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FRV *Scotia*

Cruise 1722S

Report

Dates

14 November – 6 December 2022

Half-landing: Greenock, 25 November

Personnel

F Burns SIC
M Kinghorn (deck)
R Gillespie-Mules
J Dooley
A Neeson
L Barnwall
M Gault (Part 1)
A Edridge (Part 2)
T Osmond (Vis - PhD Student)
T Sweetman (Vis – Observer, MI)

Out-turn days: 21 – IBTSWC/20672, 2 – C80040/20397

Fishing Gear: GOV Trawl (BT 137) fitted with ground gear D.
Hydrographic Gear: RBR Concerto^3 CTD

Objectives

1. Demersal trawling survey (SCOWCGFS-Q4) of the grounds off the north and west of Scotland in ICES Subarea 6a and 7b.

2. To obtain temperature and salinity data from the surface and seabed at each trawling station.

3. Collect additional biological data in connection with the UK Workplan and EU Multi Annual Plan for some parameters required for international coordination.

4. Retrieval and re-deployment of acoustic moorings located at discrete sites within the survey area as part of the INTERREG COMPASS project.

Narrative

Scotia departed Aberdeen harbour at 0900 and shortly after completed a muster drill for crew and scientific staff. *Scotia* then proceeded northwards to Aberdeen Bay to deploy the GOV trawl for a trial deployment of the trawl gear. This fulfils the dual purpose of testing the fishing gear as well as the gear parameter sensors but in addition also familiarises both scientists and crew with the fishing gear before deploying on the survey stations. With the net and sensors all working as expected Scotia then proceeded North towards the Pentland Firth and with a

following sea was able to make good speed enabling arrival at the first station West of Orkney prior to sunrise on the morning of 15 November. Despite strong wind and rough conditions that characterised much of the first half the easterly/southeasterly wind direction allowed *Scotia* to maintain steady progress throughout the first half with virtually no disruption encountered. This enabled almost all of the Northern and Western stations to be completed as well as those Northwest of Ireland and close to the Northern Irish Coast. By the time southwesterly gales made an appearance on 24 November *Scotia* was already heading East and sailing up through the Firth of Clyde having successfully completed 38 of the scheduled 60 GOV stations prior to going alongside in Greenock on the morning of 25 November. A 24 hour mid-survey break followed together with transfer of scientific staff and also a change of CO.

Scotia departed Greenock at 10 am on 26 November to commence the passage down through the upper firth towards the trawl stations further south. The strong southerly wind continued through into 26 November as *Scotia* completed her stations in the Clyde, thereafter, settled weather took over with calmer conditions being experienced for most of the remainder of the survey. The upturn in weather fortunes enabled excellent progress to be made with all the outstanding trawl stations within the Minches and Stanton Banks area as well as the COMPASS mooring retrievals to be completed without significant issue during the final week of the survey. The final trawl deployment was completed, albeit unsuccessfully by late afternoon on 4 December, 12 nm West of Cape Wrath. *Scotia* set a course for home and was alongside in Aberdeen during the afternoon of 5 December. The majority of the unused trawl gear as well as most of the Scientific gear was retained onboard for use in trawl surveys commencing at the start of the new year. The damaged net and also the worn trawl sweeps and bridles plus selected scientific kit were unloaded early on the morning of 6 December.

Results

Trawl Survey – gear performance

The SCOWCGFS - Q4 utilises a random-stratified survey design which randomly allocates 60 primary trawl locations distributed within 12 sampling strata (11 within ICES subarea 6a and one from subarea 7b) (see Figure 1). Trawls were undertaken on suitable ground as near to the station position as was practicable and also ensuring that this was within a radius of five nautical miles of the randomised trawl location. If the trawl was unable to be undertaken at the primary site or within a reasonable distance from it then a suitable replacement site is chosen from a list of secondary randomised positions located within the relevant survey stratum. All the trawl stations were conducted out-with marine protected areas (MPA's) or special areas of conservation (SAC) containing management measures that restrict the use of mobile fishing gears.

A Scanmar receiver unit together with the MSS RADOS system was used to monitor headline height, wing spread, door spread and distance covered during each tow with SS4 distance units being deployed to monitor wing and door spread. An MSS built bespoke bottom contact sensor was attached to the trawl's groundgear during each tow to monitor ground contact as well as to validate record of touch-down (TD) and lift-off (LO) of the groundgear. This was downloaded and analysed subsequent to every haul in order to verify and cross-check trawl TD and LO times against the RADOS trawl summary output.

Hauls were typically of 30 minutes duration, however, various factors (soft mud/hard/rocky terrain resulting in trawl sticking, rapid changes in bottom depth observed during the trawl as well as close proximity to static gear) resulted in reduced durations being recorded on four valid hauls (numbers. 295, 312, 317, 320). In keeping with the 2009 IBTSWG report no hauls of less than 15 minutes were marked as valid.

The GOV was deployed on 64 occasions during 1722S with the short 47m sweeps where the seabed depth was 80 m or less being deployed on nine occasions (eight valid + one invalid haul), the long 97 m sweeps being utilised on the remaining 55 deeper hauls (52 valid standard hauls + three invalid hauls). Of the 60 valid hauls completed 55 of these were completed during daylight hours. There were four foul/invalid hauls. Two trawl stations were invalidated due to strong tide that resulted in the trawl lifting off the seabed and also the presence of static gear directly ahead of the vessel (hauls 325 and 319 respectively). Two of the foul hauls were attributable to significant damage sustained to the gear whilst trawling (hauls 289 and 340). The locations used for the valid trawl positions during this survey were a combination of established MSS survey tows, commercial trawled areas and also completely new tows. On 15 occasions grounds were successfully utilised that previously had been unfished by MSS. See figure 1 for plot of all survey tows.

Catch Results (2021 results presented in brackets for comparison)

A total of 102 species were recorded for an overall catch weight of ~40.4 tonnes (*89, 39.0*). Major species components in approximate tonnes included: haddock *Melanogrammus aeglefinus* – 11.05 (*15.15*), mackerel *Scomber scombrus* – 1.49 (*3.43*), cod *Gadus morhua* – 0.25 (*0.49*), Norway pout *Trisopterus esmarkii* – 1.96 (*1.66*), whiting *Merlangius merlangus* – 3.20 (*3.47*), herring *Clupea harengus* – 2.05 (*0.17*), and scad *Trachurus trachurus* – 4.56 (*4.74*). Catches overall of target species during the 2022 survey were for the most part slightly down or on a par with those observed in 2021 and with a slight increase in overall bottom time (*28hrs, 2021 / 29hrs, 2022*). Catches of haddock were down by roughly 25% compared to catches reported in 2021 whilst catches of whiting were almost identical as was also the situation with Norway Pout. Cod effectively halved in weight from what was already a very low level with the total catchweight for cod now sitting at a mere 250 kgs for the entire survey. Saithe once again was virtually absent during this survey with only 14 fish being encountered during the survey and for a total catchweight of 20 kgs. Despite a doubling in overall catchweight for herring during 2021 the reported catchweight for this species was still extremely low when compared with results from previous surveys going back to 2011. Also interesting to note that over 80% of the entire herring catch (2.05t) from this survey was caught at one station *(haul 286)* located just south of the windsock. Almost 90% of all the mackerel reported by weight for the entire survey (*1.49T*) were derived from four hauls and at two locations, namely offshore from Northern Ireland Coast and also the North Minch. The majority of these were juvenile individuals and although no large aggregations of these were observed significant numbers were reported from these 4 stations *(hauls 304, 305, 337 and 339)* with *haul 305* located 50 nm west of Torry Island providing the vast majority of the zero group fish recorded on the survey. Table 1 provides overall catch rates per unit effort (CPUE) of the above species and several other major species.

The CPUE index (numbers caught per hour fishing) for 1-group gadoids (cod, haddock, whiting, saithe and Norway Pout) weights the indices for each of the 11 relevant subarea 6a sampling strata by the surface area of said strata. These are then pooled to produce the abundance index for the survey. Results for all age classes of the major commercial gadoid species are shown in Table 2 while those of 1-groups only for period 2015-2022 are shown in Table 3 together with percentage change between indices estimates from previous year as well as ten year average for reference.

The outlook regarding the 1-group abundance estimates for target gadoid species are altogether fairly underwhelming with haddock in particular reporting a significant decrease of almost 50% in 1-group abundance that is also well below the ten year average estimate. Numbers of 1-group cod are also down on last year albeit this was at an already low level and it should be noted that this has been the situation since the survey's inception in 2011 which is borne out with a 10 year average CPUE estimate of just 1.3. Whiting 1-group abundance increased by over 70% compared to 2021 although crucially this is still below the ten year

average whereas Norway Pout fare much better with 160% + increase on 2021 estimates that is also significantly more than the ten year average. Saithe as per last year continue to be effectively absent for all cohorts. See Table 3 for 1-group CPUE indices of target species.

The unusual and notable species of the survey was the discovery of a Warty Bobtail Squid *(Rossia palebrosa)* which was encountered during haul 296 on the shelf edge West Of St Kilda and at a depth of 322 m. This is almost certainly a first for MSS and the specimen was frozen together with the other sepiolids to be vertified by the Naturalis Biodiversity Centre in Leiden.

Several small pods of white beaked dolphins *(Lagenorhynchus albirostris)* were spotted prior to deploying the trawl during haul 324 and south of the Stanton Banks. Around 20 animals in total. Several large pods of Common dolphin *(Delphinus delphis)* were also observed around several sights around the Minches during the survey whilst a pod of ten Risso's dolphins *(Grampus griseus)* were also spotted in the Tolsta area of the North Minch and close to the location of the COMPASS mooring.

Hydrography

The CTD recorder (RBR Concerto^3) was deployed at 58 out of the 60 valid trawling stations in order to obtain a temperature and salinity profile to within approximately 5 m of the seabed. Hauls 278 and 298 had no associated hydrography data in order to provide a time saving that would enable another daylight trawl to be completed during the very short daylight window that exists at this time of year.

Compass Acoustic Moorings Deployments/Retrieval

Fiv acoustic moorings were successfully retrieved by *Scotia* from a possible six to be recovered and from five different locations from within the survey area. The five redeployed moorings at Tolsta, Shiants, and Hyskier (x3) were deployed back onto the same or similar locations to those retrieved with the deployment positions recorded in the COMPASS mooring deployment logbook (see Table 4).

Biological Sampling

In total 6370 biological observations on selected species were collected in support of the UK Workplan/EU Multi Annual plan. A summary of numbers collected for all sampled species is displayed in Table 5. All otoliths were aged back at the laboratory.

Monitoring of Non Indigenous Invasive Species (NIS)

All catches were screened for the presence of selected NIS species with the results being reported back to the project coordinator at CEFAS.

Marine litter

All litter picked up in the trawl was classified, quantified, recorded and retained for appropriate disposal ashore. The data is uploaded to the MSS database from where it will eventually be uploaded to DATRAS.

Additional sampling undertaken during 1722S

- Bobtail squid identification. All bobtail squid (Sepiolida) caught were frozen for identification at *Naturalis Biodiversity Centre, Leiden*.

- Retention of Phakellid and Craniella sponges. Collaborative phylogenic study between MSS and the *Natural History Museum*.

- All shells retained and frozen for identification ashore.

- Juvenile mackerel retained for research project into myxozoan parasite prevalence. Two samples of 25 fish collected for analysis from haul's 304 and 337 – *IMR Bergen.*

- Two sets of 50 whole individually bagged juvenile mackerel retained for investigations into variations in field metabolic rate (FMR) proxy using sagittal otoliths. Fish retained from haul's 286, 332 and 335 – *Southampton University.*

- Whiting genetics samples retained for analysis as Part of an ongoing research project – 90 samples retained from haul's 290 and 301 - *AFBI, NI.*

- 50 blue whiting measured, weighed and then frozen as part of a *MSS Pelagic Co-Sampling Trial.*

- Retention of 7kg each of mackerel and herring from the Minch area for environmental monitoring - *CRCE Scotland, Glasgow.*

Summary

Although experiencing some extreme weather during part one of the survey *Scotia* experienced no disruption to the survey and as result came alongside in Greenock for the mid-cruise break with over 60% of the trawl stations completed and the majority of the exposed offshore stations already having been successfully completed. Settled weather during the second half of the survey enabled *Scotia* to complete the remaining trawl stations in the Minches and Stanton Bank area largely without incident although it was unfortunate that the last trawl deployment ended up being foul and the net badly damaged. The restrictive daylight window at this time of year makes it virtually impossible to complete all the trawl stations within the daylight period, however, more than 90% of the trawl stations from survey 1722S were completed during the daylight period. Coupled with an overall trawl station completion rate of 100% and five from six of the COMPASS moorings being successfully retrieved, the survey was deemed to have been an outstanding success in meeting all of its objectives.

A special thank you to all the officers and crew of the Scotia for the support and cooperation received throughout the survey and which ultimately ensured it's overwhelming success.

Submitted
Finlay Burns
7February-2023

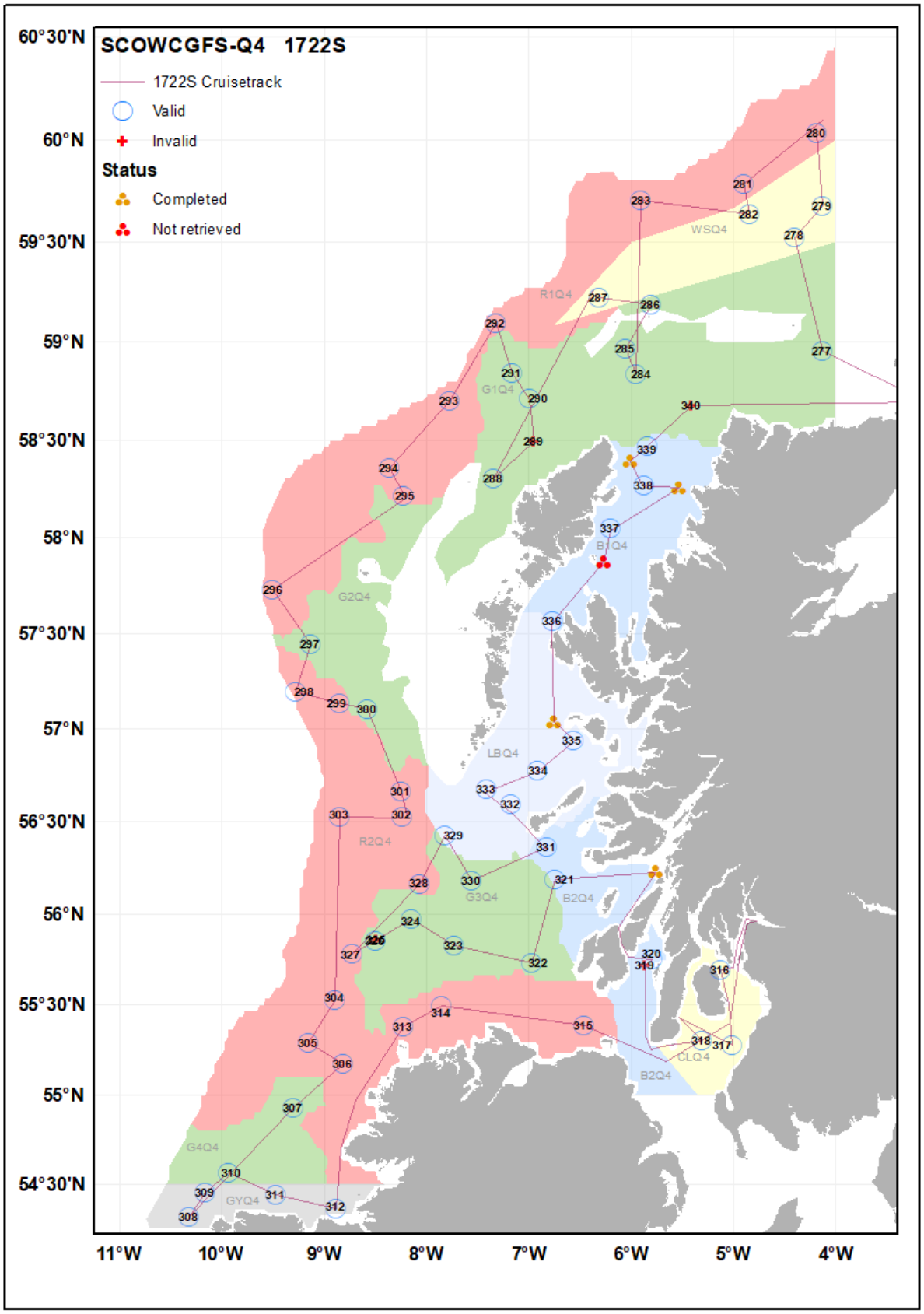

Figure 1: 1722S survey map showing survey strata (coloured polygons), trawl and COMPASS mooring deployments. Survey track is also shown.

Table 1: Overall CPUE of major components of combined catch 1722S - Q4 2022.

Species	Common name	kg/hr	no/hr
Melanogrammus aeglefinus	Haddock	380	1275
Scomber scombrus	Mackerel	51.2	482.7
Gadus morhua	Cod	8.6	3
Trisopterus esmarkii	Norway Pout	67.6	4519
Merlangius merlangus	Whiting	109.9	1042
Clupea harengus	Herring	70.6	558.9
Trachurus trachurus	Horse Mackerel	156.9	710
Scyliorhinus canicula	Lesser Spotted Dogfish	43.7	84.1
Pleuronectes platessa	Plaice	4.8	23.2
Eutrigla gurnardus	Grey Gurnard	27.2	372.5
Capros aper	Boar Fish	144.7	4368
Squalus acanthias	Spurdog	101.7	115
Pollachius virens	Saithe	0.7	0.5
Merluccius merluccius	Hake	9.1	108.3
Dipturus intermedia	Flapper Skate	16.6	2.1
Loligo sp.	Long Finned Squid	13.8	80.8
Raja montagui	Spotted Ray	6.3	7.2
Lophius piscatorius	Angler	4.6	2.6
Sprattus sprattus	Sprat	0.4	70
Raja clavata	Thornback Ray	6.4	4.6
Chelidonichthys cuculus	Red Gurnard	6	21.8
Micromesistius poutassou	Blue Whiting	79.3	2008
Limanda limanda	Common Dab	2.5	28
Microstomus kitt	Lemon Sole	2.3	20.2
Lepidorhombus whiffiagonis	Megrim	3.5	13.4

Table 2: CPUE indices (nos/hr) by year class of major demersal species 1722S - Q4 2022.

Age	Cod	Haddock	Whiting	Saithe	N. Pout
0	0.0195	35.1239	369.1505	0	3240.8912
1	0.5327	163.175	157.9762	0.0343	964.188
2	0.443	388.8038	59.767	0.3952	104.9017
3	0.8489	587.8272	61.3418	0.0783	5.6686
4	0.8509	183.3116	14.7984	0.0744	0
5	0.0783	5.1436	2.4879	0.0392	0
6	0.1064	5.7427	0.8643	0	0
7	0	0.6176	0	0	0
8	0	9.4295	0.1775	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0.0392	0

Table 3: CPUE indices (nos/hr fishing) for Q4 1-groups of major demersal species since 2015.

Species	2015	2016	2017	2018	2019	2020	2021	**2022**	% change from 2021	10 Yr Av.
Cod	2.8	0.6	1	0.5	1.8	1.6	0.9	**0.5**	-43.0267	1.3
Haddock	995.6	93.6	168.8	98.9	627.5	290.3	314.6	**163.2**	-48.1325	282.7
Whiting	279.4	241.5	294.3	50.25	195.5	239.2	91.1	**158**	73.40966	171.4
Saithe	0.5	0.06	0	0.04	0.08	0	0	**0.03**	NA	0.1
N. Pout	1481	1227	48.7	96.8	1797	296.9	359.7	**964.2**	168.0534	667.3

Table 4: Positions of COMPASS moorings deployed during 1722S.

Location name	Depth(m)	DecLat	declon	Lat (Deg dec min)	Long (Deg dec min)
Tolsta	99	58.38588	-6.00812	58° 23.153' N	6° 00.487' W
Hyskier	49	57.03622	-6.75513	57° 02.173' N	6° 45.308' W
Hyskier b	53	57.03957	-6.76606	57° 02.374' N	6° 45.9634' W
Hyskier c	43	57.03285	-6.76588	57° 01.971' N	6° 45.953' W
Shiants	72	57.86933	-6.26983	57° 52.160' N	6° 16.190' W

Table 5: Numbers of biological observations per species collected during 1722S. These consist of length, weight, sex, age unless:
* length, weight, sex, and otoliths retained (to be aged at a later date)
** length, weight, sex
*** length, weight and age
**** length, weight, sex, maturity and age
† length, weight, sex and externally determined maturity only

Species	No.	Species	No.
Melanogrammus aeglefinus	1512	**Scophthalmus maximus	5
Merlangius merlangus	1166	†Dipturus flossada	12
Gadus morhua	86	†Dipturus intermedia	58
Pollachius virens	14	†Leucoraja naevus	44
Trisopterus esmarkii	425	†Mustelus asterias	26
****Clupea harengus	256	†Raja brachyura	10
***Sprattus sprattus	199	†Raja clavata	125
****Scomber scombrus	266	†Raja montagui	189
*Merluccius merluccius	234	†Squalus acanthias	770
Pleuronectes platessa	165	†Galeorhinus galeus	10
**Scophthalmus rhombus	3	†Galeus melastomus	53
Glyptocephalus cynoglossus	58	†Scyliorhinus canicula	53
†Leucoraja fullonica	3		