R1/12

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FRV *Scotia*

Cruise 1307S

Report

Dates

5-28 September 2007

Personnel

K J Peach	(Joint SIC 5-18) (Part 1)
F Neat	(SIC 19-28)
E Jones	
F Burns	(Joint SIC 5-18)
J Drewery	
C Shand	
M Gault	(Part 1)
A Jaworski	(Part 1)
J Davies	Plymouth University (Part 1)
N Golding	JNCC (Part 1)
V Khlivnoy	PINRO, Russia (Part 1)
R Kynoch	(Part 2)
A Weetman	(Part 2)
M O'Sullivan	(Part 2)
L Allan	(Part 2)
D Clark	Dept of Fisheries Canada (Part 2)
J Turner	Bristol University (Part 2)
T Blasdale	JNCC (Part 2)

Out-turn days: RV0610 14 days **MF01TA** 10 days

Part 1 Rockall Haddock Survey

Fishing Gear

GOV Trawl fitted with ground gear C (BT 137)

FRS Objectives

1. Routine daylight survey of the Rockall Plateau to assess the haddock stock within the 200 metre contour. Identify, quantify and record all other fish species encountered during the survey.

2. Nephrops TV observation work along the East edge of the bank to depths of 500 metres.

3. Identify, quantify and record all benthic invertebrate species caught.

4. Obtain temperature and salinity data from the surface and seabed at each trawling station.

5. Collect additional biological data in connection with the EU Data Directive 1639/2001.

PU / JNCC Objectives

1. Opportunistic use of the drop frame and to contribute to mapping distribution of Annex I reef habitat as required under the EC Habitats Directive.

2. Collection of invertebrate fauna from trawl samples.

Narrative

Scotia sailed from Aberdeen at 1000 on Wednesday 5 September stopping briefly at a trawling station between Aberdeen and Peterhead to test the performance of the fishing gear. *Scotia* then proceeded to the Rockall plateau arriving at the first station ready to commence fishing operations at 0600 on the 7 September. Trawling continued during daylight hours for the next 6 days without interruption. In line with the WTD 6-7 hauls were completed within the 13 hour working day. The haddock survey was completed by 1700 on the 13 September. *Scotia* then steamed east - a westerly gale preventing any further drop frame deployments – towards St Kilda so that the vessel could switch doors and change fishing gear in readiness for the deepwater survey on the shelf edge. *Scotia* arrived in Village Bay off St Kilda on the 14 September where the gear changes were made. Prior to the weather deteriorating the 2000kg trawl doors were dropped into position in readiness for deepwater fishing.

Results

In recent years the regular annual survey to the Rockall Plateau has been restricted to a biennial survey (typically in odd years) alternating with a deepwater survey in the even dated years. In 2005 the surveys were combined allowing 6 - 7 days for the Rockall Haddock survey with the remaining time being spent trawling in deepwater. During the 2007 survey all 42 of the standard haddock survey stations on the Rockall plateau were successfully sampled with very little significant gear damage encountered beyond the wear and tear normally associated with this gear type. Trawl positions as well as the locations where the drop frame were deployed are displayed on figure 1.

The primary objective of the survey is to assess the state of the haddock stock on the Rockall Plateau: this is done by comparing the strength of the respective year classes in the current year with those of previous years. The provisional indices using a length rather than age based-delimiter indicate yet another poor 0 –group recruitment for Haddock on Rockall with 2007 being the worst on record. The paucity of one year old fish was also expected and reflects the poor recruitment seen in 2006. (See figure 2)

In line with the EU Data Directive 1639/2001 length/weight data was collected for all cod, haddock, whiting & saithe. These were collected on a 1 per cm per haul basis; in addition to this all megrim and angler were sampled for length, weight, sex and maturity.

All benthic invertebrate species caught were identified and quantified.

In addition to the usual fish species encountered on the Rockall Plateau was Rays Sea Bream *(Brama brama).* This unusual species was present in 9 out of the 42 hauls with a total of 21 individuals being recorded for the survey, ranging in length from 44 – 50cm. Inspection of the gut contents of this offshore pelagic predator yielded significant number of Snake Pipefish *(Entelurus aequorus).* Also recorded was a Yarrell's Blenny *(Chirolophis ascanii)*. They are both firsts for the Rockall Haddock Survey.

Net geometry was monitored throughout the survey using the scanmar system coupled with a bottom contact sensor. The NOAA single axis bottom contact sensor was attached to the centre of the trawl ground gear each haul.

Unfortunately the Seabird 19 CTD was lost during the first day of operation so apart from the first 4 stations there was no bottom temperature or salinity readings taken for the survey. Bottom depth water samples continued to be collected for salinity analysis with the thermosalinograph continuing to provide sea surface temperature and salinity data. A sea surface water calibration sample was also collected from each station.

During trawling downtime the Drop Frame was deployed successfully at various locations on the plateau with 16 deployments being completed over six nights. This allowed ground truthing of side-scan sonar data collected on an earlier DTI funded SEA7 survey to be done. Unfortunately due to the deteriorating weather on the last night no Nephrops abundance sledge work was undertaken on Rockall plateau during the survey. (See figure 1.)

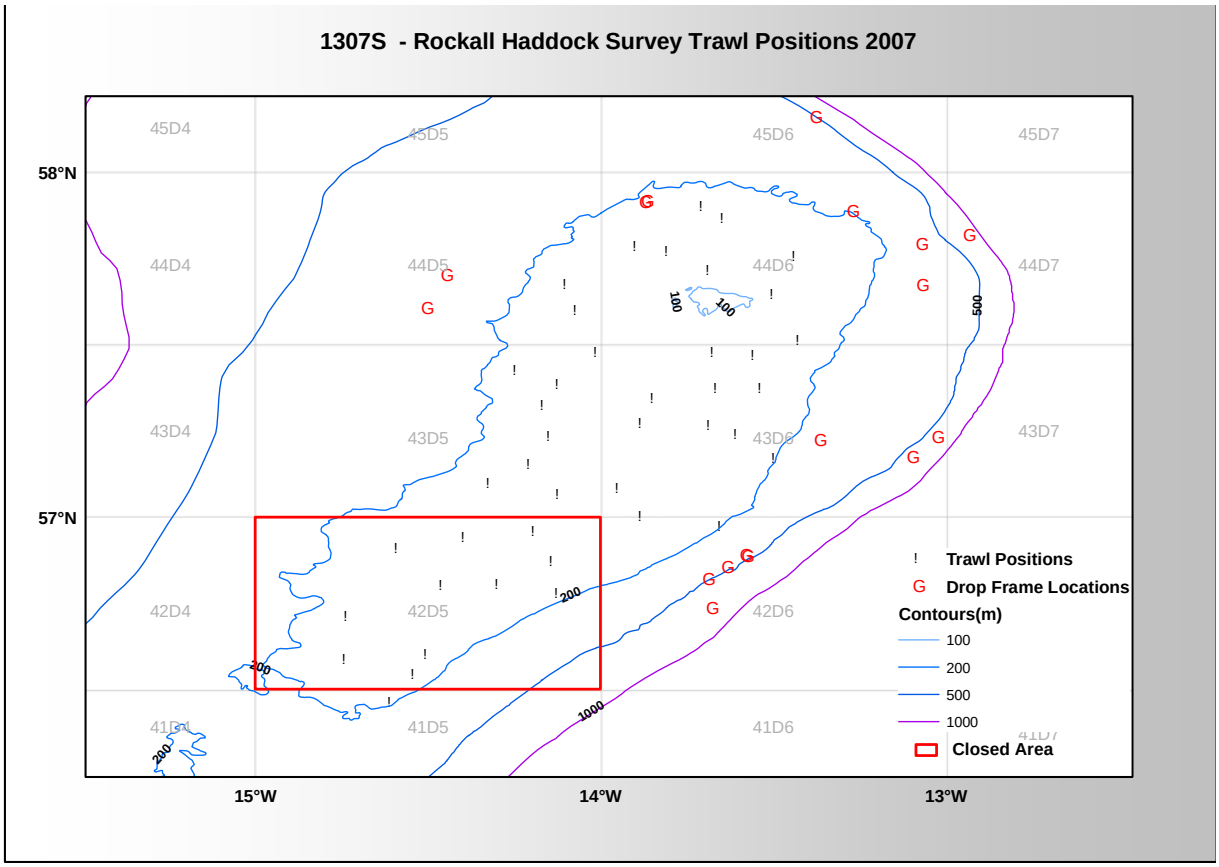
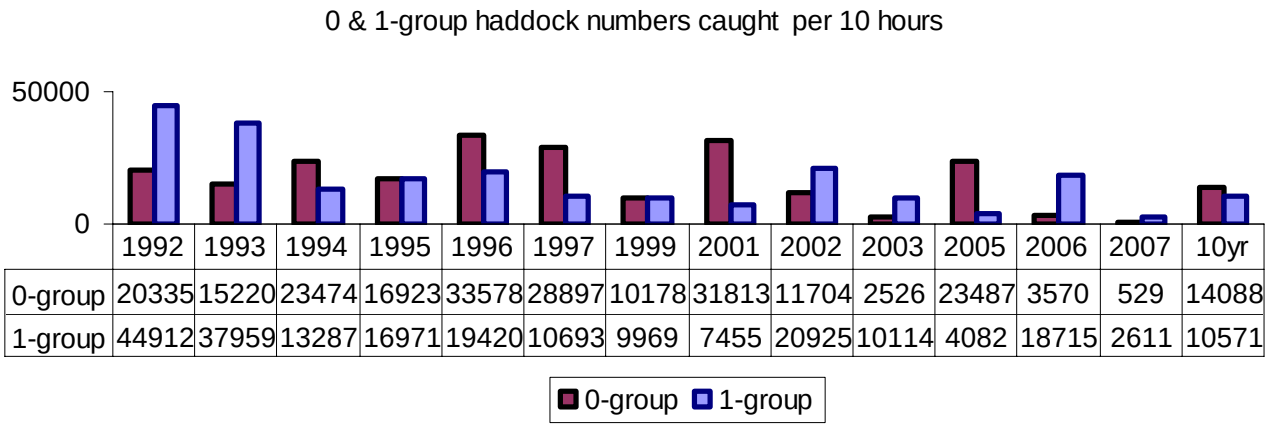


Figure 1: Rockall Plateau displaying haddock survey stations and locations of drop frame deployments.



	1992	1993	1994	1995	1996	1997	1999	2001	2002	2003	2005	2006	2007	10yr
0-group	20335	15220	23474	16923	33578	28897	10178	31813	11704	2526	23487	3570	529	14088
1-group	44912	37959	13287	16971	19420	10693	9969	7455	20925	10114	4082	18715	2611	10571

Figure 2: Rockall Haddock index 1992 – 2007, including 10 year average.

Part 2 Shelf edge and seamount deepwater survey

Fishing Gear

Jackson Deepwater trawl (BT184)

Objectives

1. To map the composition, distribution and abundance of continental slope species including anglerfish (*Lophius spp.)* on the deepwater slope west of the Hebrides and undertake trawl surveys of the Rosemary bank and Anton Dohrn Seamount.

2. To carry out comparative fishing hauls with the *Celtic Explorer*.

3. To identify, quantify and record all benthic invertebrate species caught.

4. To collect information at temperature at depth during use of a data storage tag attached to the trawl headline.

5. To investigate the occurrence of *Nephrops* on the upper shelf slope using TV systems.

6. To undertake TV drop-frame surveys for purposes of habitat mapping on seamounts in the area.

7. To collect biological samples and digital images for key species from both slope and seamount to investigate the possibility of isolated and distinct seamount communities.

Narrative

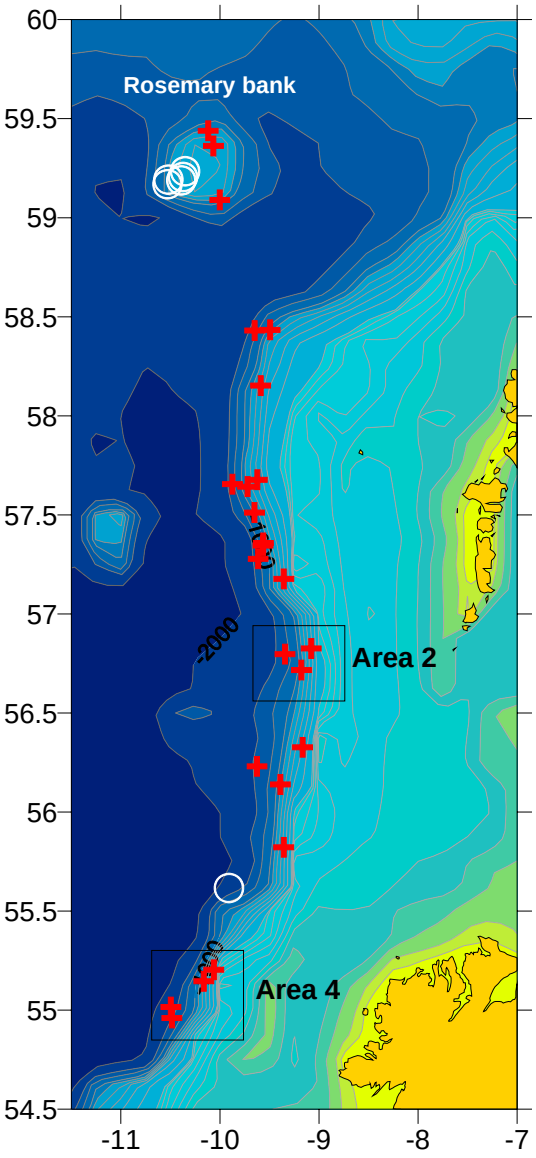
Scotia delayed sailing from Killibegs, Ireland on the 20 September for approximately 12 hours while a replacement hydraulic pipe was made and fitted. At 1830 *Scotia* departed and set a course for comparative fishing area 4 on shelf slope (see Figure 3a). The swell was too heavy for sledge TV Nephrops operations to be undertaken. Fishing operations were underway by 0650 the next morning. Three hauls were made at 1500, 1000 and 500m depths. Of note was a significant catch (54 kg) of large orange roughy (*Hoplestethus atlanticus*) at 1500m. The 1000 m tow was fouled by a lost trawl net which took some hours to clear. The haul was however considered valid as the scanmar sensors suggested fouling happened late in the tow. That night the TV sledge was deployed, but limited to 2 stations as the sea state became increasingly unfavourable. Fishing operations on 22 September focused on an area south of the Hebridean Terrace seamount with 3 hauls being successfully completed in 1500, 1000 and 500 m depths. Worsening weather that evening meant TV operations were suspended that night. Force 9 winds the following morning meant all scientific operations were suspended and *Scotia* was forced to dodge. An improvement by 1200 allowed fishing operations to recommence at 500m, although this tow had to be hauled early due to interference by a French fishing vessel. Conditions worsened again with a building swell and *Scotia* made overnight passage north to the next set of stations. Fishing began at 05.30 hrs on the morning of the 24 September with 2 tows at 1000 and 2 tows at 1500m completed. Winds again increased overnight making it unsuitable for TV Nephrops survey work. Fishing operations on the morning of the 25 September were suspended until 1200 due to force 9 northerly winds. In the afternoon and evening tows at 500, 1000, and 1500 m were completed. This marked the completion of all core time series stations of the survey. Due to the days lost due to poor weather and hydraulic

failure there was no opportunity to survey the Anton Dohrn seamount as intended. Instead passage was made to Rosemary Bank and fishing operation commenced on the morning of the 26 September. Three tows at 900, 800 and 600m (repeat tows of the 0607S survey) were completed. Of note was the large catch of spawning *Coryphaenoides rupestris* at 900 m and 50 kg of *Sebastes mentella* at 600m. For the remainder of the day the TV drop-frame was utilised for habitat mapping of the seamount. This resulted in valuable footage of various seabed types including outcrops of bedrock. Entanglement with long-line fishing gear meant that operations were curtailed slightly early and were unable to be resumed due to cable damage. At 2300 *Scotia* began passage to Aberdeen, docking at 0600 hrs on the morning of the 28 September where equipment was offloaded.

Results

Trawl and TV survey

Fifteen hauls were made which supplemented the 5 deepwater hauls made prior to the half-landing. All core time series stations were completed with the exception of the 1800 m station in statistical square 42EO. Similarly 7 out of 8 comparative fishing hauls were completed (the exception again being the 1800 m tow in 42EO). This station was not trawled because of the risk of losing headline floats (spare floats were not available since a significant number of floats had unexpectedly imploded on the 1800 m tow carried out previously in area 4). Further loss of floats would have compromised further trawling to depths > 1000m. A summary of haul statistics is given in Table 1 and trawling positions plotted in Figure 3a and 3b. The entire catch was sorted by species, weighed and length frequency data collected. A total of 136 species were recorded with several species being new records for the survey. A complete list of species and weights is presented in Table 3. Throughout the cruise several species new to the survey were recorded. Only 2 TV sledge deployments for the purposes of Nephrops surveys were completed due to the consistently poor weather. A series of 5 stations using the TV drop frame were completed on Rosemary bank for habitat mapping.



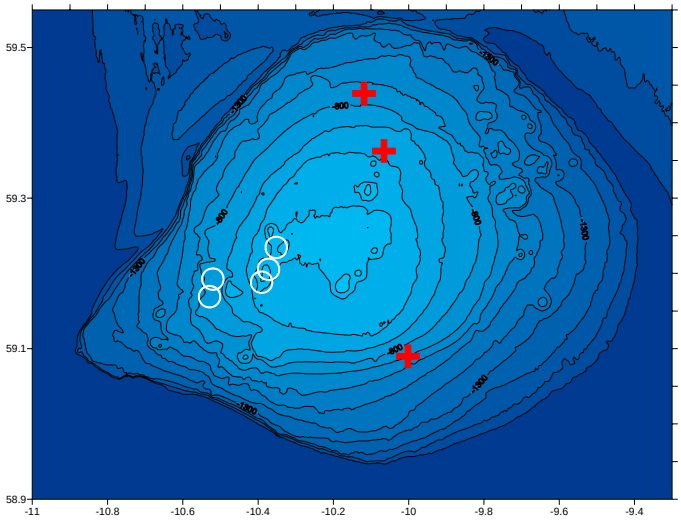


Figure 3 (a): Area covered by the deepwater survey during cruise 1307S. Trawl stations (red crosses) were at depths of 500,1000, 1500 and 1800 m. Comparative trawling in conjunction with the Marine Institute Ireland were undertaken in areas 2 and 4. TV sledge surveys for Nephrops were undertaken on the shelfedge in an area in the south (white circle). TV drop-frame surveys of habitat were undertaken on the west side of Rosemary bank (white circles).

Figure 3 (b): shows detail of trawl positions and TV drop-frame stations on Rosemary bank.

Date	Haul No.	area	depth	Stat sq	Lat Shot (N)	Long Shot (W)	Lat Haul (N)	Long Haul (W)
15/09/2007	388	SW St Kilda	580	44E0	57°40.64	9°37.34	57°33.9	9°34.34
15/09/2007	389*	SW St Kilda	1000	44E0	57°38.55	9°43.22	57°31.87	9°39.64
15/09/2007	390*	North Vidal	1000	43E0	57°20.7	9°33.91	57°14.33	9°28.44
16/09/2007	391	North Vidal	525	43E0	57°10.6	9°21.32	57°3.99	9°16.6
16/09/2007	392	North Vidal	1500	42E0	56°47.8	9°20.58	56°42.04	9°26.87
16/09/2007	393	North Vidal	1000	42E0	56°43	9°10.66	56°49.58	9°10.49
17/09/2007	394*	South Vidal	550	40E0	55°49.29	9°21.37	55°49.71	9°21.1
17/09/2007	395	Donegal	1800	39D9	55°0.92	10°29.72	55°58.27	10°39.83
21/09/2007	396	Donegal	1500	38D9	54°57.59	10°29.11	54°53.48	10°36.79
21/09/2007	397	Donegal	1000	39D9	55°8.72	10°9.79	55°15.56	10°7.7
21/09/2007	398	Donegal	500	39D9	55°12.21	10°3.72	55°6.05	10°6.89
22/09/2007	399	South Vidal	1500	41E0	56°13.81	9°37.52	56°7.28	9°37.18
22/09/2007	400	South Vidal	1000	41E0	56°8.33	9°23.37	56°15.19	9°21.13
22/09/2007	401	South Vidal	500	41E0	56°19.59	9°9.92	56°13.57	9°12.71
23/09/2007	402	North Vidal	500	42E0	56°49.53	9°4.7	56°43.94	9°2.13
24/09/2007	403	North Vidal	1000	43E0	57°21.49	9°33.7	57°14.86	9°28.96
24/09/2007	404	North Vidal	1500	43E0	57°16.69	9°36.84	57°22.41	9°42.85
24/09/2007	405	SW St Kilda	1000	44E0	57°30.7	9°39.05	57°37.45	9°43.06
24/09/2007	406	SW St Kilda	1500	44E0	57°39.29	9°52.39	57°46.13	9°52.98
25/09/2007	407	NW St Kilda	600	45E0	58°9.15	9°35.31	58°15.16	9°29.84
25/09/2007	408	NW St Kilda	1000	45E0	58°25.83	9°38.95	58°32.23	9°34.8
25/09/2007	409	NW St Kilda	1500	45E0	58°26.05	9°29.61	58°29.65	9°18.19
26/09/2007	410	Rosemary bank	900	47D9	59°5.39	10°0.1	59°6	9°56.89
26/09/2007	411	Rosemary bank	600	47D9	59°21.75	10°3.93	59°22.18	10°7.52
26/09/2007	412	Rosemary bank	850	47D9	59°26.34	10°7.11	59°26.02	10°10.39

Table 1: Haul summary information. * indicates foul hauls.

Biological data collection

Additional biological sampling was undertaken on a number of species with emphasis on deepwater shark species. Stomach samples were collected from *Etmopterus spinax*, *Etmopterus princeps* and *Deania calceus*. These will be worked up at Plymouth University as part of a Esmee Fairbairn-funded collaboration between FRS, Plymouth University and SAMS. Genetic samples from all *Centroscymnus coelolepis* and *Centrophorus squamosus* caught were collected for IPIMAR (Portugal) and Dublin University (EuroDEEP DEECON project). Genetic and otolith samples were also collected from *Coryphanenoides rupestris, Aphanopus carbo* and *Centroscymnus crepidater* caught on Rosemary Bank to add to samples collected previously from Anton Dohrn and Rockall. Collections of biological material and otolith were made for toxicology studies by the Analytical Investigations group of FRS. Whole fish samples of *C. rupestris, A. carbo* and *L. piscatorius* were collected for the Central Science Laboratory for analytical investigation. A summary of additional sampling undertaken is presented in Table 4. All invertebrate fauna was identified, recorded and selectively measured.

A number of specimens, e.g. cat shark (*Apristurus* sp) and deepwater skates were retained for identification purposes as the taxonomy of these families is still poorly known. Photographs were taken of previously unrecorded species note for incorporation into a deepwater species identification image library.

Sampling of deep water fish eyes

The visitor from Bristol University collected eyes from the following species; *A. bairdi, C. labiatus, C. rupestris, A. rostrata, T. murrayi, R. atlantica, C. monstrosa, N. aequalis, H. dactylopterus, A. silus, A. carbo, H. raleighana, S. kaupi, L. eques, G. argenteus, M. meluccius, C. fabricii* and *S. mentella* to be used in histological, spectroscopy and neurological studies.

Table 2 Species recorded sorted by total weight (kg).

code	common name	weight	code	common name	weight	code	common name	weight
RNG	Round Nosed Grenadier	7954.14	AME	Apristurus melanoasper	22.12	ACO	Fangtooth	0.21
SMO	Smoothhead	5780.97	ARO	Antimora	21.71	SAR	Sandy Ray	0.20
CHI	Rabbit Ratfish	1677.58	MEG	Megrim	20.79	BCA	Blue ray	0.20
GAR	Greater Argentine	905.45	SGR	Spectrunculus grandis	19.30	SBI	Scopelogadus beanii	0.17
BSC	Black Scabbardfish	743.34	SRA	Shagreen Ray	14.70	MAT	Melanostigma atlanticum	0.14
CCR	Longnose velvet dogfish	503.49	AMA	Madeira catshark	14.67	DOE	Duckbill oceanic eel	0.12
HAK	Hake	420.91	LSD	Lesser Spotted Dogfish	11.72	RBA	Deepwater Ray	0.12
LEQ	Lepidion eques	393.19	RAT	Straightnose rabbitfish	11.43	HAT	Hatchetfish	0.11
SHS	Shovelnosed Shark	330.61	LAT	Lycodes atlanticus	8.16	AHE	Argyropelecus hemigymnus	0.10
COC	Hollowsnout Rat tail	329.06	SKA	Skate	7.80	LRD	Long Rough Dab	0.08
BWH	Blue Whiting	310.08	BDU	Spiderfish	7.21	LFA	Lycodonus flagellicauda	0.07
BLM	Blue-mouth	309.35	GMU	Mouse catshark	6.49	TRM	Trigonolampa miriceps	0.06
CLA	Cataetyx latceps	265.72	RSE	Risso's Spiny Eel	6.12	GOE	Gonostoma elongatum	0.06
AAG	Agassiz's smooth-head	259.25	AMI	Smalleye Catshark	5.47	KSE	Koefoed's searsid	0.06
BLI	Blue Ling	254.96	SBE	Bean's sawtoothed eel	5.41	MAU	Mauls Searsid	0.06
PSH	Portuguese Shark	242.33	APU	Apristurus - Unidentified	4.66	ALD	Aldrovandia phalacra	0.05
TMU	Murray's Rat tail	237.28	BFE	Bathysaurus ferox	4.60	BER	Big-eyed Rockling	0.05
BLF	Blackfish	215.07	AAU	Southern Atlantic smooth-head	4.34	RUN	Rocklings unidentified	0.04
LSQ	Leafscale Gulper Shark	198.18	LAU	Lantern fishes unidentified	2.94	AAF	Aldrovandia affinis	0.04
GFO	Greater Forkbeard	195.69	PAS	Pallid sculpin	2.83	LSM	Lesser Smoothhead	0.04
HYA	Smalleye rabbitfish	187.63	HAM	Halosauropsis macrochir	2.75	SNE	Snubnosed Eel	0.04
SYK	Cut-throat Eel	186.17	BOU	Borostomias unidentified	2.32	BCU	Palebelly Searsid	0.02
RAA	Softskin smooth-head	185.93	VPR	Whipsnout sorcerer	2.28	CNR	Chiasmodon niger	0.02
SMM	Redfish (mentella)	150.80	HAN	Bighead searsid	2.27	TCR	Spiny scorpionfish	0.01
ANG	Angler (Monk)	145.78	ALA	Iceland Catshark	2.19	RLO	Redmouth Whalefish	0.01
EPR	Greater lantern shark	145.14	RBE	Ray's Bream	1.90	RBI	Bigelow's ray	0.01
CEE	Conger Eel	119.20	CRA	Cuckoo Ray	1.76			
BMD	Black Mouthed Dogfish	118.71	MUS	Murray's smooth-head	1.72		**Total weight**	**24605.38**
NAE	Smooth Rat tail	106.10	LCR	Lycodes crassiceps	1.61			
MOR	Mora	105.18	BMI	Smallscale smooth head	1.48			
HRA	Bentnose rabitfish	101.34	HME	Silver roughy	1.45			
GGR	Gunther's grenadier	91.58	HER	Herring	1.20			
SGS	Six Gilled Shark	90.37	MNI	Malacosteus niger	1.19			
VBE	Velvet Belly	81.79	FRA	Fylla's Ray	1.18			

SSG	Spear-snouted grenadier	78.35	**BAE**	Bathylagus euryops	1.17
HAF	Halargyreus johnsonii	77.54	**MLA**	Softhead Rat tail	1.09
MGR	Mediterranean Grenadier	70.84	**NLO**	Norway Lobster	1.08
OMM	Short Finned Squid	67.24	**SBF**	Stomias boa ferox	1.05
HPA	Hydrolagus pallidus	64.00	**SPI**	Snake Pipefish	0.95
TOR	Torsk	63.39	**PLU**	Paraliparis unidentified	0.80
CFA	Black dogfish	60.69	**BDE**	Beryx decadactylus	0.80
BSE	Bonaparte's Spiny Eel	60.60	**FME**	Four-spot Megrim	0.79
HMA	Horse Mackerel (Scad)	59.63	**HOM**	Bigeye searsid	0.70
ORO	Orange Roughy	56.75	**WHH**	Whiteheaded hagfish	0.64
CSE	Chemnitz's Spiny Eel	52.78	**MSE**	multipore searsid	0.62
LIN	Ling	49.01	**LSH**	Longfin smooth-head	0.55
HMI	Large-eyed Rabbitfish	36.45	**CHS**	Sloan's Viperfish	0.50
AAP	Pale Catshark	32.98	**KRA**	Krefft's ray	0.49
SPO	Silvery Pout	30.83	**POC**	Polymetme corythaeola	0.45
RJE	Raja Jensenii	29.86	**LAM**	Lampanyctus spp	0.43
DCH	Darkie Charlie	28.44	**ALP**	Smalleye smooth-head	0.43
XCI	Bluntsnout Smooth-head	27.09	**IBL**	Ilyophis blachei	0.39
AMN	Ghost Catshark	26.80	**RTU**	Rat tails unidentified	0.38
BUL	Bullseye	23.09	**POP**	Platyberyx opalescens	0.32
WIT	Witch	22.65	**MZU**	Melanonus zugmayeri	0.32
AME	Apristurus melanoasper	22.12	**TBR**	Three-bearded Rockling	0.22

Species	**Number**	**Data/sampling**
A. aphiodes	90	Biometrics
A. madierensis	19	Biometrics
A. melanoasper	45	biometrics
A. manis	12	biometrics
C. crepidator	254	Biometrics, maturity stage, genetics
C. fabriccii	106	Biometrics
D. licha	7	biometrics
E. princes	164	Biometrics and stomach samples
C. squamosus	20	Biometrics, genetic samples
C. coleolepis	35	Biometrics, genetic samples
D. calceus	79	Biometrics, stomach samples
E. spinax	171	biometrics, stomach samples
A. carbo	112	toxicology, otoliths and genetics
C. rupestris	141	genetics, otolith chemistry and toxicology
L. piscatorius	8	Biometrics and toxicology
H. atlanticus	20	Biometrics and otoliths

Table 3: Species for which samples and additional biological information was collected.

Temperature at depth data

The DST attached to the trawl headline recorded temperature and depth from each haul and the relationship between depth and temperature is plotted in Figure 2. Surface temperature was approximately 13.5 C. At 500 m is was typically between 9-10 C, at 1000m is was between 7-8 C, at 1500 m is was between 4-5 C and at 1800 m it was a low as 3.5 C.

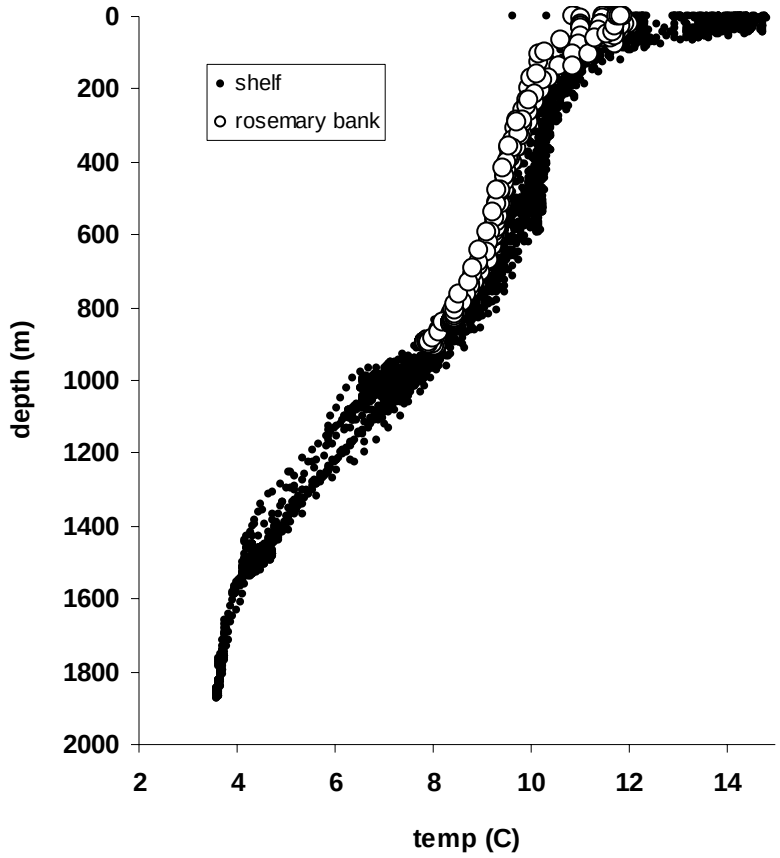


Figure 4: Temperature at depth from all 24 deep water hauls recorded by StarOddi data logger attached to headline of the trawl.

Technical issues and instrumentation

Shooting the fishing gear proved problematic in rough weather due to the difficulty in getting the trawl doors to spread effectively. This resulted on one occasion with the trawl doors becoming crossed and the haul declared foul. The problem was resolved by increasing the speed while shooting the net and paying out warp more slowly than normal in order to maintain tension and therefore door spread. However this resulted in slower than normal fishing operations. A new set of trawl doors will be requested for trials with the aim of using them for next year's deepwater survey. Concern was expressed over the uneven spooling of the warp onto the port winch although this did not ultimately interfere with fishing operations. Scanmar sensors worked well to depths of 1200 m, but gave no readings deeper than this. A full set of 1800 m scanmar sensors would be a very useful asset to the survey. The bottom-contact sensor worked very well and was valuable for accurately determining blocking-up times.

Finlay Burns (SIC part 1), Francis Neat (SIC part 2)
18 October 2007

Discussed in draft 27 September 2007 with S Schoolidge (Master, FRV *Scotia*)