

Working Document WGWIDE 2021

Overview of the Scottish Pelagic Industry Self-Sampling Programme with potential data opportunities relevant to stock assessment

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1. Purpose

Data collected by industry has the potential to provide data to stock assessment and contribute to the quality of stock assessment and ICES advice. This working document provides:

- An overview of the Scottish pelagic industry self-sampling programme.
- A summary of the Scottish pelagic industry self-sampling data collected since 2018 for mackerel, herring and blue whiting.
- Example data: distribution maps of self-sampling / co-sampling and the biological data available for mackerel in 2021, alongside Marine Scotland Science (MSS) onshore sampling data for the same fishery/period.

This is a preliminary presentation of the work carried out by the Scottish Pelagic Industry Self-sampling Programme, to communicate its future data contribution to WGWIDE.

2. The Scottish Pelagic Industry Self-Sampling Programme

The Scottish Pelagic Industry Self-Sampling Programme¹ has been developed by the Scottish Pelagic Fishermen's Association (SPFA), Shetland UHI (SUHI)² and Marine Scotland Science (MSS) with the support of the EU H2020 project PANDORA.

Building on an initial [feasibility study](#)³, the self-sampling programme began in 2018. Initial expectations for a limited pilot programme have been far exceeded, and by 2020 commitment to full voluntary participation by SPFA member vessels (representing 20 out of 21 Scottish pelagic vessels) was achieved, covering data collection from herring, mackerel and blue whiting fisheries. With [routine procedures](#)⁴ now firmly established, the Scottish pelagic industry are committed to the continuation of the self-sampling programme beyond 2021.

The industry data collection programme comprises two parts. The first part, the self-sampling scheme, requires vessel crews to sample fish from every haul of every trip. Fish length (cm) and weight (g) data are

¹ The pelagic self-sampling is part of the [SPFA Data Collection Strategy](#)

² NAFC Marine Centre merged into the Shetland UHI organization on 1st August 2021

³ [Pelagic-self-sampling FIS020-report_FINAL.pdf \(scottishpelagic.co.uk\)](#)

⁴ [Methods and protocols manual for the Scottish pelagic self-sampling programme](#)

collected as the fish are pumped onboard pelagic vessels, and haul information is recorded to connect the biological sample data to the location and date/time of the catch, and other operational and environmental parameters. The second part, the co-sampling scheme, added to the programme in 2020, requires samples of fish to be frozen and brought ashore for biological sampling on length, sex, maturity and age by scientists at SUHI and MSS laboratories. The procedure for collecting frozen samples is described in more detail below.

As part of the programme, vessel crews undertake training and are provided with all the necessary tools, including measuring boards, sampling protocols, data recording sheets and – more recently – electronic keypads for paperless data entry and standardised recording. Data quality checks are in place as part of the programme’s Data Chain of Custody; and the quality of self-sampling data have been examined by comparing the data against landings that have been sampled through the current MSS onshore sampling (as carried out by MSS and the designated agent NAFC, now SUHI).

The [SPFA Data Policy](#) describes the conditions and procedures regarding data access and use by the scientific community. All Data Products are by default publicly available.

3. Summary of industry self-sampling data collection (2018-2021)

Industry are keen to engage in the self-sampling programme, with the participation of SPFA member vessels increasing each year from 35% in 2018 to 100% in 2020 (Table 1).

Table 1. Number of unique vessels/trips/hauls/fish sampled (length and weight), from a total of 20 SPFA member vessels.

	2018	2019	2020	2021
Herring				
No. unique vessels	7	5	15	n/a
No. trips	41	14	65	n/a
No. hauls	73	30	128	n/a
No. fish	7,882	3,640	15,396	n/a
Mackerel (Autumn, Oct/Nov)				
No. unique vessels	7	7	15	n/a
No. trips	29	20	67	n/a
No. hauls	53	39	133	n/a
No. fish	6,165	4,191	15,119	n/a
Mackerel (Winter, Jan/Feb)				
No. unique vessels	n/a	7	14	18
No. trips	n/a	23	45	67
No. hauls	n/a	42	82	138
No. fish	n/a	4,862	9,140	15,822
Blue whiting				
No. unique vessels	n/a	1	5	9
No. trips	n/a	4	20	40
No. hauls	n/a	16	69	125
No. fish	n/a	1,893	8,002	15,110

4. Results of industry self-sampling and Marine Scotland Science onshore sampling for mackerel 2021 (Winter Jan/Feb)

Industry data are shown below, alongside MSS onshore sampling data. Biological data collection from onshore sampling of pelagic landings in Scottish ports has been carried out by MSS since around 1970. These data are used to provide numbers-at-age for use in stock assessment. The sampling programme is overseen by MSS and is currently undertaken by MSS and SUHI (and Marine Institute, Ireland for blue whiting). The data comprise biological information such as length, maturity and age, collected from samples of landings obtained opportunistically from the vessels at Scottish ports. The sample can be allocated to a fishing trip and the statistical rectangles reported for that trip, but not to individual hauls and their associated locations. Typically, around 50% of trips are sampled each year under the MSS onshore sampling scheme.

4.1 Sample location

Participation in the self-sampling programme requires that all hauls from all trips are sampled. With full participation of the fleet, full spatial and temporal coverage of the fishery can be achieved. This census approach enables greater reach of the self-sampling data compared to the MSS onshore sampling programme (Fig. 1) and includes sampling of landings abroad. The self-sampling data can be further resolved with individual haul locations (not shown here).

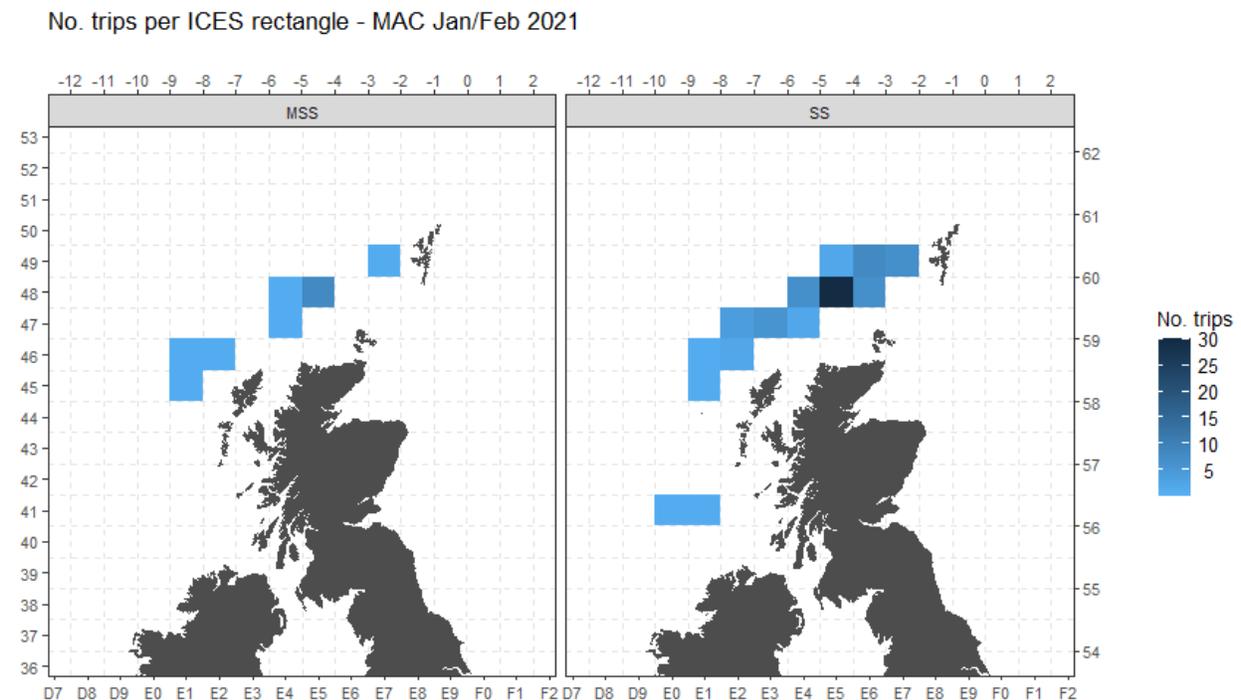


Figure 1. Sample locations from industry self-sampling and Marine Scotland Science sampling for mackerel 2021 (Winter, Jan/Feb). Number of trips per ICES rectangle, mapped by dataset, where MSS=onshore sampling overseen by MSS, and SS=self-sampling undertaken by SPFA vessels.

4.2 Sample length distribution

In 2021, 14 trips were sampled by both the self-sampling programme and the onshore sampling overseen by MSS (Fig. 2). The two datasets demonstrated similar length distributions for all but one trip.

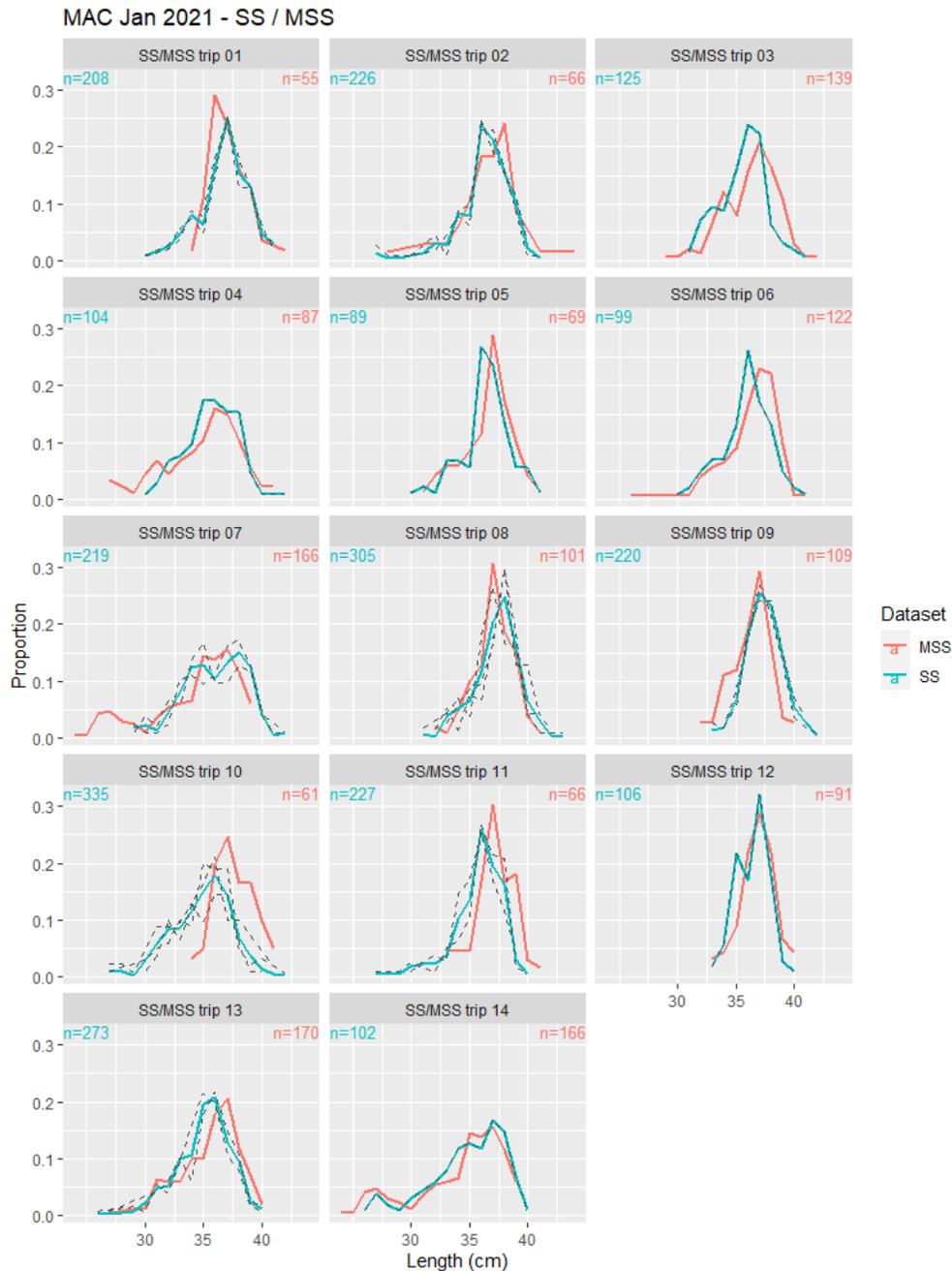


Figure 2. Length distribution from industry self-sampling and Marine Scotland Science sampling for mackerel 2021 (Winter, Jan/Feb). Length distribution of fish by trip where data coincides from each dataset. MSS=onshore sampling overseen by MSS, and SS=self-sampling undertaken by SPFA vessels. For the self-sampling data, the blue line shows the length distribution across all hauls in a single trip, while the dotted black line shows the length distribution for each haul within a trip. Trip codes have been anonymised for vessel confidentiality.

4.3 Sample length-weight relationship

The mean weights-at-length from the self-sampling data for mackerel in January and February in 2021 were compared with the monthly weight-length relationships currently used by MSS (Fig. 3). The observed self-sampling weight data indicate that the pooled mean weight of fish of intermediate lengths is greater than that predicted by the L-W relationships used by MSS, in spring 2021. Sampling both lengths and weights enables seasonal and inter-annual variations in growth patterns of cohorts to be captured and incorporated into stock assessments. It also provides valuable data for research on species ecology.

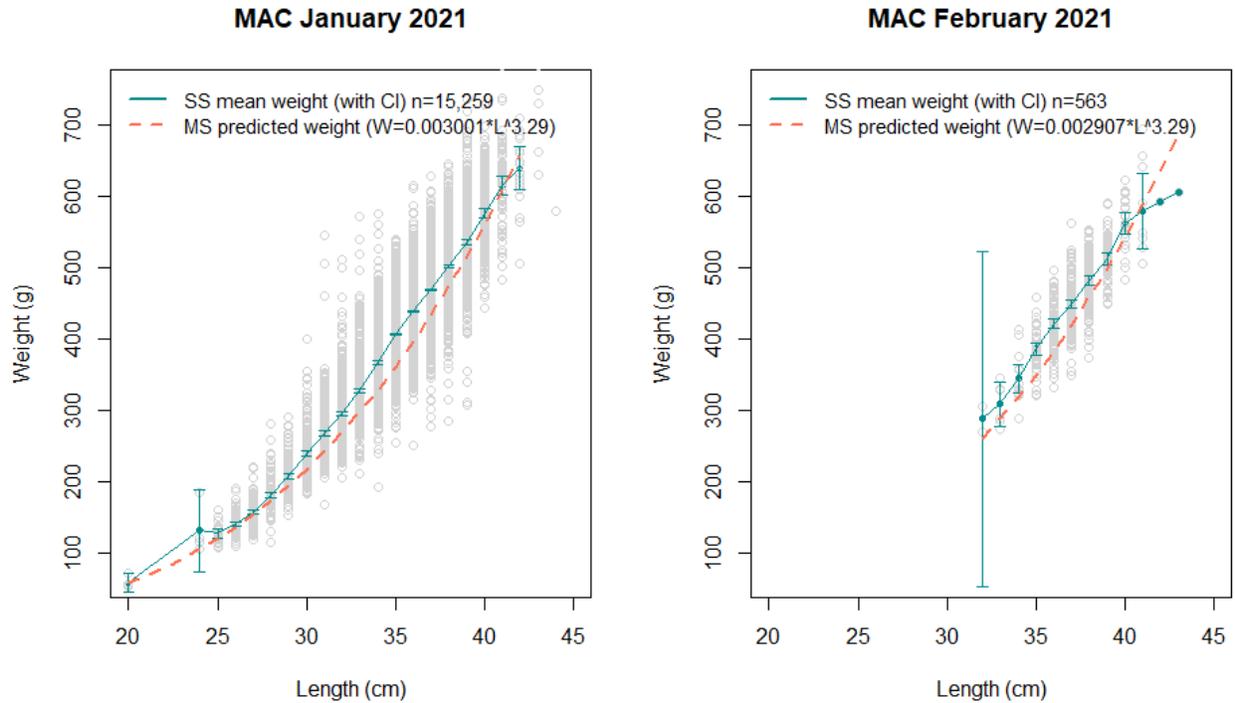


Figure 3. Fish length-weight relationship for mackerel 2021 (Winter, Jan/Feb). Fish length-weight relationship by month with SS weight-length dataset (grey circles). MSS=onshore sampling overseen by MSS (data plotted as predicted weight-at-length), and SS=self-sampling undertaken by SPFA vessels (data plotted as mean weight-at-length with confidence interval [CI]).

5. Co-sampling: age, length, sex and maturity data collection

Since 2020, fish samples are frozen and brought ashore for additional biological sampling on age, length, sex, and maturity by scientists at the SUHI and MSS laboratories. An electronic 'coin-toss' is used to randomly select the trips required to collect frozen samples. From each selected trip one box of fish is collected from each haul.

5.1 Sampling locations

No. frozen sample trips per ICES rectangle - MAC Jan/Feb 2021

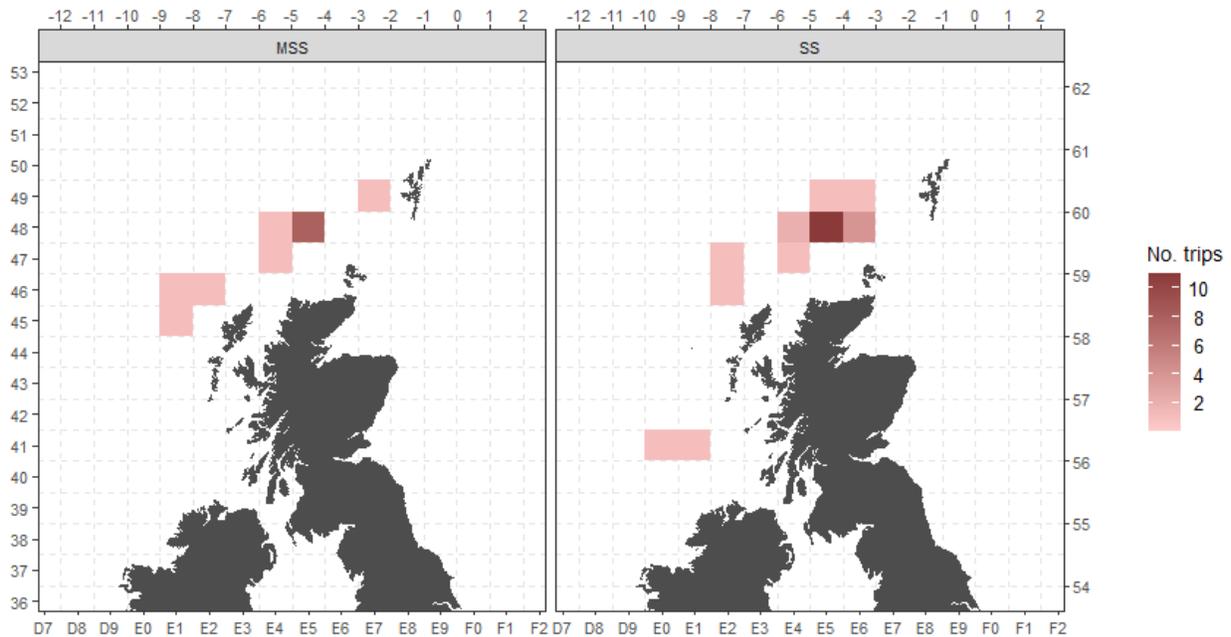


Figure 4. Sample locations of frozen samples collected via self-sampling and sample locations from MSS onshore sampling for mackerel 2021 (Winter, Jan/Feb). Number of trips per ICES rectangle, mapped by dataset, where MSS=onshore sampling overseen by MSS, and SS=self-sampling undertaken by SPFA vessels.

6. Conclusions

Industry self-sampling and co-sampling can be used to obtain biological data on commercial catches, provided that the sampling design and methods result in data that are representative of the catch composition.

The Scottish Pelagic Industry Self-sampling Programme offers several opportunities in efforts to ensure continuous improvements in the quality of stock assessment and ICES advice. In particular:

- Sample coverage can be representative of the fishing behaviour of the fleet as all but one vessel participate, and vessels that land catches overseas will also provide samples.
- Sample coverage can be representative of the spatial distribution of the fleet since every haul can be sampled.
- Samples include direct measurements of both the weight and length of fish, allowing monitoring of changes in fish growth.
- Co-sampling of frozen samples from randomly selected trips is an efficient and effective way to collect age, sex and maturity data.

Inclusion of new biological data into an existing time series has the potential to cause a shift in the data, which could be misinterpreted as a change in the structure of the stock. Therefore, prior to the introduction of any new data, examination of the resulting effects on estimates will be required. As more data are collected through the Scottish Pelagic Industry Self-sampling Programme, additional comparative work will be undertaken. Further assurances will also be made to ensure long-term access to the industry collected data.