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Ghent, Belgium



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the Exploration of the Sea

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Executive summary

This was the first interim year for the multi-annual Terms of References (ToRs) for the Working Group on Biological Parameters (WGBIOP). The group met 1–5 October in Ghent, Belgium. The overall aim for WGBIOP is to review the status of current issues, achievements and developments of biological parameters and identify future needs in line with ICES requirements and the wider European environmental monitoring and management.

ToR a is a generic ToR which reviews both the need for new calibration exercises on biological parameters as well as outcomes and recommendations of these. All the tables containing detailed information about national experts' contacts, stocks handled and techniques used in age reading, were updated and greatly improved. The WGBIOP Data Quality Assurance Repository (<http://ices.dk/commu-nity/Pages/PGCCDBS-doc-repository.aspx>) is an open source webpage containing all this kind of information and related reports traced back in time.

ToR b is also a generic ToR for WGBIOP which standardises and updates guidelines for age reading, maturity staging and other biological parameter exchanges and/or workshops following the learned experienced from past inter-calibration exercises. Also, validation is essential to ensure the accuracy of biological data used as input for assessment and in the following two years WGBIOP will continue to work on identifying and prioritising these needs

ToR c links WGBIOP with the assessment groups and ensures issues and quality indicators of biological parameter are incorporated into the assessment and management of stocks. The issue lists for upcoming benchmark assessments are annually evaluated and, where necessary, action is undertaken by WGBIOP. This year also focussed on scrutinizing results from previous age and maturity calibration exercises to detect gaps in the quality assurance of biological parameters in stocks for which a benchmark is planned. This lead to additional exchanges being proposed for 2019 and 2020. Stock coordinators of upcoming benchmarks have been contacted with responses to issues on biological parameters.

ToR d documents sources of life-history parameter estimates which are critical and relevant to improvement of assessment. At the same time this facilitates closer links between data providers and data end-users. As such there is a close relationship between WGBIOP and WKLIFE scientists. This year focussed specifically on fish stomach sampling and fish condition parameters.

The focus of ToR e is on dealing with technical and statistical recommendations addressed to WGBIOP. In some cases this lead to the proposal of age and maturity exchanges and workshops for 2019. Also, an overview was prepared with the biological parameter information required for stock assessments. This information is fundamental for ToR c and the link to the stock assessment EG's.

ToR f further developed a prioritised list of issues for SmartDots and formulated WGSMART, the SmartDots governance group. SmartDots was implemented by ICES and the first exercises have been carried out in 2018.

Besides the above ToRs, WGBIOP also organised a scientific session 'Otoliths beyond age reading', developed a workplan for the CRR Handbook on maturity staging and continued cooperation with RCG's.

1 Administrative details

Working Group name

Working Group on Biological Parameters (WGBIOP)

Year of Appointment within the current cycle

1

Reporting year within the current cycle (1, 2 or 3)

1

Chair(s)

Julie Olivia Davies, Denmark, Pierluigi Carbonara, Italy, and Cindy van Damme, The Netherlands

Meeting venue

Ghent, Belgium

Meeting dates

1-5 October 2018

2 Terms of Reference

- a) Plan studies, workshops and exchange schemes on interpretation of fisheries data on stock-related biological variables, and review the output.
- b) Improve training and quality assurance of age reading and maturity staging. Identify the need for validation studies and assign priorities.
- c) Evaluate the quality of biological parameters: Issues and guidelines.
- d) Investigate and develop data availability, documentation and methods to improve identified biological parameter estimates, as input to assessment models.
- e) Address requests for technical and statistical recommendations/advice related to biological parameters and indicators.
- f) Update and further develop tools for the exchanges and workshops (e.g. SmartDots and statistical tools.)

3 Summary of Work plan

Year 1	Continue the collation of ToR d) information related to biological parameters; c) benchmark issue lists and guidelines; ToR a, b, e and f are generic tors and will be dealt with on a yearly basis in WGBIOP. Begin the process of realigning the scheduling of WGBIOP exchanges/WKs with the benchmark cycle.
Year 2	Continue the collation of ToR d) information related to biological parameters; c) benchmark issue lists and guidelines; ToR a, b, e and f are generic tors and will be dealt with on a yearly basis in WGBIOP. Devise and implement best practice guidelines for quality assurance on a regional level under ToR b.
Year 3	Review the current status of issues, achievements and developments that falls under the remit of WGBIOP, identify future needs in line with the ICES objectives and Science Plan and the wider marine environmental monitoring and management within Europe and propose a future/alternative work plan.

4 List of Outcomes and Achievements of WGBIOP in this delivery period

During the first year of the new 3-year term of WGBIOP the work under each ToR has been carried out by designated subgroups. The deliverables for this period were more clearly defined on the first day of the meeting. Below is a short summary of the work done by ToR at the 2018 meeting. Further progress, outcomes and deliverables achieved during the meeting are described in Chapter 5.

4.1 ToR a Plan studies, workshops and exchange schemes on stock-related biological variables and review their outcomes.

This ToR is a generic ToR for the group and will be part of the WGBIOP remits. This ToR covers the following points:

- 1) Draft resolutions for workshops and exchanges to be approved for 2019 and onwards.
- 2) Report and review results from workshops and exchanges, which occurred in the past and current year.
- 3) Annually update a series of files: the interactive table of historic workshops and exchanges by species and the age-reader and maturity-stager contact lists.

4.2 ToR b Improve training and quality assurance of age reading and maturity staging

This ToR is a generic ToR for WGBIOP. Routines for monitoring the quality of age and maturity are currently based on national protocols and these need to be standardized. In addition, validation is essential to ensure the accuracy of biological data used as input for assessment. ToR b focusses on the tasks:

- 1) Improve training and quality assurance of age reading and maturity staging.
- 2) Update the guidelines for age reading and maturity calibration exercises based on the outputs of the current and previous exchanges and/or workshop.

4.3 ToR c Evaluate the quality of biological parameters: Issues and guidelines

The essence of this ToR is the link between WGBIOP and the stock assessment EG's.

In the first 3-year term 2015–2017, quality indicators for biological parameters were formulated with the ultimate goal being to incorporate these indicators in the assessment process. A case study on mackerel was carried out in 2018 (WKMACQI) and a case study for whiting is proposed in 2019 (WKWHIQI).

Annually the issue lists put forward for benchmark assessments are evaluated and, where necessary, action is undertaken by WGBIOP. This year the work of the subgroup also focussed on scrutinizing results from previous age and maturity calibration exercises in order to detect gaps in the quality assurance of biological parameters in stocks for which a benchmark is planned during the period 2019-2021. This resulted in proposals for additional exchanges in 2019 and 2020. All stock coordinators of upcoming benchmarks have been contacted with responses to issues on biological parameters, and to inform them about previous, ongoing and planned exchanges and workshop on ageing and maturity.

4.4 ToR d Data availability, documentation and methods to improve identified biological parameter estimates, as input to assessments

The overall brief for this ToR is to document current sources of life-history parameter estimates identified by ICES/GFCM EG's as critical components and relevant to improvement of modern assessment for ICES/GFCM stocks. In addition, to facilitate closer links between data providers and data end-users.

Before the meeting, we contacted one of the chairs of WKLIFE VIII to raise this ToR and start discussions on how WGBIOP can best work with WKLIFE scientists to deliver improved documentation and data for the life-history parameters required for proxy assessment models.

The other data requirement highlighted by WGBIOP 2017 was the need for improved diet matrix information. WGBIOP members were contacted to provide information on their institute's current or proposed national plans for pilot studies or regular sampling of fish stomachs. Also, information was sought on if there had been any work carried out that related to fish condition, following on from WKFICON (ICES, 2015) that was discussed at WGBIOP 2017.

4.5 ToR e Address requests related to biological parameters and indicators

Before the meeting, the list of recommendations was divided between the subgroup members. In order to get further clarification of some recommendations, the subgroup members contacted the chairs from the working groups or workshops from which those recommendations came from.

During the WGBIOP 2018, the subgroup working on ToR e focused on:

- 1) The revision and a provision of an answer or an action to each technical and statistical recommendation addressed to WGBIOP. In some cases, the recommendations were communicated to the ToR a subgroup and the possibility of including it on the age and maturity exchanges and workshops list for 2019 discussed.
- 2) The preparation of a list of all stocks currently assessed by ICES, with the indication of the type of information used in the assessment (age, age plus group, maturity ogive) plus the periodicity for age and maturity data collection used in assessment.

The preparation of this list (2.) has been based on the subgroup decision at the beginning of the meeting, that this type of information is useful when planning future age and maturity calibration exercises.

In some of the assessment reports the information concerning the input data was not so evident and easy to find, thus a standard format table for the input data was proposed. This table will be updated in 2019 and put forward to ACOM after WGBIOP 2019 to be included in the stock annexes.

4.6 ToR f Update and further develop tools for the exchanges and workshops

The history of SmartDots development is provided in Annex 8.a. In follow-up to WGBIOP 2017, the age-reader coordinators and their age-readers were provided with user manuals and a feedback document with a table where they could enter their comments, both from an age reader and age co-ordinator point of view. They were requested to deliver the feedback to the SmartDots project group and the chairs of WGBIOP by December 2017 so that comments could be considered and incorporated

into the work plan for 2018 in close collaboration with WGBIOP. Little feedback was received.

By January 2018 SmartDots was hosted by ICES and was ready to “go live”.

The North Sea Norway Pout age reading exchange was the first official ICES age calibration exercise to be set up, annotated and analysed using the SmartDots tool. The group decided to go live with the most recent version of SmartDots that was presented at WGBIOP 2017, however in order for the tool to be fully operational by January 2018 a number of developmental and deployment steps were completed by the core development team (ILVO, ICES, DTU Aqua and IMR Norway) intersessionally. The SmartDots platform was developed to accommodate the necessary changes and make it possible to propose new events, upload all data related to the event, select readers, follow the events, close the events and finally publish the event. All developments needed were implemented and the SmartDots platform was used officially for the first time in January 2018 for the North Sea Norway pout exchange. In Annex 8.d the list of events organised during 2018 is given.

4.7 Other achievements

Next to the ToRs, WGBIOP also:

- Developed a workplan for the CRR handbook on maturity staging
- Looked into possible further use of otoliths in biological parameters besides ageing
- Looked for further cooperation with RCGs

5 Progress report on ToRs and workplan

5.1 ToR a Plan studies, workshops and exchange schemes on stock-related biological variables and review their outcomes

5.1.1 Progress during WGBIOP 2018

During this year's meeting, a lot of progress has been made under ToR a as follows:

- During the meeting, the interactive table of workshops and exchanges "WK, Ex, SG History Master Table" was updated for the current year (<http://ices.dk/community/Pages/PGCCDBS-doc-repository.aspx>). The table was examined in detail and its utility was reviewed. It was concluded that the table in its current format is very informative and it is a useful table to update annually. An additional column was added to include the assessment category for each stock. It became clear during the review of the history table, that there were some issues with the historical links for previous years. The links to exchange and workshop reports were updated as far back as 2015, which corresponds with the beginning of WGBIOP.
- An additional table was also created during this year's meeting. The intention behind the creation of the "Species - Stock Quality Status" Table was to more clearly link the outputs from the exchanges, workshops and validation studies with the stocks being subject benchmark review in the coming years (2019 – 2020). The table was partially filled out as an exercise to see if it did indeed provide additional, valuable information, please see Annex 3.a for the table. As work progressed during the meeting, it became clear that there was a lot of overlap with tasks and on – going work across subgroups b and c, also dealing with stock issue lists from the benchmark review schedule, and linking the outputs of previous age and maturity calibration exercises and with the relevant stock coordinators. There is also some cross over with the existing history table. The utility of this table is yet to be decided and will be discussed further at a future WGBIOP meeting.
- The subgroup also reported and critically reviewed results from Workshops and Exchanges which took place in 2017 and in 2018, and the summaries are available in Annex 3.b. The proper channel to include an exchange/workshop in the ICES planning process is for WGBIOP to include a proposal in its annual report. This proposal then goes to WGDATA and ACOM/SCICOM for consideration. Exchanges and workshops are therefore usually planned more than a year before they are supposed to take place. WGBIOP reviews the suggestions for exchanges and workshops in relation to the needs of the data-end-users, and has paid special attention to those stocks, which have been included in the benchmark schedule for the coming years.
- Drafted resolutions for workshops and exchanges endorsed by WGBIOP and to be approved from 2019 and beyond which can be seen in Annex 3.c

5.1.2 Workplan for 20182020

To see the full list of exchanges and workshops for 2018, please see Annex 3. A very busy year is foreseen for 2019, with 14 age calibration exchanges, and 1 maturity staging exchange exercise planned. There are also four workshops planned for 2019, ranging in topics from better coordinated stomach sampling to age calibration workshop on sardine. Five age calibration exchanges are also proposed for 2020.

5.1.3 Deliverables for 2019 and 2020

A full list of exchanges has been proposed this year for 2019 and beyond with associated coordinators. Several of these exchanges have a reporting deadline of the 1st week of October 2019, to ensure the results are available for the benchmark process. WGBIOP will receive reports on the progress and the outcomes of these exchanges during its 2019/2020 meetings, and 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 meetings in 2019/2020 for consideration.

5.2 ToR b Improve training and quality assurance of age reading and maturity staging

5.2.1 Progress during WGBIOP 2018

ToR b has, for this 3-year period, been assigned the tasks:

- 1) to improve training and quality assurance of age reading and maturity staging
- 2) identify the need for validation studies and assign priorities.

At this meeting, ToR b has thus focused on a) updating the material, techniques and preparation methods by species and area for fish ageing (<http://ices.dk/community/Pages/PGCCDBS-doc-repository.aspx>), b) preparing similar tables for maturity adapting them to the structure of the age reading tables (Annex 4.a and 4.b) and c) updating the guidelines for age reading and maturity staging workshops and exchanges (<http://ices.dk/community/Pages/PGCCDBS-doc-repository.aspx>) taking into consideration what has been reported by the WGBIOP 2018 participants and the results derived from the exchanges and workshops carried out in 2017 and 2018.

For age reading a lot of work has been already done in the previous years of WGBIOP. Interactive tables containing information on quality assurance, procedures in national labs and an overview of materials, techniques and methods applied in national labs have been created. Then, the subgroup requested all national laboratories to provide up to date information on their quality assurance procedures. Each country was asked to update the WKNARC 2011 (ICES, 2011a) Annex 11 – Quality Status of Age Reading at Institutes. This will be done intersessionally and in 2019 this subgroup will review these procedures and investigate how procedures could be standardised on a regional level.

Regarding maturity, a table structured on the base of the age reading table, was created. In particular, information on the procedures used (macroscopic and /or histologic) to study the maturity of species, the type of gonads studied (testis and/or ovary), the macroscale used to define the reproductive condition within the laboratories of each country has been requested. This table will be completed intersessionally and be available for WGBIOP 2019 when this subgroup will review these procedures and investigate how procedures could be standardised on a regional level.

The subgroup has begun compiling the relevant reproductive data on the different species in each country based on the results from the ICES workshops on maturity and literature produced in recent years.

The age reading guidelines (<http://www.ices.dk/community/Pages/PGCCDBS-doc-repository.aspx>) were scrutinized thoroughly and updated with the recommendations that were put forward during past workshops and exchanges. The main changes were:

- The benchmark cycles should be followed to organize workshops and exchanges (and not follow the 3-5 year cycle as recommended before)
- CV and % agreement should be taken into consideration to decide if an exchange should be organized. Based on these, decisions can be taken on which stocks/areas should be included
- Reports of the workshops and exchanges should also be sent to the stock assessor, who should disseminate to the different interested groups.

The maturity guidelines (<http://ices.dk/community/Pages/PGCCDBS-doc-repository.aspx>) were also updated taking in consideration the recommendations accepted during workshops in 2019.

The main changes can be summarized in:

- The international agreed scales (see the “*WKMATCH 2012 maturity scale revised*” and “*GFCM scales*”) have to be followed for reporting to ICES and GFCM the maturity data.
- Validated manuals (GFCM ATLAS 2018 and CRR manual under preparation) should be utilized in order to enhance accuracy in maturity staging among laboratories.
- Discrepancies of maturity staging between laboratories should be improved analysing also the age of the samples as well. They should be statistically analysed in terms of precision and accuracy.

Intersessional work:

A complete review and update of the guidelines for ageing will be done by intersessional work between Belgium, Estonia, Finland and Scotland for presentation at the WGBIOP 2019, where it will be discussed in plenary session for feedback and finalization.

5.2.2 Workplan for 2018–2020

- A complete review and update of the guidelines for ageing will be carried out intersessional between Belgium, Estonia, Finland and Scotland for presentation at the WGBIOP 2019, where it will be discussed in plenary session for feedback and finalization.
- Based on the updated information provided by the national laboratories a full review of the national procedures for ageing and maturity staging quality assurance will be carried out and best practice guidelines compiled on a regional level.
- In co-operation with subgroups working on ToRs a and c a prioritised list of validation studies by stock will be proposed and workshops organised where feasible.

5.2.3 Deliverables for 2019 and 2020

- Up-to-date guidelines for organising ageing and maturity staging workshops and exchanges.

- Based on the review of national procedures for ageing and maturity staging quality assurance, regional best practice guidelines will be complied.
- A list of prioritised validation studies by stock

5.3 ToR c Evaluate the quality of biological parameters: Issues and guidelines

5.3.1 Progress during WGBIOP 2018

5.3.1.1 Issue lists benchmark assessments

In 2018 ToR C prepared various deliverables:

- Compiled responses to the issue lists of stocks that are proposed for a benchmark assessment in 2019, 2020 and 2021 (Annex 5 a-d).
- Compiled information on each stock to be benchmarked detailing existing age/maturity exchanges/workshops and making notes on those that had never been calibrated (Annex 5 a-d).
- Emails to the stock coordinators of 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.

The issue table was split into four groups to make it easier for the user: flatfish, gadoids, pelagics and other species. The issues put forward by the assessment WG's for the upcoming benchmark stocks were collated and the issues were discussed, with any necessary responses from WGBIOP recorded in a table (Annex 5 a-d) and reported to the stock coordinators.

This year the subgroup also scrutinised results from previous age and maturity calibration exercises for stocks for which a benchmark is planned during the period 2019-2021. The goal was to inform the stock coordinator about the outcome of the most recent age and maturity exchanges and workshops, and to detect gaps in the quality assurance of biological parameters. This task was not carried out last year due to time limitation.

The gaps in quality assurance were discussed in plenary. Several benchmark stocks had not had any age/maturity calibrations carried out; these were noted as priority stocks for future exchanges. Unfortunately, those that are up for benchmark in 2019 were removed from the proposed list, as it would not be possible to complete the exchanges before the benchmark deadline. A further selection was made, based on the quality assurance data available for other stocks of the same species and the feasibility of an exchange within the next one or two years. These exchanges are included in the list prepared by ToR a.

5.3.1.2 Case studies on incorporating uncertainty estimates of biological parameters in the assessment process

WGBIOP initiated the Workshop on Mackerel biological Quality Indicators (WKMACQI, ICES 2018). Data from recent age and maturity calibration exercises were used to provide uncertainty estimates of ageing and maturity staging for mackerel. Age (AEM) and Maturity Staging (MSEM) Error Matrices were calculated. An error matrix gives the probabilities that a sampled fish of true age/maturity class a is assigned to one of the observed age/maturity classes. For age the 'true age' is based on

the modal age. Maturity staging can be more easily validated with the use of histology, thus the maturity stages are checked against the 'true maturity'.

The error matrices were used to examine the sensitivity of the assessment model to the observed uncertainty in ageing and maturity data of mackerel. These analyses showed that errors in the determination of biological parameters affected the mackerel assessment at different levels and can have a substantial effect on the output of the assessment.

It can be expected that the sensitivity of the assessment to uncertainty in biological parameters may differ between stocks. Not only because of differences in uncertainty estimates between stocks, but also as a consequence of the assessment model used and the stability of the model. Therefore, a second case study is proposed by WGBIOP.

The criteria for selecting a new case study were:

- Stock coming up for a benchmark
- Relatively high level of ageing uncertainty
- Relatively high level of maturity staging uncertainty
- Good coverage of the assessment age range in the age calibration
- Good coverage of immature and matures in the maturity staging calibration

The compiled information on existing age/maturity exchanges/workshops for benchmark stocks was scrutinised and whiting (*Merlangius merlangus*) in divisions 7.b-c and 7.e-k (southern Celtic Seas and eastern English Channel) was selected as a suitable candidate.

Essential for the success of a workshop such as WKMACQI (ICES, 2018) is the participation of the stock assessor. WGBIOP has contacted the assessor of whiting in 7.b-c and 7.e-k to inform if he is willing to participate in the second case study on the sensitivity of the assessment to uncertainty in biological parameters.

5.3.2 Workplan for 2018–2020

- Organize the workshop on the case study and report to WGBIOP
- Follow up on the case studies: attempt to include other quality indicators besides age and maturity in the assessment process
- Continue the work with the issue lists on an annual basis

5.3.3 Deliverables for 2019 and 2020

- Report on the case studies
- Annual review of the issue lists
- Update of the quality indicators table

5.4 ToR d Data availability, documentation and methods to improve identified biological parameter estimates, as input to assessments

5.4.1 Progress during WGBIOP 2018

This ToR compiled the information collected via RCG-Baltic and WGBIOP members on current or proposed national plans for pilot studies or regular sampling of fish stomachs (Annex 6.a and 6.b) Greece reported plans for incorporating a new stomach sam-

pling pilot study of 100 hake into the national work plan. Estonia, Latvia, Poland, Germany, Denmark and Sweden reported on-going stomach sampling in the Baltic Sea. Some countries extended the information provided beyond current studies to include brief details on previous stomach sampling and fish condition research, and information on data availability.

We reviewed information on stomach sampling research and requirements from WGSAM reports (ICES, 2010; ICES 2011b; ICES, 2012a; ICES, 2016), MARE studies, the FishPI project and the recent GFCM Workshop on sampling, processing and analysing the stomach contents (WKSTCON).

The WKSTCON, chaired by Beatriz Guijarro, Spain and Maria Valls, Spain, met in Palma de Mallorca, Spain, 24-27 April 2018. The aim of the WKSTCON was to review available methodologies and to agree a common sampling protocol to the study of the stomach contents at Mediterranean level. The meeting was attended by 24 participants from eight countries. The available methodologies for the stomach content analysis were reviewed, as well as other biochemical methods (Stable isotopes and Fatty acids and lipids). Potential treatment of data obtained with this type of sampling was also reviewed and a series of case studies were presented by the participants. A general discussion was carried out. It was agreed to carry out a pilot study on one single species, *Merluccius merluccius* in the Mediterranean and *Psetta maxima* in the Black Sea. A common sampling protocol at Mediterranean level was agreed; however, it has to be noted that this was a first step toward a general regional protocol.

The EU Multi-Annual Programme (EU MAP) on Data Collection requests data on predator-prey relationships with planning for future data collection specific for each marine region, coordinated at marine region level and based on end-user needs. Currently there is variable sampling intensity on a national basis, and the sampling and analyses of stomachs are not coordinated. To realise the benefits of stomach sampling carried out by different institutes better coordination is urgently needed. Therefore, we concluded there was scientific justification for a Workshop on Better Coordinated Stomach Sampling (WKBECOSS). Draft terms of reference are provided in Annex 3.c.

There has not been any further work with the Working Group on Integrated, Physical-biological and Ecosystem Modelling (WGIPEM) to understand their data requirements for parameters related to bioenergetics (e.g. energy contents). This will be carried forward to 2019.

WKLIFEVIII (taking place the week after WGBIOP 8-12 October 2018) plan to develop a template of the information required from WGBIOP on the life-history parameters used in WKLIFE. WGBIOP members may be able to provide advice on the quality of the parameters used, either qualitatively or as possible ranges of values that could be used in simulations of uncertainty.

Work to develop proposals for how length-at-maturity and growth curve parameters could be considered within maturity staging and age-reading workshops overlapped with ToR e). Here, a minimal amount of repetition between reports is recommended. For example, basic information from the assessment to include in the staging report will be if the maturity ogive is used in the assessment and when it was updated. For age-reading workshops, the report should include for example, the plus group ages and age ranges used for assessment parameters.

The most important point remains for the exchange coordinator to directly talk to the stock coordinator and stock assessor, to learn what they think are the key issues for the stock.

5.4.2 Workplan for 2018–2020

- Support delivery of WKBECOSS.
- Review outputs of WKSTCON2, WKBECOSS and any further related workshops.
- Develop and test template of life-history parameter information provided by WKLIFE.
- Liaise with the Working Group on Integrated, Physical-biological and Ecosystem Modelling (WGIPEM) to understand their data requirements for parameters related to bioenergetics (e.g. energy contents).
- Provide overview of regional data availability on condition factor for selected stocks.

5.4.3 Deliverables for 2019 and 2020

- Planned deliverables continued from 2018. WGBIOP will continue working with WKLIFE scientists to deliver improved documentation and data for life-history parameters required for proxy assessment models.
- WGBIOP will also test proposals for how assessment information on maturity and age could be considered within maturity staging and age-reading workshops and revise the workshop guidelines.
- WGBIOP will summarize the outcomes from stomach sampling workshops and work with RCGs to take up the recommendations from these workshops.

5.5 ToR e Address requests related to biological parameters and indicators

5.5.1 Progress during WGBIOP 2018

During the WGBIOP meeting the subgroup working on ToR e, has focused on the:

- 1) revision of each technical and statistical recommendation addressed to WGBIOP 2017 and WGBIOP 2018. Some of these recommendations have been discussed with the subgroup on ToR a and considered on the list of proposals on age and maturity exchanges and workshops for 2019;
- 2) preparation of a list of stocks currently assessed by ICES, and compile all the input data used in the assessment (age, age plus group, maturity ogive) (Annex 7.a). Also in this list, the periodicity of age and maturity data collection for assessment was included. The data compiled in this list, will be useful for the planning of future age and maturity calibration exercises.

The subgroup for ToR e proposes a standard table format for the input data used in each stock assessment. This table should be included in the stock annexes of the assessment working group reports.

On the basis of the WKBIOPTIM2 input presented during WGBIOP 2018 and the Working Document “Hake (*Merluccius merluccius*) southern stock: otoliths and gonad collection” (Annex 3) the possibility to consider some metrics on age and maturity as methods to calculate effective sample size for biological parameters were discussed. It was suggested that WKBIOPTIM3 should use Hake in ICES divisions 9.a and 8.c as a case study. In support of WKBIOPTIM a table has been provided to all members of WGBIOP to provide information on national biological parameter sampling schemes by species. In addition, the input data used in stock assessment table (Annex 7, Table

7.1) mentioned above will give WKBIOPTIM an overview of the range of biological parameter estimates required for the individual stock assessments.

5.5.2 Workplan for 2018-2020

- Take up each recommendation addressed to WGBIOP and provide the appropriate action related to biological parameters and quality indicators.
- Further develop the table on biological parameter data used in assessments to be recommended to ACOM.
- Incorporate the proposed table on biological parameter data used in assessment models with the WKMSYCat34 template to evaluate if a stock could be a candidate for a full analytical assessment with forecast (i.e. category 1).

5.5.3 Deliverables for 2019 and 2020

For the following years (2019 and 2020) the ToR e subgroup plans to produce the following deliverables:

- 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.
- Format table to be added to the stock annexes providing information on biological parameters used in the assessment.
- Overview table of biological parameters used in assessments by species.

5.6 ToR f Update and further develop tools for the exchanges and workshops

5.6.1 Progress during WGBIOP 2018

The history and background of SmartDots can be found in Annex 8.a.

SmartDots WebAPI

The WebAPI is the communication channel between the software and the database. A Web API is an application programming interface for the web server to communicate with the SmartDots software. It is a web development concept, usually limited to a web application's client-side. The architecture chosen for the WebAPI was Representational State Transfer (REST). This is an architectural style that defines a set of constraints to be used for creating web services. The SmartDots WebAPI is developed in C# and it allows the communication and the operations between the software and the SmartDots Database. The SmartDots WebAPI is an open source WebAPI and it is available in GitHub (<https://github.com/ices-eg/SmartDots/tree/master/WebAPI>).

Software

SmartDots Software was released and uploaded to GitHub (<https://github.com/ices-eg/SmartDots/tree/master/SmartDots>)

A SmartDots portable version was developed. This is for users that do not have administrator access and cannot install applications on their computer. A portable application (portable app), sometimes also called standalone, is a program designed to read and write its configuration settings into an accessible folder in the computer.

During 2018, the need to establish a proper steering group or governance group was emphasised and proposed by the project group and by ICES. The decision was taken to set up a SmartDots Governance Group, ToRs were described and the Working

Group on SmartDots Governance (WGSMART) was approved in the week prior to the WGBIOP 2018 meeting (Annex 8.b). WGSMART will meet for the first time, to develop and agree the SmartDots workplan for the coming years, at ICES Headquarters in December 2018.

On the ICES website, the link <http://www.ices.dk/marine-data/tools/Pages/smartdots.aspx> is where an event can be created, events can be managed, and 'how to get started' can be found.

Additionally, during 2018, the SmartDots platform was developed further to be used for maturity.

During WGBIOP 2018, it was decided to use the GitHub SmartDots site (<https://github.com/ices-eg/SmartDots/issues>) as the only repository for describing the issues to be developed further. WGSMART will develop a user friendly platform for feedback in 2019 from which they will interpret and prioritise feedback to be placed in the GitHub SmartDots site. The issues listed in the GitHub were compiled during WGBIOP 2018 and combined with those issues in the feedback-documents filled in by the age coordinators and readers who participated in events during 2018. Comments were checked with the issues already in the GitHub SmartDots, and a final list of issues was established. The issues are allocated to different modules (Improvement, Development, WebApi) and are given a priority number 1, 2 or 3 or done. When a number 4 is given to an issues, this implies that it is not relevant to be taken in yet. The full list of the issues, and their prioritization can be found in Annex 8.c.

5.6.2 Workplan for 2018–2020

- During the WGBIOP 2018, all comments received by national age-coordinators, and the issues described on GitHub (<https://github.com/ices-eg/SmartDots/issues>) were compiled, categorised and prioritised. This will be carried out on an annual basis.
- Based on this list, WGSMART will set out the work plan for the period 2019-2020. Per issues, a time and budget indication will be added, and this will be discussed with both ICES and member states in order to find the requested resources for further development.
- On a yearly basis, WGBIOP will provide feedback to WGSMART.

5.6.3 Deliverables for 2019 and 2020

- The development of a full manual in co-operation with WGSMART. Currently, there is a short manual available, and on the website brief instructions for using the platform and creating an event. However, as there is a clear need to have good and transparent documentation, this needs to be updated and further developed based on platform developments and the comments of the different users.
- SmartDots@home: as the SmartDots age reading platform is an open source solution, the platform can also be used to manage internal age reading data. A custom web API and database must be developed to use the platform internally within an institute.
- The use of the SmartDots age reading platform on a routine basis for exchanges and workshops will continuously provide feedback to WGBIOP allowing the group to outline a plan on future needs on an annual basis.

5.7 Scientific session 'Otoliths beyond age reading'

On Wednesday afternoon, a scientific session was organised to discuss use of otoliths beyond age reading. Audrey Geffen (Imperial College London/UiB) was invited to give a presentation on the use of microchemistry of otoliths, Christoph Stransky presented otolith shape analyses and sclerochronology, Kélig Mahe presented otolith shape analyses and age-validation, Cindy van Damme presented the use of otoliths in fish predator diets and Pierluigi Carbonara presented stomach content analyses.

After the presentations discussion in subgroups provided ideas for inclusion of the methods presented in regular samplings.

Otolith microchemistry

Different methods are available for this:

1) Micromilling/Isotope ratio mass spectrometry (IRMS)

Otoliths are sampled by micromilling, followed by isotope ratio mass spectrometry (IRMS). Microsampling techniques are utilized to mechanically extract a portion of the otolith for subsequent analysis. Portions can be extracted as either powders, milled from discrete depths (e.g. annual growth zones) or as cores (e.g. first year of growth).

2) Laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) analysis

LA-ICP-MS analysis involves using inductively coupled plasma mass spectrometers through the coupling to a laser ablation system to determine trace elements at low concentrations (e.g. parts per trillion) in samples (otoliths) that have temporal axes. Trace elements from the surrounding environment are incorporated into the CaCO₃ structure during the lifetime of these organisms and once incorporated, the trace elements remain metabolically inert in the mineral phase making them ideal temporal markers.

OTOLITH MICROCHEMISTRY	FACILITIES/INSTITUTES IN THE UK	CONTACT	CONTACT AT CEFAS
Micromill	Cefas, Lowestoft	Jo Smith	Jo Smith
ICP-MS	British Geological Survey, Nottingham	Simon Chenery/ Andy Marriott	Kate Downes
ICP-MS	University of East Anglia (UEA), Norwich	Graham Chilvers	Jo Smith

Recommendations

Workshops and exchanges often result in repeated recommendations for validation of ageing routines. Otolith microchemistry techniques can be used as an age validation tool. For example, recommendations from the whiting ageing workshops, always state that otolith chemistry needs to be completed to understand features such as 'humphries shadow' or the location of the first winter ring. Age reading will not improve without carrying out such studies. Intersessional work will be carried out to prepare:

- 1) List of priority species for otolith microchemistry studies
- 2) Proposals for pilot studies/priority species to be presented at WGBIOP 2019.

Otolith Shape analyses

The discussion amongst the subgroup revolved around what can be done by WGBIOP with respect to providing quality assurance measures for national laboratories to follow when it comes to utilising otolith shape analysis supported by genetic baselines when applying stock splitting procedures. Currently there are various methods applied across regions and species and the group discussed if and how some test case examples could be used in an exercise, possibly in advance of a workshop, where a sample set of otoliths with a genetic confirmation of stock affiliation is analysed. The outcomes of such an exercise could be compared using the appropriate statistics and guidelines for achievable measures of agreement across methods drawn up. In a workshop scenario, protocols including procedures and appropriate sample collection could be compared, standardised and complied with the aim to provide a set of guidelines for future reference. Herring was suggested as a test case but not all countries applying shape analysis on a routine basis apply stock splitting measures for this species and so other test case species with different life histories may need to be considered.

WGBIOP would like input from the Stock Identification Methods Working Group (SIMWG, ICES, 2016b) on what such a workshop should involve, taking the above mentioned suggestions into consideration. As a starting point WGBIOP will ask all institutes, implementing otolith shape analysis to provide a description of their methods applied. WGBIOP can provide an outline of what should be included in these protocols, such as a clear description of the samples used (age, length, sex, maturity stage, areas and season coverage), information on image acquisition and equipment and if any quality assurance measures are already in place. The workshop could take place in early 2020 with the report available for review by SIMWG in advance of WGBIOP 2020.

5.8 Handbook on maturity staging of fish species in the ICES area

During WGBIOP 2018 approval was received on the resolutions for a CRR Handbook on maturity staging of fish species in the ICES area. Editors of the handbook are Francesca Vitale, Maria Cristina Follesa and Cindy van Damme. During the meeting an outline of the handbook proposed and a list of species was drawn up of which maturity information is available. Participants in the meeting were asked to co-author the handbook and to suggest authors from outside WGBIOP. After the meeting the editors will contact the proposed authors for confirmation of their authorship and provide the plan for the preparation of the handbook.

The suggested CRR will be produced in several steps prior to submission:

- 1) Authors are asked to produce draft text prior to the WGBIOP in 2019.
- 2) During WGBIOP 2019 the chapters are reviewed.
- 3) Authors submit their adjusted chapters to the editors by January 2020.
- 4) Editors circulate draft in April 2020.
- 5) Comments on the draft will be incorporated in the final draft at WGBIOP 2020.
- 6) Submission of final draft by December 2020.

5.9 Regional Coordination Groups and WGBIOP

This year's meetings of the Regional Coordination Groups (RCGs) have taken place from June to September 2018, followed by the 'Liaison Meeting' (Brussels, 2 Oct 2018),

where all RCG chairs meet with the European Commission (DG MARE, JRC) and data end-users such as ICES and GFCM to co-ordinate progress in regional data collection.

The topics relevant to WGBIOP are:

- Further development of the Regional Data Bases (RDBs)
- Improvement of accessibility and quality of regional fisheries and biological data (e.g. age, length)
- Regional data quality checks (e.g. age-length, length-weight)
- Results of 'data groups' at the RCGs or intersession groups, dealing with biological data
- End-user (ICES, GFCM...) interaction on data requirements (e.g. age and maturity data, stomach sampling)

Specifically, illustrations for quality checks on biological data (e.g. age@length plots, overviews of geographical sampling coverage) were presented. With regard to data end-user requirements, the 'Diadromous Sub-Group' within this year's RCGs expressed the need for a salmon age reading workshop. Eventual special requirements for salmon age reading comparisons using SmartDots should, therefore, be discussed. In the Liaison Meeting, the group was made aware of eel age reading exchanges that took place under an Interreg project. The RCG Large Pelagics identified the need for a bluefin tuna age reading workshop that should be planned together with ICCAT (Contracting Parties). An overview on stomach sampling under the DCF was made available to WGBIOP (see ToR d), progress on collating information on maturity sampling and the use of maturity data in stock assessment (ToRs b and c) and overview tables on the number of fish aged by stock and by country provided.

WGBIOP stresses the importance of keeping a close cooperation with the RCGs with regard to the (regional) collection of biological parameters.

6 Next meeting

WGBIOP will meet 7– 10 October 2019 in Lisbon, Portugal. The WGBIOP meeting will be followed up with a 2-day WGSMART meeting (11 – 12 October).

7 References

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Annex 1: List of Participants

Working Group on Biological Parameters (WGBIOP)

1–5 October 2018

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WGBIOP 2018 participants

Annex 2: Recommendations

RECOMMENDATION	ADRESSED TO
1. The ICES secretariat should inform WGBIOP of the upcoming benchmarks as soon as they are proposed by the assessment groups, to be able to check the need for organising exchanges or workshops on biological parameters necessary for the benchmark.	ICES secretariat
2. WGBIOP recommends the collection of gonad samples (images of gonads and gonads for histology) during regular sampling to ensure a basic set of samples is available for maturity exchanges and workshops. This will be followed up with an e-mail with a protocol with instructions on how to collect the samples.	WGBIFS, WGMEGS, WGACEGG, PGDATA, WGBIOP, WGIDEEPS, WGNEACS, WGBEAM, WGCATCH, WGALES, IBTSWG, WGIPS, RCG's
3. WGBIOP recommends an otolith shape analysis/stock splitting methods workshop in cooperation with SIMWG. Case studies will be defined and outcomes will include quality assurance measures for stock splitting. Input and review will be required.	SIMWG
4. WGBIOP recommends to carry out salmon and eel biological parameter calibration exercises in line with the current WGBIOP guidelines. Results of these exercises should also be communicated to WGBIOP.	WGNAS, WGBAST, WGEEL, RCG-Baltic, RCG-North Sea and Eastern Arctic, RCG-Mediterranean
5. WGBIOP recommends to provide an updated overview of maturity sampling (see RCM_NSEA_2009, Annex 5 for example) including the actual sampling source, in order for WGBIOP to review it and propose an optimized sampling strategy.	RCG s

Annex 3: ToR a

a) "Species - Stock Quality Status" Table

SPECIES	SCIENTIFIC NAME	ENGLISH COMMON NAME	STOCK CODE	AREA	AREA DESCRIPTION	STOCK COORDINATOR	ECOREGION	ASSESSMENT WG	AGE BASED ASSESSMENT Y/N?	SUBJECT TO BENCHMARK REVIEW - WHEN?	INTERNATIONALLY AGREED MATURITY SCALE AVAILABLE Y/N	MATURITY SCALE VALIDATED Y/N	AGE: % AGREEMENT FROM AGE READERS, READING FOR ASSESSMENT FROM MOST RECENT EX/WK	AGE VAILDATE D Y/N	LINKS TO VALIDATION REPORTS
<i>Engraulis encrasicolus</i>	<i>Engraulis encrasicolus</i>	European Anchovy	ANG27.8	Subarea 8		Leire Ibaibarriaga	Adriatic	GFCM	Y	2019	Y	N	Bay of Biscay = 91%, Strait of Sicily = 86%	Y	http://www.publish.csiro.au/mf/pdf/MF15092
<i>Trachurus trachurus</i>	<i>Trachurus trachurus</i>	Horse mackerel	homm.2 7.2a 4a5 b6a 7a-	Subarea 8 and division	North East Atlantic	Jens Ulleweit		WG WIDE	Y	2019	Y	N	55,80%	Y	Age Validation on Horse mackerel

SPECIES	SCIENTIFIC NAME	ENGLISH COMMON NAME	STOCK CODE	AREA	AREA DESCRIPTION	STOCK COORDINATOR	ECOREGION	ASSESSMENT WG	AGE BASED ASSESSMENT Y/N?	SUBJECT TO BENCHMARK REVIEW - WHEN ?	INTERNATIONALLY AGREED MATURITY SCALE AVAILABLE Y/N	MATURITY SCALE VALIDATED Y/N	AGE: % AGREEMENT FROM AGE READERS, READING FOR ASSESSMENT FROM MOST RECENT EX/WK	AGE VAILDATE D Y/N	LINKS TO VALIDATION REPORTS
			ce-k8	ns 2.a, 4.a, 5.b, 6.a, 7.a- c,e- k											(Trachurus trachurus) Otoliths.pdf
<i>Engraulis encrasicolus</i>	<i>Engraulis encrasicolus</i>	European Anchovy			Western, Central and Eastern Mediterranean		Bay of Biscay and the Iberian Coast Ecoregion, Oceanic Northeast Atlantic Ecoregion	GFCM	Y	2020			Bay of Biscay = 91%, Strait of Sicily = 86%	Y	http://www.publish.csiro.au/mf/pdf/MF15092

SPECIES	SCIENTIFIC NAME	ENGLISH COMMON NAME	STOCK CODE	AREA	AREA DESCRIPTION	STOCK COORDINATOR	ECOREGION	ASSESSMENT WG	AGE BASED ASSESSMENT Y/N?	SUBJECT TO BENCHMARK REVIEW - WHEN?	INTERNATIONALLY AGREED MATURITY SCALE AVAILABLE Y/N	MATURITY SCALE VALIDATED Y/N	AGE: % AGREEMENT FROM AGE READERS, READING FOR ASSESSMENT FROM MOST RECENT EX/WK	AGE VAILEDATED Y/N	LINKS TO VALIDATION REPORTS
<i>Melanogrammus aeglefinus</i>	<i>Melanogrammus aeglefinus</i>	Haddock	had.27.1-2	27.1-2	Barents Sea, Norwegian Sea		Arctic Ocean Ecoregion, Barents Sea Ecoregion, Faroes Ecoregion, Greenland Sea Ecoregion, Iceland Sea Ecoregion, Norwegian Sea Ecoregion	AFWG	Y	2020	Y	?	84.2% sectioned otoliths and 85% Broken otoliths	?	
<i>Sardinapilchardus</i>	<i>Sardinapilchardus</i>	Sardine	pil.27.8c9a	27.8 and 27.9	Eastern Mediterranean	Alexandra (Xanadu) Silva	Eastern Mediterranean	WGHANS A	Y	2020	Y	Y	80%	?	

SPECIES	SCIENTIFIC NAME	ENGLISH COMMON NAME	STOCK CODE	AREA	AREA DESCRIPTION	STOCK COORDINATOR	ECOREGION	ASSESSMENT WG	AGE BASED ASSESSMENT Y/N?	SUBJECT TO BENCHMARK REVIEW - WHEN ?	INTERNATIONALLY AGREED MATURITY SCALE AVAILABLE Y/N	MATURITY SCALE VALIDATED Y/N	AGE: % AGREEMENT FROM AGE READERS, READING FOR ASSESSMENT FROM MOST RECENT EX/WK	AGE VAILEDATED Y/N	LINKS TO VALIDATION REPORTS
<i>Gadus morhua</i>	<i>Gadus morhua</i>	Cod	cod .27. 7e- k	27,7	divisions 7.e-k (eastern English Channel and southern Celtic Seas)		Celtic Seas Ecoregion, Greater North Sea Ecoregion, Oceanic Northeast Atlantic Ecoregion	WGC SE	Y	20 20	Y	?	92,70%	N	
<i>Melanogrammus aeglefinus</i>	<i>Melanogrammus aeglefinus</i>	Haddock	had .27. 7b- k	27,7	Divisions 7.b-k (southern Celtic Seas and English Channel)	Jonathan White	Celtic Seas Ecoregion, Greater North Sea Ecoregion, Oceanic Northeast Atlantic Ecoregion	WGC SE	Y	20 20	Y	?	84.2% sectioned otoliths and 85% Broken otoliths	N	

SPECIES	SCIENTIFIC NAME	ENGLISH COMMON NAME	STOCK CODE	AREA	AREA DESCRIPTION	STOCK COORDINATOR	ECOREGION	ASSESSMENT WG	AGE BASED ASSESSMENT Y/N?	SUBJECT TO BENCHMARK REVIEW - WHEN?	INTERNATIONALLY AGREED MATURITY SCALE AVAILABLE Y/N	MATURITY SCALE VALIDATED Y/N	AGE: % AGREEMENT FROM AGE READERS, READING FOR ASSESSMENT FROM MOST RECENT EX/WK	AGE VAILEDATED Y/N	LINKS TO VALIDATION REPORTS
<i>Merlangius merlangus</i>	<i>Merlangius merlangus</i>	Whiting	whg.7b-cek	27,7	Divisions 7.b-c and 7.e-k (southern Celtic Seas and eastern English Channel)	David Stokes	Celtic Seas Ecoregion, Greater North Sea Ecoregion, Oceanic Northeast Atlantic Ecoregion	WGCSE	Y	2020	Y	?	72%	Y	http://orbit.dtu.dk/files/55340105/Ross_jai.pdf
<i>Argentina silus</i>	<i>Argentina silus</i>	Greater silver smelt	aru.27.123a4	27.1-2 and 27.3 and 27.4	sub areas 1, 2, and 4, and in Division 3.a (North-east Arctic, North Sea, Skagerrak and Kattegat)		subareas 1, 2, and 4, and in Division 3.a (Northeast Arctic, North Sea, Skagerrak and Kattegat)	WGD EEP	N	2020	N	N	NA	N	

SPECIES	SCIENTIFIC NAME	ENGLISH COMMON NAME	STOCK CODE	AREA	AREA DESCRIPTION	STOCK COORDINATOR	ECOREGION	ASSESSMENT WG	AGE BASED ASSESSMENT Y/N?	SUBJECT TO BENCHMARK REVIEW - WHEN?	INTERNATIONALLY AGREED MATURITY SCALE AVAILABLE Y/N	MATURITY SCALE VALIDATED Y/N	AGE: % AGREEMENT FROM AGE READERS, READING FOR ASSESSMENT FROM MOST RECENT EX/WK	AGE VAILDATE D Y/N	LINKS TO VALIDATION REPORTS
<i>Argenti na silus</i>	<i>Argenti na silus</i>	Great er silver smelt	aru. 27.5 a14	27.5 and 27.1 4	Subarea 14 and Division 5.a (East Greenland and Iceland grounds)		Subarea 14 and Division 5.a (East Greenland and Iceland grounds)	WGD EEP	N	20 20	N	N	NA	N	
<i>Argenti na silus</i>	<i>Argenti na silus</i>	Great er silver smelt	aru. 27.5 b6a	27.5 and 27.6	Divisions 5.b and 6.a (Faroes grounds and west of Scotland)		Divisions 5.b and 6.a (Faroes grounds and west of Scotland)	WGD EEP	N	20 20	N	N	NA	N	

b) Reviewed results from Workshops and Exchanges which took place in 2017 and in 2018

Workshops Completed in 2017–2018

The following are summaries of the biological variable workshops carried out in 2017 and 2018.

Workshop on Sexual Maturity Staging of Elasmobranchs (WKMSSEL3).

WKMSSEL3 met 19-22 February 2018 in Cagliari, Italy, and was chaired by Pierluigi Carbonara and Maria Cristina Follesa. 13 participants from 5 countries (representing 8 different institutes) joined the meeting. The meeting aimed to update and validate the international maturity stages for elasmobranch species (viviparous and oviparous) and prepare conversion tables for the maturity scales used by the institutes to the international scale. The update was carried out on the base of the results presented from the participants including histological validation.

Some changes were made on the criteria and description of each maturity stages of the WKSEL2 scale, considering the expertise and experiences from both Atlantic and Mediterranean species. Therefore particular attention was devoted to have clear elements to the discern juveniles and adults stages. Indeed this item has a high impact on the quantification of the Stock Spawning Biomass and in more general on the stock assessment for the elasmobranch species.

For the oviparous species in the male scale the specification of thorns presence was introduced as a characteristic can help to distinguish some maturity stages each other's (Stage 1 and Stage 2; stage 2 and stage 3a). Moreover the seminal vesical characteristic was specified in the maturity stages description.

In oviparous female scale the uteri appearance and oviductal glands in some maturity stages was taking into account to help the distinction of maturity stages.

In the viviparous male maturity scale lobuli segmentation and seminal vesicles were deeply specified in the stages descriptions. Moreover the name of stage 4 was change from REGRESSING to SPENT. This term was considered as more appropriate to include all phases (post-spawning, rest and regenerate) described in this stage.

In the viviparous female maturity scale was add the description of the ovary and oviductal gland for the stage 4a, 4b, 4c, 5 and 6. Moreover was added a stage 7 (LATE REGENERATING) in which the atretic follicles are unlikely because they are developing and the stage 6 was renamed (EARLY REGENERATING).

RECOMMENDATION FROM WKMSSEL3	ADRESSED TO
The group recommends to use the updated international maturity scale WKSEL3 for both ICES (Atlantic) and GFCM (Mediterranean). The improvements are carried out on base of the experiences of the participants and the histological evidences for both oviparous and viviparous species	WGEF, WGBIOP
WKSEL3 recommends to collect species specific features of the male (e.g. testis, clasper characteristics, ducts) and female (e.g. ovaries, oviducts, glands) reproductive organs, due to the high variable characteristics of these reproductive organs	Maturity National Correspondance (WGBIOP)
WKSEL3 recommends to organise an exchange using the new update scale (WKSEL3) in order to verify the agreement level among lab/country.	WGBIOP
WKSEL3 recommends to improve the collection of the macro and micro images in order to amplify the reference collection.	Maturity National Correspondance (WGBIOP); WKMATHIS2
WKSEL3 recommends to create a permanent group on the biological parameters (maturity, age), useful for the stock assessment	WGBIOP; EOSG; SCICOM\ACOM
WKSEL3 recommends to adapt the SmartDOT platform also for the Maturity pictures.	WGBIOP

WGBIOP supports the recommendations of WKMSSEL 3.

Workshop for advancing sexual maturity staging in fish (WKASMSF)

The workshop took place at ICES, Copenhagen, Denmark, from the 30 April – 4 May 2018 and was chaired by Cindy van Damme and Maria Cristina Follesca. 13 participants from 8 countries (both ICES and GFCM countries) participated in the meeting.

The meeting aimed to

- 1) prepare a historic overview of maturity scales used to collect and report maturity data to ICES, RDB and GFCM databases,
- 2) prepare conversion tables from the national and maturity staging workshop maturity scales to the internationally agreed maturity scale,
- 3) prepare an implementation plan for consistently reporting of maturity data in one international maturity staging scale, and 4) to review histological descriptions of maturity stages.

Historic overviews of maturity data reported were gathered from the ICES databases and from survey groups and national maturity stage coordinators for both ICES and GFCM areas. The ICES databases contain 13 different maturity scales, whereas from the survey groups and maturity stage coordinators over 70 different maturity staging scales were received. 13 different maturity staging scales were received from maturity stage coordinators adhering to GFCM. It is unclear whether maturity data uploaded to the ICES databases are properly converted to the selected uploaded scale.

In 2012 WKMATCH proposed one common maturity scale to be used for all species in the ICES areas. Since then maturity staging workshops have adopted this scale, which is also the scale that is suggested for the reporting. We present here the 'WKMATCH 2012 maturity scale revised'. The difference in this revised scale is that the coding is no

longer in digits (1-6), but in letters (A-F). Most of the national maturity scales also use the digits suggested by WKMATCH, and this could potentially lead to misunderstandings, as people have difficulty to separate for example stage 5 from the national scale and stage 5 from the WKMATCH. Using letters solved this confusion considerably. For the GFCM areas, the GFCM-Data Collection Reference Framework (DCRF) presents the maturity scales to be used for reporting to the GFCM databases. These maturity scales have been adopted in 2015, and it is mandatory from 2018 onwards to report maturity data in these scales.

Using the information from the reports of the various maturity staging workshops, conversion tables to the 'WKMATCH 2012 maturity scale revised' were prepared. These tables should be used to convert the national maturity data before uploading to the international databases. Furthermore, conversion tables from those received from national maturity stage coordinators to the mandatory GFCM scales were prepared. Conversion tables from the 'WKMATCH 2012 maturity scale revised' and GFCM ones are also provided.

With the information above, it was possible to prepare an implementation plan for reporting maturity data in the 'WKMATCH 2012 maturity scale revised' to the ICES survey and commercial fisheries databases. Following these steps, it will be mandatory to report maturity data to ICES and RDB databases using the 'WKMATCH 2012 maturity scale revised' from the 1st January 2020. WGBIOP will be responsible for carrying out the implementation plan and any questions concerning maturity scale and data should be directed to WGBIOP.

For the GFCM areas, since 2018, it is mandatory in the DCRF to report maturity data in the maturity scales reported in the DCRF document.

WGBIOP will inform all survey groups, maturity stagers and data submitters of the implementation plan and the 'WKMATCH 2012 maturity scale revised'. WGBIOP will also prepare a handbook of maturity staging, collating maturity stage descriptions from the workshop reports for the different species and combining these with histological descriptions and conversion tables. An atlas composed of macro and microscopic photos of a wide range of species included in the DCRF will be printed by FAO GFCM by summer 2018.

RECOMMENDATION FROM WKASMSF	ADDRESSED TO
1.WKASMSF recommends to implement the 'WKMATCH 2012 maturity scale revised' (as described in chapter 4) in the ICES and RCG databases following the implementation plan (as described in chapter 7), and use this as the only scale for data submissions from 01-01-2020.	ICES data centre, RCG's, WGBIOP, ACOM, SCICOM
2.The GFCM countries have to implement the maturity scales reported in DCRF as mandatory since 2018.	WGBIOP
3.WKASMSF recommends to: 1.Prepare and give instructions for the 'WKMATCH2012 maturity scale revised' in Q3 2019 and make the instruction document available on the repository 2.Inform survey groups, maturity stagers and data sub-mitters of the 'WKMATCH 2012 maturity scale re-vised' and implementation from 01-01-2020 3.Inform survey groups, maturity stagers and data sub-mitters of the presence in the DCRF of the macro-scopic maturity scales are mandatory since 2018 4.Review, revise and approve conversion tables from national to 'WKMATCH 2012 maturity scale revised' scales and from national scales to GFCM scales. 5.Prepare documentation on maturity data specifically for data submitters and data users. 6.Prepare CRR handbook on maturity staging (see chapter 11 and Annex 8)	WGBIOP
4.WKASMSF recommends to adopt the 'WKMATCH2012 maturity scale revised' and approve the implementation plan (presented in chapter 7). Approval should be sent to WGBIOP. (Note that all requests with regards to maturity scales or stages in the ICES, RCG and GFCM data-bases should be directed, in the form of a recommendation, to WGBIOP for approval.)	WGBIFS, WGMEGS, WGACEGG, WKNEPS, PGDATA, WGBIOP, WGIDEEPS, WGNEACS, WGBEAM, WGCATCH, WGALES, IBTSWG, WGIPS, ICES data centre, RCG's
5.All survey groups should update their manuals with the correct references (see chapter 4 in this report) and include or update the conversion table for the national maturity scales.	WGBIFS, WGMEGS, WGACEGG, WKNEPS, PGDATA, WGBIOP, WGIDEEPS, WGNEACS, WGBEAM, WGCATCH, WGALES, IBTSWG, WGIPS, ICES data centre, RCG's
6.Insert a field 'maturity scale' in DATRAS format showing the maturity scale used for the submitted maturity stages.	ICES data centre, DATRAS governance group
7.WKASMSF recommends to follow the suggested method of estimation of the maturity ogive (see chapter 9) for the 'WKMATCH 2012 maturity scale revised' and GFCM scales.	ACOM, ICES data centre, RCG's, WGBIOP

WGBIOP supports the recommendations of WKASMSF.

Workshop on sexual maturity staging of herring and sprat (WKMSHS2).

The workshop took place in Lysekil, Sweden and was chaired by Cindy van Damme, The Netherlands and Jo Smith.

Objectives were as follows:

- a) has the goal of assessing the usefulness of the maturity scale agreed in 2011 and the conversion to and from other scales used in the different labs/institutes.
- b) to validate the criteria and descriptions to classify maturity stages of the 2011 scale which takes into account the difficulties and / or inconsistencies of the maturity scales in use in different labs;
- c) to calibrate staging of herring and sprat using fresh fish between the different laboratories;
- d) to calibrate staging of herring and sprat following the pattern of trial-discussion-retrial using photographs, following the pattern of trial-discussion-retrial;
- e) to validate with histological analysis the macroscopic maturity stage, mainly the resting stages that are incorrectly classified as immature.
- f) to address the generic ToRs adopted for maturity staging workshops (see 'WGBIOP Guidelines for Workshops on Maturity Staging').

The results for herring staging were as follows:

	Herring expert only, both sexes			
	Round 1 pictures modal	Round 1 pictures validated	Round 2 frozen modal	Round 3 pictures modal
N	75	75	50	56
Agreement	74%	52%	76%	73%
Overestimation	stage 1,2	stage 1,2	stage 1,2	stage 1,2
Underestimation	stage 3,4,6	stage 3,4,6	stage 3,4	stage 3,4,6
Stage missing	5	5	5,6	5

And results for sprat were as follows:

	Sprat expert only, both sexes		
	Round 1 pictures modal	Round 2 frozen modal	Round 3 pictures modal
N	62	50	63
Agreement	71%	74%	75%
Overestimation	stage 1,2	stage 2	stage 1,2
Underestimation	stage 3	stage 3,4	stage 3,4
Stage missing	4,5,6	1,5,6	5,6

The workshop concluded the following:

- Validated agreement much lower compared to modal
- No improvement over calibration rounds for herring
- Tiny improvement for sprat
- Males generally more difficult to stage compared to females
- Herring stage description is mismatch with WKMATCH

Workshop on Mackerel biological parameter Quality Indicators (WKMACQI).

The Workshop on Mackerel biological Quality Indicators (WKMACQI) met 15–17 May 2018 in IJmuiden, The Netherlands and was chaired by Cindy van Damme. WKMACQI was initiated by the Working Group on Biological Parameters (WGBIOP) and aimed to carry out sensitivity analyses of the mackerel assessment for uncertainty in biological parameters.

Many biological parameters are collected for assessment purposes, but quality indicators are rarely available for these parameters. In those few cases, when they are available, the quality indicators are not incorporated in the assessment process. In the past three years, WGBIOP has developed qualitative and quantitative quality indicators for biological parameters. Ambitiously, WGBIOP wanted to incorporate quality indicators in the assessment process, but this goal has not been reached up till now. This was due to the fact that it was not possible to get stock assessors involved in the WGBIOP meetings. WGBIOP did receive positive reactions on the work that was carried out on the quality indicators and this workshop is the result.

For mackerel, age and maturity data were available to develop a quantitative quality indicators. First the data available to estimate the maturity ogive was analysed to check for outliers and if there is evidence of sexual dimorphism in mackerel. Some 'older' mackerel (5+), mostly females, were noted as immature. This is probably due to the fact that mackerel has a long spawning season. Large females start spawning early and are already in spent or resting stage while younger fish are still spawning. These spent or resting females are then macroscopically easily confused with immatures. Despite these outliers the resulting maturity ogive seems reasonable and there is no evidence of sexual dimorphism.

Age and maturity calibration exercises have been carried out in the recent past. Data of these calibrations provide an uncertainty measure of ageing and maturity staging. Age (AEM) and Maturity Staging (MSEM) Error Matrices were developed. The error matrix gives the probabilities that a sampled fish of true age/maturity class a is assigned to one of the observed age/maturity classes. For age the 'true age' is based on the modal age. Maturity staging can be more easily validated with the use of histology, thus the maturity stages are checked against the 'true maturity'.

WKMACQI made the assumption that the data available on the mackerel stock is not affected by any error on age or maturity stage determination, and the WGWIDE 2017 data and assessment are the reference. The error matrices are used to "pollute" this input data and the assessment is run on the polluted data to determine the sensitivity. Each of the different parts of the assessment model, where age and maturity are used, were investigated separately and after that an assessment with all data combined was carried out. The analyses show that errors in the determination of biological parameters affected the mackerel assessment at different levels and can have a substantial effect on the output of the assessment. For instance, when ageing errors are affecting all data sources, a difference of +14% in the SSB and -14% in F_{bar} is observed. This is a substantial difference, and the SSB and F_{bar} trends of the model based on data affected by ageing errors are close to the limit of the confidence bounds of the WGWIDE 2017 assessment. Also the weighting of the different input data sources is affected, which seems to have different consequences depending on the assessment model used. The sensitivity of assessment methods to these errors should be investigated in a more systematic way to understand the model and species-specific consequences of these errors.

WKMACQI was an excellent opportunity to work on biological data with people from both the assessment and biology side. This increased the understanding of the uncertainties in biological data, how biological data are used in assessments, and what data are needed to evaluate the effect of uncertainties on the outcome of the assessment. Such a close collaboration cannot be achieved by assessors participating in WGBIOP or survey people participating in the assessment group.

RECOMMENDATION FROM WKASMSF	ADRESSED TO
<p>1. To optimise the estimation of error matrices WKMACQI recommends (see also Chapter 7):</p> <p>Follow the WGBIOP guidelines for ageing workshops and exchanges, and update and emphasise the guidelines to stratify samples for calibrations by age.</p> <p>Stratify samples for maturity staging workshops by maturity stage (including immature fish). The WGBIOP guidelines should be updated with this recommendation.</p> <p>Follow the WGBIOP guidelines and include a validation by histology in maturity staging workshops.</p> <p>Include length and age of the fish in the reporting of the results of the maturity staging workshops.</p> <p>Certify that the age range in age calibration exercises corresponds with the age range used in the assessment.</p> <p>Certify that spatial and temporal coverage of the samples used on both age and maturity calibration exercises correspond with the coverage in the assessment.</p> <p>Confirm that all who deliver data for the assessment participate in age and maturity calibration exercises. Synchronisation of workshops and exchanges with the benchmarks of stocks might improve involvement in the calibrations.</p> <p>Not necessary for the creation of error matrices but to improve maturity staging workshops, WKMACQI recommends to:</p> <p>Preferentially conduct the maturity staging workshop during the main spawning period. This will considerably enhance the chance of getting fresh samples in the most reliable period for macroscopic maturity staging.</p> <p>At least one of the samples used in the maturity staging workshops should be fresh, in order to allow performing the microscopic validation of the maturity stages.</p>	WGBIOP
<p>2. During regular samplings a few extra samples should be collected for future ageing and maturity staging exercises. This ensures enough samples</p>	WGBIOP

RECOMMENDATION FROM WKASMSF	ADDRESSED TO
from the correct areas are available for future calibrations and the collection of samples is spread among all participating countries. WGBIOP should prepare general guidelines to be included in sampling manuals. WGBIOP should insemminate this recommendation to WGBIFS, WGMEGS, WGACEGG, WKFATHOM, PGDATA, WGIDEEPS, WGNEACS, WGBEAM, WGCATCH, IBTSWG and WGIPS	
3. WKMACQI recommends to estimate the error in egg identification and staging for the mackerel egg surveys and check the effect of this error on the SSB index from the egg survey and prepare advice for the assessment with regards to this error.	WGMEGS, WKFATHOM, WGBIOP
4. During the 2019 mackerel egg survey, mackerel gonads from immature fish by age should be collected for histology and be used to construct a microscopic maturity ogive for stock assessment. (See also Chapter 6.1).	WKFATHOM, WGMEGS, WGACEGG,

WGBIOP supports the recommendations of WKMACQI.

Workshop on Optimization of Biological Sampling (WKBIOPTIM2)

The Workshop on Optimization of Biological Sampling (WKBIOPTIM2) took place at IFREMER in Nantes, France, from 29-31 May 2018 and was chaired by Ana Cláudia Fernandes (IPMA, Portugal) and Maria Teresa Facchini (COISPA, Italy). 14 participants from 8 countries (Belgium, Finland, France, Germany, Greece, Norway, Portugal, Sweden) participated in the workshop.

The objectives of the workshop were as follows:

- 1) Further develop catch-sampling evaluation toolbox (following WKBIOPTIM 1): Improvements will be considered based on additional case studies (i.e. stocks or fisheries), consideration of additional metrics (e.g age and maturity) and considerations for methods to calculate effective sample size for these metrics.
- 2) Development of quality indicators: evaluate a second set of quality indicators.
- 3) Discuss progress achieved in implementation at national level since WKBIOPTIM 1.

Workshop Procedure:

- i. Improvement of the scripts: at sample level by including ages and sex as the biological variables; at multilevel sampling by considering the concurrent sampling and the integration of space, time, gear and species in the optimization process.
- ii. The new version of the Sampling Design Tool (presented in WKBIOPTIM 1) was developed and made available for participants to test in their own case studies.

- iii. Preparation of a function to allow the input of data derived from surveys (DATRAS)
- iv. Participants tested the scripts in their own case studies.
- v. Inclusion of more metrics and statistical tests in the scripts, to analyse the results derived from the optimization processes.
- vi. A participant presented a framework to determine the adequate sample size to estimate a length structure.
- vii. Participants presented work being completed in national labs related to sampling optimization both for commercial sampling and surveys and presented some suggestions for scripts improvements.

Recommendations:

- 1) Input of stock assessors, specifically the data from surveys, so these methodologies can be adapted to the surveys sampling design.
- 2) WKBIOPTIM 2 agreed to compile the scripts and procedures being developed during these workshops and to provide documentation in a Toolbox (e.g. R-Package) so national labs can analyse their own data and optimise their sampling resources.
- 3) Produce 'Best Practice Guidelines' for the implementation of optimization procedures for sampling biological parameters, at national level (e.g. statistical sound sampling scheme).

WGBIOP supports the recommendations of WKBIOPTIM2.

Hake (*Merluccius merluccius*) southern stock: otoliths and gonad collection (Gonçalves *et al.* WD WGBIOP 2018)

Tagging experiments revealed an overestimation on age determination on hake and no new otolith reading criteria was agreed. As a consequence, a length-structured model replaced the previous age based model in the hake southern stock assessment (ICES divisions 9.a and 8.c). The otolith sample collection must be maintained to allow the re-construction of the age data-series when a new ageing criterion is available. However, some guidelines must be available to define the sampling effort in those cases.

Maturity ogive (maturity proportions-at-length) used on hake assessment is estimated with sexes combined but only comprises data from a part of the stock distribution (part of the ICES division 8.c). This is mainly due to maturity inconsistencies between the different institutes involved on this species assessment. As a solution, a maturity exchange to calibrate the maturity staging on hake between Portugal and Spain must be performed, with the main goal of obtaining a sex combined maturity ogive with the two datasets combined (from ICES divisions 9.a and 8.c). This exchange must follow the proposals already settled up during the ICES WKMSHM (ICES, 2007) ICES WKMOG (ICES, 2008) and WKMSGAD (ICES, 2014).

Coordinated by Patricia Gonçalves.

WGBIOP supports the recommendations of the hake exchange.

Workshop on Age Estimation Methods of Deep Water Species (WKAMDEEP2).

The Workshop on Age Estimation Methods of Deep Water Species (WKAMDEEP2) took place in Cadiz, Spain, from 17–21 September 2018, and was chaired by Albert Ole Thomas, Norway, Kélig Mahé, France, and Juan Gil Herrera, Spain.

The objectives of the workshop were as follow:

Collect and review the consistency of age data used in stock evaluations of deep water fish, including, but not restricted to, tusk (*Brosme brosme*), ling (*Molva molva*), blue ling (*Molva dypterygia*), roundnose grenadier (*Coryphaenoides rupestris*), greater silver smelt (*Argentina silus*), black scabbardfish (*Aphanopus carbo*), black-spotted sea bream (*Pagellus bogaraveo*), greater forkbeard (*Phycis blennoides*) and orange roughy (*Hoplostethus atlanticus*);

Review new information on precision and accuracy of age estimation of the seven first species listed above, for which WKAMDEEP1 agreed on individual ageing protocols, and revise those protocols as appropriate;

Review age estimation procedures, and propose new ageing protocols for deep water species not considered by WKAMDEEP1;

Assemble age reading experts on deep water species for training on age reading of several species, following the recommendation from WKAMDEEP1 to conduct age reading comparisons collectively for the whole group of slow-growing deep water fish;

Estimate the bias for the long-life species.

Twelve readers participated in the workshop, agreeing and producing an age reading manual for the seven species considered during the workshop. Many recommendations for future work were made by the workshop, including the following:

RECOMMENDATION	ADDRESSED TO
WGDEEP should indicate as soon as possible for which species and/or stock age are required or would be advantageous	WGDEEP, WGBIOP
SmartDots should be further developed to allow the application to be used independent of the ICES management, in order to facilitate further exchanges and training within and between national laboratories.	WGBIOP, ACOM
WKAMDEEP2 recommends to organize another exchange in 2020 with 50 images of each species, and another exchange in 2022 with the same 50 images in random order and with additionally 50 images of each species. After the last exchange WKAMDEEP3 should be organized in 2023	WGDEEP, WGBIOP, ACOM
Individual researchers and laboratories are encouraged to follow up on WKAMDEEP2 by continuing investigations to validate the age reading of each species, especially considering the validity of the first growth zones	National laboratories

WGBIOP supports the recommendations of WKAMDEEP 2, and notes that the developments requested for SmartDots were discussed and these requests have been logged for future developments, which will be considered and prioritised by the Working Group on SmartDots Governance (WGSMART).

A follow on exchange has been proposed for 2020, for which a coordinator is yet to be found.

Exchanges Completed in 2017–2018

The following are summaries of the age reading exchanges carried out in 2017 and 2018.

Anchovy (*Engraulis encrasicolus*) Otolith Small Scale Exchange 2018.

During the last anchovy workshop (WKARA2) held in 2016 a great effort of standardization of procedures among different labs and groups for age determination was carried out. These efforts produced a general agreement on anchovy growth patterns among areas (both Mediterranean and Atlantic waters) and common reading criteria were adopted. According to all these new insights, along the meeting it was proposed to test if the mentioned efforts finally produced an increase of agreement among readers and labs compared to the previous exchange. Therefore it was recommended the realization of a small exchange to be carried out in 2018 and this was adopted by WGBIOP 2017.

The Objectives of the present exchange were: 1) Evaluate if the updated Age reading protocol in WKARA2 have been adopted by all readers (at least the participants in WKARA2). 2) Evaluate if the accuracy and precision in otolith age reading of anchovy among readers of fishery and surveys samples throughout the year has improved. 3) Report results to the WGBIOP that will take place in October 2018.

To that purpose an exchange program of anchovy otoliths was organized by IEO, AZTI and IAMC-CNR between April and September 2018, before WGBIOP 2018. A set of altogether 160 images of anchovy otoliths were selected and uploaded for analysis using the SmartDots application, distributed in the Bay of Biscay and the Strait of Sicily. These areas have been chosen for the following reasons: 1) The Atlantic and Mediterranean areas are represented with these two stocks; 2) They have differences in the complexity of otolith interpretation: easier otoliths of the Bay of Biscay than those of the Strait of Sicily; 3) different conventional birth date are used: 1st of January in the Bay of Biscay and 1st of July in the Strait of Sicily and 4) by practical logistical reasons, more simple and quick to obtain the images for the exchange since the coordinators are involved in these areas. A protocol for the exchange of age readings was provided to all participants (including WKARA2 age reading protocol).

Twenty-five readers from fourteen institutes and nine countries (Germany, England, France, Spain, Portugal, Tunisia, Italy, Croatia and Greece) participated. From all readers fourteen readers have a long time experience reading anchovy otoliths (experts); seven was intermediate and four trainees. Thirteen of the 25 readers also took part in the last anchovy workshop (WKARA2 2016), representing the 52% of the total readers of this Exchange, and twelve readers attended the exchange directly without participating in the WKARA2 (48%). Seventeen of the participants to this Exchange (13 experts, 3 medium and 1 trainee readers) are readers providing input to the assessment of anchovy (71%). Participants' coverage in the Exchange was very good, it is the first time that readers from all the main areas of the European anchovy distribution participate in this kind of exchanges.

For the total areas (all samples together and all readers), the average percentage of agreement (62%), CV (55%) and APE of 40% does not seem to be satisfactory. Furthermore, the agreement compared with the last exchange in 2014 decreases. However, these are just preliminary results: Many new readers have joined this 2018 exchange, almost doubling the 2014 exchange readers, this prevent a direct comparison with the current complete results with those of WKARA2.

By stock, the agreement with the modal age of all readers was also low (68% for Bay of Biscay and 56% for Strait of Sicily) and CV was high (47% and 62% respectively). In the case of the advanced readers, agreements and CV are variable, depending on the stock, showing the highest agreement in the Bay of Biscay stock, with 73% agreement and 44 of CV. In the case of Strait of Sicily the percentage agreement of the advanced readers was 58% with 55% of CV. These are preliminary results: Given that the current version of SmartDots do not allow complete separate analyze of results by stocks and do not allow separate analysis of a subset of readers, a direct comparison of results by stock and for same readers attending WKARA2 cannot be done. Therefore we cannot assess if the readers attending WKARA 2 have applied the reading criteria adopted there. As such our main objective of assessing improvements with past results in WKARA2 has so far not been reached.

In this 2018 Exchange the overall agreement and precision between all readers and areas was very low. Many new readers who did not participate in the WKARA2 prevent the comparisons with the 2014 exchange results. It is necessary to analyze in more detail the results to draw more clear conclusions: Proper comparison is to be based on the same readers for the two exercises and this work is still pending. To finish properly the analysis we need to extract from the SmartDots detailed results by stock and for the group of readers that participated in the WKARA2 exchange. We need also be able to extract the results by stock for the readers who provide age determination for inputs to the stock assessment for the selected stock (for instance to infer the age error matrix, etc.).

In view of the current results and that there are new readers a new workshop might be considered for 2020/2021. Meanwhile, we recommend the readers to review and read the WKARA2 report (where there are many examples) and to review the collection of otoliths of reference that is in the Age Forum Reader.

Coordinated by: Begoña Villamor, [IEO-Spain], Andres Uriarte, [AZTI-Spain] Gualtiero Basilone [IAMC-CNR-Italy]

North Sea Norway Pout (*Trisopterus esmarkii*). Otolith Exchange 2018

In 2015 a preliminary age reading exchange took place between the primary age readers of Norway pout from DTU Aqua (Denmark) and IMR (Norway) to identify if any age reading issues exist. The samples included in the exchange were from the commercial Norway pout fishery in the North Sea and Skagerrak-Kattegat areas (nop.27.3a4 stock) as age readings from this fishery are used directly in the Norway pout stock assessment to estimate catch, mean weight, maturity and mortality at age. 227 samples were selected from quarter 4, 2014 and quarter 3, 2015 covering the fish length range of Norway pout in the North Sea. Results showed an overall percentage agreement of 72%, with 100% agreement at age 0 and a decrease in agreement with an increase in age. Results showed a tendency for the Norwegian reader to estimate the ages of the fish to be one year older in comparison to the Danish reader. As Norway pout grow very quickly in the first year the centre of the otoliths are highly opaque and this can cause problems when identifying the first winter ring. In addition, subsequent growth zones are much narrower in comparison and the interpretation of growth zones towards edge may also contribute to difficulties in age determination, especially for older fish. The exchange was carried out without the inclusion of otolith images and thus no record of which growth structures the readers identify when determining the age of the fish. These results indicated the need for a full scale exchange to be carried out

based on otoliths images and including all age reading laboratories who routinely read Norway pout.

The full scale exchange was initially planned for 2016 and a timetable proposed which would allow for the results to be considered in relation to the 2017 stock assessment and potential InterBenchmark Assessment if required. Due to difficulties with sample collection and the WebGR age reading platform delays were encountered. A revised timetable was proposed in line with the launch of the BETA version of the new age reading tool – SmartDots, making the results available for the Norway pout stock assessment in Spring 2018. The exchange took place from January to March 2018 and 14 readers from seven countries participated (Scotland, UK, France, Norway, Denmark, Netherlands and Germany). Different methods are applied for age determination of this species; whole, broken and sectioned otoliths and images were provided of samples prepared using each method. Samples were collected during the 2016 Q3 IBTS and 2014 Q4 commercial fishing trips from ICES area 27.4.a. covering the length range of the fish and considered adequately representative of the stock.

Results based on sectioned otoliths were exceptional with an overall percentage agreement based on modal age of 99% and an average CV of 3%. For the whole and broken otoliths the average percentage agreement based on modal age is 82%, with an average CV of 20%. There is a slight tendency for some readers to overestimate the age at modal age 0 and 1 and underestimate in comparison to modal age 2. The bias that existed between the primary readers from Norway and Denmark in 2016 is still apparent. These results are based only on those readers who provide age data for assessment purposes.

Conclusions:

Overall there is a high level of agreement between readers of the Norway Pout - nop.27.3a4 stock. The agreement is higher between the countries who read sectioned otoliths (Germany and UK-England) compared to those who read whole (Denmark) and broken otoliths (Denmark, Norway and UK-Scotland). This can be partly attributed to one Norwegian and one Danish reader who occasionally overestimate in comparison to modal age 0 and 1 with the identification of the first winter ring being problematic. At modal age 2 there is a stronger tendency for readers to underestimate in comparison to modal age with the exception of the Norwegian reader who continues to overestimate. Most variability is seen in the annotations of the broken otoliths which is the preferred method. It should be noted that the image quality of the sectioned otoliths is much higher. The AEM's show that there is a difference of just one year when comparing the readers estimates to modal age.

Recommendations:

- Any further exchanges should include images of whole, broken and sectioned otoliths from the same fish to allow for a more thorough comparison of age readers and methods. Images of broken otoliths should be taken with the appropriate software.
- Further investigations should be made on the reliability of reading whole otoliths.
- AQ scores are utilised in the analyses.
- Only reader "approved" annotations are included in the analyses.
- SmartDots needs development to facilitate agreed aged reference collections.

In follow up to the communication with the stock assessor, national coordinators were asked to provide information on the number of fish ages submitted on an annual basis per country for stock assessment purposes. This would allow for a more thorough analysis of how reader error impacts the stock assessment. Through the RCG North Sea this information was provided. This overview table by species and stock was presented to WGBIOP and it was concluded that this would be very useful information to have included in the workshop and exchange reports in the future. A similar overview from DATRAS should be requested.

The Stock assessor will report to ADGPOUT and would like feedback from WGBIOP. Coordinated by Julie Coad Davies (DTU, Denmark) and Mandy Gault (MARLAB, Scotland).

Sardine (*Sardina pilchardus*) in Areas 7, 8, 9a and Mediterranean.

The sardine exchange was originally requested by WGBIOP (2015) to be held during 2016, following a recommendation of WGHANSA (2015). With the main objective as follows:

To assess sardine otoliths age readings agreement between age readers of the North-east Atlantic and of the Mediterranean Sea in order to identify any age readings issues in each area.

380 images of whole otoliths' pairs were analyzed by the participant readers for age determination. Otoliths came from both the North East Atlantic (ICES Areas of Bay of Biscay and Atlantic Iberian Coast) and from the Mediterranean Sea.

All participants followed a common age reading protocol in a document uploaded to WebGR called "Guidelines for sardine otoliths picture samples preparation, observation and age determination criteria (adapted from ICES, 2011)" which was based on the conclusions of the Workshop on Age Reading of European Atlantic Sardine (WKARAS) in 2011 (ICES, 2011).

Similar to SmartDots, R scripts based on Eltink MS Excel spreadsheet (Eltink, 2000) following the recommendations of the "Guidelines and tools for age reading comparisons" (Eltink *et al.*, 2000) were developed and used for the exchange age readings comparative analyses and to assess the age reading agreement level amongst participant readers.

From the analysis of the results we can see that the NE Atlantic Percentage Agreement (PA) varied between 60 and 70%, experts and also trainees showing higher PA (close to 70%). The Mediterranean Sea results showed that the Percentage Agreement varied between 60 and 75%, trainees showing higher PA (>75%), followed by experts (close to 70%). Overall, in this case trainees and experts showed higher PA (between 70 and 80%).

Generally there was relatively low age reading agreement between readers for both areas ranging between 60 and 80% in all cases analyzed. Experts and trainees showed higher PA in comparative analyses of mixed readers from all areas and of NE Atlantic readers, both by expertise and area. On the other hand, intermediates and trainees showed higher PA on comparative analysis of Mediterranean readers by expertise and area;

Age reader 33 was excluded from analyses, as his readings were in disagreement with the remaining readers, probably due to issues that had happen with his observations;

The use of digitized images of otoliths as the only basis for age attribution within an otoliths' exchange does not seem to be adequate to obtain reliable results, since they do not provide a simulation of the real observation conditions under a stereoscopic magnifier (3D visualization of the otoliths, use of variable light and magnification conditions, etc.). Instead, images should be a complement of the real otoliths observation under a stereoscopic magnifier, in which participant age readers will identify the growth rings with marks, to help the Exchange results analyses;

It is recommended to hold a workshop in either 2019 or 2020, in order to clarify sardine otoliths' age reading difficulties and criteria in each area, to find ways to increase the age reading precision and the percentage of agreement among readers.

Coordinated by: Eduardo Soares, Andreia Silva and Pedro Torres

Norwegian Spring-spawning herring (*Clupea harengus*).

The exchange on age reading of Norwegian Spring Spawning herring was initiated in 2016. Five countries and 17 readers participated in the exchange. Three institutes read otoliths while two institutes read scales. This exchange was a follow up from the 2015 workshop WKNSSAGE, requested by WGWISE to WGBIOP to review any technical problems regarding age-reading of Norwegian spring spawning herring between Norway, Denmark, Iceland and the Faroe Islands. For this exchange institutes had collected both otoliths and scales from the same individuals. The structures were sent around in 2016 and 2017 and annotations were done in WebGR.

The results were analyzed for all readers combined, for each structure and modal age from the two readings were also combined. During the workshop in 2015 a general trend appeared where the scales were estimated to be one year older than the otoliths. This was not as clear in this exchange. When analyzing the readings from all readers using the EFAN-sheet a percent agreement of 72% was found. When looking at the structures separately, otolith readers had a percent agreement of 69%, while scale readers had an agreement of 87%. Modal age of the two readings were compared using the ATAQCS-sheet (Mark Etherton, CEFAS), and an agreement of 60% was found.

WKNSSAGE concluded that the different ages obtained from scale and otolith readings could be due to a number of issues relating to identification of the first winter ring and age interpretation of older fish, confounded by stock mixing issues. Final conclusions cannot be reached based on the samples from neither the previous workshop nor this exchange. The issue was discussed at WGWISE, and it was concluded to attempt to do the same analyses for NSS-herring as were done for mackerel. This will be done by the NSS stock coordinator. We suggest that a workshop should be planned when the results of these analyses are available.

Coordinated by Jane Godiksen (IMR, Norway).

WGBIOP Supports the proposal to postpone a workshop until the results of statistical analysis are available.

Herring (*Clupea harengus*) Otolith Microstructure (OM) exchange.

A visual inspection of otolith microstructure (OM) is used as a stock identification method in mixed Atlantic herring (*Clupea harengus*) stocks in the North Sea and Western Baltic. An exchange of herring otolith microstructure between DK and SWE was initiated in 2018. Four readers, two from each country, participated. All 4 readers are

experienced and provide data for splitting commercial and survey samples, used for assessment purposes.

The exchanged otoliths included 65 otoliths (ground and polished) from 0-group fish (DK samples; IBTS; area 3aN, 3aS and 4b) of which 23 had genetic confirmation of spawning type and 31 otoliths (ground and polished) from age 1+ (SWE samples; commercial samples; area 3aN and 3aS).

For the DK samples, 100% agreement was achieved in 57% of the otoliths and for the SWE samples 55%. When comparing the readings to the genetic confirmations only five out of 23 otoliths were in 100% agreement.

A Skype meeting was held with all readers and results presented. Methods were discussed and readers apply the same methods in both laboratories. Increment width (IW) measurements based on 0 group and spawning fish from 2001, 2002 and 2003 are used for confirmation of spawning time when readers are in doubt. Otolith images were examined and discussed. Readers agreed that overtime OM patterns have changed and it has become more and more difficult to clearly distinguish between the spawning types, mostly between the Western Baltic spring spawners (WBSS, 4's) from the Downs winter spawners (12's).

2018 HERAS samples are currently being processed at DTU Aqua (OM analysis for spawning type confirmation and images of whole otoliths for shape analysis). Included is a subset with genetic confirmation of spawning type for internal calibration and which will be incorporated into an updated baseline for future stock splitting. More genetic samples are needed, a coordinated effort on sampling is needed, and protocols for OM analysis needs to be updated with IW measurement guidelines.

These issues have been addressed at Workshop on Stock Identification and Allocation of Catches of Herring to Stocks (WKSIDAC 2017) and Benchmark Workshop on Pelagic Stocks (WKPELA 2018).

Coordinated by Julie Coad Davies (DTU, Denmark).

Atlantic Chub Mackerel (*Scomber colias*) Exchange 2017

Atlantic chub mackerel (*Scomber colias*) is not yet assessed. However, the increase of the captures of this species in Portugal and Spain could lead to its assessment in the near future. Hence the importance of the realization of calibration exercises between otolith readers.

The first Workshop on age estimation of chub mackerel otoliths (WKARCM), meeting in November 2015, recommended the realization of an otolith exchange of chub mackerel during 2016, in order to see if the new criteria established during the workshop had been adopted by all readers. As it was not possible to find the time to be carried out during 2016, the realization of the exchange was recommended again by the Working Group on Biological Parameters (WGBIOP), meeting in October 2016, to be carried out during 2017.

The exchange was carried out via WebGR during May-October 2017. A total of 15 readers from four European countries (Portugal, Spain, Italy and Greece) participated in the exchange. Also, due the interest shown in comparing the information of chub mackerel between the two Atlantic areas, a reader from USA (University of Southern Mississippi) was invited to participate as well.

A total of 216 otolith images from Atlantic and Mediterranean areas were used, covering all working areas of the participants (East Atlantic: ICES divisions 8c and 9a, CECAF-Canarias; Mediterranean Sea: GSA09 and GSA22; and West Atlantic: North West Atlantic).

The analysis were performed for the total of areas (including and excluding the West Atlantic set) and each area separately, in four groups: All readers, WKARCM readers (previous workshop participants), Training readers and Main European readers (readers whose age estimation would be used in case of assessment).

The overall agreement was very low (59.4%), lower than in last workshop exchange, WKARCM (60.6%). Overall CV was high (59.0%) in comparison with last workshop exchange (45.6%). The same results were obtained for WKARCM participants (59.2% agreement and CV of 62.0%). The best results were obtained by the group of Main European readers (66.5% agreement and CV of 34.0%). By area, the best agreement was obtained for the CECAF-Canarias set for each group analyzed (70-80% agreement). Lowest agreement was obtained for the NWA and GSA09 sets (51.7% and 52.4% agreement, respectively).

The results show problems in identifying the first ring and otoliths with age 0 by some readers and confusion when the date of birth is 1st July (Mediterranean sets) by readers of Atlantic areas.

It was recommended the realization of a Workshop on age estimation of chub mackerel otoliths in 4-5 years, with a previous otolith exchange and the realization of validation studies of each area.

Coordinated by Chair(s): Rosario Navarro (IEO, Spain) and Andreia Silva (IPMA, Portugal)

On Going Work in 2018

Workshops ongoing in 2018

The Following workshops are scheduled to take place in Q4 2018.

- **Workshop on Age Estimation of Atlantic Mackerel (*Scomber scombrus*) (WKARMAC2)** which will take place from the 22-26 October 2018, San Sebastian (Spain). Chaired by: Jens Ulleweit (TI-SF, Germany) and Rosario Navarro (IEO, Spain)
- **Workshop on Age reading of Horse Mackerel, Mediterranean Horse Mackerel and blue Jack Mackerel (*Trachurus*, *T. Mediterranean* and *T. picturatus*).(WKARHOM3)** Co-chairs: Alba Jurado, Spain, Pierluigi Carbonara (Italy) and Kelig Mahé, France will meet in Livorno (Italy), 5 – 9 November 2018.

Exchanges ongoing in 2018

- Otolith Exchange 2018–**Megrim** (*Lepidorhombus spp*). Coordinator: Mandy Gault (Scotland). This exchange is currently on – going. Currently the exchange covers areas 4a & 6a, and will be expanded to include 6b if possible. Exchange images will be uploaded to SmartDots soon. **Ongoing**
- Otolith Exchanges **Lemon sole** (*Microstomus kitt*) from North Sea and 7d. Coordinator: Joanne Smith (United Kingdom). **Ongoing**
- Otolith exchange–**Turbot and Brill** (*Scophthalmus maximus* and *Scophthalmus rhombus*). Coordinator: Karen Bekaert (Belgium). A presentation was made to WGBIOP, outlining the preparations for this upcoming exchange, which is hoped to begin in November or December 2018. **Ongoing**

Work Programme 2019 onwards.

Age Calibration Exchanges proposed for 2019:

- Otolith age reading exchange on Blue whiting (*Micromesistius poutassou*) Coordinators: Patrícia Gonçalves (Portugal) and Jane Godiksen (Norway). During 2019
- Small Otolith exchange 2019 Whiting (*Merlangus merlangus*). Coordinator Joanne Smith (United Kingdom). Data from exchange lost during transfer from WebGR to SmartDots, small exchange will need to be repeated in 2019. The purpose of the small exchange is to compare readings of whole and sectioned otoliths, by experienced readers.
- Otolith Exchanges 2019 Haddock (*Melanogrammus aeglefinus*) from Rockall and North Sea (areas IVa and VIa) has been expanded to also include subareas I & II, to align with the upcoming benchmark review in 2020 for this stock. Coordinator: Mandy Gault (Scotland).
- Otolith Exchanges 2019 Dab (*Limanda limanda*) from North Sea and 5a. Coordinators: Holger Haslob (Germany) and Loes Bolle (The Netherlands).
- The exchange was originally proposed for 2018 but has been postponed to 2019. The exchange was proposed as follow-up of the 2015 workshop (WKARDAB2) and has two aims which will be addressed in two separate

exercises: (1) compare the three different methods used by the institutes ageing dab, (2) carry out an otolith edge study to determine when the opaque and translucent zones are deposited in different geographical regions. Clarification of the necessity of these exercises and further details are given in the WKARDAB2 (2016) report.

- Ref: ICES 2016 Report of the Workshop on Age reading of Dab (*Limanda limanda*) (WKARDAB2), 17–20 November 2015, Hamburg, Germany. ICES CM/SSGIEOM:12
- Otoliths Exchanges 2019–Red mullet and striped red mullet (*Mullus barbatus* and *Mullus surmuletus*), Coordinator: Pierluigi Carbonara (Italy)
- Otolith Exchanges 2019–Redfish (*Sebastes* spp), Coordinator: Lise Heggebakken (Norway).
- Small otolith exchanges 2019 –Sandeel (*Ammodytes marinus*), Coordinator: Julie Coad Davies (Denmark).
- Small Scale image Otolith/illicia Exchanges 2019 –Anglerfish (*Lophius piscatorius*, *Lophius budegassa*), and Hake (*Merluccius merluccius*) Proposed for expert readers only. Coordinator: Kélig Mahé (France). Being organised outside the remit of WGBIOP, but the results will be reported to the next WGBIOP meeting.
- Otolith Exchanges 2019 –Plaice (*Pleuronectes platessa*), in Areas 7f and 7g (Bristol Channel and Celtic Sea). Coordinator: Karen Bekaert (Belgium). To be completed by October 1st 2019.
- Otolith Exchanges 2019 –Plaice (*Pleuronectes platessa*), in Area 7h – k (Celtic Sea South, Southwest of Ireland). Coordinator: Marcin Blaszkowski (Ireland). To be completed by October 1st 2019.
- Otolith Exchanges 2019 –Sole (*Solea solea*), in subdivisions 20–24 (Skagerrak and Kattegat, western Baltic Sea). Coordinator: Julie Davies (Denmark). The basis for this exchange is a 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. To be completed by October 1st 2019.
- Otolith Exchanges 2019 –European Eel (*Anguilla anguilla*), Coordinator: Esti Diaz (Spain – ASTI). This exchange is being organised by Esti Diaz for the Iberian region through an INTERREG project). WGBIOP has contacted the coordinator and requested that the exchange be opened up to age readers of Eel across Europe. WGBIOP will assist the coordinator to use the SmartDots platform to run the exchange, thereby aligning it more closely with the work of WGBIOP.
- Scale Exchanges 2019 –Salmon (*Salmo salar*), Coordinator: Zuzanna Mirny and Adam Lejk (Poland)
- Scale and Otolith exchange 2019 - Sea bass (*Dicentrarchus labrax*) will be coordinated by Mary Brown (UK – England). With a follow on workshop (WKARDL2) to take place in 2021, Chars to be decided at WGBIOP 2019.

Maturity Staging Exchange proposed for 2019:

- Maturity staging exchange 2019 on **elasmobranch spp.** Coordinated by Maria Cristina Follesa This exchange will follow up on recommendations by WKMSSEL and will take place in 2019.

Other Exchanges proposed for 2020:

- Vertebrae exchange **Elasmobranchs** (*Raja* spp), Coordinators: Pierluigi Carbonara (Italy), Maria Cristina Follesa (Italy).
- Otolith Exchanges 2020–**Deepwater Spp.** Image only exchange. Coordinator: Torfinn Erling Larsen (Norway).
- Otolith exchanges 2020 - **Megrim** (*Lepidorhombus whiffiagonis*) in divisions 7.b-k, 8.a-b, and 8.d: This exchange will be coordinated by Jorge Landa (IEO, Spain) & another (TBD at WGBIOP 2019).
- Otolith exchanges 2020 - **Megrim** (*Lepidorhombus whiffiagonis*) in divisions 8c & 9a (southern Bay of Biscay and Atlantic Iberian waters east). This exchange will be coordinated by Jorge Landa (IEO, Spain) & another (TBD at WGBIOP 2019).
- Otolith exchanges 2020 - **Four spotted megrim** (*Lepidorhombus boscii*) in divisions 8.c and 9.a (southern Bay of Biscay and Atlantic Iberian waters east). There is possibly only one Institute reading *L. boscii* in this area. The necessity of this exchange will be reviewed at the WGBIOP meeting, October 2019. coordinated by Jorge Landa (IEO, Spain) & another (TBD at WGBIOP 2019)
- Sole and Plaice maturity staging exchange 2020 to include immature fish. Need to find a coordinator
- Workshops proposed for 2019
- Workshop on age validation studies of small pelagic species (**WKVALPEL**) (replaces WKMIAS). Co-Chairs: Javier Rey, Spain, Kelig Mahé, France, and Pierluigi Carbonara (Italy), will meet in Boulogne sur mer (France), 21 – 25 October 2019.
- Workshop on Better Coordinated Stomach Sampling (**WKBECOSS**): Chaired by Izaskun Preciado (Spain) and Stefan Neuenfeldt. Santander, Spain. 2019.
- Workshop on **sardine** (*Sardina pilchardus*) Age reading of otoliths (NE Atlantic and Mediterranean). Chaired by Eduardo Soares (IPMA, Portugal), and Pedro Torres (IEO, Spain). Lisbon, Portugal, 18th-22nd, February 2019.
- Workshop on **Whiting** biological parameter Quality Indicators (**WKWHIQI**), Chaired by TBD, location: TBD, dates TBD 2019. (Under development)

Workshop planned for 2021:

- Workshop on Age reading of Sea bass (*Dicentrarchus labrax*) 2 (**WKARDL2**) will meet in TBD, TBD 2021 in TBD to: Chaired by: TBD. (Under development)

c) Resolutions for workshops and exchanges endorsed by WGBIOP and to be approved

Work plan for 2019–2021

Workshops planned for 2019:

- Workshop on age validation studies of small pelagic species (**WKVALPEL**) (replaces WKMIAS). Co-Chairs: Javier Rey, Spain, Kelig Mahé, France, and Pierluigi Carbonara (Italy), will meet in Boulogne sur mer (France), 21 – 25 October 2019.
- Workshop on Better Coordinated Stomach Sampling (**WKBECOSS**): Co - Chaired by Izaskun Preciado (Spain) Stefan Neuenfeldt (Denmark) will meet in Santander, Spain, 3-6 September 2019.
- Workshop on sardine (*Sardina pilchardus*) Age reading of otoliths (NE Atlantic and Mediterranean). (**WKARAS 2**) Chaired by Eduardo Soares (IPMA, Portugal), and Pedro Torres (IEO, Spain). Lisbon, Portugal, 18-22, February 2019.
- Workshop on Whiting biological Quality Indicators (**WKWHIQI**), Chaired by TBD, will meet in XXX, Country, XX 2019.

WKVALPEL Workshop on age validation studies of small pelagic species

A Workshop on age validation studies of small pelagic species (WKVALPEL) to replace WKMIAS (Co-Chairs: Javier Rey, Spain, Kelig Mahé, France, and Pierluigi Carbonara, Italy, will meet in Boulogne sur Mer (France), 21–25 October 2019 to

- a) Review information on age estimations, otolith exchanges, workshops, and validation works done for each pelagic species
- b) Assemble and compare the results of different validation methods (i.e. marking and recapture, marking the calcified structure, marginal increment analysis, marginal analysis, modal progression analysis, length back-calculation, micro increment analysis, etc.);
- c) Discuss and propose the most appropriate validation methods of age and growth pattern of calcified structures (CS), for each species and stock;
- d) Propose the appropriate validation methods to recognise the growth checks.

WKVALPEL will report by DATE to the attention of ACOM and SCICOM

Supporting information:

Priority:	The current activities of this Group will lead ICES into issues related to the ecosystem effects of fisheries, especially with regard to the application of the Precautionary Approach. Consequently, these activities are considered to have a very high priority
Scientific justification:	Based on main results produced in previous ICES workshops and Exchanges on ageing adult anchovy and sardine (WKARA 2009, WKARAS 2011, Anchovy Exchange 2014), a focal point was to correctly identify the right position of the first ring (annulus) on sagittal otoliths of these species, being one of the main sources of error affecting ageing precision. Improving precision in age reading is extremely important in general, even more in short-lived species such as anchovy and sardine. One of the most common method to validate the timing and position of the first ring consists of counting of otolith micro-increments (daily rings) in juveniles (young-of-the-year). Daily growth studies of anchovy and sardine are currently carried out in different European laboratories, principally to analyse the effects of environmental parameters on growth and survival, and thus to understand the factors affecting recruitment processes of these species. However, given the wide span of methodologies already existing within laboratories, ageing data are often difficult to compare, actually masking the contribute of environmental conditions of different growth rate patterns observed among areas. The aim of the workshop is to collate these different protocols as starting point to produce single validated protocol to better standardize age estimates, either on daily or annual basis.
Resource requirements:	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible
Participants::	The Group is normally attended by some 20–25 members and guests.
Secretariat	None
Financial:	None

Linkages to advisory	ACOM, GFCM
Linkages to other committees or	WGBIOP, WGHANSA
Linkages to other organizations cost:	There is a direct link with the EU DCF

The Workshop on Better Coordinated Stomach Sampling (WKBECOSS)

The **Workshop on Better Coordinated Stomach Sampling (WKBECOSS)**, chaired by, Izaskun Preciado, Spain, and Stefan Neuenfeldt (Denmark) will meet in Santander, Spain, 3-6 September 2019 to:

- a) Review, update and disseminate existing best practice guidelines for stomach sampling programmes (e.g. spatio-temporal information, sampling sizes, taxonomic resolution of food items, data compatibility with ICES stomach database)
- b) Present and discuss recent findings from fish diet studies, including those using stable isotope analysis, relevant for advancing regional stomach sampling schemes
- c) Summarize specific input data needs of end users of fish diet data and define the end products for the data collection (multi-species models, MSFD indicators, etc.)
- d) Identify matches and mismatches between end user needs and current EU MAP (DCF) and national collection of diet data, and propose an Action Plan to improve regional stomach sampling schemes (involving species, methods, sampling design, databases etc.)

WKBECOSS will report by 20th September 2019 for the attention of WGBIOP and EOSG.

Supporting information

Priority	The EU Multi-Annual Programme (EU MAP) on Data Collection requests data on predator-prey relationships and planning for future data collection specific for each marine region, coordinated at marine region level and based on end-user needs. This means that pilot studies involving fish stomach sampling are needed. Currently there is variable sampling intensity on a national basis and the sampling and analyses of stomachs are not coordinated. Therefore, on-going and planned activities may not match the needs of end-users of diet data. To realise the benefits of stomach sampling carried out by different Institutes better co-ordination is urgently needed. Therefore, these activities are considered to have a high priority.
Scientific justification	The EU MAP provides a unique opportunity for the regular collection of diet data within fisheries research surveys. To ensure a homogeneous data set with suitable spatio-temporal coverage and make effective and efficient use of available resources, co-ordination of stomach sampling studies is essential. Stomach sampling is necessary to ensure that multi-species and ecosystem models remain relevant and to support

	MSFD descriptor 4 regarding the structure and functioning of foodwebs. This work could benefit from new research on genetic identification of food items and link to new research on the presence of marine litter in the food chain.
	Term of References a) and b) Multiple international projects and national studies have been carried out, so it is important to share the advances from this work.
	Term of Reference c) For sampling to be fit-for-purpose it must relate to the end user needs and this workshop will build links between data collectors and end users.
	Term of Reference d) Present sampling can be optimised and sampling beyond present survey coverage may be required. Having a longer-term coordinated structure, for example a flexible rolling cycle of sampling, would provide benefits.
Resource requirements	None.
Participants	A combination of experts on stomach contents analysis, multispecies and foodweb modelling. Marine litter and survey planning for each region will be required. Up to 25 participants are expected.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to advisory committees	ACOM, SCICOM.
Linkages to other committees or groups	This workshop directly links to WGSAM and survey groups: IBTS, BITS. There are also links to work on microplastics in fish stomachs underway by WG on Marine Litter (WGML)
Linkages to other organizations	Regional Co-ordination Groups, GFCM WKSTCON2

Workshop on Age reading of European Sardine

A **Workshop on Age reading of European Sardine (*Sardina pilchardus*) (NE Atlantic and Mediterranean)** [WKARAS 2], chaired by Eduardo Soares, Portugal, and Pedro Torres, Spain, will be held in Lisbon, Portugal, 18–22, February, 2019, to:

- a) Discuss the European Sardine Otoliths Exchange 2017 results in order to identify possible causes of age determination low agreement among readers;
- b) Review the sardine age determination criteria, clarify the otoliths' annual growth rings identification, the methodologies applied and age reading validation techniques used on this species;
- c) Update the common age reading protocol and make specific guidelines for the improvement of age reading precision and the reduction of bias between readers and laboratories;
- d) Create a reference collection of clearly-defined otoliths with a consensual age in a data base of digitized images for the Atlantic and the Mediterranean Sea;
- e) Address the generic ToR's adopted for workshops on age calibration.

Standardization of otoliths preparation procedures and of age reading criteria will be therefore in the scope of this Workshop in order to increase the age reading data quality for the sardine stocks assessment in these areas.

WKARAS 2 will report by 2019 for the attention of WGBIOP and ACOM.

Supporting information

Priority	Age determination is essential in fish stock assessment for the estimation of rates of mortality and growth. Thus, it is fundamental to get reliable age readings in order to contribute to accurate assessments. Therefore, a sardine otolith exchange program was carried out in 2017 for inter-calibration between age readers of fisheries research labs in NE Atlantic and Mediterranean Sea areas. One of the main problems identified from the results analysis of the European Sardine Otoliths Exchange 2017 was the low age reading agreement among readers for both areas, which in average ranged between 60 and 80%. This enhanced the need to held a Workshop on Age reading of European Sardine (WKARAS 2) in 2019 to convene age readers of both areas in order to discuss the exchange results, review the sardine age determination criteria, clarify the otoliths' annual growth rings identification, the methodologies applied, to update the common age reading protocol and to define a reference collection of well-defined otoliths for this species for each area. Thus, this Workshop aims to contribute to increase the age reading data quality and reliability for the sardine stock assessments in these areas.
Scientific justification	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 specific resource requirement beyond the need for members to prepare for and participate in the meeting.
Participants	The Workshop is foreseen to be attended by researchers from Portugal, Spain, France, United Kingdom, Germany, Italy, Greece, Croatia, Morocco and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to advisory committees	ACOM

Linkages to other committees or group WGBIOP

Linkages to other or- ganizations There is a direct link with the EU DCF.

Workshop on Age reading of seabass (*Dicentrarchus labrax*).

The **Workshop on Age reading of Sea bass (*Dicentrarchus labrax*) 2 (WKARDL2)** will meet in xx, XX 2021 in xx, XX to:

- a) Clarify the interpretation of annual growth rings using stained otolith sections and scales on the same fish;
- b) Continue the guidelines and common ageing criteria;
- c) Develop existing reference collections of calcified structures and improve the existing database of scales images;
- d) Address the generic ToRs adopted for workshops on age calibration (see 'PGCCDBS Guidelines for Workshops on Age Calibration').

Supporting Information

Priority:	Essential. Age determination is an essential feature in fish stock assessment to estimate the rates of mortalities and growth. Age data are provided by different countries and are estimated using international ageing criteria. It is necessary to continue to clarify this guideline of age interpretation. Therefore, an appropriate otolith and scale exchange programme will be carried out in 2019 for the purpose of inter-calibration between ageing labs. Results of this otolith exchange will be discussed during WKARDL2.
Scientific justification:	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 specific resource requirement beyond the need for members to prepare for and participate in the meeting.
Participants:	In view of its relevance to the DCF, and ICES WG, the Workshop will try to join international experts on growth, age estimation and scientists involved in assessment in order to progress towards a solution. Participants should announce their intention to participate in the WK no later than two months before the meeting.
Secretariat facilities:	
Financial:	
Linkages to advisory committees:	ACOM, SCICOM
Linkages to other committees or groups:	WGBIOP, WGCSE, WGBIE
Linkages to other organizations:	There is a direct link with the EU DCF.

The Workshop on Whiting biological Quality Indicators (WKWHIQI), Chaired by TBD, Correspondence/location: TBD, July/August 2019

- a) Collate data on recent calibration and validation exchanges and workshop on ageing and maturity for whiting;
- b) Calculate Age Error Matrices (AEMs) and Maturity Staging Error Matrices (MSEMs);
- c) Carry out sensitivity analyses using the AEMs and MSEMs, to show the impact of uncertainty in ageing and maturity on the assessment;
- d) Discuss how other biological parameter indicators can be incorporated (quantitatively) in the assessment

WKWHIQI will report by XXX 2019 for the attention of the WGBIOP and WGCSE.

Supporting information

Priority	WGBIOP has prepared quality indicators for biological parameters in the first 3-year term 2015–2017. The ultimate goal is to include quality indicators in the assessment process, but it is difficult to get stock assessors involved in WGBIOP. Contact has been established with the stock coordinators of upcoming benchmark assessments and issues and quality indicators on biological parameters have been put forward to them. Positive reactions from them led to incorporating the indicators in a qualitative way. However, it is necessary to improve the assessment process by further incorporating the indicators in a quantitative way. This workshop with Celtic Sea whiting as a case study will be an example of how the quality indicators can be quantitatively incorporated in the assessment. Celtic Sea whiting was selected because a benchmark assessment is planned in 2020 and because previous exchanges/workshops show high levels of uncertainty in both ageing and maturity.
Scientific justification	<p>Term of Reference a) Collate data on recent calibration and validation exchanges and workshop on ageing and maturity for whiting.</p> <p>Term of Reference b) Calculate Age Error Matrices (AEMs) and Maturity Staging Error Matrices (MSEMs).</p> <p>Term of Reference c) Carry out sensitivity analyses using the AEMs and MSEMs, to show the impact of uncertainty in ageing and maturity on the assessment.</p> <p>Term of Reference d) Discuss how other biological parameter indicators can be incorporated (quantitatively) in the assessment.</p>
Resource requirements	No specific resource requirements beyond the need for members to prepare for and participate in the meeting.
Participants	It is vital that the stock assessor of Celtic Sea whiting will participate in this workshop. WGBIOP participants involved in quality indicators and issues with biological parameters.
Secretariat facilities	None.
Financial	Travel costs will be eligible for participants from Member States of the European Union through the EU Data Collection MAP (DCMAP).
Linkages to advisory committees	ACOM

Linkages to other committees or groups	WGBIOP, WKCeltic, WGCSE
Linkages to other organizations	There is a direct link with the EU DCMAP.

Annex 4: ToR b

a) Suggested format for the maturity staging overview table

INSTITUTE		
COUNTRIES	Spain	Spain
LATIN NAME	<i>Abramis brama</i>	<i>Abramis brama</i>
ENGLISH_NAME	Bream	Bream
ECOREGION	Bay of Biscay and the Iberian Coast	Bay of Biscay and the Iberian Coast
FAO	27	27
ECOREGION_ICES DIVISION	27.8.c	27.8.c
NATIONAL ICES DIVISION	27.8.a,8.b	27.8.a,8.b
GFCM DIVISION (GSA)		
QUARTER OF SAMPLING FOR ICES COUNTRIES (1ST, 2ND ETC.)	3rd	2nd
MACROSCOPY (Y/N)	N	Y
HISTOLOGY (Y/N)	Y	N
OVARIES (O) OR TESTES (T) OR BOTH	O	T
GONAD CONDITION (FROZEN/FRESH)	Fresh	Frozen
NAME OF MACROSCALE		
YEARS DATA BEING COLLECTED		
METHOD USED (IN CASE OF HISTOLOGY)		
PURPOSE OF COLLECTING	For validation	for fecundity
OTOLITHS READING (Y/N)	N	Y
COMMENTS		

Annex 5: ToR c

a) Issue tables Flatfishes

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2020	bll.27.3a47de	Brill (<i>Scophthalmus rhombus</i>) in Sub-area 4 and divisions 3.a and 7.d-e (North Sea, Skagerrak and Kattegat, English Channel)	WKNor thSea	-	Lies Vansteenbrugge (lies.vansteenbrugge@ilvo.vlaanderen.be)	length, maturity, sex, weight	When using length based indicators, correct information on length at maturity (L_{mat}), and length von Bertalanfy growth curve ($L_{inifinity}$) are needed. Determine the sex ratio in the stock area.	van der Hammen et al (2013) suggested values for L_{inf} and L_{mat} based on Dutch market samples; check whether these are representative for the entire fleet fishing on brill. Data from surveys and commercial sampling on maturity (at age/length per sex) and on individual weights (at age/length per sex)	-	Advise to only use the data collected during the spawning season or in a 3 month period before the spawning season. Stock coordinator has been informed
						maturity	-	-	last overall brill maturity calibration was a WK in 2012 (maturity range= 1-4; agreement= 81%)	Stock coordinator has been informed

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
						age	-	-	An age calibration exchange will be launched soon. The last exchange was held in 2005 and covered the North Sea (age range = 1-11; agreement all readers= 90%)	Stock coordinator has been informed
2020	ghl.27.561214	Greenland halibut (<i>Reinhardtius hippoglossoides</i>) in subareas 5, 6, 12, and 14 (Iceland and Faroes grounds, West of Scotland, North of Azores,	WkUp North	-	Jesper Boje (jbo@aquadtu.dk)	no issue list available			-	-
						age			last age calibration was a WK in 2016 (age range and agreement readers is not presented, CV was 9-12% depending on the method)	Stock coordinator has been informed
						maturity			Data limited stock, no maturity data used/collected	WGBIOP won't undertake any maturity QA actions until we are informed that maturity data are collected and

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
		East of Greenland)								used. Stock coordinator has been informed
2020	lbd.27.8c9a	Four-spot megrim (<i>Lepidorhombus boscii</i>) in divisions 8.c and 9.a (southern Bay of Biscay and Atlantic Iberian waters East)	WKMe grim	-	Esther Abad (esther.abad@ieo.es)	maturity	Old maturity ogive	Update the new maturity ogive presented in WD 07 in this report. Statistical method review. Continue with sampling on board fishing vessels in the reproduction period	-	-
						maturity	-	-	No maturity calibration data available for this species. (Assessment uses fixed ogive; BIOSDEF 1998)	WGBIOP has decided to give this a low priority because maturity data are not used, or a fixed ogive is used for all the Lepidorhombus stocks. Stock coordinator has been informed.
						age	-	-	last megrim age calibration was an exchange and WK in 2004.	Exchange recommended? Patricia Gonçalves will inquire if needed,

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
									Origin of otoliths (species/stocks) was not specified. (Age range= 2-11 & 13; agreement all readers= 48%)	and if so will look for coordinators for an age calibration exercise for Lepidorhombus boscii and L. whiffiagonis in divisions 8c and 9a. The exchange needs to be finished before WGBIOP 2019. Stock coordinator has been informed

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2020	meg.27.8c9a	Megrim (<i>Lepidorhombus whiffiagonis</i>) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)	WKMe grim	-	Esther Abad (esther.abad@ieo.es)	maturity	Old maturity ogive	Update the new maturity ogive presented in WD 07 in this report. Statistical method review. Continue with sampling on board fishing vessels in the reproduction period	-	-
						maturity	-	-	No maturity calibration data available for this species. (Assessment uses fixed ogive; BIOSDEF 1998)	WGBIOP has decided to give this a low priority because maturity data are not used, or a fixed ogive is used for all the Lepidorhombus stocks Stock coordinator has been informed.
						age	-	-	last megrim age calibration was an exchange and WK in 2004. Origin of otoliths (species/stocks) was	Exchange recommended? Patricia Gonçalves will inquire if needed, and if so will look for coordinators for an age

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
									not specified. (Age range= 2-11 & 13; agreement all readers= 48%)	calibration exercise for Lepidorhombus boscii and L. whiffiagonis in divisions 8c and 9a. The exchange needs to be finished before WGBIOP 2019. Stock coordinator has been informed.
2020	lez.27.4a6a	Megrim (<i>Lepidorhombus spp.</i>) in divisions 4.a and 6.a (northern North Sea, West of Scotland)	WKMe grim	-	Jonathan White (jonathan.white@marine.ie)	<i>no issue list available</i>			-	-
						maturity	-	-	No maturity data collected/used for this species (assessment uses surplus method)	WGBIOP has decided to give this a low priority because maturity data are not used, or a fixed ogive is used for all the Lepidorhombus stocks. Stock coordinator has been informed.

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
						age	-	-	An age calibration exchange is ongoing, preliminary results are available (age range = 3-13; agreement expert readers= 52%)	Stock coordinator has been informed
2020	lez.27.6b	Megrim (<i>Lepidorhombus ssp.</i>) in Division 6.b (Rockall)	WKMe grim	-	Jonathan White (jonathan.white@marine.ie)	<i>no issue list available</i>			-	-
						maturity	-	-	No maturity data collected/used for this species (assessment uses surplus method)	WGBIOP has decided to give this a low priority because maturity data are not used, or a fixed ogive is used for all the Lepidorhombus stocks. Stock coordinator has been informed.
						age	-	-	last megrim age calibration was an exchange and WK in 2004. Origin of oto-	Mandy Gault will attempt to include 6b as a separate exercise in the ongoing exchange for 4a

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
									liths (species/stocks) was not specified. (Age range= 2-11 & 13; agreement all readers= 48%)	and 6a. Whether or not this succeeds depends on the availability of otoliths related to where the fishing fleet goes. Stock coordinator has been informed.
2021+	meg.27.78abd	Megrin (<i>Lepidorhombus whiffiagonis</i>) in divisions 7.b-k, 8.a-b, and 8.d (west and southwest of Ireland, Bay of Biscay)	-	-	Ane Iriondo (airiondo@azti.es)	no issue list available			-	-
						maturity	-	-	No maturity calibration data available for this species. (Assessment uses fixed ogive; BIOSDEF 1998)	WGBIOP has decided to give this a low priority because maturity data are not used, or a fixed ogive is used for all the <i>Lepidorhombus</i> stocks Stock coordinator has been informed.
						age	-	-	last megrim age calibration was an exchange and WK in 2004. Origin of oto-	Exchange recommended? Begoña Villamor inquired with her colleague Jorge

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
									liths (species/stocks) was not specified. (Age range= 2-11 & 13; agreement all readers= 48%)	Lande if an exchange for this stock was necessary. According to him the otoliths from this stock are very similar to those from 4a and 6a, for which an exchange is currently ongoing. He proposes to wait for the results of this exchange before initiating an additional exchange (with the same readers). Stock coordinator has been informed.
2020	ple.27.7fg	Plaice (<i>Pleuronectes platessa</i>)	WKFlat	-	Vladimir Laptikhov sky (vladimir.laptikhov)		<i>no issue list available</i>		-	-
						age	-	-	no age calibration data available for this stock	Exchange recommended. Karen Bekaert will coordinate this ex-

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
		in divisions 7.f and 7.g (Bristol Channel, Celtic Sea)			sky@cefas.co.uk)					change. The exchange needs to be finished before WGBIOP 2019. Stock coordinator has been informed.
						maturity	-	-	last overall plaice maturity calibration was a WK in 2012 (maturity range= 2-4; agreement= 80%)	An overall (multi-stock) maturity exchange is recommended to include more maturity stages, specifically immature fish. It will probably not be possible to complete this exchange before WGBIOP 2019. Cindy van Damme will inquire for coordinators for the exchange. Stock coordinator has been informed.
2020	ple.27.7h-k		WKFlat	-		<i>no issue list available</i>			-	-

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
		Plaice (<i>Pleuronectes platessa</i>) in divisions 7.hk (Celtic Sea South, southwest of Ireland)			Claire Moore (claire.moore@marine.ie)	age	-	-	no age calibration data available for this stock	Exchange recommended. Grainne Ni Chonchuir will coordinate this exchange. The exchange needs to be finished before WGBIOP 2019. Stock coordinator has been informed.
						maturity	-	-	last overall plaice maturity calibration was a WK in 2012 (maturity range= 2-4; agreement= 80%)	An overall (multi-stock) maturity exchange is recommended to include more maturity stages, specifically immature fish. It will probably not be possible to complete this exchange before WGBIOP 2019. Cindy van Damme will in-

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
										quire for coordinators for the exchange. Stock coordinator has been informed.
2020	sol.27.7h-k	Sole (<i>Solea solea</i>) in Divisions 7.h-k (Celtic Sea South, southwest of Ireland)	WKFlat	-	Claire Moore (claire.moore@marine.ie)	<i>no issue list available</i>			-	-
						age	-	-	no age calibration data available for this stock	An exchange was recommended, but because of the overall high agreement rates in sole this exchange is not prioritised. Stock coordinator has been informed.
						maturity	-	-	last overall sole maturity calibration was a WK in 2012 (maturity range= 2 & 5; agreement= 82%)	An overall (multi-stock) maturity exchange is recommended to include more maturity stages, specifically immature fish. It will probably not be possible to complete this exchange before

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
										WGBIOP 2019. Cindy van Damme will inquire for coordinators for the exchange. Stock coordinator has been informed.
2020	sol.27.7fg	Sole (<i>Solea solea</i>) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea)	WKFlat	-	Sofie Nimmegeers (sofie.nimmegeers@ilvo.vlaanderen.be)	weight	The mean weights have dropped over time (2000–2010) and recently increased again. *What drives this change? *Is it driven by an ecosystem change? *Is there a similar trend in the weights from other stocks?	information on the evolution in the Celtic Sea ecosystem	Should be taken up more broadly, issue has been seen in other flatfish stocks as well	Stock coordinator has been informed
						age	-	-	last age calibration was an exchange in 2005 (age range=2-8	Stock coordinator has been informed

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
						maturity	-	-	<p>& 10-11; agreement all readers= 90%)</p> <p>last overall sole maturity calibration was a WK in 2012 (maturity range= 2 & 5; agreement= 82%)</p>	<p>An overall (multi-stock) maturity exchange is recommended to include more maturity stages, specifically immature fish. It will probably not be possible to complete this exchange before WGBIOP 2019. Cindy van Damme will inquire for coordinators for the exchange. Stock coordinator has been informed.</p>
2020	sol.27.20-24	Sole (<i>Solea solea</i>) in subdivisions 20-	WKNor thSea	-	Jesper Boje (jbo@aquadtu.dk)	Abundance and distribution of	identification of nursery grounds and evaluation of their im-	Data available from historic Danish coastal surveys	-	-

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
		24 (Skagerrak and Kattegat, western Baltic Sea)				juveniles	importance for recruitment to the stock.			
						Stock structure - genetics	genotyping spawning fish in order to identify stock structure in the entire stock assessment area SD 20-24 and also to evaluate main migration patterns	Samples will be collected from fishery and survey; analysis conducted by DTU Aqua	-	-
						Growth and recruitment (age)	improvement of ageing by means of otolith calibration between readers and otolith structure to validate age	A calibration workshop/exchange will be arranged	No age calibration data are available for this stock and no international calibration exercise was planned according to WGBIOP. An internal exchange is going to be carried out by DTU Aqua	The internal DTU Aqua exchange will be launched as an international exchange by Julie Davies. The exchange needs to be finished before WGBIOP 2019. Stock coordinator has been informed.

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
						maturity	-	-	last overall sole maturity calibration was a WK in 2012 (maturity range= 2 & 5; agreement= 82%)	An overall (multi-stock) maturity exchange is recommended to include more maturity stages, specifically immature fish. It will probably not be possible to complete this exchange before WGBIOP 2019. Cindy van Damme will inquire for coordinators for the exchange. Stock coordinator has been informed.
2020	sol.27.4	Sole (<i>Solea solea</i>) in Subarea 4 (North Sea)	-	-	Ruben Verkempynck (ruben.verkempynck@wur.nl)	<i>no issue list available</i>			-	-
						age			last age calibration was an exchange in 2015/16 (age range= 0-12;	Stock coordinator has been informed

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
									agreement assessment readers= 90%)	
						maturity			last overall sole maturity calibration was a WK in 2012 (maturity range= 2 & 5; agreement= 82%)	An overall (multi-stock) maturity exchange is recommended to include more maturity stages, specifically immature fish. It will probably not be possible to complete this exchange before WGBIOP 2019. Cindy van Damme will inquire for coordinators for the exchange. Stock coordinator has been informed.
2021+	sol.27.8ab		-	-	- (used to be	maturity	Old maturity ogive	Update the maturity ogive. Fishing sample from the first quarter	-	-

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
		Sole in Bay of Biscay			maurice.lissardy@ifremer.fr			(under the commercial size)		
						maturity	-	-	last overall sole maturity calibration was a WK in 2012 (maturity range= 2 & 5; agreement= 82%)	An overall (multi-stock) maturity exchange is recommended to include more maturity stages, specifically immature fish. It will probably not be possible to complete this exchange before WGBIOP 2019. Cindy van Damme will inquire for coordinators for the exchange. Stock coordinator has been informed.
						age	-	-	last age calibration was an exchange in 2011 (age range= ?; agreement all readers= 89%)	Stock coordinator has been informed

b) Issue Table Gadoids

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	EMAIL STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	MAYBE INCLUDE IN NEXT NORTH SEA EXCHANGE	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2021	bss.27.47				lisa.readdy@cefas.co.uk	Natural Mortality	Natural mortality is considered as constant over time at a value of 0.24, set for all ages. Inappropriate treatment of M could bias the assessment and reference points	Examine sensitivity of assessment and advice to this. Develop parameter inputs for future assessments.	-	-
						Age	Studies are needed to investigate the accuracy/bias		Last overall age calibration 2015 (Age range 4-13, overall agreement 78%). New exchange in 2019 (Co-ordinator	Find a co-ordinator for exchange and inform the stock co-ordinator.

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	EMAIL STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	MAYBE INCLUDE IN NEXT NORTH SEA EXCHANGE	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
							in ageing and errors due to historically age sampling schemes		needed) and WKARLD2 in 2021.	Suggestions to be confirmed
						Maturity	-		IFREMER only institute to collect data in 2014/15 so no action needed.	
2020	cod.27.6a	Cod (<i>Gadus morhua</i>) in Division 6.a (West of Scotland)	WKRockall		Helen Dobby	No Issue list available				
						Age				No exchange has been done, this may be because we do not receive many otoliths from this stock.
						Maturity			WKMSGAD held in 2013 (Range 1-6, Agreement males 66%, females 73%)	inform coordinator

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	EMAIL STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	MAYBE INCLUDE IN NEXT NORTH SEA EXCHANGE	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2020	cod.27.7e-k	Cod (<i>Gadus morhua</i>) in divisions 7.e-k (eastern English Channel and southern Celtic Seas)	WKCeltic	3-7 Feb 2020 Copenhagen	Marianne Robert	No Issue list				
						Age			Small non ICES exchange in 2016. Kelig Mahe Coordinator, agreement of 100% .	
						Maturity			WKMSGAD held in 2013 (Range 1-6, Agreement males 66%, females 73%)	inform coordinator
2019	cod.27.22-24	Cod (<i>Gadus morhua</i>) in subdivisions 22-24, western Baltic stock (western Baltic Sea)	WKBALTCOD2	4-8 February 2019	Uwe Krumme	Age	Historical DK changes in national commercial age data: documentation? InterCatch? Effects? Show "old data	Consider DE age validation results from SD22 in age reading routine (1,9 mm diameter of first ring); discuss progress in otolith preparation (broken vs sliced) Organize yearly exchange of otoliths in order to include an age	WKSIBCA2_postponed until further notice is given from RCM-Baltic. Small scale (non ICES) age exchange was carried out between two labs in Germany and Denmark (Co-ordinator Julie Olivia Davies). Percent agreement was	Likelihood of exchange discussed at WGBIOP, however it was decided not to go ahead as benchmark too close

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	EMAIL STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	MAYBE INCLUDE IN NEXT NORTH SEA EXCHANGE	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
							set" vs "new, corrected data set" (e.g. age-length and age-weight distribution of DK data by strata, e.g. active/passive, quarter or half-yearly); indicate years	error matrix in the routine assessment (consider experience from otolith exchange in 2015)	94%, data range 1-11 years.	
						Maturity	-		WKMSGAD held in 2013 (Range 1-6, Agreement males 66%, females 73%)	
						otolith shape	Otolith shape:	Otolith shape: Extending and completing the	We are currently working on this within a sub-	

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	EMAIL STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	MAYBE INCLUDE IN NEXT NORTH SEA EXCHANGE	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
							Organization of future otolith sampling and analysis to achieve an improved spatial and temporal coverage	existing time series Otolith shape: More years with genetic validation Otolith shape: Compare data from same years	group at WGBIOP. Stock co-ordinator is a part of this sub group.	
2019	cod.27.1-2	Cod (<i>Gadus morhua</i>) in NAFO Subarea 1, in-shore (West Greenland cod)	Wkarctic		Yuri Kovalev		No Issue list		Contact co-ordinator	
						Age				Likelihood of exchange discussed at WGBIOP, however it was decided not to go ahead as

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	EMAIL STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	MAYBE INCLUDE IN NEXT NORTH SEA EXCHANGE	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
										benchmark too close
						Maturity			WKMSGAD held in 2013 (Range 1-6, Agreement males 66%, females 73%)	
2019	had.27.6b	Haddock (<i>Melanogrammus aeglefinus</i>) in Division 6,b (Rockall)	WKhadMSE	feb-19	khlivn@pinro.ru	Age	There are doubts on the degree of age-reading agreement by international experts. Results of age-reading of the identical otoliths differ. The mean weights-at-age in	it would be beneficial to develop and introduce standardization methods for reading the age for haddock. Recalculate new the mean weights-at-age in the stock. Make an analysis of the influence of new stock weights-at-age data on the results of assessment. Age reading comparison by	No age calibration done before	Exchange in 2019 planned (North sea and 6b, Mandy Gault COORDINATOR), recommended at a standardized method for reading haddock be an output from the exchange.

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	EMAIL STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	MAYBE INCLUDE IN NEXT NORTH SEA EXCHANGE	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
							the stock are assumed to be the same as the catch weights.	correspondence – SMARTDOTS.		
						Maturity	-		WKMSGAD held in 2013 (Range 1-6, Agreement males 54%, females 73%)	
2019	had.27.1-2	Haddock (<i>Melanogrammus aeglefinus</i>) in subareas 1 and 2 (North-east Arctic)	WkUpNorth	jan-19	Alexey Russkikh	Weight	Quality control of weight in stock and maturity	Check relationships between survey estimates, Growth and maturity related to stock size Calibrate maturity /growth estimation for lack of any survey data		
						Age	-		WKA VSG in 2013 no age calibration before	Recommended by WGBIOP to add this

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	EMAIL STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	MAYBE INCLUDE IN NEXT NORTH SEA EXCHANGE	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
										stock to the 2019 exchange. Mandy has agreed and Jane (Norway) has agreed to provide images for this.
						Maturity	-		WKMSGAD held in 2013 (Range 1-6, Agreement males 54%, females 73%)	
2019 / 2021	hke.27.3a46-8abd	Northern Hake			dgarcia@azti.es	Sex	Hake is sex dimorphic species. Accounting for differences on growth, maturity and mortality by	Hake is an active cannibal species having a great impact on M at younger classes.		

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	EMAIL STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	MAYBE INCLUDE IN NEXT NORTH SEA EXCHANGE	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
							sex. Hake is an active cannibal species having a great impact on M at younger classes.			
						Age	-		Ex/WK, Post-poned till outcome of: CALL FOR TENDERS- Validating age-determination of anglerfish and hake	WKA EH 2009, (percentage agreement 41% age range 0-10)
						Maturity	-		WKMSGAD (2013) - agreement 78% (range 1-6)	
2020 / 2021	Whgkask	IIIa			alko@aqu.dtu.dk	Age	-			This stock is cat 5 so no action is needed
						Maturity		Maturity studies		

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	EMAIL STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	MAYBE INCLUDE IN NEXT NORTH SEA EXCHANGE	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
							Maturity ogive		This stock is cat 5 so no action is needed	
2020	whg.27.7b-ce-k	Whiting (<i>Merlangius merlangus</i>) in divisions 7.b -c and 7.e-k (southern Celtic Seas and eastern English Channel)	WKCeltic		David Stokes		No Issue list			
						Age	-	-	WKARWHG2 carried out in 2016. Range 1-8, percentage agreement 72%	
						Maturity	-		WKMSGAD held in 2013 (Range 1-6, Agreement males 51%, females 70%)	
2020	whg.27.6a	Whiting (<i>Merlangius merlangus</i>) in Division 6.a (West	WKRocKall		Andrzej Jaworski		No issue list available			
						Age	-		Not included in 2016 exchange/workshop - do not read	

BENCH-MARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	EMAIL STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	MAYBE INCLUDE IN NEXT NORTH SEA EXCHANGE	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
		of Scot-land)							many from this area so should be fine	
						Maturity	-		WKMSGAD held in 2013 (Range 1-6, Agreement males 51%, fe-males 70%)	

c) Issue Table Pelagics

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2020	cap.27.1-2	Capelin (<i>Mallo-tus villosus</i>) in subareas 1 and 2 (Northeast Arctic), excluding Division 2.a west of 5°W (Barents Sea capelin)	-	-	Dmitri Prozorkevich (belikov@pin.ro.murmansk.ru)		<i>no issue list available</i>			
						age	-	-	The last capelin age calibration was an exchange in 2016, agreement=99.3% (otoliths sampled in June 2015) and 87,3% (otoliths sampled in winter 2016), which is considered to be high; the age range covered was not reported	Stock coordinator has been informed
						maturity	-	-	No calibration data are available for maturity staging of capelin, although maturity data is used in the assessment	maturity calibration recommended. Stock coordinator has been informed

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2020	cap.27.2a5 14	Capelin (<i>Mallo- tus villosus</i>) in subareas 5 and 14 and Division 2.a west of 5°W (Iceland and Faroes grounds, East Greenland, Jan Mayen area)	-	-	Birkir Bardarson (birkir.bardarson@hafogvatn.is), Teunis Jan- sen (tej@aquadtu.dk)	age	-	-	A small exchange was scheduled between Iceland and Norway in 2013 but is no longer necessary as a non-ICES exchange took place between Norway, Iceland, Russia and Canada in 2010-11, agreement=91.5%, the age range covered was not reported	Stock coordinator has been informed
						maturity	Discrimination between immature and mature stock components in autumn surveys.	Microscopic histologic examination of capelin gonads to increase accuracy of macroscopic evaluation of gonad development in autumn survey.	No calibration data are available for maturity staging of capelin, although maturity data is used in the assessment	maturity calibration recommended Stock coordinator has been informed

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2019	her.27.6a7bc	Herring in divisions 6.a and 7.b-c (West of Scotland, West of Ireland)	IBPherring	Early Feb 2019	Susan Lusseau (s.lusseau@marlab.ac.uk), Afra Egan (Afra.Egan@Marine.ie)	age	-	-	last herring age calibration was an exchange in 2015, overall agreement=69,1%	Stock coordinator has been informed
						maturity	-	-	last herring maturity calibration was a WK in 2017, agreement=52% (validated) and 76% (modal); maturity range=1-4 & 6	inform herring stock coordinators about WKMSHS2 report, which will be available soon

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2020	her.27.28	Herring (<i>Clupea harengus</i>) in Subdivision 28.1 (Gulf of Riga)	WkPela	-	??	stock identity	Mixing of Gulf of Riga herring and Central Baltic herring in SD 28. The populations are discriminated in the catches on the base of otolith structure		-	-
						age	-	-	last herring age calibration was a WK in 2008, agreement=83%, age range=2-8	
						maturity	-	-	last herring maturity calibration was a WK in 2017, agreement=52% (validated) and 76% (modal); maturity range=1-4 & 6	inform herring stock coordinators about WKMSHS2 report, which will be available soon

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2020	her.27.25-2932	Herring (<i>Clupea harengus</i>) in subdivisions 25-29 and 32, excluding the Gulf of Riga (central Baltic Sea)	WkPela	-	Kristin Ohman (kristin.ohman@slu.se)	mortality	Investigate new estimates for natural mortality.	Estimate M from life history traits and models. Update SMS model with new cod stomach data for recent years	-	-
						age	-	-	last herring age calibration was an exchange in 2016, agreement for whole herring otoliths from SD26 - 52-94% and from the stained otolith slices from herring in SDs 30 and 32 - 87-96%	Stock coordinator has been informed
						maturity	Currently maturity is held constant over the time series.	Analyses of maturity data and Sensitivity analyses of SAM model outputs to changing maturity	last herring maturity calibration was a WK in 2017, agreement=52% (validated) and 76% (modal); maturity range=1-4 & 6	Inform herring stock coordinators about WKMSHS2 report, which will be available soon. Stock coordinator has been informed

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
						mean weight in the stock	Equals currently mean weight in the catch!	Do we have something better? Do we have data?	-	-
2019	hom.27.2a 4a5b6a7a- ce-k8	Horse mackerel (<i>Trachurus trachurus</i>) in Sub-area 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a-c-e-k (the North-east Atlantic)	IBPrefpts	-	jens.Ulleweit (jens.ulleweit@thuener.de)	age	-	-	last horse mackerel age calibrations was a WK in 2015, agreement=65%, age range=1-15; an exchange is ongoing and a WK is planned for 5-9 October 2018	Stock coordinator has been informed
						maturity	-	-	last horse mackerel maturity calibration was a WK in 2015, agreement=50,6% (histology) and 64,9% (modal); maturity range=1-4 & 6	Stock coordinator has been informed

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	STOCK COORDINATOR (EMAIL)	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2019	mac.27.nea	Mackerel (<i>Scomber scombrus</i>) in subareas 1-8 and 14 and division 9.a (the Northeast Atlantic and adjacent waters)	IBPmackerel	-	Afra Egan (Afra.Egan@Marine.ie)	age	-	-	last mackerel age calibration was a small scale exchange in 2014, agreement=68%, the age range covered was not reported; WKARMAC2 planned for 22-26 of October 2018	Stock coordinator has been informed
						maturity	-	-	last mackerel maturity calibration was a WK in 2015, agreement=61,4% (histology) and 77,8% (modal), maturity range=1-4	Stock coordinator has been informed

d) Issue Table Deep Wide fish

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2020	aru.27.123a4	Greater silver smelt (<i>Argentina silus</i>) in subareas 1, 2, and 4, and in Division 3.a (North-east Arctic, North Sea, Skagerrak and Kattegat)	WKDEEP	3-7 February 2020	elverh@hi.no	Life history parameters	Recalculate with more recent data	Data available at IMR		
						Age			Included in WKAMDEEP 2018 (by species not by stocks)	Stock coordinator has been informed
						Maturity			No maturity data available or used; No maturity calibration	WGBIOP won't undertake any maturity QA actions until we are informed that maturity data are collected and used. Stock coordinator has been informed

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2020	aru.27.5a14	Greater silver smelt (<i>Argentina silus</i>) in Subarea 14 and Division 5.a (East Greenland and Iceland grounds)	WKDEEP	3-7 February 2020	pamela@hafogvatn.is	Life history parameters	Estimate within age- and age- and length-based models	Data available at MFRI		
						Age			No age calibration. Age used in assessment (stock category 3.3). Included in WKAMDEEP 2018 (by species not divided by stocks)	Stock coordinator has been informed
						Maturity			No maturity calibration. Estimates of maturity ogives of greater silver smelt in 5.a were presented at the WKDEEP 2010 using data collected in the Icelandic autumn survey. Most of the greater silver smelt caught in commercial catches in 5.a are mature.	Advise to only use the data collected during the spawning season or in a 3 month period before the spawning season. Stock coordinator has been informed

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2020	aru.27.5b6a	Greater silver smelt (<i>Argentina silus</i>) in divisions 5.b and 6.a (Faroes grounds and west of Scotland)	WKDEEP	3-7 February 2020	liseo@hav.fo	Biological Parameters	Take a closer look at the ALK	Now the background data for ALK in each year is calculated by using the data for 3 years to get enough ages e.g. for 2016, data for 2014-2016 are used. All data are available		
						Age			Stock category 3.2. Age used in exploratory assessment. Included in WKAMDEEP 2018 (not divided by stock)	Stock coordinator has been informed
						Maturity			No maturity calibrations. Maturity of greater silver smelt from Russian commercial trawl catches in the Faroese Fishing Zone in April 2017 are calculated. Most of the	Advise to only use the data collected during the spawning season or in a 3 month period before the

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
									greater silver smelt caught in commercial catches in Division 5.b is mature.	spawning season. Stock coordinator has been informed
2020	boc.27.6-8	Boarfish (<i>Capros aper</i>) in subareas 6-8 (Celtic Seas, English Channel, and Bay of Biscay)	WKDEEP	3-7 February 2020	guillaume.bal@marine.ie	<i>no issue list available</i>			Information of maturity and age are exhaustive and included in WGWISE. No age calibration data are available for this stock and no international calibration exercise was planned according to WGBIOP.	No international calibration exercise was planned according to WGBIOP. Advise to only use the data collected during the spawning season or in a 3 month period before the spawning season. Stock coordinator has been informed

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2020	lin.27.5b	Ling (<i>Molva molva</i>) in Division 5.b (Faroes grounds)	WKDEEP	3-7 February 2020	liseo@hav.fo	Biological Parameters	Take a closer look at the ALK	Investigate if it is ok to use the same ALK for all years. Now the background data for ALK in each year is calculated by using the all age read data. All data are available		
						Age			Age explored in assessment. Dealt with in WKAMDEEP2 2018	Stock coordinator has been informed
						Maturity			No calibration before. Maturity explored in assessment (Stock category 3.2).	Advise to only use the data collected during the spawning season or in a 3 month period before the spawning season. Stock

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
										coordinator has been informed
2020	reg.27.561214	Golden redfish benchmark in subareas 5, 6 and 14	WkUpNorth	February 2020	Kristjan.kristinsson@hafogvatn.is	Biological Parameters	Time varying growth and maturity	Investigate the appropriateness of the current growth and maturity model used in the assessment. Biological information are available in 5a		
						Age		Age data used in assessment	Otolith Exchange Redfish (Sebastes spp) Coordinator: Lise Heggebakken	Stock coordinator has been informed
						Maturity		Maturity data used in assessment	No calibration before	Advise to only use the data collected during the spawning season or in a 3 month period before the spawning season. Stock

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
										coordinator has been informed
2021	ank.27.78abd	Black-bellied anglerfish (<i>Lophius budegassa</i>) in divisions 7.b-k, 8.a-b, and 8.d (west and south-west of Ireland, Bay of Biscay)		TBD	Joana.silva@cefas.co.uk		<i>no issue list available</i>			
						Age			A benchmark occurred in 2018 (WKANGLER) and No agreed method for ageing (low priority). WK benchmark 2004 (for black anglerfish the agreement between illicia and otoliths was only 8% for both reference readers). Exchange and validation ongoing outside WGBIOP within EASME/EMFF/2016/1.3.2.7/SI2.762036.	Stock coordinator has been informed
						Maturity			During WKANGLER 2018. Maturity:review of literature and data from labs. A plausible range was identified (both species, both sexes).	Advise to only use the data collected during the spawning season or in a 3 month period before the spawning season. Stock

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
										coordinator has been informed
2021	ank.27.8c9a	Black-bellied anglerfish (Lophius budegassa) in divisions 8.c and 9.a (Cantabrian Sea, Atlantic Iberian waters)		TBD	ralpoim@ipma.pt	<i>no issue list available</i>				
						Age			A benchmark occurred in 2018 (WKANGLER) and there is no agreed method for ageing. Length-based or production assessment models are considered. WK benchmark 2004 (for black anglerfish the agreement between illicia and otoliths was only 8% for both reference readers). Exchange and validation ongoing outside WGBIOP within EASME/EMFF/2016/1.3.2.7 /SI2.762036.	Stock coordinator has been informed
						Maturity			WKANGLER2018 maturity from literature is used	No action
2021	gur.27.3-8	Red gurnard (<i>Chelidomich-</i>		TBD	Neil.Campbell@gov.scot	<i>no issue list available</i>				
						Age			Unknown Study proposal 2011 in the Master table?? NO age calibration. lack of regular sampling for red	No action

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
		<i>thys cuculus</i>) in subareas 3-8 (North-east Atlantic)							gurnard in commercial landings and discarding to provide series of length or age compositions usable for a preliminary analytical assessment.	
						Maturity			no maturity data	WGBIOP won't undertake any maturity QA actions until we are informed that maturity data are collected and used. Stock coordinator has been informed
2021	mon.27.78ab	White anglerfish (<i>Lophius piscatorius</i>) in divisions 7.b-k, 8.a-b,		TBD	lisa.readdy@cefas.co.uk					
							<i>no issue list available</i>			
						Age			A benchmark occurred in 2018 (WKANGLER) and there is no agreed method for ageing monkfish (low priority). WK benchmark 2004 (For white anglerfish there was only 27% agreement between experienced illicia readers and	Stock coordinator has been informed

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
		and 8.d (southern Celtic Seas, Bay of Biscay)							one experienced otolith reader (11% for the other experience otolith reader). Exchange and validation ongoing outside WGBIOP within EASME/EMFF/2016/1.3.2.7 /SI2.762036.	
						Maturity			In the WKANGLER 2018 report it is stated Maturity unknown/Progress made: review of literature and data from labs. A plausible range was identified	Advise to only use the data collected during the spawning season or in a 3 month period before the spawning season. Stock coordinator has been informed

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
2021	mon.27.8c9a	White anglerfish (<i>Lophius piscatorius</i>) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)		TBD	paz.sampedro@ieo.es	<i>no issue list available</i>			A benchmark occurred in 2018 (WKANGLER) and there is no agreed method for ageing. Length-based or production assessment models are considered. WK benchmark 2004 For white anglerfish there was only 27% agreement between experienced illicia readers and one experienced otolith reader (11% for the other experience otolith reader). Exchange and validation ongoing outside WGBIOP within EASME/EMFF/2016/1.3.2.7 /SI2.762036.	Stock coordinator has been informed
						Maturity				
2021	rng.27.5b6712b	Round-nose		TBD		Biological Parameters	Intrinsic growth rate is suspected to be	Use new methods to estimate		

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
		grenadier (<i>Coryphaenoides rupestris</i>) in sub-areas 6-7 and divisions 5.b and 12.b (Celtic Seas and the English Channel, Faroes grounds, and western Hatton Bank)			lionel.pawlowski@ifremer.fr		too high in surplus production model	growth dynamics of the stock based on other indicator such as length distribution. All data are available. Biological parameters from the literature. Life history expert for DLS or long-lived stock are needed.		
						Age			NO data on age and No age calibration	No action
						Maturity			NO data on maturity and No maturity calibration	No action
2021	SAL.27.22-31	Baltic salmon	WKBALTS AL (?)	TBD	johan.dannewitz@slu.se	Biological Parameters	Some stocks fail to recover in projections	Calculating eggs per recruit as a		

BENCHMARK YEAR	STOCK CODE	SPECIES / STOCK	PROPOSED WK	WK DATES	(EMAIL) STOCK COORDINATOR	BIOLOGICAL PARAMETER	ISSUE (SOURCE: ISSUE LISTS)	SOLUTION PROPOSED (SOURCE: ISSUE LISTS)	WGBIOP COMMENTS OR QUESTIONS	WGBIOP ACTIONS
							with no fishing. This may be related to calculation of stock-recruit parameters. Eggs per recruit has been given a stock specific prior in the past that is not related to vital rates (survival, maturation, fecundity) under unfished conditions.	function of vital rates; testing alternative re-parameterisations of the stock-recruitment function.		
						Age			WGBIOP 2018 recommended a scale exchange for 2019	Stock coordinator has been informed
						Maturity			no info	no action

Annex 6: ToR d

a) Stomach Sampling overview

Stomach sampling Baltic 2018 - Pilot Study: Level of fishing and impact of fisheries on biological resources and marine ecosystem

MS	ESTONIA	LATVIA	LITHUANIA	POLAND	GERMANY	DENMARK	SWEDEN	FINLAND
	SURVEYS: GRAHS, BIAS, BITS	BIT SURVEYS		BIT SURVEYS	BIT SURVEYS, COMMERCIAL SAMPLES, NATIONAL SURVEYS	BIT SURVEYS	BIT AND IBT SURVEYS	BIA SURVEY
Aim of the pilot Study	Sampling of sprat and herring stomachs has been performed during the surveys to continue the respective data series from 1980-1990-s				stomach samples of cod and flatfish; use in feeding ecology, food-web and multi-species analyses	Stomach samples to be used in multi-species analysis	Stomach samples to be used in food-web analysis and multispecies analyses. Condition: analyses on the reasons of changes in eastern Baltic cod condition 1978-2014 (published in Casini et al. 2016; Royal Society Open Science)	

MS	ESTONIA	LATVIA	LITHUANIA	POLAND	GERMANY	DENMARK	SWEDEN	FINLAND
Duration of the pilot study/year concluded?	Collection of stomachs of pelagic species started in the 1980s. EST is collecting stomach samples of herring and sprat during the GRAHS since 1999, during BIAS since 2014. During BITS (q4) sampling of cod stomachs takes place	Cod stomach samples are collected during BITS Q1 and BITS Q4 surveys.	No stomach sampling performed	2006-2007; since 2012 annually	since 2015; BITS q1, q4; commercial samples; national surveys (2018/19)	Denmark started to conduct stomach samples as a routine sampling in the Baltic Sea BITS survey in 2012. The sample has been conducted on all aged cod (1 fish/cm/ haul)	Sampling started in 2012 and has been ongoing since then with the exception of Q4 2014 and Q1 2015. cod, whiting, gurnard, mackerel from Skagerrak/Kattegat from IBTS (only 2013)	2014-2016
Outcomes or expected outcomes	Collected information has been used in food web analyses and is partly published in scientific papers.	Latvia is collecting cod stomach samples during cod demersal surveys from the sixties of the last century. Now sampling is conducted during interna-		Cod stomach samples collected during BITS Q1 and Q4 surveys (in years: 2006-2007, and each year from 2012 except BITS Q4 in 2014)	more detailed understanding of feeding ecology of cod and flatfish (e.g. flounder and plaice)	Data has been used in the multispecies analysis and to analyse predator-prey relationships in the Baltic to be used in the benchmark for increased natural mortality. The	Knowledge of species interactions will increase. Important for advice underlying fisheries management and science	Finland reported that altogether 9 stomach samples of salmon were taken from control hauls in SD30 in 2014-2016

MS	ESTONIA	LATVIA	LITHUANIA	POLAND	GERMANY	DENMARK	SWEDEN	FINLAND
		<p>tional BITS surveys in Q1 and Q4.</p>				<p>samples has further been used in scientific publications</p>		
<p>Significant Issues encountered/conclusions drawn</p>					<p>analysis ongoing, conclusions pending</p>	<p>Presently the most costly part of the process is to analyse the data and not the sampling. Therefore the sampling has been continued but the data analysis is only conducted if projects can pay for the labour</p>	<p>The costly part is the analysis of samples and not the sampling itself. Future continuation of the sampling might be dependent on funds to do the analysis.</p>	

MS	ESTONIA	LATVIA	LITHUANIA	POLAND	GERMANY	DENMARK	SWEDEN	FINLAND
Incorporation into NWP - progress or plans					extra-effort to sample stomachs is relatively small, however, stomach content analysis only within the scope of projects; sampling intensity to be decided after data analysis	As the time used in connection with the sampling is considered minor, this is conducted within the present sampling.		

b) Stomach Sampling WGBIOP 2018 - Pilot Study: Level of fishing and impact of fisheries on biological resources and marine ecosystem

MS	PORTUGAL	SPAIN	UK	GREECE	FRANCE	IRELAND	NETHERLANDS	BELGIUM	NORWAY	ITALY
	IBT SURVEYS	IBT SURVEYS	IBT SURVEYS							
Aim of the pilot Study	Stomach samples to be used in foodweb and network analysis	Stomach samples are used to study predator-prey interactions, and have been used in the development of food web indicators and trophodynamic modelling	Stomach samples have been used in multi-species models, food web and predator-prey mass ratio analyses. Pilot work is underway to assess microplastics in fish stomachs.	To provide information on European hake diet.	Stomach samples are used to study predator-prey interactions.	No stomach sampling is currently carried out.	No stomach sampling is currently carried out.	No stomach sampling is currently carried out.		

MS	PORTUGAL	SPAIN	UK	GREECE	FRANCE	IRELAND	NETHERLANDS	BELGIUM	NORWAY	ITALY
	IBT SURVEYS	IBT SURVEYS	IBT SURVEYS							
Duration of the pilot study/year concluded?	IPMA scientists conducted multi species stomach sampling in the Autumn Portuguese IBTS survey Q4 in 2010,2011,2013,2014. The sampling has been conducted on the IBTS target predator species.	Spain started to conduct stomach contents analyses as a routine sampling in the Bay of Biscay (IBT surveys) in 1990. Stomach sampling is conducted consistently on 24 demersal and pelagic fish species while a se-	There is currently no stomach sampling to measure the species composition of fish diets. DAPSTOM stomach database (Pinnegar, 2014) is available and being updated. Barnes et al (2008) compiled predator-prey mass data	A pilot study will be included when revisions of the national plan are submitted in October 2018. The plan is for analysis in 2019.	Collection takes place based on projects, mostly on a small spatial and temporal scale.					

MS	PORTUGAL	SPAIN	UK	GREECE	FRANCE	IRELAND	NETHERLANDS	BELGIUM	NORWAY	ITALY
	IBT SURVEYS	IBT SURVEYS	IBT SURVEYS							
		<p>ries of prospective diet analyses have also been performed for more than 40 predator species to acquire some knowledge on their feeding habits. A trophometer is used to measure the volume</p>	<p>from 21 international studies, available from https://figshare.com/articles/Full_Archive/3529112</p>							

MS	PORTUGAL	SPAIN	UK	GREECE	FRANCE	IRELAND	NETHERLANDS	BELGIUM	NORWAY	ITALY
	IBT SURVEYS	IBT SURVEYS	IBT SURVEYS							
		of stomachs on board.								

MS	PORTUGAL	SPAIN	UK	GREECE	FRANCE	IRELAND	NETHERLANDS	BELGIUM	NORWAY	ITALY
	IBT SURVEYS	IBT SURVEYS	IBT SURVEYS							
Outcomes or expected outcomes	Information was used in the characterization of predator - prey relationships and food-web network analysis. Data has been used in scientific publications and MSFD Implementation.	Data has been used in the development of food web indicators under the MSFD, as well as to analyse predator-prey interactions and develop a EwE model. Most of these works have already been published in scientific	Data are used multi-species and predator-prey interaction modelling, and feeding ecology. E.g. see citations of Pinnegar (2014) and Barnes et al (2008, 2010).	Information to use in the characterization of predator - prey relationships.						

MS	PORTUGAL	SPAIN	UK	GREECE	FRANCE	IRELAND	NETHERLANDS	BELGIUM	NORWAY	ITALY
	IBT SURVEYS	IBT SURVEYS	IBT SURVEYS							
		peer-re-viewed journals								
Significant Issues encountered/conclusions drawn	The opportunistic stomach sampling during the IBTS was discontinued in 2014. Continuation of the sampling	The main issue is that the analyses of stomach contents are cost-effective due to the need of qualified staff on board to do	The main issue is cost of analysing the samples.		There is not national or international co-ordination for the collection of stomach contents. Similarly, there is no					

MS	PORTUGAL	SPAIN	UK	GREECE	FRANCE	IRELAND	NETHERLANDS	BELGIUM	NORWAY	ITALY
	IBT SURVEYS	IBT SURVEYS	IBT SURVEYS							
	was dependent on available time/personnel and additional specialists for the sampling and stomach content analysis during the surveys.	the sampling and the subsequent analyses. Additional funding is needed to go on with the analyses.			standardization of the indices used.					
Incorporation into NWP - progress or plans			Stomach sampling is not currently part of the NWP.	A pilot study will be included when revisions of the national plan are						

MS	PORTUGAL	SPAIN	UK	GREECE	FRANCE	IRELAND	NETHERLANDS	BELGIUM	NORWAY	ITALY
	IBT SURVEYS	IBT SURVEYS	IBT SURVEYS							
				submitted in October 2018.						

Annex 7: ToR e

7.1 Input data used in stock assessment

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
AFWG	<i>Lophius budegassa</i> , <i>Lophius piscatorius</i>	anf.27.1-2	no	no	no	yes	no	no	
AFWG	<i>Mallotus villosus</i>	cap.27.1-2	yes	A	5+	yes	yes	A	
AFWG	<i>Gadus morhua</i>	cod.27.1-2	yes	M	15+	yes	yes	A	
AFWG	<i>Gadus morhua</i>	cod.27.1-2coast	yes	A	11+	yes	yes	A	
AFWG	<i>Reinhardtius hippoglossoides</i>	ghl.27.1-2	no	no	no	yes	yes	A	
AFWG	<i>Melanogrammus aeglefinus</i>	had.27.1-2	yes	A	13+	yes	yes	A	
AFWG	<i>Pollachius virens</i>	pok.27.1-2	yes	A	12+	yes	yes	A	
AFWG	<i>Sebastes mentella</i>	reb.27.1-2	yes	A	19+	no	yes	A	
AFWG	<i>Sebastes norvegicus</i>	reg.27.1-2	yes	M	16+	yes	yes	M	
HAWG	<i>Clupea harengus</i>	her.27.20-24	yes	Q	8+	no	yes	Q	
HAWG	<i>Clupea harengus</i>	her.27.3a47d	yes	Q	9+	no	yes	Q	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
HAWG	<i>Clupea harengus</i>	her.27.6a7bc	yes	Q	9+	no	yes	Q	
HAWG	<i>Clupea harengus</i>	her.27.irls	yes	Q	9+	no	yes	Q	
HAWG	<i>Clupea harengus</i>	her.27.nirs	yes	Q	8+	no	yes	Q	
HAWG	<i>Ammodytes</i>	san.sa.1r	yes	Q	4+	yes	yes	A	
HAWG	<i>Ammodytes</i>	san.sa.2r	yes	Q	4+	yes	yes	A	
HAWG	<i>Ammodytes</i>	san.sa.3r	yes	Q	4+	no	yes	A	
HAWG	<i>Ammodytes</i>	san.sa.4	yes	Q	4+	yes	yes	A	
HAWG	<i>Ammodytes</i>	san.sa.5r	no	no	no	yes	no	no	
HAWG	<i>Ammodytes</i>	san.sa.6	no	no	no	yes	no	no	
HAWG	<i>Ammodytes</i>	san.sa.7r	no	no	no	yes	no	no	
HAWG	<i>Sprattus sprattus</i>	spr.27.3a	yes	Q	4+	yes	yes	Q	
HAWG	<i>Sprattus sprattus</i>	spr.27.4	yes	Q	4+	no	yes	Q	
HAWG	<i>Sprattus sprattus</i>	spr.27.67a-cf-k	no	no	no	no	no	no	
HAWG	<i>Sprattus sprattus</i>	spr.27.7de	yes	Q	no	yes	no	no	no data
NIPAG	<i>Pandalus borealis</i>	pra.27.1-2	no	no	no	no	no	no	no data
NIPAG	<i>Pandalus borealis</i>	pra.27.3a4a	no	no	no	yes	yes	A	no data
NIPAG	<i>Pandalus borealis</i>	pra.27.4a	no	no	no	no	no	no	
NWWG	<i>Mallotus villosus</i>	cap.27.2a514	yes	A	5+	yes	yes	A	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
NWWG	<i>Gadus morhua</i>	cod.21.1	yes	M	10+	yes	yes	A	no data
NWWG	<i>Gadus morhua</i>	cod.21.1a-e	yes	M	10+	yes	yes	M	
NWWG	<i>Gadus morhua</i>	cod.2127.1f14	yes	Q	10+	yes	yes, fixed	no	
NWWG	<i>Gadus morhua</i>	cod.27.5a	yes	A	14+	yes	no	no	
NWWG	<i>Gadus morhua</i>	cod.27.5b1	yes	M	10+	yes	yes	A	no data
NWWG	<i>Gadus morhua</i>	cod.27.5b2	yes	M	10+	yes	no	no	
NWWG	<i>Reinhardtius hippoglossoides</i>	ghl.27.561214	no	no	no	no	no	no	
NWWG	<i>Melanogrammus aeglefinus</i>	had.27.5a	yes	M	10+	yes	yes	A	
NWWG	<i>Melanogrammus aeglefinus</i>	had.27.5b	yes	M	10+	yes	yes	A	
NWWG	<i>Clupea harengus</i>	her.27.5a	yes	M	15+	no	yes, fixed	no	
NWWG	<i>Pollachius virens</i>	pok.27.5a	yes	M	10+	yes	yes	A	
NWWG	<i>Pollachius virens</i>	pok.27.5b	yes	M	15+	yes	yes	A	
NWWG	<i>Sebastes mentella</i>	reb.2127.dp	yes	A	no	yes	no	no	data limited stock
NWWG	<i>Sebastes mentella</i>	reb.2127.sp	yes	A	no	yes	no	no	
NWWG	<i>Sebastes mentella</i>	reb.27.14b	no	no	no	no	no	no	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
NWWG	<i>Sebastes mentella</i>	reb.27.5a14	yes	M	30+	yes	no	no	
NWWG	<i>Sebastes norvegicus</i>	reg.27.561214	yes	M	30+	yes	no	no	
WGBAST	<i>Salmo salar</i>	sal.27.22-31							
WGBAST	<i>Salmo salar</i>	sal.27.32							
WGBAST	<i>Salmo trutta</i>	trs.27.22-32							
WGBFAS	<i>Scophthalmus rhombus</i>	bll.27.22-32							Age data available only from Germany, thus they have not been used for stock assessment.
WGBFAS	<i>Gadus morhua</i>	cod.27.21	yes	A	6		yes	A	
WGBFAS	<i>Gadus morhua</i>	cod.27.22-24	yes	A	7		yes	A	
WGBFAS	<i>Gadus morhua</i>	cod.27.24-32							Age-reading problems defined the stock as "data poor". Discusses various schemes used for maturity ogives
WGBFAS	<i>Limanda limanda</i>	dab.27.22-32	yes	S			yes	A	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGBFAS	<i>Platichthys flesus</i>	fle.27.2223	yes	S			yes		
WGBFAS	<i>Platichthys flesus</i>	fle.27.2425	yes	S			yes	S	
WGBFAS	<i>Platichthys flesus</i>	fle.27.2628	yes						Ageing was conducted but data were not fully used. Bertalanffy equation came from literature data
WGBFAS	<i>Platichthys flesus</i>	fle.27.2729-32	?						no clear information on ageing
WGBFAS	<i>Clupea harengus</i>	her.27.25-2932	yes						Age data adequate, available from the countries exploiting the stock
WGBFAS	<i>Clupea harengus</i>	her.27.28							Age data available from the countries exploiting the stock
WGBFAS	<i>Clupea harengus</i>	her.27.3031							Annual maturity data from Finnish from commercial trawl catches

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGBFAS	<i>Pleuronectes platessa</i>	ple.27.21-23					yes	Y	Mean weight at age graphs presented from annual data
WGBFAS	<i>Pleuronectes platessa</i>	ple.27.24-32							Ageing conducted by Denmark, Poland and Germany. No data from Sweden. Maturity is measured only in German surveys.
WGBFAS	<i>Solea solea</i>	sol.27.20-24							Inadequate data for ageing and maturity. Maturity - at-age based on assumption.
WGBFAS	<i>Sprattus sprattus</i>	spr.27.22-32							No age data provided. Advice to look at maturity data in more detail.
WGBFAS	<i>Scophthalmus maximus</i>	tur.27.22-32							Ageing data available only from German commercial fishery.

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGBIE	<i>Lophius budegassa</i>	ank.27.78abd	N	N	N	Y	N	Estimates of L50	
WGBIE	<i>Lophius budegassa</i>	ank.27.8c9a	Surplus production methods		N	Y	N	N	
WGBIE	<i>Dicentrarchus labrax</i>	bss.27.8ab	N	Fixed	16	Y	N	IFREMER Started to collect data 2014 and 2015.	
WGBIE	<i>Dicentrarchus labrax</i>	bss.27.8c9a	Landings only						
WGBIE	<i>Merluccius merluccius</i>	hke.27.3a46-8abd	N	Fixed	?	Y	N	L50 = 42.85 cm and slope = - 0.2 (ICES, 2010b WD8	
WGBIE	<i>Brosme brosme, Merluccius merluccius</i>	hke.27.8c9a	N	FIXED	15	Y	Y	IEO DATA	
WGBIE	<i>Lepidorhombus boscii</i>	ldb.27.7b-k8abd	NOT IN THE DATA CALL LAST YEAR			?	?		
WGBIE	<i>Lepidorhombus boscii</i>	ldb.27.8c9a	Y	Y	5	Y	N	BIOSDEF, 1998	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGBIE	<i>Lepidorhombus whiffiagonis</i>	meg.27.7b-k8abd	Y	Y	10	Y	N	BIOSDEF, 1998	
WGBIE	<i>Lepidorhombus whiffiagonis</i>	meg.27.8c9a	Y	Y	7	Y	N	BIOSDEF, 1998	
WGBIE	<i>Lophius piscatorius</i>	mon.27.78abd	length-split based on VBGF to estimate age comp			Y	N	knife-edge (e.g. 0%vmature at ages 0–4; 100% mature at ages 5+). WKAnglerfish (2018)	
WGBIE	<i>Lophius piscatorius</i>	mon.27.8c9a	Fixed(differents methods)			Y	N	Quincoces, 2002	
WGBIE	<i>Nephrops norvegicus</i>	nep.fu.2324	N	N	N	Y	N	Jegou, 2007	
WGBIE	<i>Nephrops norvegicus</i>	nep.fu.25	N	N	N	Y	N	Fariña, 1996	
WGBIE	<i>Nephrops norvegicus</i>	nep.fu.2627	N	N	N	Y	N	Fariña, 1996	
WGBIE	<i>Nephrops norvegicus</i>	nep.fu.2829	N	N	N	Y	N	ICES-WKNEPH 2006	
WGBIE	<i>Nephrops norvegicus</i>	nep.fu.30						WKNEP 2016 (Vila, 2016)	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGBIE	<i>Nephrops norvegicus</i>	nep.fu.31	low levels of landings and fishing effort are insufficient to carry out an adequate assessment						

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGBIE	<i>Pleuronectes platessa</i>	ple.27.89a							
			Plaice was not present in the Spanish and Portuguese research surveys and not caught in sufficient quantities in the French survey in the Bay of Biscay to serve as an abundance index						
WGBIE	<i>Pollachius pollachius</i>	pol.27.89a	N	N	N	N	Y	Fernaández Cohen et al. (1990)	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGBIE	<i>Solea solea</i>	sol.27.8ab	Y	Q	8	Y	N	ma- turity/age/length key thus obtained to the length dis- tribution of the first quarter in 2000	
WGBIE	<i>Solea solea</i>	sol.27.8c9a	Y	Y	N	Y	Y	Y	
WGBIE	<i>Merlangius merlangus</i>	whg.27.89a	N	N	N	N	N	N	
WGCSE	<i>Lophius budegassa</i> , <i>Lophius piscatorius</i>	anf.27.3a46	N			Y	N		
WGCSE	<i>Dicentrarchus labrax</i>	bss.27.4bc7ad-h	Y	Q	10	Y	Y	A	
WGCSE	<i>Dicentrarchus labrax</i>	bss.27.6a7bj	N	N	N	N	N	N	
WGCSE	<i>Gadus morhua</i>	cod.27.6a	Y	Q	7	Y	Y	A	
WGCSE	<i>Gadus morhua</i>	cod.27.6b	N	N	N	N	N	N	
WGCSE	<i>Gadus morhua</i>	cod.27.7a	Y	A	6	Y	Y	A	
WGCSE	<i>Gadus morhua</i>	cod.27.7e-k	Y	A	7	Y	Y	A	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGCSE	<i>Melanogrammus aeglefinus</i>	had.27.6b	Y	A	7	Y	Y	A	
WGCSE	<i>Melanogrammus aeglefinus</i>	had.27.7a	Y	A	5	Y	Y	A	
WGCSE	<i>Melanogrammus aeglefinus</i>	had.27.7b-k	Y	A	8	Y	Y	A	
WGCSE	<i>Lepidorhombus</i>	lez.27.4a6a	Surplus production methods		N	N	N	N	
WGCSE	<i>Lepidorhombus</i>	lez.27.6b	Surplus production methods		N	N	N	N	
WGCSE	<i>Nephrops norvegicus</i>	nep.27.6aoutFU	N						
WGCSE	<i>Nephrops norvegicus</i>	nep.27.7outFU	N						
WGCSE	<i>Nephrops norvegicus</i>	nep.fu.11	N	N	N	Y	N	Queirós et al., 2013	
WGCSE	<i>Nephrops norvegicus</i>	nep.fu.12	N	N	N	Y	N	Adapted from Bailey and Chapman (1983)	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGCSE	<i>Nephrops norvegicus</i>	nep.fu.13	N	N	N	Y	N	Queirós et al., 2013	
WGCSE	<i>Nephrops norvegicus</i>	nep.fu.14	N	N	N	Y	N	Briggs (1988)	
WGCSE	<i>Nephrops norvegicus</i>	nep.fu.15	N	N	N	Y	N	McQuaid et al., 2006	
WGCSE	<i>Nephrops norvegicus</i>	nep.fu.16	N	N	N	Y	N	González Herraiz, 2011	
WGCSE	<i>Nephrops norvegicus</i>	nep.fu.17	N	N	N	Y	N	IBPNEPH 2015	
WGCSE	<i>Nephrops norvegicus</i>	nep.fu.19	N	N	N	Y	N	WKCELT 2014	
WGCSE	<i>Nephrops norvegicus</i>	nep.fu.2021	N	N	N	N	N	L50 is taken from FU22	
WGCSE	<i>Nephrops norvegicus</i>	nep.fu.22	N	N	N	Y	N	WKNEPH 2006 (ICES, 2006)	
WGCSE	<i>Trisopterus esmarkii</i>	nop.27.6a	NO LANDINGS						
WGCSE	<i>Pleuronectes platessa</i>	ple.27.7a	Y	Y	8	Y	Y	y	
WGCSE	<i>Pleuronectes platessa</i>	ple.27.7bc	N	N	N	N	N	N	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGCSE	<i>Pleuronectes platessa</i>	ple.27.7e	Y	Y	10	Y	Y	Pawson and Harley, 1997	
WGCSE	<i>Pleuronectes platessa</i>	ple.27.7fg	Y	Y	8		Y	Pawson and Harley, 1997	
WGCSE	<i>Pleuronectes platessa</i>	ple.27.7h-k	N	N	N	N	N	N	
WGCSE	<i>Pollachius pollachius</i>	pol.27.67	Alemaný et al. 2017, in prep	N	N	N	N	Alemaný et al. 2017, in prep	
WGCSE	<i>Ammodytes</i>	san.27.6a	N	N	N	N	N	N	
WGCSE	<i>Solea solea</i>	sol.27.7a	Y	Y	8	Y	Y	Y	
WGCSE	<i>Solea solea</i>	sol.27.7bc	N	N	N	N	N	N	
WGCSE	<i>Solea solea</i>	sol.27.7e	Y	Y	12	Y	N	Pawson and Harley, 1997	
WGCSE	<i>Solea solea</i>	sol.27.7fg	Y	Y	10	Y	N	Pawson and Harley, 1997	
WGCSE	<i>Solea solea</i>	sol.27.7h-k	N	N	N	N	N	Pawson and Harley, 1997	
WGCSE	<i>Merlangius merlangus</i>	whg.27.6a	Y	Y	7	Y	N	knife-edged at age 2	
WGCSE	<i>Merlangius merlangus</i>	whg.27.6b	N	N	N	N	N	N	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGCSE	<i>Merlangius merlangus</i>	whg.27.7a	Y	Q	6	Y	N	knife-edged at age 2	
WGCSE	<i>Merlangius merlangus</i>	whg.27.7b-ce-k	Y	Q	7	Y	N	knife-edged at age 2	
WGDEEP	<i>Beryx</i>	alf.27.nea	NO	-	-	yes	NO	-	
WGDEEP	<i>Argentina silus</i>	aru.27.123a4	YES	Year	20+	yes	NO	-	
WGDEEP	<i>Argentina silus</i>	aru.27.5a14	YES	Year	24	yes	yes	Fixed (WKDEEP 2010, GSS04)	
WGDEEP	<i>Argentina silus</i>	aru.27.5b6a	YES	Year	21	yes	yes	Fixed (Ofstad, WD14 WGDEEP 2017)	
WGDEEP	<i>Argentina silus</i>	aru.27.6b7-1012	NO	-	-	yes	NO	-	
WGDEEP	<i>Molva dypterygia</i>	bli.27.5a14	No	-	-	yes	yes	Fixed	
WGDEEP	<i>Molva dypterygia</i>	bli.27.5b67	YES (french data only)	Quarter	9+	yes	yes	fixed (Ofstad, 2018, WD)	
WGDEEP	<i>Molva dypterygia</i>	bli.27.nea	NO	-	-	yes	NO	-	
WGDEEP	<i>Aphanopus carbo</i>	bsf.27.nea	NO	-	-	yes	NO	-	
WGDEEP	<i>Phycis blenoides</i>	gfb.27.nea	NO	-	-	yes	yes	A, Spanish data	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGDEEP	<i>Molva molva</i>	lin.27.1-2	YES	Year	11	yes	YES	A	
WGDEEP	<i>Molva molva</i>	lin.27.3a4a6-91214	YES (norwegian data only)	Year	15	yes	yes	Fixed (Magnusson et al., 1997)	
WGDEEP	<i>Molva molva</i>	lin.27.5a	YES	Year	11	yes	yes	Fixed	
WGDEEP	<i>Molva molva</i>	lin.27.5b	YES	Year	15	yes	yes	Fixed (Magnusson et al., 1997)	
WGDEEP	<i>Hoplostethus atlanticus</i>	ory.27.nea	NO	-	-	yes	NO	-	
WGDEEP	<i>Macrourus berglax</i>	rhg.27.nea	NO	-	-	yes	NO	-	
WGDEEP	<i>Coryphaenoides rupestris</i>	rng.27.1245a8914ab	NO	-	-	yes	NO	-	
WGDEEP	<i>Coryphaenoides rupestris</i>	rng.27.3a	YES (Bergstad et al. 2014)	Year	20+	yes	NO	-	
WGDEEP	<i>Coryphaenoides rupestris</i>	rng.27.5a10b12ac14b	NO	-	-	yes	NO	-	
WGDEEP	<i>Coryphaenoides rupestris</i>	rng.27.5b6712b	NO	-	-	yes	NO	-	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGDEEP	<i>Pagellus bogaraveo</i>	sbr.27.10	NO	-	-	yes	yes	Fixed (WD Silva et al., 2015)	
WGDEEP	<i>Pagellus bogaraveo</i>	sbr.27.6-8	NO	-	-	yes	NO	-	
WGDEEP	<i>Pagellus bogaraveo</i>	sbr.27.9	Fixed (WKAMDEEP 2013)	-	10	yes	NO	-	
WGDEEP	<i>Trachyrincus scabrus</i>	tsu.27.nea	NO	-	-	yes	NO	-	
WGDEEP	<i>Brosme brosme</i>	usk.27.1-2	NO	-	-	yes	NO	-	
WGDEEP	<i>Brosme brosme</i>	usk.27.12ac	NO	-	-	yes	NO	-	
WGDEEP	<i>Brosme brosme</i>	usk.27.3a45b6a7-912b	NO	-	-	yes	NO	-	
WGDEEP	<i>Brosme brosme</i>	usk.27.5a14	YES	Year	10	yes	Fixed	-	
WGDEEP	<i>Brosme brosme</i>	usk.27.6b	NO	-	-	yes	NO	-	
WGDEL	<i>Anguilla anguilla</i>	ele.2737.nea	YES	-	-	yes	YES	-	
WGEF	<i>Squatina squatina</i>	agn.27.nea	NO	-	-	yes	NO	-	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGEF	<i>Cetorhinus maximus</i>	bsk.27.nea	NO	-	-	yes	NO	-	
WGEF	<i>Centrophorus squamosus</i> , <i>Centroscymnus coelolepis</i>	cyo.27.nea	NO	-	-	yes	NO	-	
WGEF	<i>Squalus acanthias</i>	dgs.27.nea	NO	-	-	yes	NO	-	
WGEF	<i>Galeorhinus galeus</i>	gag.27.nea	NO	-	-	yes	NO	-	
WGEF	<i>Centrophorus squamosus</i>	guq.27.nea	NO	-	-	yes	NO	-	
WGEF	<i>Lamna nasus</i>	por.27.nea	NO	-	-	yes	NO	-	
WGEF	<i>Rajidae</i>	raj.27.1012	NO	-	-	yes	NO	-	
WGEF	<i>Rajidae</i>	raj.27.3a47d	NO	-	-	yes	NO	-	
WGEF	<i>Rajidae</i>	raj.27.67a-ce-h	NO	-	-	yes	NO	-	
WGEF	<i>Rajidae</i>	raj.27.89a	NO	-	-	yes	NO	-	
WGEF	<i>Rostroraja alba</i>	rja.27.nea	NO	-	-	yes	NO	-	
WGEF	<i>Dipturus batis</i>	rjb.27.3a4	NO	-	-	yes	NO	-	
WGEF	<i>Dipturus batis</i>	rjb.27.67a-ce-k	NO	-	-	yes	NO	-	
WGEF	<i>Dipturus batis</i>	rjb.27.89a	NO	-	-	yes	NO	-	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGEF	<i>Raja clavata</i>	rjc.27.3a47d	NO	-	-	yes	NO	-	
WGEF	<i>Raja clavata</i>	rjc.27.6	NO	-	-	yes	NO	-	
WGEF	<i>Raja clavata</i>	rjc.27.7afg	NO	-	-	yes	NO	-	
WGEF	<i>Raja clavata</i>	rjc.27.7e	NO	-	-	yes	NO	-	
WGEF	<i>Raja clavata</i>	rjc.27.8	NO	-	-	yes	NO	-	
WGEF	<i>Raja clavata</i>	rjc.27.9a	NO	-	-	yes	NO	-	
WGEF	<i>Raja microocellata</i>	rje.27.7de	NO	-	-	yes	NO	-	
WGEF	<i>Raja microocellata</i>	rje.27.7fg	NO	-	-	yes	NO	-	
WGEF	<i>Leucoraja fullonica</i>	rjf.27.67	NO	-	-	yes	NO	-	
WGEF	<i>Raja brachyura</i>	rjh.27.4a6	NO	-	-	yes	NO	-	
WGEF	<i>Raja brachyura</i>	rjh.27.4c7d	NO	-	-	yes	NO	-	
WGEF	<i>Raja brachyura</i>	rjh.27.7afg	NO	-	-	yes	NO	-	
WGEF	<i>Raja brachyura</i>	rjh.27.7e	NO	-	-	yes	NO	-	
WGEF	<i>Raja brachyura</i>	rjh.27.9a	NO	-	-	yes	NO	-	
WGEF	<i>Leucoraja circularis</i>	rji.27.67	NO	-	-	yes	NO	-	
WGEF	<i>Raja montagui</i>	rjm.27.3a47d	NO	-	-	yes	NO	-	
WGEF	<i>Raja montagui</i>	rjm.27.67bj	NO	-	-	yes	NO	-	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGEF	<i>Raja montagui</i>	rjm.27.7ae-h	NO	-	-	yes	NO	-	
WGEF	<i>Raja montagui</i>	rjm.27.8	NO	-	-	yes	NO	-	
WGEF	<i>Raja montagui</i>	rjm.27.9a	NO	-	-	yes	NO	-	
WGEF	<i>Leucoraja naevus</i>	rjn.27.3a4	NO	-	-	yes	NO	-	
WGEF	<i>Leucoraja naevus</i>	rjn.27.678abd	NO	-	-	yes	NO	-	
WGEF	<i>Leucoraja naevus</i>	rjn.27.8c	NO	-	-	yes	NO	-	
WGEF	<i>Leucoraja naevus</i>	rjn.27.9a	NO	-	-	yes	NO	-	
WGEF	<i>Amblyraja radiata</i>	rjr.27.23a4	NO	-	-	yes	NO	-	
WGEF	<i>Raja undulata</i>	rju.27.7bj	NO	-	-	yes	NO	-	
WGEF	<i>Raja undulata</i>	rju.27.7de	NO	-	-	yes	NO	-	
WGEF	<i>Raja undulata</i>	rju.27.8ab	NO	-	-	yes	NO	-	
WGEF	<i>Raja undulata</i>	rju.27.8c	NO	-	-	yes	NO	-	
WGEF	<i>Raja undulata</i>	rju.27.9a	NO	-	-	yes	NO	-	
WGEF	<i>Dalatias licha</i>	sck.27.nea	NO	-	-	yes	NO	-	
WGEF	<i>Mustelus asterias</i>	sdv.27.nea	NO	-	-	yes	NO	-	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGEF	<i>Galeus melastomus</i>	sho.27.67	NO	-	-	yes	NO	-	
WGEF	<i>Galeus melastomus</i>	sho.27.89a	NO	-	-	yes	NO	-	
WGEF	<i>Scyliorhinus canicula</i>	syc.27.3a47d	NO	-	-	yes	NO	-	
WGEF	<i>Scyliorhinus canicula</i>	syc.27.67a-ce-j	NO	-	-	yes	NO	-	
WGEF	<i>Scyliorhinus canicula</i>	syc.27.8abd	NO	-	-	yes	NO	-	
WGEF	<i>Scyliorhinus canicula</i>	syc.27.8c9a	NO	-	-	yes	NO	-	
WGEF	<i>Scyliorhinus stellaris</i>	syt.27.67	NO	-	-	yes	NO	-	
WGEF	<i>Alopias</i>	thr.27.nea	NO	-	-	yes	NO	-	
WGHANSA	<i>Engraulis encrasicolus</i>	ane.27.8	yes	Q	5+	yes	yes	DEPM surveys, triennial	
WGHANSA	<i>Engraulis encrasicolus</i>	ane.27.9a	yes	Q	3+	yes	yes	DEPM surveys, triennial	
WGHANSA	<i>Trachurus trachurus</i>	hom.27.9a	yes	Q	11+	yes	yes	DEPM surveys	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGHANSA	<i>Trachurus picturatus</i>	jaa.27.10a2	yes	A	18+	yes	yes		
WGHANSA	<i>Sardina pilchardus</i>	pil.27.7	no	A	5+	yes	no		
WGHANSA	<i>Sardina pilchardus</i>	pil.27.8abd	yes	Q	10+	yes	yes	DEPM surveys, triennial	
WGHANSA	<i>Sardina pilchardus</i>	pil.27.8c9a	yes	Q	6+	yes	yes	DEPM surveys, triennial	
WGNAS	<i>Salmo salar</i>	sal.21.2-5				yes			
WGNAS	<i>Salmo salar</i>	sal.2127.1a-f14				yes			
WGNAS	<i>Salmo salar</i>	sal.27.nea				yes			
WGNSSK	<i>Scophthalmus rhombus</i>	bll.27.3a47de	yes	A	9+	yes	no		
WGNSSK	<i>Cadus morhua</i>	cod.27.47d20	yes	A	11+	yes	yes	A	
WGNSSK	<i>Limanda limanda</i>	dab.27.3a4	yes	A	6+	yes	yes	fixed	
WGNSSK	<i>Platichthys flesus</i>	fle.27.3a4	no			yes	no		
WGNSSK	<i>Eutrigla gurnardus</i>	gug.27.3a47d	no			yes	no		
WGNSSK	<i>Melanogrammus aeglefinus</i>	had.27.46a20	yes	A	8+	yes	yes	fixed, Knife-edge at age 3 (interim measure)	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGNSSK	<i>Microstomus kitt</i>	lem.27.3a47d	no			yes	yes	fixed, from the IBTS -Q1 and Q3 data (2006-2012)	
WGNSSK	<i>Mullus surmuletus</i>	mur.27.3a47d	yes	6+		yes	yes	fixed, Mahé et al., 2005	
WGNSSK	<i>Nephrops norvegicus</i>	nep.27.4outFU				yes			
WGNSSK	<i>Nephrops norvegicus</i>	nep.fu.10	no			yes	no		
WGNSSK	<i>Nephrops norvegicus</i>	nep.fu.3-4	no			yes	yes	ICES WKNEPH 2006	
WGNSSK	<i>Nephrops norvegicus</i>	nep.fu.32	no			yes	no		
WGNSSK	<i>Nephrops norvegicus</i>	nep.fu.33	no			yes	no		
WGNSSK	<i>Nephrops norvegicus</i>	nep.fu.34	no			yes	yes	adapted from Bailey and Chapman (1983)	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGNSSK	<i>Nephrops norvegicus</i>	nep.fu.5	N			N	Yes	N	No specific information on ageing parameters. Length composition for different years (2009 missing)
WGNSSK	<i>Nephrops norvegicus</i>	nep.fu.6	yes	Q			Yes		sex ratio distributions provided
WGNSSK	<i>Nephrops norvegicus</i>	nep.fu.7	yes	A		N	Yes	N	
WGNSSK	<i>Nephrops norvegicus</i>	nep.fu.8							No biological data provided
WGNSSK	<i>Nephrops norvegicus</i>	nep.fu.9							No biological data provided
WGNSSK	<i>Trisopterus esmarkii</i>	nop.27.3a4	yes	Q	4		Yes	Q	No age data available for 2007 and 2008
WGNSSK	<i>Pleuronectes platessa</i>	ple.27.420	yes	A	10		Yes	A	
WGNSSK	<i>Pleuronectes platessa</i>	ple.27.7d	yes	A	7		yes	A	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGNSSK	<i>Pollachius virens</i>	pok.27.3a46							For subareas 3a and 4 data have not been processed yet, for subarea 6 there is no reference on biological data
WGNSSK	<i>Pollachius pollachius</i>	pol.27.3a4							Some biological data have been collected but have not been processed yet
WGNSSK	<i>Solea solea</i>	sol.27.4	N	N	N		N	N	Maturity ogives used, based on market samples from sixties and seventies
WGNSSK	<i>Solea solea</i>	sol.27.7d	N	N	N		N	N	
WGNSSK	<i>Scophthalmus maximus</i>	tur.27.3a	N	N	N		N	N	
WGNSSK	<i>Scophthalmus maximus</i>	tur.27.4	yes	Y	8+	yes	yes	Y	
WGNSSK	<i>Merlangius merlangus</i>	whg.27.3a							No data in the report

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGNSSK	<i>Merlangius merlangus</i>	whg.27.47d	van der Hammen et al. (2013)		?	Y	N	van der Hammen et al. (2013)	
WGNSSK	<i>Glyptocephalus cynoglossus</i>	wit.27.3a47d	Y	Y	?	Y	N	Fixed	
WGWIDE	<i>Capros aper</i>	boc.27.6-8	no			yes	no		
WGWIDE	<i>Chelidonichthys cuculus</i>	gur.27.3-8	no			yes	no		
WGWIDE	<i>Clupea harengus</i>	her.27.1-24a514a	yes	Q	15+	yes	yes	A	
WGWIDE	<i>Trachurus trachurus</i>	hom.27.2a4a5b6a7a-ce-k8	yes	Q	15+	yes	yes	fixed, since 1998	
WGWIDE	<i>Trachurus trachurus</i>	hom.27.3a4bc7d	yes	Q	15+	yes	no		
WGWIDE	<i>Scomber scombrus</i>	mac.27.nea	yes	Q	12+	yes	yes	Constant for North Sea and Southern components, time varying for Western components	

Expert Group	Species	Stock	Age			Length	Maturity ogive		Comments
			Used	Stratification	Plus group		Used	Period	
WGWIDE	<i>Mullus surmuletus</i>	mur.27.67a-ce-k89a	no			yes	no		Age structured analytical stock assessment not currently possible due to a too short time series of available data
WGWIDE	<i>Micromesistius poutassou</i>	whb.27.1-91214	yes	Q	15+	yes	yes	fixed, since 1994	

Period "M" refers to month; "Q" refers to Quarter and "A" refers to annual

Annex 8: Tor f

a) History & background of SmartDots

PGDATA 2017 and WGBIOP 2017 endorsed the SmartDots platform as the tool to be used for age reading & maturity exchanges and workshops.

Early in 2017 it was decided to expand SmartDots software with some extra modules in order to fit international needs. ILVO turned the existing SmartDots fat client into a more generic client-server application. ICES developed the database, web application and Web API to be able to handle and store data at ICES. DTU Aqua analysed the different datasets and created a first version of a workshop / exchange output report.

At WGBIOP 2017 a proof of concept of the SmartDots age reading platform was presented. All national age reader coordinators attending WGBIOP were able to test, during a hands-on exercise, the proposed SmartDots age reading platform.

The SmartDots age reading platform is in a first step developed to facilitate age readings based on otolith images.

A set of software tools supports the user in managing all data of ICES age reading. On the one hand the database can manage the meta data related to workshops and exchanges and on the other hand, the age reader can carry out age readings by annotating otolith images. All registered data are available in the connected reporting environment.

The SmartDots age reading platform is an open source solution. All source code is publicly accessible. The SmartDots age reading platform consists of several modules. We distinguish data input, data storage and data output modules (see module scheme, figure 8.a).

The SmartDots age reading platform consists of two user interface modules:

- **Web application**

This module will be to manage the age readers expertise and events.

This is the module that allows the connection with the database.

The functionalities of the web application are:

- Manage age readers and their expertise
- Manage events meta-data
- Manage sample data and upload the linked files (e.g. images)
- Reporting
- Query the database
- View and download data

- **SmartDots user interface**

SmartDots is a Windows client-server application. This is the main module for the age readers (Figure 8.b).

The functionalities of SmartDots are:

- Select the activity

- Create annotations on otolith images by drawing a line on the otolith and adding a dot for each age ring.

The **web API** (Application Programming Interface) is the interface between the SmartDots user interface and the database. All business logic¹ is integrated in the Web API.

The output or reporting module contains generic datasets and R-scripts for business intelligence purposes.

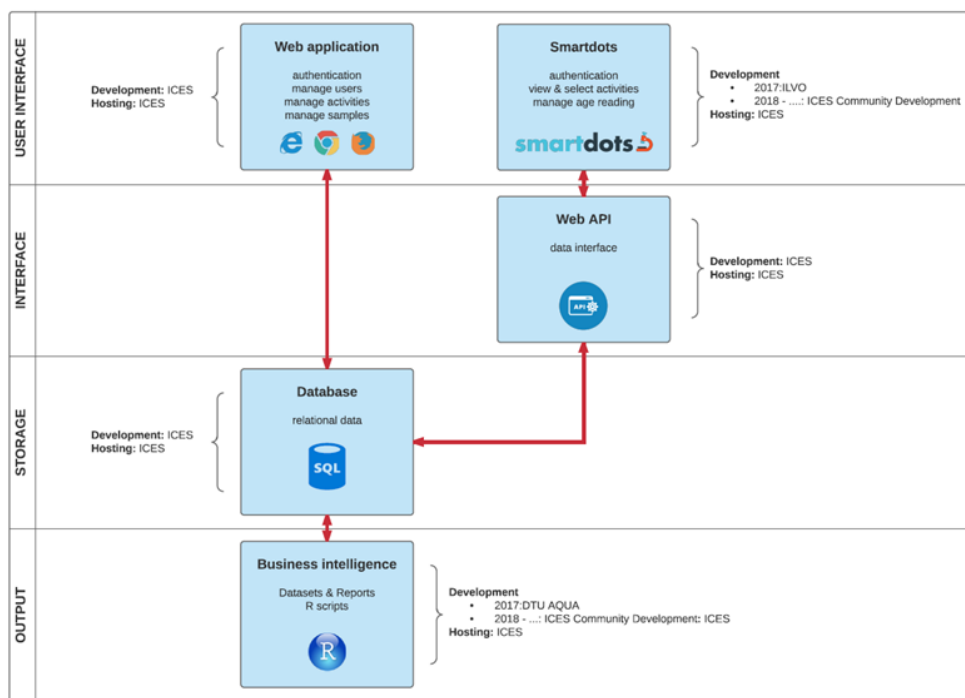


Figure 8.a Module scheme of SmartDots platform

Following the presentations, demonstrations and hands-on time with SmartDots at WGBIOP 2017 the group officially adopted the SmartDots platform as the tool for age reading exchanges and workshops from 2018 onwards.. During WGBIOP 2017 a meeting was held to discuss the future plans for SmartDots, topics discussed included; development and deployment of the combined modules; planning for “going live” and project governance. The meeting was held by the core SmartDots team who have been working in close collaboration over the last year and the chairs of WGBIOP. Those attending proposed that in the future WGBIOP should look to expand this group to a formal steering group which could include additional expertise to ensure the effective project governance which will require both monetary input and manpower.

A full description can be found on : <http://www.ices.dk/marine-data/tools/Pages/smardots.aspx>.

¹ Business logic = the part of the program that encodes the real-world business rules that determine how data can be created, stored, and changed

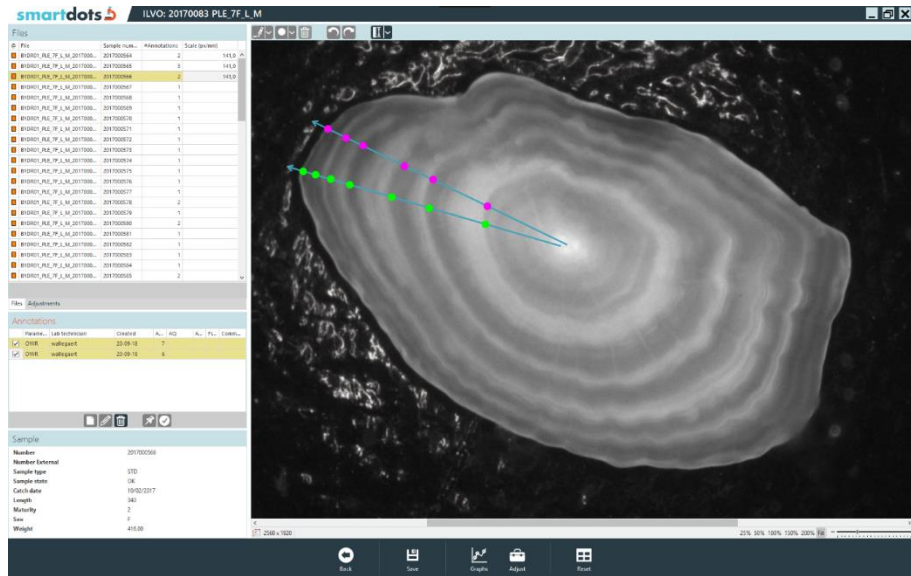


Figure 8.b SmartDots user interface

b) Working Group on SmartDots Governance (WGSMART)

2018/MA2/EOSG01 The **Working Group on SmartDots Governance²** (WGSMART), co-chaired by Julie Coad Davies* (Denmark) and Jane Aanestad Godiksen* (Norway), will meet intersessionally, 4 times per year via WebEx and may meet physically once per year, to work on ToRs and generate deliverables as listed in the Table below.

	WEBEX MEETING DATES	MEETING DATES AND VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
Year 2018	10-12 December	ICES HQ		First meeting of WGSMART
Year 2019	1) 10 January 2) 25 April 3) 29 August 4) 14 November	11-12 October Venue as WGBIOP	Interim report by TBD to EOSG	
Year 2020	1) 14 January 2) 21 April 3) 25 August 4) 17 November	9-10 October Venue as WGBIOP	Interim report by TBD to EOSG	
Year 2021	1) 12 January 2) 20 April 3) 24 August 4) 16 November	8-9 October Venue as WGBIOP	Final report by TBD to EOSG	

WGSMART will report on its activities by the March SCICOM meeting the following year to EOSG and DIG.

² <http://ices.dk/marine-data/tools/Pages/smardots.aspx>

ToR descriptors

ToR	Description	Background	Science Plan codes	Duration	Expected Deliverables
a	Oversee and advise on the interpretation and prioritisation of recommendations and requests addressed to SmartDots	SmartDots is an operational tool that aims to improve the overall quality of age data delivered to assessment EG's. The tool is now operational and an integral part of the ICES QAQC for aging many fish species for which ICES provides advice, procedure largely under the guidance of WGBIOP. However maintenance and future development of the platform are beyond the scope of the scientific WG's and WK's.	3.1, 4.1	3 years/ Generic ToR	A prioritised list of SmartDots related expert group recommendations with a proposed annual work plan to address concerns and implement improvements to SmartDots.
b	Provide a platform for end user feedback to the SmartDots system. User feedback will be requested from the end users via the GitHub site, exchange/workshop reports, EG'S and committees. Feedback will be compiled by WGSMART and appropriate actions to be taken with assigned responsibilities will be listed and prioritised.	SmartDots will be further developed to meet the requirements of a broad range of end users and thus needs to be responsive to user feedback. This feedback system needs to be independent of WGBIOP as a greater responsiveness (more than one meeting a year) is required to manage the system effectively.	3.1, 4.1	3 years/ Generic ToR	
c	Elaborate a forward plan for the sustainability of SmartDots as a platform	To achieve a continuous quality, SmartDots needs to be developed in line with end users needs. This	4.4, 3.6	3 years/ Generic ToR	A workplan outlining what resources are required for

		development requires an input of resources; knowledge, expertise, manpower and funding over a period of time which extends beyond the initial phase. A workplan with clear objectives and milestones can only be successfully implemented when the availability of such resources is clear.			development, support, training and dissemination of relevant information. An estimated budget including identified funding resources.
d	Oversee development of user guidance and training in SmartDots	As SmartDots develops overtime a range of users will require various levels of training including step by step user manuals, tutorials and possibly workshops. Documentation of guidelines and procedures in line with WGBIOP will also be necessary. Outreach activities will be required.	3.1, 4.1	3 years/ Generic ToR	Annually updated training documentation. Workshops with specific goals proposed and planned where necessary. Relevant fora for dissemination investigated and outreach activities planned.

Summary of the Work Plan

In addition to the ongoing maintenance and improvements by the end of year three we aim to have; the data output and reporting module fully operational, SmartDots maturity staging module fully operational and user manuals updated in line with all developments made.

Year 1	ToR a) and b) will be addressed in quarterly WebEx meetings, with the potential annual meetings intended to coincide with WGBIOP and prioritising ToRs c) and d).
Year 2	ToR a) and b) will be addressed in quarterly WebEx meetings, with the potential annual meetings intended to coincide with WGBIOP and prioritising ToRs c) and d).
Year 3	ToR a) and b) will be addressed in quarterly WebEx meetings, with the potential annual meetings intended to coincide with WGBIOP and prioritising ToRs c) and d).

Supporting information

PRIORITY	
RESOURCE REQUIREMENTS	A commitment of time from the members of the group consistent with progressing actions identified in the quarterly meetings
PARTICIPANTS	Chair of WGBIOP, one member from each country from the core development group (BE, DK, NO), ICES Secretariat as hosts of International SmartDots, other WGBIOP members as need be
SECRETARIAT FACILITIES	Community SharePoint site, Remote meeting facilities
FINANCIAL	No financial implications
LINKAGES TO ACOM AND GROUPS UNDER ACOM	This is an integral component to the overall Quality Assurance framework (of Advice) that ACOM together with the Coordination group are describing
LINKAGES TO OTHER COMMITTEES OR GROUPS	There is a very close working relationship with WGBIOP. There is a strong linkage to DIG as the main umbrella for data/software governance structures.
LINKAGES TO OTHER ORGANIZATIONS	EU Commission has partially funded SmartDots and is therefore following its progress, GFCM in the Mediterranean also has interest in this system

c) List of issues

ID	MODULE	GitHub ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
1	Database	#59	#59 - Tokens Development	Development	done	GitHub					
2	Database	#6	#6 - Design data model enhancement	Improvement	done	GitHub					
3	Documentation		The annotation line pinning by the administrator, in some cases was wrong not reaching the otolith edge or not plotted in the longest part. This is a problem for the readers since they cannot mark the point on all the rings of the otolith. This means that it would be necessary to write in the manuals to be very careful when pinning the annotation line.	Help wanted		GR-HCMR					Add a section as Pinning the annotation line to an image in SmartDots
4	Documentation		No manual was provided	Help wanted		GR-HCMR					Manual should be downloadable from the webpage (http://smartdots.ices.dk/)

ID	MODULE	GitHub ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
											manage/ListOperations)
5	Documentation	#15	#15 - Have WGBIOP update the age reader contact list to include expertise level per species and area governance	Governance	1	GitHub					This needs to be done annually
6	Documentation	#19	#19 - Draft a guidance document on how to use management console for coordinators: insert your Age Readers experts, Setup and Manage a new Event documentation	Documentation	1	GitHub					There is a document that needs updating
7	Documentation	#20	#20 - Send the guidance document to all the coordinators to insert their experts in the system	Documentation	1	GitHub					
8	Documentation	#22	#22 - Format definition enhancement	Improvement	done	GitHub					
9	Documentation	#28	#28 - Draft Smartdots user manual documentation smartdots ui	Governance	1	GitHub					This needs to be developed continuously
10	Documentation	#33	#33 - follow up with Inaki to check that he sends the backup of WebGR / IMR		1	GitHub					This is a waste of time
11	Documentation	#41	#41 - Develop a SmartDots disclaimer governance	Governance	1	GitHub					

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
12	Documen tation	#70	#70 - Button that opens a link to documentation	Documentat ion	1	GitHub					Once this is ready the link is cre- ated on the Web Appli- cation
12	WebAppli cation	#70	#70 - Button that opens a link to documentation	Documentat ion	1	GitHub					This would depend on having the documenta- tion ready
13	Documen tation		Add in the manual that all the im- ages should be equally formatted and what features they should have, so that the administrator can add the scale automatically and no manually	Documentat ion	1						There is a document that needs updating
14	Documen tation		Automatic reporting? The same for all exchanges? I think it will depend on each stock and how the data is extracted and analyzed	Documentat ion	1						
15	Reporting		More possibilities for having varia- tions in the report	Developme nt	3	Begonia					
16	Reporting		How do we deal with difficult oto- liths? Should all provide an age to all otoliths? Should we omit otoliths with AQ3? How many readers	Improveme nt	4						

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
			should consider it an AQ3 for it to be omitted?								
17	Reporting		Combine some of IPMA R-scripts in SmartDots	Improvement	4						
18	Reporting		Adjustment of the statistics (and EltinkSpreadSheet) with sensitivity for short-lived and long-lived species ageing respectively.	Improvement	4	WebGR					
19	Reporting		Output enabling the comparison of age resulting from two or more structures of the same individual (e.g. otolith and scale). Or two or more exchanges (one on scales and one on otoliths)	Development	1	WebGR					Cannot be done until stock assessment has been contacted and we know what output they need (salmon, eel, etc.)
20	Reporting	#26	#26 - Determine Line direction enhancement SmartDots ui		done	GitHub					
21	Reporting	#61	#61 - Order the users for the report reporting user management		done	GitHub					

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
22	Reporting	#62	#62 - Extract country-individual results only	Documentat ion	done	GitHub					Everyone can extract all data and from that extract own readers material when an exchange is closed. This needs to be specified in the manual.
23	Software	77	When finalising an annotation the next image opens automatically; or a next/previous button	Improveme nt	4	FIH					
24	Software		Image enhancement and image adjustment should be put into a separate panel. The list should not be hidden where it is hard to find	Improveme nt	4	NL					
25	Software	76	Additional field in the panel annotations: nucleus opaque or translucent; non-obligatory field clarification: necessary for herring age reading at our institute	Developme nt	1	NL					This should be implemented in the database then software and Web API

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
25	WebAPI	76	Additional field in the panel annotations: nucleus opaque or translucent; non-obligatory field clarification: necessary for herring age reading at our institute	Development	1	NL					This should be implemented in the database then software and Web API
26	Software	76	Additional field in the panel annotations: edge opaque or translucent; non-obligatory field clarification nice to have for marginal increment studies	Development	1	NL					This should be implemented in the database then software and Web API
26	WebApplication	76	Additional field in the panel annotations: edge opaque or translucent; non-obligatory field clarification nice to have for marginal increment studies	Development	1	NL					This should be implemented in the database then software and Web API
27	Software		Option to have a version for tablet and Macintosh	Development	3	Kélig					
28	Software		Zoom in and zoom out are not so easy and takes time	Improvement	4	GR-HCMR					

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
29	Software		The annotation line is defined only by the coordinator for each workshop. It would be useful for the reader to be able to measure distances during a reading. This would be helpful to distinguish possible false rings.	Improvement	2	GR-HCMR					
30	Software		The bas (brightness graph usefulness) is not working well. It is very slow and not effective. We could not use it.	Improvement	4	GR-HCMR					
31	Software		In some exchange has been very slow to move from one image to another, maybe it is the size of the images, should have all the same characteristics and small size	Improvement	2	GR-HCMR/ Julie					(in some cases, i.e. <i>Trachurus sp</i>)
32	Software		Users cannot view their total progress of how many images they edited. When they open SmartDots they have to pass all images that have been already edited to find their last edited image to continue. It needs to be a visual in the image list what images a reader has annotated.	Development	1	GR-HCMR					The red/green/orange colour coding solves this
33	Software	25	Offline version	Development	2	WebGR					

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
34	Software		The possibility to make a comment on a specific dot and to have it appear on the image	Improvement	4	WebGR					
35	Software		Possibility of double field aging, which is necessary for some species like salmon to mark separately years spent at sea and in fresh water.	Development	Done	WebGR					
36	Software		Need to be able to identify two reference axis for an exchange. Some images use reference axis 1 and others reference axis 2. This is because on some images the preferred axis is impossible to read (often deep-water species). When analysing the results it is important that length measurements of the zones are not compared from the two axes. This is not an issue for age.		3	Kélig					
37	Software		Need to develop growth line (lower left corner) to compare different annotations by the same reader - the growth line as it is not useful. It is of course important that the reader cannot get info of the other readers.		3	Kélig					

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
38	Software		When discussing the annotations in a workshop (web browser) it is useful to be able to retrieve the growth line (from the lower left corner of SmartDots software) and compare selected users.		3						
39	Software	#10	#10 - create fixed reading line functionality enhancement SmartDots ui		done	GitHub					
40	Software	#11	#11 - each age dot should get a number: functionality enhancement SmartDots ui; First point of line is always starting point. Mark start point of line (eg. with arrow)		done	GitHub					
41	Software	#17	#17 - Water type (for salmon freshwater ring and sea water rings). enhancement SmartDots ui		done	GitHub					
42	Software	#36	#36 - 3rd Party component in SmartDots		done	GitHub					
43	Software	#57	#57 - Resize of the columns (software) SmartDots ui		waiting for trial	GitHub					
44	Software	#64	#64 - Prevent warning notification from firewall when starting SmartDots		LOOK SOME WHERE ELSE	GitHub					

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
45	Software	#65	#65 - SmartDots .exe on GitHub blocked by firewall help wanted SmartDots ui /Windows defender SmartScreen	Help wanted	1	GitHub					I think this has been dealt with by the portable version?
46	Software	#66	#66 - Improve image adjustments functionalities: add gradation curve enhancement SmartDots ui		3	GitHub					
47	Software	#68	#68 - When annotating: Can it be made possible to delete one single dot in the middle of the otolith? SmartDots ui		done	GitHub					
48	Software	#73	#73 - Custom Ranking of chemical age Development enhancement	Improvement	4	GitHub					
49	Software		Given that age class 0 appears by default in the readings, there is no way to differentiate when considering an illegible otolith (which should be left blank) from an otolith age class 0 with little security (AQ3). It should be possible to select another AQ- "illegible" that left the Age field blank.	Development	1						solved with AQ3

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
50	Software		It seems that it could be useful for the reader to leave a clear record of whether he considers that the last ring is finished or not, in order to discuss or reinforce the assimilation of the agreed growth schemes. For example, with a box where to mark a "+" or something like that.	Development	2						
51	WebAPI		Choice to see or not TL information for coordinator or reader	Development	1	Kélig					The coordinator should be allowed to show/hide specific sample info in the UI
53	WebAPI	#23	#23 - Technical adjustments SmartDots: integration Web API methods Web API		done	GitHub					
54	WebAPI	#32	#32 - WebAPI last details to make it fully functional		done	GitHub					
55	WebAPI	#56	#56 - Functionality for the reader to signalize that he has finish the exercise Web API enhancement SmartDots ui		1	GitHub					
56	WebAPI	#74	#74 - Event manager is not able to edit age readers annotations Development enhancement	Development	0	GitHub					They should not be able to. Instead it

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
											should be possible to open the event again and ask the reader to correct.
57	WebApplication		Use of token could be easier. If you make your own password, it would be nice	Not possible	0	HR					
58	WebApplication		A copy token bottom. No need to mark the token to copy it	Improvement	2	Jane					
59	WebApplication	74	Possibility to close or open the exchange during the workshop	Development	1	Kélig					If a reader forget to finalize or place a dot somewhere by mistake, it is important to be able to open an event again.

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
60	WebApplication	45	The Event manager should be able to define the colour and/or the size of the dots for a user. We need to find a good solution for not all readers ending up with red when comparing the results in a workshop	Development	2	sl					It would be useful from the point of view of the administrator, but also of the reader, that the colour of the mark be assigned randomly for each reader, and that it be different to the colour of the annotation line. On the other hand the size of the mark changes according to the magnification of the image, it would be useful to

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
											keep the size chosen by the reader in all the images
61	WebApplication		Automatically send an email to the coordinator when the readings are finished	Improvement	4	Kélig					
62	WebApplication		Include in the viewer the agreed birth date for the species so that readers do not depend on "memory"; for example, next to the capture date in the sample part	Development	2	Kélig/Julie					Be able to change the birthday date in the software. Currently SmartDots automatically give the age of the fish based on the number of ring annotations that you make, this implies

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
											<p>that SmartDots already has a pre-established birthday date (1st of January). This has been a problem in the case of the anchovy from Mediterranean area (birthday on 1st of July) and it was necessary to leave the last winter ring unmarked so that the automatic age determination agreed with the one corresponding with</p>

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
											birthday date on July 1. This implied that for otoliths from the first half of the year it was not possible to compare the position of the winter rings which were not annotated with other area results.
63	WebApplication		When going through the images (in a browser) at a workshop, can we go to next image instead of going back to the main screen every time?	Improvement	3	Jane					
64	WebApplication		When going through the images (in a browser) at a workshop, can we remove the line, so it is easier to see the annotations?	Development	1	Jane					
65	WebApplication		When going through the images (in a browser) at a workshop, can I	Development	1	Jane					

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
			chose more than one reader's annotation?								
66	WebApplication		When creating a workshop, an email should be sent to the stock coordinators and readers of the species to inform of the action.	Development	3	WebGR					
67	WebApplication		Comments to be included in the exported .csv-file and on the image	Development	2	WebGR					
68	WebApplication		Workshop manager can export an .csv (or xls) file of the annotations and fish data whenever needed.	Development	done	WebGR					
69	WebApplication		The possibility of grouping of 2-3 images belonging to the same individual, as this is required for the examination of maturity stages. When annotating one image, all images of the same individual will automatically get the same result. This is also needed for micro-increments annotation in certain parts of otoliths, and it will be a huge advantage when dealing with species where both otolith and scale from the same fish is represented.	Development	1	WebGR					

ID	MODULE	GitHub ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
70	WebApplication		Put a form in SmartDots for suggestions to improvements/issues for SmartDots. The WGSMArt steering group will go through the suggestions and add them to GitHub. This will be done during the WebEx meetings		1						
71	WebApplication		Uploading of larger size/mosaic images, as those used e.g. for micro-increments count.	Development	done	WebGR					
72	WebApplication	#18	#18 - Build the system to register the users		done	GitHub					
73	WebApplication	#21	#21 - Module overview		done	GitHub					
74	WebApplication	#24	#24 - Web form to manage the users		done	GitHub					
75	WebApplication	#27	#27 - ICES area and Statistical Rectangles references and lookups. Link to map	Event management	1	GitHub					
76	WebApplication	#31	#31 - Create a SmartDots landing page in SharePoint. SmartDots webpage		done	GitHub					
77	WebApplication	#34	#34 - Set up of Events		done	GitHub					
78	WebApplication	#35	#35 - Images matching samples bug	Bug	done	GitHub					

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
79	WebApplication	#37	#37 - Scale update for all event images in one go		done	GitHub					
80	WebApplication	#38	#38 - Develop a page to follow the event management	Event management	1	GitHub					
81	WebApplication	#4	#4 - Analysis workshop / exchange setup enhancement	Improvement	done	GitHub					
82	WebApplication	#42	#42 - There need to be a way where the Event Manager can order the Age readers bug event management	Event management	done	GitHub					
83	WebApplication	#43	#43 - Implement the Event Alias		Done	GitHub					
84	WebApplication	#44	#44 - Add feature to change the scale for all images of an event enhancement event management	Event management	done	GitHub					
85	WebApplication	#49	#49 - Modal age in the view event page event management	Development	2	GitHub					
86	WebApplication	#54	#54 - Reorganize the ViewImage details page event management	Event management	2	GitHub					
87	WebApplication	#55	#55 - Show dots and lines in the images on the web enhancement event management	Event management	2	GitHub					
88	WebApplication	#63	#63 - Manage Age readers Expertise: link species user management		1	GitHub					

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
89	WebApplication	#7	#7 - Image and Data management event management	Event management	done	GitHub					
90	WebApplication	#71	#71 - About form		4	GitHub					
91	WebApplication	#75	#75 - Sent an email to the participants of an event Development	Development	1	GitHub					
92	WebApplication	#8	#8 - Define and manage users enhancement user management	Improvement	done	GitHub					
93	WebApplication		Use shape analysis to define fish to a stock. Give a warning if the stock set by the coordinator do not fit with the shape analysis. The analysis should occur while uploading the images to SmartDots	Development	4						
94	WebApplication		tiff		4						
95	WebApplication		Species name should appear on the "List of events"	Development	1						
96	WebApplication	78	Extract Lists from web application (list of participants, list of readers)		1	GitHub					
98		#69	#69 - Develop ToR's for a formal Governance Group: GGSmarTs governance	Governance	done	GitHub					

ID	MODULE	GITHUB ID	DETAILED DESCRIPTION	TYPE OF ISSUE	PRIORITY	AUTHOR	TIME ESTIMATED	COST (HOURS NEEDED)	RESPONSIBLE PERSON	DATE TO BE FINALIZED	COMMENT
99	WebApplication		SmartDots needs development to facilitate agreed aged reference collections.	Development	2	Julie					
100	Software		SmartDots needs development to facilitate agreed aged reference collections.	Development	2	Julie					
97	Software		The possibility to be able to see the measurements from one annotation to the next in the software	Development	1	DTU					
103	WebApplication		Creating reporting tool for maturity staging events. Basis should be the same as reporting tool for ageing	Development	1						
104	Reporting		Creating reporting tool for maturity staging events. Basis should be the same as reporting tool for ageing	Development	1						

d) List of events 2018

List of event for the year of

Event ID	Purpose	Event Type	Name Of Event	StartDate	EndDate	Type Of Structure	Protocol	Organizer Email
49	Age reading	Exchange	North Sea Herring 2	07/11/2017	12/2017			joco@aqu.dtu.dk
50	Age reading	Exchange	Whiting Scale bar test	13/11/2017	12/2017			joco@aqu.dtu.dk
51	Age reading	Exchange	Test Jane Sei	15/11/2017	12/2017			jane.godiksen@imr.no
62	Age reading	Exchange	Saithe test 3	28/11/2017	12/2017			jane.godiksen@imr.no
63	Age reading	Exchange	Saithe WKARV test	30/11/2017	01/2018			jane.godiksen@imr.no
64	Age reading	Exchange	Test annotation line	30/11/2017	01/2018			jane.godiksen@imr.no
65	Age reading	Exchange	Smarddot test IMR	05/12/2017	02/2018			jane.godiksen@imr.no
70	Age reading	Exchange	Sebastes test 2	07/12/2017	03/2018			jane.godiksen@imr.no
71	Age reading	Internal	Plaice internal test	11/12/2017	02/2018			joco@aqu.dtu.dk
72	Age reading	Internal	Sandeel test	13/12/2017	02/2018			joco@aqu.dtu.dk
73	Age reading	Exchange	Norway Pout Exchange 2018	10/01/2018	05/2018			joco@aqu.dtu.dk
74	Age reading	Exchange	2018 Norway Pout Exchange - Whole and Broken	10/01/2018	03/2018			joco@aqu.dtu.dk
75	Age reading	Exchange	testing	11/01/2018	02/2018			joco@aqu.dtu.dk
76	Age reading	Exchange	2018 Norway Pout Exchange - Sectioned	15/01/2018	05/2018			joco@aqu.dtu.dk
77	Age reading	Exchange	2018 Norway Pout Exchange - Sectioned	11/01/2018	03/2018			joco@aqu.dtu.dk
80	Age reading	Exchange	Exchange turbot 2018	01/04/2018	06/2018			Karen.Bekaert@ilvo.vlaanderen.be
81	Age reading	Exchange	Anchovy Exchange 2018	01/05/2018	09/2018			begona.villamor@ieo.es
82	Age reading	Exchange	IOS Demo Sandeel	28/03/2018	04/2018			joco@aqu.dtu.dk
85	Age reading	Exchange	IOS Demo Plaice	04/04/2018	05/2018			joco@aqu.dtu.dk
86	Age reading	Exchange	Trac Med 2018	09/04/2018	10/2018			Kelig.Mahe@ifremer.fr
87	Age reading	Exchange	Trac trac 2018	22/06/2018	10/2018			Kelig.Mahe@ifremer.fr
88	Age reading	Internal	Test carlos	12/04/2018	04/2018			carlos@ices.dk
90	Age reading	Internal	2018 Megrim otolith exchange for 4. a and 6.a	14/04/2018	09/2018			joco@aqu.dtu.dk
91	Age reading	Training	IOS Demo Saithe	14/04/2018	05/2018			joco@aqu.dtu.dk
92	Maturity determination	Internal	TestEvent Carlos	10/05/2018	05/2018			carlos@ices.dk
94	Age reading	Training	Plaice age training	16/05/2018	05/2019			joco@aqu.dtu.dk
95	Age reading	Training	trachurus pict 2018	22/06/2018	10/2018			Kelig.Mahe@ifremer.fr
102	Age reading	Exchange	PRE-WKARMAC2 Exercise	03/10/2018	10/2018			begona.villamor@ieo.es
104	Age reading	Training	Black scabbardfish 2018	02/10/2018	10/2018			Kelig.Mahe@ifremer.fr
105	Age reading	Internal	Greater forkbeard 2018	02/10/2018	10/2018			Kelig.Mahe@ifremer.fr
106	Age reading	Internal	Ling 2018	02/10/2018	10/2018			Kelig.Mahe@ifremer.fr
107	Age reading	Training	Blueling 2018	02/10/2018	10/2018			Kelig.Mahe@ifremer.fr
108	Age reading	Training	Greater argentine 2018	02/10/2018	10/2018			Kelig.Mahe@ifremer.fr
109	Age reading	Training	Tusk 2018	02/10/2018	10/2018			Kelig.Mahe@ifremer.fr
110	Age reading	Training	Blackspot seabream 2018	02/10/2018	10/2018			Kelig.Mahe@ifremer.fr
111	Age reading	Training	Dab age reading	03/09/2018	12/2018			joco@aqu.dtu.dk
112	Age reading	Training	cod validation	05/09/2018	11/2018			francesca.vitale@slu.se
114	Age reading	Internal	Store Tlucturatus Canary Islands Samples	06/09/2018	09/2018			carlos@ices.dk
115	Age reading	Internal	LEM Exchange	07/09/2018	10/2018			joanne.smith@cefas.co.uk
116	Maturity determination	Training	Herring maturation test event	13/09/2018	09/2018			carlos@ices.dk
144	Age reading	Training	WKARMAC2 calibration exercise	21/10/2018	10/2018			begona.villamor@ieo.es
145	Age reading	Exchange	Trisopterus esmarkii	10/01/2018	03/2018			joco@aqu.dtu.dk
146	Age reading	Exchange	Trisopterus esmarkii	10/01/2018	03/2018			joco@aqu.dtu.dk
147	Maturity determination	Internal	To show this to Fran	02/10/2018	10/2018			carlos@ices.dk
148	Maturity determination	Internal	Test for Pierluigi	10/10/2018	10/2018			carlos@ices.dk
149	Age reading	Exchange	2018 Norway Pout Exchange - Whole and Broken(Public training)	10/01/2018	03/2018			joco@aqu.dtu.dk
150	Maturity determination	Internal	Test event for Cindy	01/01/190001	01/1900			carlos@ices.dk
151	Maturity determination	Internal	Test event for Maria	01/01/190001	01/1900			carlos@ices.dk
152	Age reading	Internal	test images	17/10/2018	26/10/2018			carlos@ices.dk
153	Maturity determination	Training	Herring Maturity demo for Els	07/10/2018	18/10/2018			carlos@ices.dk
154	Maturity determination	Training	Demo event to Pierluigi	17/10/2018	24/10/2018			carlos@ices.dk
155	Age reading	Exchange	Anchovy Exchange 2018(Public training)	01/05/2018	04/09/2018			begona.villamor@ieo.es