

KONUR ERU LÍKA
Í SJÁVARÚTVEGI



Vísindasamvinna milli sjávarútvegs og vísindaheimsins í Evrópu

Anna Heiða Ólafsdóttir



HAFRANNSÓKNASTOFNUN

Rannsókn- og ráðgjafarstofnun hafs og vatna
MARINE & FRESHWATER RESEARCH INSTITUTE

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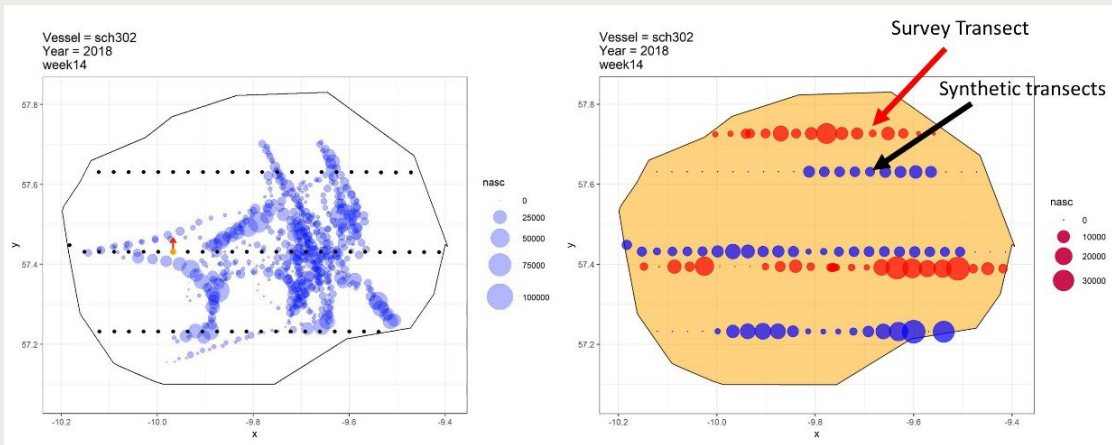
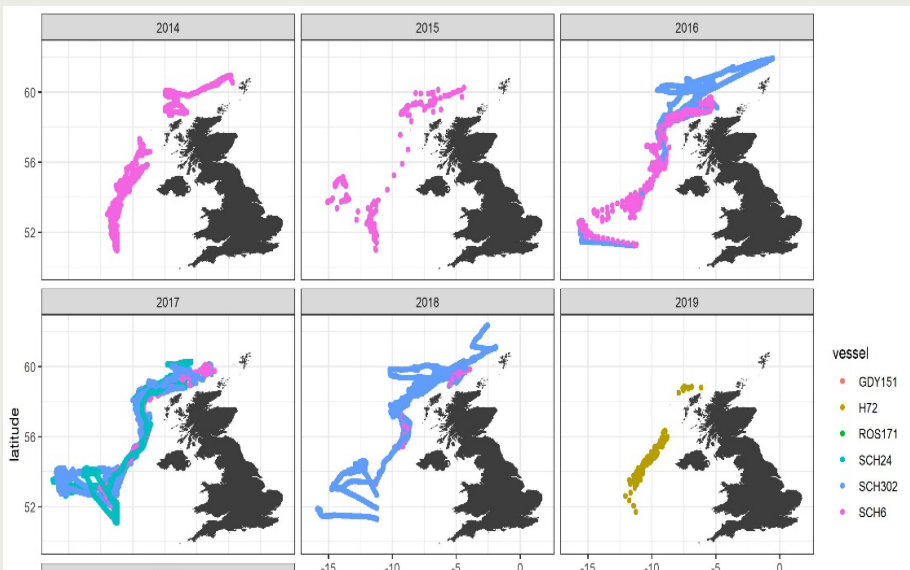
SJÁVARÚTVEGS
RÁDSTEFNAN
2022

Dæmi frá 4 samtökum sjávarútvegsfyrirtækja



PFA, byrjaði 2014: þróa sjálfvirkar aðferðir til að nota bergmálgögn fiskiskipa fyrir rannsóknir

OceanBox: safnar og vinnur hrágögn sjálfvirkt um borð, þróa sjálfvirka greiningu tegunda



Rannsóknir og vísindagreinar byggðar á rútinu mælingum í veiðum og vinnslu



ICES Journal of Marine Science



ICES Journal of Marine Science (2022), 79(1), 88–99. <https://doi.org/10.1093/icesjms/fsab244>

Original Article

Intra- and inter-annual variability in the fat content of Atlantic herring (*Clupea harengus*) as revealed by routine industry monitoring

Susan Kenyon^{1,*}, Martin Pastoors², Steven Mackinson³, Thomas Cornulier¹, and C. Tara Marshall¹

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²Pelagic Freezer-Trawler Association, Louis Braillelaan 80, 2719 EK Zoetermeer, Netherlands

³Scottish Pelagic Fishermen's Association, Heritage House, 135-139 Shore Street, Fraserburgh, AB43 9BP, UK



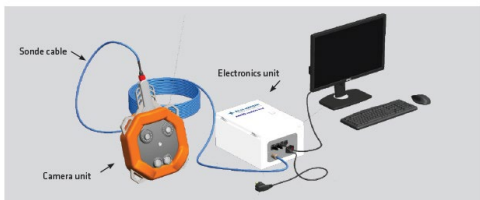
<https://www.pelagicfish.eu/research>

PFA: fleiri rannsóknarverkefni

Greina tegund áður
en kastað

SeaScout

Vivid and Clear Images from Trawl | Real Time Video on Bridge



Note: Blue sonde-cable is shown for illustration purposes. In reality, ship's available sonde-cable is used.

Mechanical Specifications

Camera size 60 x 40 x 12 cm
Camera weight 1 kg in water, 14 kg in air
Electronics dimensions 40 x 30 x 21 cm (mounted on ship)
Depth rating 4000 m
Max cable length 1100 m

Interface Specifications

Power supply 240VAC, 50/60Hz, 100W
Data storage 1 TB internal storage
User interaction USB connectors for keyboard and mouse
Monitor HDMI (VGA and display port upon request)



Sjálfvirk mæling á
lengd og þyngd um
borð



Safna
líffræðisýnum á sjó
fyrir rannsóknir

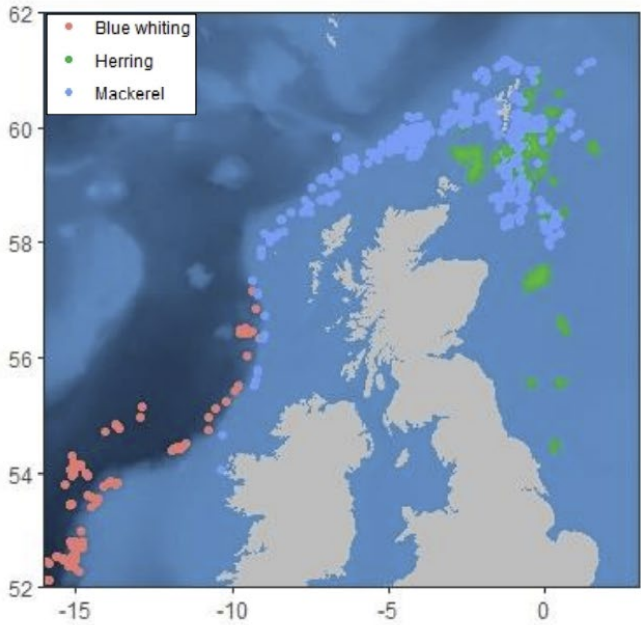


Alþjóðahafrannsóknaráðið
taka þátt stofnmati og
ýmsum vinnuhópum



SPFA, byrjaði 2016: mæla aflasýni uppsjávarfiska

Scottish Pelagic Industry-Science Data Collection Programme



Two elements: Self-sampling and co-sampling both delivering information for pelagic stock assessment



Stats: Jun 18- Jan 2022

- 550+ trips
- 1250+ hauls
- 150,000+ fish measured



Frysta fiska, senda í land, fyrir kvarnir og erfðasýni.

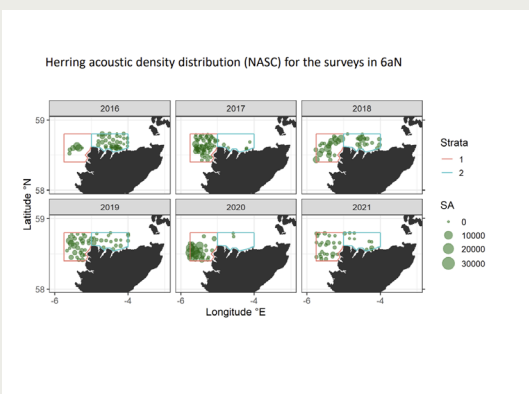
SPFA: rannsóknaverkefni

Endurheimtur RFID merki

Rannsóknir

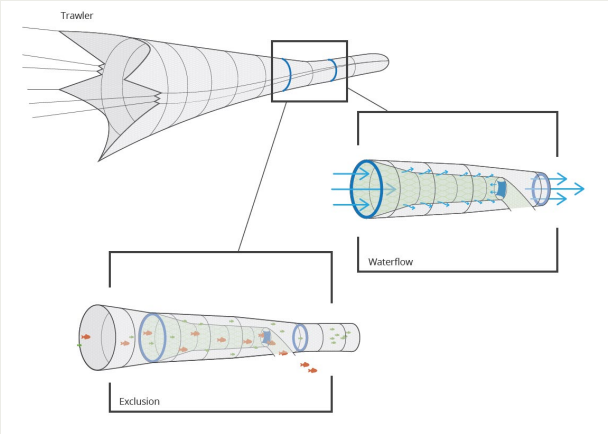
Bergmálsgögn fiskiskip

Alþjóðahafrannsóknaráððið



DPPO, 2013: yfirlit um rannsóknir

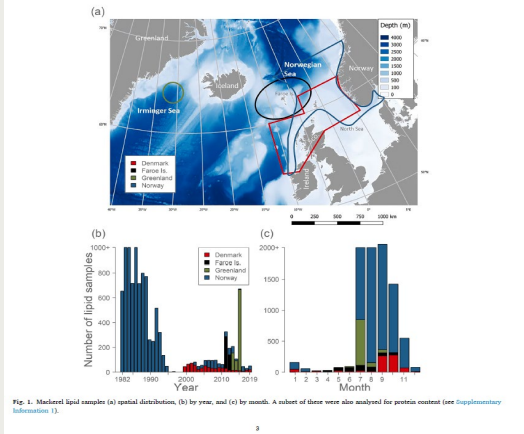
Veiðarfæri



Dýravelferð



Rannsóknir



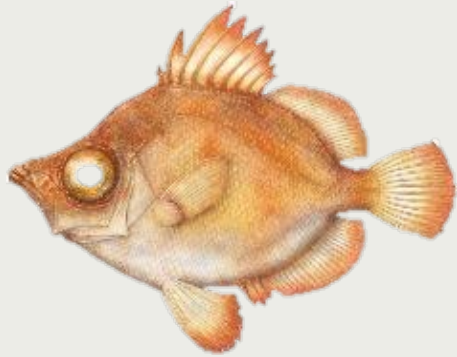
Alþjóðahafrannsóknaráðið



KFO, 2022: yfirlit um rannsóknir

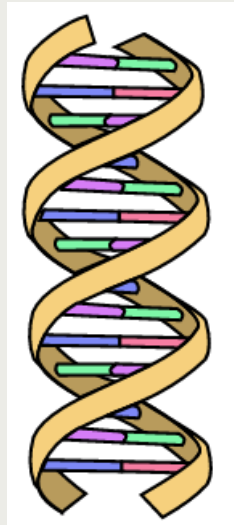


Rannsóknir:
hafgöltur, stofnmat



Mynd Edward Farrell

Stofngerð síld og brynstirtla



Alþjóðahafrannsóknaráððið



<https://kfo.ie/>

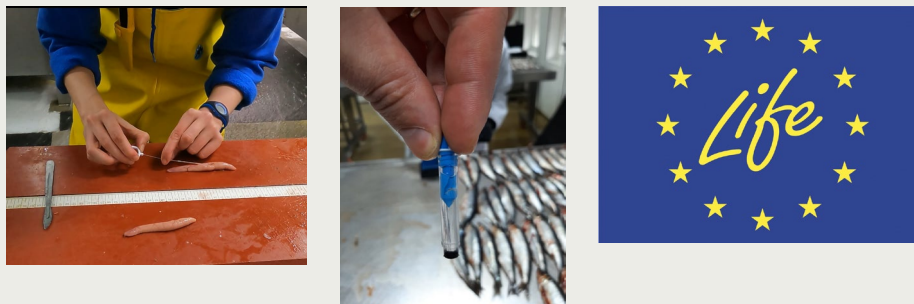
Samantekt á rannsóknastarfi



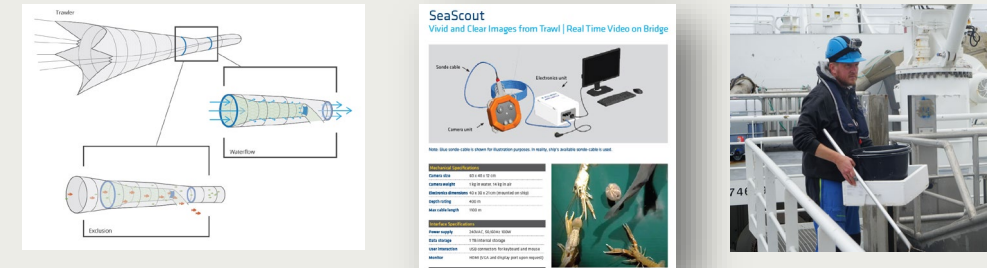
- Leiða vistfræðirannsóknir á lífríkinu



- Þátttaka í rannsóknum á lífríki hafsins með háskólum og stofnunum



- Rannsóknir minnka áhrif veiða á lífríkið



- Virk þátttaka í Alþjóðahafrannsóknaráðinu



Forsvarsmenn vísindastarfs samtakanna



Pelagic Freezer-Trawler Association, Hollandi

- Martin Pastoors (mpastoors@pelagicfish.eu)



Scottish Pelagic Fishermen's Association, Skotlandi

- Steve Mackinson (steve.mackinson@scottishpelagic.co.uk) og Katie Brigden (katie.brigden@uhi.ac.uk)



Denmarks Pelagic Producentorganisation, Danmörku

- Claus R. Sparrevohn (crs@pelagisk.dk)



Killybegs Fisherman's Organisation, Írlandi

- Edward Farrell (edward@kfo.ie)

Takk fyrir

Meiri upplýsingar um rannsóknir hagsmunasamtaka í fyrirlestrarglærum á netinu!



PFA

PELAGIC FREEZER-
TRAWLER ASSOCIATION

PFA pelagic research activities

Martin Pastoors



PFA Research & knowledge strategy



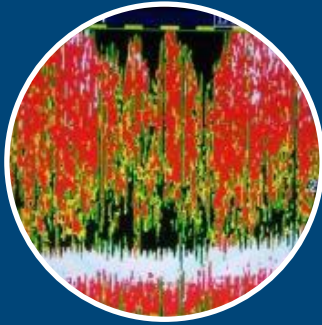
Ambition

PFA (*Pelagic Freezer-trawler Association*) is committed to initiate, develop, contribute and sustain knowledge development that is needed for sustainable management and exploitation of fish stocks in all areas where PFA members are active.

**Catching with care
for a better world.**



Self
sampling



Vessel
acoustics



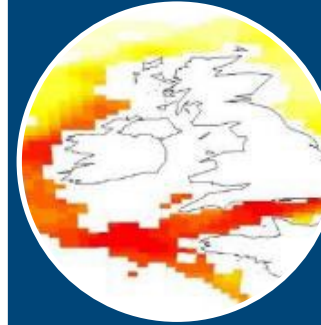
Improve
selectivity



Assess
impacts



Collaborat
e with
industry
and NGOs



Contribut
e to
science



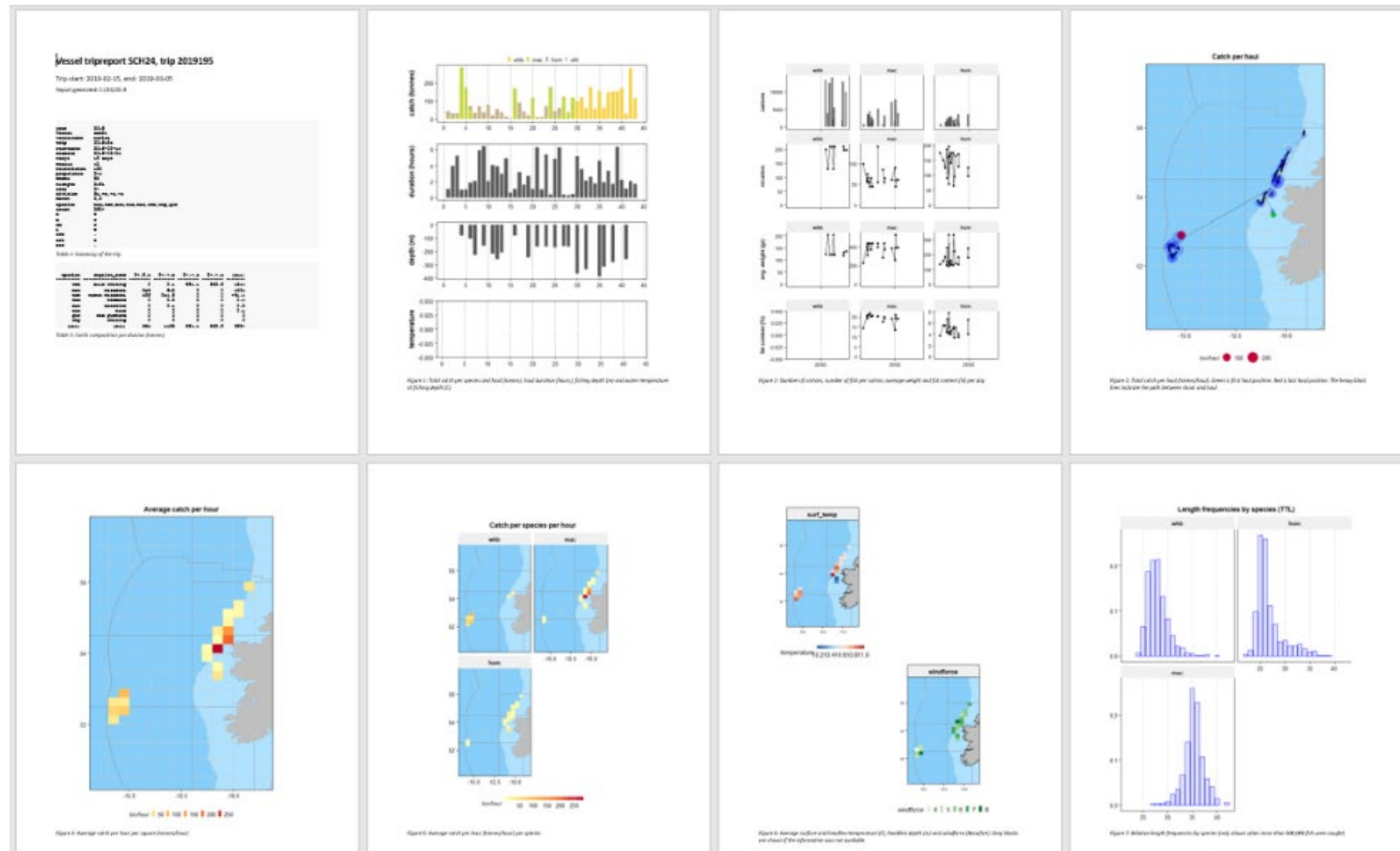
Communi
cate
results

PFA research programme

Self-sampling: data/knowledge from fisheries

year	nvessels	ntrips	ndays	nhauls	catch	catch/day	nontarget	nlength	nbio
2015	8	44	761	1,738	130,286	171	0.75%	108,098	0
2016	11	98	1,538	4,066	270,037	176	0.69%	142,286	0
2017	15	122	2,030	4,940	333,784	164	0.38%	282,900	1,042
2018	17	157	2,489	5,919	456,863	184	0.29%	327,650	1,871
2019	17	159	2,687	6,655	416,727	155	0.55%	280,298	1,922
2020	17	171	2,579	6,195	494,083	192	0.48%	273,426	3,639
2021	19	184	2,784	6,431	507,031	182	1.32%	270,197	2,507
2022*	19	145	2,032	4,811	371,246	183	0.77%	148,838	5,086
(all)		1,080	16,900	40,755	2,980,059			1,833,693	16,067

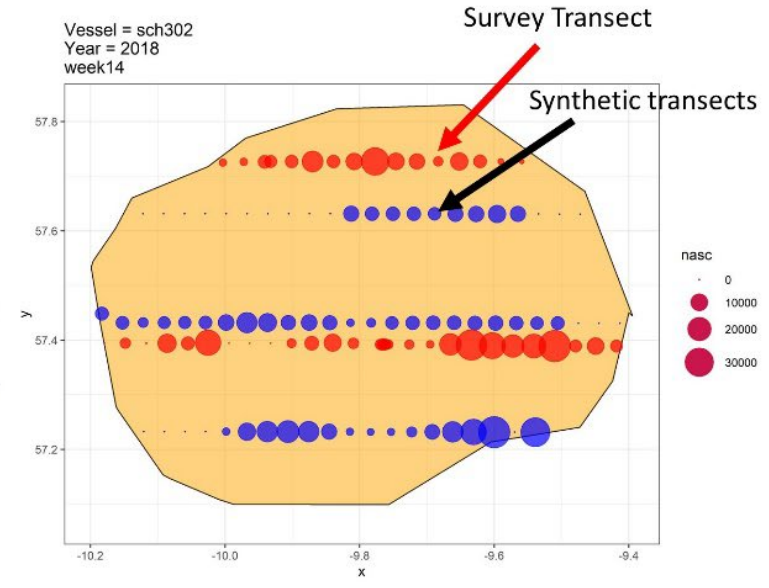
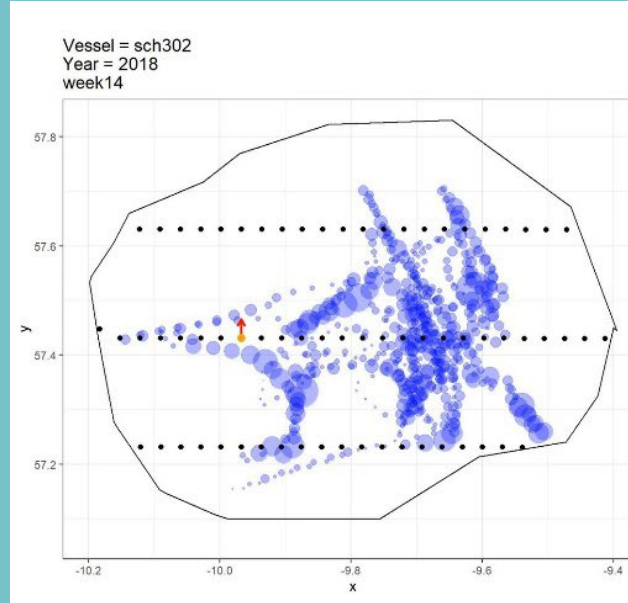
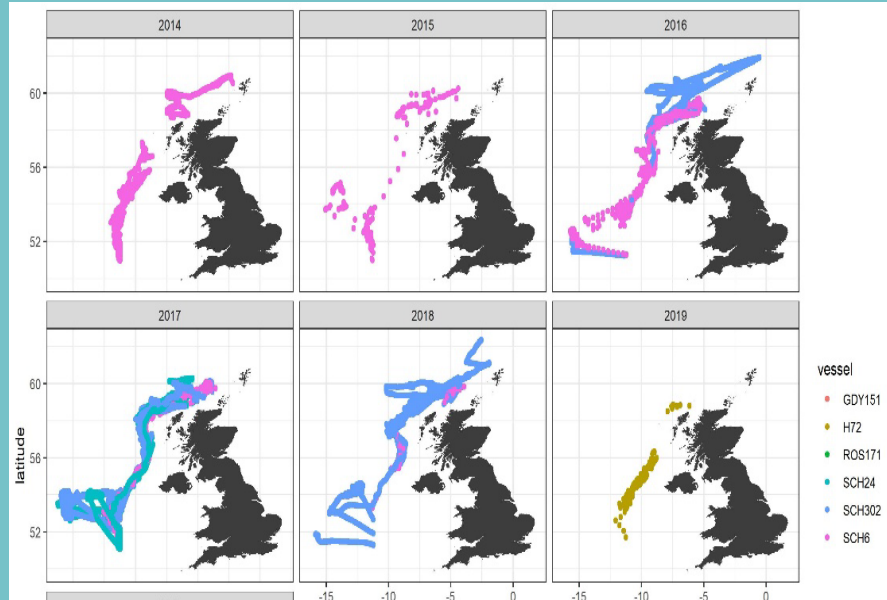
Tripreports: direct feedback to skipper and crew



... transparent reporting to expert groups



Using acoustic data from fishing vessels



New method, developed by WMR, to compare acoustic data from trawlers with scientific surveys +
Focus on automated processing of acoustic data

Pre-catch identification



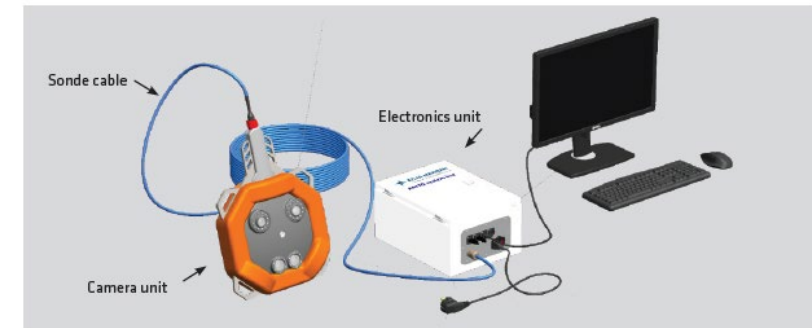
GoPro with fixed
Downrigger on
Wiron5



Upcoming trial with live camera

SeaScout

Vivid and Clear Images from Trawl | Real Time Video on Bridge

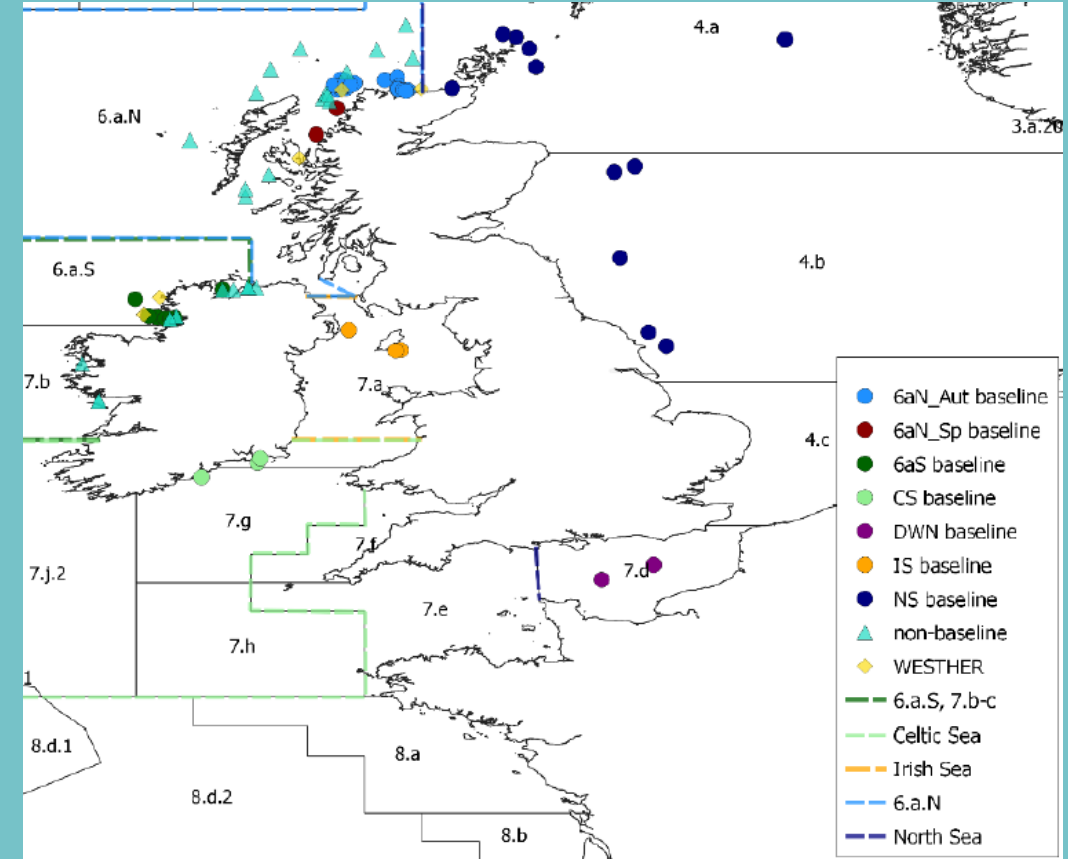


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Genetic research into stock identification



Gonad research to support scientific egg surveys



PFA researcher Lina de Nijs joined 2 trips on Frank Bonefaas to sample mackerel gonads for the international mackerel egg survey 2022.

Automated weighing and length measurements

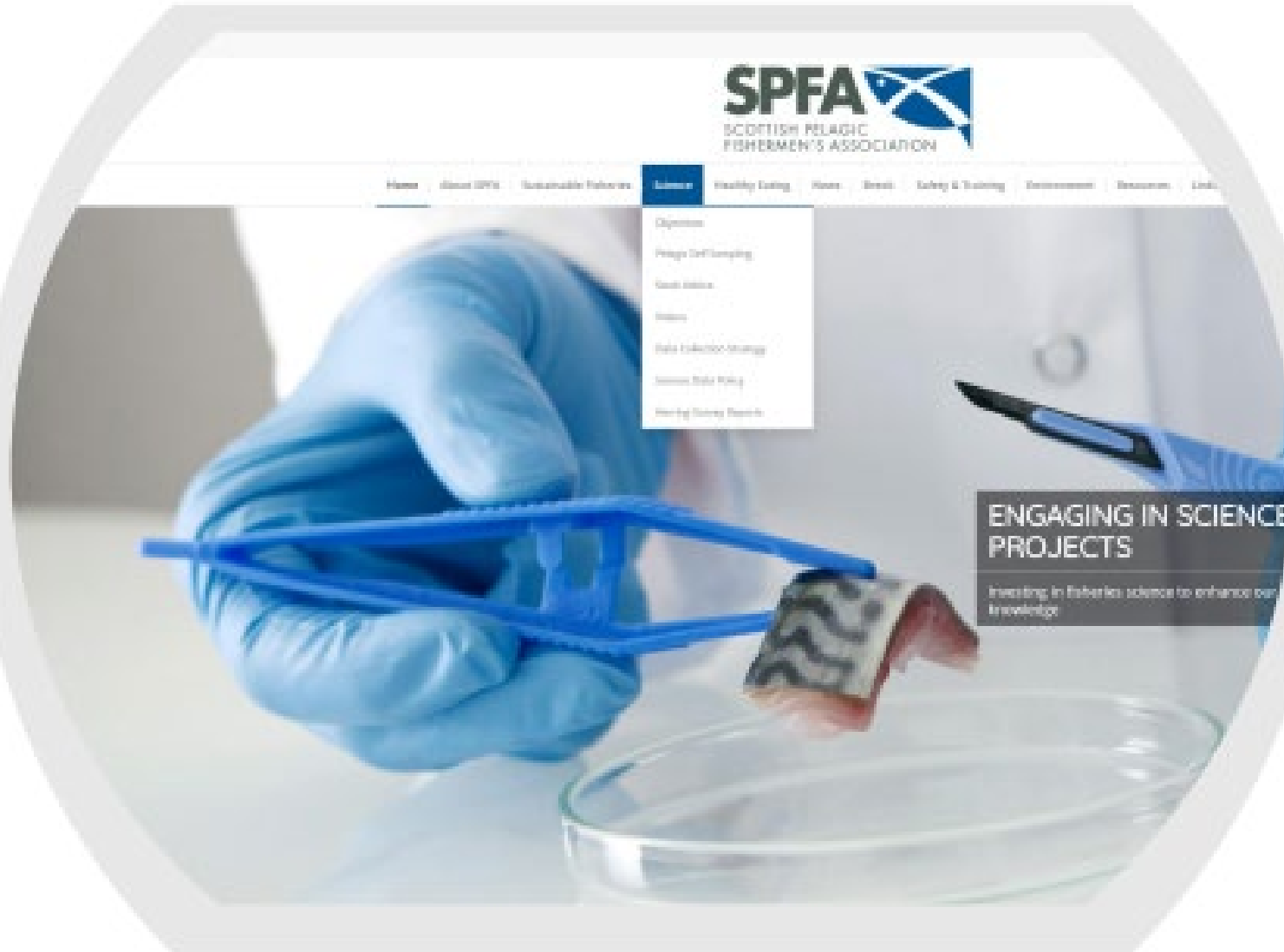


How can we efficiently increase the number of length and weight measurements (i.e. condition index)?

Working with industry to improve science and management



Pelagic Science Projects



Steven Mackinson

Chief Scientific Officer, Scottish Pelagic Fishermen's Association

Our vision

Scottish pelagic fishermen, respected providers of scientifically credible data that's used to assess fish stocks, monitor changes in the pelagic ecosystem, and support management decisions.

Science Plan

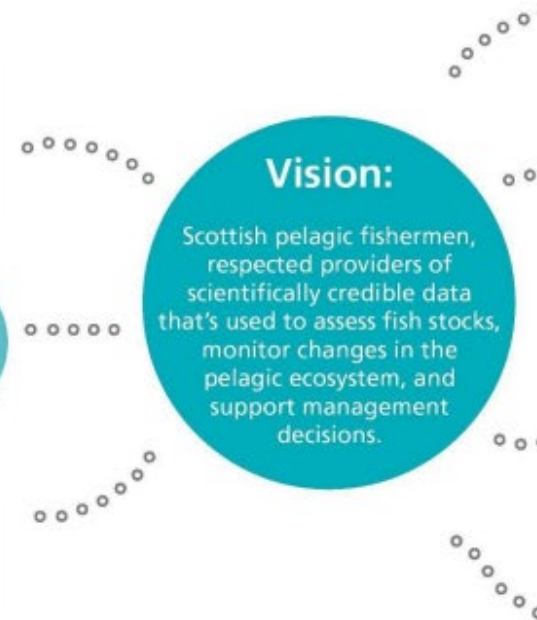


01 Establish pelagic fishing vessels as research platforms for mapping changes in the abundance of pelagic fish

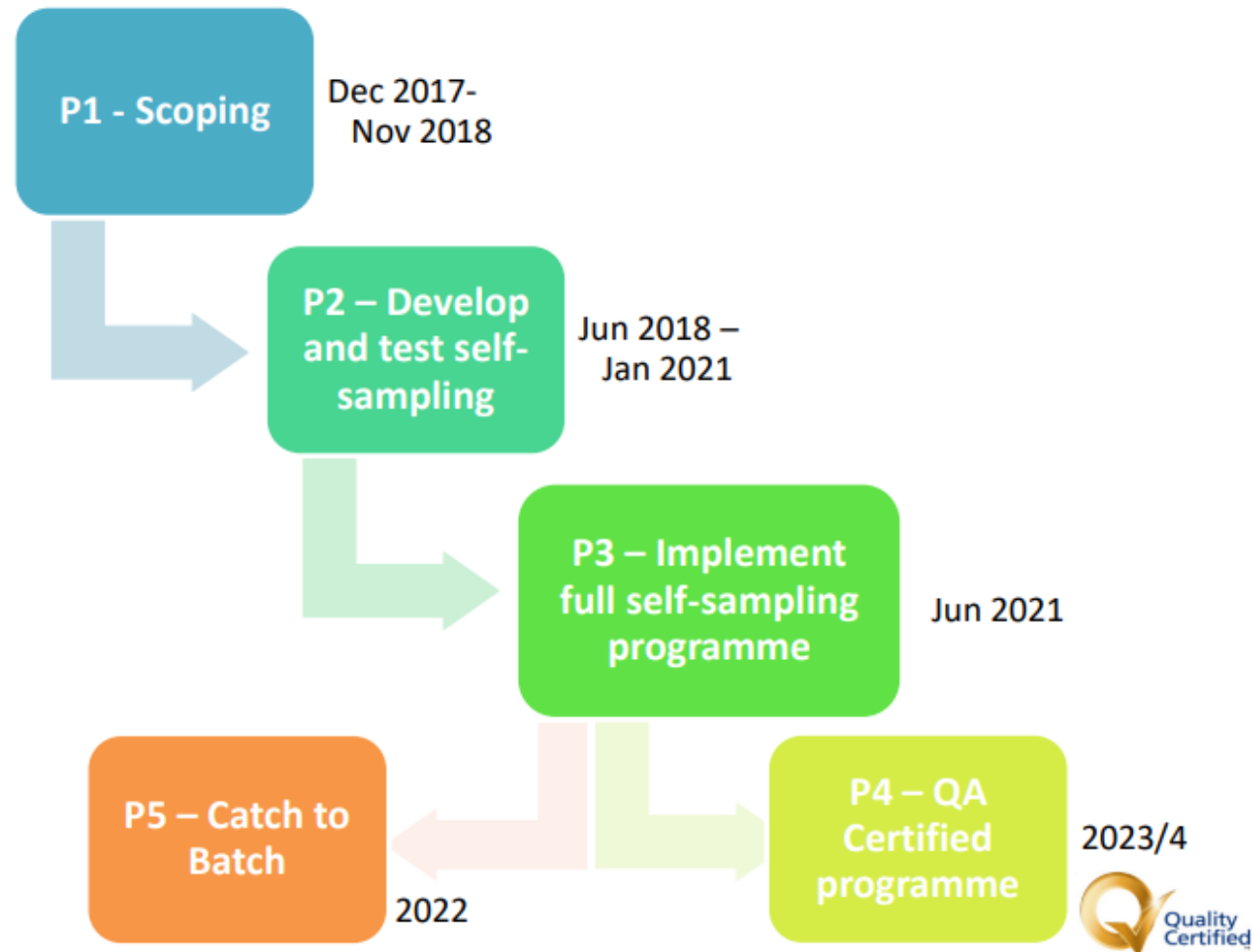
Equip and train in relevant technologies



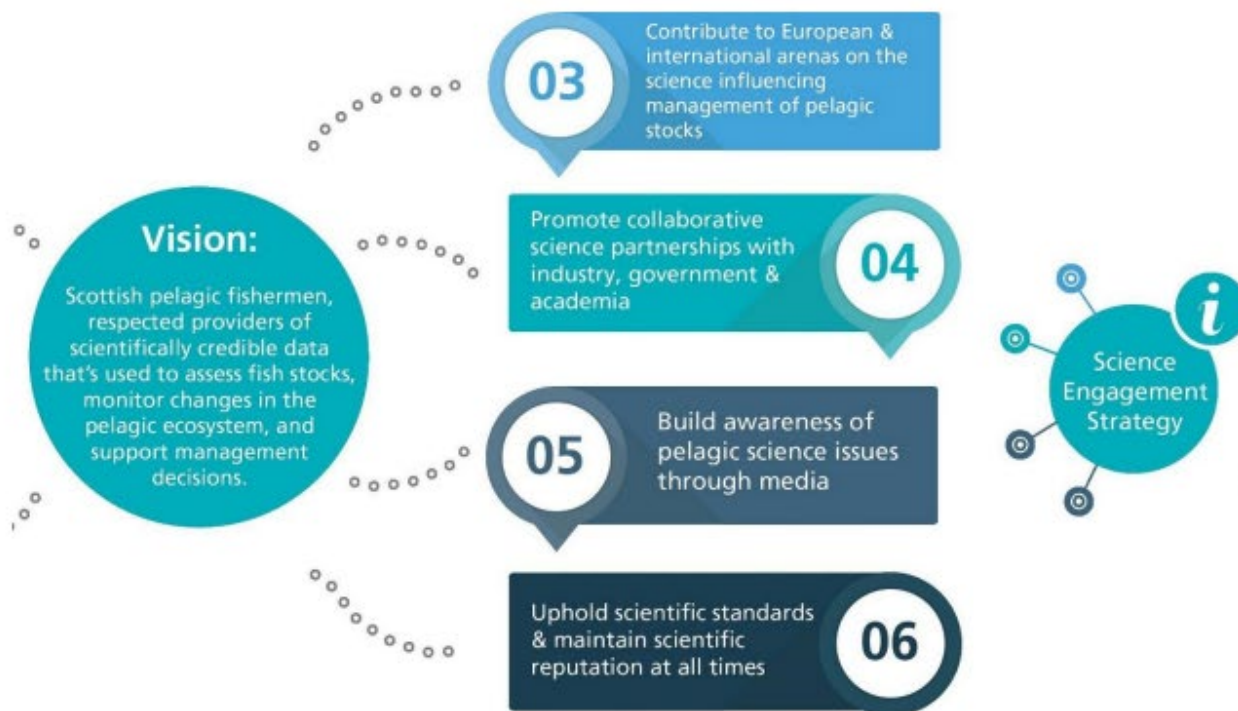
02 Work with fish factories to promote the collection of data



Data Collection strategy phases



Science Plan



ICES Pelagic surveys and assessments working
CIEM groups, benchmark workshops etc **Pelagic**
ADVISORY COUNCIL

marinescotland
science Catch sampling, stock surveys and
ecological research



UHI | SHETLAND



Science Plan

Vision:

Scottish pelagic fishermen, respected providers of scientifically credible data that's used to assess fish stocks, monitor changes in the pelagic ecosystem, and support management decisions.

03

Contribute to European & international arenas on the science influencing management of pelagic stocks

04

Promote collaborative science partnerships with industry, government & academia

05

Build awareness of pelagic science issues through media

06

Uphold scientific standards & maintain scientific reputation at all times

Science Engagement Strategy

Adhoc science engagement Consultations, e.g. REM and Sandeels

Fishing industry takes on new role in collection of data on fish catches

Move enhances the relationships between industry and science

Scotland's fishing industry will take a new hands-on role in collecting the data used to make yearly management decisions about herring, mackerel and blue whiting stocks (collectively known as pelagic fish). Since the 1970s the Scottish Government has collected data on the catches of pelagic species, mainly from fish obtained from processors when the vessels land their catch. Now fishers will collect fish samples on-board directly from their individual hauls and will supply these to scientists for analysis. This collaboration has been developed by the Scottish Pelagic Fishermen's Association (SPFA), Shetland UHI and the Marine Scotland directorate of the Scottish Government.

MARE Publication Series 22

Petter Holm
Maria Hadjimichael
Sebastian Linke
Steven Mackinson Editors

Collaborative Research in Fisheries

Knowledge Governance in Europe

Springer

Original Article

Intra- and inter-annual variability in the fat content of Atlantic herring (*Clupea harengus*) as revealed by routine industry monitoring

Susan Kervyn^{1*}, Martin Pastoor², Steven Mackinson³, Thomas Contulder¹, and C. Tara Marshall¹

¹School of Biological Sciences, University of Aberdeen, Zoology Building, Tillydrone Avenue, Aberdeen, AB9 8DZ, UK
²Shetland Pelagic Fishermen's Association, 1000 Boreland Rd, 1719-04, Garmouth, Peterhead
³Scottish Pelagic Fishermen's Association, 1000 Boreland Rd, 1719-04, Garmouth, Peterhead

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Received 15 August 2020; revised 17 November 2020; accepted 18 November 2020; advance access publication 11 December 2020

Fat content indicates individual condition and both annual reproductive cycles in many fish species. These cycles, coupled with seasonal changes, can result in large inter- and intra-annual fluctuations in fat content. However, quantifying this variability is challenging when accurate sampling does not cover the full reproductive cycle. Scottish and Shetland fish processors routinely measure muscle fat content of North Sea herring (*Clupea harengus*) throughout the spawning season. We validated these high temporal resolution data by estimating a strong intra-annual signal in fat content, which reached having reproductive status. Fat content increased from 4.1% (95% CI 3.0–5.2) in May to 10.1% (95% CI 8.9–11.3) in June before spawning and decreasing to 5.1% (95% CI 4.0–6.2) in September which coincided with the onset of spawning. We also examined inter-annual variability in the seasonal pattern and the timing and magnitude of peak fat content in 2019 and 2020. There was no difference in the timing and magnitude of peak fat content between years. Our study validates the scientific use of routinely collected fat content data from pelagic fish processors.

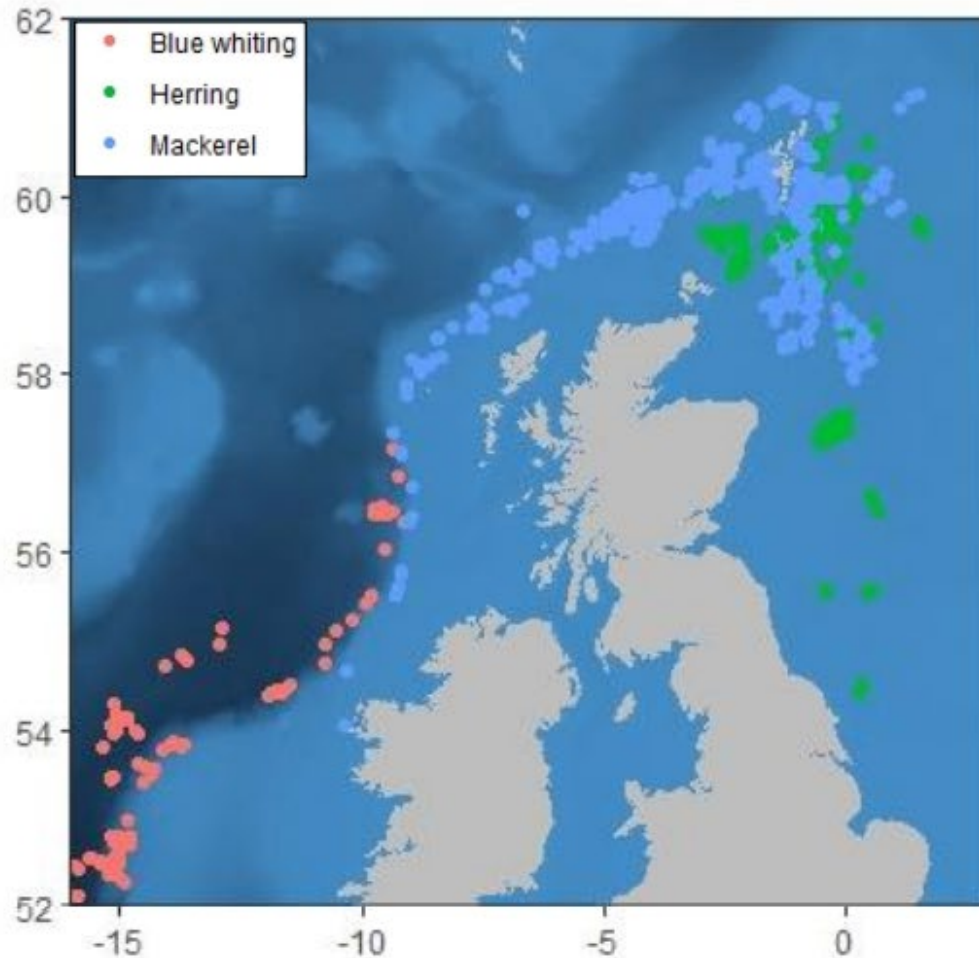
Keywords: between-year variability, *Clupea harengus*, fat content, fish condition, industry sampling, North Sea herring, seasonal variability

Introduction

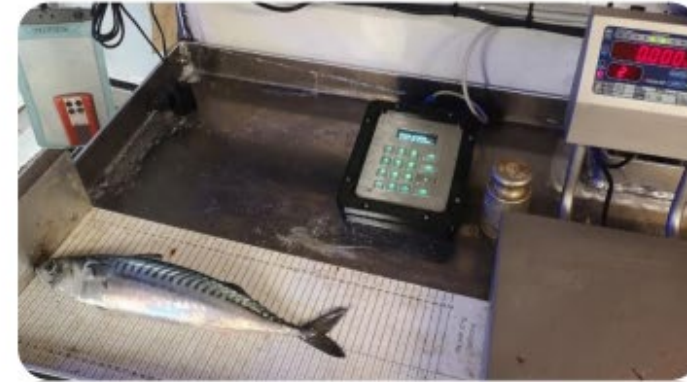
Fat constitutes the main energy reserves in fish and is used as a reliable indicator of fish condition (Stevens and Woods, 2006). Following onset of maturity, many fish species undergo annual cycles of feeding, reproduction, and overwintering. Fat is particularly important for capital spawners who store the energetic cost of spawning during relatively short periods (Stearns et al., 2011). Indicators for fitness and increased likelihood of skipped spawning (Stearns et al., 2011).

SPFA
SCOTTISH PELAGIC FISHERMEN'S ASSOCIATION

Scottish Pelagic Industry-Science Data Collection Programme



Two elements: Self-sampling and co-sampling
both delivering information for pelagic stock
assessment



Stats: Jun 18- Jan 2022

- 550+ trips
- 1250+ hauls
- 150,000+ fish measured

Biological Sampling Overview

(see manual for more details)



Mackerel 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 each 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 the sample needs to be taken at different times during pumping. We will try 3 times: the start, middle and end.

How?

1. During pumping, take just under $\frac{2}{3}$ rd 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 40-45kg and provide a sample of around 100-130 fish.
2. Take each fish and measure its length (see diagram) to the nearest lowest cm (for example, if it is 37.7cm, write down 37 cm. If its 37.4 cm, write down 37), then measure its weight in grams.
3. Record the measurements of each fish on the recording sheet provided. Use a separate sheet for each haul.



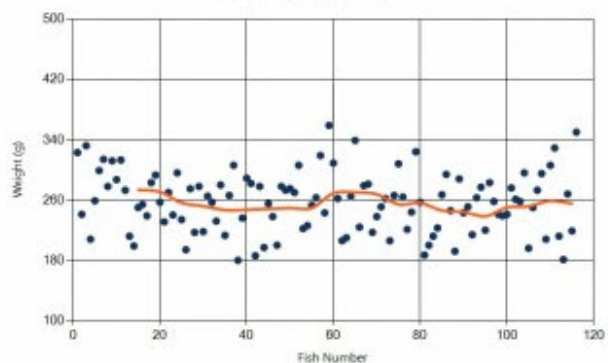


Trip: 4
haul: 1
ike: 1

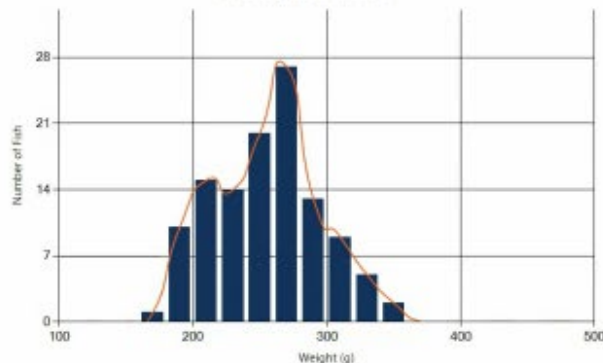
Replay: 10/06/2020 18:55:05

Average Minimum Maximum
Fish Sampled **116** Weight **256a** **180a** **359a**
Total Weight **29.78k** Length **289m** **260m** **330m**

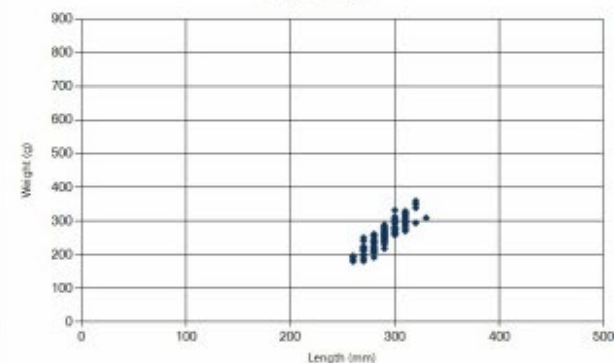
Visual Weight Data Check



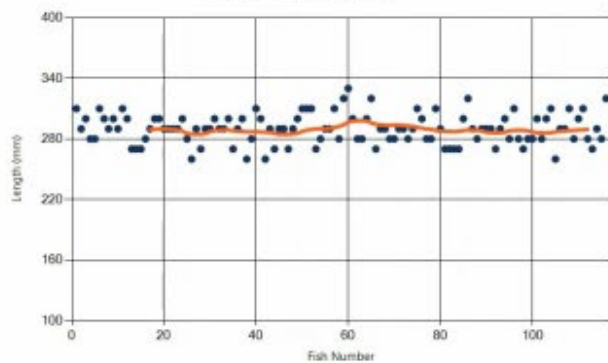
Fish Weight Distribution



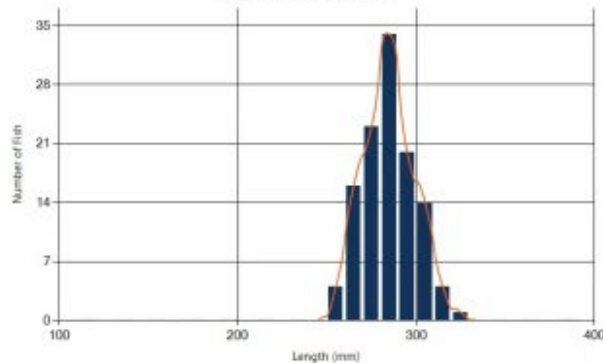
Length vs Weight



Visual Length Data Check

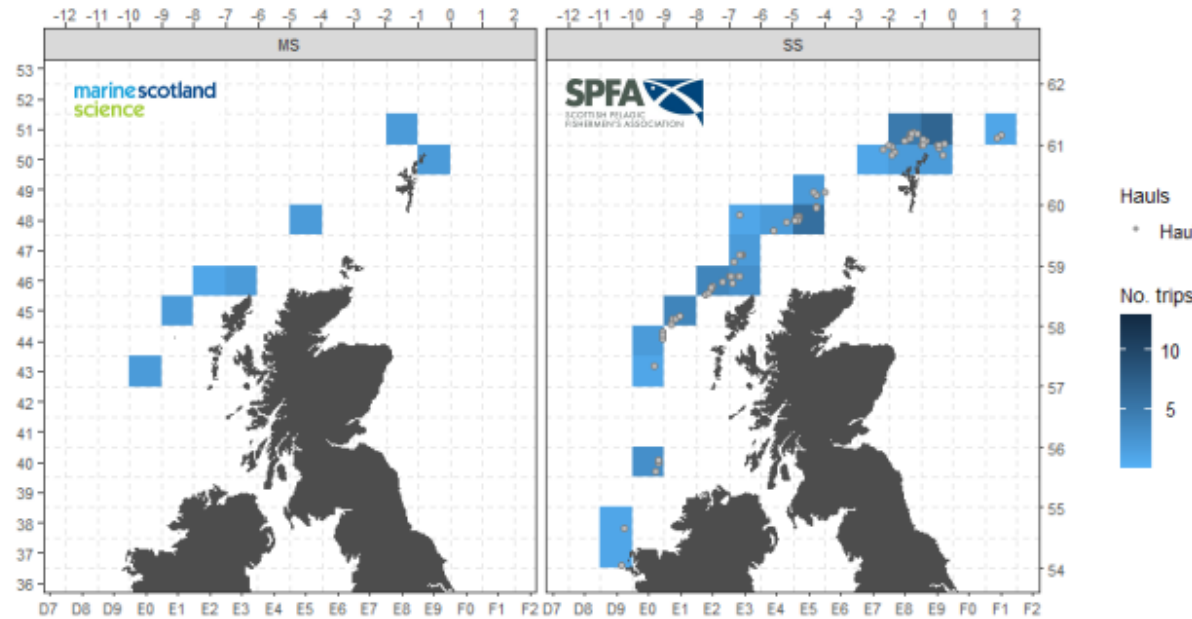


Fish Length Distribution



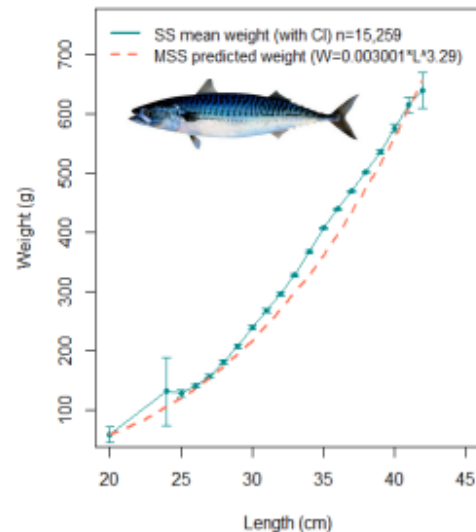
Grade	Min.	Max.	Count	%
Below Limit	0	50	0	0.00%
G1	50	99	0	0.00%
G2	100	149	0	0.00%
G3	150	199	9	7.76%
G4	200	249	38	32.76%
G5	250	299	53	45.69%
G6	300	349	14	12.07%
G7	350	400	2	1.72%
Above Limit	400		0	0.00%

Comparisons with Marine Scotland data

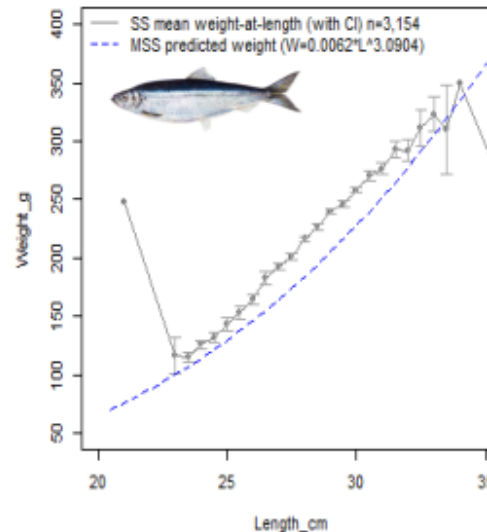


- Better coverage in time and space because every boat can be sampled.
- Richer data – every haul rather than every landing

MAC January 2021



HER Sept 2019



- Industry measures length and weight of fish
- MSS measure length only and predict the weight and use this as input to assessment.
- Comparisons show real measurements don't match predictions.



THE SCOTSMAN

SCOTLAND'S NATIONAL NEWSPAPER

Tuesday 22nd March 2022

Fishing industry takes on new role in collection of data on fish catches

Move enhances the relationship between industry and science, writes
Dr Steven Mackinson

Scotland's fishing industry will take a new hands-on role in collecting the data used to make yearly management decisions about herring, mackerel and blue whiting stocks (collectively known as pelagic fish).

Since the 1970s the Scottish Government has collected data on the catches of pelagic species, mainly from fish obtained from processors when the vessels land their catch. Now fishers will collect fish samples on-board directly from their individual hauls and will supply these to scientists for analysis. This collaboration has been developed by the Scottish Pelagic Fishermen's Association (SPFA), Shetland UHI and the Marine Scotland directorate of the Scottish Government.

"The Scottish pelagic industry recognises that engagement in science is

more important now than ever," commented Ian Gatt, chief executive of the SPFA. "Taking new responsibilities for providing scientific samples is seen by the industry as a welcome opportunity to directly contribute to the continuous improvement of stock assessments."

The programme has proved popular, with almost all Scottish pelagic fishing vessels volunteering to take part in the data collection programme.

"The strong uptake from industry strengthens the evidence base, improving insight into the health of these fish stocks and the state of Scotland's marine environment," commented Matt Gubbins, Head of Fisheries Data within the Scottish Government's Marine Scotland directorate.

The information gathered by the programme is used by the International Council for the Exploration of the Sea

(ICES) to make yearly assessments of the status of these fish stocks. These stock assessments are then used to make management decisions including fishing quotas for the following year; and the better the data, the better the management. One of the major benefits of this collaboration is access to catches landed abroad. Fishers will deliver samples from their catch wherever it is landed, improving the quality of the data used for stock assessments.

Prof Jane Lewis, Principal and CEO Shetland UHI, said: "We are delighted to see how the collaboration between SPFA, Scottish Government and ourselves has developed new ways of collecting scientific data to support improvements in fish stock assessments. The pelagic sector is of huge importance locally and working co-operatively with industry remains a

key strategic aim for us." Involving fishers in data collection enhances the relationship between industry and science, creating a pathway for even closer collaboration in the future.

"The example here of the development of an industry-led pelagic sampling programme can serve as a role model for others intent on similar applications," said Ian Gatt. "This new arrangement of collaborative sampling also gives scope for greater industry involvement and responsibility in

scientific research in the future."

The new programme has been successfully implemented for the first mackerel fishing season of 2022. "This is a welcome partnership which will support the protection of pelagic fish and, in turn, bring long term economic benefits," added Matt Gubbins.

Dr Steven Mackinson, Chief Scientific Officer, Scottish Pelagic Fishermen's Association

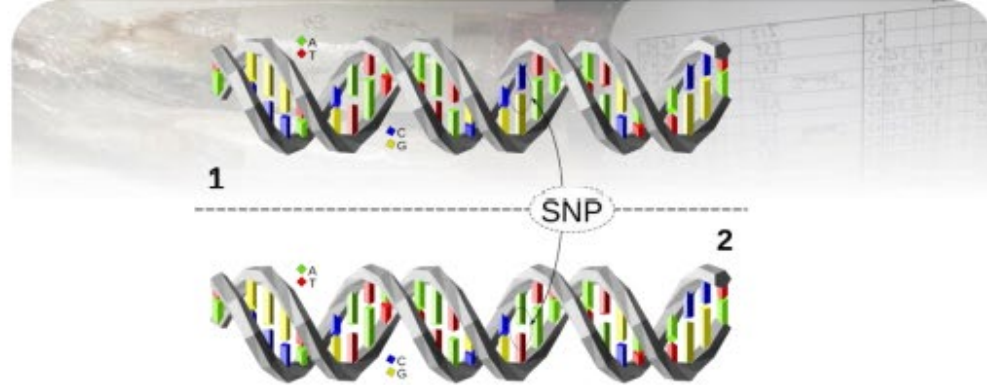


Bringing fishermen's data to life

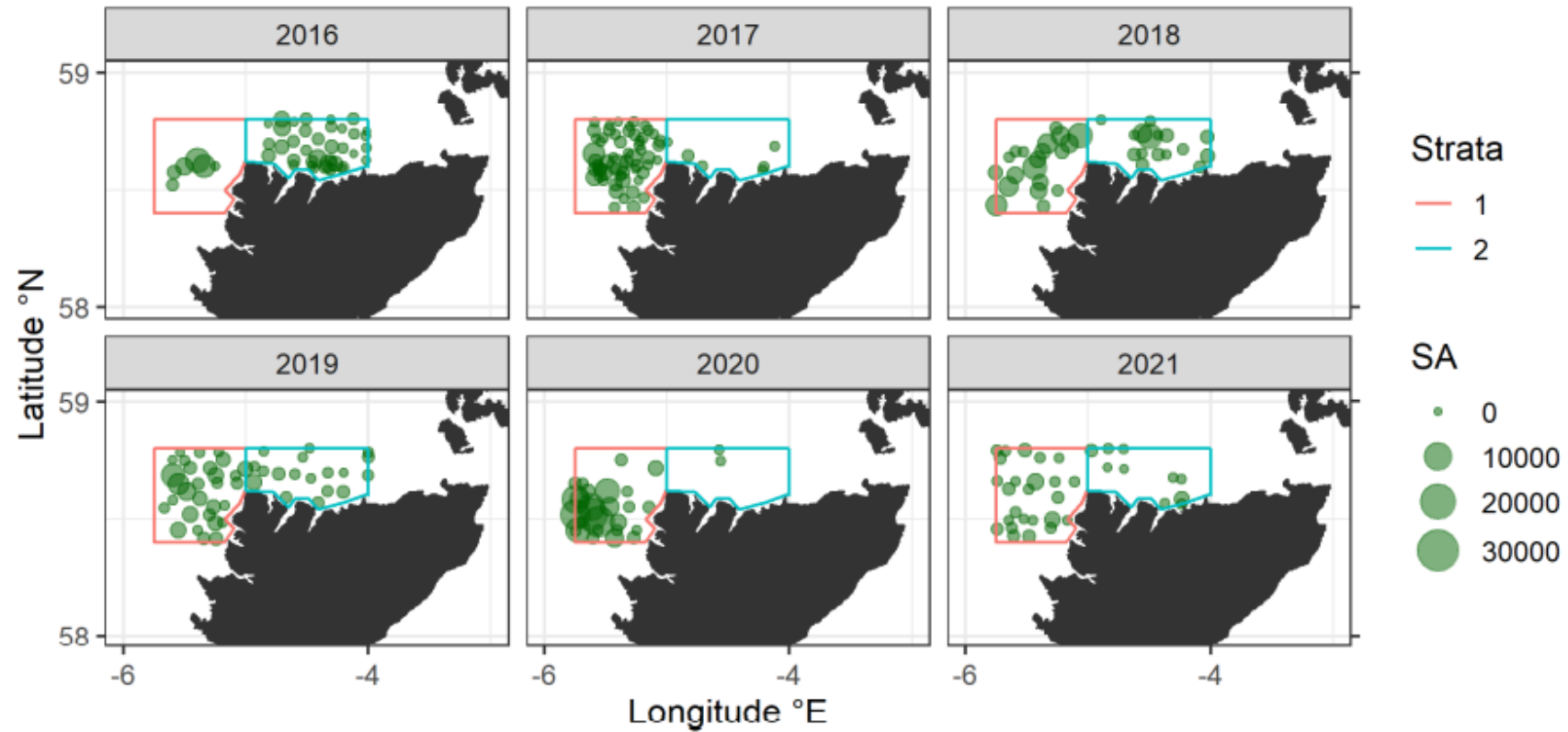


Other science inputs supporting stock assessment

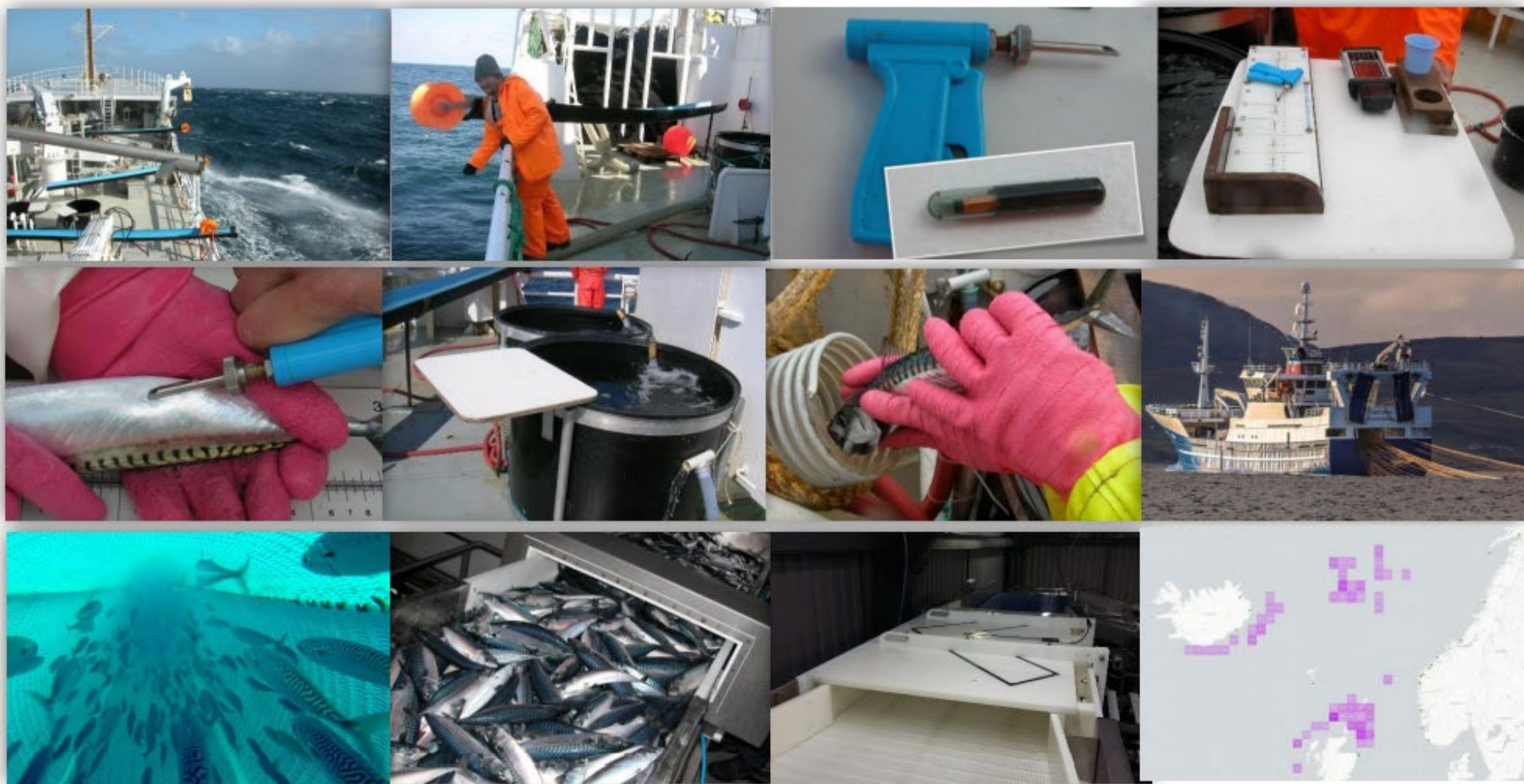
Identity of West Coast Herring Stocks



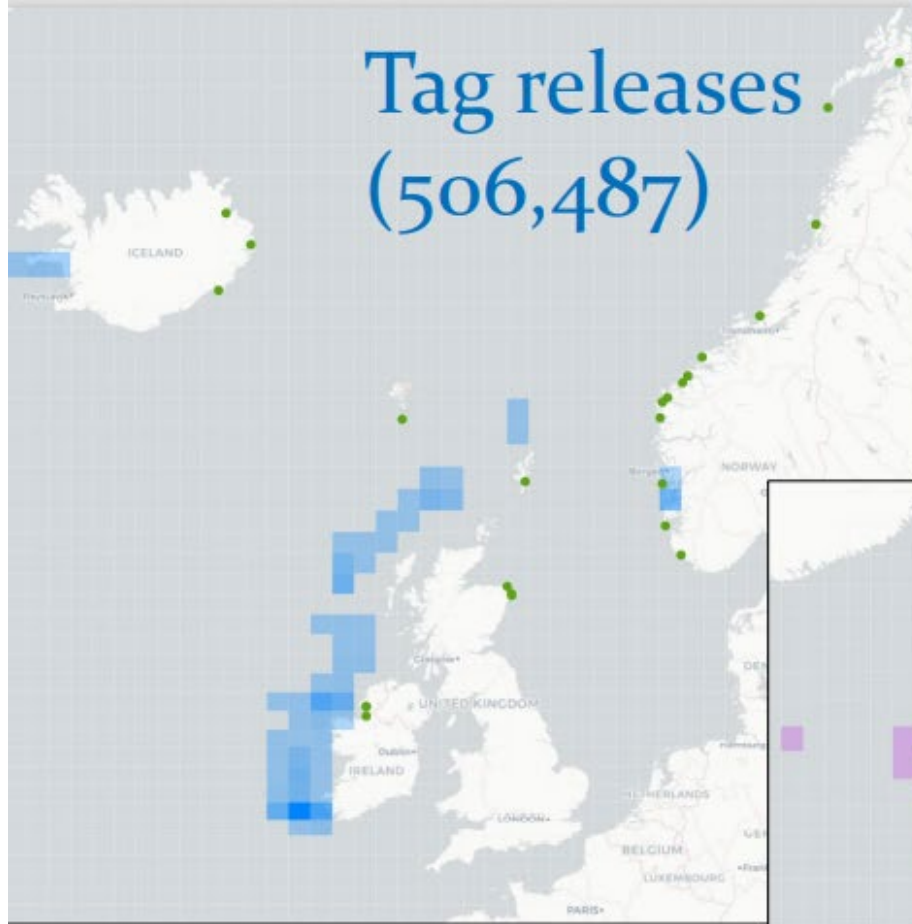
Herring acoustic density distribution (NASC) for the surveys in 6aN



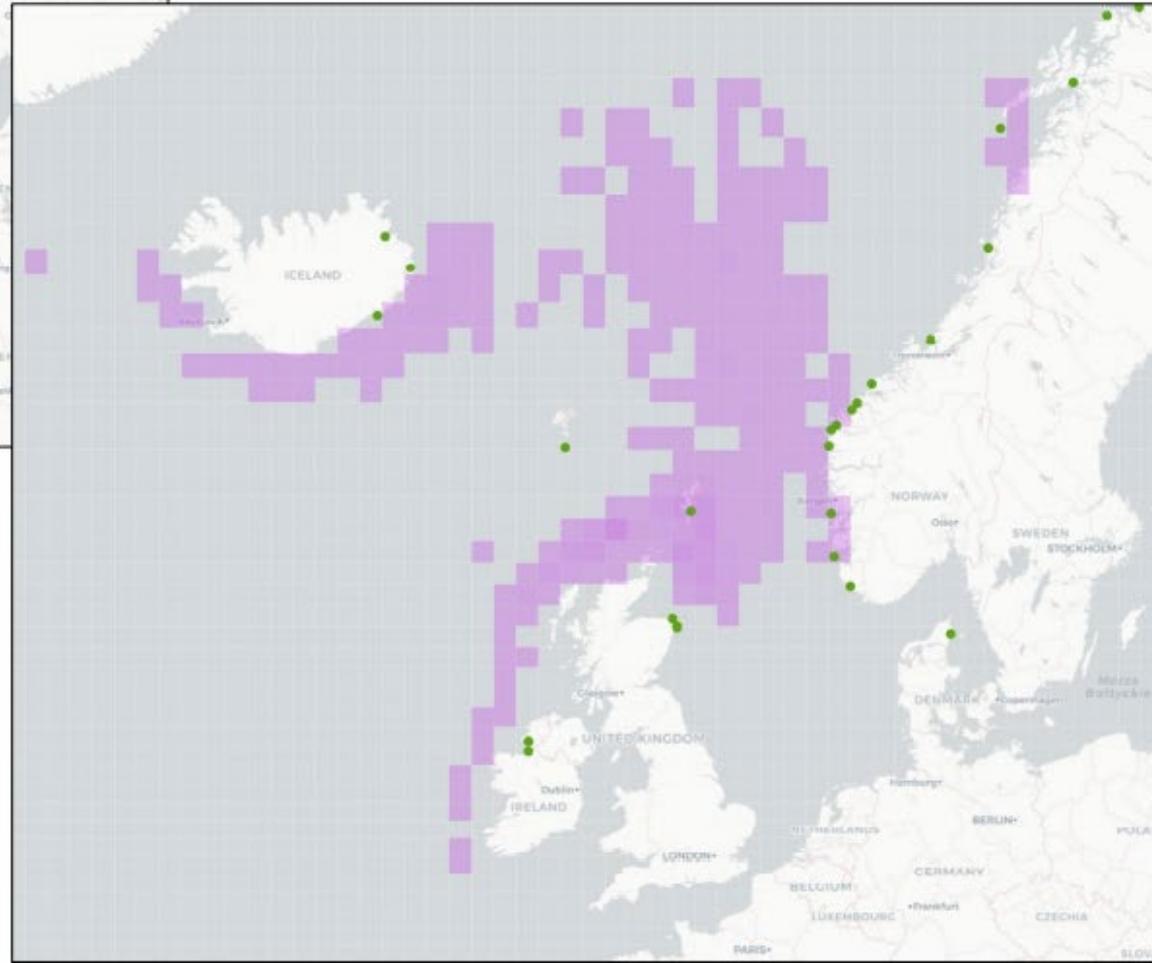
Mackerel stock abundance and migration



Tag releases
(506,487)



Tag recaptures (9,404)





The Fatter the Better?

Revealing the ecological value of industry data on mackerel and herring fat content



Susan Kenyon (PhD candidate, Aberdeen University)

UNIVERSITY OF
ABERDEEN

SPFA
SCOTTISH PELAGIC
FISHERMEN'S ASSOCIATION



PELAGIC FREEZER-
TRAWLER ASSOCIATION

Dr Tara Marshall
Dr Steven Mackinson
Martin Pastoors

The Sustainable Management of UK Marine Resources (SMMR) Strategic Priorities Fund is a £12.4m initiative dedicated to funding marine research in order to address critical gaps in understanding that have been identified by UK policy makers.



Marine Spatial Planning Addressing Climate Effects (MSPACE)

Principle Investigator: Ana Queirós, Plymouth Marine Laboratory

MSPACE is a highly integrated, multidisciplinary project conceptualised to drive forward the capability of the four UK nations in designing and implementing climate-smart marine spatial plans (MSP).

Pyramids of Life: Working with Nature

Principle Investigator: Jon Pitchford, York University

The 'Pyramids of Life' approach to a sustainable future captures and helps to communicate complex relationships between different species, human behaviours, and marine ecosystem functions.



Bycatch project 'CIBBRiNA' – Coordinated Development and Implementation of Best Practice in Bycatch Reduction in the North Atlantic Region

DPPO Scientific projects:

- Two PhD. Students,
- Forefront of developing selective gear such as Excluders,
- Historical mackerel fat content
- Fully documented fishery on all Danish Pelagic vessels from 2023 (CCTV and other relevant sensors),
- Fish welfare project with animal protection Denmark.



Industry science projects



Killybegs Fishermen's

ORGANISATION LTD.

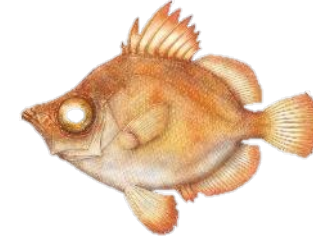
- Based in Killybegs Ireland
 - Pelagic, demersal and crustacean members
- Active members of EU Advisory Councils
 - PelAC, NWWAC, LDAC, MAC
- Strong emphasis on supporting science
- Partners in numerous large projects
 - H2020, Life+, Interreg
- Irish Fisheries Science Research Partnership
 - Industry, Marine Institute, Bord Iascaigh Mhara
 - Established in 2008 by fisheries Minister
 - Meet quarterly
 - Discuss research needs and find solutions



KFO initiated Science Projects

- Boarfish

- Funded the development of science for assessment
- Biological data, acoustic survey, stock identification
- Contracted a scientist, Edward Farrell for the project



- Development of Genetic Stock Identification (GSI)

- Initiated and supported the GSI research on Herring in 6.a, 7.b-c
- Involved with Horse Mackerel GSI project

- Hired 'Scientific & Sustainability Officer' in 2022

- Can now actively contribute to ICES WGs and WKs
- HAWG, WGWISE, WGCSE, WKEVUT
- More active scientific input into framework projects



- Scientific aims

- Identify data gaps and help to fill them when institutes lack capacity
- Facilitate knowledge transfer from industry to science and the reverse
- Facilitate access to vessels for data collection



More information



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