement	In maturity scales validation: 1) For some species, biological sampling not carried out regularly, covering the whole reproductive cycle, samples only available from annual surveys (ex: Anglers); 2) For some species, not all maturity stages available in samples collected (ex: Nephrops norvegicus, Scomber colias); 3) Insufficient human resources and laboratory availability to process histologically the gonad samples to clarify/validate maturity assignment doubts in due time; In internal maturity stages calibration: logistically challenging for the maturity readers of the same species working geographically distant.	Priority should be given to microscopically validate the maturity scales in usage.	Ongoing maturity stage validation studies using histology for several species (Engraulis encrasicolus, Micromesistius poutassou, Scomber scombrus, Scomber colias, Trachurus picturatus, Nephrops norvegicus, Lepidorhombus boscii)
UK	Cefas, UK				

Country	MS institute	Satisfaction[23]	Challenges[24]	Improvements[25]	Ongoing validation or methodological studies in your lab[26]
Italy	University of Cagliari; COISPA				
Greece	Institute of Marine Biological Resources and Inland Waters (HCMR)	2	to conduct histological studies	using histological sections	validation is performed indirectly by comparing the macroscopic stages with GSI data.
Greece	Fisheries Research Institute, FRI-ELGO, Greece	2=satisfied but some room for improvement: need for international and interlaboratory scale so all training and reference can apply easier, need for validation studies in Mediterranean.	Lack of equipment and lack of human resources.	Maturity workshops for training, validation studies, enrich stuff.	There are no ongoing studies at the moment.
Netherlands	Wageningen Marine Research	1, currently we have not a plan in place, but in 2021 we will prepare a QA internal handbook			We had some specific projects in the past, but with the new internal handbook and QA workplan we will implement the preparation of validation as well
Finland	Natural Research Institute Finland (Luke)	2	With ICES assessed stocks, no big chanllenges: readers are able to discuss and compare their estimates in the surveys where they participate together annually.	By continuing comparisons, also with calibrations.	
Denmark	Technical University of Denmark, Institute for Aquatic Resources (DTU AQUA)	2	Maturity stagers generally work individually and maturity stage on fresh fish on surveys. No follow-up.	Set up maturity events on SmartDots to inter- and intracalibrate.	All maturity manuals for gadoids, flatfish, pelagics are being updated in 2019/2020 to follow the new revised WKMATCH maturity scale. Stages are verified histologically.

Country	MS institute	Satisfaction[23]	Challenges[24]	Improvements[25]	Ongoing validation or methodological studies in your lab[26]
Sweden	SLU Aqua Institute of Marine Research	2	We do not routinely validate maturity stages assigned by eye (macroscopically) with histology. Lack of time for quality check due to the huge amount of samples to be processed	Set up maturity events on SmartDots to inter- and intracalibrate. Verified Stages histologically.	All maturity manuals for gadoids, flatfish, pelagics have been updated in 2021 to follow the new revised SMSF maturity scale.
Sweden	SLU Aqua Institute of Coastal Research				
Norway	Institute of Marine Research	2			

Annex 6: Additional information (ToR c)

Annex 6-Table 5. Issues table.

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
2022	sal.nac.all	Salmon (Salmo salar) from North America	WKSALMON2 2021	31/12/2021			*no issue list and available*			
						Age	_	_	The last Workshop on Age Determination of Salmon (WKADS 2) was in 2012,	No WGBIOP action required.
						Maturity	_	_	No need to be collected – all returning adults are mature	
2022	sal.neac.all	Salmon (Salmo salar) in Northeast Atlantic and Arctic Ocean	WKSALMON2 2021	31/12/2021			*no issue list available*			
						Age	EXTENT OF DCF COVERAGE UNCLEAR; SAMPLING INTENSITIES IN OTHER FISHERIES INAPPROPRIATE TO SALMON	Improve coverage and sampling intensity in DC-MAP	The last Workshop on Age Determination of Salmon (WKADS 2) was in 2012,	No WGBIOP action required.
						Maturity	_	_	No need to be collected – all returning adults are mature	

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
2022	sal.wgc.all	Salmon (Salmo salar) in Subarea 14 and NAFO division 1 (east and west of Greenland)	WKSALMON2 2021	31/12/2021			*no issue list available*		-	
						Age	_	_	The last Workshop on Age Determination of Salmon (WKADS 2) was in 2012,	No WGBIOP action required.
						Maturity	_	_	No need to be collected – all returning adults are mature	
2022	sal.27.22-31	Salmon (Salmo salar) in subdivisions 22-31 (Baltic Sea, excluding the Gulf of Finland)	_	autumn 2022	martin.kesler@ut.ee		*no issue list available*		-	
						Age	_	_	The scale exchange is ongoing on smartdots (id 357). Coordinators: Zuzanna Mirny and Adam Lejk (Poland)	Inform the stock coordinator about the ongoing exchange.
						Maturity	_	_	No need to be collected – all returning adults are mature	No WGBIOP action required.

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
2022	cap.27.1-2	Capelin (Mallotus villosus) in subareas 1 and 2 (Northeast Arctic), excluding Division 2.a west of 5°W (Barents Sea capelin)	WKREDCAP 2022	20-24.06.2022	belikov@pinro.murmansk.ru		*no issue list available*			
						Age	_	_	Every second year age readers from PINRO, Murmansk and IMR, Bergen come together and evaluate discrepancies, which are seldom more than 1 year, and the results show an improvement over the period. A capelin age reading Workshop was in 2016; PA=99.3% (otoliths sampled in June 2015) and 87,3% (otoliths sampled in winter 2016), which is considered to be high. The next age	Inform the stock coordinator about the workshop report and ask if the results from the exchange in 2019 are available.

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP ac-tions
									reading Workshop for capelin was planned for October 2019.	
						Maturity	_	_	_	_
2022	cap.27.2a514		WKREDCAP 2022	20-24.06.2022	birkir.bardarson@hafog-vatn.is, tej@aqua.dtu.dk		*no issue list availa-ble*			

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
		Capelin (Mallotus villosus) in subareas 5 and 14 and Division 2.a west of 5°W (Iceland and Faroes grounds, East Greenland, Jan Mayen area)				Age	_	_	Non-ICES exchange took place between Norway, Iceland, Russia and Canada in 2010-11, PA=91.5%	Inform the stock coordinator about the workshop results.
						Maturity	_	_	_	No WGBIOP action required.
2022	pra.27.1-2	Northern shrimp (Pandalus borealis) in subareas 1 and 2 (Northeast Arctic)	WKPRAWN 2022	24-28.01.2022			*no issue list and stock annex available*			
						Age	For crustaceans, for which age is difficult to determine because of the lack of ageing characteristics, estimation of catch-at-age based on cohort slicing or age–length keys (ALKs) may prevent precise population estimates in cases when annual	_	No ditrct age reading is available for this stock.	No WGBIOP action required.

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
							growth variation is evident			
						Maturity	_	_	_	No WGBIOP action required.
2022	pra.27.3a4	Northern shrimp (Pandalus borealis) in divisions 3.a and 4.a East (Skagerrak and Kattegat and northern North Sea in	WKPRAWN 2022	24-28.01.2022	mats.ulmestrand@slu.se	Age	For crustaceans, for which age is difficult to determine because of the lack of ageing characteristics, estimation of catch-at-age based on cohort slicing or age–length keys (ALKs) may prevent precise population estimates in cases when annual growth variation is evident	_	No ditrct age reading is available for this stock.	No WGBIOP action required.

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
		the Norwegian Deep)				Maturity	Pandalus is a protandric hermaphrodite, i.e. the individuals are born as males and then become females. In the Skagerrak and Norwegian Deep, sex change takes place at-age 2 during summer. Based on the on-board sampling of the commercial catches, maturity data on size distributions (in length of the carapace in mm) of the shrimp in the catches are available and used in the assessment. The proportion of females at length was fitted to a logistic maturity curve.	–	–	

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
2022	cod.27.7a	Cod (Gadus morhua) in Division 7.a (Irish Sea)	WKNSCS 2022	7-11.02.2022	Sofie.Nimmegeers@ilvo.vlaanderen.be (WGCSE chair)	M	The natural mortality as well as maturity are unclear, with an observed migration of Irish Sea cod into the Celtic Sea and environmental changes of cod experienced in the Irish Sea due to increased temperature. The increased temperature might impact on an increased natural mortality and decreased maturity in older/larger fish due to metabolic issues.	One option to identify a shift in natural mortality would be to calculate the natural mortality from eth FSP survey, as the fishing pressure for the past years has been negligeble. Additional work is being done on tagging to understand the biological response to increasing ocean temperatures and migratory behaviour.	_	No WGBOP action required.
						Stock identity	The prviously benchmarked assessment model (ASAP) was rejected at the WGCSE 2019 due to its large retrospective pattern in F and SSB and a consistent downward revision of SSB and upward revision of F. The stock is currently reviewed as part of the WKMSYSpict	No new catch data or survey indices are required as these data have been prepared recently. However the data will have to closely investigated as to which to use for the assessment. Should a category 1 assessment fail to be agreed, adittional data will have to come from the DST tagging project to provide the data-limited approach the highest ecological and biological precision.	_	No WGBIOP action required.

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
							benchmark, however it might not lead to a success after initial data compilation workshop. However, It is aimed to keep cod7a as an example.			
						Maturity	The stock identity of Irish Sea cod is at the moment unclear. It is understood that mature fish migrate out of the area, such as the Celtic Sea. However it is unknown whether the migration is permanent or whether the fish still contribute to the SSB or recruitment in area 7A.	The migratory pattern of cod and the stock structure is being investigated using DST tags, otolith trace element analysis and genetics. The use of DST tags will hopefully also shed light on the movement of cod in the Irish Sea itself regarding temperature.	The last Workshop on sexual maturity staging of cod (WKMSGAD) was in 2013. Maturity stages: 1 - 5 (with the exception of 4 for females). Overall agreement for females was 77% (based on modal stage) and 73% (based on histology); Overall	Inform the stock coordinator about the workshop report.

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP ac-tions
									agreement for males was 69% (based on modal stage) and 66% (based on histology)	
						Age	_	_	no age-based assesment; The last age validation workshop was in 2013: Report of the Workshop on Age Valida-tion Studies of Gadoids (WKAVSG)	Inform the stock coordi-nator about the workshop report.
2022	ple.27.7fg		WKNSCS 2022	7-11.02.2022	vladimir.laptikhov-sky@cefas.co.uk		*no issue list availa-ble*			

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
		Plaice (Pleuronectes platessa) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea)				Maturity	A maturity ogive based on UK(E&W) 7.f–g survey data for March 1993 and March 1994 was produced in 1997 and is applied to all years in the assessment. The recent size of 50% maturity was estimated from results of surveys by “Cefas Endeavour” in the area 7.fg in 2015 and 2016.	_	_	No WGBIOP action required.
						Age	-	_	The last age calibration for plaice 27.7fg was an otolith exchange in 2019 (smartdots id 221); PA=75%; CV=18%; APE = 10% for advanced readers	Inform the stock coordinator about the results.

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
2022	ple.27.420	Plaice (Pleuronectes platessa) in Subarea 4 (North Sea) and Subdivision 20 (Skagerrak)	WKNSCS 2022	7-11.02.2022	chun.chen@wur.nl	Age	-	_	The last age calibration for Plaice in Skagerrak and the North Sea was an otolith exchange in 2020 (smartdots event 281). PA=69%, CV=56%	Inform the stock coordinator about the results.
						Maturity	-	_	Plaice maturity staging exchange to include immature fish was carried out in 2020 (SmartDots event 282). PA=60%; The report is not available on SmartDots.	Inform the stock coordinator about the results.

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
2022	had.27.46a20	Haddock (Melanogrammus aeglefinus) in Subarea 4, Division 6.a, and Subdivision 20 (North Sea, West of Scotland, Skagerrak)	WKNSCS 2022	7-11.02.2022	needlec@marlab.ac.uk / h.cole@marlab.ac.uk	Age	_	_	The last age calibration for haddock 27.1-6 was an otolith exchange in 2019 (smartdots id 235), results for advanced readers - broken otoliths: PA=78%, CV=19%, sectioned: PA=74%, CV=21% An age reading workshop for haddock is planned for 2022.	Inform the stock coordinator about the results.
						Maturity	The assessment uses a knife-edge maturity-at-age 3 (that is, maturity = 0.0 for ages 0–2, and maturity = 1.0 for ages ≥ 3).	Derive time-varying maturity estimate.	The last maturity WK for haddock was a Workshop on sexual maturity staging of cod, whiting, haddock, saithe and hake (WKMSGAD) in 2013	Inform the stock coordinator about the workshop report.

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
						Mean weights-at-age	Mean weights-at-age for total catch are used for stock weights.	Derive estimates of mean weights at age for stock.	_	No WGBIOP action required.
2022	her.27.6a7bc	Herring (Clupea harengus) in divisions 6.a and 7.b-c (West of Scotland, West of Ireland)	WKNSCS 2022	7-11.02.2022	cecilie.kvamme@hi.no: afra.egan@marine.ie (HAWG chairs)	Age	Lack of information on recruitment and the abundance of fish of younger ages	Recruitment index from MIK -Explore survey index calculation with different assumptions of North Sea – 6a boundary. Does that improve cohort tracking and temporal stability of the index.	The last herring age calibration was an otolith exchange in, 2015, overall PA=69,1%, CV=18,8%	Inform the stock coordinator about the results.
							Absence of older ages in catch and surveys in 6aN	Consider link to North Sea		
						Maturity	Maturity-at-ages 2 and 3 is highly variable among years	Examine maturity-at-age data over time and compare with maturity ogive used in the assessment	The last herring maturity calibration was a WK in 2017, PA=52% (validated) and 76% (modal); maturity range=1-4 & 6	Inform the stock coordinator about the results.
2022	reb.27.5a14	Beaked redfish	WKNORTH 2022	_	RaHe@natur.gl / jbo@aqua.dtu.dk		*no issue list available*			

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
		(Sebastes mentella) in Subarea 14 and Division 5.a, Icelandic slope stock (East of Greenland, Iceland grounds)				Age	The advice is based on the Data Limited Stock approach (DLS). Otolith sampling started in 2016, however aging has not been conducted and no age-based assessment is therefore possible.	_	An exchange for Beaked Redfish from area 21 and 27 started in 2020 and is ongoing (smartdots id 298); Coordinator: Lise Heggebakken (Norway)	Inform the stock coordinator about the exchange.
						Maturity	_	_	Maturity is not used in the assesment	No WGBOP action required.
2022	ghl.27.1-2	Greenland halibut (Reinhardtius hippoglossoides) in subareas 1 and 2 (Northeast Arctic)	WKNORTH 2022	_	elvar.hallfredsson@hi.no		*no issue list available*			

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
					Age		The report from Workshop on Age Reading of Greenland Halibut (WKARGH) (ICES CM 2011/ACOM:41) described and evaluated several age reading methods for Greenland Halibut. A second workshop (WKARGH 2) was conducted in August 2016 and worked on further validation on new age reading methods. The workshop recommended that two of new methods can be used to provide age estimations for stock assessments. Further, recognizing some bias and low precision in methods, the WKARGH2 recommends that an ageing error matrix or growth curve with error be provided for use in future stock assessments (WKARGH2 report	AFWG suggests that Russian and Norwegian scientists and age readers meet to work out issues of disagreements on Greenland halibut aging.	The last age calibration of greenland halibuth was an otolith exchange prior to the WKARGH2 in 2016. Frozen whole right otolith method CV 15.5% Thin-sectioned left otolith method CV 17.5% PA was not defined.	Inform the stock coordinator about the results.

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
							2016, ICES CM 2016/SSGIEOM:16). WKARGH2 recommends regular inter-lab calibration exercises to improve precision. The new age readings are not comparable with older data or the Russian age readings, and the new methods show that the species is more slow-growing and vulnerable than the previous age readings suggest.			

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
						Maturity	At present in the analytical assessment ogives are calculated based on data from all EggaNor surveys since 2000.	_	The last maturity calibration of greenland halibuth was a Workshop on Sexual Maturity Staging of Redfish and Greenland Halibut (WKMSREGH) in 2011.	Inform the stock coordinator about the workshop report.
2022	ghl.27.561214	Greenland halibut (Reinhardtius hippoglossoides) in subareas 5, 6, 12, and 14 (Iceland and Faroes grounds, West of Scotland, North of Azores, East of	WKNORTH 2022	_	tej@aqua.dtu.dk (NWWG chair)		*no issue list available*			
						Age	Considerable ageing problems are still unsolved, it seems that present ageing underestimates the current age of fish more than a few years old. Therefore since 2001 no age readings of otoliths were available from the main fishing areas. Otoliths are still being sampled in hope that this problem will be solved in future.	_	The last age calibration of greenland halibuth was an otolith exchange prior to the WKARGH2 in 2016. Frozen whole right otolith method CV 15.5% Thin-sectioned left otolith method CV 17.5%	Inform the stock coordinator about the results.

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP ac-tions
		Green-land)							PA was not defined.	
						Maturity	_	_	_	No WGBOP action re-quired.
2022	cod.21.1	Cod (Ga-dus morhua) in NAFO Subarea 1, in-shore (West Green-land cod)	WKNORTH 2022	_	tej@aqua.dtu.dk (NWWG chair)		*no issue list availa-ble*			
						Age	_	_	The last age validation workshop was in 2013: Report of the Workshop on Age Valida-tion Studies of Gadoids (WKAVSG)	Inform the stock coordi-nator about the workshop report.

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
						Maturity	The maturity ogive for the two periods (1987 vs. 2007–2016) was estimated by a general linear model (GLM) with binomial errors. The ogives for the two periods are estimated to be different. L50 from 1987 was 5.07 years (SE = 0.18), and for 2007–2016 L50 was 4.32 years (SE = 0.04). It was decided to use the years with very low catches (600–800 tonnes) as transition years between the two maturity ogives. The maturity ogive for the period 1976–2006 was set constant to the estimated 1987 ogive. For the remaining period (2007–2016) the maturity ogive was fixed at the 2007–2016 estimates.	_	The last Workshop on sexual maturity staging of cod (WKMSGAD) was in 2013. Maturity stages: 1 - 5 (with the exception of 4 for females). Overall agreement for females was 77% (based on modal stage) and 73% (based on histology); Overall agreement for males was 69% (based on modal stage) and 66% (based on histology)	Inform the stock coordinator about the workshop report.
2022	cod.21.1a-e	Cod (Gadus	WKNORTH 2022		tej@aqua.dtu.dk (NWWG chair)		*no issue list available*			

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP ac-tions
		morhua) in NAFO divisions 1.A-E, offshore (West Green-land)				Age	_	_	no age-based assesment; The last age validation workshop was in 2013: Report of the Workshop on Age Valida-tion Studies of Gadoids (WKAVSG)	Inform the stock coordi-nator about the workshop report.
						Maturity	The majority of the maturity infor-mation is based on a survey in 2009 and on extensive sampling from commercial experi-mental fishery in 2007. The maturity ogive was esti-mated by a general linear model (GLM) with binomial er-rors. L50 was esti-mated to 5.19 years (SE = 0.07). Since 2018 a sepa-rate ogive was esti-mated based on cod sampled from an experimental fishery in the same spawning area as in 2007. The two	_	The last Workshop on sexual maturity staging of cod (WKMS-GAD) was in 2013. Ma-turity stages: 1 - 5 (with the exception of 4 for fe-males). Over-all agree-ment for fe-males was 77% (based on modal stage) and 73% (based on histology); Overall agreement for males was 69% (based	Inform the stock coordi-nator about the workshop report.

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP ac-tions
							maturity ogives were similar.		on modal stage) and 66% (based on histology)	
2022	por.27.nea	Porbeagle (Lamna nasus) in subareas 1-10, 12 and 14 (the Northeast Atlantic and adjacent waters)	WKELASMO 2022	7-11.03.2022	Jurgen.Batsleer@wur.nl; pascal.lorance@ifremer.fr (WGEF chairs)		*no issue list available*			
						Age	Further age and growth studies are needed to provide growth parameters for the NE Atlantic porbeagle stock. (SA)	_	_	No WGBIOP action required.
						Maturity	-	_	_	
2022	rjc.27.8	Thornback ray	WKELASMO 2022	7-11.03.2022			*no issue list available*			

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
		(Raja clavata) in Subarea 8 (Bay of Biscay)			Jurgen.Batsleer@wur.nl; pascal.lorance@ifremer.fr (WGEF chairs)	Age	-	_	Vertebrae exchange of Elasmobranchs in Mediterranean and Atlantic was going to take place in 2020, but have been postponed to 2021. Coordinators: Karen Bekaert (Belgium) and Kelig Mahe (France)	Inform the stock coordinator about the exchange.
						Maturity	-	_	Raja spp Maturity staging exchange (smartdots event ID 398) is ongoing. Coordinators: Maria Cristina Follesa (Italy) and Karen Baekert (Belgium). This exchange will follow up on recommendations by WKMSEL.	Inform the stock coordinator about the exchange.

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
2022	rju.27.7de	Undulate ray (Raja undulata) in divisions 7.d and 7.e (English Channel)	WKELASMO 2022	7-11.03.2022	alain.tetard@ifremer.fr		*no issue list available*			
						Age	-	_	_	No WGBIOP action required.
						Maturity	-	_	Raja spp Maturity staging exchange (smartdots event ID 398) is ongoing. Coordinators: Maria Cristina Follesa (Italy) and Karen Baekert (Belgium). This exchange will follow up on recommendations by WKMSEL.	Inform the stock coordinator about the exchange.
2022	rjn.27.678abd	Cuckoo ray (Leucoraja	WKELASMO 2022	7-11.03.2022			*no issue list and stock annex available*			

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
		naevus) in subareas 6-7 and divisions 8.a-b and 8.d (West of Scotland, southern Celtic Seas, and western English Channel, Bay of Biscay)			Jurgen.Batsleer@wur.nl; pascal.lorance@ifremer.fr (WGEF chairs)	Age	-	_	_	No WGBIOP action required.
						Maturity	-	_	_	
2022	ldb.27.8c9a	Four-spot megrim (Lepidorhombus boscii) in divisions 8.c and 9.a (southern Bay of Biscay and Atlantic	WKMEGANG 2022	_	esther.abad@ieo.es	Age	Age compositions of landings are based on annual Spanish ALKs since 1990, whereas a survey ALK from 1986 combined with an annual ALK from 1990 was applied to years 1986–1989. Landings weights-at-age are also used as the weights-at-age in the stock.	_	age is used in the assesment; Otolith exchange will take place in 2022 and the results will be ready for 2023. Coordinator: Jorge Landa (Spain).	Inform the stock coordinator about the exchange.

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
		Iberian waters East)				Maturity	Old maturity ogive and old L-W relationship (1996)	Update the maturity ogive and L-W relationship. Data required: Maturity data obtained by species and sex and for both sexes combined based on a more robust microscopic methodology and recent Length weight data from sampling program.	It is highly recommended to have histological results as the basis for establishing a validated macroscopic maturity scale.	No WGBIOP action required.
2022	meg.27.7b-k8abd	Megrim (Lepidorhombus whiffiagonis) in divisions 7.b-k, 8.a-b, and 8.d (west and southwest of Ireland, Bay of Biscay)	WKMEGANG 2022	_	airiondo@azti.es	Age	_	_	An exchange for Megrim 7.b-k - 8.abd age started in 2021 and is ongoing (smartdots id 355). Results are expected for the end of 2022. Coordinator: Jorge Landa (Spain)	Inform the stock coordinator about the exchange.
						Maturity	-Old maturity ogive. -Old L-W relationship.	-Update the maturity ogive. -Update L-W relationship.	_	No WGBIOP action required.

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
2022	meg.27.8c9a	Megrim (Lepidorhombus whiffiagonis) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)	WKMEGANG 2022	_	esther.abad@ieo.es	Age	_	_	The last megrim age calibration was an otolith exchange in 2020 (smartdots id 277); for stock assesment (advanced) readers PA=82%, CV=11%	Inform the stock coordinator about the results.
						Maturity	-Old maturity ogive. -Old L-W relationship.	-Update the maturity ogive. -Update L-W relationship. Data required:Maturity data obtained by species and sex and for both sexes combined based on a more robust microscopic methodology and recent Length weight data from sampling program.	_	No WGBIOP action required.

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
2022	mon.27.8c9a*	White anglerfish (Lophius piscatorius) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)	WKMEGANG 2022	_	paz.sampedro@ieo.es	Age	The last research about white anglerfish ageing, White Anglerfish Illicia and Otoliths Exchange 2011 (ICES, 2012b), highlighted that neither illicia nor otolith age readings have been validated and, in the case of illicia studies, the agreement among readers and the precision were not acceptable. Therefore, it was concluded that the available age-reading criteria for white anglerfish southern stock is not valid to build an ALK. (SA)	_	The results of the last age exchange in 2019 were not satisfactory. PA was only about 40% and the precision was low. No age information is available for this stock..	No WGBIOP action required.
						Maturity	• Maturity ogive: length-based logistic	_	The last maturity calibration exercise for white anglerfish was a Workshop on Sexual Maturity Staging of Hake and Monk (WKMSHM) in 2007.	

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
2022	mon.27.78abd	White anglerfish (Lophius piscatorius) in Subarea 7 and divisions 8.a-b and 8.d (Celtic Seas, Bay of Biscay)	WKMEGANG 2022	_	aurtizberea@azti.es	Age	Age data are not available for this stock. The age compositions of the catch and tuning indices are estimated (outside the assessment model) by applying a length-split to the length–frequency distributions. The mean lengths-at-age are estimated from a von Bertalanffy growth function (SA)	_	_	No WGBIOP action required.
						Maturity	knife-edge maturation Spawning females are very rarely observed which makes it difficult to estimate maturity.Based on estimates from the literature and sampling data from Ireland, the mean length-at-first maturity was estimated. WKAnglerfish (2018) decided to use female maturity in order to be conservative and also in an	_	The last maturity calibration exercise for white anglerfish was a Workshop on Sexual Maturity Staging of Hake and Monk (WKMSHM) in 2007.	

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
							attempt to make SSB more closely related to the reproductive potential of the stock (assuming that this is limited by the biomass of mature females). (SA)			
2022	ank.27.78abd	Black-bellied anglerfish (Lophius budegassa) in Subarea 7 and divisions 8.a-b and 8.d (Celtic Seas, Bay of Biscay)	WKMEGANG 2022		hans.gerritsen@marine.ie	Age	_	_	Age is not used in the assesment.	No WGBIOP action required.
						Maturity	Spawning females are very rarely observed, which makes it difficult to estimate maturity. Based on estimates from the literature and sampling data from Ireland, the mean length-at-	_	_	

Benchmark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
							first maturity was estimated. (SA)			
2023	her.27.25-2932	Herring (Clupea harengus) in subdivisions 25–29 and 32, excluding the Gulf of Riga (central Baltic Sea)		_	tomas.groehsler@thuenen.de	Age	Quality of age readings needs improvement.	Comparison of age readings. Reference otolith collection is needed.	The last age calibration for herring was an otolith exchange in 2016. The results are as follows: PA S1: 88–94%; S2: 52–85%; S3: 52–81%, S4: 87 – 96%, CV S1: 1.9–7.5%; S2: 1.9–7.5%; S3: 11–20%, S4: 4.0 – 8.1%, *S1-S3 - whole otoliths from SD 26 *S4 - sliced and stained otoliths from SD 30 and 32 The next otolith exchange for this stock is planned for 2022.	Inform the stock coordinator about the results.

Bench-mark year	Stock code	Species/ stock	Proposed WK	WK dates	Stock coordinator e-mail	Biological parameter	Issue (source: issue lists/stock annex)	Solution proposed (source: issue lists)	WGBIOP comments or questions	WGBIOP actions
						Maturity	Maturity is not used in the assessment.	_	_	No WGBIOP action required.
2023	spr.27.22-3	Sprat (Sprattus sprattus) in subdivisions 22–32 (Baltic Sea)		_	olavi.kaljuste@slu.se	Age	_	_	The last age calibration of baltic sprat was in 2021 (smartdots event: 323); results for advanced readers: PA=66%, CV=25%, bias=0,01. The next otolith exchange for this stock is planned for 2022.	Inform the stock coordinator about the results.
						Maturity	_	_	There was a Workshop on Sexual Maturity Staging of Herring and Sprat (WKMSHS2) in 2017, but no report is available.	No WGBIOP action required.

Annex 6-Table 6. Replies from stock coordinators in 2020.

Species/stock	biological parameters	replied to WGBIOP	advice taken onboard/considered	replies	follow-up WGBIOP	feedback
dgs.27.nea	age	yes	yes	In terms of calibration on itself, from previous experience with ageing elasmos we should consider both calibration and validation procedures. Saying this, my thoughts would be that this subject would benefit from a wider discussion between both WGEF and WGBIOP chairs on how to bring such work forward between the two groups and various members (and, not necessarily exclusively to spurdog). From my involvement with WGEF I know a fair share of members who have been involved in national projects for ageing elasmobranchs through the years, not exclusively on spurdog, but also other sharks and, skates and rays (e.g. Rajidae), so future collaborations between both groups would be of merit to combine efforts on ageing such species.		An exchange for elasmobranchs is being carried out in 2021, but spurdog is not included in this event.

Species/stock	biological parameters	replied to WGBIOP	advice taken onboard/considered	replies	follow-up WGBIOP	feedback
cod.27.1-2	age, maturity	yes	yes	Concerning age reading for NEA cod (cod.27.1-2), Norway and Russia has had a program with annual exchange of otoliths and biennial exchange of age readers since the early 1990s. We can send you our latest report (2019) if you like. Natalia Yaragina (cc on this e-mail) is the scientist who has followed this most closely over the years, so she can answer any questions you may have. We consider that the reports from this and preceding workshops provide enough documentation on age reding for the benchmark workshop. Concerning maturation staging intercalibration, we have not had such a regular programme and as far as I know NEA cod was not considered during WKMSGAD in 2013, Natalia could probably fill in with more info here also. (Bjarte Bogstad) We also done some evaluations of the possible impact of discrepancies in age reading on stock assessment based on the otholite exchege program. (Yury Kovalev) The latest report (2019) are saved on AFWG 2020 site as WD 8: Report on the meeting between Norwegian and Russian age reading specialists at Polar Branch of FSBSI “VNIRO” Murmansk, 20-24 May 2019. As for maturation staging intercalibration, we have not got such a regular programme. Russian and Norwegian Manuals are known to each side and during combining joint survey results we take this information into account. (Natalia Yaragina)	look for the latest age exchange report	

Species/stock	biological parameters	replied to WGBIOP	advice taken onboard/considered	replies	follow-up WGBIOP	feedback
her.27.30-31	maturity	yes	yes	We are indeed using (annually updated) maturities in the herring 3031 assessment. The maturities are determined from the aged individual samples from Finnish commercial fishery, and the information we are using in the assessment comes from the open sea samples that are taken before spawning time; i.e. January-March in SD 30 and April – May in SD 31 (the Bothnian Bay [SD 31] is mostly ice-covered still in March). The timing is because the spawners are still mixed with the non-spawners (young fish) and not separated into spawning schools where almost all are spawners. We have had several maturity-determination-calibration meetings with Sweden (with the SLU Lysekil Sea-lab and SLU Öregrund Coast-lab) starting when we were conducting the survey with the old Swedish research vessel Argos and Danish RV Dana, 2007 - 2012. We produced together a sort of a manual with photographs, and it was in use for a while, but later on we have applied the Danish guide (2013->). Since the scientific crew on the annually arranged survey come from all over the Finnish coast with participants also from Sweden, we have thought that being together in a 2-week survey serves as a good internal Finnish, and bilateral Finnish-Swedish maturity-calibration. So no, the exchange does not seem to be of any additional help. For some years we used a common maturity scale with Sweden (where maturing stage is divided to first time spawners and repeat-spawners), but that was considered too much time-consuming and uncertainty- and insecurity-inducing procedure for the fact that that information is not even used in the assessments. Or anywhere else either according to my knowledge.		
spr.27.7de	age	no	no			
fle.27.3a4	maturity	no	no			
sol.27.7d	age	no	no			Sole 7d age exchange was performed in 2021 (smrtdots event id 314). The results for advanced readers were as follows: PA 80%, CV 8%, APE 5%. More details can be

Species/stock	biological parameters	replied to WGBIOP	advice taken onboard/considered	replies	follow-up WGBIOP	feedback
						found in the report on SmartDots.
	maturity	no	no			
ple.27.7h-k	age	no	no			
	maturity	no	no			
dab.27.3a4	age	no	no			
	maturity	no	no			
bll.27.3a47de	age	no	no			
	maturity	no	no			
cod.27.47d20	age	no	no			The last age calibration for this stock was a long time ago. WGBIOP is considering organizing a new one.
	maturity	no	no			

Annex 6-Table 7. (Part 1). Quality indicators by stock–WGBIOP 2020 answers[27]. Part 1: Sampling Design, Stock Identity, Methods and Definitions.

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
NIPAG	*Pandalus borealis*	pra.27.4a	0. Quality of biological data not evaluated	N	Y	1. No mixing	0. No overview table	0. No overview table	0. No comparisons between labs	3. Estimated indirectly	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	2. Staging year-round				

[27] Note: Table has been slightly modified to fit into the WGBIOP 2021 report. Full table will be available to download as an .xlsx file from the WGBIOP community page.

[28] Were possible weaknesses of the survey design critically assessed?

[32] Documentation of different structures used by country and stock.

[35] Growth parameters are used in assessments (e.g. Nephrops). On what information are growth parameters based? Estimated by direct or indirect methods (e.g. tagging studies), extrapolated (from neighbouring regions), or assumed?

[36] Documentation of different structures used by country and stock.

[38] Do differences between countries exist(ed)? Have different national maturity scales been successfully merged into one international standard?

[39] Is the maturity staging conducted during the whole year or only during a specified period of the year?

[40] If sufficient maturity data are available, then spatially and/or temporally varying ogives can be considered.

[41] Different countries use different coding for male and female in their national databases. This should be standardised before the data are submitted to ICES/GFCM, but there is a risk of errors.

[43] On what information is the value for natural mortality based? Estimated (based on predator-prey studies), extrapolated from neighbouring regions or assumed?

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
NWWG	*Mallotus villosus*	cap.27.2a514																
NWWG	*Gadus morhua*	cod.21.1																
NWWG	*Gadus morhua*	cod.21.1a-e																

[37] Documentation of different preparation techniques used by country and stock.

[38] Do differences between countries exist(ed)? Have different national maturity scales been successfully merged into one international standard?

[39] Is the maturity staging conducted during the whole year or only during a specified period of the year?

[40] If sufficient maturity data are available, then spatially and/or temporally varying ogives can be considered.

[41] Different countries use different coding for male and female in their national databases. This should be standardised before the data are submitted to ICES/GFCM, but there is a risk of errors.

[42] Sexual dimorphism occurs in many species, but sex-specific parameters are only applicable in sex-specific stock assessments. Is sex-specific information available and needed? Are the sample sizes per strata representative enough to allow sex-specific conclusions?

[43] On what information is the value for natural mortality based? Estimated (based on predator-prey studies), extrapolated from neighbouring regions or assumed?

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
NWWG	*Gadus morhua*	cod.2127.1f14																
NWWG	*Gadus morhua*	cod.27.5a																
NWWG	*Gadus morhua*	cod.27.5b1	0. Quality of biological data not evaluated	N	Y	1. No mixing	0. No overview table	1. Overview table available	1. No differences	4. Estimated directly	0. No overview table	1. Overview table available	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	2. Careful selection of a type of ogive	2. International database correct	1. Preliminary analyses of sex-specific issues	3. Estimated

			Sampling Design			Stock ID	Methods and Definitions											
EG	Species	Stock	All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
NWWG	*Gadus morhua*	cod.27.5b2	0. Quality of biological data not evaluated	N	Y	1. No mixing	0. No overview table	1. Overview table available	1. No differences	4. Estimated directly	0. No overview table	1. Overview table available	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	2. Careful selection of a type of ogive		1. Preliminary analyses of sex-specific issues	1. Assumed
NWWG	*Reinhardtius hippoglossoides*	ghl.27.561214																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
NWWG	*Melanogrammus aeglefinus*	had.27.5a	0. Quality of biological data not evaluated	N	Y	1. No mixing	0. No overview table	1. Overview table available	1. No differences	4. Estimated directly	0. No overview table	1. Overview table available	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	2. Careful selection of a type of ogive	2. International database correct	1. Preliminary analyses of sex-specific issues	1. Assumed
NWWG	*Melanogrammus aeglefinus*	had.27.5b																
NWWG	*Clupea harengus*	her.27.5a																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
NWWG	*Pollachius virens*	pok.27.5a																
NWWG	*Pollachius virens*	pok.27.5b	0. Quality of biological data not evaluated	N	Y	2. Mixing exists: not accounted for	1. Overview table available	1. Overview table available	1. No differences	4. Estimated directly	0. No overview table	1. Overview table available	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	2. Careful selection of a type of ogive		1. Preliminary analyses of sex-specific issues	1. Assumed
NWWG	*Sebastes mentella*	reb.2127.dp																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
NWWG	*Sebastes mentella*	reb.2127.sp																
NWWG	*Sebastes mentella*	reb.27.14b																
NWWG	*Sebastes mentella*	reb.27.5a14																
NWWG	*Sebastes norvegicus*	reg.27.561214																
WGBAST	*Salmo salar*	sal.27.22-31																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBAST	*Salmo salar*	sal.27.32																
WGBAST	*Salmo trutta*	trs.27.22-32																
WGBFAS	*Scophthalmus rhombus*	bll.27.22-32																

			Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
EG	Species	Stock	Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBFAS	*Gadus morhua*	cod.27.21	1. Preliminary analysis of quality of biological data	Y	N/A	3. Mixing exists: accounted for, not validated	0. No overview table	1. Overview table available	1. No differences	4. Estimated directly	0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGBFAS	*Gadus morhua*	cod.27.22-24																
WGBFAS	*Gadus morhua*	cod.27.24-32																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBFAS	*Limanda limanda*	dab.27.22-32	1. Preliminary analysis of quality of biological data	Y	Y	1. No mixing	0. No overview table	1. Overview table available	0. No comparisons between labs	4. Estimated directly	0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBFAS	*Platichthys flesus*	fle.27.2223	1. Preliminary analysis of quality of biological data	Y	Y	1. No mixing	0. No overview table	1. Overview table available	0. No comparisons between labs	4. Estimated directly	0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBFAS	*Platichthys spp*	bwq.27.2425	1. Preliminary analysis of quality of biological data	Y	Y	2. Mixing exists: not accounted for	0. No overview table	1. Overview table available	0. No comparisons between labs	4. Estimated directly	0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBFAS	*Platichthys spp*	bwq.27.2628	1. Preliminary analysis of quality of biological data	Y	N/A	2. Mixing exists: not accounted for	0. No overview table	1. Overview table available	0. No comparisons between labs	4. Estimated directly	0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGBFAS	*Platichthys solemdali*	bwp.27.2729-32	0. Quality of biological data not evaluated	Y	Y	2. Mixing exists: not accounted for	0. No overview table	1. Overview table available	0. No comparisons between labs	4. Estimated directly						2. International database correct	0. Sex-specific issues not evaluated	1. Assumed

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBFAS	*Clupea harengus*	her.27.25-2932	1. Preliminary analysis of quality of biological data	Y	Y	3. Mixing exists: accounted for, not validated	0. No overview table	0. No overview table	2. Differences between labs are known but ingnored	1. Assumed	0. No overview table	0. No overview table	1. Differences between labs are known but ingnored	2. Staging year-round	2. Careful selection of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBFAS	*Clupea harengus*	her.27.28	1. Preliminary analysis of quality of biological data	Y	Y	6. Mixing exists: markers study and good spatio-temporal coverage of mixing	1. Overview table available	0. No overview table	1. No differences	4. Estimated directly	0. No overview table	0. No overview table	1. Differences between labs are known but ingnored	2. Staging year-round	2. Careful selection of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGBFAS	*Clupea harengus*	her.27.3031																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBFAS	*Pleuronectes platessa*	ple.27.21-23																
WGBFAS	*Pleuronectes platessa*	ple.27.24-32	2. Detailed analysis of the quality of biological data	Y	Y	2. Mixing exists: not accounted for	0. No overview table	1. Overview table available	2. Differences between labs are known but ingnored	4. Estimated directly	0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	2. Careful selection of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGBFAS	*Solea solea*	sol.27.20-24																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBFAS	*Sprattus sprattus*	spr.27.22-32	1. Preliminary analysis of quality of biological data	Y	Y	0. No evidence	1. Overview table available	1. Overview table available	1. No differences		0. No overview table	0. No overview table	1. Differences between labs are known but ingnored	2. Staging year-round	2. Careful selection of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	4. Assessed (SMS key runs, ...)
WGBFAS	*Scophthalmus maximus*	tur.27.22-32	1. Preliminary analysis of quality of biological data	Y	Y	1. No mixing	0. No overview table	1. Overview table available	0. No comparisons between labs	4. Estimated directly	0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	2. Careful selection of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBIE	*Lophius budegassa*	ank.27.78abd	2. Detailed analysis of the quality of biological data	N/A	N/A	2. Mixing exists: not accounted for				3. Estimated indirectly	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	2. Careful selection of a type of ogive		1. Preliminary analyses of sex-specific issues	3. Estimated
WGBIE	*Lophius budegassa*	ank.27.8c9a																
WGBIE	*Dicentrarchus labrax*	bss.27.8ab																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBIE	*Dicentrarchus labrax*	bss.27.8c9a																
WGBIE	*Merluccius merluccius*	hke.27.3a46-8abd	0. Quality of biological data not evaluated	N	N	2. Mixing exists: not accounted for	0. No overview table	0. No overview table	0. No comparisons between labs	1. Assumed	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	2. Staging year-round	3. Selection of type of ogive based on thorough analysis of all options	1. Potential errors in international database	1. Preliminary analyses of sex-specific issues	1. Assumed

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBIE	*Brosme brosme, Merluccius merluccius*	hke.27.8c9a			Y	0. No evidence				3. Estimated indirectly	2. Overview table complete and up-to-date	2. Overview table complete and up-to-date		1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)			2. Detailed analysis of sex-specific issues	
WGBIE	*Lepidorhombus boscii*	ldb.27.7b-k8abd																
WGBIE	*Lepidorhombus boscii*	ldb.27.8c9a																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBIE	*Lepidorhombus whiffiagonis*	meg.27.7b-k8abd	0. Quality of biological data not evaluated	N	N/A	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs	1. Assumed	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	2. Staging year-round	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGBIE	*Lepidorhombus whiffiagonis*	meg.27.8c9a																
WGBIE	*Lophius piscatorius*	mon.27.78abd																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBIE	*Lophius piscatorius*	mon.27.8c9a	0. Quality of biological data not evaluated	N	N/A	2. Mixing exists: not accounted for	0. No overview table	0. No overview table	0. No comparisons between labs	3. Estimated indirectly	0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	3. Selection of type of ogive based on thorough analysis of all options	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGBIE	*Nephrops norvegicus*	nep.fu.2324																
WGBIE	*Nephrops norvegicus*	nep.fu.25																

			Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
EG	Species	Stock	Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBIE	*Nephrops norvegicus*	nep.fu.2627																
WGBIE	*Nephrops norvegicus*	nep.fu.2829	0. Quality of biological data not evaluated	N	N/A	0. No evidence				2. Extrapolated	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGBIE	*Nephrops norvegicus*	nep.fu.30																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBIE	*Nephrops norvegicus*	nep.fu.31																
WGBIE	*Pleuronectes platessa*	ple.27.89a																
WGBIE	*Pollachius pollachius*	pol.27.89a	0. Quality of biological data not evaluated	N	N/A	2. Mixing exists: not accounted for	0. No overview table	0. No overview table	0. No comparisons between labs	2. Extrapolated	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	2. Staging year-round	3. Selection of type of ogive based on thorough analysis of all options	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGBIE	*Solea solea*	sol.27.8ab																
WGBIE	*Solea solea*	sol.27.8c9a	0. Quality of biological data not evaluated	N	N/A	2. Mixing exists: not accounted for	0. No overview table	0. No overview table	0. No comparisons between labs	2. Extrapolated	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	2. Staging year-round	3. Selection of type of ogive based on thorough analysis of all options	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGBIE	*Merlangius merlangus*	whg.27.89a																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGCSE	*Lophius budegassa, Lophius piscatorius*	anf.27.3a46	0. Quality of biological data not evaluated	N	N													
WGCSE	*Dicentrarchus labrax*	bss.27.4bc7ad-h	0. Quality of biological data not evaluated	N	N	2. Mixing exists: not accounted for	0. No overview table	0. No overview table	0. No comparisons between labs		0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive	1. Potential errors in international database	2. Detailed analysis of sex-specific issues	1. Assumed
WGCSE	*Dicentrarchus labrax*	bss.27.6a7bj																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGCSE	*Gadus morhua*	cod.27.6a																
WGCSE	*Gadus morhua*	cod.27.6b																
WGCSE	*Gadus morhua*	cod.27.7a																
WGCSE	*Gadus morhua*	cod.27.7e-k																
WGCSE	*Melanogrammus aeglefinus*	had.27.6b																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGCSE	*Melanogrammus aeglefinus*	had.27.7a																
WGCSE	*Melanogrammus aeglefinus*	had.27.7b-k	2. Detailed analysis of the quality of biological data	Y	Y	2. Mixing exists: not accounted for			1. No differences 2. Differences between labs are known but ignored	4. Estimated directly					2. Careful selection of a type of ogive	2. International database correct		3. Estimated
WGCSE	*Lepidorhombus*	lez.27.4a6a																
WGCSE	*Lepidorhombus*	lez.27.6b																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGCSE	*Nephrops norvegicus*	nep.27.6aoutFU																
WGCSE	*Nephrops norvegicus*	nep.27.7outFU																
WGCSE	*Nephrops norvegicus*	nep.fu.11																
WGCSE	*Nephrops norvegicus*	nep.fu.12																
WGCSE	*Nephrops norvegicus*	nep.fu.13																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGCSE	*Nephrops norvegicus*	nep.fu.14																
WGCSE	*Nephrops norvegicus*	nep.fu.15																
WGCSE	*Nephrops norvegicus*	nep.fu.16																
WGCSE	*Nephrops norvegicus*	nep.fu.17																
WGCSE	*Nephrops norvegicus*	nep.fu.19																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGCSE	*Nephrops norvegicus*	nep.fu.2021																
WGCSE	*Nephrops norvegicus*	nep.fu.22																
WGCSE	*Trisopterus esmarkii*	nop.27.6a																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGCSE	*Pleuronectes platessa*	ple.27.7a	0. Quality of biological data not evaluated	N	Y	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs		0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive	1. Potential errors in international database	2. Detailed analysis of sex-specific issues	1. Assumed
WGCSE	*Pleuronectes platessa*	ple.27.7bc																
WGCSE	*Pleuronectes platessa*	ple.27.7e																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGCSE	*Pleuronectes platessa*	ple.27.7fg																
WGCSE	*Pleuronectes platessa*	ple.27.7h-k																
WGCSE	*Pollachius pollachius*	pol.27.67																
WGCSE	*Ammodytes*	san.27.6a																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGCSE	*Solea solea*	sol.27.7a	0. Quality of biological data not evaluated	N/A	N/A	1. No mixing	0. No overview table	1. Overview table available	1. No differences 2. Differences between labs are known but ingnored		0. No overview table	0. No overview table	1. Differences between labs are known but ingnored		3. Selection of type of ogive based on thorough analysis of all options			1. Assumed
WGCSE	*Solea solea*	sol.27.7bc																
WGCSE	*Solea solea*	sol.27.7e																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGCSE	*Solea solea*	sol.27.7fg	0. Quality of biological data not evaluated	N/A	N/A	1. No mixing	0. No overview table	1. Overview table available	1. No differences 2. Differences between labs are known but ingnored		0. No overview table	0. No overview table	1. Differences between labs are known but ingnored		3. Selection of type of ogive based on thorough analysis of all options			1. Assumed
WGCSE	*Solea solea*	sol.27.7h-k																
WGCSE	*Merlangius merlangus*	whg.27.6a																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGCSE	*Merlangius merlangus*	whg.27.6b																
WGCSE	*Merlangius merlangus*	whg.27.7a	1. Preliminary analysis of quality of biological data	Y	Y	2. Mixing exists: not accounted for	0. No overview table	0. No overview table	0. No comparisons between labs	4. Estimated directly	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	3. Estimated
WGCSE	*Merlangius merlangus*	whg.27.7b-ce-k																

			Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
EG	Species	Stock	Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGDEEP	*Beryx*	alf.27.nea																
WGDEEP	*Argentina silus*	aru.27.123a4	1. Preliminary analysis of quality of biological data	Y	Y	1. No mixing	1. Overview table available	1. Overview table available	3. Differences clearly documented and considered in data compilation	4. Estimated directly	1. Overview table available	1. Overview table available	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	2. Careful selection of a type of ogive	1. Potential errors in international database	2. Detailed analysis of sex-specific issues	1. Assumed

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGDEEP	*Argentina silus*	aru.27.5a14	2. Detailed analysis of the quality of biological data	Y	Y	1. No mixing	0. No overview table	0. No overview table	3. Differences clearly documented and considered in data compilation	4. Estimated directly	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	3. Selection of type of ogive based on thorough analysis of all options	2. International database correct	2. Detailed analysis of sex-specific issues	1. Assumed
WGDEEP	*Argentina silus*	aru.27.5b6a																
WGDEEP	*Argentina silus*	aru.27.6b7-1012	0. Quality of biological data not evaluated	N	N	0. No evidence	0. No overview table	0. No overview table	1. No differences									

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGDEEP	*Molva dypterygia*	bli.27.5a14	0. Quality of biological data not evaluated	N/A	Y	2. Mixing exists: not accounted for	0. No overview table	0. No overview table	0. No comparisons between labs	4. Estimated directly	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive	1. Potential errors in international database	0. Sex-specific issues not evaluated	1. Assumed
WGDEEP	*Molva dypterygia*	bli.27.5b67																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGDEEP	*Molva dypterygia*	bli.27.nea	0. Quality of biological data not evaluated	Y	N	2. Mixing exists: not accounted for	0. No overview table	0. No overview table	0. No comparisons between labs		0. No overview table	0. No overview table	0. No chronicle (standard scale) available			1. Potential errors in international database	0. Sex-specific issues not evaluated	1. Assumed
WGDEEP	*Aphanopus carbo*	bsf.27.nea																
WGDEEP	*Phycis blennoides*	gfb.27.nea																
WGDEEP	*Molva molva*	lin.27.1-2																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGDEEP	*Molva molva*	lin.27.3a4a6-91214																
WGDEEP	*Molva molva*	lin.27.5a	2. Detailed analysis of the quality of biological data	Y	Y	1. No mixing	0. No overview table	0. No overview table	3. Differences clearly documented and considered in data compilation	4. Estimated directly	0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	3. Selection of type of ogive based on thorough analysis of all options	2. International database correct	2. Detailed analysis of sex-specific issues	1. Assumed
WGDEEP	*Molva molva*	lin.27.5b																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGDEEP	*Hoplostethus atlanticus*	ory.27.nea																
WGDEEP	*Macrourus berglax*	rhg.27.nea																
WGDEEP	*Coryphaenoides rupestris*	rng.27.1245a8914ab																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGDEEP	*Coryphaenoides rupestris*	rng.27.3a	1. Preliminary analysis of quality of biological data	N/A	Y	1. No mixing	1. Overview table available	1. Overview table available	0. No comparisons between labs		1. Overview table available	1. Overview table available	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)		1. Potential errors in international database		1. Assumed
WGDEEP	*Coryphaenoides rupestris*	rng.27.5a10b12ac14b																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGDEEP	*Coryphaenoides rupestris*	rng.27.5b6712b	0. Quality of biological data not evaluated	Y	N	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs	2. Extrapolated	0. No overview table	0. No overview table	0. No chronicle (standard scale) available			2. International database correct	0. Sex-specific issues not evaluated	2. Extrapolated
WGDEEP	*Pagellus bogaraveo*	sbr.27.10																
WGDEEP	*Pagellus bogaraveo*	sbr.27.6-8																
WGDEEP	*Pagellus bogaraveo*	sbr.27.9																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGDEEP	*Trachyrincus scabrus*	tsu.27.nea																
WGDEEP	*Brosme brosme*	usk.27.1-2																
WGDEEP	*Brosme brosme*	usk.27.12ac																
WGDEEP	*Brosme brosme*	usk.27.3a45b6a7-912b																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions												
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGDEEP	*Brosme brosme*	usk.27.5a14	2. Detailed analysis of the quality of biological data	Y	Y	1. No mixing	0. No overview table	0. No overview table	3. Differences clearly documented and considered in data compilation	4. Estimated directly	0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	3. Selection of type of ogive based on thorough analysis of all options	2. International database correct	2. Detailed analysis of sex-specific issues	1. Assumed
WGDEEP	*Brosme brosme*	usk.27.6b																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGEEL	*Anguilla anguilla*	ele.2737.nea	1. Preliminary analysis of quality of biological data	N	N	1. No mixing	0. No overview table	0. No overview table	1. No differences							2. International database correct	1. Preliminary analyses of sex-specific issues	2. Extrapolated
WGEF	*Squatina squatina*	agn.27.nea																
WGEF	*Cetorhinus maximus*	bsk.27.nea																
WGEF	*Centrophorus squamosus, Centroscymnus coelolepis*	cyo.27.nea																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGEF	*Squalus acanthias*	dgs.27.nea																
WGEF	*Galeorhinus galeus*	gag.27.nea																
WGEF	*Centrophorus squamosus*	guq.27.nea																
WGEF	*Lamna nasus*	por.27.nea																
WGEF	*Rajidae*	raj.27.1012																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGEF	*Rajidae*	raj.27.3a47d																
WGEF	*Rajidae*	raj.27.67a-ce-h																
WGEF	*Rajidae*	raj.27.89a																
WGEF	*Rostroraja alba*	rja.27.nea																
WGEF	*Dipturus batis*	rjb.27.3a4																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGEF	*Dipturus batis*	rjb.27.67a-ce-k																
WGEF	*Dipturus batis*	rjb.27.89a																
WGEF	*Raja clavata*	rjc.27.3a47d																
WGEF	*Raja clavata*	rjc.27.6																
WGEF	*Raja clavata*	rjc.27.7afg																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGEF	*Raja clavata*	rjc.27.7e																
WGEF	*Raja clavata*	rjc.27.8																
WGEF	*Raja clavata*	rjc.27.9a																
WGEF	*Raja microocellata*	rje.27.7de																
WGEF	*Raja microocellata*	rje.27.7fg																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGEF	*Leucoraja fullonica*	rjf.27.67																
WGEF	*Raja brachyura*	rjh.27.4a6																
WGEF	*Raja brachyura*	rjh.27.4c7d																
WGEF	*Raja brachyura*	rjh.27.7afg																
WGEF	*Raja brachyura*	rjh.27.7e																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGEF	*Raja brachyura*	rjh.27.9a																
WGEF	*Leucoraja circularis*	rji.27.67																
WGEF	*Raja montagui*	rjm.27.3a47d																
WGEF	*Raja montagui*	rjm.27.67bj																
WGEF	*Raja montagui*	rjm.27.7ae-h																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGEF	*Raja montagui*	rjm.27.8																
WGEF	*Raja montagui*	rjm.27.9a																
WGEF	*Leucoraja naevus*	rjn.27.3a4																
WGEF	*Leucoraja naevus*	rjn.27.678abd																
WGEF	*Leucoraja naevus*	rjn.27.8c																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGEF	*Leucoraja naevus*	rjn.27.9a																
WGEF	*Amblyraja radiata*	rjr.27.23a4																
WGEF	*Raja undulata*	rju.27.7bj																
WGEF	*Raja undulata*	rju.27.7de																
WGEF	*Raja undulata*	rju.27.8ab																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGEF	*Raja undulata*	rju.27.8c																
WGEF	*Raja undulata*	rju.27.9a																
WGEF	*Dalatias licha*	sck.27.nea																
WGEF	*Mustelus asterias*	sdv.27.nea																
WGEF	*Galeus melastomus*	sho.27.67																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGEF	*Galeus melastomus*	sho.27.89a																
WGEF	*Scyliorhinus canicula*	syc.27.3a47d																
WGEF	*Scyliorhinus canicula*	syc.27.67a-ce-j																
WGEF	*Scyliorhinus canicula*	syc.27.8abd																
WGEF	*Scyliorhinus canicula*	syc.27.8c9a																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGEF	*Scyliorhinus stellaris*	syt.27.67																
WGEF	*Alopias*	thr.27.nea																
WGHANSA	*Engraulis encrasicolus*	ane.27.8	2. Detailed analysis of the quality of biological data	Y	Y	0. No evidence	2. Overview table complete and up-to-date	2. Overview table complete and up-to-date	1. No differences	4. Estimated directly	2. Overview table complete and up-to-date	2. Overview table complete and up-to-date	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	2. Careful selection of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	3. Estimated

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGHANSA	*Engraulis encrasicolus*	ane.27.9a_southcomponent	2. Detailed analysis of the quality of biological data	Y	N	0. No evidence	2. Overview table complete and up-to-date	2. Overview table complete and up-to-date	1. No differences	4. Estimated directly	2. Overview table complete and up-to-date	2. Overview table complete and up-to-date	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	2. Careful selection of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	3. Estimated

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions												
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
		ane.27.9a_westcomponent	2. Detailed analysis of the quality of biological data	N/A	N	0. No evidence	0. No overview table	1. Overview table available	1. No differences 2. Differences between labs are known but ingnored	N	0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	no	2. International database correct	0. Sex-specific issues not evaluated	Not estimated

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGHANSA	*Trachurus trachurus*	hom.27.9a	0. Quality of biological data not evaluated	N	N	2. Mixing exists: not accounted for	2. Overview table complete and up-to-date	2. Overview table complete and up-to-date	1. No differences 2. Differences between labs are known but ingnored	3. Estimated indirectly	1. Overview table available	1. Overview table available	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	2. Careful selection of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed

			Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
EG	Species	Stock	Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGHANSA	*Trachurus picturatus*	jaa.27.10a2	0. Quality of biological data not evaluated	Y	Y	0. No evidence	1. Overview table available	1. Overview table available	0. No comparisons between labs	3. Estimated indirectly	1. Overview table available	1. Overview table available	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round		2. International database correct	4. No sexual dimorphism occurs	3. Estimated

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGHANSA	*Sardina pilchardus*	pil.27.7	0. Quality of biological data not evaluated	N	N	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs		0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive		0. Sex-specific issues not evaluated	

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGHANSA	*Sardina pilchardus*	pil.27.8abd	yes	no	no		yes	only France is doing ageing	very consistent. Age reading is easy on this stock	estimated by the model but von Bertalanffy parameters, alometric relationships can be estimated every year	only France is providing those data	only France is providing those data	N/A	survey, 2nd quarter	no	Not relevant	no	Estimated by model (Gislason)

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGHANSA	*Sardina pilchardus*	pil.27.8c9a	2. Detailed analysis of the quality of biological data	Y	Y	0. No evidence	2. Overview table complete and up-to-date	2. Overview table complete and up-to-date	1. No differences	4. Estimated directly	1. Overview table available	2. Overview table complete and up-to-date	2. Chronicle (standard scale) clearly documented and considered in data compilation	2. Staging year-round	2. Careful selection of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	3. Estimated
WGNAS	*Salmo salar*	sal.21.2-5	0. Quality of biological data not evaluated															

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNAS	*Salmo salar*	sal.2127.1a-f14	0. Quality of biological data not evaluated	N/A	N/A	6. Mixing exists: markers study and good spatio-temporal coverage of mixing	0. No overview table	0. No overview table	0. No comparisons between labs	1. Assumed	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)			0. Sex-specific issues not evaluated	2. Extrapolated

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNAS	*Salmo salar*	sal.27.nea	0. Quality of biological data not evaluated	N/A	N/A	3. Mixing exists: accounted for, not validated	0. No overview table	0. No overview table	0. No comparisons between labs	1. Assumed	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)			0. Sex-specific issues not evaluated	2. Extrapolated
WGNSSK	*Scophthalmus rhombus*	bll.27.3a47de	0. Quality of biological data not evaluated	N/A	N/A	0. No evidence	0. No overview table	1. Overview table available	1. No differences 2. Differences between labs are known but ingnored		0. No overview table	0. No overview table						

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Gadus morhua*	cod.27.47d20	2. Detailed analysis of the quality of biological data	N/A	Y	3. Mixing exists: accounted for, not validated									2. Careful selection of a type of ogive		0. Sex-specific issues not evaluated	4. Assessed (SMS key runs, ...)
WGNSSK	*Limanda limanda*	dab.27.3a4	1. Preliminary analysis of quality of biological data	N/A	N	0. No evidence	1. Overview table available	2. Overview table complete and up-to-date	1. No differences		0. No overview table	0. No overview table	0. No chronicle (standard scale) available					

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Platichthys flesus*	fle.27.3a4	1. Preliminary analysis of quality of biological data	N/A	N	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs		0. No overview table	0. No overview table	0. No chronicle (standard scale) available					
WGNSSK	*Eutrigla gurnardus*	gug.27.3a47d																
WGNSSK	*Melanogrammus aeglefinus*	had.27.46a20	2. Detailed analysis of the quality of biological data	N/A	N	2. Mixing exists: not accounted for	1. Overview table available				0. No overview table	0. No overview table		1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	2. Careful selection of a type of ogive		1. Preliminary analyses of sex-specific issues	4. Assessed (SMS key runs, ...)

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Microstomus kitt*	lem.27.3a47d	0. Quality of biological data not evaluated	N/A	N/A	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs	1. Assumed	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGNSSK	*Mullus surmuletus*	mur.27.3a47d	1. Preliminary analysis of quality of biological data	N/A	N	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs		0. No overview table	0. No overview table		2. Staging year-round	2. Careful selection of a type of ogive		1. Preliminary analyses of sex-specific issues	3. Estimated

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions										
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Nephrops norvegicus*	nep.27.4outFU	0. Quality of biological data not evaluated	N	N	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs	2. Extrapolated	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGNSSK	*Nephrops norvegicus*	nep.fu.10																
WGNSSK	*Nephrops norvegicus*	nep.fu.3-4																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Nephrops norvegicus*	nep.fu.32	0. Quality of biological data not evaluated	N	N	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs	2. Extrapolated	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	2. Extrapolated

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Nephrops norvegicus*	nep.fu.33	0. Quality of biological data not evaluated	N	N	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs	2. Extrapolated	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGNSSK	*Nephrops norvegicus*	nep.fu.34																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Nephrops norvegicus*	nep.fu.5	0. Quality of biological data not evaluated	N	N	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs	2. Extrapolated	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Nephrops norvegicus*	nep.fu.6	0. Quality of biological data not evaluated	N	N	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs	3. Estimated indirectly	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGNSSK	*Nephrops norvegicus*	nep.fu.7																
WGNSSK	*Nephrops norvegicus*	nep.fu.8																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Nephrops norvegicus*	nep.fu.9																
WGNSSK	*Trisopterus esmarkii*	nop.27.3a4	1. Preliminary analysis of quality of biological data	Y	Y	0. No evidence	1. Overview table available	0. No overview table	3. Differences clearly documented and considered in data compilation	3. Estimated indirectly	0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	3. Selection of type of ogive based on thorough analysis of all options	2. International database correct	2. Detailed analysis of sex-specific issues	3. Estimated

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Pleuronectes platessa*	ple.27.420	2. Detailed analysis of the quality of biological data	N/A	N					4. Estimated directly					2. Careful selection of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGNSSK	*Pleuronectes platessa*	ple.27.7d	1. Preliminary analysis of quality of biological data	N/A	Y	4. Mixing exists: markers study as a base line	0. No overview table	0. No overview table	1. No differences		0. No overview table			2. Staging year-round	1. Careless use of a type of ogive	2. International database correct	0. Sex-specific issues not evaluated	3. Estimated

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Pollachius virens*	pok.27.3a46	1. Preliminary analysis of quality of biological data	Y	Y	2. Mixing exists: not accounted for	0. No overview table		1. No differences		0. No overview table	0. No overview table	2. Chronicle (standard scale) clearly documented and considered in data compilation	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	3. Selection of type of ogive based on thorough analysis of all options	2. International database correct	0. Sex-specific issues not evaluated	1. Assumed
WGNSSK	*Pollachius pollachius*	pol.27.3a4	0. Quality of biological data not evaluated	N/A	N/A	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs		0. No overview table	0. No overview table	0. No chronicle (standard scale) available			2. International database correct	0. Sex-specific issues not evaluated	

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Solea solea*	sol.27.4	1. Preliminary analysis of quality of biological data	N/A	N/A	3. Mixing exists: accounted for, not validated	0. No overview table	1. Overview table available	0. No comparisons between labs	2. Extrapolated	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	1. Careless use of a type of ogive		0. Sex-specific issues not evaluated	1. Assumed

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Solea solea*	sol.27.7d	1. Preliminary analysis of quality of biological data	N/A	N/A	2. Mixing exists: not accounted for	0. No overview table	1. Overview table available	1. No differences 2. Differences between labs are known but ingnored		0. No overview table	0. No overview table	1. Differences between labs are known but ingnored		3. Selection of type of ogive based on thorough analysis of all options			1. Assumed
WGNSSK	*Scophthalmus maximus*	tur.27.3a	0. Quality of biological data not evaluated	N/A	N/A	2. Mixing exists: not accounted for	0. No overview table	0. No overview table	0. No comparisons between labs		0. No overview table	0. No overview table	0. No chronicle (standard scale) available				0. Sex-specific issues not evaluated	3. Estimated

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Scophthalmus maximus*	tur.27.4	1. Preliminary analysis of quality of biological data	N/A	N/A	2. Mixing exists: not accounted for	0. No overview table	1. Overview table available	1. No differences	extrapolated	0. No overview table	0. No overview table	0. No chronicle (standard scale) available	1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)			0. Sex-specific issues not evaluated	1. Assumed
WGNSSK	*Merlangius merlangus*	whg.27.3a				2. Mixing exists: not accounted for	0. No overview table	1. Overview table available	0. No comparisons between labs		0. No overview table						0. Sex-specific issues not evaluated	

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGNSSK	*Merlangius merlangus*	whg.27.47d	2. Detailed analysis of the quality of biological data	N/A	Y	2. Mixing exists: not accounted for	1. Overview table available	1. Overview table available	0. No comparisons between labs		0. No overview table			1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3= bad, Q4=moderate)	3. Selection of type of ogive based on thorough analysis of all options		0. Sex-specific issues not evaluated	1. Assumed
WGNSSK	*Glyptocephalus cynoglossus*	wit.27.3a47d	1. Preliminary analysis of quality of biological data	N	N	0. No evidence	0. No overview table	0. No overview table	0. No comparisons between labs		0. No overview table	0. No overview table	0. No chronicle (standard scale) available				0. Sex-specific issues not evaluated	1. Assumed

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGWIDE	*Capros aper*	boc.27.6-8																
WGWIDE	*Chelidonichthys cuculus*	gur.27.3-8																
WGWIDE	*Clupea harengus*	her.27.1-24a514a																
WGWIDE	*Trachurus trachurus*	hom.27.2a4a5b6a7a-ce-k8																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGWIDE	*Trachurus trachurus*	hom.27.3a4bc7d																
WGWIDE	*Scomber scombrus*	mac.27.nea	2. Detailed analysis of the quality of biological data	N/A	Y	3. Mixing exists: accounted for, not validated	1. Overview table available	1. Overview table available	1. No differences		0. No overview table	0. No overview table	1. Differences between labs are known but ingnored	2. Staging year-round				1. Assumed
WGWIDE	*Mullus surmuletus*	mur.27.67a-ce-k89a																

EG	Species	Stock	Sampling Design			Stock ID	Methods and Definitions											
			All			All	Age			Growth	Maturity					Sex	All	Natural Mortal.
			Survey Design[28]	Design Commercial Sampling[29]	Spatial Coverage[30]	Mixing Ratio[31]	Structure[32]	Preparation[33]	Birthdate & "Scheme"[34]	Growth[35]	Structure[36]	Preparation[37]	Scaling[38]	Timing[39]	Ogive[40]	Coding[41]	Sex-specific Parameters[42]	M[43]
WGWIDE	*Micromesistius poutassou*	whb.27.1-91214	1. Preliminary analysis of quality of biological data	N/A	Y	2. Mixing exists: not accounted for	1. Overview table available	0. No overview table			0. No overview table	0. No overview table	0. No chronicle (standard scale) available	2. Staging year-round				1. Assumed

Annex 6-Table 7. (Part 2) Quality indicators by stock–WGBIOP 2020 answers. Part 2: Data Collection and Validation.

			Data Collection		Validation					
EG	Species	Stock	Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
NIPAG	*Pandalus borealis*	pra.27.4a								
NWWG	*Mallotus villosus*	cap.27.2a514								
NWWG	*Gadus morhua*	cod.21.1								

[44] Was length/age at maturity estimated or extrapolated from neighbouring stocks?

[45] Was sex ratio estimated or extrapolated from neighbouring stocks?

[46] Is there an age validation study available? (What was the method of age validation?)

[47] Measure for accuracy in relation to true age (seldom available) (Quantitative estimate; evaluation stock-specific).

[48] Probability distribution of repeated measurements relative to true age (Quantitative estimate; evaluation stock-specific).

[49] Were gonad stages compared with macroscopic and histological methods?

[50] Measure for accuracy in relation to true maturity (histological analysis) (Quantitative estimate; evaluation stock-specific).

[51] Probability distribution of repeated measurements relative to true maturity (Quantitative estimate; evaluation stock-specific).

			Data Collection		Validation					
EG	Species	Stock	Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
NWWG	*Gadus morhua*	cod.21.1a-e								
NWWG	*Gadus morhua*	cod.2127.1f14								
NWWG	*Gadus morhua*	cod.27.5a								
NWWG	*Gadus morhua*	cod.27.5b1	2. Estimated	2. Estimated	0. No validation study			0. No validation study		
NWWG	*Gadus morhua*	cod.27.5b2	2. Estimated	2. Estimated	0. No validation study			0. No validation study		
NWWG	*Reinhardtius hippoglossoides*	ghl.27.561214								
NWWG	*Melanogrammus aeglefinus*	had.27.5a	2. Estimated	2. Estimated	0. No validation study			0. No validation study		
NWWG	*Melanogrammus aeglefinus*	had.27.5b								

			Data Collection		Validation					
EG	Species	Stock	Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
NWWG	*Clupea harengus*	her.27.5a								
NWWG	*Pollachius virens*	pok.27.5a								
NWWG	*Pollachius virens*	pok.27.5b	2. Estimated	2. Estimated	0. No validation study			0. No validation study		
NWWG	*Sebastes mentella*	reb.2127.dp								
NWWG	*Sebastes mentella*	reb.2127.sp								
NWWG	*Sebastes mentella*	reb.27.14b								
NWWG	*Sebastes mentella*	reb.27.5a14								
NWWG	*Sebastes norvegicus*	reg.27.561214								
WGBAST	*Salmo salar*	sal.27.22-31								
WGBAST	*Salmo salar*	sal.27.32								

			Data Collection		Validation					
EG	Species	Stock	Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGBAST	*Salmo trutta*	trs.27.22-32								
WGBFAS	*Scophthalmus rhombus*	bll.27.22-32								
WGBFAS	*Gadus morhua*	cod.27.21	2. Estimated	2. Estimated	0. No validation study			2. Validation maturity criteria based on histology available		
WGBFAS	*Gadus morhua*	cod.27.22-24								
WGBFAS	*Gadus morhua*	cod.27.24-32								
WGBFAS	*Limanda limanda*	dab.27.22-32	2. Estimated	0. Not estimated	0. No validation study			0. No validation study		
WGBFAS	*Platichthys flesus*	fle.27.2223	2. Estimated	0. Not estimated	0. No validation study			0. No validation study		
WGBFAS	*Platichthys spp*	bwq.27.2425	2. Estimated	0. Not estimated	0. No validation study			0. No validation study		

			Data Collection		Validation					
EG	Species	Stock	Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGBFAS	*Platichthys spp*	bwq.27.2628	2. Estimated	2. Estimated	1. Only one method with major limitations			0. No validation study		
WGBFAS	*Platichthys solemdali*	bwp.27.2729-32	2. Estimated	0. Not estimated	1. Only one method with major limitations			0. No validation study		
WGBFAS	*Clupea harengus*	her.27.25-2932	2. Estimated	0. Not estimated	1. Only one method with major limitations	not estimated	not estimated	0. No validation study		
WGBFAS	*Clupea harengus*	her.27.28	2. Estimated	0. Not estimated	1. Only one method with major limitations			0. No validation study		
WGBFAS	*Clupea harengus*	her.27.3031								
WGBFAS	*Pleuronectes platessa*	ple.27.21-23								
WGBFAS	*Pleuronectes platessa*	ple.27.24-32	2. Estimated	0. Not estimated	0. No validation study			0. No validation study		
WGBFAS	*Solea solea*	sol.27.20-24								

			Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
EG	Species	Stock	Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGBFAS	*Sprattus sprattus*	spr.27.22-32	2. Estimated	0. Not estimated	1. Only one method with major limitations			0. No validation study		
WGBFAS	*Scophthalmus maximus*	tur.27.22-32	2. Estimated	0. Not estimated	0. No validation study			0. No validation study		
WGBIE	*Lophius budegassa*	ank.27.78abd	2. Estimated	0. Not estimated					No	No
WGBIE	*Lophius budegassa*	ank.27.8c9a								
WGBIE	*Dicentrarchus labrax*	bss.27.8ab								
WGBIE	*Dicentrarchus labrax*	bss.27.8c9a								
WGBIE	*Merluccius merluccius*	hke.27.3a46-8abd	0. Not estimated	0. Not estimated	0. No validation study					

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGBIE	*Brosme brosme, Merluccius merluccius*	hke.27.8c9a	2. Estimated					1. Validation by histology available		
WGBIE	*Lepidorhombus boscii*	ldb.27.7b-k8abd								
WGBIE	*Lepidorhombus boscii*	ldb.27.8c9a								
WGBIE	*Lepidorhombus whiffiagonis*	meg.27.7b-k8abd	0. Not estimated	0. Not estimated	0. No validation study			0. No validation study		
WGBIE	*Lepidorhombus whiffiagonis*	meg.27.8c9a								
WGBIE	*Lophius piscatorius*	mon.27.78abd								
WGBIE	*Lophius piscatorius*	mon.27.8c9a	0. Not estimated	0. Not estimated	0. No validation study			0. No validation study		

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGBIE	*Nephrops norvegicus*	nep.fu.2324								
WGBIE	*Nephrops norvegicus*	nep.fu.25								
WGBIE	*Nephrops norvegicus*	nep.fu.2627								
WGBIE	*Nephrops norvegicus*	nep.fu.2829	2. Estimated	2. Estimated				0. No validation study		
WGBIE	*Nephrops norvegicus*	nep.fu.30								
WGBIE	*Nephrops norvegicus*	nep.fu.31								
WGBIE	*Pleuronectes platessa*	ple.27.89a								
WGBIE	*Pollachius pollachius*	pol.27.89a	0. Not estimated	0. Not estimated	0. No validation study			0. No validation study		
WGBIE	*Solea solea*	sol.27.8ab								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGBIE	*Solea solea*	sol.27.8c9a	0. Not estimated	0. Not estimated	0. No validation study			0. No validation study		
WGBIE	*Merlangius merlangus*	whg.27.89a								
WGCSE	*Lophius budegassa, Lophius piscatorius*	anf.27.3a46								
WGCSE	*Dicentrarchus labrax*	bss.27.4bc7ad-h	2. Estimated	0. Not estimated	0. No validation study	NO	NO	0. No validation study	Unknown	Unknown
WGCSE	*Dicentrarchus labrax*	bss.27.6a7bj								
WGCSE	*Gadus morhua*	cod.27.6a								
WGCSE	*Gadus morhua*	cod.27.6b								
WGCSE	*Gadus morhua*	cod.27.7a								

			Data Collection		Validation					
EG	Species	Stock	Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGCSE	*Gadus morhua*	cod.27.7e-k								
WGCSE	*Melanogrammus aeglefinus*	had.27.6b								
WGCSE	*Melanogrammus aeglefinus*	had.27.7a								
WGCSE	*Melanogrammus aeglefinus*	had.27.7b-k	2. Estimated	2. Estimated						
WGCSE	*Lepidorhombus*	lez.27.4a6a								
WGCSE	*Lepidorhombus*	lez.27.6b								
WGCSE	*Nephrops norvegicus*	nep.27.6aoutFU								
WGCSE	*Nephrops norvegicus*	nep.27.7outFU								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGCSE	*Nephrops norvegicus*	nep.fu.11								
WGCSE	*Nephrops norvegicus*	nep.fu.12								
WGCSE	*Nephrops norvegicus*	nep.fu.13								
WGCSE	*Nephrops norvegicus*	nep.fu.14								
WGCSE	*Nephrops norvegicus*	nep.fu.15								
WGCSE	*Nephrops norvegicus*	nep.fu.16								
WGCSE	*Nephrops norvegicus*	nep.fu.17								
WGCSE	*Nephrops norvegicus*	nep.fu.19								
WGCSE	*Nephrops norvegicus*	nep.fu.2021								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGCSE	*Nephrops norvegicus*	nep.fu.22								
WGCSE	*Trisopterus esmarkii*	nop.27.6a								
WGCSE	*Pleuronectes platessa*	ple.27.7a	2. Estimated	0. Not estimated	0. No validation study	NO	NO	0. No validation study	Unknown	Unknown
WGCSE	*Pleuronectes platessa*	ple.27.7bc								
WGCSE	*Pleuronectes platessa*	ple.27.7e								
WGCSE	*Pleuronectes platessa*	ple.27.7fg								
WGCSE	*Pleuronectes platessa*	ple.27.7h-k								
WGCSE	*Pollachius pollachius*	pol.27.67								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGCSE	*Ammodytes*	san.27.6a								
WGCSE	*Solea solea*	sol.27.7a	2. Estimated		0. No validation study			0. No validation study		
WGCSE	*Solea solea*	sol.27.7bc								
WGCSE	*Solea solea*	sol.27.7e								
WGCSE	*Solea solea*	sol.27.7fg	2. Estimated		0. No validation study			0. No validation study		
WGCSE	*Solea solea*	sol.27.7h-k								
WGCSE	*Merlangius merlangus*	whg.27.6a								
WGCSE	*Merlangius merlangus*	whg.27.6b								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGCSE	*Merlangius merlangus*	whg.27.7a	0. Not estimated	0. Not estimated	0. No validation study			0. No validation study		
WGCSE	*Merlangius merlangus*	whg.27.7b-ce-k								
WGDEEP	*Beryx*	alf.27.nea								
WGDEEP	*Argentina silus*	aru.27.123a4	2. Estimated	2. Estimated	0. No validation study			0. No validation study		
WGDEEP	*Argentina silus*	aru.27.5a14	2. Estimated	0. Not estimated	1. Only one method with major limitations			0. No validation study		
WGDEEP	*Argentina silus*	aru.27.5b6a								
WGDEEP	*Argentina silus*	aru.27.6b7-1012								
WGDEEP	*Molva dyptterygia*	bli.27.5a14	0. Not estimated	0. Not estimated	0. No validation study			0. No validation study		
WGDEEP	*Molva dyptterygia*	bli.27.5b67								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGDEEP	*Molva dyptergia*	bli.27.nea	0. Not estimated	0. Not estimated	0. No validation study			0. No validation study		
WGDEEP	*Aphanopus carbo*	bsf.27.nea								
WGDEEP	*Phycis blennoides*	gfb.27.nea								
WGDEEP	*Molva molva*	lin.27.1-2								
WGDEEP	*Molva molva*	lin.27.3a4a6-91214								
WGDEEP	*Molva molva*	lin.27.5a	2. Estimated	0. Not estimated	1. Only one method with major limitations			0. No validation study		
WGDEEP	*Molva molva*	lin.27.5b								
WGDEEP	*Hoplostethus atlanticus*	ory.27.nea								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGDEEP	*Macrourus berglax*	rhg.27.nea								
WGDEEP	*Coryphaenoides rupestris*	rng.27.1245a8914ab								
WGDEEP	*Coryphaenoides rupestris*	rng.27.3a	0. Not estimated	0. Not estimated	0. No validation study			0. No validation study		
WGDEEP	*Coryphaenoides rupestris*	rng.27.5a10b12ac14b								
WGDEEP	*Coryphaenoides rupestris*	rng.27.5b6712b	1. Not estimated but extrapolated	2. Estimated	0. No validation study	No	No	0. No validation study	No	No
WGDEEP	*Pagellus bogaraveo*	sbr.27.10								
WGDEEP	*Pagellus bogaraveo*	sbr.27.6-8								
WGDEEP	*Pagellus bogaraveo*	sbr.27.9								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGDEEP	*Trachyrincus scabrus*	tsu.27.nea								
WGDEEP	*Brosme brosme*	usk.27.1-2								
WGDEEP	*Brosme brosme*	usk.27.12ac								
WGDEEP	*Brosme brosme*	usk.27.3a45b6a7-912b								
WGDEEP	*Brosme brosme*	usk.27.5a14	2. Estimated	0. Not estimated	1. Only one method with major limitations			0. No validation study		
WGDEEP	*Brosme brosme*	usk.27.6b								
WGEEL	*Anguilla anguilla*	ele.2737.nea	0. Not estimated	2. Estimated	1. Only one method with major limitations	No	No	1. Validation by histology available		
WGEF	*Squatina squatina*	agn.27.nea								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGEF	*Cetorhinus maximus*	bsk.27.nea								
WGEF	*Centrophorus squamosus, Centroscymnus coelolepis*	cyo.27.nea								
WGEF	*Squalus acanthias*	dgs.27.nea								
WGEF	*Galeorhinus galeus*	gag.27.nea								
WGEF	*Centrophorus squamosus*	guq.27.nea								
WGEF	*Lamna nasus*	por.27.nea								
WGEF	*Rajidae*	raj.27.1012								
WGEF	*Rajidae*	raj.27.3a47d								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGEF	*Rajidae*	raj.27.67a-ce-h								
WGEF	*Rajidae*	raj.27.89a								
WGEF	*Rostroraja alba*	rja.27.nea								
WGEF	*Dipturus batis*	rjb.27.3a4								
WGEF	*Dipturus batis*	rjb.27.67a-ce-k								
WGEF	*Dipturus batis*	rjb.27.89a								
WGEF	*Raja clavata*	rjc.27.3a47d								
WGEF	*Raja clavata*	rjc.27.6								
WGEF	*Raja clavata*	rjc.27.7afg								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGEF	*Raja clavata*	rjc.27.7e								
WGEF	*Raja clavata*	rjc.27.8								
WGEF	*Raja clavata*	rjc.27.9a								
WGEF	*Raja microocellata*	rje.27.7de								
WGEF	*Raja microocellata*	rje.27.7fg								
WGEF	*Leucoraja fullonica*	rjf.27.67								
WGEF	*Raja brachyura*	rjh.27.4a6								
WGEF	*Raja brachyura*	rjh.27.4c7d								
WGEF	*Raja brachyura*	rjh.27.7afg								

			Data Collection		Validation					
EG	Species	Stock	Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGEF	*Raja brachyura*	rjh.27.7e								
WGEF	*Raja brachyura*	rjh.27.9a								
WGEF	*Leucoraja circularis*	rji.27.67								
WGEF	*Raja montagui*	rjm.27.3a47d								
WGEF	*Raja montagui*	rjm.27.67bj								
WGEF	*Raja montagui*	rjm.27.7ae-h								
WGEF	*Raja montagui*	rjm.27.8								
WGEF	*Raja montagui*	rjm.27.9a								
WGEF	*Leucoraja naevus*	rjn.27.3a4								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGEF	*Leucoraja naevus*	rjn.27.678abd								
WGEF	*Leucoraja naevus*	rjn.27.8c								
WGEF	*Leucoraja naevus*	rjn.27.9a								
WGEF	*Amblyraja radiata*	rjr.27.23a4								
WGEF	*Raja undulata*	rju.27.7bj								
WGEF	*Raja undulata*	rju.27.7de								
WGEF	*Raja undulata*	rju.27.8ab								
WGEF	*Raja undulata*	rju.27.8c								
WGEF	*Raja undulata*	rju.27.9a								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGEF	*Dalatias licha*	sck.27.nea								
WGEF	*Mustelus asterias*	sdv.27.nea								
WGEF	*Galeus melastomus*	sho.27.67								
WGEF	*Galeus melastomus*	sho.27.89a								
WGEF	*Scyliorhinus canicula*	syc.27.3a47d								
WGEF	*Scyliorhinus canicula*	syc.27.67a-ce-j								
WGEF	*Scyliorhinus canicula*	syc.27.8abd								
WGEF	*Scyliorhinus canicula*	syc.27.8c9a								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGEF	*Scyliorhinus stellaris*	syt.27.67								
WGEF	*Alopias*	thr.27.nea								
WGHANSA	*Engraulis encrasicolus*	ane.27.8	2. Estimated	0. Not estimated	2. Several complementary age validation methods showing similar results	NA	NA	2. Validation maturity criteria based on histology available	NA	NA
WGHANSA	*Engraulis encrasicolus*	ane.27.9a_southcomponent	0. Not estimated	0. Not estimated	1. Only one method with major limitations	no	no	0. No validation study	no	no
		ane.27.9a_westcomponent	0. Not estimated	0. Not estimated	0. No validation study	no	no	1. Validation by histology available	yes	no
WGHANSA	*Trachurus trachurus*	hom.27.9a	2. Estimated	2. Estimated	0. No validation study			2. Validation maturity criteria based on histology available	no	no
WGHANSA	*Trachurus picturatus*	jaa.27.10a2	2. Estimated	2. Estimated	0. No validation study	NA	NA	0. No validation study	NA	NA

			Data Collection		Validation					
EG	Species	Stock	Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGHANSA	*Sardina pilchardus*	pil.27.7	2. Estimated	0. Not estimated	0. No validation study			0. No validation study		
WGHANSA	*Sardina pilchardus*	pil.27.8abd	Estimated	Not relevant	Ageing is easy for this stock	unknown	unknown	unknown	unknown	unknown
WGHANSA	*Sardina pilchardus*	pil.27.8c9a	2. Estimated	2. Estimated	2. Several complementary age validation methods showing similar results	NA	NA	1. Validation by histology available	No	No
WGNAS	*Salmo salar*	sal.21.2-5								
WGNAS	*Salmo salar*	sal.2127.1a-f14	0. Not estimated	0. Not estimated	0. No validation study			0. No validation study		
WGNAS	*Salmo salar*	sal.27.nea	0. Not estimated	0. Not estimated	0. No validation study			0. No validation study		
WGNSSK	*Scophthalmus rhombus*	bll.27.3a47de			0. No validation study			0. No validation study		
WGNSSK	*Gadus morhua*	cod.27.47d20	0. Not estimated	0. Not estimated						

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGNSSK	*Limanda limanda*	dab.27.3a4	0. Not estimated	0. Not estimated	0. No validation study					
WGNSSK	*Platichthys flesus*	fle.27.3a4	0. Not estimated	0. Not estimated	0. No validation study					
WGNSSK	*Eutrigla gurnardus*	gug.27.3a47d								
WGNSSK	*Melanogrammus aeglefinus*	had.27.46a20	0. Not estimated	0. Not estimated						
WGNSSK	*Microstomus kitt*	lem.27.3a47d	2. Estimated	0. Not estimated	0. No validation study	NA	NA	0. No validation study	NA	NA
WGNSSK	*Mullus surmuletus*	mur.27.3a47d	2. Estimated	0. Not estimated	2. Several complementary age validation methods showing similar results			0. No validation study		
WGNSSK	*Nephrops norvegicus*	nep.27.4outFU	0. Not estimated	0. Not estimated	0. No validation study	No data	No data	0. No validation study	No data	No data
WGNSSK	*Nephrops norvegicus*	nep.fu.10								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGNSSK	*Nephrops norvegicus*	nep.fu.3-4								
WGNSSK	*Nephrops norvegicus*	nep.fu.32	1. Not estimated but extrapolated	2. Estimated	0. No validation study	No age data	No age data	0. No validation study	No histological study	Not available
WGNSSK	*Nephrops norvegicus*	nep.fu.33	0. Not estimated	0. Not estimated	0. No validation study	No data	No data	0. No validation study	No data	No data
WGNSSK	*Nephrops norvegicus*	nep.fu.34								
WGNSSK	*Nephrops norvegicus*	nep.fu.5	0. Not estimated	0. Not estimated	0. No validation study	No data	No data	0. No validation study	No data	No data
WGNSSK	*Nephrops norvegicus*	nep.fu.6	0. Not estimated	2. Estimated	0. No validation study	No data	No data	0. No validation study	No data	No data
WGNSSK	*Nephrops norvegicus*	nep.fu.7								
WGNSSK	*Nephrops norvegicus*	nep.fu.8								
WGNSSK	*Nephrops norvegicus*	nep.fu.9								

EG	Species	Stock	Data Collection		Validation					
			Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGNSSK	*Trisopterus esmarkii*	nop.27.3a4	0. Not estimated	0. Not estimated	2. Several complementary age validation methods showing similar results	available in recent age reading report	avaiable in recent age reading report	0. No validation study	Yes, evaluated in scientific peer reviewed papers	yes, evaluated in scientific peer reviewed literature
WGNSSK	*Pleuronectes platessa*	ple.27.420	2. Estimated	0. Not estimated	1. Only one method with major limitations	avaiable in recent age reading exchange workshop report	avaiable in recent age reading report	0. No validation study		
WGNSSK	*Pleuronectes platessa*	ple.27.7d	2. Estimated	0. Not estimated		available in recent age reading exchange workshop report	available in recent age reading report	0. No validation study		
WGNSSK	*Pollachius virens*	pok.27.3a46	2. Estimated	0. Not estimated	1. Only one method with major limitations	Not available		0. No validation study	Not evaluated	Not evaluated
WGNSSK	*Pollachius pollachius*	pol.27.3a4			0. No validation study			0. No validation study	Not evaluated	Not evaluated
WGNSSK	*Solea solea*	sol.27.4								
WGNSSK	*Solea solea*	sol.27.7d	2. Estimated		0. No validation study			0. No validation study		

			Data Collection		Validation					
EG	Species	Stock	Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGNSSK	*Scophthalmus maximus*	tur.27.3a		0. Not estimated						
WGNSSK	*Scophthalmus maximus*	tur.27.4	0. Not estimated	0. Not estimated	0. No validation study			0. No validation study		
WGNSSK	*Merlangius merlangus*	whg.27.3a	0. Not estimated	0. Not estimated	1. Only one method with major limitations			0. No validation study		
WGNSSK	*Merlangius merlangus*	whg.27.47d	2. Estimated	0. Not estimated	0. No validation study			0. No validation study		
WGNSSK	*Glyptocephalus cynoglossus*	wit.27.3a47d	2. Estimated	0. Not estimated	0. No validation study			0. No validation study		
WGWIDE	*Capros aper*	boc.27.6-8								
WGWIDE	*Chelidonichthys cuculus*	gur.27.3-8								

			Data Collection		Validation					
EG	Species	Stock	Maturity	Sex	Age			Maturity		
			Length/age at Maturity[44]	Sex Ratio[45]	Age Validation[46]	Absolute Bias[47]	Absolute Age Error Matrix[48]	Maturity Validation[49]	Absolute Bias[50]	Absolute Maturity Error Matrix[51]
WGWIDE	*Clupea harengus*	her.27.1-24a514a								
WGWIDE	*Trachurus trachurus*	hom.27.2a4a 5b6a7a-ce-k8								
WGWIDE	*Trachurus trachurus*	hom.27.3a4b c7d								
WGWIDE	*Scomber scombrus*	mac.27.nea	0. Not estimated	0. Not estimated	1. Only one method with major limitations			0. No validation study		
WGWIDE	*Mullus surmuletus*	mur.27.67a-ce-k89a								
WGWIDE	*Micromesistius poutassou*	whb.27.1-91214	0. Not estimated	0. Not estimated	1. Only one method with major limitations			0. No validation study		

Annex 6-Table 7. (Part 3) Quality indicators by stock–WGBIOP 2020 answers. Part 3: Calibration.

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
NIPAG	*Pandalus borealis*	pra.27.4a										
NWWG	*Mallotus villosus*	cap.27.2a514										

[52] When was the last exchange that included age readers from major data contributors?

[53] Measure for accuracy in relation to modal age (Quantitative estimate; evaluation stock-specific).

[54] Measure for precision (Quantitative estimate; evaluation stock-specific).

[55] Percentage agreement between age readers (Quantitative estimate; evaluation stock-specific).

[56] Probability distribution of repeated measurements relative to modal age (Quantitative estimate; evaluation stock-specific).

[57] When was the last exchange that included maturity readers from major data contributors?

[58] Measure for accuracy in relation to modal maturity (Quantitative estimate; evaluation stock-specific).

[59] Measure for precision (Quantitative estimate; evaluation stock-specific).

[60] Percentage agreement between maturity readers (Quantitative estimate; evaluation stock-specific).

[61] Probability distribution of repeated measurements relative to modal maturity (Quantitative estimate; evaluation stock-specific).

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
NWWG	*Gadus morhua*	cod.21.1										
NWWG	*Gadus morhua*	cod.21.1a-e										
NWWG	*Gadus morhua*	cod.2127.1f14										
NWWG	*Gadus morhua*	cod.27.5a										
NWWG	*Gadus morhua*	cod.27.5b1	0. No exchange					0. No exchange				
NWWG	*Gadus morhua*	cod.27.5b2	0. No exchange					0. No exchange				
NWWG	*Reinhardtius hippoglossoides*	ghl.27.561214										
NWWG	*Melanogrammus aeglefinus*	had.27.5a	4. Exchange recently, good results					0. No exchange				

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
NWWG	*Melanogrammus aeglefinus*	had.27.5b										
NWWG	*Clupea harengus*	her.27.5a										
NWWG	*Pollachius virens*	pok.27.5a										
NWWG	*Pollachius virens*	pok.27.5b	0. No exchange									
NWWG	*Sebastes mentella*	reb.2127.dp										
NWWG	*Sebastes mentella*	reb.2127.sp										
NWWG	*Sebastes mentella*	reb.27.14b										
NWWG	*Sebastes mentella*	reb.27.5a14										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
NWWG	*Sebastes norvegicus*	reg.27.561214										
WGBAST	*Salmo salar*	sal.27.22-31										
WGBAST	*Salmo salar*	sal.27.32										
WGBAST	*Salmo trutta*	trs.27.22-32										
WGBFAS	*Scophthalmus rhombus*	bll.27.22-32										
WGBFAS	*Gadus morhua*	cod.27.21	4. Exchange recently, good results	-0.08	*20.3*	82.1		3. Exchange long time ago and good results				
WGBFAS	*Gadus morhua*	cod.27.22-24										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGBFAS	*Gadus morhua*	cod.27.24-32										
WGBFAS	*Limanda limanda*	dab.27.22-32	0. No exchange					0. No exchange				
WGBFAS	*Platichthys flesus*	fle.27.2223	1. Exchange long time ago and poor results					0. No exchange				
WGBFAS	*Platichthys spp*	bwq.27.2425	1. Exchange long time ago and poor results			70,4%		0. No exchange				
WGBFAS	*Platichthys spp*	bwq.27.2628	1. Exchange long time ago and poor results					1. Exchange long time ago and poor results				
WGBFAS	*Platichthys solemdali*	bwp.27.2729-32	1. Exchange long time ago and poor results									

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGBFAS	*Clupea harengus*	her.27.25-2932	4. Exchange recently, good results	S1: ±0.00–0.24; S2: ±0.04–0.49; S3: ±0.02–0.52	**CV** S1: 1.9–7.5%; S2: 1.9–7.5%; S3: 11–20%	S1: 88–94%; S2: 52–85%; S3: 52–81%,		1. Exchange long time ago and poor results				
WGBFAS	*Clupea harengus*	her.27.28	5. Exchange recently, very good results			95%		0. No exchange				
WGBFAS	*Clupea harengus*	her.27.3031										
WGBFAS	*Pleuronectes platessa*	ple.27.21-23										
WGBFAS	*Pleuronectes platessa*	ple.27.24-32	1. Exchange long time ago and poor results					0. No exchange				

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGBFAS	*Solea solea*	sol.27.20-24										
WGBFAS	*Sprattus sprattus*	spr.27.22-32	3. Exchange long time ago and good re-sults					0. No ex-change				
WGBFAS	*Scoph-thalmus maximus*	tur.27.22-32	0. No ex-change					0. No ex-change				
WGBIE	*Lophius bude-gassa*	ank.27.78abd						0. No ex-change				
WGBIE	*Lophius bude-gassa*	ank.27.8c9a										
WGBIE	*Dicen-trarchus labrax*	bss.27.8ab										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGBIE	*Dicentrarchus labrax*	bss.27.8c9a										
WGBIE	*Merluccius merluccius*	hke.27.3a46-8abd										
WGBIE	*Brosme brosme, Merluccius merluccius*	hke.27.8c9a										
WGBIE	*Lepidorhombus boscii*	ldb.27.7b-k8abd										
WGBIE	*Lepidorhombus boscii*	ldb.27.8c9a										
WGBIE	*Lepidorhombus whiffiagonis*	meg.27.7b-k8abd	2. Exchange recently, poor results					0. No exchange				

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGBIE	*Lepidorhombus whiffiagonis*	meg.27.8c9a										
WGBIE	*Lophius piscatorius*	mon.27.78abd										
WGBIE	*Lophius piscatorius*	mon.27.8c9a	1. Exchange long time ago and poor results					3. Exchange long time ago and good results				
WGBIE	*Nephrops norvegicus*	nep.fu.2324										
WGBIE	*Nephrops norvegicus*	nep.fu.25										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGBIE	*Nephrops norvegicus*	nep.fu.2627										
WGBIE	*Nephrops norvegicus*	nep.fu.2829						0. No exchange				
WGBIE	*Nephrops norvegicus*	nep.fu.30										
WGBIE	*Nephrops norvegicus*	nep.fu.31										
WGBIE	*Pleuronectes platessa*	ple.27.89a										
WGBIE	*Pollachius pollachius*	pol.27.89a	0. No exchange					0. No exchange				
WGBIE	*Solea solea*	sol.27.8ab										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGBIE	*Solea solea*	sol.27.8c9a	0. No exchange					0. No exchange				
WGBIE	*Merlangius merlangus*	whg.27.89a										
WGCSE	*Lophius budegassa, Lophius piscatorius*	anf.27.3a46										
WGCSE	*Dicentrarchus labrax*	bss.27.4bc7ad-h	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
WGCSE	*Dicentrarchus labrax*	bss.27.6a7bj										
WGCSE	*Gadus morhua*	cod.27.6a										
WGCSE	*Gadus morhua*	cod.27.6b										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGCSE	*Gadus morhua*	cod.27.7a										
WGCSE	*Gadus morhua*	cod.27.7e-k										
WGCSE	*Melano-grammus aeglefi-nus*	had.27.6b										
WGCSE	*Melano-grammus aeglefi-nus*	had.27.7a										
WGCSE	*Melano-grammus aeglefi-nus*	had.27.7b-k	4. Exchange recently, good re-sults									
WGCSE	*Lepi-dorhom-bus*	lez.27.4a6a										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGCSE	*Lepi-dorhom-bus*	lez.27.6b										
WGCSE	*Nephrops norvegi-cus*	nep.27.6aoutFU										
WGCSE	*Nephrops norvegi-cus*	nep.27.7outFU										
WGCSE	*Nephrops norvegi-cus*	nep.fu.11										
WGCSE	*Nephrops norvegi-cus*	nep.fu.12										
WGCSE	*Nephrops norvegi-cus*	nep.fu.13										
WGCSE	*Nephrops norvegi-cus*	nep.fu.14										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGCSE	*Nephrops norvegicus*	nep.fu.15										
WGCSE	*Nephrops norvegicus*	nep.fu.16										
WGCSE	*Nephrops norvegicus*	nep.fu.17										
WGCSE	*Nephrops norvegicus*	nep.fu.19										
WGCSE	*Nephrops norvegicus*	nep.fu.2021										
WGCSE	*Nephrops norvegicus*	nep.fu.22										
WGCSE	*Trisopterus esmarkii*	nop.27.6a										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGCSE	*Pleuronectes platessa*	ple.27.7a	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
WGCSE	*Pleuronectes platessa*	ple.27.7bc										
WGCSE	*Pleuronectes platessa*	ple.27.7e										
WGCSE	*Pleuronectes platessa*	ple.27.7fg										
WGCSE	*Pleuronectes platessa*	ple.27.7h-k										
WGCSE	*Pollachius pollachius*	pol.27.67										
WGCSE	*Ammodytes*	san.27.6a										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGCSE	*Solea solea*	sol.27.7a	0. No ex-change					3. Ex-change long time ago and good re-sults	stage 2 = 0.26 stage 5 = -0.90 (fresh fish, sole in gen-eral, not linked to a certain stock)	not availa-ble	82% (fresh fish)	not availa-ble
WGCSE	*Solea solea*	sol.27.7bc										
WGCSE	*Solea solea*	sol.27.7e										
WGCSE	*Solea solea*	sol.27.7fg	0. No ex-change					3. Ex-change long time ago and good re-sults	stage 2 = 0.26 stage 5 = -0.90 (fresh fish, sole in gen-eral, not linked to a certain stock)	not availa-ble	82% (fresh fish)	not availa-ble

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGCSE	*Solea solea*	sol.27.7h-k										
WGCSE	*Merlan-gius mer-langus*	whg.27.6a										
WGCSE	*Merlan-gius mer-langus*	whg.27.6b										
WGCSE	*Merlan-gius mer-langus*	whg.27.7a	0. No ex-change					0. No ex-change				
WGCSE	*Merlan-gius mer-langus*	whg.27.7b-ce-k										
WGDEEP	*Beryx*	alf.27.nea										
WGDEEP	*Argen-tina silus*	aru.27.123a4	4. Exchange recently, good re-sults					3. Ex-change long time ago and good re-sults				

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGDEEP	*Argentina silus*	aru.27.5a14	4. Exchange recently, good results					0. No exchange				
WGDEEP	*Argentina silus*	aru.27.5b6a										
WGDEEP	*Argentina silus*	aru.27.6b7-1012										
WGDEEP	*Molva dypterygia*	bli.27.5a14	0. No exchange					0. No exchange				
WGDEEP	*Molva dypterygia*	bli.27.5b67										
WGDEEP	*Molva dypterygia*	bli.27.nea	4. Exchange recently, good results		*cv=3.9*	48%		0. No exchange				
WGDEEP	*Aphanopus carbo*	bsf.27.nea										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGDEEP	*Phycis blen-noides*	gfb.27.nea										
WGDEEP	*Molva molva*	lin.27.1-2										
WGDEEP	*Molva molva*	lin.27.3a4a6-91214										
WGDEEP	*Molva molva*	lin.27.5a	4. Exchange recently, good re-sults					0. No ex-change				
WGDEEP	*Molva molva*	lin.27.5b										
WGDEEP	*Hoploste-thus at-lanticus*	ory.27.nea										
WGDEEP	*Macrour us ber-glax*	rhg.27.nea										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGDEEP	*Cory-phae-noides rupestris*	rng.27.1245a8914ab										
WGDEEP	*Cory-phae-noides rupestris*	rng.27.3a	3. Exchange long time ago and good re-sults		*cv=11.2*	30%		0. No ex-change				
WGDEEP	*Cory-phae-noides rupestris*	rng.27.5a10b12ac14b										
WGDEEP	*Cory-phae-noides rupestris*	rng.27.5b6712b	0. No ex-change	No	No	No	No	0. No ex-change	No	No	No	No
WGDEEP	*Pagellus bo-garaveo*	sbr.27.10										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGDEEP	*Pagellus bogaraveo*	sbr.27.6-8										
WGDEEP	*Pagellus bogaraveo*	sbr.27.9										
WGDEEP	*Trachyrincus scabrus*	tsu.27.nea										
WGDEEP	*Brosme brosme*	usk.27.1-2										
WGDEEP	*Brosme brosme*	usk.27.12ac										
WGDEEP	*Brosme brosme*	usk.27.3a45b6a7-912b										
WGDEEP	*Brosme brosme*	usk.27.5a14	4. Exchange recently, good results					0. No exchange				

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGDEEP	*Brosme brosme*	usk.27.6b										
WGEEL	*Anguilla anguilla*	ele.2737.nea	2. Exchange recently, poor results		*cv=39%*	40		0. No exchange	A mature eel was never caught			
WGEF	*Squatina squatina*	agn.27.nea										
WGEF	*Cetorhinus maximus*	bsk.27.nea										
WGEF	*Centrophorus squamosus, Centroscymnus coelolepis*	cyo.27.nea										
WGEF	*Squalus acanthias*	dgs.27.nea										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGEF	*Galeorhinus galeus*	gag.27.nea										
WGEF	*Centrophorus squamosus*	guq.27.nea										
WGEF	*Lamna nasus*	por.27.nea										
WGEF	*Rajidae*	raj.27.1012										
WGEF	*Rajidae*	raj.27.3a47d										
WGEF	*Rajidae*	raj.27.67a-ce-h										
WGEF	*Rajidae*	raj.27.89a										
WGEF	*Rostroraja alba*	rja.27.nea										
WGEF	*Dipturus batis*	rjb.27.3a4										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGEF	*Dipturus batis*	rjb.27.67a-ce-k										
WGEF	*Dipturus batis*	rjb.27.89a										
WGEF	*Raja clav-ata*	rjc.27.3a47d										
WGEF	*Raja clav-ata*	rjc.27.6										
WGEF	*Raja clav-ata*	rjc.27.7afg										
WGEF	*Raja clav-ata*	rjc.27.7e										
WGEF	*Raja clav-ata*	rjc.27.8										
WGEF	*Raja clav-ata*	rjc.27.9a										
WGEF	*Raja mi-croocel-lata*	rje.27.7de										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGEF	*Raja mi-croocel-lata*	rje.27.7fg										
WGEF	*Leucoraja fullonica*	rjf.27.67										
WGEF	*Raja brachy-ura*	rjh.27.4a6										
WGEF	*Raja brachy-ura*	rjh.27.4c7d										
WGEF	*Raja brachy-ura*	rjh.27.7afg										
WGEF	*Raja brachy-ura*	rjh.27.7e										
WGEF	*Raja brachy-ura*	rjh.27.9a										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGEF	*Leucoraja circularis*	rji.27.67										
WGEF	*Raja montagui*	rjm.27.3a47d										
WGEF	*Raja montagui*	rjm.27.67bj										
WGEF	*Raja montagui*	rjm.27.7ae-h										
WGEF	*Raja montagui*	rjm.27.8										
WGEF	*Raja montagui*	rjm.27.9a										
WGEF	*Leucoraja naevus*	rjn.27.3a4										
WGEF	*Leucoraja naevus*	rjn.27.678abd										
WGEF	*Leucoraja naevus*	rjn.27.8c										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGEF	*Leucoraja naevus*	rjn.27.9a										
WGEF	*Ambly-raja radi-ata*	rjr.27.23a4										
WGEF	*Raja un-dulata*	rju.27.7bj										
WGEF	*Raja un-dulata*	rju.27.7de										
WGEF	*Raja un-dulata*	rju.27.8ab										
WGEF	*Raja un-dulata*	rju.27.8c										
WGEF	*Raja un-dulata*	rju.27.9a										
WGEF	*Dalatias licha*	sck.27.nea										
WGEF	*Mustelus asterias*	sdv.27.nea										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGEF	*Galeus melastomus*	sho.27.67										
WGEF	*Galeus melastomus*	sho.27.89a										
WGEF	*Scyliorhinus canicula*	syc.27.3a47d										
WGEF	*Scyliorhinus canicula*	syc.27.67a-ce-j										
WGEF	*Scyliorhinus canicula*	syc.27.8abd										
WGEF	*Scyliorhinus canicula*	syc.27.8c9a										
WGEF	*Scyliorhinus stellaris*	syt.27.67										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGEF	*Alopias*	thr.27.nea										
WGHANSA	*Engraulis encrasicolus*	ane.27.8	5. Exchange recently, very good results	NA	NA	NA	NA	3. Exchange long time ago and good results	NA	NA	NA	NA
WGHANSA	*Engraulis encrasicolus*	ane.27.9a_southcomponent	5. Exchange recently, very good results	y	*y*	y	no	0. No exchange	no	no	no	no
		ane.27.9a_westcomponent	5. Exchange recently, very good results	y	*y*	y	no	0. No exchange	no	no	no	no
WGHANSA	*Trachurus trachurus*	hom.27.9a	4. Exchange recently, good results					0. No exchange				
WGHANSA	*Trachurus picturatus*	jaa.27.10a2	2. Exchange recently, poor results	NA	*sections: 36,0-168,8%*	sections: 35,3-79,3% whole: 56,3%	Not available	0. No exchange	NA	NA	NA	NA

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
					whole: 69,85%							
WGHANSA	*Sardina pilchardus*	pil.27.7	0. No exchange					0. No exchange				
WGHANSA	*Sardina pilchardus*	pil.27.8abd	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
WGHANSA	*Sardina pilchardus*	pil.27.8c9a	5. Exchange recently, very good results	NA	*CV=20 %, APE=22 % (expert readers)*	80% (expert readers)	NA	0. No exchange	No	No	No	No
WGNAS	*Salmo salar*	sal.21.2-5										
WGNAS	*Salmo salar*	sal.2127.1a-f14	0. No exchange					0. No exchange				
WGNAS	*Salmo salar*	sal.27.nea	0. No exchange					0. No exchange				

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Work-shop[52]	Relative Bias[53]	CV or APE[54]	% Agree-ment[55]	Relative Age Error Matrix[56]	Exchange/ Work-shop[57]	Relative Bias[58]	CV or APE[59]	% Agree-ment[60]	Relative Maturity Error Ma-trix[61]
WGNSSK	*Scoph-thalmus rhombus*	bll.27.3a47de	5. Exchange recently, very good results	-0.01 (ad-vanced readers, stained sections)	*CV = 8% APE = 1% (ad-vanced read-ers, stained sec-tions)*	95% (ad-vanced read-ers, stained sections)	available in SmartDots report	3. Ex-change long time ago and good re-sults	stage 2 = -0.26 stage 3 = -0.67 (fresh sam-ples, brill in general, not linked to a certain stock)	not availa-ble	94% (fresh samples, ex-pert stag-ers)	not availa-ble
WGNSSK	*Gadus morhua*	cod.27.47d20	3. Exchange long time ago and good re-sults	74%	*39.80%*			3. Ex-change long time ago and good re-sults	69-77%			
WGNSSK	*Limanda limanda*	dab.27.3a4	4. Exchange recently, good re-sults									
WGNSSK	*Platich-thys fle-sus*	fle.27.3a4	0. No ex-change									

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGNSSK	*Eutrigla gurnardus*	gug.27.3a47d										
WGNSSK	*Melanogrammus aeglefinus*	had.27.46a20										
WGNSSK	*Microstomus kitt*	lem.27.3a47d	0. No exchange	NA	*NA*	NA	NA					
WGNSSK	*Mullus surmuletus*	mur.27.3a47d	0. No exchange					0. No exchange				
WGNSSK	*Nephrops norvegicus*	nep.27.4outFU	0. No exchange	No data	*No data*	No data	No data	0. No exchange	No data	No data	No data	No data
WGNSSK	*Nephrops norvegicus*	nep.fu.10										
WGNSSK	*Nephrops norvegicus*	nep.fu.3-4										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGNSSK	*Nephrops norvegicus*	nep.fu.32	0. No exchange	No age data	*No age data*	No age data	No age data	0. No exchange	Not available	Not available	Not available	Not available
WGNSSK	*Nephrops norvegicus*	nep.fu.33	0. No exchange	No data	No data	No data	No data	0. No exchange	No data	No data	No data	No data
WGNSSK	*Nephrops norvegicus*	nep.fu.34										
WGNSSK	*Nephrops norvegicus*	nep.fu.5	0. No exchange	No data	*No data*	No data	No data	0. No exchange	No data	No data	No data	No data
WGNSSK	*Nephrops norvegicus*	nep.fu.6	0. No exchange	No data	*No data*	No data	No data	0. No exchange	No data	No data	No data	No data
WGNSSK	*Nephrops norvegicus*	nep.fu.7										
WGNSSK	*Nephrops norvegicus*	nep.fu.8										

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGNSSK	*Nephrops norvegicus*	nep.fu.9										
WGNSSK	*Trisopterus esmarkii*	nop.27.3a4	4. Exchange recently, good results	avaiable in recent age reading exchange workshop report	*avaiable in recent age reading exchange workshop report*	avaiable in recent age reading exchange workshop report	avaiable in recent age reading exchange workshop report	0. No exchange	published in scientific peer reviewed literature	published in scientific peer reviewed literature	No data	No data
WGNSSK	*Pleuronectes platessa*	ple.27.420	4. Exchange recently, good results	avaiable in recent age reading exchange workshop report	avaiable in recent age reading exchange workshop report	avaiable in recent age reading exchange workshop report	avaiable in recent age reading exchange workshop report	0. No exchange				

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGNSSK	*Pleuronectes platessa*	ple.27.7d	3. Exchange long time ago and good results	available in recent age reading exchange workshop report	available in recent age reading report	available in recent age reading exchange workshop report	available in recent age reading report	0. No exchange				
WGNSSK	*Pollachius virens*	pok.27.3a46	4. Exchange recently, good results	-0.04 (reflected light) to -0.08 (transmitted light)	*CV = 6.2%*	85.90%		1. Exchange long time ago and poor results			75% females, 65% males (WKMSGAD 2013)	
WGNSSK	*Pollachius pollachius*	pol.27.3a4	0. No exchange	No age data	No age data	No age data	No age data	0. No exchange	No data	No data	No data	No data
WGNSSK	*Solea solea*	sol.27.4										
WGNSSK	*Solea solea*	sol.27.7d	4. Exchange recently,	-0.27	*CV = 9% and APE=5*	80%	available in SmartDots report	3. Exchange long time	stage 2 = 0.26 stage 5 = -0.90	not available	82%	not available

EG	Species	Stock	Calibration: Age – Exchange / Workshop[52]	Age – Relative Bias[53]	Age – CV or APE[54]	Age – % Agreement[55]	Age – Relative Age Error Matrix[56]	Maturity – Exchange/ Workshop[57]	Maturity – Relative Bias[58]	Maturity – CV or APE[59]	Maturity – % Agreement[60]	Maturity – Relative Maturity Error Matrix[61]
			good results		*% (expert readers)*			ago and good results	(fresh fish, sole in general, not linked to a certain stock)			
WGNSSK	*Scophthalmus maximus*	tur.27.3a										
WGNSSK	*Scophthalmus maximus*	tur.27.4	4. Exchange recently, good results	0.09	*CV = 17%*	78%	available in smartdots report for event 216	3. Exchange long time ago and good results	stage 1: 0.6, stage 2: -0.29	not available	94 % fresh staging; 79 % image-based staging	not available
WGNSSK	*Merlangius merlangus*	whg.27.3a						0. No exchange				
WGNSSK	*Merlangius merlangus*	whg.27.47d	4. Exchange recently, good results	-0.04	*CV=14.9%*	69.50%		0. No exchange				

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
WGNSSK	*Glyptocephalus cynoglossus*	wit.27.3a47d	0. No exchange					0. No exchange				
WGWIDE	*Capros aper*	boc.27.6-8										
WGWIDE	*Chelidonichthys cuculus*	gur.27.3-8										
WGWIDE	*Clupea harengus*	her.27.1-24a514a										
WGWIDE	*Trachurus trachurus*	hom.27.2a4a5b6a7a-ce-k8										
WGWIDE	*Trachurus trachurus*	hom.27.3a4bc7d										
WGWIDE	*Scomber scombrus*	mac.27.nea	2. Exchange recently, poor results	-0.03 (all ICES divs)	*CV=30.4 (all*	66.5% (all ICES divs)	Calculated using results from 2018 age reading workshop. Will be discussed at	2. Exchange recently,	Stage 1:0.66, Stage 2:0.89,		61.40%	

EG	Species	Stock	Calibration									
			Age					Maturity				
			Exchange / Workshop[52]	Relative Bias[53]	CV or APE[54]	% Agreement[55]	Relative Age Error Matrix[56]	Exchange/ Workshop[57]	Relative Bias[58]	CV or APE[59]	% Agreement[60]	Relative Maturity Error Matrix[61]
					ICES divs)		the next benchmark for mackerel.	poor results	Stage 3:-0.08, Stage 4:-1.57 (WKMSMAC 2 2015)			
WGWIDE	*Mullus surmuletus*	mur.27.67a-ce-k89a										
WGWIDE	*Micromesistius poutassou*	whb.27.1-91214	2. Exchange recently, poor results	-0.14	*CV=26*	66%	Available for the all ICES areas combined (stock distribution whole area) and by stock component (southern component areas considering only the readers that read the otoliths from the southern areas and the same for the northern component)	0. No exchange				

Annex 6-Table 7. (Part 4) Quality indicators by stock–WGBIOP 2020 answers. Part 4: Stock Assessment and General comments.

			Stock Assessment						General comments[62]
EG	Species	Stock	Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
NIPAG	*Pandalus borealis*	pra.27.4a							
NWWG	*Mallotus villosus*	cap.27.2a514							
NWWG	*Gadus morhua*	cod.21.1							

[62] Any related information/ suggestion/ comment for the specific stock.

[63] Is the stock assessment model age-structured?

[64] Variance structure can directly be incorporated into stochastic stock assessment models.

[65] Is maturity function used in stock assessment model?

[66] Variance structure can directly be incorporated into stochastic stock assessment models.

[67] Sensitivity runs will show effects of different biological data sets (e.g. age) on the assessment outcomes in terms of key parameters such as fishing mortality (F) and spawning stock biomass (SSB).

[68] Use of new parameters could improve stock assessments. Has the potential of new parameters been considered or included in the data compilation and input to stock assessment?

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
NWWG	*Gadus morhua*	cod.21.1a-e							
NWWG	*Gadus morhua*	cod.2127.1f14							
NWWG	*Gadus morhua*	cod.27.5a							
NWWG	*Gadus morhua*	cod.27.5b1	2. Age structure used in assessment	1. Error matrix not used in assessment	4. Yearly maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
NWWG	*Gadus morhua*	cod.27.5b2	1. Age structure not used in assessment						
NWWG	*Reinhardtius hippoglossoides*	ghl.27.561214							
NWWG	*Melanogrammus*	had.27.5a	2. Age structure used in assessment	1. Error matrix not used in assessment	4. Yearly maturity ogive at age or	1. Error matrix not used in assessment	3. Numerous sensitivity runs	2. New parameters used in assessment	

EG	Species	Stock	Stock Assessment: Age: Variance Structure[63]	Stock Assessment: Age: Error Matrix[64]	Stock Assessment: Maturity: Variance Structure[65]	Stock Assessment: Maturity: Error Matrix[66]	Stock Assessment: All: Sensitivity Analysis[67]	Stock Assessment: New Parameters: New Parameters[68]	General comments[62]
	aeglefinus				length in assessment		with alternative datasets tested		
NWWG	*Melanogrammus aeglefinus*	had.27.5b							
NWWG	*Clupea harengus*	her.27.5a							
NWWG	*Pollachius virens*	pok.27.5a							
NWWG	*Pollachius virens*	pok.27.5b	2. Age structure used in assessment						
NWWG	*Sebastes mentella*	reb.2127.dp							
NWWG	*Sebastes mentella*	reb.2127.sp							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
NWWG	*Sebastes mentella*	reb.27.14b							
NWWG	*Sebastes mentella*	reb.27.5a14							
NWWG	*Sebastes norvegicus*	reg.27.561214							
WGBAST	*Salmo salar*	sal.27.22-31							
WGBAST	*Salmo salar*	sal.27.32							
WGBAST	*Salmo trutta*	trs.27.22-32							
WGBFAS	*Scophthalmus rhombus*	bll.27.22-32							
WGBFAS	*Gadus morhua*	cod.27.21	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGBFAS	*Gadus morhua*	cod.27.22-24							
WGBFAS	*Gadus morhua*	cod.27.24-32							
WGBFAS	*Limanda limanda*	dab.27.22-32	1. Age structure not used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGBFAS	*Platichthys flesus*	fle.27.2223	1. Age structure not used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGBFAS	*Platichthys spp*	bwq.27.2425	1. Age structure not used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGBFAS	*Platichthys spp*	bwq.27.2628	1. Age structure not used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or	1. Error matrix not used in assessment	1. No alternative input	1. New parameters not used in assessment	

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
					length in assessment		datasets produced		
WGBFAS	*Platichthys solemdali*	bwp.27.2729-32	1. Age structure not used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment			
WGBFAS	*Clupea harengus*	her.27.25-2932	2. Age structure used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGBFAS	*Clupea harengus*	her.27.28	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGBFAS	*Clupea harengus*	her.27.3031							
WGBFAS	*Pleuronectes platessa*	ple.27.21-23							

EG	Species	Stock	Stock Assessment: Age: Variance Structure[63]	Stock Assessment: Age: Error Matrix[64]	Stock Assessment: Maturity: Variance Structure[65]	Stock Assessment: Maturity: Error Matrix[66]	Stock Assessment: All: Sensitivity Analysis[67]	Stock Assessment: New Parameters: New Parameters[68]	General comments[62]
WGBFAS	*Pleuronectes platessa*	ple.27.24-32	2. Age structure used in assessment	1. Error matrix not used in assessment	4. Yearly maturity ogive at age or length in assessment	1. Error matrix not used in assessment	3. Numerous sensitivity runs with alternative datasets tested	1. New parameters not used in assessment	
WGBFAS	*Solea solea*	sol.27.20-24							
WGBFAS	*Sprattus sprattus*	spr.27.22-32	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGBFAS	*Scophthalmus maximus*	tur.27.22-32	1. Age structure not used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGBIE	*Lophius budegassa*	ank.27.78abd	1. Age structure not used in assessment		2. Knife-edge maturity-at-age or length in assessment	1. Error matrix not used in assessment	3. Numerous sensitivity runs with alternative	1. New parameters not used in assessment	As stock coordinator, I am not in a position to answer many of these questions; at assessment working groups we cannot evaluate the quality of the data we receive in detail; during benchmark (data compilation) workshops we investigate the data in more detail but

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
							datasets tested		not usually to the extent that we can answer the questions posed here. Data submitters would be in a better position to answer someof these questions for the data provided on behalf of their country. Also note that many of the stocks listed here have length-based assessments so there will not be coherent answers for age data.
WGBIE	*Lophius budegassa*	ank.27.8c9a							
WGBIE	*Dicentrarchus labrax*	bss.27.8ab							
WGBIE	*Dicentrarchus labrax*	bss.27.8c9a							
WGBIE	*Merluccius merluccius*	hke.27.3a46-8abd	1. Age structure not used in assessment		3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGBIE	*Brosme brosme, Merluccius merluccius*	hke.27.8c9a							
WGBIE	*Lepidorhombus boscii*	ldb.27.7b-k8abd							
WGBIE	*Lepidorhombus boscii*	ldb.27.8c9a							
WGBIE	*Lepidorhombus whiffiagonis*	meg.27.7b-k8abd	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGBIE	*Lepidorhombus whiffiagonis*	meg.27.8c9a							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGBIE	*Lophius piscatorius*	mon.27.78abd							
WGBIE	*Lophius piscatorius*	mon.27.8c9a	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGBIE	*Nephrops norvegicus*	nep.fu.2324							
WGBIE	*Nephrops norvegicus*	nep.fu.25							
WGBIE	*Nephrops norvegicus*	nep.fu.2627							
WGBIE	*Nephrops norvegicus*	nep.fu.2829			2. Knife-edge maturity-at-age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Stock in Category 3. Length-based assessment methods used by sex (LBI, MLZ)

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGBIE	*Nephrops norvegicus*	nep.fu.30							
WGBIE	*Nephrops norvegicus*	nep.fu.31							
WGBIE	*Pleuronectes platessa*	ple.27.89a							
WGBIE	*Pollachius pollachius*	pol.27.89a	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Stock in category 5, assessment based on catch information (by now)
WGBIE	*Solea solea*	sol.27.8ab							
WGBIE	*Solea solea*	sol.27.8c9a	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Stock in category 3, lenght-based

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGBIE	*Merlangius merlangus*	whg.27.89a							
WGCSE	*Lophius budegassa, Lophius piscatorius*	anf.27.3a46							
WGCSE	*Dicentrarchus labrax*	bss.27.4bc7ad-h	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGCSE	*Dicentrarchus labrax*	bss.27.6a7bj							
WGCSE	*Gadus morhua*	cod.27.6a							
WGCSE	*Gadus morhua*	cod.27.6b							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGCSE	*Gadus morhua*	cod.27.7a							
WGCSE	*Gadus morhua*	cod.27.7e-k							
WGCSE	*Melanogrammus aeglefinus*	had.27.6b							
WGCSE	*Melanogrammus aeglefinus*	had.27.7a							
WGCSE	*Melanogrammus aeglefinus*	had.27.7b-k	2. Age structure used in assessment		3. Fixed maturity ogive at age or length in assessment		1. No alternative input datasets produced		
WGCSE	*Lepidorhombus*	lez.27.4a6a							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGCSE	*Lepidorhombus*	lez.27.6b							
WGCSE	*Nephrops norvegicus*	nep.27.6aoutFU							
WGCSE	*Nephrops norvegicus*	nep.27.7outFU							
WGCSE	*Nephrops norvegicus*	nep.fu.11							
WGCSE	*Nephrops norvegicus*	nep.fu.12							
WGCSE	*Nephrops norvegicus*	nep.fu.13							
WGCSE	*Nephrops norvegicus*	nep.fu.14							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGCSE	*Nephrops norvegicus*	nep.fu.15							
WGCSE	*Nephrops norvegicus*	nep.fu.16							
WGCSE	*Nephrops norvegicus*	nep.fu.17							
WGCSE	*Nephrops norvegicus*	nep.fu.19							
WGCSE	*Nephrops norvegicus*	nep.fu.2021							
WGCSE	*Nephrops norvegicus*	nep.fu.22							
WGCSE	*Trisopterus esmarkii*	nop.27.6a							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGCSE	*Pleuronectes platessa*	ple.27.7a	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Unsure on history of age and maturity data
WGCSE	*Pleuronectes platessa*	ple.27.7bc							
WGCSE	*Pleuronectes platessa*	ple.27.7e							
WGCSE	*Pleuronectes platessa*	ple.27.7fg							
WGCSE	*Pleuronectes platessa*	ple.27.7h-k							
WGCSE	*Pollachius pollachius*	pol.27.67							

EG	Species	Stock	Stock Assessment: Age – Variance Structure[63]	Stock Assessment: Age – Error Matrix[64]	Stock Assessment: Maturity – Variance Structure[65]	Stock Assessment: Maturity – Error Matrix[66]	Stock Assessment: All – Sensitivity Analysis[67]	Stock Assessment: New Parameters – New Parameters[68]	General comments[62]
WGCSE	*Ammodytes*	san.27.6a							
WGCSE	*Solea solea*	sol.27.7a	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGCSE	*Solea solea*	sol.27.7bc							
WGCSE	*Solea solea*	sol.27.7e							
WGCSE	*Solea solea*	sol.27.7fg	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGCSE	*Solea solea*	sol.27.7h-k							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGCSE	*Merlangius merlangus*	whg.27.6a							
WGCSE	*Merlangius merlangus*	whg.27.6b							
WGCSE	*Merlangius merlangus*	whg.27.7a	2. Age structure used in assessment	1. Error matrix not used in assessment	2. Knife-edge maturity-at-age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Category 1 stock
WGCSE	*Merlangius merlangus*	whg.27.7b-ce-k							
WGDEEP	*Beryx*	alf.27.nea							
WGDEEP	*Argentina silus*	aru.27.123a4	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Category 3 stock

EG	Species	Stock	Stock Assessment: Age		Stock Assessment: Maturity		Stock Assessment: All	Stock Assessment: New Parameters	General comments[62]
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGDEEP	*Argentina silus*	aru.27.5a14	2. Age structure used in assessment	1. Error matrix not used in assessment	4. Yearly maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	2. New parameters used in assessment	Category 1 stock
WGDEEP	*Argentina silus*	aru.27.5b6a							
WGDEEP	*Argentina silus*	aru.27.6b7-1012							Category 3, very data-limited
WGDEEP	*Molva dypterygia*	bli.27.5a14	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Category 3 stock
WGDEEP	*Molva dypterygia*	bli.27.5b67							
WGDEEP	*Molva dypterygia*	bli.27.nea	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Category 5 stock

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGDEEP	*Aphanopus carbo*	bsf.27.nea							
WGDEEP	*Phycis blennoides*	gfb.27.nea							
WGDEEP	*Molva molva*	lin.27.1-2							
WGDEEP	*Molva molva*	lin.27.3a4a6-91214							
WGDEEP	*Molva molva*	lin.27.5a	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	2. New parameters used in assessment	Category 1 stock
WGDEEP	*Molva molva*	lin.27.5b							
WGDEEP	*Hoplostethus atlanticus*	ory.27.nea							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGDEEP	*Macrourus berglax*	rhg.27.nea							
WGDEEP	*Coryphaenoides rupestris*	rng.27.1245a8914ab							
WGDEEP	*Coryphaenoides rupestris*	rng.27.3a	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Category 3 stock; 2/3 rule and no reference points set.
WGDEEP	*Coryphaenoides rupestris*	rng.27.5a10b12ac14b							
WGDEEP	*Coryphaenoides rupestris*	rng.27.5b6712b	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Category 5 stock

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGDEEP	*Pagellus bogaraveo*	sbr.27.10							
WGDEEP	*Pagellus bogaraveo*	sbr.27.6-8							
WGDEEP	*Pagellus bogaraveo*	sbr.27.9							
WGDEEP	*Trachyrincus scabrus*	tsu.27.nea							
WGDEEP	*Brosme brosme*	usk.27.1-2							
WGDEEP	*Brosme brosme*	usk.27.12ac							
WGDEEP	*Brosme brosme*	usk.27.3a45b6a7-912b							
WGDEEP	*Brosme brosme*	usk.27.5a14	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or	1. Error matrix not used in assessment	1. No alternative input	2. New parameters used in assessment	Category 1 stock

EG	Species	Stock	Stock Assessment: Age		Stock Assessment: Maturity		Stock Assessment: All	Stock Assessment: New Parameters	General comments[62]
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
					length in assessment		datasets produced		
WGDEEP	*Brosme brosme*	usk.27.6b							
WGEEL	*Anguilla anguilla*	ele.2737.nea	1. Age structure not used in assessment		1. No maturity information in assessment		1. No alternative input datasets produced	2. New parameters used in assessment	category 3 stocks with assessment mostly based on time-series of recruitment. As such, no stock assessment model currently used and biometric data are rarely used. Growth/maturity/sex-ratio are known to be highly variable in space. Recent WKFEA workshop promotes the development of spatial model in which biometric data would be highly relevant
WGEF	*Squatina squatina*	agn.27.nea							
WGEF	*Cetorhinus maximus*	bsk.27.nea							
WGEF	*Centrophorus squamosus,*	cyo.27.nea							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
	Centroscymnus coelolepis								
WGEF	*Squalus acanthias*	dgs.27.nea							
WGEF	*Galeorhinus galeus*	gag.27.nea							
WGEF	*Centrophorus squamosus*	guq.27.nea							
WGEF	*Lamna nasus*	por.27.nea							
WGEF	*Rajidae*	raj.27.1012							
WGEF	*Rajidae*	raj.27.3a47d							
WGEF	*Rajidae*	raj.27.67a-ce-h							
WGEF	*Rajidae*	raj.27.89a							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGEF	*Rostroraja alba*	rja.27.nea							
WGEF	*Dipturus batis*	rjb.27.3a4							
WGEF	*Dipturus batis*	rjb.27.67a-ce-k							
WGEF	*Dipturus batis*	rjb.27.89a							
WGEF	*Raja clavata*	rjc.27.3a47d							
WGEF	*Raja clavata*	rjc.27.6							
WGEF	*Raja clavata*	rjc.27.7afg							
WGEF	*Raja clavata*	rjc.27.7e							
WGEF	*Raja clavata*	rjc.27.8							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGEF	*Raja clavata*	rjc.27.9a							
WGEF	*Raja microocellata*	rje.27.7de							
WGEF	*Raja microocellata*	rje.27.7fg							
WGEF	*Leucoraja fullonica*	rjf.27.67							
WGEF	*Raja brachyura*	rjh.27.4a6							
WGEF	*Raja brachyura*	rjh.27.4c7d							
WGEF	*Raja brachyura*	rjh.27.7afg							

EG	Species	Stock	Stock Assessment: Age – Variance Structure[63]	Stock Assessment: Age – Error Matrix[64]	Stock Assessment: Maturity – Variance Structure[65]	Stock Assessment: Maturity – Error Matrix[66]	Stock Assessment: All – Sensitivity Analysis[67]	Stock Assessment: New Parameters – New Parameters[68]	General comments[62]
WGEF	*Raja brachyura*	rjh.27.7e							
WGEF	*Raja brachyura*	rjh.27.9a							
WGEF	*Leucoraja circularis*	rji.27.67							
WGEF	*Raja montagui*	rjm.27.3a47d							
WGEF	*Raja montagui*	rjm.27.67bj							
WGEF	*Raja montagui*	rjm.27.7ae-h							
WGEF	*Raja montagui*	rjm.27.8							
WGEF	*Raja montagui*	rjm.27.9a							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGEF	*Leucoraja naevus*	rjn.27.3a4							
WGEF	*Leucoraja naevus*	rjn.27.678abd							
WGEF	*Leucoraja naevus*	rjn.27.8c							
WGEF	*Leucoraja naevus*	rjn.27.9a							
WGEF	*Amblyraja radiata*	rjr.27.23a4							
WGEF	*Raja undulata*	rju.27.7bj							
WGEF	*Raja undulata*	rju.27.7de							
WGEF	*Raja undulata*	rju.27.8ab							
WGEF	*Raja undulata*	rju.27.8c							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGEF	*Raja undulata*	rju.27.9a							
WGEF	*Dalatias licha*	sck.27.nea							
WGEF	*Mustelus asterias*	sdv.27.nea							
WGEF	*Galeus melastomus*	sho.27.67							
WGEF	*Galeus melastomus*	sho.27.89a							
WGEF	*Scyliorhinus canicula*	syc.27.3a47d							
WGEF	*Scyliorhinus canicula*	syc.27.67a-ce-j							
WGEF	*Scyliorhinus canicula*	syc.27.8abd							

EG	Species	Stock	Stock Assessment: Age		Stock Assessment: Maturity		Stock Assessment: All	Stock Assessment: New Parameters	General comments[62]
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGEF	*Scyliorhinus canicula*	syc.27.8c9a							
WGEF	*Scyliorhinus stellaris*	syt.27.67							
WGEF	*Alopias*	thr.27.nea							
WGHANSA	*Engraulis encrasicolus*	ane.27.8	2. Age structure used in assessment	1. Error matrix not used in assessment	2. Knife-edge maturity-at-age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGHANSA	*Engraulis encrasicolus*	ane.27.9a_southcomponent	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	this is a category 3 stock component, but stock biomass indicators and (relative) biomass-based reference points are derived from a Gadget model
		ane.27.9a_westcomponent	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment		1. New parameters not used in assessment	this is a category 3 stock component; no analytical assessment, survey trend

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGHANSA	*Trachurus trachurus*	hom.27.9a	1. Age structure not used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	1. No alternative input datasets produced
WGHANSA	*Trachurus picturatus*	jaa.27.10a2		1. Error matrix not used in assessment		1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGHANSA	*Sardina pilchardus*	pil.27.7	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGHANSA	*Sardina pilchardus*	pil.27.8abd		2. Error matrix used in assessment		2. Error matrix used in assessment	yes	yes, also a switch from age based to length based structure in SS3	
WGHANSA	*Sardina pilchardus*	pil.27.8c9a	2. Age structure used in assessment	1. Error matrix not used in assessment	4. Yearly maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGNAS	*Salmo salar*	sal.21.2-5							
WGNAS	*Salmo salar*	sal.2127.1a-f14	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	2. New parameters used in assessment	Tried my best to fit information to this table, but salmon stock assessment is a bit of a different kettle of fish.
WGNAS	*Salmo salar*	sal.27.nea	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	2. New parameters used in assessment	
WGNSSK	*Scophthalmus rhombus*	bll.27.3a47de	1. Age structure not used in assessment		1. No maturity information in assessment		1. No alternative input datasets produced	1. New parameters not used in assessment	Category 3 stock without quantitative assessment. Fields left blank means not applicable for this stock.
WGNSSK	*Gadus morhua*	cod.27.47d20	2. Age structure used in assessment	1. Error matrix not used in assessment	4. Yearly maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced		Category 1 assessment

EG	Species	Stock	Stock Assessment: Age – Variance Structure[63]	Stock Assessment: Age – Error Matrix[64]	Stock Assessment: Maturity – Variance Structure[65]	Stock Assessment: Maturity – Error Matrix[66]	Stock Assessment: All – Sensitivity Analysis[67]	Stock Assessment: New Parameters – New Parameters[68]	General comments[62]
WGNSSK	*Limanda limanda*	dab.27.3a4							Category 3 stock without quantitative assessment. Fields left blank means not applicable for this stock.
WGNSSK	*Platichthys flesus*	fle.27.3a4							Category 3 stock without quantitative assessment. Fields left blank means not applicable for this stock.
WGNSSK	*Eutrigla gurnardus*	gug.27.3a47d							Category 3 stock without quantitative assessment. Fields left blank means not applicable for this stock.
WGNSSK	*Melanogrammus aeglefinus*	had.27.46a20	2. Age structure used in assessment	1. Error matrix not used in assessment	2. Knife-edge maturity-at-age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced		Category 1 assessment. Benchmark set for early 2022
WGNSSK	*Microstomus kitt*	lem.27.3a47d	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGNSSK	*Mullus surmuletus*	mur.27.3a47d	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input	1. New parameters not used in assessment	Since 2021 stock was downgraded to category 5 due to the lack of age (only one country sampling) and size sampling.

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
							datasets produced		
WGNSSK	*Nephrops norvegicus*	nep.27.4outFU	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Category 5 stock without quantitative assessment
WGNSSK	*Nephrops norvegicus*	nep.fu.10							
WGNSSK	*Nephrops norvegicus*	nep.fu.3-4							
WGNSSK	*Nephrops norvegicus*	nep.fu.32	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Data limited stock with no quantitative assessment. Fishery has decreased
WGNSSK	*Nephrops norvegicus*	nep.fu.33	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Category 4 stock without quantitative assessment

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGNSSK	*Nephrops norvegicus*	nep.fu.34							
WGNSSK	*Nephrops norvegicus*	nep.fu.5	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Category 4 stock without quantitative assessment
WGNSSK	*Nephrops norvegicus*	nep.fu.6	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Category 1 stock with quantitative assessment based on a separable cohort analysis, with MSY proxy of 35% of virgin spawners per recruit
WGNSSK	*Nephrops norvegicus*	nep.fu.7							
WGNSSK	*Nephrops norvegicus*	nep.fu.8							
WGNSSK	*Nephrops norvegicus*	nep.fu.9							

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
WGNSSK	*Trisopterus esmarkii*	nop.27.3a4	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	3. Numerous sensitivity runs with alternative datasets tested	2. New parameters used in assessment	
WGNSSK	*Pleuronectes platessa*	ple.27.420	2. Age structure used in assessment	1. Error matrix not used in assessment	2. Knife-edge maturity-at-age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGNSSK	*Pleuronectes platessa*	ple.27.7d	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGNSSK	*Pollachius virens*	pok.27.3a46	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Some fields left blank as no information readily available
WGNSSK	*Pollachius*	pol.27.3a4							No stock assessment for pollack

EG	Species	Stock	Stock Assessment: Age		Stock Assessment: Maturity		Stock Assessment: All	Stock Assessment: New Parameters	General comments[62]
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
	pollachius								
WGNSSK	*Solea solea*	sol.27.4	2. Age structure used in assessment	1. Error matrix not used in assessment	2. Knife-edge maturity-at-age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGNSSK	*Solea solea*	sol.27.7d	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Some fields are left blank (or I filled in N/A) because not applicable.
WGNSSK	*Scophthalmus maximus*	tur.27.3a	1. Age structure not used in assessment		1. No maturity information in assessment				Category 3 stock assessed with a surplus production model
WGNSSK	*Scophthalmus maximus*	tur.27.4							
WGNSSK	*Merlangius merlangus*	whg.27.3a	1. Age structure not used in assessment	1. Error matrix not used in assessment	1. No maturity information in assessment	1. Error matrix not used in assessment	1. No alternative input	1. New parameters not used in assessment	Category 3 stock assessed with surplus production model and advice based on trends of estimated relative biomass

EG	Species	Stock	Stock Assessment						General comments[62]
			Age		Maturity		All	New Parameters	
			Variance Structure[63]	Error Matrix[64]	Variance Structure[65]	Error Matrix[66]	Sensitivity Analysis[67]	New Parameters[68]	
							datasets produced		
WGNSSK	*Merlangius merlangus*	whg.27.47d	2. Age structure used in assessment	1. Error matrix not used in assessment	4. Yearly maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	
WGNSSK	*Glyptocephalus cynoglossus*	wit.27.3a47d	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment	1. No alternative input datasets produced	1. New parameters not used in assessment	Category 1 stock with a SAM assessment using a biomass survey index and total landings until 2008 and age specific information from 2009 onward
WGWIDE	*Capros aper*	boc.27.6-8							
WGWIDE	*Chelidonichthys cuculus*	gur.27.3-8							
WGWIDE	*Clupea harengus*	her.27.1-24a514a							

EG	Species	Stock	Stock Assessment: Age – Variance Structure[63]	Stock Assessment: Age – Error Matrix[64]	Stock Assessment: Maturity – Variance Structure[65]	Stock Assessment: Maturity – Error Matrix[66]	Stock Assessment: All – Sensitivity Analysis[67]	Stock Assessment: New Parameters – New Parameters[68]	General comments[62]
WGWIDE	*Trachurus trachurus*	hom.27.2a4a5b6a7a-ce-k8							
WGWIDE	*Trachurus trachurus*	hom.27.3a4bc7d							
WGWIDE	*Scomber scombrus*	mac.27.nea	2. Age structure used in assessment	1. Error matrix not used in assessment	4. Yearly maturity ogive at age or length in assessment	1. Error matrix not used in assessment	3. Numerous sensitivity runs with alternative datasets tested	1. New parameters not used in assessment	
WGWIDE	*Mullus surmuletus*	mur.27.67a-ce-k89a							
WGWIDE	*Micromesistius poutassou*	whb.27.1-91214	2. Age structure used in assessment	1. Error matrix not used in assessment	3. Fixed maturity ogive at age or length in assessment	1. Error matrix not used in assessment		1. New parameters not used in assessment	

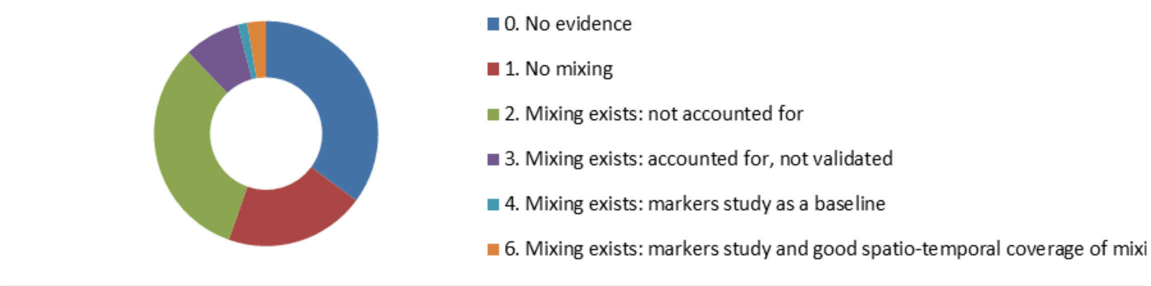
Annex 6-Table 7. (Part 5) Quality indicators by stock–WGBIOP 2020 answers. Part 5: Summary Table–Corrected Answers and Figures.

Sampling Design_All_Survey Design Were possible weaknesses of the survey design critically assessed?	n	%
0. Quality of biological data not evaluated	36	47
1. Preliminary analysis of quality of biological data	25	33
2. Detailed analysis of the quality of biological data	15	20
Total	76	100

Sampling Design_All_Design Commercial Sampling **Has the quality of (national) sampling schemes used to collect biological material been thoroughly evaluated? (Refer to annual evaluation of national work plans by STECF)**	**n**	**%**
Y	25	33
N	25	33
N/A	25	33
Total	75	99

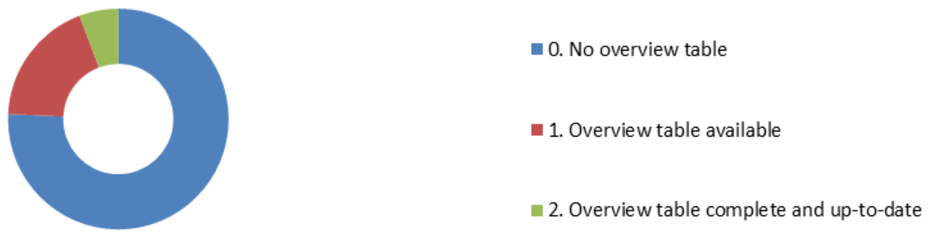
Sampling Design_All_Spatial Coverage **Is the full range of the stock covered by biological sampling? (E.g. evaluate distribution maps of national VMS tracks and commercial samples)**	**n**	**%**
Y	34	45
N	23	30
N/A	19	25
Total	76	100

Stock Identity_All_Mixing Ratio Is there any evidence of mixing? What methods are used to identify stock components? How reliable are spatio-temporal patterns in mixing resolved?	n	%
0. No evidence	26	35
1. No mixing	15	20
2. Mixing exists: not accounted for	24	32
3. Mixing exists: accounted for, not validated	6	8
4. Mixing exists: markers study as a baseline	1	1
6. Mixing exists: markers study and good spatio-temporal coverage of mixing	2	3
Total	74	100

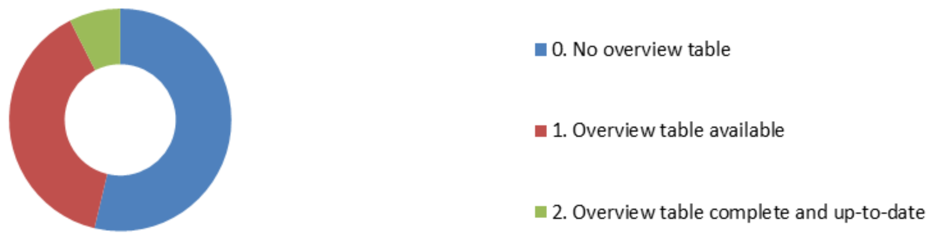


Methods and Definitions_Age_Structure Documentation of different structures used by country and stock	n	%
0. No overview table	53	76

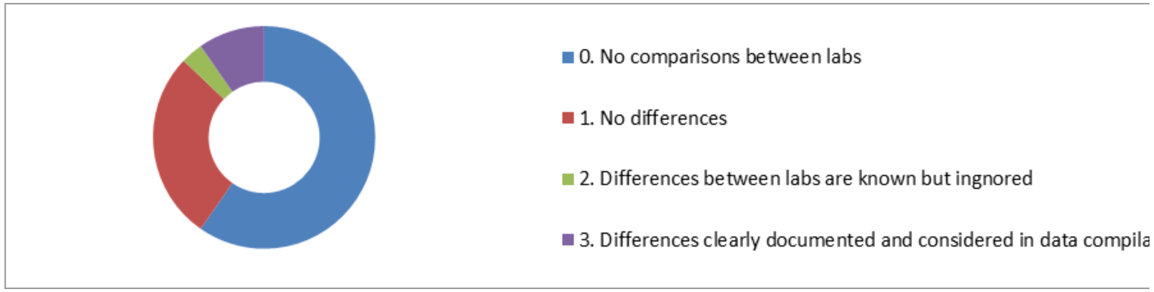
1. Overview table available	13	19
2. Overview table complete and up-to-date	4	6
Total	70	100



Methods and Definitions_Age_Preparation		
Documentation of different preparation techniques used by country and stock	**n**	**%**
0. No overview table	36	54
1. Overview table available	26	39
2. Overview table complete and up-to-date	5	7
Total	67	100

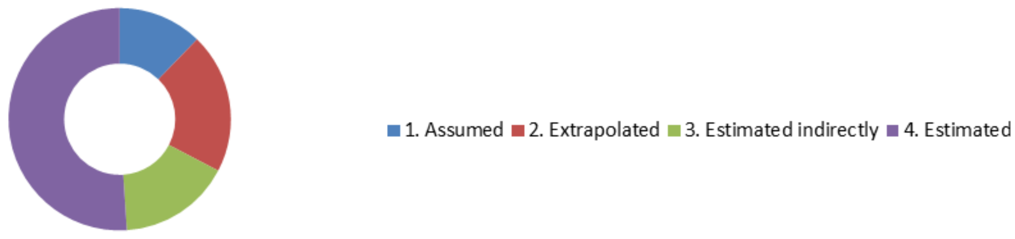


Methods and Definitions_Age_Birthdate & "Scheme" **Consistency in the definition of the birthdate *(usually January 1st)* and in the interpretation of the seasonality in deposition of opaque and translucent material *(the "scheme")***	**n**	**%**
0. No comparisons between labs	37	60
1. No differences	17	27
2. Differences between labs are known but ingnored	2	3
3. Differences clearly documented and considered in data compilation	6	10
Total	62	100

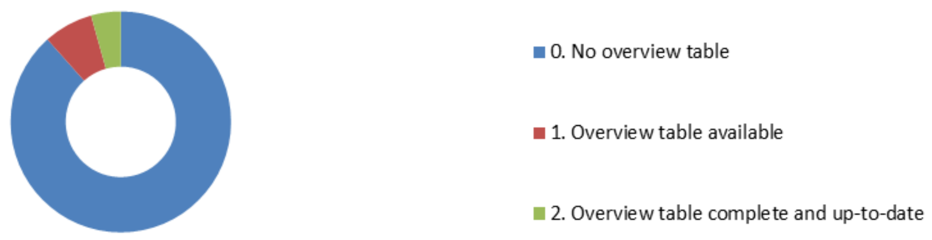


Methods and Definitions_Growth_Growth **Growth parameters are used in assessments (e.g. Nephrops). On what information are growth parameters based? Estimated by direct or indirect methods (e.g. tagging studies), extrapolated (from neighbouring regions), or assumed?**	**n**	**%**
1. Assumed	6	12
2. Extrapolated	10	20
3. Estimated indirectly	8	16

4. Estimated directly	25	51
Total	49	100

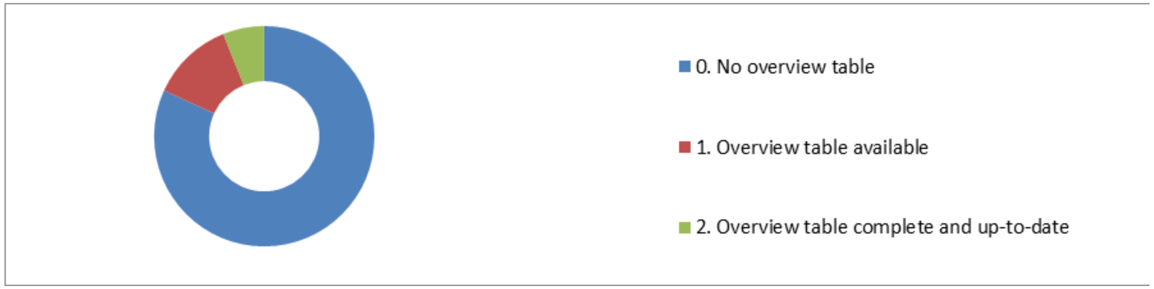


Methods and Definitions_Maturity_Structure		
Documentation of different structures used by country and stock	**n**	**%**
0. No overview table	61	88
1. Overview table available	5	7
2. Overview table complete and up-to-date	3	4
Total	69	100



Methods and Definitions_Maturity_Preparation

Documentation of different preparation techniques used by country and stock		
0. No overview table	54	82
1. Overview table available	8	12
2. Overview table complete and up-to-date	4	6
Total	66	100

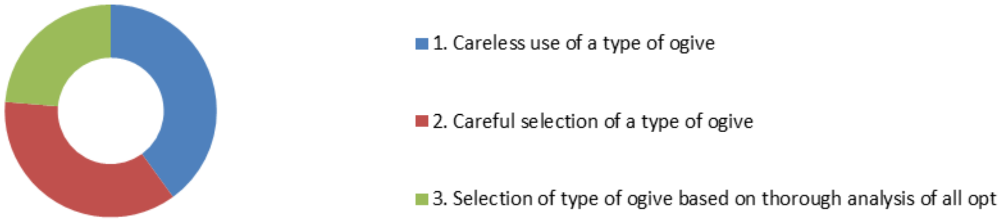


Methods and Definitions_Maturity_Scaling Do differences between countries exist(ed)? Have different national maturity scales been successfully merged into one international standard?	n	%
0. No chronicle (standard scale) available	37	60
1. Differences between labs are known but ingnored	7	11
2. Chronicle (standard scale) clearly documented and considered in data compilation	18	29
Total	62	100

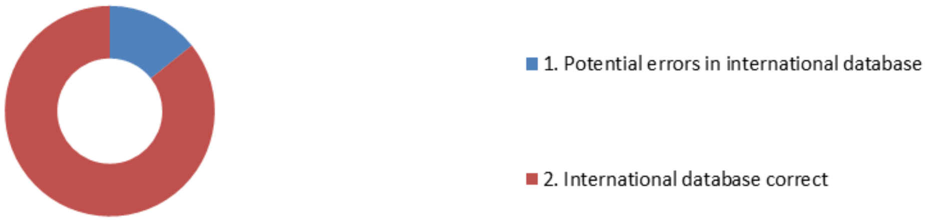
Methods and Definitions_Maturity_Timing		
Is the maturity staging conducted during the whole year or only during a specified period of the year?	**n**	**%**
1. Conducted in a restricted staging period (e.g.: If Q1 is advised: Q1= good, Q2&Q3=bad, Q4=moderate)	29	51
2. Staging year-round	28	49
Total	57	100

Methods and Definitions_Maturity_Ogive		
If sufficient maturity data are available, then spatially and/or temporally varying ogives can be considered	**n**	**%**
1. Careless use of a type of ogive	22	40
2. Careful selection of a type of ogive	20	36

3. Selection of type of ogive based on thorough analysis of all options	13	24
Total	55	100

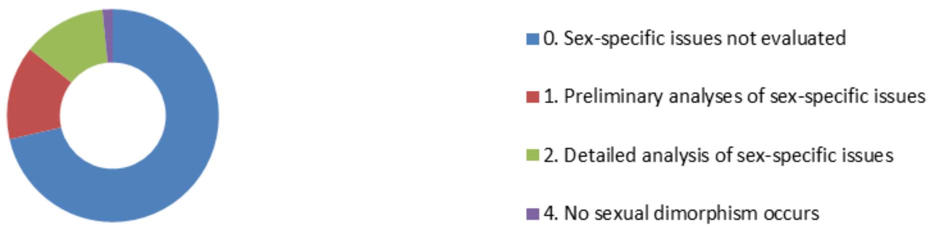


Methods and Definitions_Sex_Coding **Different countries use different coding for male and female in their national databases. This should be standardized before the data are submitted to ICES/GFCM, but there is a risk of errors.**	**n**	**%**
1. Potential errors in international database	7	14
2. International database correct	42	86
Total	49	100



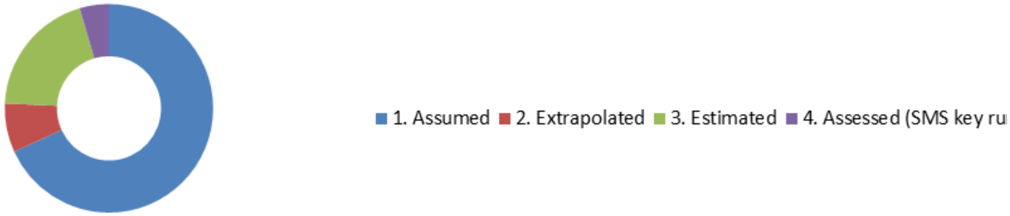
Methods and Definitions_All_Sex-specific Parameters

Sexual dimorphism occurs in many species, but sex-specific parameters are only applicable in sex-specific stock assessments. Is sex-specific information available and needed? Are the sample sizes per strata representative enough to allow sex-specific conclusions?	n	%
0. Sex-specific issues not evaluated	45	71
1. Preliminary analyses of sex-specific issues	9	14
2. Detailed analysis of sex-specific issues	8	13
4. No sexual dimorphism occurs	1	2
Total	63	100



Methods and Definitions_Natural Mortality_M On what information is the value for natural mortality based? Estimated (based on predator–prey studies), extrapolated from neighbouring regions or assumed?	n	%
1. Assumed	45	68
2. Extrapolated	5	8
3. Estimated	13	20
4. Assessed (SMS key runs, ...)	3	5

Total	66	100

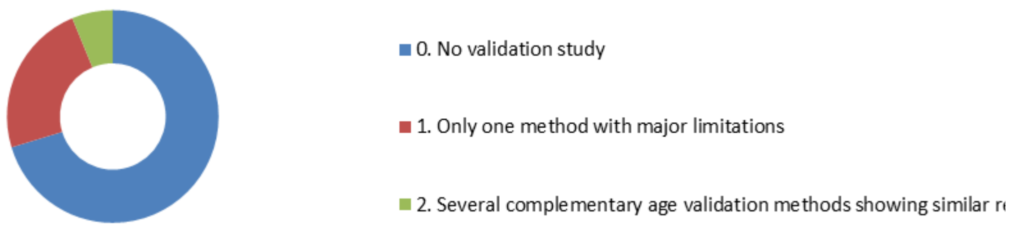


Data Collection_Maturity_Length/age at Maturity		
Was length/age at maturity estimated or extrapolated from neighbouring stocks?	**n**	**%**
0. Not estimated	27	39
1. Not estimated but extrapolated	2	3
2. Estimated	41	59
Total	70	100

Data Collection_Maturity_Sex Ratio		
Was sex ratio estimated or extrapolated from neighbouring stocks?	**n**	**%**

0. Not estimated	50	76
2. Estimated	16	24
Total	66	100

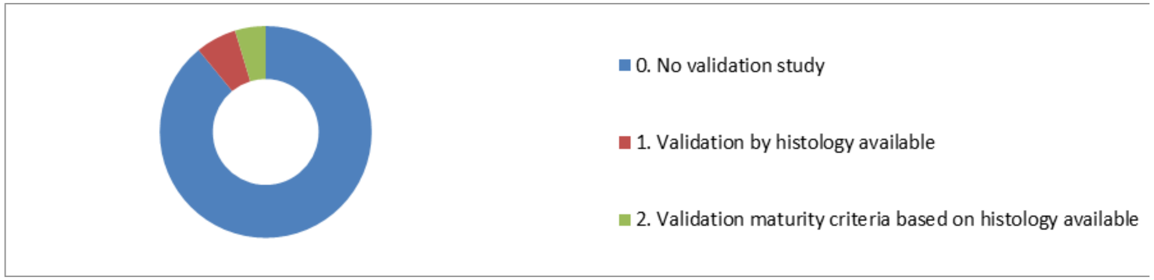
Validation_Age_Age Validation		
Is there an age validation study available? (What was the method of age validation?)	**n**	**%**
0. No validation study	45	70
1. Only one method with major limitations	15	23
2. Several complementary age validation methods showing similar results	4	6
Total	64	100



Validation_Age_Absolute Bias Measure for accuracy in relation to true age (seldom available) (Quantitative estimate; evaluation stock-specific)	n	%
available in recent age reading exchange workshop report	3	15
Not available	17	85
Total	20	100

Validation_Age_Absolute Age Error Matrix Probability distribution of repeated measurements relative to true age (Quantitative estimate; evaluation stock-specific)	n	%
available in recent age reading report	3	16
Not available	16	84
Total	19	100

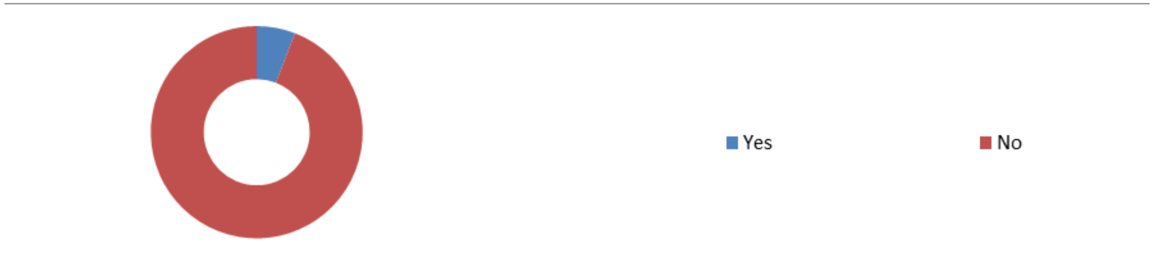
Validation_Maturity_Maturity Validation **Were gonad stages compared with macroscopic and histological methods?**	n	%
0. No validation study	57	89
1. Validation by histology available	4	6
2. Validation maturity criteria based on histology available	3	5
Total	64	100



Validation_Maturity_Absolute Bias **Measure for accuracy in relation to true maturity (histological analysis) (Quantitative estimate; evaluation stock-specific)**	n	%

Yes	2	12
No	15	88
Total	17	100

Validation_Maturity_Absolute Maturity Error Matrix		
Probability distribution of repeated measurements relative to true maturity (Quantitative estimate; evaluation stock-specific)	**n**	**%**
Yes	1	6
No	16	94
Total	17	100



Calibration_Age_Exchange / Workshop

When was the last exchange that included age readers from major data contributors?	n	%
0. No exchange	25	40
1. Exchange long time ago and poor results	6	10
2. Exchange recently, poor results	5	8
3. Exchange long time ago and good results	4	6
4. Exchange recently, good results	17	27
5. Exchange recently, very good results	6	10
Total	63	100

Calibration_Age_Relative Bias

Measure for accuracy in relation to modal age (Quantitative estimate; evaluation stock-specific)

Most (6/9) of the Age_Relative Bias of the stocks lower than ± 0.1

Calibration_Age_CV or APE

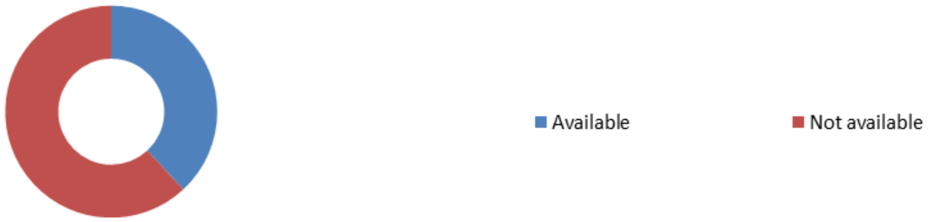
Measure for precision (Quantitative estimate; evaluation stock-specific)				
Mean CV of 17% and range 4-39% from 12 stocks				
39	20	17	4	39
	17			
	6			
	8			
	9			
	11			
	15			
	20			
	26			
	4			
	30			
	39			
Calibration_Age_% Agreement				
Percentage agreement between age readers (Quantitative estimate; evaluation stock-specific)				

Mean agreement of 70% and range 30-95% from 14 stocks

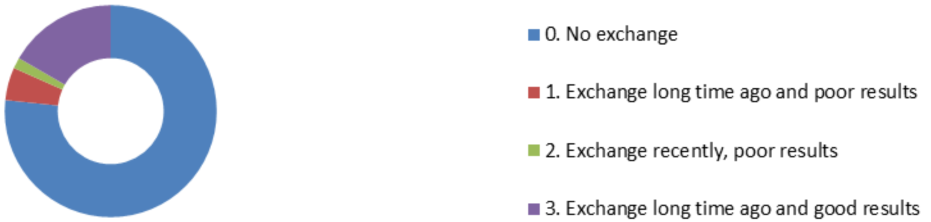
95	30	70	30	95
	48			
	66			
	70			
	78			
	80			
	86			
	95			
	40			
	82			
	67			
	70			
	80			
	95			

Calibration_Age_Relative Age Error Matrix		
Probability distribution of repeated measurements relative to modal age (Quantitative estimate; evaluation stock-specific)	**n**	**%**
Available	8	38
Not available	13	62

Total	21	100

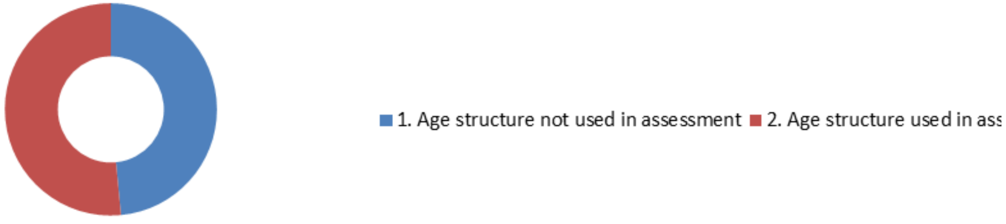


Calibration_Maturity_Exchange/Workshop		
When was the last exchange that included maturity readers from major data contributors?	**n**	**%**
0. No exchange	46	77
1. Exchange long time ago and poor results	3	5
2. Exchange recently, poor results	1	2
3. Exchange long time ago and good results	10	17
Total	60	100

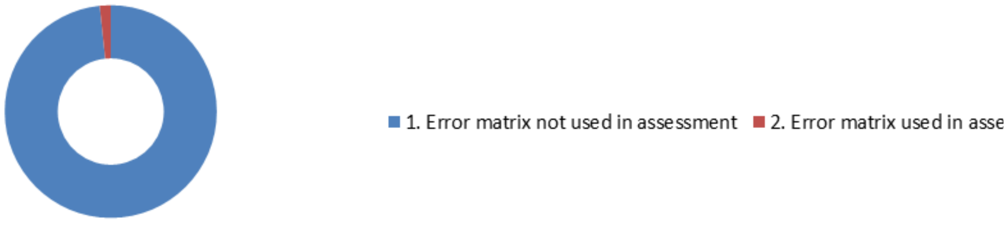


Calibration_Maturity_Relative Bias

Measure for accuracy in relation to modal maturity (Quantitative estimate; evaluation stock-specific)	n	
Answers with values	7	Highly variable relative bias values depending on the maturity stage
Calibration_Maturity_CV or APE		
Measure for precision (Quantitative estimate; evaluation stock-specific)	**n**	
Answers with values	1	
Calibration_Maturity_% Agreement		
Percentage agreement between maturity readers (Quantitative estimate; evaluation stock-specific)	**n**	
Answers with values	7	Values between 61-94%
Calibration_Maturity_Relative Maturity Error Matrix		
Probability distribution of repeated measurements relative to modal maturity (Quantitative estimate; evaluation stock-specific)	**n**	
No values available		
Stock Assessment_Age_Variance Structure		
Is the stock assessment model age-structured?	**n**	**%**
1. Age structure not used in assessment	32	48
2. Age structure used in assessment	34	52
Total	66	100

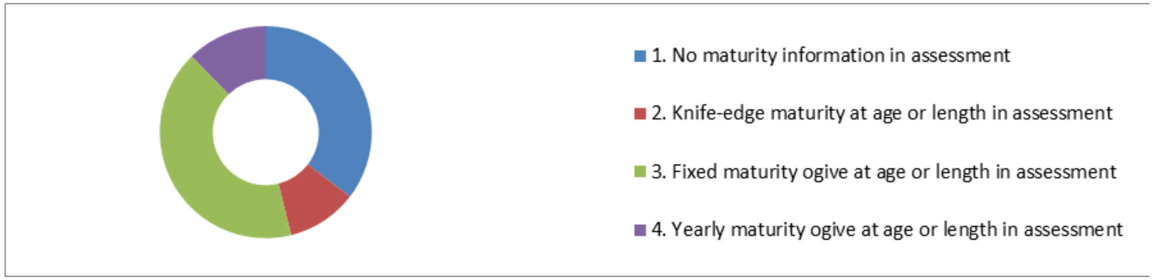


Stock Assessment_Age_Error Matrix		
Variance structure can directly be incorporated into stochastic stock assessment models	**n**	**%**
1. Error matrix not used in assessment	59	98
2. Error matrix used in assessment	1	2
Total	60	100

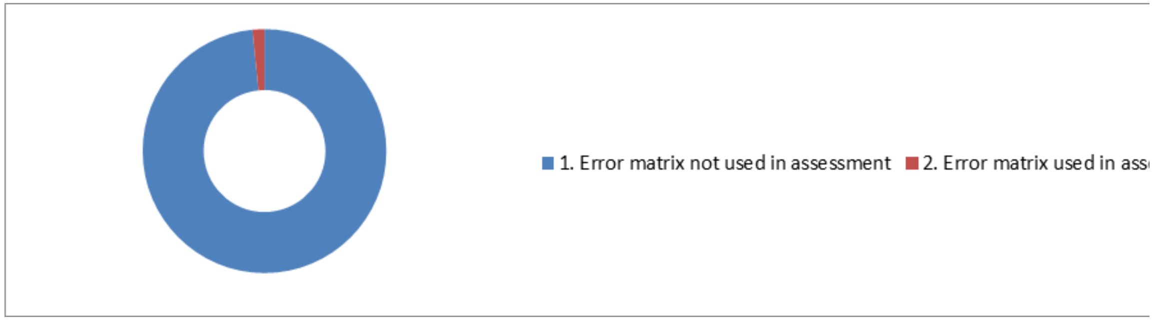


Stock Assessment_Maturity_Variance Structure		
Is maturity function used in stock assessment model?	**n**	**%**

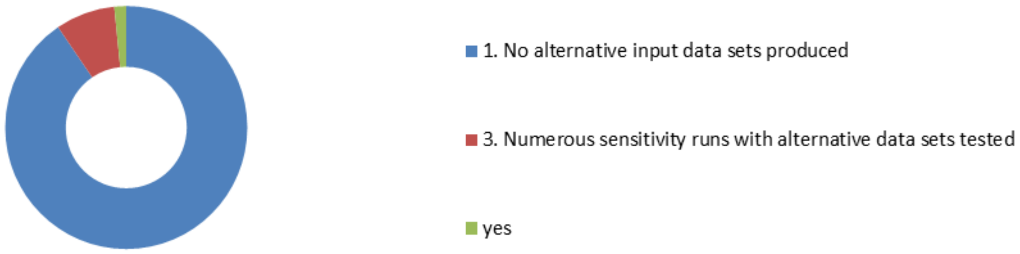
1. No maturity information in assessment	23	35
2. Knife-edge maturity-at-age or length in assessment	7	11
3. Fixed maturity ogive at age or length in assessment	27	42
4. Yearly maturity ogive at age or length in assessment	8	12
Total	65	100



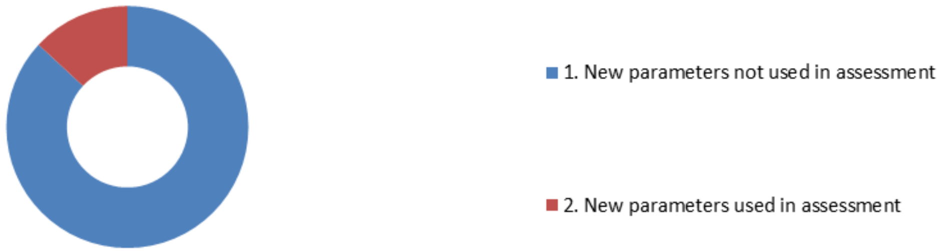
Stock Assessment_Maturity_Error Matrix		
Variance structure can directly be incorporated into stochastic stock assessment models	**n**	**%**
1. Error matrix not used in assessment	62	98
2. Error matrix used in assessment	1	2
Total	63	100



Stock Assessment_All_Sensitivity Analysis Sensitivity runs will show effects of different biological datasets (e.g. age) on the assessment outcomes in terms of key parameters such as fishing mortality (F) and spawning-stock biomass (SSB)	n	%
1. No alternative input datasets produced	57	90
3. Numerous sensitivity runs with alternative datasets tested	5	8
yes	1	2
Total	63	100



Stock Assessment_New Parameters_New Parameters		
Use of new parameters could improve stock assessments. Has the potential of new parameters been considered or included in the data compilation and input to stock assessment?	**n**	**%**
1. New parameters not used in assessment	53	87
2. New parameters used in assessment	8	13
Total	61	100



Annex 6-Table 7. (Part 6) Quality indicators by stock–WGBIOP 2020 answers. Part 6: Summary Table–Summary of Results.

Summary of Quality Indicators Table questionnaire
1. Sampling Design
Regarding the survey design, the quality of the biological data were not evaluated in almost half of the stocks. Related to commercial sampling design, the quality of (national) sampling schemes used to collect biological material has been thoroughly evaluated in a third of the stocks. Regarding spatial coverage, the full range of 45% of the stocks is covered by biological sampling.
2. Stock Identity
For 35% of the stocks there is no evidence of mixing. In case of 20% of stocks mixing does not exist. Mixing exists but is not accounted for in case of 32% of stocks.
3. Methods and Definitions
3.1. Age. 3/4 of the stocks do not have an overview table documenting ageing structures used by country and stock. Regarding the documentation of preparation techniques used by country and stock, there is no overview table for half (54%) of the stocks. Regarding the consistency in the definition of the birthdate (usually January 1st) and in the interpretation of the seasonality in deposition of opaque and translucent material (the "scheme"), there is no comparisons between labs for 60% of the stocks.
3.2. Growth. Growth parameters used in stock assessments are estimated directly in half of the stocks.
3.3. Maturity. The vast majority of the stocks (88 and 82%, respectively) do not have an overview table documenting the structures and different preparation techniques used by country and stock. For 60% of the stocks, maturity standard scale is not available. In half of the stocks, the maturity staging is conducted during the whole year, while in the other half it is only based in a restricted staging period. When sufficient maturity data are available, then spatially and/or temporally varying ogives can be considered. Careless use (spatially and/or temporally variation is not considered) of a type of ogive occurs in 40% of the stocks, however a careful selection of an ogive type takes place in 36% of the stocks.
3.4. Sex. Regarding the coding, the answers showed that International database is correct in the vast majority of the stocks (86%).
3.5. Regarding if sex-specific information is available and needed and if the sample sizes per strata are representative enough to allow sex-specific conclusions, sex-specific issues are not evaluated in 71% of the stocks.
3.6. Natural Mortality. The natural mortality is assumed for 2/3 and estimated for 20% of the stocks.
4. Data collection
Length/age at Maturity was estimated in 59% of the stocks. Sex Ratio is estimated for 1/4 of the stocks.
5. Validation
Age Validation study is available for 30% of the stocks. Absolute Bias is only available in recent age reading reports for 15% of the stocks (answers from only 21 stocks). Absolute Age Error Matrix is only available in recent age reading reports for 16% of the stocks (answers from only 21 stocks).
Maturity Validation study comparing macroscopic and histological methods is available for the vast minority of the stocks (11%). Absolute Bias is available only in recent age reading reports for 12% of the stocks (answers in only 20 stocks). Absolute Maturity Error Matrix is available only in recent age reading reports for 6% of the stocks (answers from only 20 stocks).
6. Calibration
6.1. Age. Exchange / Workshop: No exchange was performed for 40% of the stocks.
The results of exchanges/workshops given in the table were as follows:

Summary of Quality Indicators Table questionnaire
Relative Bias lower than ± 0.1 for most (6 out of 9) stocks.
Mean CV of 17% with range 4-39% from 12 stocks.
Mean agreement of 70% with range 30-95% from 14 stocks.
Absolute Age Error Matrix is available for only 38% of the stocks (answers from only 21 stocks).
6.2. Maturity. No Maturity exchange was performed for 77% of the stocks. Relative Bias values are available for 7 stocks, and CV values are available for only 1 stock . with Agreement values are available for 7 stocks with range: 61-94%. Maturity Error Matrix: no values available for any of the stocks.
7. Stock Assessment
7.1 Age. Age structure models are used in the assessment in the half of the stocks. Error Matrix is not usually (98%) used in the stock assessment.
7.2 Maturity. In case of 35% of the stocks maturity information is not used in the stock assessment . Error Matrix is not usually (98%) used in the stock assessment.
7.3. Regarding Sensitivity Analysis, alternative input datasets are produced for 10% of the stocks.
7.4. 90% of the stocks do not use New Parameters in the assessment.

Annex 7: Recommendations & responses (ToR e)

Recommendation from WGIPS
WGIPS recommend that WGBIOP investigate how differences in preparation of herring otoliths (mounted/un-mounted/different mediums such as water, oil, ethanol, etc.) affect age reading results, particularly for older ages.
Background:
HAWG has recommended that WGIPS give consideration to how herring otoliths have been aged by institutes contributing ages to the HERAS survey index on North Sea herring over the time-series and if / when changes have occurred how such changes might have affected aging results especially at older ages (recommendation 29 in 2020 from HAWG to WGIPS).
WGIPS can provide a review of methods used in each institute involved and the timing of changes where they have occurred. However, how the preparation of herring otoliths for aging might affect the age reading results is beyond the expertise of WGIPS, and therefore we cannot comment on how these changes might have affected aging results without drawing on expertise from WGBIOP.
WGIPS recommend that WGBIOP look into this, and ask that if this is indeed an issue of concern for the integrity of the survey index, that studies are reviewed or carried out to investigate the magnitude of the issue. WGIPS notes that if this is considered an issue for concern that it has wider implications than the North Sea herring survey index as the same institutes provide ages to the catch data and survey indices used in the assessment of most herring stocks assessed in HAWG.
Response from WGBIOP
WGBIOP recommends that when an institute changes the preparation method they are using for a particular species or stock it is their responsibility to make sure that the results from this new method are consistent with those achieved using the previous method. This is similar to when a new reader is introduced in that the same precautions would need to be taken in that situation to make sure that results were the same as those achieved by other experienced readers. WGBIOPs role is to ensure consistency of results across different institutes with an interest in the same species/stock and this is done via exchanges and workshops and is most usually applied to species/stocks that are up for benchmark but can also be arranged on a more adhoc basis if required.

Recommendation from WGBEAM
WGBEAM noted requirements for further developments of DATRAS and recommends that this is discussed in WGDG:
Record methodology of distance (calculated by speed and duration, by ship's log, by calculation shoot-haul position, etc.)
Record conservation status of species: fresh, frozen, cooked, ...
Although WGBEAM suggests not to add so-called 'seeded ages' and upload individual fish for which no age has been collected with Age=-9, it may be considered to add additional coding in TSAgeSource, e.g. 'estimate'.
It appeared that DATRAS does not allow for submission of HH records of valid tows without HL and/or CA records. WGBEAM concluded that this should be allowed, as valid tows may occur, but in single-species surveys (stdspecrec=1, bycspecrec=0) it may lead to wrong estimates of average catches if 0-hauls are not taken into account.
Response from WGBIOP
In the context of this recommendation WGBIOP understands 'conservation status' to mean the way the fish specimen is preserved. WGBIOP would suggested that rather than having a separate conservation status this would be merged with METFP, where the suggested states could be added. With regard to 'seeded' otoliths, WGBIOP supports the use of Age =-9 for individual fish for which no age data has been collected.

Recommendation from WGNSSK
We recommend to consider an otolith exchange workshop to calibrate age readings across participating national laboratories (i.e. for cod and plaice in the North Sea)
Response from WGBIOP
WGBIOP plans exchanges and workshops following the benchmark schedule. It may be possible to arrange an exchange or workshop associated with an inter benchmark meeting if a particular issue is identified and communicated to WGBIOP by another Expert Group. There has been a plaice exchange recently and a follow up workshop is planned for later on this year. A cod exchange is also planned for 2022.

Recommendation from WKNSEA
We see in a lot of stocks that fish mature at an earlier age / length. If an annual maturity ogive is used, this will give an increase in the SSB. However, there are some uncertainties on the fecundity between ages and this is often not accounted for. Is it possible the give different species / stock different weighting by age to account for the different fecundity?
Response from WGBIOP
Fecundity data are not collected routinely. WGBIOP agrees that these data would be valuable but acknowledges that further studies would need to be planned and delivered in order to gather this information for specific stocks. Suggest further conversation between WGBIOP chairs and WKNSEA to establish a more detailed proposal for this work.

Recommendation from WKCOLIAS
The WKCOLIAS2 proposes to WGBIOP that S. colias maturity and otoliths/age exchanges using SmartDots to be held in 2022 and, if possible, a physical workshop in 2023, involving both European and African participants
Response from WGBIOP
WGBIOP propose a Chub Mackerel Scomber colias otolith exchange to take place in 2022, coordinators have been allocated for this work. A workshop has also been discussed.