WORKSHOP ON RAISING DATA USING THE RDBES AND TAF (WKRDBES-RAISE&TAF; OUTPUTS FROM 2022 MEETING)

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Contents

i Executive summary

The Workshop on Raising Data using the RDBES and TAF (WKRDBES-Raise&TAF) met online (26–30 of September 2022) to evaluate the use of the Regional Database and Estimation System (RDBES) format to reproduce the 2022 InterCatch input and output, identifying a Transparent Assessment Framework (TAF) structure to organize the intermediate steps and to propose standardized output formats. The main outcomes of WKRDBES-Raise&TAF were:

- RDBES provides sufficient support for current national estimation protocols. However, some minor issues were reported that hampered an exact reproduction of the estimates. Therefore, adaptations of the data model should not be excluded completely.
- All the input to stock assessment that InterCatch currently provides, could be reproduced. The participants started from the current stock extracts that can be downloaded from InterCatch.
- A workflow was proposed with a national TAF repository for each country, a stock estimation repository and a stock assessment repository. The intermediate output of those repositories will be stored in an 'intermediate output database' and depending on the user role, you will get access to the relevant stages in this workflow.
- The following requirements for the standard output formats were defined: they cannot be more restrictive than the InterCatch input and output format; they should present measures of uncertainty and sample sizes (for national estimates) and should have a configurable domain definition (for national estimates).

Despite those successful outcomes, the current plan for transition to an operational system was concluded to be too optimistic. WKRDBES-Raise&TAF therefore recommends to the Working Group on Governance of the Regional Database and Estimation System (WGRDBESGOV) to revise the roadmap and allow RDBES to be in a test phase also for 2023.

WKRDBES-Raise&TAF felt the need to test the proposed workflow on a small scale and therefore recommends to the WGRDBESGOV to arrange a workshop where two stocks (pok.27.3a46 (Saithe (*Pollachius virens*) in Subareas 4, 6 and Division 3.a (North Sea, Rockall and West of Scotland, Skagerrak and Kattegat) and wit.27.3a47d (Witch (*Glyptocephalus cynoglossus*) in Subarea 4 and Divisions 3.a and 7.d (North Sea, Skagerrak and Kattegat, eastern English Channel)) will be set up to go through the whole flow.

ii Expert group information

Expert group name	Workshop on Raising Data using the RDBES and TAF (WKRDBES-Raise&TAF)
Expert group cycle	Annual
Year cycle started	2022
Reporting year in cycle	1/1
Chairs	Edvin Fuglebakk, Norway
	Sofie Nimmegeers, Belgium
Meeting venue and dates	26–30 September 2022, online meeting (56 participants)

1   Introduction

The objective of the WKRDBES-Raise&TAF workshop is to test if new workflows for commercial catch data used in ICES advice can reproduce the results of previous workflows. Specifically, the workflows implemented with the transparent assessment framework (TAF) and the Regional Database and Estimation System (RDBES) will be compared with the output of corresponding workflows that institutions have submitted to InterCatch (national estimates), or that has been implemented in InterCatch (stock estimates).

The Regional Database and Estimation System (RDBES) is being developed with the ambition to replace current databases supporting archiving of commercial fisheries data and produce stock assessment input, that is the 'Regional Database' (RDB) and 'InterCatch'. The governance group for the RDBES development (WGRDBESGOV) anticipates that the new system will be developed until 2024, at which point it will be ready to replace RDB and InterCatch. An important prerequisite for phasing out RDB and InterCatch is to demonstrate that RDBES can provide sufficient support for current estimation protocols. This is well demonstrated if RDBES and TAF can be used to reproduce the output from current protocols.

To these ends, the WKRDBES-Raise&TAF has convened to address the following Terms of Reference:

	Term of reference	Addressed in this report
a)	Reproduce the 2022 upload (2021 data) to InterCatch by producing R-scripts that raise national data extracted from the RDBES format to national level estimates. Compare with previously uploaded estimates.	Yes
b)	Reproduce the 2022 stock coordination (2021 data) previously done in InterCatch, with the R-scripts that run on ToRa output. Compare with previously achieved estimates.	Yes
c)	Evaluate and propose TAF structure and roles for ToR a & b.	Yes
d)	Evaluate and propose standard output formats for ToR a & b, in order to facilitate standard access to RDBES estimate, both for stock assessment and for other uses of national estimates.	Yes

WKRDBES-Raise&TAF also contributes to the continued development of RDBES and TAF, by specifying requirements for roles in RDBES-TAF workflows, and requirements for standard output formats of national estimates and stock estimates.

The focus of WKRDBES-Raise&TAF is to implement current practices as closely as possible. The workshop complements other estimation workshops and working groups developing estimation support for RDBES. These are mentioned here to clarify the distinction. The WKRATIO workshop has been using the RDBES data model, and has been focusing on harmonising approaches to ratio estimation between institutions. The WGRDBES-EST has been focusing on developing support for design-based estimation using the RDBES data model.
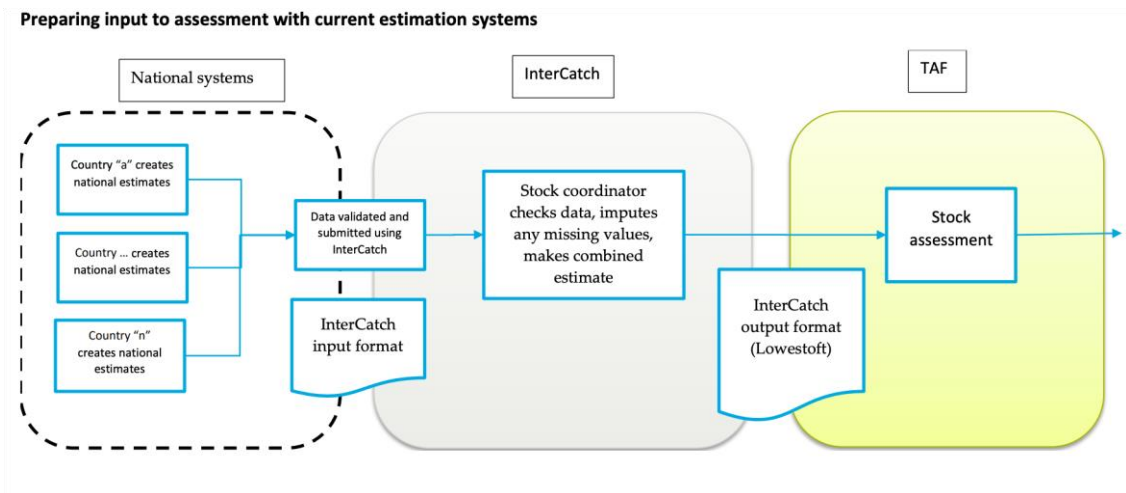
Figure 1: Workflows that WKRDBES-Raise&TAF is aiming to reproduce.

Figure 1 was presented in the WGRDBESGOV 2021 meeting (Figure 3 in the report[1]) and illustrates the workflows that "WKRDBES-Raise&TAF is aiming to reproduce, specifically the outputs labelled "InterCatch input" (ToR a) and "InterCatch output" (ToR b). Figure 2 was presented at WKTAF_2022 (workshop on Transparent Assessment Framework (TAF) stock assessment outputs) and summarises previous discussions at RDBES-related workshops and in the RDBES core group about roles in the TAF-RDBES workflows. The TAF-repositories labelled "National Estimates" produces the output that should reproduce the "InterCatch input" (ToR a) and the TAF-repositories labelled "Stock Estimates" produce the output that should reproduce the "InterCatch output" (ToR b). For WKRDBES-Raise&TAF the aim was only to use TAF-projects offline for the reproduction analysis, not submitting them to online repositories.

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[1] ICES. 2022. Working Group on Governance of the Regional Database and Estimation System (WGRDBES-GOV; outputs from 2021 meeting). ICES Business Reports. 2:10. 71 pp.
https://doi.org/10.17895/ices.pub.21133372

Figure 2: Roles in the TAF-RDBES workflows.

2 Reproduction of national estimates (ToR a)

The progress towards reproducing national estimates is summarised in the table below.

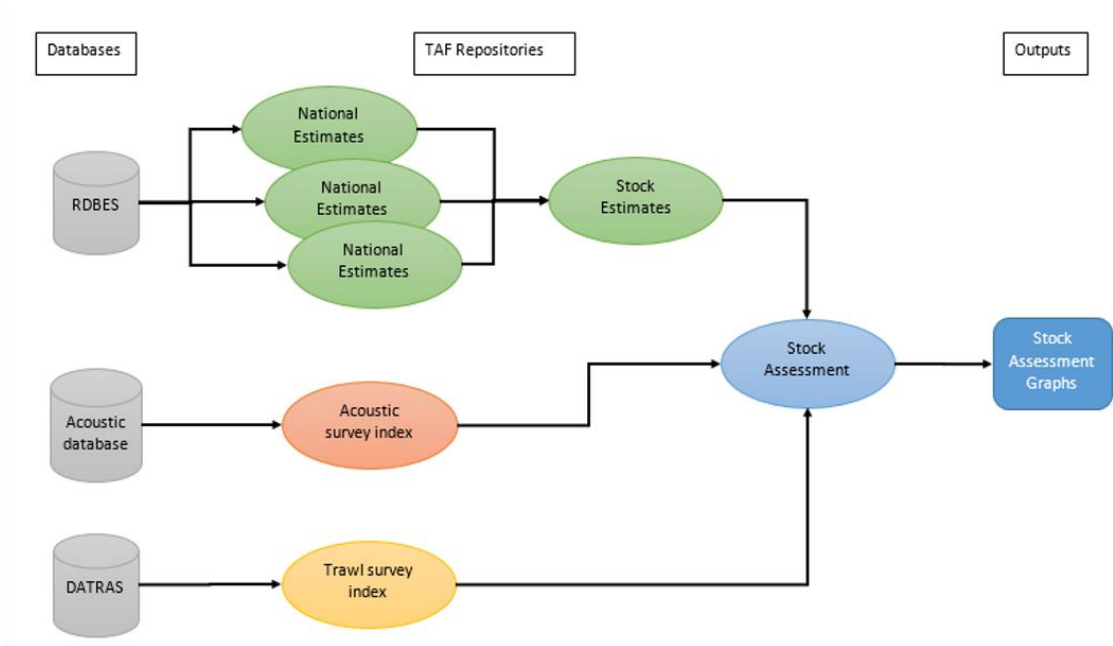| Participants	Prior ef-fort	Stocks	Quantity	TAF progress	Implementation	Reproduction
IMR, Norway	days	pok.27.3a46	LAN	Started	Complete	Partial
IPMA, Portugal	None	syc.27.8c9a	LLN	Started	Partial	Reproduced
IPMA, Portugal	None	pil.27.8c9a	LLN	Started	Complete	Reproduced
IPMA, Portugal	None	whb.27.1-91214	LLN	Started	Complete	Reproduced
Thünen Institute of North Sea Fisheries, Germany	None	hke.27.4	LLN	Started	Complete	Complete
Thünen Institute of Baltic Sea Fisheries, Germany	None	No specific stocks	LAN, partial DB	Started	Partial	Started
IFREMER, France	None	sol.27.8ab	None	Started	Started	Started
Cefas UK - England and Wales	None	No specific stocks tested	LLN, DLN and DB	Started	Partial	Started
MSS, UK Scotland	days	mac.27.nea	LAN	Started	Complete	Issues
NMFRI, Poland	days	ple.27.24-32	LAN	Started	Complete	Reproduced
ILVO, Belgium	None	sol.27.7fg	LAN, DAN, DB	Started	Complete	Partial
IEO, Spain	None	hke.27.8c9a	LLN	Started	Partial	Started
AZTI, Spain	None	several stocks tested	LLN	Started	Started	Started
WMR, Netherlands	None	ple.27.420	LAN	Started	Issues	Started
SLU, Sweden	None	cod.27.21	LAN	Started	Complete	Reproduced
Marine Institute, Ireland	days	had.27.7b-k	LAN, DLN	Started	Complete	Reproduced
Marine Institute, Ireland	days	whg.27.7a	LAN, DAN	Started	Complete	Reproduced
Marine Institute, Ireland	days	ple.27.7h-k	LLN, DLN	Started	Complete	Reproduced
Marine Institute, Ireland	days	hom.27.2a4a5b6a7a-ce-k8	LAN	Started	Complete	Reproduced

Participants	Prior effort	Stocks	Quantity	TAF progress	Implementation	Reproduction
Marine Institute, Ireland	days	mac.27.nea	LAN	Started	Complete	Partial
Marine Institute, Ireland	days	boc.27.6-8	LLN LAN	Started	Complete	Reproduced

Prior effort: If any work was done in adapting the estimate(s) to RDBES and TAF before the workshop. Use categories: 'None', 'days', 'weeks''

Stocks: stocks reproduced, uses ICES stock codes

Quantity: Which quantity was estimated. Free text, but may be using the following abbreviations:

- *LAN*: landings-at-age in numbers: total landings in numbers by age groups
- *LLN*: landings-at-length in numbers: total landings in numbers by length groups
- *DAN*: discards-at-age in numbers: total discard in numbers by age groups
- *DLN*: discards-at-length in numbers: total discard in numbers by length groups
- DB: total discards in weight: total discards in weight, not decomposed by age or length

TAF progress: To what extent TAF was used in the reproduction.

- *Started*: Did not organise code according to TAF standards.
- *Partial*: the estimate was organised with the standard TAF directories and scripts (icesTAF::taf.skeleton)
- *Complete*: the estimate can be re-run with icesTAF::sourceAll

Implementation: To what extent the implementation of estimator was done:

- *Started:* the implementation did not progress far enough to decide if the RDBES data model provides the necessary information
- *Issues:* the implementation could not be completed because of issues with the RDBES data model.
- *Partial:* not all code necessary to run estimates was implemented, but sufficient to test the RDBES and no issues with the RDBES encountered.
- *Complete*: All code necessary to run estimates was implemented.

Reproduction: To what extent the reproduction was successful:

- *Started*: Did not progress far enough to conclude on reproduction.
- *Reproduced*: Results are reproduced to the satisfaction of the person implementing the reproduction.
- *Partial*: Results are not reproduced to the satisfaction of the person implementing the reproduction, but the reasons why are thought to not be limitations of the RDBES data model.
- *Issues*: Results are not reproduced to the satisfaction of the person implementing the reproduction, and it the reasons why are thought to be limitations of the RDBES data model..

2.1 Report from reproduction studies

2.1.1 IMR, Norway

The partial reproduction is illustrated in Figure 2.1.
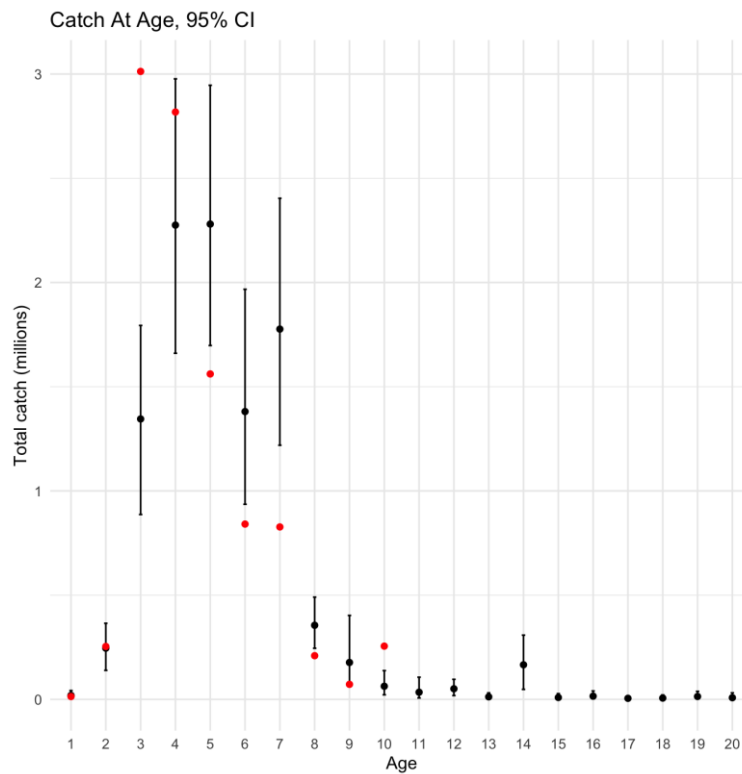
Figure 2.1. Black dots and arrow bars are results from RDBES-TAF calculation of catch-at-age for Norwegian fisheries of pok.27.3a46 in 2021. Red dots are the estimates submitted to InterCatch (aggregated over all fleets), where age group 10 is a plus-group.

It was verified that the two estimates were not based on the exact same samples, and this likely explains the differences. There are more samples available through the RDBES. One reason for that is that the data-submitter had made assumptions about the kind of length-measurements provided when that information was missing from national records. The national estimator that provided data for InterCatch did not have that option available for technical reasons. Another reason is that the extraction from local databases was done at different times, and some data-deliveries may have come too late for the InterCatch estimation.

In order to verify that discrepancies do not stem from differences in data-allocations that follow from standardisation of coding-systems, the reproduction analysis would have to be carried out on an RDBES data submission that was dedicated for the purpose, so that data extraction would happen at the same time for both analyses and assumptions about incomplete records could be harmonized between data-submitter and estimator.

2.1.2 IPMA, Portugal

For all stocks under analysis in this WK, the RDBES data model could not be fully tested due to issues with landing data submission. National estimates were conducted using the landing data previously submitted to ICES through InterCatch.

Biological variables are still missing from the RDBES databases which precludes the raising estimation procedure of numbers-at-age. For the mean weight-at-length auxiliary tables with information previously estimated were used.

syc.27.8c9a – for this stock, length data has not been submitted to InterCatch in the past but the same information is annually submitted to WGEF through accessions. Although not fully reproduced, results are satisfactory, and differences are minimal. Those are probably related to an issue in the original code which still needs to be verified. Estimates by sex were not verified (data was not submitted by sex).

pil.27.8c9a -The WGHANSA data call requires Portugal to submit length data (to accessions) for the Iberian sardine stock (pil.27.8c9a). This stock is considered to be within hierarchy number 5 (onshore sampling programme) and number 9 (landing location sampling). It was possible to extract the same samples (and individuals) within hierarchy number 5 from the RDBES database. The estimation procedure was reproduced considering that only samples from hierarchy number 5 were used. It was necessary to use landing data previously submitted to ICES due to the already mentioned issue with the submission of landing data to RDBES.

To reproduce the estimation procedure, RDBES data tables were manipulated to achieve the format used within the country. Then the existing code for the estimation procedure was executed. Figure 2.2 shows the outputs from the estimation procedure done with the data extracted from the Portuguese (PT, red line) database and the data extracted from the RDBES (RDBES, blue line). Deviations were found but are considered to be small. Reasons for these deviations are attributed to the fact that in the data submission to RDBES some landing harbours were not included in the initial code list and had to be attributed with the name of another landing harbour.

No issues in the RDBES format were identified that prevented replicating the current estimation procedure.
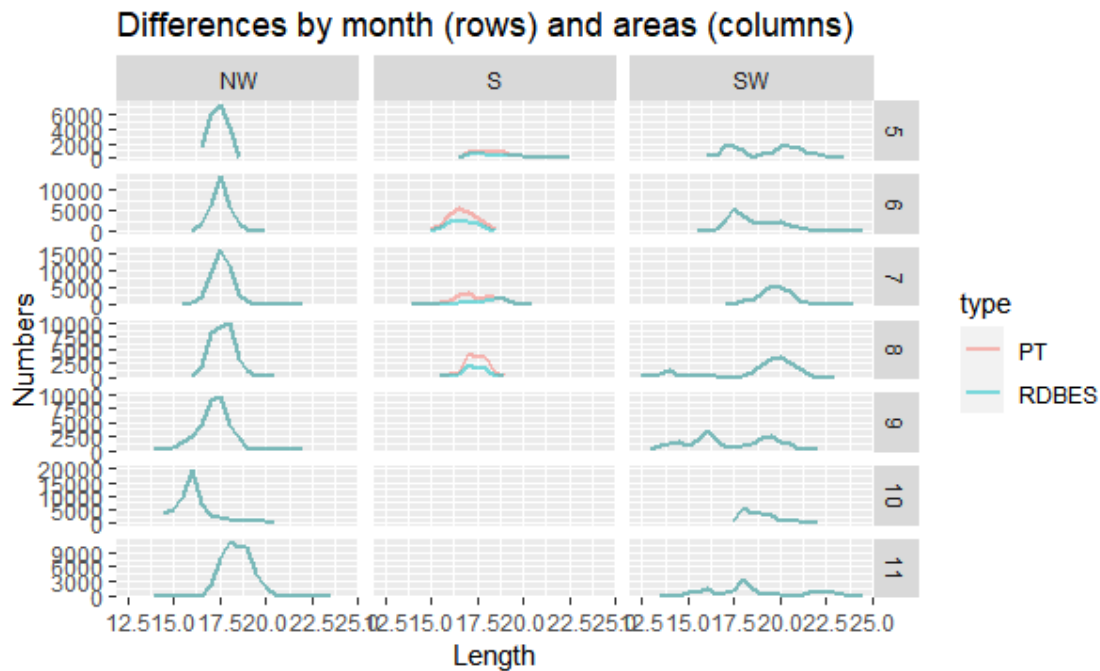
Figure 2.2. Numbers-at-length class by area (columns) and month (lines).

whb.27.1-91214 - the numbers-at-length have been reproduced using the RDBES data and the procedures currently used to produce and submit the data to InterCatch have been replicated. Similarly, to the application on sardine stock, for blue whiting the replication of the raising procedure as based only on the samples available for hierarchy 5. The standard procedure used annually for the preparation of the data to WGWIDE includes also the use of samples collected under hierarch 9 sampling scheme.

For the assessment of this stock, numbers-at-age are also annually submitted to InterCatch. At this stage those estimates have not been duplicated. Although, by using an external age-length key we will be able to estimate the numbers-at-age by using the data currently available in the RDBES format.

2.1.3 UK - England and Wales (Cefas)

Our aim for this workshop was to get familiar with RDBES data format and assess if the estimation procedure currently used for providing length and age catch data and discards estimates for InterCatch and assessment WGs could be reproducible using the RDBES data model. The hierarchies used for the national sampling programmes are H1 for the Offshore sampling programme and H5 for the onshore sampling programme.

At the end of this week we reproduced the method to provide landings length compositions from the onshore sampling programme (H5). However, we were unable to attempt reproducing an estimate for a specific stock because some of the necessary fields for estimation were not populated in some of the tables. We also started reproducing the method to produce length compositions for discards and discards estimates, but is still working in progress. We will continue to develop the code in the next few weeks.

Issues:

- During the RDBES data exploration a few issues were identified related with the data submission (e.g. difference in the number of samples submitted to RDBES and the ones used for the InterCatch submission, fields not populated or populated incorrectly, missing species (e.g. monkfish species: MON and WAF, megrim species LBI)).
- Need to resource external reference tables to estimate sampled weight from length (L/W parameters).
- Some inconsistencies in grouping metiers from CL and CE data or from the national databases will result in differences in the estimates. However, this was not possible to quantify at this workshop.

Despite the issues found during the workshop, no fundamental issues were found in the RDBES structure that would preclude the current estimation procedure to be reproducible.

2.1.4   Spain (IEO)

Our aim during this workshop was to understand the RDBES format and TAF procedures. In our particular case, our offshore sampling programme would correspond to hierarchy 1 (H1) while our onshore sampling programme would fit into hierarchy 5 (H5).

During this week we have been trying to replicate our InterCatch estimates to provide landings length compositions from H5 (onshore sampling programme) using the output from RDBES for hake in ICES divisions 27.8c. and 27.9a. Although we did not complete this task during this week we are certain we can successfully reproduce the estimation procedure and we intend to finalise this task shortly.

We have been also trying to reproduce landings and effort from CL and CE in order to compare them with those in IC format. Although we did not find differences regarding the effort, we observed some discrepancies in landings data. We do not know at this stage the reason behind those differences but we intend to work on that.

2.1.5   Spain (AZTI)

Our aim for this workshop was to start coding the procedure of providing estimates using the RDBES data model following the same methods that we use for InterCatch (IC) and assessment WGs. The hierarchies used for the national sampling programmes are H5 for onshore sampling programme and H3 for the offshore sampling programme.

Issues identified:

- The first day we found that the sampling data uploaded in the RDBES was incomplete and that several strata were missing. The problem was found to be in the last step of the process, when the CS files are created following the order of the tables which are established in each hierarchy. We made a new function to create CS files for hierarchies 5 and 3 to solve the problem and uploaded the complete data set.
- Errors were found in the CL file. Errors will be communicated to the body responsible for creating this file.
- Difficulties are foreseen for those species which are landed together (monkfishes, megrims, rays, …). In CL files, the weight of these species comes from the logbooks and sales notes, and it is often not correct. The aggregation of the different species needs to be sorted before producing the estimates.
- We need to resource external reference tables to estimate sampled weight from length (L/W parameters).
- For some stocks, it will not be possible to reproduce exactly the imputations we make when sampling data is missing, but the differences should be small.

During the WK, we started developing the estimates of numbers at length. All the necessary variables are available in the RDBES data model, except for the L/W parameters which need to be taken from external reference tables. At the end of this week we had a generic code to get the estimates, but it needs to be checked as the results are different from those provided to IC. Work is still in progress.

We haven't started with the estimates of catch at length, discards and species landed together. They will be produced at a later stage.

2.1.6 France (Ifremer)

Our aim was to apprehend the RDBES format and TAF procedures. In our case, in the future, our onboard sampling programs would fit into hierarchy 1 and our onshore program into hierarchy 5. However, for now, both have been submitted in hierarchy 1.

During this week, one subgroup from France has been trying to replicate our InterCatch estimates for sol.27.8ab. We successfully reproduced total landings by rectangle (CL). We encountered some issues reproducing the effort by fleet and rectangle (CE), probably due to differences in metrics used between RDBES upload and InterCatch upload. We plan to address this issue in the following weeks. Due to missing fields in the CS RDBES upload (notably metier & weights), it was not possible to go further in the estimations and we could not reproduce the length-age metrics. As with the effort issues, we plan to address these problems in the upcoming weeks. In a nutshell, not much progress was made but lots of issues were identified thanks to this workshop which we intend to work on in the weeks to come.

2.1.7 WMR, Netherlands

The Netherlands uses hierarchy 1 for the at sea sampling and hierarchy 5 for the onshore sampling. The focus of this workshop was to reproduce the landings at age estimation for the ple.27.420 stock we provide to ICES via InterCatch. We were able to reproduce the stock landings and effort from table CL and CE respectively after harmonising the métiers to the assessment WG's allowed métier list. Then, we formatted the CS RDBES data back to the original format we use for our estimation script and we compared the two datasets for potential inconsistencies. It is possible to reproduce the estimation, however, due to missing population data that we were unable to include in the CL table for this stock, we had to source the data externally. Ideally, an auxiliary table could contain these data in RDBES for the ratio estimation.

2.1.8 ILVO, Belgium

Our aim for this workshop was to get familiar with RDBES format and to replicate the estimation procedure currently used for providing weight, length and age catch data using the RDBES data model.

We were able to replicate the original raising procedure for sole in the Celtic seas (sol.27.7fg). We reconstructed discard raising, length weight and age length keys, raised length frequencies to numbers at length and age, discard and landings. There is a small deviation, (1 to 5 %) between the original estimates uploaded to InterCatch and the new estimates. We are still searching for the reasons for these deviations. There is either a difference in the submitted data or a difference in the raising procedure. In the past we used the r package COST for raising, now we use our own functions to do the raising. We identified some errors in the identifiers for our BV records.

Figure 2.3 shows the Belgian landing numbers at age for sol.27.7fg. The black dots and lines are the results from RDBES-TAF calculation, the blue dots and lines are the estimates submitted to InterCatch.
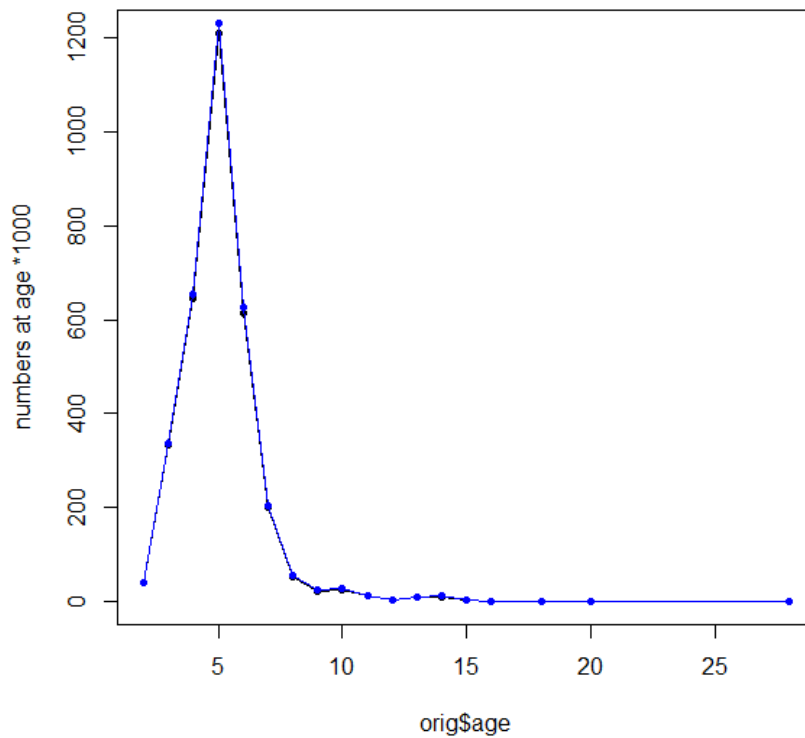

Figure 2.3. Belgian landing numbers at age for sol.27.7fg. Black dots and lines are the results from RDBES-TAF calculation; blue dots and lines are the estimates submitted to InterCatch.

2.1.9   Sweden

Our aim for this workshop was to enlarge the pool of people familiar with RDBES format and increase our perception on the challenges ahead in terms of using RDBES as the source of data used to produce our national commercial catch estimates. Our approach to the ToR involved a) getting hands-on experience and familiarity with the RDBES data structure, b) developing R code that manipulates and summarizes RDBES data into a format that could be directly compared with the format we most routinely use as input to our estimation algorithms (specifically the present RDB format), and c) attempt a first run of one of our estimation scripts based on RDBES data.

During the week, two data estimators got familiar with the data structure and started manipulating it towards future estimation. This advanced our perception on the time involved in the upcoming transition between InterCatch and RDBES. Furthermore, a set of R functions was developed to convert data from H1 and H5 of RDBES into RDB format (CL, TR, HH, SL, HL, CA). The two input datasets were then broadly compared, a process that involved a set of data resubmissions to RDBES that focused on the population of optional fields and improvements of the data. Overall, the convergence between the two datasets in the case studies analysed proved satisfactory with only a few issues being suggested in the RDBES github (e.g., #167-169). At the end of the meeting, a quick final comparison was made between previously submitted national estimates on age of landings of cod.27.21 and similar ones obtained from RDBES. This

comparison yielded slight differences that appear to be more related to the relatively fast "blind" run of the estimation script than to structural problems related to RDBES variables or its data-structure.

Overall, our evaluation indicates that it should be possible to upload our sampling data reliably to RDBES, convert data extracted from RDBES to our usual input format for estimation, and replicate our estimates. It must however be underscored that a) only one estimation case was addressed during the week, and b) under the relative complexity of the RDBES data model the time spent in learning the data structure and adapting estimation code to the new format, including quality checking its results, and tracking down the origin of differences, is relatively high. To meet regular data-call demands the latter aspects will require substantial internal planning (at institute level). That advises for a gradual phase-in of the new system at ICES level so that a smooth transition between the two systems can be achieved.

2.1.10   Thünen Institute of Sea Fisheries (North Sea), Germany

To test the RDBES model, we used length-structured H1 landing data on hake (HKE) in subarea 27.4 from 2021. The tables FM, SA, SS, FO and CL were merged with purpose to obtain a corresponding raising factor. The a and b parameters for linear regression with log-transformed weight were obtained from merged BV, FM, SA, SS and FO tables. Several metiers were aggregated, to get the metiers allowed for the corresponding working group (WGBIE).

Reproduction outcome shown in Figure 2.4 illustrates estimates for the third quarter 2021. Estimation was based on the same samples and demonstrates that results are very close to Inter-Catch. Note that for this particular case we have enough biological measurements in RDBES to estimate parameters a and b. Otherwise a larger deviation between RDBES and InterCatch would be expected.
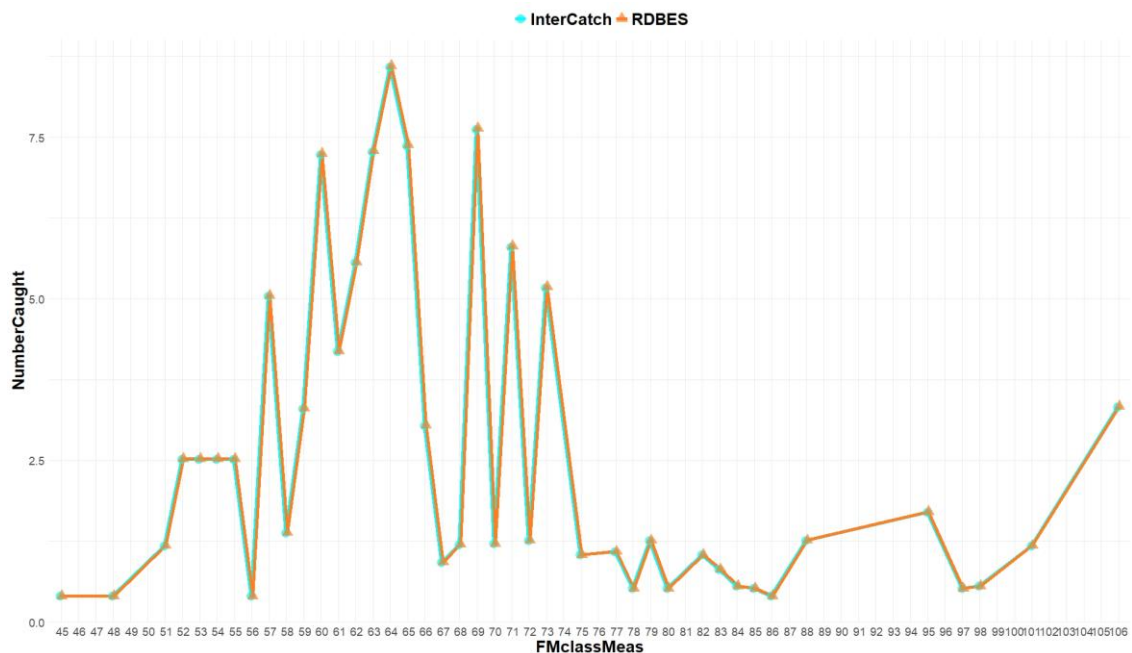

Figure 2.4. Reproduction outcome; estimates for the third quarter 2021.

2.1.11 Marine Institute, Ireland

2.1.11.1 Marine Institute, Ireland - had.27.7b-k

The national estimation process for the age composition of the landings uses an adaptation of the code developed in the COST project (https://wwz.ifremer.fr/cost/). The approach for the workshop was to reproduce the COST input from data that was downloaded from the RDBES and run the estimation procedures on this. Minor differences were found and investigated, they included differences in the way metiers are assigned (or grouped); subsample raising factors; a small number of biological samples that were inadvertently removed.

Figure 2.5 shows the outcome of the national estimation process using the current COST views and the views based on the RDBES data. For all age classes, the differences were less than 0.5%.

Figure 2.5. Outcome of the national estimation process using the current COST views and the views based on the RDBES data.

For estimating discards, the COST and RDBES inputs matched exactly (after correcting a small mistake in the COST input). Therefore, the estimation procedure was not further explored.

No gaps in the RDBES format were identified that prevented replicating the current estimation procedure.

2.1.11.2 Marine Institute, Ireland - whg.27.7a

The national estimation process for the age composition of the landings uses an adaptation of the code developed in the COST project (https://wwz.ifremer.fr/cost/). The approach for the workshop was to reproduce the COST input from data that was downloaded from the RDBES and run the estimation procedures on this. Minor differences were found and need to be investigated. Figure 2.6 shows the outcome of the national estimation process using the current COST views and the views based on the RDBES data. For all age classes, the differences were less than 0.5%.
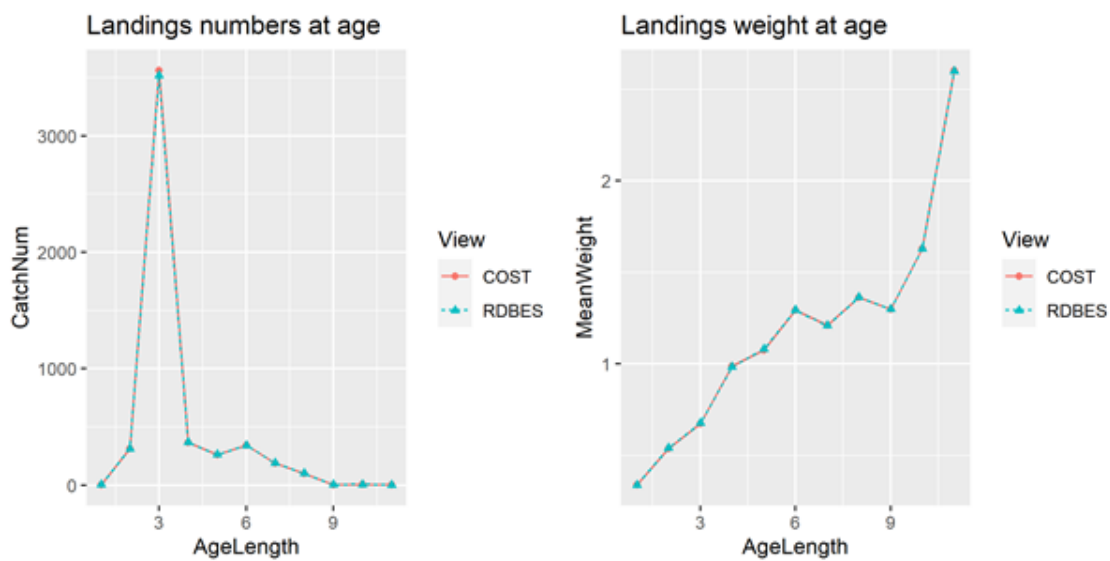
Similarly, for the had.27.7b-k, for estimating discards, the COST and RDBES inputs matched exactly. Therefore, the estimation procedure was not further explored.

No gaps in the RDBES format were identified that prevented replicating the current estimation procedure.
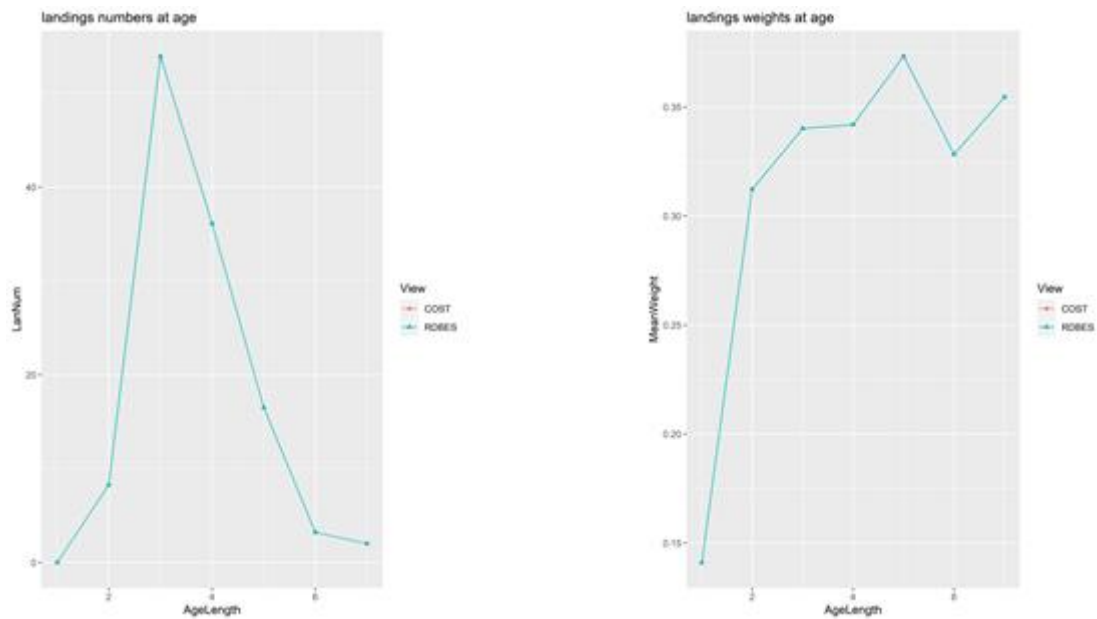
Figure 2.6. Outcome of the national estimation process using the current COST views and the views based on the RDBES data.

2.1.11.3 Marine Institute, Ireland - ple.27.7h-k

The national estimation process for the length composition of the landings uses an adaptation of the code developed in the COST project (https://wwz.ifremer.fr/cost/). The approach for the workshop was to reproduce the COST input from data that was downloaded from the RDBES and run the estimation procedures on this. Minor differences were found and investigated, they included differences in the way metiers are assigned (or grouped); subsample raising factors; a small number of biological samples that were inadvertently removed.

Figure 2.7 shows the outcome of the national estimation process using the current COST views and the views based on the RDBES data. For all length classes, the differences were less than 0.5%.
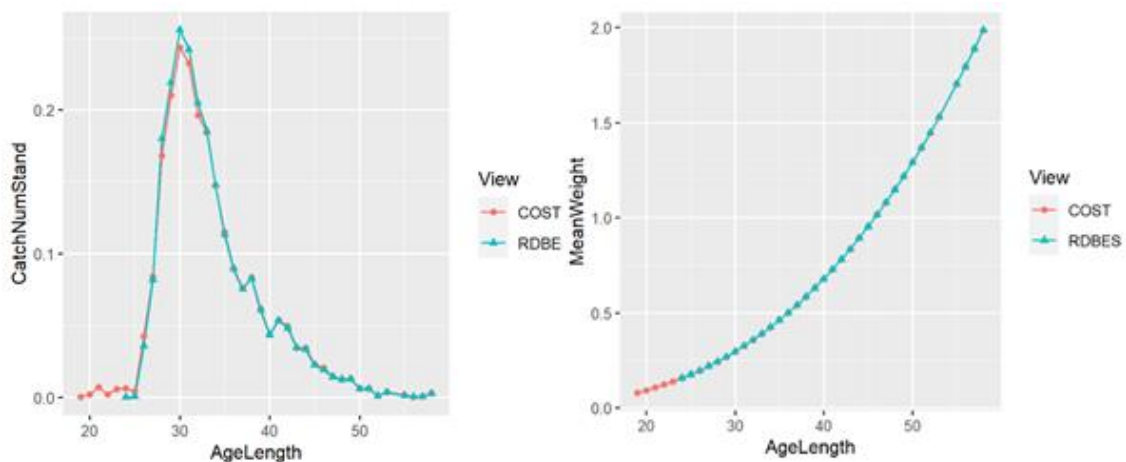
Figure 2.7. Outcome of the national estimation process using the current COST views and the views based on the RDBES data.

For estimating discards, the COST and RDBES inputs matched exactly (after correcting a small mistake in the COST input). Therefore, the estimation procedure was not further explored.

No gaps in the RDBES format were identified that prevented replicating the current estimation procedure.

2.1.11.4 Marine Institute, Ireland - hom.27.2a4a5b6a7a-ce-k8

The national estimation process for the age composition of pelagic landings for submission to the working groups uses internal legacy systems. To replace these systems an R script was developed to replicate the process. The approach for this workshop was to reproduce estimates from data that was downloaded from the RDBES and run the estimation procedures using this updated R script. Minor differences were found and investigated, they included differences in the way fill ins are handled. The catch numbers at age and mean weights at age comparing both methods are presented below (Figure 2.8).

No gaps in the RDBES format were identified that prevented replicating the current estimation procedure.

Figure 2.8. Catch numbers at age and mean weights at age comparing both methods.

2.1.11.5   Marine Institute, Ireland - mac.27.nea

The national estimation process for the age composition of pelagic landings for submission to the working groups uses internal legacy systems. To replace these systems an R script was developed to replicate the process. The approach for this workshop was to reproduce estimates from data that was downloaded from the RDBES and run the estimation procedures using this updated R script. Minor differences were found and investigated, they included differences in the way fill ins are handled. Once this is addressed exact replication will be possible. The catch numbers at age and mean weights at age comparing both methods are presented below (Figure 2.9).

No gaps in the RDBES format were identified that prevented replicating the current estimation procedure.
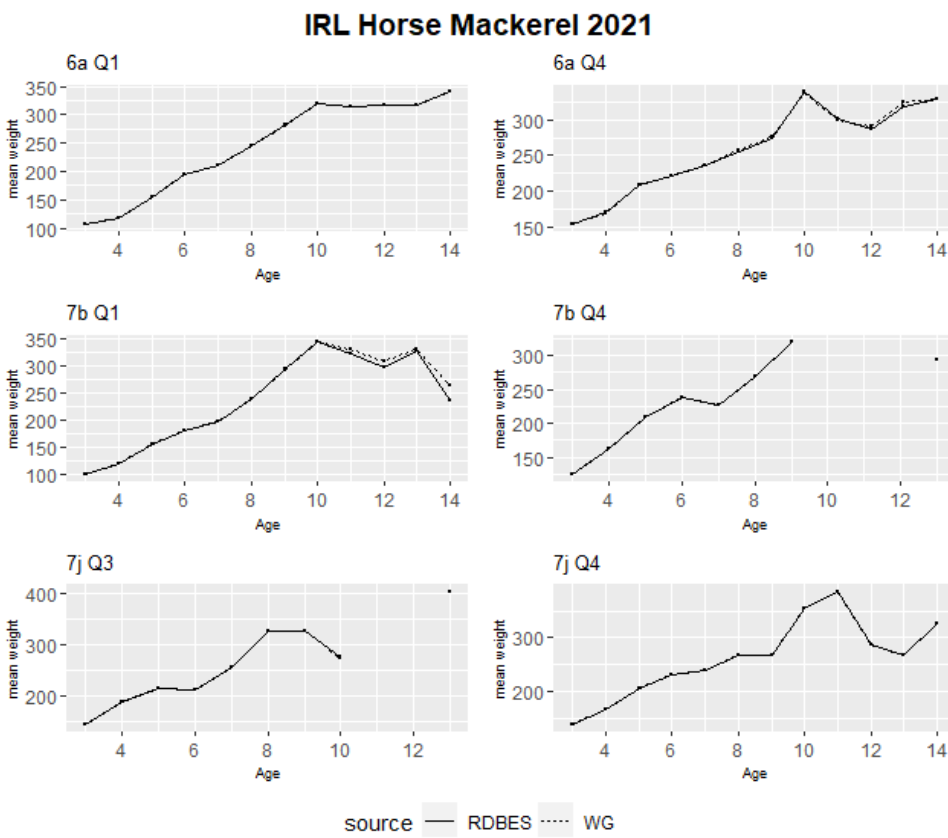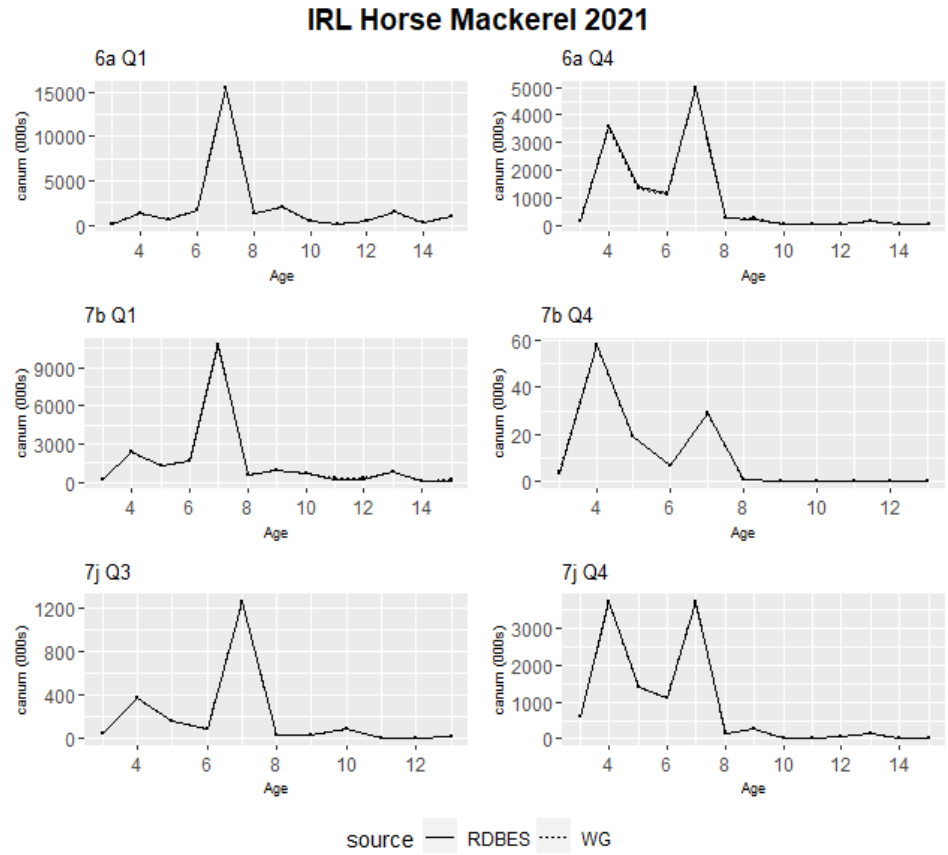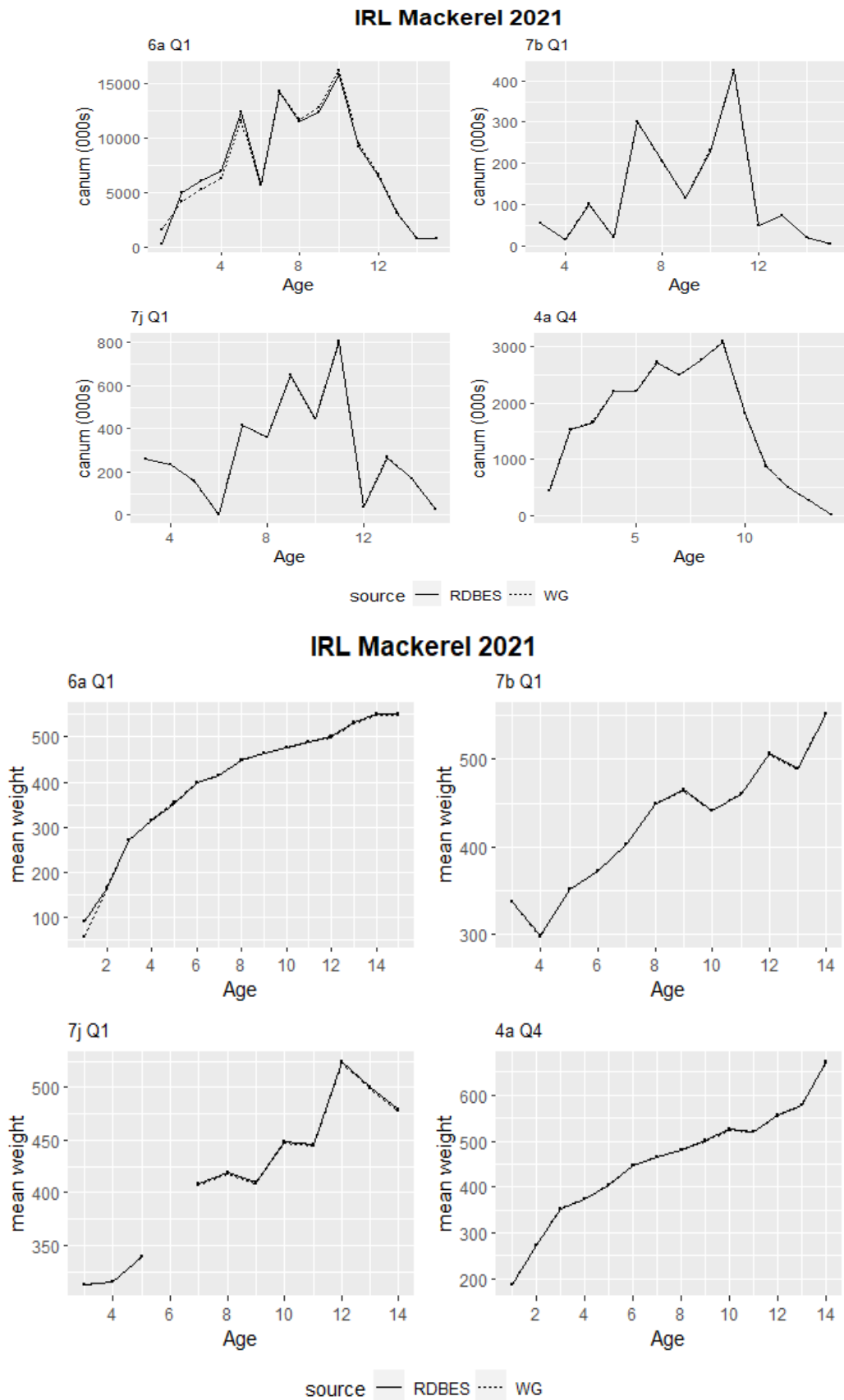
Figure 2.9. Catch numbers at age and mean weights at age comparing both methods.

2.1.11.6 Marine Institute, Ireland - boc.27.6-8

The landings submission files for boarfish are usually produced through a series of R scripts that executes the whole process from accessing the different databases to creating the InterCatch files. For this term of reference, data stored in RDBES were used in the execution of the scripts and to reproduce the InterCatch files. The scripts ran successively and the files for landings by length and age were reproduced with minor differences observed. The differences were investigated and were found to be the result of some declared landings not having a corresponding entry in the operations database. These differences were successively resolved.
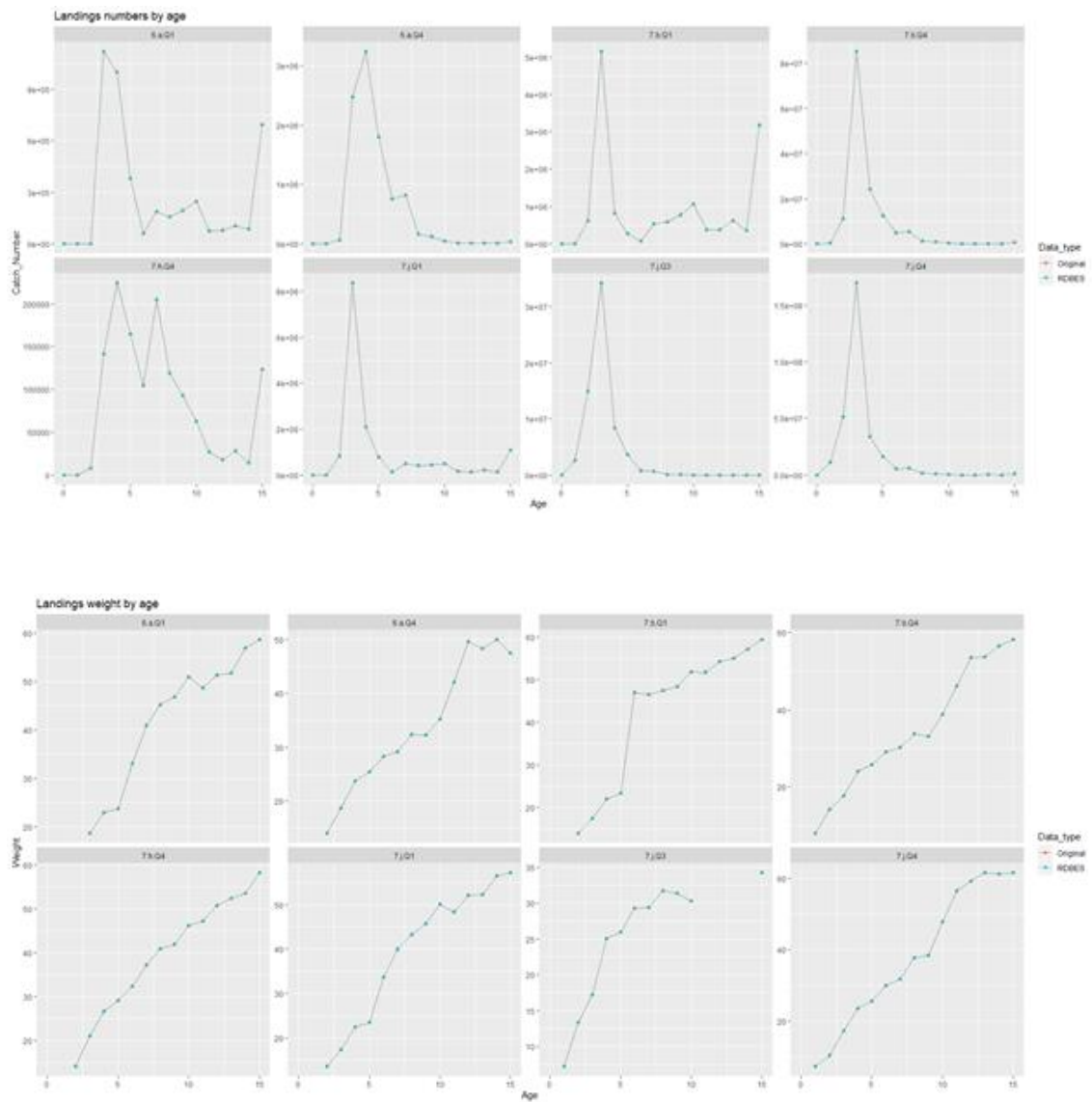
2.1.12 Poland, NMFRI

During the WKRDBES-Raise&TAF workshop, the participation of NMFRI focused on reproducing national estimates based on an example stock. The Baltic plaice stock (ple.27.24-32) was selected for this exercise. The existing routines, which have been used to create the national estimates imported to InterCatch, consist of a series of R and SQL scripts. They extract data from the national DCF database, process them and save in the InterCatch data format. The desired outcome from the workshop was to develop an R script, which takes the national data extracted from RDBES as input and reproduces national estimates uploaded to InterCatch. This task was preceded by an analysis of the format of data downloaded from RDBES. The data were then explored using the ICES RDBES R package developed by RDBES Core Group. After data preparation, the existing national procedures were modified to comply with the new data format. Finally, the numbers at age and mean weights at age were estimated. The comparison of numbers at age estimated from the RDBES data with the values submitted to the InterCatch shows almost no differences.

Landings numbers at age
ple.27.24-32, 2021, Q4, active, SD24
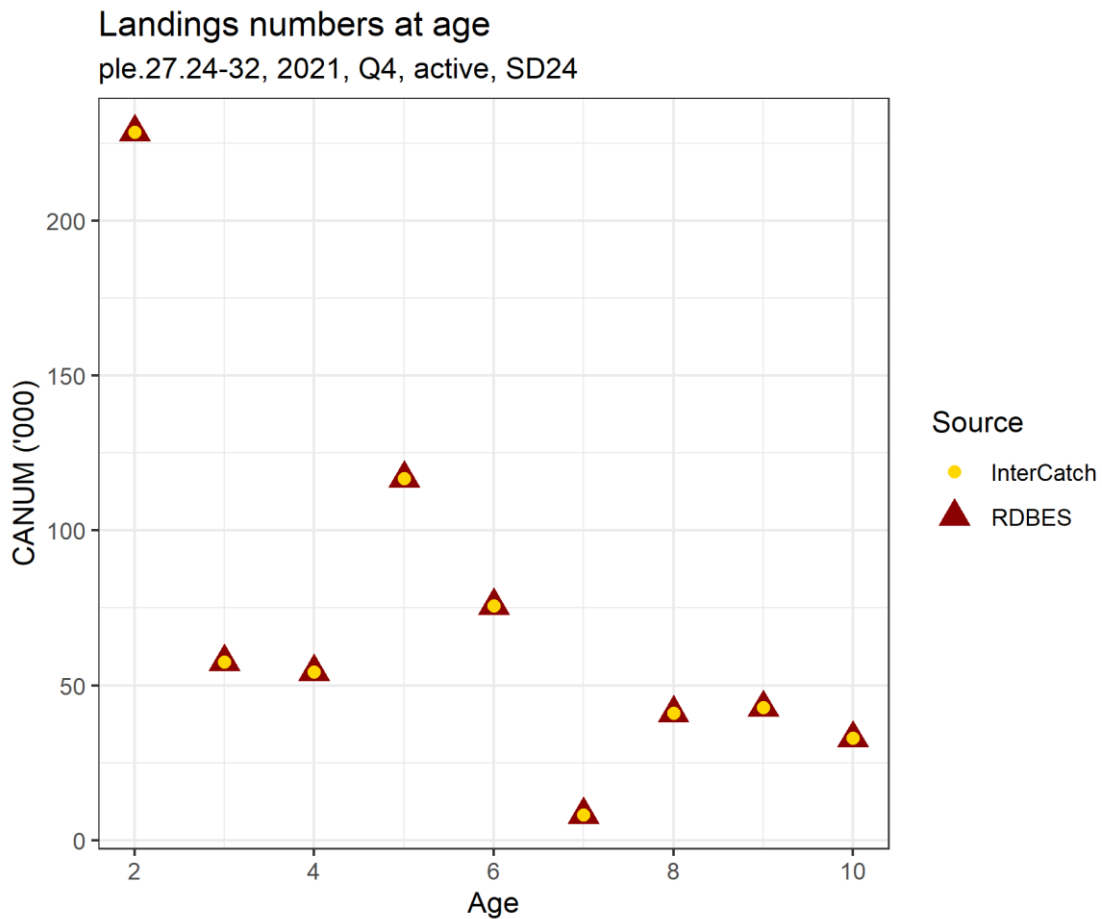
The script developed during the workshop will serve as a basis for further development. It needs to be improved to deal with other stocks where more complex data processing is needed.

3   Reproduction of stock coordination (ToR b)

It was suggested to start writing the R scripts from the current stock extracts that can be down-loaded from InterCatch. Those files show all the imported data related to the relevant stock (stock overview, numbers at age/length, mean weights at age/length). In a continuation of this work, the aim should be to use the output from ToR a) as input.

The progress towards reproducing stock estimates is summarised in Table 3.1.

Table 3.1.

Participants	Prior effort	Stocks	Quantity	TAF progress	Reproduction
IMR, Norway	None	pok.27.3a46	*All CATON, CANUM and WECA*	Started	Reproduced
ILVO, Belgium	7 days	sol.27.7d	*CANUM_LAN, WECA_LAN, CANUM_DIS, WECA_DIS, CATON_DIS*	Started	Reproduced
ILVO, Belgium	None	bll.27.3a47de	*CATON_DIS*	Started	Reproduced
ILVO, Belgium	None	sol.27.7fg	*CANUM_LAN, WECA_LAN, CANUM_DIS, WECA_DIS, CATON_DIS*	Started	Reproduced
IFREMER, France	None	sol.27.8.ab	*CANUM_LAN, WECA_LAN, CANUM_DIS, WECA_DIS, CATON_DIS*	Started	Reproduced
Marine Institute, Ireland	None	had.27.7b-k	*CANUM_CATCH, WECA_CATCH*	Started	Qualitatively Reproduced
AFBI, UK	None	cod.27.7a	*CANUM_LAN* *CANUM_DIS* *CANUM_CATCH* *WECA_CATCH* *CATON_DIS*	Started	Reproduced: CANUM, CATON Issues: WECA_Catch/WECA_DIS this is a work in progress and looking for a way forward.

Prior effort: If any work was done in adapting the estimate(s) to RDBES and TAF before the workshop. Use categories: 'None', 'days', 'weeks''

Stocks: stocks reproduced, uses ICES stock codes

Quantity: Which quantity was estimated. Free text, but may be using the following abbreviations:

- *CANUM_LAN*: numbers-at-age or length for the landings
- *WECA_LAN*: mean weights-at-age or length for the landings
- *CANUM_DIS*: numbers-at-age or length for the discards
- *WECA_DIS*: mean weights-at-age or length for the discards
- *CANUM_CATCH*: numbers-at-age or length for the catch
- *WECA_CATCH*: mean weights-at-age or length for the catch
- *CATON_DIS*: total discards in weight

TAF progress: To what extent TAF was used in the reproduction.

- *Started*: Did not organise code according to TAF standards.
- *Partial*: the estimate was organised with the standard TAF directories and scripts (icesTAF::taf.skeleton)
- *Complete*: the estimate can be re-run with icesTAF::sourceAll

Reproduction (started from the InterCatch input files): To what extent the reproduction was successful:

- *Started:* Did not progress far enough to conclude on reproduction.
- *Reproduced*: Results are reproduced to the satisfaction of the person implementing the reproduction.
- Partial: Results are not reproduced to the satisfaction of the person implementing the reproduction, but the reasons why are thought to be understood and described in this report.
- *Issues*: Results are not reproduced to the satisfaction of the person implementing the reproduction,

3.1 Report from reproduction studies

3.1.1 IMR, Norway

The comparisons were based on InterCatch 2021 inputs (stockOverview, NumbersAtAgeLength and MeanWeigthAtAgeLength) and outputs saved before the 2022 assessment working group (WGNSSK), for the North Sea saithe (pok.27.3a46).

The scripts developed by IMR replicate

1. the InterCatch discards raising by strata based on (i) main trawling fleet (TR1), from the main countries (Germany, France and Norway), per quarter and (ii) for the rest, distinction of TR1 (other countries only) from others métiers, per quarter and ICES subdivision group (4 and 6 together, 3). The replicated discard raising used the default CATON weighting.
2. the age sample allocations
   a. for landings per quarter and area (all métiers together), and for all seasons together in area 6 due to scarce samples. Some landings reported at the year resolution in area 4 were further matched to age samples from all seasons in the same area.
   b. for discards and below minimum size (BMS) landings together, matched to all age samples within area 3 and 6 together, or 4 (all seasons grouped, due to scarce data).
3. and the corresponding catch at age and mean weight imputations (including 10+ group) for landings, discards, BMS landings and whole catch, using the default weighting based on numbers at age.

Figure 3.1 to 3.3 show the relative difference between the original and new estimates for different portions of the catch.

Figure 3.1: Relative difference between original (IC) and new (scripts) estimates of overall catch weights for various portions of the catch. C: whole catch, B: BMS landings, D: discards, L: landings.

Figure 3.2: Relative difference between original (IC) and new (scripts) estimates of catch number at age for various portions of the catch. C: whole catch, B: BMS landings, D: discards, L: landings. Age 10 is a "plus" group.
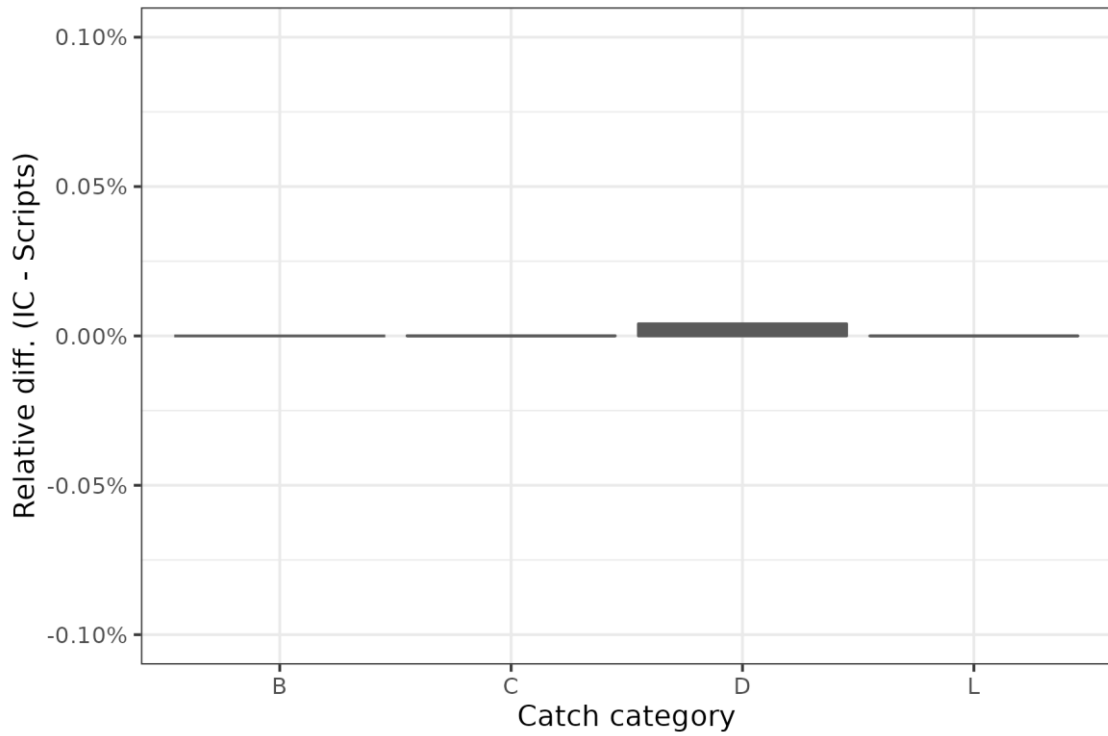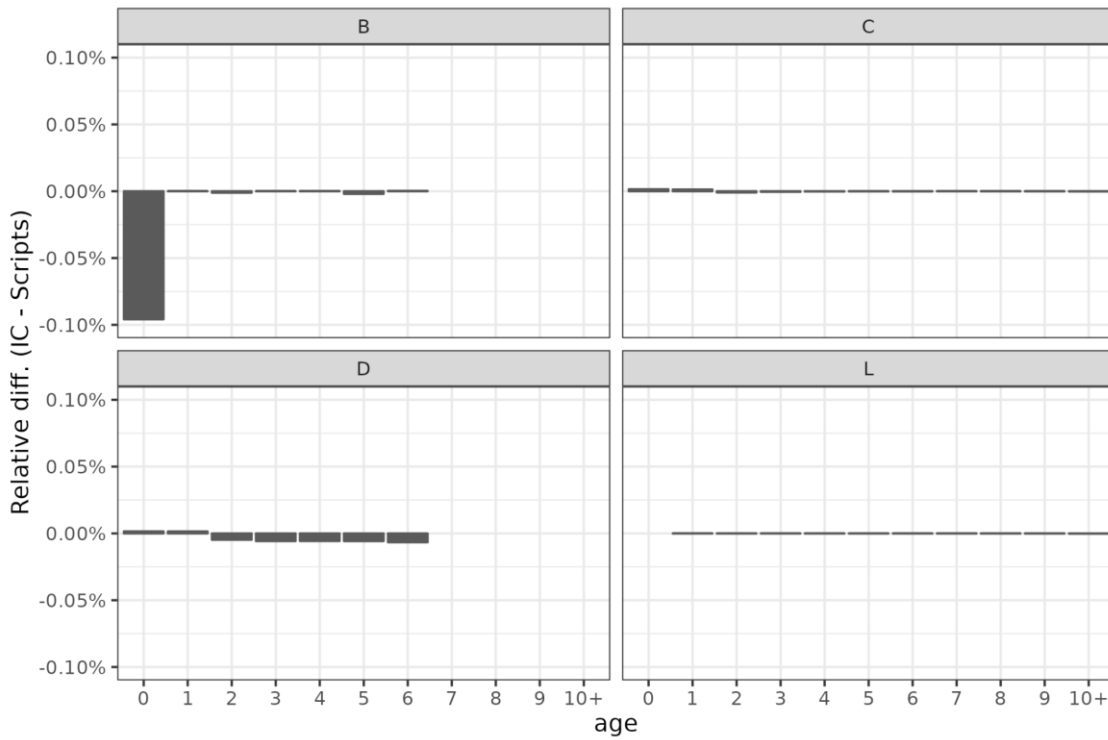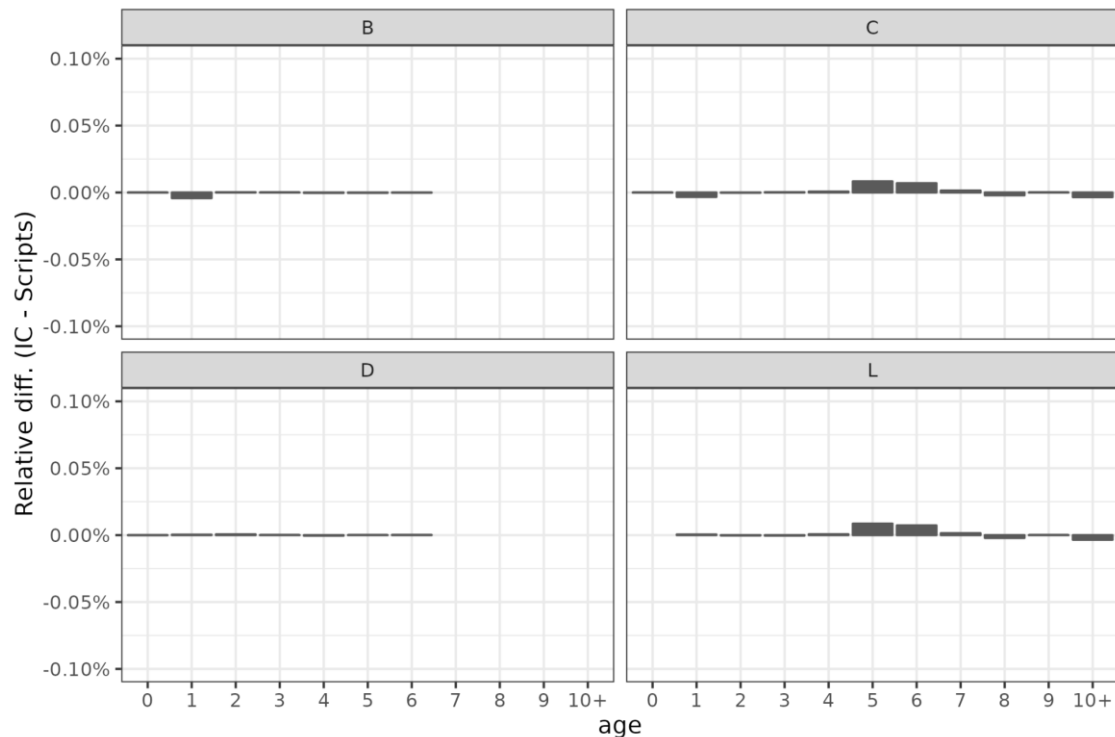
Figure 3.3: Relative difference between original (IC) and new (scripts) estimates of mean weights at age for various portions of the catch. C: whole catch, B: BMS landings, D: discards, L: landings. Age 10 is a "plus" group.

Differences are very low (less than 0.01% for all except for one estimate), and consistent with InterCatch internally using and reporting rounded values. In particular, BMS landing numbers at age zero were <1 individuals, making the InterCatch rounded report the main culprit for the relatively larger deviation observed for this category (Figure 3.2, top-left panel). The replication was therefore deemed completely successful for the North Sea saithe.

Moreover, BMS landings in the NS saithe assessment are allocated to different catch categories depending on their country of origin (to landings for Norway and discards for other countries, following the 2016 benchmark decisions). InterCatch outputs are usually post-processed to consistently propagate changes in the catch and weights at age, but the replication of the InterCatch stock estimates offers the opportunity to further incorporate this step in the stock estimate calculations. This was implemented during the workshop but not fully tested, and results are therefore not shown.

The scripts produced during the week allow to flexibly define strata for discards raising and age allocation groups (with possibility for those to use the same samples for imputations within several strata, when deemed relevant), but still lack genericity. Future development will focus on integration within the TAF framework, data exploration to help defining the groups, and code genericity.

3.1.2 ILVO, Belgium

For the reconstruction of InterCatch estimation for the sol.27.7d, sol.27.7fg and bll.27.3a47de stocks, ILVO developed a script starting from the 'StockOverview.txt', 'MeanWeightAt-AgeLength.txt' and 'NumbersAtAgeLength.txt' currently available from InterCatch after extracting the uploaded data.

Discards were raised for all landing strata (excl. BMS landings). First imported landing and discard strata were matched, then a ratio was calculated: discard caton over landing caton. These ratios were then applied to all landing strata without discards according to gear groups (e.g. TBB, GTR/GNS, OTB/SSC/SDN and REST) using the CATON weighting as described in the stock annex.

Age or length allocation was performed per fate category (discards (incl. BMS) with discards, landings with landings and IBC landings (when available) with both discard and landing information) for the different gear groups. Numbers-at-age/length and mean weights-at-age/length were calculated using the 'mean weight weighted by numbers at age/length weighting factor.

In the aggregation step, final numbers-at-age/length were calculated as the sum of the numbers-at-age/length from the sampled strata and the strata where a distribution was allocated. The final mean weights-at-age were calculated by multiplying the mean weight-at-age/length per gear group with the corresponding numbers divided by the overall sum of the numbers per gear group and taking the overall sum. For both the numbers-at-age/length and the weight-at-age/length, a plusgroup was made.

An overview of the CATON and numbers and weight-at-age for sole in 27.7d are shown in the table below. Minor differences are due to rounding.

2021	Method	LAN CATON	DIS CATON*
sol.27.7d	InterCatch	1561.317	347.958
	R	1561.318	347.958
	Diff	0.001	0.000
sol.27.7fg	InterCatch	1335.715	61.637
	R	1335.716	61.638
	Diff	0.001	0.001
bll.27.3a47de	InterCatch	1546.65106	151.60579
	R	1546.65106	151.60567
	Diff	0.00000	-0.00012

* including BMS

2021	sol.27.7d											
	Landings						Discards					
Method	InterCatch	R	Diff	InterCatch	R	Diff	InterCatch	R	Diff	InterCatch	R	Diff
Age	Numbers			Weight (in kg)			Numbers			Weight		
0							38.69503	38.69502	-0.00001	0.03405	0.03405	0.00000
1	77.879521	77.879518	-0.000003	0.13055	0.13055	0.00000	921.34965	921.34968	0.00003	0.07942	0.07942	0.00000
2	390.171740	390.171738	-0.000002	0.15854	0.15853	-0.00001	713.57196	713.57198	0.00001	0.10602	0.10602	0.00000
3	2024.842322	2024.842320	-0.000002	0.18711	0.18711	0.00000	1091.88801	1091.88804	0.00003	0.10799	0.10799	0.00000
4	1176.993765	1176.993769	0.000004	0.22898	0.22898	0.00000	445.68520	445.68523	0.00003	0.10873	0.10873	0.00000
5	1007.693587	1007.693591	0.000004	0.25384	0.25384	0.00000	118.98666	118.98669	0.00003	0.11599	0.11599	0.00000
6	449.001188	449.001166	-0.000022	0.29349	0.29349	0.00000	28.59199	28.59200	0.00002	0.10701	0.10701	0.00000
7	376.221052	376.221004	-0.000048	0.29415	0.29415	0.00000	18.88471	18.88408	-0.00063	0.11755	0.11755	0.00000
8	230.152995	230.152971	-0.000024	0.32719	0.32719	0.00000	3.80543	3.80543	0.00000	0.12223	0.12223	0.00000
9	116.503928	116.503924	-0.000004	0.37832	0.37832	0.00000	0.50073	0.50073	0.00000	0.11674	0.11674	0.00000
10	62.087762	62.087741	-0.000021	0.39431	0.39431	0.00000	0.37202	0.37202	-0.00001	0.12000	0.12000	0.00000
11	63.609555	63.609577	0.000022	0.36506	0.36506	0.00000	0.02860	0.02861	0.00001	0.12800	0.12800	0.00000
12	37.705850	37.705846	-0.000004	0.53181	0.53181	0.00000						
13	30.678581	30.678593	0.000012	0.53368	0.53368	0.00000						
14	20.766159	20.766152	-0.000007	0.57134	0.57134	0.00000						
15+	35.014000	35.014922	0.000922	0.53901	0.53900	-0.00001						

2021	sol.27.7fg											
	Landings						Discards					
Method	InterCatch	R	Diff	InterCatch	R	Diff	InterCatch	R	Diff	InterCatch	R	Diff
Age	Numbers			Weight (in kg)			Numbers			Weight (in kg)		
0												
1	0.000556	0.000555	-0.000001	0.12037	0.12038	0.00001						
2	52.973073	52.973080	0.000007	0.15009	0.15009	0.00000	75.192722	75.192725	0.000003	0.10983	0.10983	0.00000
3	528.283243	528.283265	0.000022	0.18694	0.18694	0.00000	159.890155	159.890159	0.000004	0.11610	0.11610	0.00000
4	954.087876	954.087869	-0.000007	0.22349	0.22349	0.00000	123.497510	123.497514	0.000004	0.12382	0.12382	0.00000
5	1847.943195	1847.943211	0.000016	0.25770	0.25770	0.00000	95.927485	95.927483	-0.000002	0.12828	0.12828	0.00000
6	895.323122	895.323116	-0.000006	0.26723	0.26723	0.00000	46.735698	46.735696	-0.000002	0.13156	0.13156	0.00000
7	357.096446	357.096485	0.000039	0.35192	0.35192	0.00000	4.076398	4.076402	0.000004	0.13548	0.13548	0.00000
8	123.464292	123.464301	0.000009	0.41943	0.41943	0.00000	3.361098	3.361100	0.000002	0.14300	0.14300	0.00000
9	63.088619	63.088619	0.000000	0.49348	0.49348	0.00000						
10	56.590104	56.590125	0.000021	0.47863	0.47863	0.00000						
11	29.979418	29.979438	0.000020	0.51405	0.51405	0.00000						
12	15.144184	15.144197	0.000013	0.58448	0.58448	0.00000						
13	23.798661	23.798681	0.000020	0.55532	0.55531	-0.00001						
14	21.290175	21.290177	0.000002	0.55448	0.55448	0.00000						
15+	23.610000	23.610816	0.000816	0.64332	0.64329	-0.00003						

3.1.3 Marine Institute, Ireland – had.27.7b-k

For this stock, InterCatch is not used to allocate unsampled discards and landings. Instead this is already done in an R script. This script was reviewed and accepted at the most recent benchmark. Therefore, there is no further work to do under ToR b for this stock.

3.1.4 AFBI, UK -cod27.7a

For the reconstruction of InterCatch estimation for the cod.27.7a stock, AFBI adapted an approach set out by ILVO, described above, using 'StockOverview.txt',

'MeanWeightAtAgeLength.txt' and 'NumbersAtAgeLength.txt' currently available from Inter-Catch after extracting the uploaded data. The files had to be pre-processed to include a column for mesh size, as the metiers in the Irish Sea are largely distinguished by those.

Discards were raised for all landing strata (excl. BMS landings). First imported landing and discard strata were matched, then a ratio was calculated: discard caton over landing caton. These ratios were then applied to all landing strata without discards according to gear groups (e.g. TR1, TR2 and REST) using the CATON weighting as described in the stock annex. CATON, total discards and total landings were reproduced successfully.

Numbers at age for landings and discards were fully reproduced (bar a few rounding errors) as well as the total catch numbers at age.

Age allocation was performed per category with discards and landings for the different mesh size groups. Numbers-at-age/length and mean weights-at-age/length were calculated using the 'mean weight weighted by numbers at age/length weighting factor.

In the aggregation step, final numbers-at-age/length were calculated as the sum of the numbers-at-age from the sampled strata and the strata where a distribution was allocated. The final mean weights-at-age were calculated by multiplying the mean weight-at-age per mesh-size group with the corresponding numbers divided by the overall sum of the numbers per gear group and taking the overall sum. For both the numbers-at-age and the weight-at-age, a plusgroup was made.

The reproduction was successful for numbers at age in both discards and landings. Weights at age (weca) could not be reproduced so far. InterCatch is only used to estimate weca for the whole catch, rather than separately for landings and discards, however, so far the procedure is not able to reproduce the mean weights. Mean weights for the older age classes are closer to the Inter-Catch output, however ages 1 and 2 are considerably below the InterCatch values. This is likely due to the very low amount of sampled discards in the TR1 group (only 6 kg of discards were sampled in the TR1 group, in the TR2 group 600 kg were sampled, all the same quarter). This results in considerably low mean catch weights for the discards.

Further investigations will be necessary.

Quantity	Intercatch	Reproduction
Landings (tonnes)	133.274	133.274
Discards (tonnes)	4.033	3.997
CANUM (catch at age) 1	11.814	11.723
2	22.123	22.084
3	13.094	13.094
4	4.719	4.719
5	0.292	0.292
6	0.703	0.704

4 TAF - structure and roles (ToR c)

During WKRDBES-Raise&TAF, a subgroup was dedicated to define the user roles and TAF structures that are thought to be required in the workflow where the RDBES supports both estimation from raw-data, and provides input to stock assessments. The proposals from this subgroup were discussed in plenary and are summarised below.
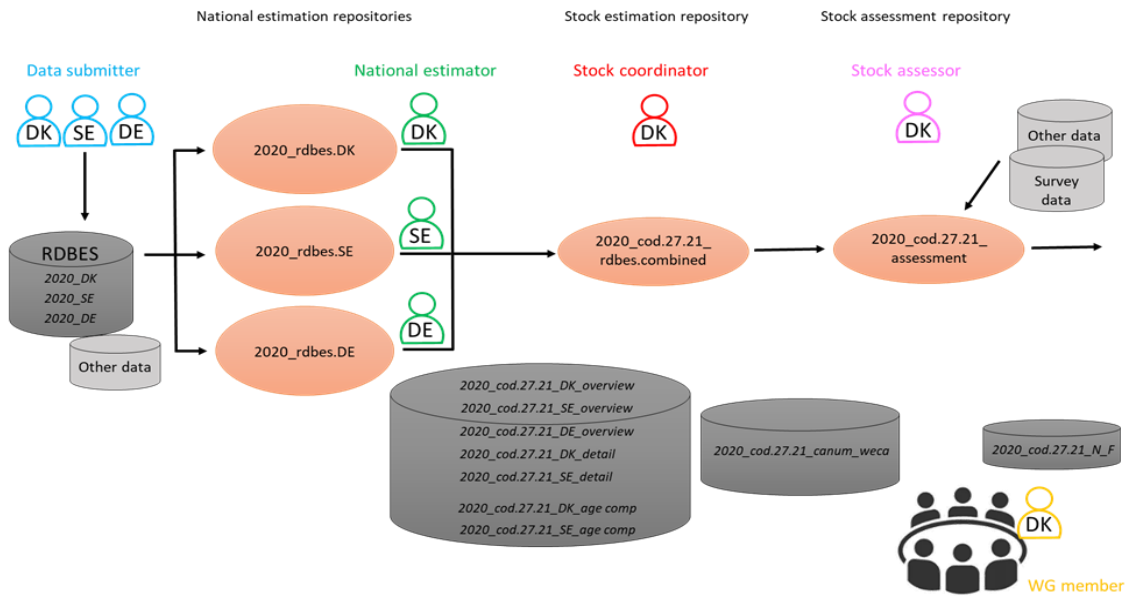
In this workflow (cod.27.21 as an example), the raw data of the countries fishing for cod in the Kattegat, are uploaded in the RDBES. National TAF repositories (one for each of the countries involved: Denmark (2020_DK), Sweden (2020_SE) and Germany (2020_DE)) are set up so that all the national data can be downloaded from the RDBES and are available to create the national estimates. This is demanding as in some raising procedures, the volume of discards is proportional to the landings of all species. The output of those national repositories for cod.27.21, will be stored in an 'intermediate output database' and will be the input for the stock estimation TAF repository. Those intermediate outputs are not only the national age and or length compositions (e.g. 2020_cod.27.21_DK_age_comp), but also an overview that presents the national cod.27.21 data in a more aggregated format (e.g. 2020_cod.27.21_DK_overview). In this overview it would be informative to include more details on the data that were used in the estimation (e.g. outliers). It would be beneficial to define a standard format for those overviews, so that they can be generated in an automatic procedure. However, this raises concern when the data need to be preprocessed (grouping of métiers) by a national expert. A detailed, raw cod.27.21 data set would only be available if the country gives permission (e.g. 2020_cod.27.21_DK_detail). The stock assessment procedures are done in the stock assessment TAF repository (already implemented for some stocks) and need the output from the stock estimation repository as input. The numbers at age and mean weights at age of the stock (e.g. 2020_cod_27.21_canum_weca), the national age and/or length compositions, and the national overviews will be available in the intermediate output database for all the members of the working group. For the assessment audit procedure, a WG member needs access to all the relevant input and output assessment information.

In order to reduce the demand of publishing several data calls, it is important that secondary users of the data (e.g. ICES special requests) get access to the relevant stages in this workflow.

In the future a regional estimation approach might be more common, therefore it should be possible that a national estimator gets access to the repositories from the countries involved.

Table 4.1. User roles and the corresponding 'read and edit' restrictions

Intermediate output	Data submitter (RDBES)			National estimator (TAF repos)			Stock coordinator (TAF repos)	Stock assessor (TAF repos)	WG member
	DK	SE	DE	DK	SE	DE			
2020_DK	👁 ✏			👁					
2020_cod.27.21_DK_detail				👁 ✏			[👁]	[👁]	
2020_cod.27.21_DK_overview				👁 ✏			👁	👁	👁
2020_SE		👁 ✏			👁				
2020_cod.27.21_SE_detail					👁 ✏		[👁]	[👁]	
2020_cod.27.21_SE_overview					👁 ✏		👁	👁	👁
2020_DE			👁 ✏			👁			
2020_cod.27.21_DE_overview						👁 ✏	👁	👁	👁
2020_cod.27.21_DK_age comp				👁 ✏			👁	👁	👁
2020_cod.27.21_SE_age comp					👁 ✏		👁	👁	👁
2020_cod.27.21_canum_weca							👁 ✏	👁	👁
2020_cod.27.21_N_F								👁 ✏	👁

👁 Read and download [👁] Read and download if country gives permission
✏ Edit

Table 4.1 summarises the user roles and the corresponding 'read and edit' restrictions.

The following user roles and tasks were defined (note that a single person can hold multiple roles at the same time):

· **Data submitter**:

- is responsible to upload new data to the RDBES from his country

- can delete any existing data in the RDBES that originated from his country

· **National estimator**:

- can download all data from the RDBES from his country

- is responsible to produce national estimates (age and or length compositions) of stock X

- is responsible to produce the national overview of stock X

- is responsible to produce a detailed (raw) data set of stock X

· **Stock coordinator for stock X**:

- can download the national estimates of stock X

- can download the national overviews of stock X

- can download the detailed data sets of stock X, if country gives permission

- is responsible for the stock X - coordination tasks to provide input to stock assessments

· **Stock assessor for stock X**:

- can download the national estimates of stock X

- can download the national overviews of stock X

- can download the detailed data sets of stock X,, if country gives permission

- can download the assessment input (canum and weca) of stock X

- is responsible for the stock X - assessment tasks to provide advice

· **WG member**:

- can download the national estimates of stock X

- can download the national overviews of stock X

- can download the detailed data sets of stock X, if country gives permission

- can download the assessment input (numbers at age (canum) and mean weights at age(weca) of stock X

- can download the assessment output (stock numbers (N) and fishing mortality (F)) of stock X

WKRDBES-Raise&TAF felt the need to test this proposed workflow on a small scale as the way forward. Therefore a recommendation was made to the WGRDBESGOV to arrange a workshop were 2 stocks (pok.27.3a46 (Saithe (*Pollachius virens*) in Subareas 4, 6 and Division 3.a (North Sea, Rockall and West of Scotland, Skagerrak and Kattegat) and wit.27.3a47d (*Witch (Glyptocephalus cynoglossus)* in Subarea 4 and Divisions 3.a and 7.d (North Sea, Skagerrak and Kattegat, eastern English Channel)) will be set up to go through the whole flow. During this test, format specifications of the detailed data set and the national overviews should be continued. Those stocks were chosen as the data submitters, stock coordinators/stock assessors for those stocks were present at the meeting and could express their interest. There was a preference to organise this workshop in January/February 2023 and to spread the meeting days over time, to be able to work on it in between.

Confidentiality related problems were also discussed at WKRDBES-Raise&TAF, resulting in the suggestion to only give access to the detailed data set for a particular stock, if the country gives permission. Grant access by default, raised concern that this would stop people from uploading data to the RDBES because this might conflict with their national rules to ensure confidentiality. WKRDBES-Raise&TAF discussed the best way to implement giving permission. It was suggested to add a contact list to every data call, so that the stock coordinator or stock assessor knows who to contact if he or she wants access to the detailed stock data. Another suggestion was to work with a pre-approval for all the stock coordinators and stock assessors that are members of a working group, to use the detailed data for advice on fisheries management. There was a general feeling that it's good to share data, but we need the right data licence to deal with this. It should also be clearly stated who is responsible to give this permission (e.g. the national correspondent). It was agreed that this implementation should be addressed by the WGRDBES-GOV.

5 TAF - standard outputs (ToR d)

ToR d was addressed through a subgroup meeting and a plenary discussion. A summary of the discussions is presented below, followed by some remarks about how to continue the process of specifying standard RDBES output formats for TAF. Refer to Figure 1 and 2 for an illustration of where in the estimation process these formats will be used.

Summary of ToR d discussions

Colin Millar summarised in his presentation a potential structure for estimation in RBDES, that emerges from the RDBES Core group work and previous workshops. This outlines one TAF standard output for "National Estimates", and one standard output for "Stock Estimates". This reflects the workflow pre-RDBES, where the corresponding standard output format for "National Estimates", is the "Intercatch input format" and the corresponding output format for "Stock Estimates" is the "Intercatch output format" (Figure 3, WGRDBESGOV; outputs from 2021 meeting).

WGRDBESGOV 2021 also identified that the standard output formats must be compatible with legacy formats in the sense that it should be possible to convert from InterCatch formats to the new standard formats (Figure 4, WGRDBESGOV; outputs from 2021 meeting).

Simply adopting the InterCatch formats as the new standard would be too restrictive for two reasons:

- A key motivation for RDBES has been to facilitate the calculation of uncertainty measures, such measures should be communicated to the users and available for downstream analysis (stock assessment).

- Experience with InterCatch has shown that the domains for which estimates are requested (e.g. DCF metier level 6) are not always the right level of detail for all users and assessment WGs. Therefore, the output format should allow a more flexible domain definition so that policies on how to report can be adopted to respond to the specific assessment needs.

Based on these two desired changes to the InterCatch formats, we discussed requirements for new standard output formats that are summarized below.

Compatibility
Any new information facilitated by the new standard output format must be made optional, in order to ensure compatibility with legacy formats.

Uncertainty measures
There are many variants of uncertainty measures that may be desirable to report, but we should keep in mind that it is also possible to extract non-standard outputs from a TAF-project, and we should try to identify which uncertainty measures are most commonly applicable. The standard output should have a field describing a scalar error measure type and a field describing its value (e.g. type: "standard deviation", value: 1).

In addition, we discussed more complex ways of representing the uncertainty:

- Some representation of a statistical distribution, type of distribution and parameters in standard notation, eg. "N(0,1)" for a normally distributed error with a standard deviation of 1.

- Some representation of intervals. A value for upper bound, a value for lower bound, and some representation of the type of interval. We recognized that there are many more options than the most common ones (different levels of confidence intervals, different kinds of Bayesian intervals), and it will be important to either be very general or make a conscious choice of what to support.

Interval representations have the benefit that they can be used to analyse how the uncertainty propagates to downstream analysis, even when those analyses are not adapted to dealing with quantitative uncertainty measures. Any stock assessment method that can handle a point estimate, can also be run with one of the interval bounds. It is however not obvious how they should be aggregated when domains are summed. This may limit their usefulness for "National Estimates".

Configurable domain definition

InterCatch has rigid definitions of domains (e.g. Métier, Division, Quarter). It would be advantageous to have more flexible domains.

The situations we discussed as motivating cases were:

- The precision of an estimate is generally lower the more it is partitioned. Partitioning an estimate into small domains, and then later summing over these domains lead to loss of precision, and in some cases the stock coordinator may simply re-assemble the national estimate to the total it was decomposed from. In some cases, this can lead to real loss of precision in the estimate, and in some cases to errors in the uncertainty estimates.

- Often we spend considerable effort making it possible to provide an estimate for low-activity domains (métiers with small volume of catch). It would be nice to be able to discuss with the stock coordinators ways to group them, or to decide not to provide estimates for them. That requires that the domain specification is subject to policy and to technical constraints.

We recognized the need for some restrictions on how to define domains. As an example, we suggest that it may not be possible to define overlapping domains. It is also desirable to be able to look up in CL and CE tables what the total volume and effort is for the domains. Both suggest that the variables used to define domains should be those that exist in the CL table, and possibly the CE table as well.

Other quality indicators

We discussed additional quality indicators:

- sample sizes should be available, and specifically defined to make sure they are well interpreted. Since we don't envision effective sample sizes to be readily available, we suggest facilitate those that are common for most sampling: "number of lengths sampled", "number of weights sampled", "number of ages sampled", and "number of PSUs sampled", where PSU are the primary sampling units.

- We would like a way to flag when a domain is estimated with or without the use of imputation. When imputation is used, this could be flagged as a simple TRUE/FALSE or it could be documented where the imputation originated from (i.e. beam trawl data were

used to impute a bottom trawl domain). This would allow the stock coordinator to iden-tify large domains that have been imputed using small or poorly sampled domains. It could also enable the stock assessor to disregard an estimate for a domain if better op-tions for imputation are available from other countries' domain estimates.

Summary requirements

In summary, we suggest the following requirements for the output format to be further consid-ered, along with the remarks above:

Standard TAF output format for "National Estimates":

- Cannot be more restrictive than "InterCatch input format". It should be possible to con-vert from "InterCatch input format" to the new standard output format.

- Should present measures of uncertainty that can be aggregated in a standard way when domains are summed (optional).

- Should present sample sizes for the sampling units and parameters that are common to most sampling programs: "number of lengths sampled", "number of weights sampled", "number of ages sampled", "number of PSUs sampled", "type of PSU" (optional).

- Should have a configurable domain definition (compatible with InterCatch domains), so that which domains to report national estimates for can be agreed directly between na-tional estimators and the stock coordinators.

Requirements for standard TAF output format for "Stock Estimates":

- Cannot be more restrictive than "Intercatch output format". It should be possible to con-vert from "Intercatch output format" to the new standard output format.

- Should present measures of uncertainty (optional).

Continuation of format specification

The requirements suggested above are the result of initial discussions on standard output for-mats for RDBES-TAF repositories. They serve to illustrate that it is necessary to develop these formats beyond just adapting the formats of InterCatch, and they serve as a starting point for further discussions. Such discussions should lead to a detailed format specification and practical testing of the format by national estimators, stock coordinators, and stock assessors. If a follow up WKRDBES-Raise&TAF workshop is arranged in 2023 we suggest that ToR d is adapted to continue the format specification.

6 RDBES issues

We did not identify any cases where the RDBES data model did not support the necessary estimation. However, solutions to some issues are still being pursued and requests for adaptations of the data model should not be excluded completely.

Some issues were reported that do not directly imply that changes to the data model are necessary, but indicate some barriers to usage:

- Currently, each UK country submits CL and CE data individually, by vessel flag. However, to reproduce the current estimation procedures, each UK country should have access to the landings of the other UK flag vessel into their country (e.g. UK-England Cefas should have access to the landings from Scottish vessels into English Ports). This situation needs to be solved by allowing access to all UK CL and CE data or needs to be nationally coordinated.

- Some countries report that the responsibility for reporting landings, effort and samples are split between different institutions. Any issues encountered in the use of landings for estimation requires that those institutions harmonise their approach to populate the data model (how to use scientific weights in landings, which taxonomic level to report species that are hard to distinguish, etc.)

- In general, there may be a need to harmonize the practices for submitting CL and CE data. Some consider sales-notes to be official data for landings also in terms of the data used to partition them in the CL table (area-codes, gear-codes, etc.) while some consider logbooks or some joint logbook and sales-notes data to be the basis for CL. There are also various approaches on how to report species with unreliable species-identification. A suggestion for guidance for the current CL definition is included in annex 3. We propose that the core-group reviews this and considers if the definition of official weight needs to be clarified (for the variables that partition the landings in CL). For instance:

  - if they should be based on sales-notes or some combination of sales notes and landings.

  - if it is clear how to provide scripts for the scientific weight, when this is based on CS-data and part of the estimation in TAF.

  - If it is desired to have a clearer distinction on when scientific weights equal to official weight does signify an endorsement of the official weight, and when it does not (keeping in mind that the RDBES will issue data calls for all landed species).

Some comments were made on the current RDBES-TAF workflow that may need some clarification on responsibilities:

- It was remarked that the archiving of results from both "National Estimates" and "Stock Estimates" is currently not facilitated by either TAF or RDBES. TAF supports their recalculation, but practical difficulties in arranging the exact computational environment for recalculation makes this approach cumbersome and time-consuming (e.g. obtaining the correct version of R-libraries).

7 Evaluation of the RDBES roadmap

The Roadmap for the RDBES development as it is laid out in the report of WGRDBESGOV 2021[2] anticipates that the RDBES should be considered in production as of 2023 and that InterCatch should be terminated if appropriate in 2024. Testing the production of stock-assessment input, as was done at this workshop, is identified as a requirement for transitioning into RDBES production use. At this workshop we have identified no technical reason why this plan should not be followed. At the same time, only a few national stock estimates were carried through to complete reproduction of "National Estimates", and no participant would volunteer to be the pioneering user of RDBES for the production of estimates next year.

We would therefore suggest to revise the roadmap and allow RDBES to be in a test phase also for 2023, so that the data-call can still have a deadline in the fall and not yet in the spring. It is however important to keep in mind that the progress/transition should not be set according to the slowest. People must be able to move ahead and the changes will be gradually phased in.

While the issues encountered by participants are sought to be resolved without proposing changes to the data model, we still consider the risk of further adaptations of the data model to be unavoidable. Such changes typically require the deletion of data. If RDBES moves into production in 2023, this risk should be clearly communicated to early adapters.

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[2] ICES. 2022. Working Group on Governance of the Regional Database and Estimation System (WGRDBES-GOV; outputs from 2021 meeting). ICES Business Reports. 2:10. 71 pp.
https://doi.org/10.17895/ices.pub.21133372

8 Lessons for further workshops

If a workshop similar to WKRDBES-Raise&TAF is held in the following years, we have noted some practical experience from 2022:

→ As a first practical use of the RDBES data for many countries, many participants encountered issues with the uploaded data. They detected errors, or found that non-mandatory fields were needed to support the estimation. When data-submitters were present at the workshop, it enabled some countries to re-submit data and progress beyond initial data issues. Future workshops may consider encouraging the participation of data submitters as well as national estimators and stock assessors.

→ Many participants experienced differences in their estimates compared to the InterCatch estimates that could be attributed to updates and corrections to their national database (samples or landings) that happened between the time of the InterCatch submissions and the time of the RDBES submissions. While most participants found this to be the likely explanation for the differences observed in partial reproductions, issues with the data model cannot be excluded with certainty. In order to isolate the different sources of discrepancy it may be necessary to make dedicated data-submissions for the purpose of reproduction studies, where it is ensured that the data used for providing the InterCatch estimates and those provided to the RDBES are extracted at the same time.

9 Conclusion

WKRDBES-Raise&TAF was proposed by the WGRDBESGOV to test if the RDBES can be used in replacement of InterCatch. In the transition to RDBES, it is important to be able to reproduce the current InterCatch input (ToR a) and output (ToR b) files, starting from the raw RDBES data. ToR a was successfully completed as we did not identify any cases where the RDBES data model did not contain sufficient information and support for the estimation of the national estimates. However, only a few national estimates have currently progressed far enough to confirm that reproductions can be done to satisfaction, and some minor issues were reported that hampered an exact reproduction of some estimates. Therefore, additional requests for adaptations of the data model should not be excluded completely. To address ToR b, it was suggested to start from the current stock extracts that can be downloaded from InterCatch. In a continuation of this work, the aim should be to use the output from ToR a as input. All the input to stock assessment that InterCatch currently provides, could be reproduced. Despite those successful outcomes, the current plan for transition to an operational system, was concluded to be too optimistic. WKRDBES-Raise&TAF therefore recommends to the WGRDBESGOV to revise the roadmap and allow RDBES to be in a test phase also for 2023.

The transition from InterCatch to RDBES also depends on a working TAF structure (ToR c) being defined for producing and archiving RDBES estimates with standardized (intermediate) output (ToR d) for national estimates and for stock estimates. This was mainly addressed in subgroup discussions and led to a proposal of a workflow with a national TAF repository for each country, a stock estimation repository and a stock assessment repository. The intermediate output of those repositories should be stored in an 'intermediate output database' and depending on the user role, you'll get access to the relevant stages in this workflow. The responsibility for developing archiving of intermediate output may have to be clarified by the WGRDBESGOV. WKRDBES-Raise&TAF felt the need to test this proposed workflow on a small scale and therefore recommends to the WGRDBESGOV to arrange a workshop were 2 stocks (pok.27.3a46 (*Saithe (Pollachius virens)* in Subareas 4, 6 and Division 3.a (North Sea, Rockall and West of Scotland, Skagerrak and Kattegat) and wit.27.3a47d (Witch (*Glyptocephalus cynoglossus*) in Subarea 4 and Divisions 3.a and 7.d (North Sea, Skagerrak and Kattegat, eastern English Channel)) will be set up to go through the whole flow.

From subgroup discussions on standard output formats for RDBES-TAF repositories, the following requirements were concluded: they cannot be more restrictive than the InterCatch input and output format; they should present measures of uncertainty and sample sizes (for national estimates) and should have a configurable domain definition (for national estimates).

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Annex 2: Guidance on CL: official weight and scientific weight

Guidance on CLofficialWeight and CLscientificWeight

The RDBES requires CLofficialWeight and CLscientificWeight to be reported. The interpretation of CLscientificWeight is clear with regards to weights estimated from catch sampling programmes (e.g., on small-scale fisheries), but less clear with regards to data coming from official statistics (logbook, sales, etc.). A guidance is therefore needed.

Ambiguity in the filling of these fields is problematic. It is suggested that the core-group issues guidance that clarifies that. The following specifications are needed:

- Official weight is to be considered the official weight known to the data submitter at the time of submission. The sum of its entries should correspond to the official total weight of the country.

- Scientific weight is to be considered the best available scientific information known to the data submitter at the time of submission. The sum of its entries should correspond to the best available estimate of the total weight in the country.

- For most species the best available scientific information on weights is the official information itself. In those situations, the CLscientificWeight and CLofficialWeight will coincide.

- In some cases, scientific evidence or judgement exists that permits official weights to be corrected/improved for scientific purposes. Doing such leads to different values being reported in CLscientificWeight and CLofficialWeight. This is perfectly acceptable but should be justified in field CLexplainDifference. See example 1-3 provided below.

- It is important to note that

  a) Scientific corrections to official data should be documented and be known to the assessment chain. This can happen by a variety of forms: ideally, via data&scripts in TAF, but can also be by WD sent to assessment working groups, etc.

  b) The official weights and their species resolution should match the official information.

  c) The identity between CLscientificWeight and CLofficialWeight does not in itself constitute scientific endorsement of the official estimates.

Example 1. In the example below there is scientific evidence supporting a reallocation of official weight originally reported as Lophiidae into two species (*Lophius budegassa* and *L. piscatorius*). Field in blue is not in RDBES and is provided only for interpretation purposes.

Species	..	CLspeciesCode	CLspeciesFaoCode	..	CLofficial-Weight	CLscientific-Weight	CLexplainDifference
Lophiidae		125493	ANF		200000	0	innacTaxonomy
Lophius budegassa		126554	ANK		0	150000	innacTaxonomy
Lophius piscatorius		126555	MON		0	50000	innacTaxonomy

Example 2. In the example below there is scientific evidence or judgement indicating that official statistics at species level are not reliable and that proportions between species may have gross errors. However, it was considered that there is not enough evidence to support a different reallocation with the data submitter considering that scientific weight is more accurately depicted if attributed to Family level. Field in blue is not in RDBES and is provided only for interpretation purposes.

Species	..	CLspeciesCode	CLspeciesFaoCode	...	CLofficial-Weight	CLscientific-Weight	CLexplainDifference
Rajidae		105711	RAJ		0	180000	innacTaxonomy
Raja undulata		105891	RJU		100000	0	innacTaxonomy
Raja montagui		105887	RJM		50000	0	innacTaxonomy
Raja clavata		105883	RJC		30000	0	innacTaxonomy

Example 3. In the example below there is scientific evidence or judgement indicating that official statistics at species level are not reliable and there is scientific evidence supporting a better reallocation. Field in blue is not in RDBES and is provided only for interpretation purposes.

Species	...	CLspeciesCode	CLspeciesFaoCode	...	CLofficial-Weight	CLscientific-Weight	CLexplainDifference
Raja undulata		105891	RJU		100000	30000	innacTaxonomy
Raja montagui		105887	RJM		50000	100000	innacTaxonomy
Raja clavata		105883	RJC		30000	50000	innacTaxonomy