



▶ Pelagic AC

Herring 6a, 7bc Focus Group
28th September 2020
13:30 – 17:30hrs CET
Remote Meeting

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Participants

Representative

Organisation

Sean O'Donoghue (Chairman)

Killybegs Fishermen's Organisation

Campbell C. Pert

Scottish Government

Ed Farrell

EDF Scientific Limited

Emma White

Marine Institute

Gerard van Balsfoort

PFA

Guillaume Carruel

Pelagic AC

John Ward

Irish Fish Producers Organisation

Katrina Borrow

Mindfully Wired (Pelagic AC)

Martin Pastoors

PFA

Michaël Gras

Marine Institute

Michael O'Malley

Marine Institute

Neil Campbell

Scottish Government

Patrick Murphy

Irish South and West ?

Simon Bolger

Department of Agriculture, Food and the Marine

Steve Mackinson

SPFA

Steve O'Connell

Government Scotland



1. Welcome, introduction & adoption of the agenda

The Chair, Sean O'Donoghue, welcomed participants to the meeting of the Herring 6a, 7b-c Focus Group (FG). He remarked that a meeting of the FG hadn't been held in a while, and that the meeting was important: it would focus on genetic stock identification work carried out for herring, which is in its final stages.

The agenda was adopted without amend.

2. Action items from the previous meeting

The Chair listed action items from the previous meeting of the Herring FG, held in February of 2019.

The Chair was to work with the Marine Institute to push to see genetic sampling work included under the Data Collection Framework. This was ongoing, and he commented that there was 'lots of work going on in the PELAC on this'.

Ed Farrell had been assigned a number of actions: to update the FG on sampling analysis results following a discussion in April 2019; to undertake morphometrics work on herring, update the FG on this and determine if this is a viable method to make comparisons with genetics identification results, and; to set up protocols, look at automation, and secure quotes from design companies with a view to developing the ideal genetic sampling device. All these actions were complete, or very well advanced.

A DTU Aqua presentation had been included on the agenda for the April PELAC meeting, following a discussion between the FG Chair and Chair of WGI.

Option one in the 2019 acoustic survey proposal was to be discussed amongst industry members and agreed – this was complete.

Survey design and timings had been discussed at survey planning meetings in April 2019.

A 6a herring FG had been held within 2020 – completing another action. And, finally, the PELAC had continued work on genetic, acoustic and morphometric research for herring.

This concluded the update on previous actions.

3. Update & finalisation of the genetic project – Ed Farrell

Ed Farrell provided an update on the genetics project for herring, which was in its final stages. The Chair noted he had been 'looking forward to this presentation for five years' – Ed Farrell responded that there was a huge amount of information to share, given that the presentation covered five years' of data, and said he would circulate the slide deck to members following the meeting.

The headline points of the presentation were as follows:

- The research aimed to discriminate between 6a north and 6a south/7b-c herring. Farrell explained that 'essentially every herring caught in 6a north is considered a 6a north autumn-



spawner', officially. This doesn't reflect the biology within the stock assessment. Movements for the stock change year to year, and – over time – lead to big changes in the abundance of individual populations in these areas.

- The ability to tell stocks apart is dependent on genetic markers. Research for herring is advanced in this regard. This latest scientific endeavour has involved looking at the full genome for herring populations and using this to identify differences – the project has examined over 20 million different genetic markers. From that 20 million, 45 markers – or 'SNPs' – were selected, producing a small panel for stock identification, that can be run quickly and cheaply.
- Over the past five years, sampling of the herring stock has been extensive. The project has sampled all the main populations known in areas surrounding Ireland and the UK. Different populations are identified by their biology: spawning in different areas at distinct times. Only spawning fish are used for genetic baseline data.
- Baseline spawning samples show a spread of early and late spawning components of the stock in 6a south, with other populations more closely clustered. By looking at individual fish genetic samples, scientists can see where stocks are more distinct and where there is more overlap.
- Farrell explained the different methods for forming baselines within the data: either defining groups before 'assigning them' to populations, based on biology, or a second approach based on using the power of genetic data through the analysis. This allows scientists to see 'clusters' of genetic similarity. He went on to detail the approach to then 'assigning' fish. The project had looked at Support Vector Machine Learning (SVML), which finds the best 'line' between the clusters, or the best 'split' with the least amount of misclassification. This uses an R package called Assign POP, which in this context of this worked well: showing a high self-assignment effect of 98%.
- Scientists then used various cross-validation methods to strengthen the model, and a level-two assignment to further strengthen it and clear up uncertainty. The team also undertook extra validation of the baselines used. Testing the model eventually showed what Farrell described as 'near-perfect assignment'.
- Using this approach to test and assign herring samples across 2016-2019, the project found that:
 - The model has a high power to separate out 6a north autumn-spawning fish from the rest of 6a herring, but low proportions of this population are seen in survey hauls. Higher proportions were seen in the northern survey areas.
 - 6a south fish are distributed across the entire area, with evidence of 6a south fish up to at least the 4-degree western line.
 - This pattern was consistent across years and hauls.
 - Given this, the current 56-degree delineation of the stock is not appropriate.
 - There is some uncertainty between the 6a north spring-spawners and the late spawning 6a south split.
 - There are potentially significant number of 6a north spring-spawning fish west of the Hebrides.



The Chair thanked Ed Farrell for this presentation, congratulated him on his work and opened the floor to discussion.

Gerard Van Balsfoort asked if the conclusion of the research was that 6a north herring is actually North Sea herring. Farrell believed this to be true, and borne out by the data. He said an extensive literature review, looking at the split between North Sea and 6a north herring, had shown very little evidence to support the split.

Steve Mackinson inquired as to when the project would be finalised. Ed Farrell explained the final report of the project was in production, and had to be submitted to EASME for the 6th November 2020. The results presented were essentially final. In terms of next steps, Farrell said that the EASME project ends on December 7th 2020. The results of the project are 'significant enough to warrant a benchmark in 2021, and to try and resolve some of the issues with the assessment'. He said that some further samples could be analysed prior to the benchmark, in order to have extra data for that process.

Farrell shared a proposed plan for continuing the work into 2021, noting that a first step could be requesting that EASME gets the project report reviewed by ICES Stock Identification Methods (SIM) WG. Beyond this, he said there was nearly a year's worth of work to get the results ready for the benchmark process, and supplied estimated costs for this work. Farrell highlighted that his contract for the current work concludes on the 26th November, but that he would like to continue be involved in the work moving forward.

The Chair asked for clarification on what further work needs to be done in terms of genetics research – inquiring if an ongoing programme of activity would be required in the same way as with surveying. Farrell replied that every time a survey is undertaken, there would be a need to genetically identify the resulting samples. He had been investigating private companies that could handle that ongoing workload: working up the samples and providing a standardised result. This would be a yearly cost. Every 'couple of years', he added, the baselines for the stock would need updating.

Michael Gras asked about timing for processing of samples. Ed Farrell explained that if the new sampling tool developed for the project was used on board vessels, this would provide the samples in a format that could be processed rapidly by a company he had been in contact with, Identogen. With samples back at the end of July, Identogen could provide raw genotype data within a 4-5 week turnaround. Gras noted this meant the data would be available for the annual HERAS survey meeting in November. He agreed that the genetic identification work should be carried out annually, 'in order to keep the pace on the data'.

Martin Pastoors asked if genetic sampling for catch data would be required, to which Farrell responded that commercial catches would need to be sampled in future – adding, 'if you're going to be taking catches in 6a north, ideally you're sampling them'. The Chair said this would be added to the action list, to bear in mind moving forward.



The Chair also noted that the need for ongoing funding for this initiative should be taken forward to the wider PELAC.

Steve Mackinson urged the Group to discuss the next steps in more detail, asking about the formal review of the EASME report. Ed Farrell explained that the EASME internal review would not go into the 'nitty gritty' of the report in the way that ICES would require, hence his idea to ask that the SIMWG review the report – this would 'set us up nicely to get it accepted for the benchmark'.

Michael Gras commented that he had experience of this process, as a sitting member of the SIMWG – he had seen similar requests in the past. He suggested that Emma White (present at the meeting) could contact the Chair of the WG and ask him about the process for such a review. The Chair noted the importance of getting the Commission on board with the proposal, too. The Chair and Steven Mackinson discussed this, and agreed that Emma White could initiate conversations at the ICES WG level, and the PELAC could move to inform the Commission in parallel.

- **Update on morphometrics component of the genetics project – Emma White**

At this juncture, Emma White provided an update on her work on morphometrics of herring. This work had been carried out using baseline spawning samples from between 2014-2019. These samples were used to describe 'what a herring from 6a south looks like, and what a herring from 6a north looks like'. Biological measures are taken to distinguish between them, showing some slight differences, but not sufficient differences for this to be visible and clear for any given fish.

Morphometrics looks at the shape of fish, determining a 'truss network' of measurements across the body, and using this for comparisons. Otolith shape is also considered. A 'discriminant' analysis is then carried out, placing individuals in different groups based on different variables.

As with the genetic samples, a 'support vector' model was used, to carry out self-assignments within the model. Using the morphometrics approach, assignments were 91% correct for 6a north herring and 81% correct for 6a south.

White explained that comparisons between the genetics assignments and the morphometrics assignments did not show good enough agreement at this stage. There is too much uncertainty between the two sets of results. She was undertaking a 'final push' to reduce this uncertainty, but explained there may be limitations in the approach due to a small sample size to work with.

The Chair thanked her for the update. He noted that the hope had been that if a good relationship between the morphometrics assignments and the genetics assignments could be shown, then the morphometrics approach may be able to help split stocks for which there is missing genetic data – ie. data from between the years 2010 and 2013. Emma White confirmed this was the case, but reiterated that 'at the moment' the team were not in a position to do this.

Martin Pastoors asked who would provide the baseline samples covering herring spawning grounds. Emma White said this would have to be the industry – samples are needed from August and September when industry surveys are being carried out. Pastoors went on to say that the long time



series of catch data for herring also needs to be split. Ed Farrell responded that there was a ‘realistic chance the time series will have to be started again’. The Chair remarked that the ‘pattern of the fishery has changed so much’ that he agreed with Farrell on this, and Michael Gras commented that the ‘start of the time series could be when the fishing behaviour started on spawning grounds’.

Gerard Van Balsfoort, with agreement from the Chair, said that the PELAC should consider whether to continue funding the morphometrics work, as it was unclear whether it could serve the intended purpose of helping to split historic data. Ed Farrell and Emma White said final conclusions on the value of the morphometrics would be in the report to be submitted to EASME.

The Chair detailed follow-up items: the group should pursue how to get a review of the EASME final report (and determine the best way to approach this). Additionally, with that report finalised, a decision should be made about the value of morphometrics in comparison to genetics.

4. 6a north herring acoustic surveying – Steve Mackinson

Steve Mackinson presented on the collaborative industry-science survey of herring in 6a north. The survey had just concluded, a week prior. In 2020, there was both less quota available and less time to conduct the survey than in previous years. The industry had made an agreement not to take any commercial catch from 6a north, and to swap payment for alternative quota. This decision had created some challenges for this year’s survey.

There were two parts to 2020’s surveying work: one was to support the HERAS survey to get good data from the Malin Shelf area in Strata 1. The second part was the usual surveying: the fifth year of gathering an acoustic index on spawning herring. Mackinson explained that the best chance of having a ‘useful index for a benchmark’ was to focus on two specific areas for the survey – leading to a different configuration than in previous years.

For the work supporting HERAS, one industry vessel – the Charisma – went to the Malin Shelf area at the same time as the HERAS vessels, the Celtic Explorer and the Scotia, and worked in Strata 1 and Strata 3. The Charisma undertook ten hauls, covered a lot of ground, and ‘saw fish in many places’. However, it turned out to be ‘an unlucky survey’, with only two samples with any herring, and both with low numbers of herring – and two broken nets. Since then, Mackinson said he had examined data from all the surveys and come to the decision to borrow samples from the HERAS vessels to work-up the Charisma data.

He moved on to discuss the spawning time acoustic survey, carried out by the Ocean Star and the Alida. The original plan had been to carry out: acoustic surveys and scouting; genetic sampling and scouting, and; scouting and catch-sampling. In the end, the final two items had been cut, and the vessels had focused on acoustic surveys and sampling, with some genetic sample. The surveys had taken place at the end of August and in early September, with transects 2nm apart, covering about 500 miles. The survey had covered Strata 1 and Strata 2, seeing ‘much more densely packed’ fish in Strata 1. Mackinson said the levels of herring in Strata 1 had ‘much cleaner traces on the acoustics’



and were ‘more than we’d seen for a number of years’. In Strata 2 there were very few marks on the acoustics.

Looking ahead to 2021 surveys, Steve Mackinson said that the benchmark for the stock should start in November 2021 and conclude in 2022. The EASME genetics work (presented earlier in the meeting) is a key contribution to the benchmark. He said that Marine Scotland want a clear ‘stop’ in activity to take stock on the survey, and said he had asked for early discussions and engagement on any review of activity – as a break in surveying would mean a lack of continuity in the new acoustic index, and reduce ability to monitor age structure in the stock. Mackinson said that if an acoustic survey was carried out in 2021, there would be the possibility of having that data ready for the benchmark in November of that year.

The Chair remarked it would be a ‘very disappointing’ if the survey didn’t continue in 2021. Steve Mackinson agreed, noting that he could make ‘reasoned arguments’ but ultimately the ‘ball was in Marine Scotland’s court’.

Gerard Van Balsfoort said that ‘crunch time’ is coming with Brexit – and this will affect decisions for these surveys. After Brexit, there will be time to decide on this ‘from all sides of the industry’. He said a decision should be taken by May of 2021. The Chair agreed and determined to defer any decisions on this agenda point until the early PELAC meeting in 2021.

Michael O’Malley remarked that, in light of some of the results coming out of the genetics work, it seemed that there could be a significant component of the west coast herring stock that are 6a spring spawners – saying this would mean the survey needed to be even sooner in the year. Steve Mackinson replied that in 2019, the fleet had some carry-over quota and was able to do a survey in early March, gathering spring spawning samples. He said it would be great to do this again, but ‘it’s a matter of priorities’. Mackinson concluded it would ‘be good to get a specific survey to address that issue’ and that payment should be sought to address this.

Goncalo Carvalho asked about the ‘quota as payment’ terms Steve Mackinson had referenced, and whether this referred to 6a herring quota or to other stocks. Mackinson said the quota received was ‘not for him to decide’, and that this was a policy decision that differed between Member States. In previous years, monitoring TAC has been used as the payment.

5. 6a south, 7b-c acoustic survey – Michael Gras & Michael O’Malley

Michael O’Malley presented on the 6a south, 7b-c acoustic surveys. These surveys had started in 2016, so four had been completed. The objective of the survey was to carry out surveying activity in the winter, when the stock is mostly geographically separated from other stocks. Additionally, it aimed to provide an indicative assessment of stock size and describe its distribution, as well as obtain sample for EASME stock splitting. The survey takes place at the same time as the monitoring fishery in the area.



Herring has been found to be distributed in similar areas in 2016-2019. By November, the stock is mostly distributed inshore, and can still be found in these areas up until March or April. This points towards fish coming into inshore areas and spawning in waves. The survey data shows good cohort tracking, and scientists are improving the design year on year. Outputs were reviewed at ICES WKHASS in 2019, and in the same year an improved uncertainty estimate for the survey was developed. There is good industry co-operation with the scientific work.

From 2020 onwards the scientists are hoping to use smaller vessels within the survey, and have purchased a new echosounder system that can be used on very small vessels to accommodate this. O'Malley explained that they survey would try to encourage many, smaller vessels to get involved for one-day-only surveys, up to around 10 in total – and these one-day surveys would be focused on core areas of interest. This will provide higher intensity transects in defined areas, and allow for a flexible, quick launch of surveying activity.

Results from the survey tell a positive story: the WESPAS July 2020 survey shows increased abundance and biomass of immature herring, with wide distribution.

The Chair thanked O'Malley for his update, and noted that the change to using smaller vessels was 'very much welcomed'.

Martin Pastoors asked how the 2020 survey, with this new approach, would be connected to previous survey designs. O'Malley said this was a valid question, which he also had queried whether a time series could be created with a changing survey design. He said that the survey outputs in their current form may not be appropriate for use as an index, but rather as additional information to complement the main survey in the summer.

The Chair asked O'Malley for a brief presentation on the work for the PELAC WGII meeting in October.

6. Consideration of the monitoring TAC proposed for 2021

The Chair invited a brief discussion of the monitoring TAC for herring proposed in 2021. This had been covered in the last WGII meeting in July. He sought views from scientific colleagues on whether a monitoring TAC should be applied in 2021, given that there is zero-catch advice for the stock.

Michael Gras said that the current plan is to continue with the time series of the commercial catch data, saying 'we have models primarily based on commercial catch data and survey data to tune them, both are important for the stock assessment'. He said the TAC proposed was calculated to gather data, but reduce impact on stock 'and it will remain stable'. The key consideration was ensuring there was sufficient commercial catch data to support a Category 1 assessment for the stock, preventing a down-grading to Category 3.



Steve Mackinson said, looking forward to 2021, that the SPFA had taken the voluntary 'no-take' decision for commercial catches 'at a time when the assessment shows everything is in bad shape'. He said that 2021 may be 'quite different', resulting in a different approach from the industry: 'it might be appropriate or sustainable to resume it [monitoring TAC] next year'.

The Chair noted this discussion item would return at the WGII level.

He then moved on to summarise agreed actions for the meeting. He said that a central item would be determining how to progress a review of the herring EASME report through the Commission, to an ICES WG. Emma White was tasked with providing informal assistance in this regard.

Morphometrics research would be finalised, and a recommendation was required in terms of whether this work should be taken further forwards.

In terms of splitting historic data on herring, this was seen as a key action by Martin Pastoors. With this in mind, and a number of options to consider in this regard, the Chair listed an action for Ed Farrell to explore what the possibilities are for splitting historic data, and noted the possibility of holding another Focus Group in early 2021 on the subject.

A discussion on acoustic surveys would be deferred until 2021, when more information would be available on the Marine Scotland position, and on Brexit.

On 6a south, the Chair noted the change in the survey design and the implications this has for the time series for the stock. An action item was listed to look at what can be done with this data set going forward, and to explore what use it may have for the herring benchmark in 2021. Martin Pastoors supported this action.

The Chair noted agreement from the FG that a monitoring TAC should be maintained in 2021, in order to support a Category 1 assessment for the stock.

A further action was noted by Ed Farrell with regards to the genetics project. The company, Identogen, that will be processing genetic samples will need a slot for 2021 activity booked relatively urgently. The Chair noted this.

At this point the meeting concluded, and the Chair thanked all participants for their input.

7. Action items

- Continue work, within this FG and the wider PELAC, to push to see genetic sampling work included under the Data Collection Framework. *Chair, Marine Institute, Secretariat*
- Consider commercial catch sampling of 6a north herring to inform genetics work in future, and consider funding for this. Include this in future FG discussions. *Chair, Martin Pastoors, Secretariat*



- Determine how to secure an ICES WG review of the EASME genetics report, and pursue this in order to have this information assessed ahead of the benchmark in 2021. *Chair, Emma White, Secretariat*
- Finalise morphometrics research and determine whether to proceed with this beyond the end of the EASME-funded project. *Ed Farrell, Emma White, Chair*
- Explore all possibilities for splitting historic stock data, and consider a Focus Group on this in early 2021. *Ed Farrell, Chair*
- Hold discussion on 2021 acoustic surveys in early 2021, with more clarity over Brexit and the Marine Scotland position. *Steve Mackinson, Chair, Secretariat*
- Consider 6a south survey adjustments and implications for the time-series moving forward, including utility for 2021 herring benchmark. *Martin Pastoors, Chair, Secretariat*
- Look into booking genetic samples assessment slot with Identogen for 2021. *Ed Farrell, Chair*

