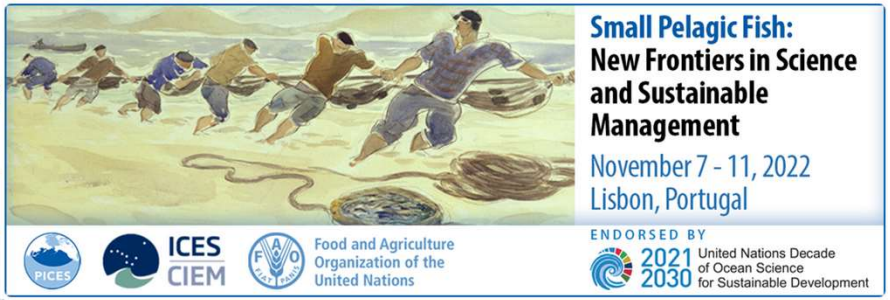
# Key lessons for fishing industry self-sampling programs

Martin Pastoors

Small pelagic fish symposium, 10 November 2022, Lisbon


Small pelagic fish symposium, 8 November




**Martin Pastoors**

*Pelagic Freezer-trawler Association (PFA)*

Dr. Martin Pastoors is the Chief Science Officer at the Pelagic Freezer-trawler Association (PFA). In this role he initiates and coordinates research activities within the fishing industry and functions as the linking pin between fisheries science and fisheries practice. Based on the industry research activities, he provides scientific input to several international expert groups on stock assessment. Previously, Martin was a Senior Researcher at RIVO/IMARES, Netherlands (1997–2014), with a specialization in fisheries science and advice, and marine governance. He has coordinated and participated in several European research projects on fisheries science, fisheries governance and marine spatial planning. Martin served as the Chair of the ICES Advisory Committee on Fishery ...agement (ACFM, 2006–2007) and Vice-Chair of the ICES Advisory Committee (A... 2008). He has been a Chair and member of many ICES expert groups.

Talk [pdf, 4.5 MB]

*Sustainable collaborative approaches between the fishing industry and fisheries science*

https://meetings.pices.int/publications/presentations/2022-Pelagics/Plenary-General-Pastoors.pdf

April 2014: from research institute to industry researcher

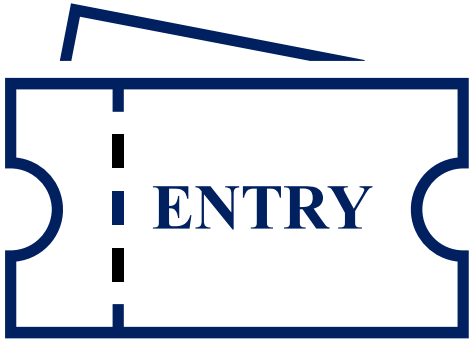
# Entering into a parallel universe …


| Merk | Aantal cartons | Voorraad in (m/t) | Tijd in tank | Stukstallen per p | Stuks per kg | Sorteerklasse | Kwaliteit | Sorteringskwaliteit | Voedsel | Textuur | Model | Buikvulling Hom/Kuit | Beschadigd andere vis |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARU010 | 5667 | 20 | 0 - 12uur | 60/80 | 3 a 5 | A | 2 | A | 0 | B | A | A | A/B |
| ARU011 | 2030 | 20 | 0 - 12uur | 40/60 | 2 a 3 | A | 2 | A | 0 - 1 | B | A/B | A/B | A/B |
| WHB012 | 1360 | 20 | 0 - 12uur | 120/160 | 4 a 7 | A/B | 2/3 | A/B | 0 | B | C | A | B/C |
| WHB013 | 1664 | 20 | 0 - 12uur | 180/220 | 5 a 9 | A/B | 2/3 | A/B | 0 | B | C | A | B/C |
| ARU014 | 2435 | 20 | 0 - 12uur | 60/80 | 3 a 5 | A | 2 | A | 0 | B | A | A | A/B |
| WHB015 | | 30 | 0 - 12uur | 300 + | 13 a 16 | A/B | 2 | A | 0 | B | C | A | B/C |
| WHB018 | | 30 | 0 - 12uur | 220/260 | 8 a 11 | A/B | 2 | A/B | 0 | B | C | A | B/C |
| WHB019 | 5023 | 30 | 0 - 12uur | 120/160 | 4 a 7 | A/B | 2 | A/B | 0 | B | C | A | B/C |
| WHB021 | | 30 | 0 - 12uur | 180/220 | 6 a 10 | A/B | 2 | A/B | 0 | B | C | A | B/C |
| WHB022 | 4992 | 30 | 0 - 12uur | 260/300 | 10 a 13 | A/B | 2 | A/B | 0 | B | C | A | B/C |
| ARU023 | 1543 | 20 | 0 - 12uur | 40/60 | 2 a 3 | A | 2 | A | 0 - 1 | B | A/B | A/B | A/B |

# How can fisheries best contribute to science (and vice versa)

- Voluntary self-sampling programs
  - Harmonize & Quality Control existing industry sampling programs

- Self-sampling as an “entry ticket”
  - Dedicated catch sample collection
  - Acoustics
  - Specific biological sampling
  - Information & knowledge exchange



# Key elements in voluntary self-sampling programs

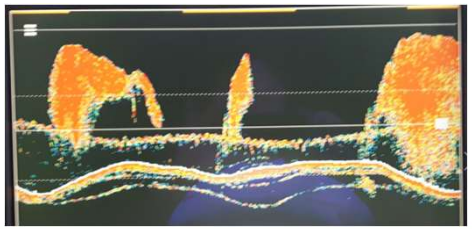
1. Harmonizing, standardizing & engaging

2. Quality controlling

3. Feedback & useable products

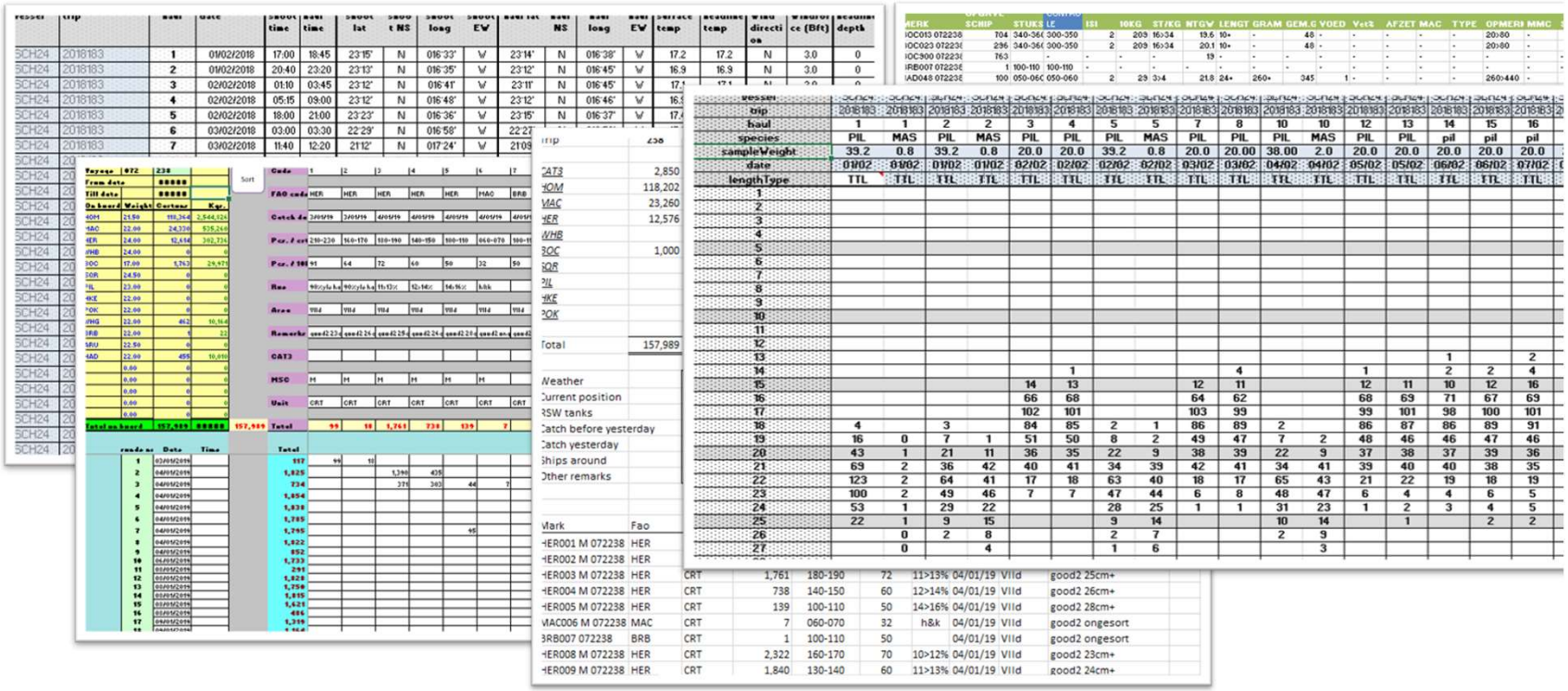
# 1. Harmonizing, standardizing and engaging

# Step 1: understanding fishing practices



# Step 2: assessing existing data collection procedures

## The “many lists” problem



# Step 3: discussing opportunities & constraints

# Step 4: harmonizing procedures & data capture

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | vessel | trip | haul | date | shoot time | haul time | shoot lat | shoot NS | shoot long | shoot EW | haul lat | haul NS | haul long | haul EW | surface temp | headline temp | Wind direction | Windforce (Bft) | headline depth | water depth |
| 2 | ROS170 | 201709 | 1 | 10/08/2017 | 13:00 | 19:45 | 71°32' | N | 003°18' | E | 72°00' | N | 003°02' | E | 8.9 | 2.9 | NE | 3.0 | 410 | 1500 |
| 3 | ROS170 | 201709 | 2 | 11/08/2017 | 03:10 | 21:20 | 71°52' | N | 002°48' | E | 71°40' | N | 003°10' | E | 9.2 | 2.8 | NE | 4.0 | 410 | 1500 |
| 4 | ROS170 | 201709 | 3 | 12/08/2017 | 02:20 | 23:20 | 71°45' | N | 004°30' | E | 72°38' | N | 006°29' | E | 9.5 | 3.0 | NE | 5.0 | 410 | 1500 |
| 5 | ROS170 | 201709 | 4 | 13/08/2017 | 03:00 | 23:25 | 72°39' | N | 005°31' | E | 72°36' | N | 005°29' | E | 9.5 | 3.0 | SE | 4.0 | 420 | 1500 |
| 6 | ROS170 | 201709 | 5 | 14/08/2017 | 02:15 | 21:15 | 72°37' | N | 005°29' | E | 72°43' | N | 005°35' | E | 9.5 | 2.8 | SE | 3.0 | 420 | 1500 |
| 7 | ROS170 | 201709 | 6 | 15/08/2017 | 00:10 | 19:55 | 72°44' | N | 005°42' | E | 72°24' | N | 003°07' | E | 9.6 | 2.8 | SW | 4.0 | 420 | 1500 |
| 8 | ROS170 | 201709 | 7 | 15/08/2017 | 22:00 | 19:50 | 72°27' | N | 005°33' | E | 72°29' | N | 005°20' | E | 9.5 | 3.0 | WSW | 4.0 | 420 | 1500 |
| 9 | ROS170 | 201709 | 8 | 16/08/2017 | 23:40 | 21:10 | 72°10' | N | 004°30' | E | 72°06' | N | 003°20' | E | 9.6 | 3.8 | SW | 4.0 | 425 | 1500 |
| 10 | ROS170 | 201709 | 9 | 17/08/2017 | 23:45 | 20:30 | 72°14' | N | 003°24' | E | 72°10' | N | 005°10' | E | 9.5 | 3.7 | SE | 4.0 | 425 | 1500 |
| 11 | ROS170 | 201709 | 10 | 18/08/2017 | 22:40 | 21:00 | 72°11' | N | 005°45' | E | 72°10' | N | 005°50' | E | 9.6 | 2.8 | E | 5.0 | 415 | 1500 |
| 12 | ROS170 | 201709 | 11 | 19/08/2017 | 23:55 | 21:55 | 72°08' | N | 005°51' | E | 72°14' | N | 006°30' | E | 9.5 | 2.6 | E | 4.0 | 415 | 1500 |
| 13 | ROS170 | 201709 | 12 | 21/08/2017 | 00:20 | 20:40 | 72°13' | N | 006°16' | E | 72°13' | N | 006°56' | E | 9.5 | 2.7 | NE | 5.0 | 430 | 1500 |
| 14 | ROS170 | 201709 | 13 | 21/08/2017 | 22:45 | 21:15 | 72°14' | N | 006°47' | E | 72°18' | N | 005°56' | E | 9.5 | 3.3 | NE | 3.0 | 430 | 1500 |
| 15 | ROS170 | 201709 | 14 | 23/08/2017 | 00:00 | 22:15 | 72°19' | N | 006°24' | E | 72°14' | N | 005°46' | E | 9.2 | 3.0 | VAR | 2.0 | 430 | 1500 |
| 16 | ROS170 | 201709 | 15 | 24/08/2017 | 00:30 | 20:45 | 72°14' | N | 005°40' | E | 71°50' | N | 003°22' | E | 9.2 | 3.8 | VAR | 2.0 | 410 | 1500 |
| 17 | ROS170 | 201709 | 16 | 24/08/2017 | 23:30 | 21:15 | 71°42' | N | 003°52' | E | 70°48' | N | 006°05' | E | 9.2 | 3.7 | VAR | 2.0 | 410 | 1500 |
| 18 | ROS170 | 201709 | 17 | 26/08/2017 | 02:00 | 23:10 | 71°11' | N | 006°47' | E | 72°13' | N | 007°10' | E | 9.2 | 3.9 | | | | |
| 19 | ROS170 | 201709 | 18 | 27/08/2017 | 01:30 | 19:10 | 72°20' | N | 007°08' | E | 72°22' | N | 006°24' | E | 9.5 | 3.0 | | | | |
| 20 | ROS170 | 201709 | 19 | 28/08/2017 | 01:25 | 23:25 | 72°23' | N | 006°33' | E | 72°24' | N | 007°04' | E | 9.5 | 3.0 | | | | |
| 21 | ROS170 | 201709 | 20 | 29/08/2017 | 04:15 | 21:15 | 72°50' | N | 008°10' | E | 73°08' | N | 007°45' | E | 9.5 | 2.9 | | | | |
| 22 | ROS170 | 201709 | 21 | 30/08/2017 | 04:20 | 17:00 | 73°11' | N | 007°38' | E | 73°11' | N | 007°36' | E | 9.3 | 2.7 | | | | |
| 23 | ROS170 | 201709 | 22 | 30/08/2017 | 20:00 | 13:15 | 73°16' | N | 007°26' | E | 72°53' | N | 008°18' | E | 9.3 | 3.0 | | | | |
| 24 | ROS170 | 201709 | 23 | 31/08/2017 | 15:40 | 07:45 | 72°55' | N | 008°14' | E | 73°03' | N | 007°52' | E | 9.1 | 3.0 | | | | |
| 25 | ROS170 | 201709 | 24 | 01/09/2017 | 10:30 | 07:00 | 73°03' | N | 007°57' | E | 73°02' | N | 007°38' | E | 8.9 | 3.0 | | | | |
| 26 | ROS170 | 201709 | 25 | 02/09/2017 | 11:00 | 03:30 | 73°30' | N | 008°06' | E | 72°52' | N | 008°23' | E | 8.9 | 2.9 | | | | |
| 27 | ROS170 | 201709 | 26 | 03/09/2017 | 06:30 | 04:15 | 72°48' | N | 008°12' | E | 72°52' | N | 008°09' | E | 8.9 | 2.8 | | | | |
| 28 | ROS170 | 201709 | 27 | 04/09/2017 | 07:15 | 04:45 | 72°48' | N | 008°19' | E | 73°10' | N | 007°31' | E | 9.2 | 3.0 | | | | |
| 29 | ROS170 | 201709 | 28 | 05/09/2017 | 06:45 | 04:30 | 73°11' | N | 007°33' | E | 72°19' | N | 008°59' | E | 9.2 | 2.9 | | | | |
| 30 | ROS170 | 201709 | 29 | 06/09/2017 | 06:30 | 05:00 | 72°25' | N | 009°01' | E | 72°33' | N | 008°40' | E | 9.3 | 3.0 | | | | |

Info | merkenlijst | tellijst | Vet | overzicht per soort | Macros | Haul | Merk | lists | Rect | Print

# Step 5: develop manuals and instructions

**Methods and procedures manual for the Scottish pelagic self-sampling programme**

K. Brigden[1], S. Mackinson[2], L. Clarke[3]

[1] Fisheries Scientist
PANDORA Project
NAFC Marine Centre
University of the Highlands and Islands

[2] Chief Scientific Officer
Scottish Pelagic Fishermen's Association
SPFA
SCOTTISH PELAGIC FISHERMEN'S ASSOCIATION

[3] Senior Fisheries Statistician
Marine Scotland Science
Scottish Government
Riaghaltas na h-Alba
gov.scot
marinescotland

SPFA
SCOTTISH PELAGIC FISHERMEN'S ASSOCIATION

**Herring weight and length sampling protocol**

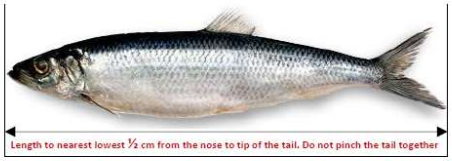
**Why?** Measuring both the weight and length of fish at the same time provides information on their growth that can be used in assessing the state of the stock.

**When?** A sample of weight and length should be taken from every haul, and the details of the haul recorded so that the date and position can be linked to the sample details. A sheet for recording the haul data is provided.

**What?** The sample needs to be representative of overall catch, so fish for the sample need to be taken at different times during pumping. We will use the start, middle and end.

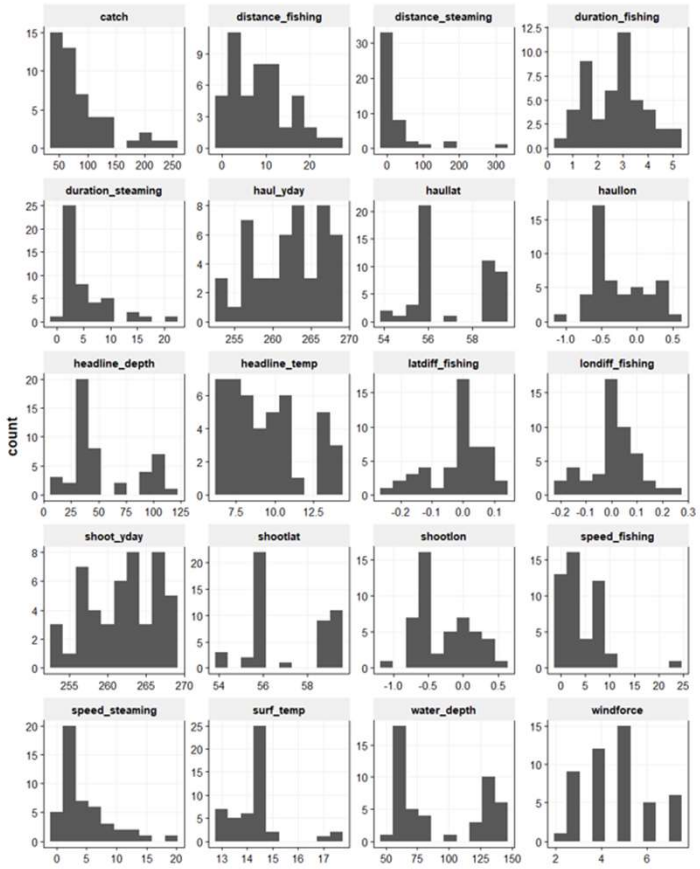
**How?**

1. During pumping, take 1/3rd of a basket of fish at the start, middle and end, and put them to one side until the fishing work is done. The order of the baskets doesn't matter because all the fish will be weighed and measured. The three baskets together should be around 25-30kg.
2. Take each fish and measure its length (see diagram) to the nearest lowest ½ cm (for example, if it is 37.7cm, write down 37.5 cm. If its 37.4 cm, write down 37), then measure its weight in grams.
3. Record the measurements of all the fish in the basket on the recording sheet provided. Use a separate sheet for each haul.
4. Enter the data from the paper copy into the spreadsheet sent to the skipper. The file is called 'Length-Weight Data Entry sheet_SPFA.xlsx'

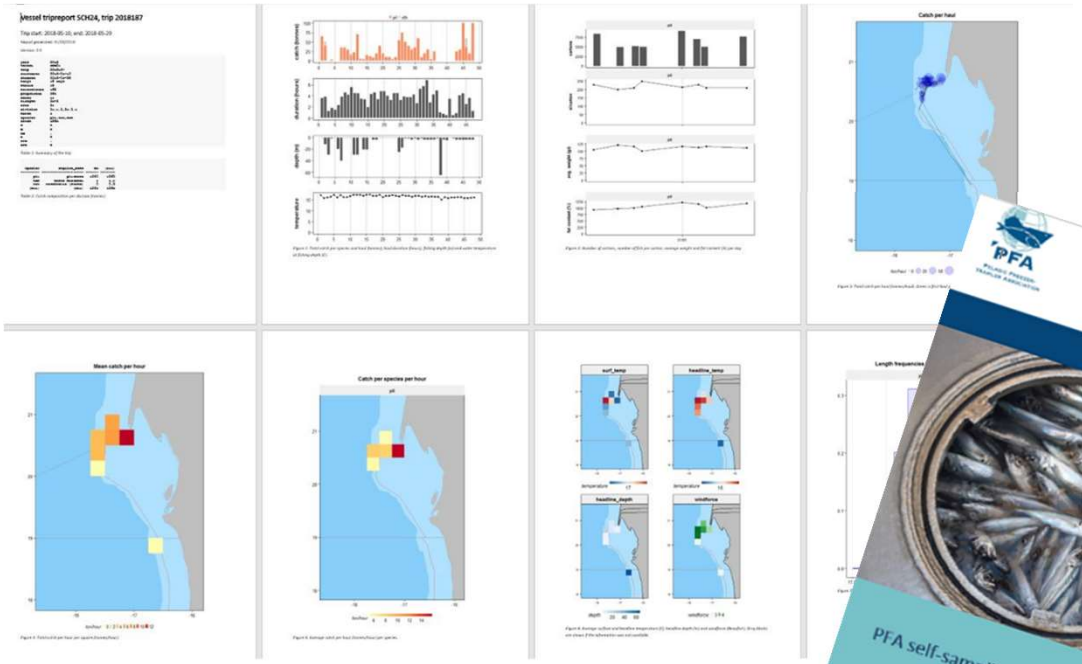


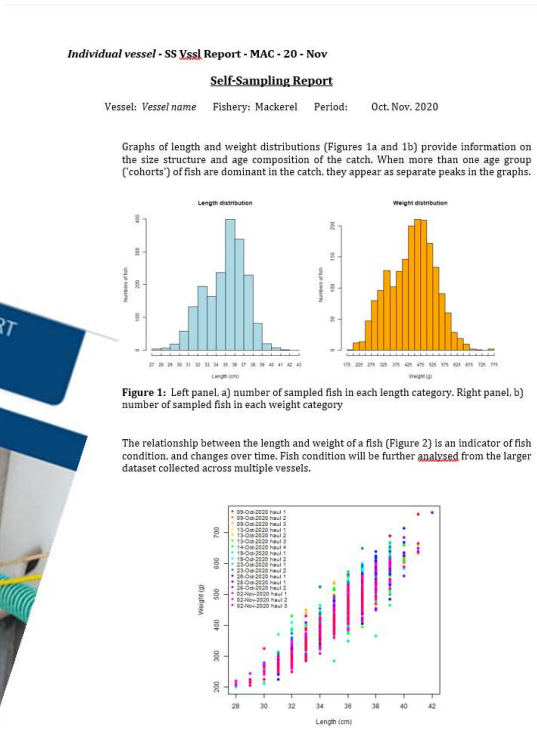

# Step 6: implement quality control procedures

- E.g. outlier detection



# Step 7: developing feedback & products



*Individual vessel* - SS Vssl Report - MAC - 20 - Nov

**Self-Sampling Report**

Vessel: *Vessel name* Fishery: Mackerel Period: Oct. Nov. 2020

Graphs of length and weight distributions (Figures 1a and 1b) provide information on the size structure and age composition of the catch. When more than one age group ('cohorts') of fish are dominant in the catch, they appear as separate peaks in the graphs.



**Figure 1:** Left panel, a) number of sampled fish in each length category. Right panel, b) number of sampled fish in each weight category

The relationship between the length and weight of a fish (Figure 2) is an indicator of fish condition, and changes over time. Fish condition will be further analysed from the larger dataset collected across multiple vessels.



**Figure 2:** Fish length-weight relationship from all hauls (coloured by date/haul no.)

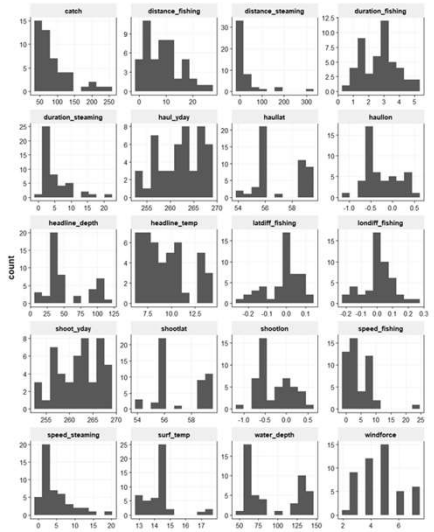
# Step 8: talk about it, frequently

# 2. Quality controlling

# Quality control of self-sampling methods

1. Data checks on incoming data
2. Inter-vessel comparisons
3. Comparisons between regular “sampling” and self-sampling
4. Comparisons between observer trips and self-sampling

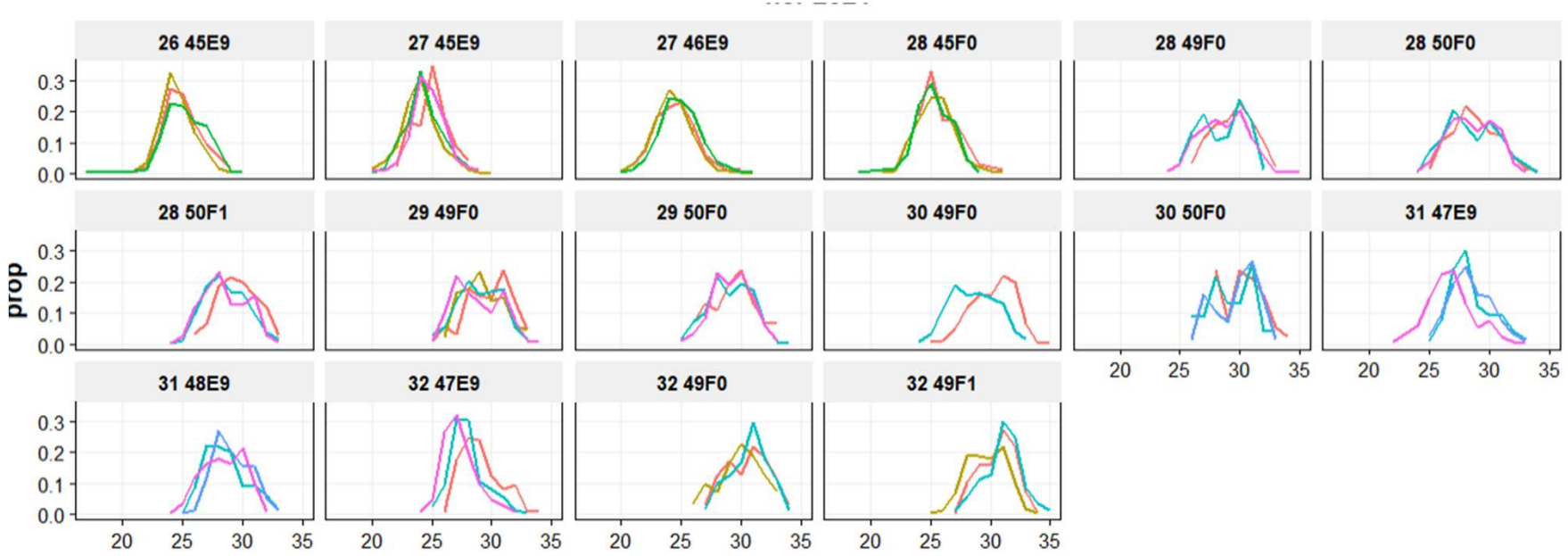
# Data checks




- Prevent erroneous data to be entered (data model)
  - Commas, dots, degrees, spaces, spelling variants, ….
- Assess whether data is within bounds
  - E.g. define maximum weight for a fish species
  - Check units being used!!
- Assess consistency within the data
  - E.g. are times and positions consistent and feasible between hauls
  - E.g. can catch compositions be compared from different sources
- Assess occurrence of outliers and check them

# Inter-vessel comparisons

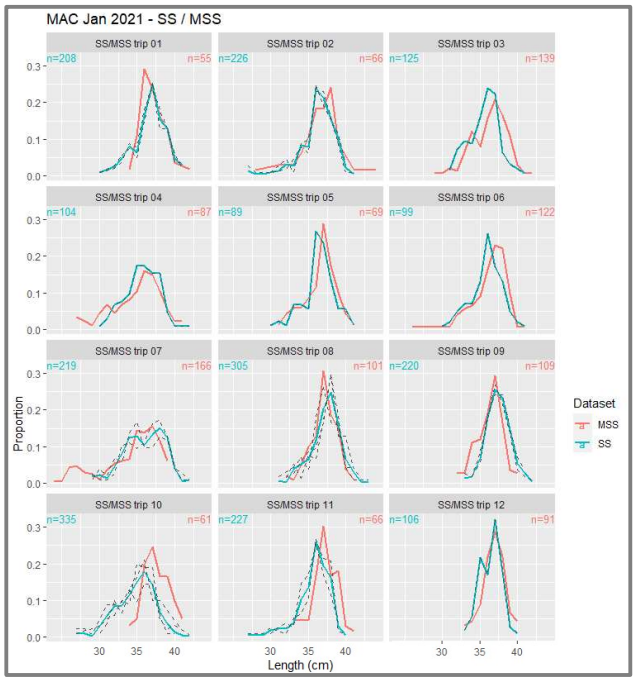
- Vessel in same area/season with comparable results?
  - Not trivial to interpret!




PFA herring fishery 2021, LF by vessel, week and rectangle

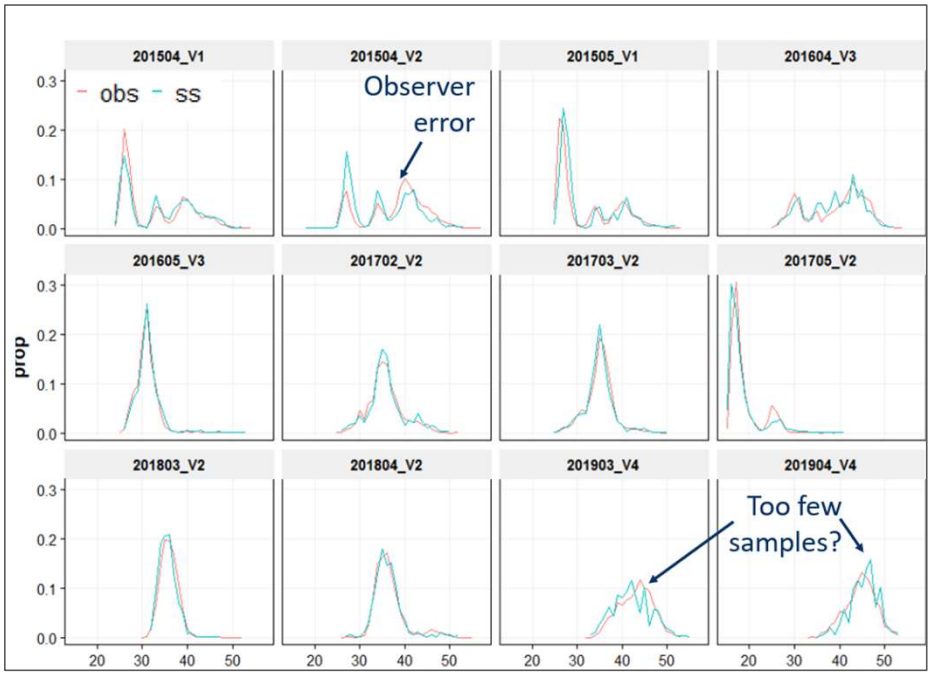
# Comparisons with different sampling programs

## With catch sampling




SPFA-Marine Scotland comparison

## With observer trips

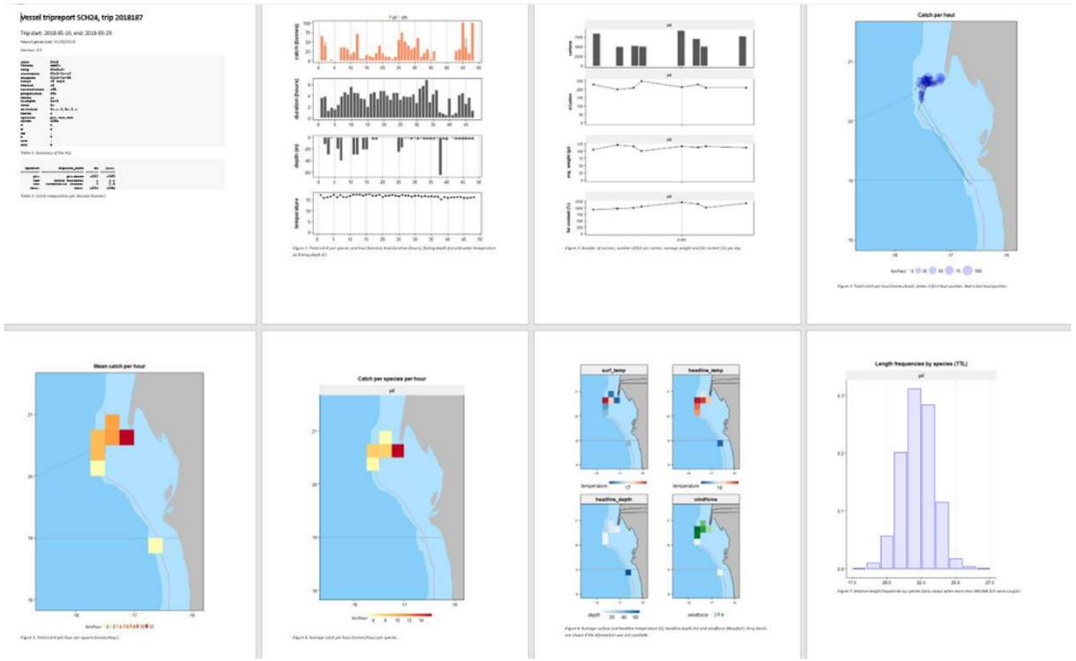



PFA-EU observer comparison

A transparent and clear quality control program is an important requirement for self-sampling

# 3. Feedback and useable products

# Tripreports: immediate feedback (& conversation)

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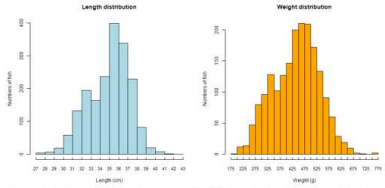


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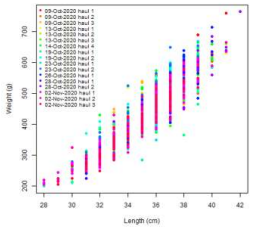
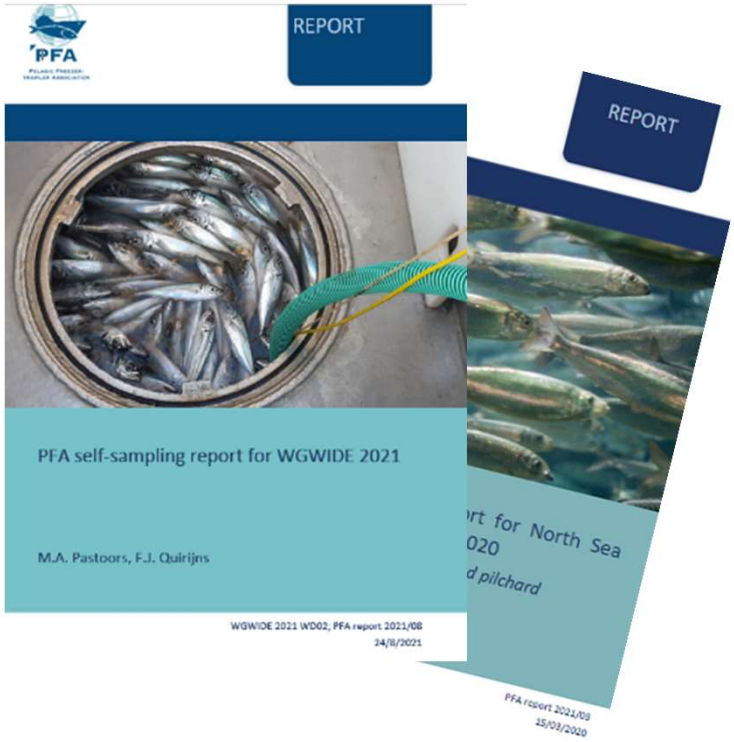
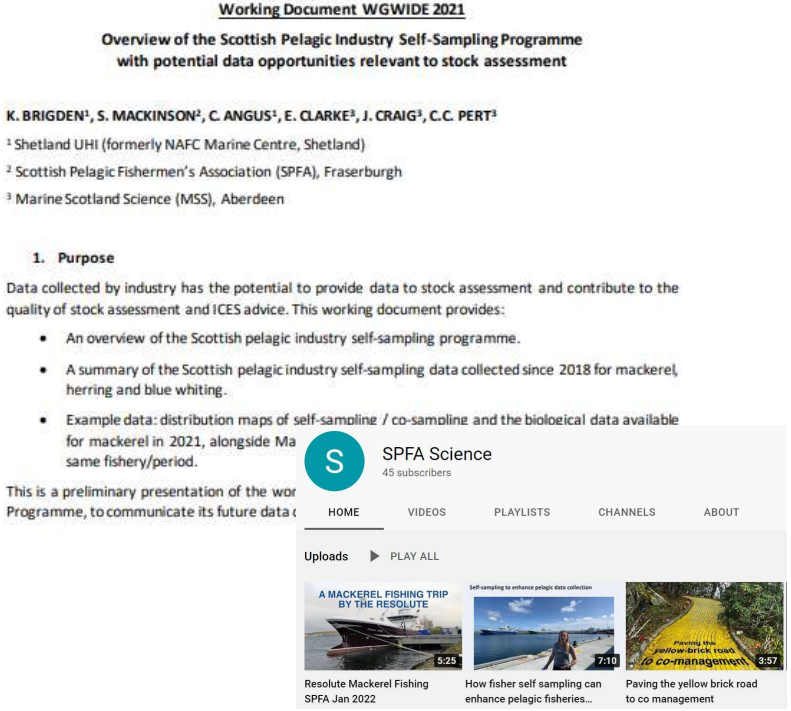



**Figure 2:** Fish length-weight relationship from all hauls (coloured by date/haul no.)

# Overview reports: what is happening in the fishery



**Working Document WGWIDE 2021**

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

**K. BRIGDEN[1], S. MACKINSON[2], C. ANGUS[1], E. CLARKE[3], J. CRAIG[3], C.C. PERT[3]**

[1] Shetland UHI (formerly NAFC Marine Centre, Shetland)

[2] Scottish Pelagic Fishermen's Association (SPFA), Fraserburgh

[3] Marine Scotland Science (MSS), Aberdeen

**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 Ma
same fishery/period.

This is a preliminary presentation of the wor
Programme, to communicate its future data

# Talking points with skippers / experts

What is happening in the fishery?

- Distribution of herring in 2022 very different from previous years?
- Season for fishing mackerel is changing?
- Only large blue whiting in particular area?

Analyze data and report back

*or*

Setup new research project

# Key lessons

# Key lessons

- Explicit strategy to involve crews in setup and results of sampling
- Provide immediate feedback to crews
  - quality control & engagement
- Implement documented quality control mechanisms
- Self-sampling as powerful mechanism for real-time information
  - high spatio-temporal resolution
- Through engagement, create potential to address other biological and ecological questions (e.g. growth, condition, reproduction acoustics, …).

PFA
PELAGIC FREEZER-TRAWLER ASSOCIATION

# Fishing Industry Science:
# to improve fisheries, science and management


mpastoors@pelagicfish.eu