

Cruise report: Camera Survey

M/T Paamiut SFW RejeFiskVest Survey Togat 1
June 11-20, 2011: Nuuk - Asiaat



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1. Camera survey Statement of Work

This camera survey was undertaken during leg 1 of the annual Greenland Institute of Natural Resources SFW RejeFiskVest Survey, aboard *M/T Paamiut* between June 11-20th. This leg of the fisheries survey focused on offshore regions between 64°11' N and 68°43' N (Figure 1, boxes 3, 4, 6, 7, 8 and 9). The camera survey was undertaken during nighttime hours when fishing was not underway, and the stated aims of this work were to take photographs of the sea bottom off the coast of West Greenland between Nuuk and Aasiaat in, and near, areas that are subject to commercial bottom-trawl fishery for northern shrimp. The camera operator was required in particular to:

- a. In cooperation with the cruise leader and considering the constraints of the trawl survey programme, direct *the M/T Paamiut* in night-time hours to select sites and take photographs of the sea bottom in heavily fished and less heavily fished areas at different depths;
- b. Record ancillary data including date, time, position, depth, weather, temperature;
- c. Download from the camera, backup and store data files of the imagery acquired;
- d. Prepare an initial report on field activities.

And, in addition, to:

- e. Interpret photographs to identify and tally visible benthic organisms and to identify signs of physical damage to habitats that might be due to trawling;
- f. Analyse data to quantify differences in species abundance or diversity associated with bottom type, depth, intensity of trawling, or other environmental factors, and;
- g. Report on the findings.

This report is intended to outline the work undertaken (as per a - d above), and serve as a true record of the activities and decisions undertaken. Working notes are included. No analysis is presented in this report.

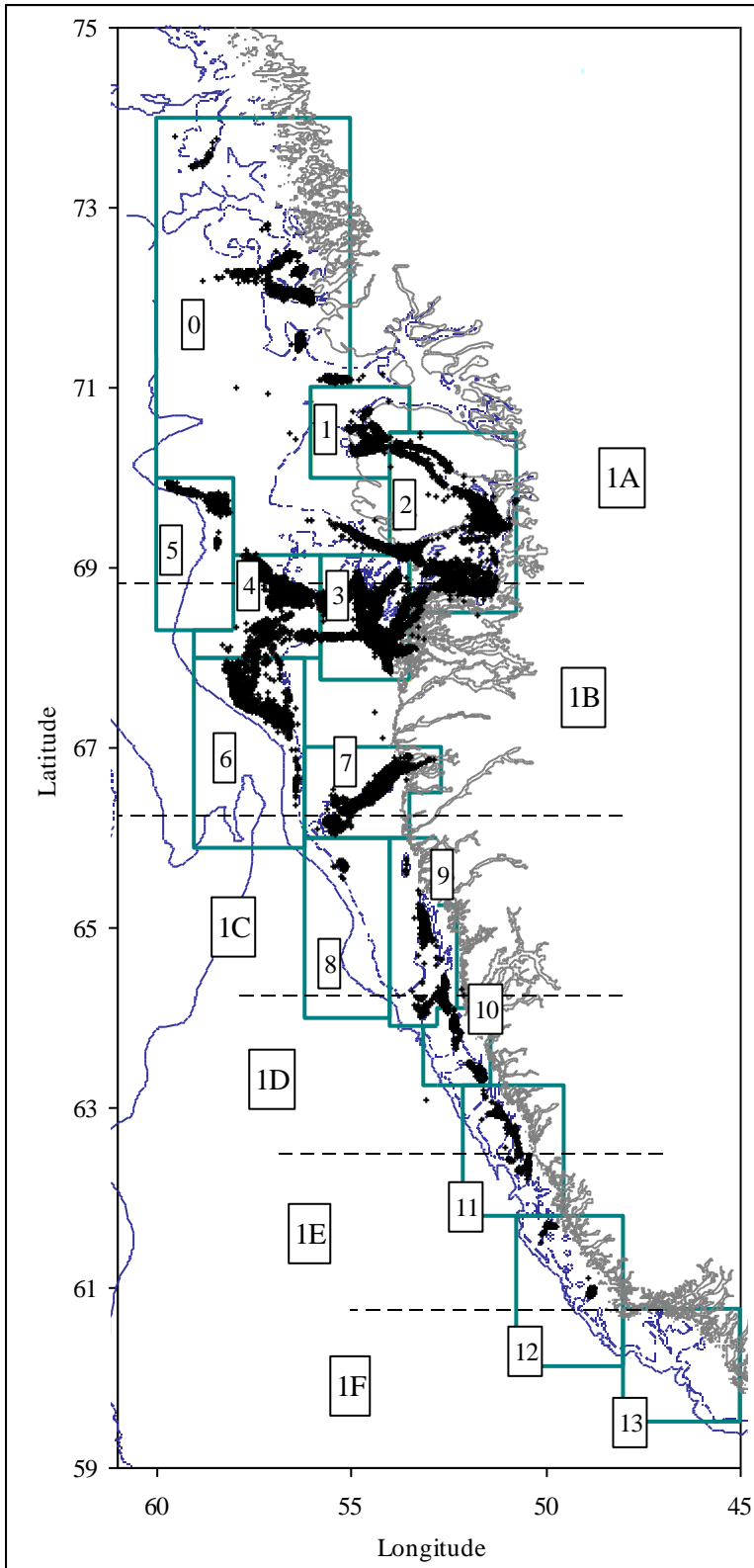


Figure 1. Indication of fishing intensity (black dots) by shrimp trawlers in Greenland waters, July 2009 through June 2010. Maps created and provided by the Greenland Institute of Natural Resources.

2. Pre-cruise preparations

2.1 Data provision and manipulation

Data from the Greenland and Danish logbooks for the period 1996-2010 were used; these were the only fleets fishing for shrimp in West Greenland waters in this period. Logbook data were supplied by the Greenland Fishery and Licence Control through the Greenland Institute of Natural Resources, and were manipulated and formatted for use by M. Kingsley on behalf of Sustainable Fisheries Greenland, as follows. Only hauls with start and end positions were used. Each haul was treated as a straight line and its length calculated by spherical methods. Each haul was divided into an integral number of equal-length segments of about 0.2 nautical miles in length and the position of the centre of each segment calculated by linear (not spherical) interpolation. For hauls with start and end depths recorded, a depth was calculated for each segment, again by linear interpolation between the start and end depth.

Segments were allocated, on the basis of their centre positions, to 'FixPos' cells. These are standard map units used for various purposes in connection with the West Greenland survey. They measure 1/32 of a degree of latitude by 1/12 of a degree of longitude. In the region between Nuuk and Aasiaat they measure 1.875 n.mi. north-south and about 2 n.mi. east-west. A 7-character FixPos code comprises:

- a two-character latitude code, defining a latitude band of 1/8 of a degree. Code JA has its southern boundary at 63°45'N and LJ has its northern boundary at 69°30'N. The letters C, I, O, Q, U, W and Y are not used.
- a three-digit longitude code defining a longitude band of 1/4 of a degree. Code 001 has its western boundary at 58°00'W.
- a two-digit Cell code, numbered, within the 5-character Stedkode so far defined, row-wise from 1 in the NW corner to 12 in the SE.

The whole of each segment was assigned to the FixPos containing its centre. Depths were averaged for each FixPos, and the 10th and 90th percentiles of depth were also calculated. Segment lengths trawled with double trawls were multiplied by 1.7. Segment lengths were summed for each year and FixPos. The annual distance trawled in each FixPos was averaged for three periods: 1996–2000; 2001–2005; and 2006–2010. FixPos cells in the shrimp strata of the West Greenland trawl survey were also included, even if there was no trawling recorded for them, but without depth information.

Manipulated data thus included, for each of the retained FixPos cells:

- the FixPos identifier;
- the mean annual distance trawled in each of the three periods;
- the latitude and longitude (in degrees, minutes and tenths of minutes) of the centre of the FixPos cell.
- if available, the mean, and 10th and 90th percentiles, of interpolated depths.

An Excel workbook was provided that enabled filtering of the data by:

- distance (n. mi.) from a present position (maximum only)
- bearing (degrees) from a present position (maximum and minimum)
- latitude and longitude (degrees and decimal degrees, max. and min.)
- trawl activity (annual mean trawled distance in n. mi; max. and min.)

2.2 Equipment

The camera apparatus used was provided by Prof. S. Rysgaard of the Greenland Climate Research Centre, Greenland Institute of Natural Resources. It consisted of a stills camera (Model DSC-10000 Digital, Ocean Imaging Systems, USA) in a 2000m-rated underwater housing, a flash unit (200 W-S Remote Head Strobe Model 3831, Ocean Imaging Systems, USA), and a remote trigger (Figure 2). These were fixed to a frame that was lowered to the seafloor on a winch wire. The camera was triggered and an image taken, by contact of the trigger weight with the seafloor (Figure 2). Camera settings are specified in Table 1. The area photographed in each image is 0.3 m².

Table 1. Ocean Imaging Systems UW camera settings used in all images

Shutter speed	1/100 sec
Distance bottom frame to camera lens	80 cm
Focus distance	70 cm (manual)
F-stop	11
Programme	Manual (M)
WB	Flash
ISO	100
Black tape on outer part of flash strobe (to reduce backscatter) Lead attached to releaser rope. Hanging approx 10cm below frame Wire guide mounted on frame Scaling: two rulers mounted to the frame Area of photos = 0.3 m²	



Figure 2. (a) The apparatus consisted of a downward facing stills camera, flash unit, battery pack, trigger and trigger weight. (b) Detail of camera unit and connectors. (c) The trigger weight was adjusted to hang ~8cm below the frame. (d) The apparatus was deployed and recovered using the starboard winch wire.

3. Cruise progress

3.1 Development of survey design

Three hours were available on the first night of sailing before fishing could begin, and in which camera work could be undertaken. This time was used to develop and test an initial survey design.

3.1.1 Survey Design 1

Target 3 positions equally spaced along the central latitudinal line of a chosen FixPos cell. Ten images at each position will yield 30 images per FixPos cell. Determine the transect line from the FixPos central position and 0.25nm either side. This gives a 0.5nm survey line (~0.9 km). Then move to next station.

- 10 images → 10 → 10 @ 4 min per photo = 120 min per transect
- 10 minutes relocating ship (within transect) x 2 = 20mins
- Estimate 140min (2h 20 min) per FixPos cell
- Within these time restraints maximum 3 transects could be accomplished per night.
- *Positives*: survey design offers a robust sampling plan with 30 images per site and built in contingency (ie if 50% images fail).
- *Negatives*: takes time to complete one station and could end up limiting work to 2 stations per night (equating to 16 stations total during the cruise).

3.1.2 Survey Design 2

Target the central position of a chosen FixPos cell and take 10 images, then move to next station.

- 10 images @ 4 min per photo = 40 min per FixPos cell
- *Positives*: much more flexible for getting many position and no possibility of breaking a 'transit' half way through as a result of time constraints. More transit time factored in so wider geographical distribution of positions can be targeted per night.
- *Negatives*: Only 10 images per station/FixPos cell.

3.1.3 Testing of survey designs

Design 1 was used once, at Station 1 (Tables 2 and 3) to determine how long one survey would take, and therefore how many could realistically be undertaken per night. Design 1 is time-intensive and the short distances (0.25nm) between survey positions are unrealistic for maneuvering the ship. This distance is easily covered simply through ship's drift in the time taken to collect the photographs from one position. Survey design 2 was chosen and undertaken for all remaining stations (2-49, Tables 2 and 3).

3.2 Choice of survey stations

Survey sites were chosen from a range of depth strata, and with a wide range of trawl history characteristics. Target areas were between 150 and 600m where good shrimp habitat is generally found.

Survey positions were chosen at the beginning of each night. During discussion with the fisheries survey leader the final trawl positions for that day and the first position for the next day were identified. Based on these positions the full geographical area that the ship could realistically reach in the intervening hours was identified. Depth, location and trawl history data for each FixPos cell that fell within this range was extracted from the database. These

were then prioritized based on the overall aim to gather imagery roughly balanced across trawl history categorisations and from a range of depth strata. Locations with very high historical fishing (10-15 years ago) and no recent fishing (past 5-10 years) were prioritized. These were rare but were targeted because in addition to representing a snapshot of benthic diversity at the present time, images from these locations may give information on potential recovery of benthic habitat after trawling impact.

To determine the trawl history category of a given location the 5-year averages (1996-2000, 2001-2005, 2006-2010) of annual distance trawled (nm) were summed; based on that sum average the FixPos cell was assigned a category between Z (zero trawling in the 15 year historical record) and H (High: >200nm).

Trawl history categorisations are:

- Z (ZERO): no trawling in the 15 year historical record
- L (LOW): sum of 5yr average annual trawled distance is 0-15 nm
- LM (LOW-MEDIUM): sum of 5yr average annual trawled distance is 15-100 nm
- HM (HIGH-MEDIUM): sum of 5yr average annual trawled distance is 100-200 nm
- H (HIGH): sum of 5yr average annual trawled distance is > 200 nm
- PR (POTENTIAL RECOVERY SITE): any site where trawling activity has been undertaken 15-5 years ago, but where there has been no activity in the past 5 years

These are arbitrary designations. “Low” does not designate a biologically low or safe limit, only a categorisation designated to facilitate the choice of survey target areas.

The depth data for each chosen location (taken from logbook data) was then checked against that in the ship's navigational software. Substrate, current speed and drift direction were noted and with this information the order of survey locations to be targeted was determined. Ideally stations were ordered to take advantage of ship's drift, and to move progressively from the current location at end-of-fishing to the designated start position for the following day's fishing. Substrate type and current speed also informed the determination of an appropriate interval between images. Muddy substrate and/or low current conditions require longer intervals between images to allow for sediment clouds (stirred up by the camera touching bottom) to settle and/or the ship to drift a suitable distance from cloudy areas.

All times are reported as West Greenland summer time.

3.3 Camera survey protocol

The following protocol was established for undertaking surveys:

1. Pre survey (each morning):
 - a. Choose survey locations (as above)
 - b. Check with bridge: substrate, current speed, direction
 - c. Order survey locations and input into ship's navigational system
 - d. Check camera, flash and all connections
 - e. Tighten all nuts/bolts
 - f. LENS CAP OFF, CAMERA ON
2. Survey:
 - a. 1 minute minimum between images
 - b. Record time and location of each image
 - c. Note current speed and wire angle, any other observations
 - d. Recording start/end/on deck/transit times is useful for estimating future schedules
3. Post survey:
 - a. Camera apparatus onto deck; secure and rinse
 - b. Download images to computer and hard drive
 - c. Label images
 - d. Record all logs to computer and hard drive
 - e. Assess current spread of data and targets for the next day
 - f. Write document log
 - g. Write personal log

4. Survey stations

4.1 Station summary log

Table 2 is a summary list of stations surveyed, and survey conditions, trawl history categorizations and image success ratio from each station.

Table 2. Station Summary

Station	Fix Pos code	Date		Time	Latitude (N)	Longitude (W)	Depth (m)	GPS (kn)	Log (kn)	Drift direction	TRAWL HISTORY Annual distance trawled (nm) averaged over 5yr periods			IMAGES			
											Category	1996-2000	2001-2005	2006-2010	Intended	Actual	Successful
1	JE01812	12/06/2011	start end on deck	3.46 4.04	64 08.093 64 08.120	53 32.149 53 32.035	293.4 295.5	0.7	0.3 to 0.4		M	69	56	16	6	4	3
1	JE01812	12/06/2011	start end on deck	4.15 4.36	64 08.064 64 08.120	5 31.508 53 31.504	288.2 289.4					69	56	16	6	5	3
1	JE01812	12/06/2011	start end on deck	4.52 5.27	64 08.064 64 08.291	53 31.508 53 31.504	288.9 289.1	0.4	0.2	N		69	56	16	6	6	1
2	JH01209	12/06/2011	start end on deck	21.46 22.52	64 30.016 64 30.981	54 67.302 54 56.900	321 307	1.1 1.1	0.05 0.02		ML	14	1	0	10	12	12
3	JH01205	12-13/06/2011	start end on deck	23.26 1.10	64 33.073 64 34.354	55 02.457 55 02.389	348 312.8	1.1	0		L	1	0	0	8	14	14
4	JH01310	13/06/2011	start end on deck	1.51 3.53	64 34.858 64 36.896	55 07.351 55 06.694	402 367.1				M	66	1	0	10	7	22
5	JS01102	13/06/2011	start end on deck	20.24 21.50 21.56	65 32.816 65 33.667	55 22.208 55 23.020	529.8 512.9	0.6	0		H	239	153	17	10	18	6
6	JS01105	13/06/2011	start end on deck	22.15 22.40 22.47	65 34.653 65 34.685	55 22.489 55 22.649	458 460	0.3	0		M	45	8	0	10	7	7
7	JS01108	13/06/2011	start end on deck	23.09 23.34 23.39	65 36.423 65 36.485	55 22.309 56 22.747	352.9 367.4	0.9	0		L	7	2	0	10	11	11
8	JS01106	14/06/2011	start end on deck	0.08 0.32 0.37	65 34.689 65 34.754	55 18.090 55 18.857	314.4 350.8	0.9	0		H	216	225	28	10	10	10
9	JS01109	14/06/2011	start end on deck	1.13 1.43 1.47	65 32.687 65 32.681	55 16.874 55 17.480	428 448	0.6 to 0.70			HM	136	45	3	10	9	2
10	JS01210	14/06/2011	start end on deck	2.13 2.38 2.43	65 30.736 65 30.621	55 12.192 55 12.294	392.9 401.2	0.6	0		H M	236	159	16	10	11	0
11	JS01211	14/06/2011	start end on deck	3.02 3.20 3.22	65 30.547 65 30.453	55 07.980 55 08.417	158.2 155	0.9	0		M	12	73	19	10	14	11
12	JS01212	14/06/2011	start end on deck	3.41 4.00 4.03	65 30.606 65 30.501	55 02.808 55 03.006	154.2 151	0.5	0		LM	0	1	17	10	13	11

Station	Fix Pos code	Date		Time	Latitude (N)	Longitude (W)	Depth (m)	GPS (kn)	Log (kn)	Drift direction	Category	1996-2000	2001-2005	2006-2010	Intended	Actual	Successful
27	KL00505	16/06/2011	start	22.57	67 19.520	56 53.202	226.2	0.8 to 0.6	0	SE	H	0	81	148	10	12	8
			end	23.22	67 19.283	56 52.737	228.3										
			on deck	0.58													
28	KL00508	17/06/2011	start	1.22	67 17.740	56 52.760	231.4	1.3	0	SW	H	2	119	140	10	15	10
			end	1.26	67 17.484	56 53.824	233.1										
			on deck	1.41													
29	KL00511	17/06/2011	start	2.04	67 16.059	56 52.426	234.8	0.9	0		H	12	195	110	10	7	7
			end	2.08	67 15.816	56 53.063	237.8										
			on deck	2.29													
30	KL00507	17/06/2011	start	2.46	67 17.680	56 57.595	234.5	0.9	0		H	3	131	126	10	11	11
			end	2.51	67 17.503	56 58.084	233.8										
			on deck	4.09													
31	KM00410	17/06/2011	start	4.34	67 23.054	57 11.689	220.6	0.5	0		HM	0	24	77	10	11	11
			end	dnr	67 22.912	57 12.020	218.2										
			on deck														
32	KS00312	17/06/2011	start	18.36	67 54.371	57 16.746	287.5	0.7	0	S	L	0	0	5	10	13	12
			end	19.06	67 54.030	57 16.807	286.8										
			on deck	19.12													
33	KT00412	18/06/2011	start	4.46	68 03.419	57 01.025	133.1	0.3	0		LM	0	6	15	10	11	7
			end	5.04	68 03.270	57 01.340	133.8										
			on deck	5.10													
34	LD00710	18/06/2011	start	18.47	68 45.839	56 29.255	282.8	0.3			H	0	0	224	10	11	11
			end	19.12	68 45.885	56 29.012	280.6										
			on deck	19.17													
35	LD00711	18/06/2011	start	20.33	68 45.468	56 22.129	264.9	0.5		E	H	0	0	279	10	11	10
			end	20.55	68 45.633	56 21.855	255.3										
			on deck	20.59													
36	LD00712	18/06/2011	start	21.16	68 45.236	56 16.905	244.9	0.5		E-NE	H	0	0	209	10	10	10
			end	21.33	68 45.369	56 16.696	238.6										
			on deck	21.37													
37	LB00801	18/06/2011	start	21.55	68 44.095	56 12.506	279.4	0.6		SE	H	0	0	237	10	10	10
			end	22.14	68 44.293	56 12.539	270.5										
			on deck	22.18													
38	LB01002	18-19/06/2011	start	23.53	68 44.054	55 37.382	197	0.6		NE	Z	0	0	0	10	10	10
			end	0.10	68 44.176	55 36.949	197.6										
			on deck	0.13													
39	LB01103	19/06/2011	start	1.03	68 44.238	55 16.314	269	0.4		NE	Z	0	0	0	10	11	10
			end	1.20	68 44.349	55 15.975	267.8										
			on deck	1.24													
40	LD01204	19/06/2011	start	2.05	68 49.683	55 12.079	243.5	0.6		N	Z	0	0	0	10	11	9
			end	2.23	68 49.844	55 11.958	244.2										
			on deck	2.26													
41	LD01306	19/06/2011	start	3.35	68 49.505	54 47.538	209	0.6 to 0.7		N	H	5	93	123	10	11	10
			end	3.53	68 49.692	54 47.312	205										
			on deck	3.56													

Station	Fix Pos code	Date		Time	Latitude (N)	Longitude (W)	Depth (m)	GPS (kn)	Log (kn)	Drift direction	Category	1996-2000	2001-2005	2006-2010	Intended	Actual	Successful	
42	LF01310	19/06/2011	start	5.03	69 01.166	54 57.344	211	0.9		N	Z	0	0	0	10	13	11	
			end	5.29	69 01.583	54 57.090	208.8											
			on deck	5.33														
43	KZ00903	19/06/2011	start	19.05	68 29.257	55 46.323	450.8	0.7				Z	0	0	0	10	10	10
			end	19.36	68 29.515	55 45.693	412.8											
			on deck	19.42														
44	KZ00905	19/06/2011	start	20.22	68 27.012	55 52.158	507.4	0.5		NE	Z	0	0	0	10	9	0	
			end	20.53	68 27.194	55 51.627	503.5											
			on deck	21.00														
45	KX00906	19/06/2011	start	21.57	68 20.026	55 47.082	501.1	0.4		N-NE	Z	0	0	0	10	13	0	
			end	22.27	68 20.197	55 46.715	499.7											
			on deck	22.33														
46	KV01201	20/06/2011	start	23.58	68 14.717	55 13.135	289.9	0.7		N	H	86	226	232	10	9	0	
			end	0.23	68 14.976	55 12.891	320.9											
			on deck	0.28														
47	KV01202	20/06/2011	start	0.45	68 14.597	55 08.144	271.2	0.7		N	H	75	233	224	10	10	10	
			end	1.11	68 14.729	55 08.061	288.5											
			on deck	1.16														
48	KV01209	20/06/2011	start	2.02	68 10.439	55 01.938	59.3	1.1 to 1.2		N	Z	0	0	0	10	10	10	
			end	2.23	68 10.771	55 01.612	62.1											
			on deck	2.24														
49	EGM2	20/06/2011	start	3.43	68 02.046	55 26.784	69.3	0.9							10	15	14	
			end	4.00	68 02.210	55 26.371	69.5											
			on deck	4.02														
															Totals:	506	584	464

4.2 Full image log

Table 3 lists full details of all image locations and times, associated survey conditions and notes recorded during each survey.

Table 3. Image Log

Station 1; 12/06/2011

Fix Pos	JE01812
Transect distance	1.5 nm
Station interval	0.25 nm
Stations per transect	3
Photos per transect station	10
Total photos per transect	30

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	JE01812	3.46	64 08.093	53 32.149	293.4		0.7	0.3 to 0.4	3 good photos of 4 taken
1		4.04	64 08.120	53 32.035	295.5				
2		4.15	64 08.064	5 31.508	288.2				3 good photos of 5 taken
2		4.36	64 08.120	53 31.504	289.4				
3		4.52	64 08.064	53 31.508	288.9		0.4	0.2 north	1 good photo of 6 taken
3		5.27	64 08.291	53 31.504	289.1				

Notes:

Apparatus stayed in water between stations
3 minute interval between images
Camera approx 20m off bottom as we move between stations

Station 2; 12/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	JH01202	21.46	64 30.016	54 67.302	321		1.1	0.05	
2									
3									
4							1.1	0.02	
5									
6		22.21	64 30.525	54 57.061	312.8				
7		22.27	64 30.620	54 56.995	310.6				
8		22.35	64 30.718	54 56.972	308.2		1	0	
9		22.45	64 30.868	54 56.929	306.8				
10		22.50	64 30.939	54 56.918	307.5				

Notes:

Very strong currents, wire at 35 deg angle - skeptical about quality of vertical image
Hoisting and lowering camera apparatus without waiting time in between
In this current we will move ~30m per min - the time it takes to raise and lower it is sufficient to move far enough between images
Camera up and down at 1.5 m per sec - increased speed in attempt to overcome drift and ensure frame hits bottom in vertical orientation
0.9 nm distance between images 1 and 10
Images above water at the end of this station
3nm (20 min) to next station

Station 3; 12-13/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	JH01205	23.31	64 32.142	55 02.419	348.8		1.1	0	
2		23.36	64 33.214	55 02.365	347.9				
3		23.45	64 33.337	55 02.287	345				
4		23.50	64 33.392	55 02.253	342.7				
5		23.57	64 33.481	55 02.195	338	580			
6		0.09	64 33.640	55 02 173	334	716	1.1 to 1.3		* hoisted (after this image)
7		0.34	64 33.943	55 02.196	325.4	716			* hoisted (after this image)
8		0.49	64 34.107	55 02.305	321.8	358			
9		0.56	64 34.190	55 02.334	320	492			
10		1.09	64 34.336	55 02.386	312.4	774			not sure of bottom contact

Notes:

High waves/big swell - danger of damaging the camera if it hits seabottom
Hoisting apparatus up to ~250m (50m above bottom) before lowering again
*Apparatus brought up to surface to check wire length registering correctly; did not feel camera touch down on bottom
Wire at 45 degree angle
GPS and log are swinging around a lot but approx 1.1 - 1.3 kn
The weight of the wire is probably causing it to bow out during deployment
Drifted 1.3 nm between images 1 and 10

Station 4; 13/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	JH01208	2.02	64 35.047	55 07.284	396.8	724	1.3	0.1 to 0.2	
2		2.22	64 35.393	55 07.134	384.2	455	1.3		40m/min drift
3		2.34	64 35.609	55 07.134	375.1	438.5			
4		2.47	64 35.830	55 07.148	375.7	520			
5		2.59	64 36.035	55 07.115	378.7	425	1		
6		3.14	64 36.277	55 07.025	379.3	830			
7		3.31	64 36.558	55 06.861	378.1	417.6			
8		3.46	64 36.805	55 06.733	379.4	820			not sure of bottom contact
9		forced to finish as we must head to fishing position (2h steaming)							
10									

Notes:

Is it a full moon? Strong tides

Wire angle varying erratically between 30 and 50 degrees, tricky, maybe impossible conditions

Predict we'll be hitting the bottom at an angle tonight, bad conditions for this tonight

Lowering the camera system at 1.5 meters per minute

Between images 1 and 5 we have drifted 1.4 nm at about 330 degrees

Necessary to hoist nearly all the way up each time as the current drags apparatus out further and further: this takes time

Coral bycatch came up on the camera frame - (small amount of branched octocoral) - fixed in ship's alcohol

Recovered apparatus and fixed chain weight onto the base to try to improve the vertical image

Possible camera improvements:

An additional bar on frame to protect the flash shade

Round shield on flash shade: at present it works as a parachute during deployment, catching water and altering the descent of the framework

Station 5; 13/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	JS01102	20.36	65 32.975	55 22.105	528	889			Not sure of bottom contact
2		21.15	65 33.376	55 22.637	520.6	590			
3		21.20	65 33.377	55 22.637	520	530			
4		21.22	65 33.443	55 22.699	518.7	560	0.6	0	
5		21.26	65 33.474	55 22.736	517.8	541			
6		21.31	65 33.534	55 22.814	516.2	558			
7		21.35	65 33.562	55 22.851	515.7	523			
8		21.37	65 33.583	55 22.885	515.7	524.6			
9		21.42	65 33.625	55 22.952	515.8	574.1			
10		21.45	65 33.642	55 22.981	513.9	531	0.4 to 0.5	0	
11		21.47	65 33.656	55 23.004	513.4	524.9			

Notes:

Recovered apparatus to deck after the first image and added another (2nd) chain to the base of the framework; it is too light to go so deep

Upon release after adding chain apparatus is sinking more slowly; wire let out too rapidly; stopped slacking wire at 590m and let it settle

Hoisting up approximately 20m above bottom between photos

Ship is drifting 15-20m per minute and it is a very muddy bottom; waiting 1 min between images to try to avoid mud clouds in images

Station 6; 13/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		22.15	65 34.653	55 22.489	458				
2		22.20	65 34.651	55 22.491	459.1				
3		22.21	65 34.651	55 22.497	459.7	465			
4		22.24	65 34.655	55 22.507	459.4	460	0.3	0	
5		22.26	65 34.659	55 22.510	459.1	470			
6		22.28	65 34.666	55 22.515	459.9	484.6			
7		22.32	65 34.603	55 22.619	462.7	527			
8		22.35	65 34.621	55 22.682	463.5	496			
9		22.37	65 34.642	55 22.700	462.6	479			
10		22.40	65 34.685	55 22.649	460.8	480.6			

Notes:

Only hoisting up 2m (plus the length offered by the angle of the wire) between images

Slight worry of mud cloud being resuspended here; check images after this station

Images downloaded to check after this station.

Station 7; 13/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		23.15	65 36.449	55 22.529	358.4	374.8	0.9	0	
2		23.17	65 36.464	55 22.546	359.1	560	1	0	
3		23.19	65 36.489	55 22.569	358	353			
4		23.21	65 36.509	55 22.542	356	356			
5		23.23	65 36.511	55 22.526	355	360			
6		23.25	65 36.499	55 22.507	355	349			<-- odd but true
7		23.27	65 36.486	55 22.529	357.1	363			
8		23.29	65 36.473	55 22.568	359.4	363			
9		23.31	65 36.470	55 22.689	363.9	366			
10		23.34	65 36.485	55 22.747	366.7	366.5			

Notes:

*In checked images we have some mud clouds; could wait longer between images but current has picked up; waiting 1 minute as before
Very quick station*

Station 8; 14/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		0.13	65 34.655	55 18.270	333.6	375.2	0.9	0	
2		0.16	65 34.660	55 18.388	339.1	340.2			
3		0.18	65 34.667	55 18.453	341	338			
4		0.20	65 34.673	55 18.503	342	340			
5		0.22	65 34.682	55 18.578	344	344			
6		0.24	65 34.691	55 18.635	345	345			
7		0.26	65 34.703	55 18.692	347	343			
8		0.28	65 34.723	55 18.763	349	343			
9		0.30	65 34.738	55 18.810	350.2	350			
10		0.32	65 34.754	55 18.857	350.8	350			

Notes:

Hoisting up to 10m above bottom (plus wire angle) between images and waiting 1 min

Station 9; 14/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		1.23	65 32.646	55 16.946	430.1	430	0.6 to 0.7	0	
2		1.25	65 32.645	55 17.009	431.7	427.6			
3		1.27	65 32.647	55 17.076	434.1	434			
4		1.29	65 32.648	55 17.126	435.2	435			
5		1.31	65 32.652	55 17.174	437.3	430			
6		1.33	65 32.655	55 17.232	439.1	433			
7		1.35	65 32.659	55 17.274	441	434.4			
8		1.37	65 32.661	55 17.319	442	436			
9		1.39	65 32.660	55 17.376	444.6		0.6	0	
10		1.41	65 32.669	55 17.413	446	438			
11		1.43	65 32.681	55 17.480	448	443			

Notes:

Beautiful full moon --> strong currents

After image 7 I had counted 7 and Jakup had counted 6 so took advantage and took an 11th image

Station 10; 14/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		2.20	65 30.728	55 12.111	391.5	448			<--but we had excess wire out
2		2.23	65 30.703	55 12.091	392	392	0.6	0	
3		2.25	65 30.676	55 12.126	394.8				
4		2.27	65 30.672	55 12.143	395.3	395			
5		2.29	65 30.666	55 12.174	396.4	393			
6		2.31	65 30.657	55 12.202	397.7	392			
7		2.32	65 30.650	55 12.222	398.4	381.9			
8		2.34	65 30.642	55 12.247	399.5	395.8			
9		2.36	65 30.632	55 12.274	400.5	396.1			
10		2.38	65 30.621	55 12.294	401.2	395.9			

Notes:

Check that the uneven distribution of the chain weight on the frame does not affect the behaviour of the trigger

Possible that heaviest corner of the frame will hit first and stir up mud cloud before the trigger hits bottom

Lengthened trigger weight by about 8cm: check for any visible difference in images

Station 11; 14/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		3.05	65 30.526	55 08.016	156.9	161.1	0.9	0	
2		3.07	65 30.507	55 08.060	154.8	160			
3		3.08	65 30.500	55 08.094	154.2	158			
4		3.09	65 30.490	55 08.142	153.5	156			
5		3.11	65 30.477	55 08.188	154	156			
6		3.13	65 30.470	55 08.239	154.1	154.7			
7		3.14	65 30.464	55 08.290	154.1	154.5			
8		3.16	65 30.461	55 08.335	154.8	154			
9		3.18	65 30.457	55 08.377	154.8	153			
10		3.20	65 30.453	55 08.417	155	153			

Notes:

*Very quick station; very shallow
Hoisting up ~5 m between images*

Station 12; 14/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		3.44	65 30.589	55 02.818	154	154	0.5	0	
2		3.46	65 30.572	55 02.833	153.5	154			
3		3.47	65 30.561	55 02.850	153.5	154			
4		3.49	65 30.549	55 02.872	153.4	152.2			
5		3.51	65 30.538	55 02.891	152.2	152.8	0.4 to 0.5	0	
6		3.53	65 30.528	55 02.922	152.1	151.1			
7		3.54	65 30.522	55 02.942	152.1	151.2			
8		3.56	65 30.521	55 02.958	152.1	150.3			
9		3.58	65 30.514	55 02.977	151.7	150	0.3	0	
10		4.01	65 30.501	55 03.006	151	150.5			

Notes:

*Is trigger weight still a little low? Check images
Drifting 15m per minute: waiting 1 minute between images
Hoisting ~10m between images
Securing apparatus to the platform tonight instead of recovering to deck; weather is good
Check camera battery tonight*

Station 13; 14/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		19.24	66 08.294	56 12.437	188.2	184.4			
2		19.26	66 08.298	56 12.450	189.5	199.1			
3		19.28	66 08.294	56 12.456	188.5	194.2			
4		19.29	66 08.290	56 12.461	188.4	205			
5		19.31	66 08.287	56 12.480	188.8	211.7	0.6	0	
6		19.34	66 08.284	56 12.501	189	206			
7		19.35	66 08.282	56 12.506	188.5	212			
8		19.38	66 08.277	56 12.511	189.9	223.5			
9		19.40	66 08.273	56 12.516	189.9	219			
10		19.43	66 08.266	56 12.524	189.8	231			

Notes:

*Trawl history - low trawling in AV1 and AV2, and zero in AV 3 ; this region has therefore experienced a ~5 year recovery period
The camera has a few issues; periodically fails to delete all images from the camera despite giving "deleted" notification
Consequently when I download I get images from previous night mixed in
Also periodically refuses to download, saying jpg is an unrecognised file type; when this happens I wait and try again later
Started putting tape on one of the marker rulers to make distinguishing images from each position easier
Images from this position have 1 black mark on the ruler
1.5h steaming to the next station
This station was much quicker than I anticipated; I will add 1, possibly 2 more stations now and go and tell the bridge
Noted a discarded trawl net floating very near us just as we finished here; we were extremely lucky to avoid that*

Station 14; 14/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		21.26	66 17.727	55 56.623	169.2	199.2	0.8	0	
2		21.28	66 17.722	55 56.690	167.3	207.4			
3		21.31	66 17.714	55 56.745	167.5	220.7			
4		21.33	66 17.700	55 56.815	166.4	200			
5		21.37	66 17.694	55 56.903	164.9	194			
6		21.40	66 17.682	55 56.953	164.1	192			
7		21.42	66 17.669	55 57.012	164.4	192.7	0.8	0	
8		21.45	66 17.654	55 57.075	163.5	211.1			
9		21.48	66 17.638	55 57.124	163.5	194.8			
10		21.51	66 17.616	55 57.190	162.8	205.9			

Notes:

Trawl history - zero

Images from this position with 2 tape marks on the ruler

Wire at ~35 degrees (medium current)

8-9 nm to next station (approx 1 hr)

Station 15; 14/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		23.11	66 13.998	55 37.945	209.8	235			
2		23.15	66 13.946	55 38.026	208.3	237.9	0.9	0	
3		23.18	66 13.890	55 38.071	207.5	230.1			
4		23.21	66 13.852	55 38.124	206.9	225			
5		23.23	66 13.825	55 38.163	207.4	230	1.5	0	wire at about 45 degree angle
6		23.25	66 13.791	55 38.193	207.1	217			
7		23.27	66 13.761	55 38.225	207.1	232.5	1.35	0	
8		23.30	66 13.715	55 38.273	207.3	309.8			
9		23.35	66 13.646	55 38.358	206.4	257.5			
10		23.38	66 13.608	55 38.406	206.3	247.1	1		

Notes:

Images have 3 black tape marks

Ship drifting approx 45m/min (GPS 1.5)

Between pictures 1 and 10 have drifted 0.5 nm; direction ~190 degrees

Camera not flashing upon recovery so taking it fully onboard for check

System battery replaced during steaming time to next station, ready to go

nb. camera has a backup battery so it was still operational, but the strobe has no backup battery so fails when system battery fails

Station 16; 15/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		1.03	66 10.258	55 27.323	232.7	245.7	1.2	0	changeable current
2		1.04	66 10.228	55 27.339	232.5	254.7			
3		1.06	66 10.182	55 27.363	233.1	250			
4		1.09	66 10.139	55 27.396	232.7	251.6			
5		1.11	66 10.097	55 27.435	233.3	245			
6		1.13	66 10.061	55 27.462	233.6	251	1.1 to 1.3		
7		1.16	66 10.062	55 27.516	232.7	254			
8		1.18	66 09.961	55 27.541	233	252			
9		1.20	66 09.911	55 27.571	232.4	252.6			
10		1.23	66 09.867	55 27.600	232.9	251.7			

Notes:

Trawl history - high

Station 17; 15/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		2.15	66 12.389	55 26.835	202	204			
2		2.16	66 12.366	55 26.844	201.3	200	1.1		
3		2.18	66 12.323	55 26.859	203.2	201.2			
4		2.19							photo taken but I missed recording position
5		2.21	66 12.289	55 26.871	201.3	205			
6		2.22	66 12.254	55 26.874	201.2	200			
7		2.24	66 12.212	55 26.878	201.4	203.3	1.2 to 1.4		but wire is vertical - very strange currents
8		2.26	66 12.164	55 26.894	203.6	204.7			
9		2.28	66 12.129	55 26.908	205.4	209.6			
10		2.29	66 12.100	55 26.927	207.5	219.8			

Notes:

Trawl history - high

Weather drastically improved after station 1 and has been improving since

5 markers on the ruler in these images (black)

Drifted 1 nautical mile between pictures 1 and 10

Station 18; 15/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		3.57	66 18.961	55 17.004	199.3	204.4			
2		3.58	66 18.931	55 16.997	198.5	207.6			
3		3.59	66 18.893	55 16.995	197.2	205.8	1.6		
4		4.02	66 18.898	55 16.993	194.1	203.3			
5		4.03	66 18.803	55 16.989	196	201.8			
6		4.05	66 18.751	55 16.994	200.6	207.1			
7		4.07	66 18.709	55 16.999	200.1	211	1.3 to 1.4		
8		4.08	66 18.662	55 17.007	202	213.8			
9		4.10	66 18.626	55 17.008	201.6	211.2			
10		4.12	66 18.580	55 17.015	202	209.9			

Notes:

Trawl history - medium

6 black markers on the ruler in these images (5+1)

50m per min drifting

Wire wrapped around the camera frame upon recovery - same problem as before; checked images last time (last position) - okay

0.7 nm drift between images 1 and 10

30 min to next station

Station 19; 15/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1		4.57	66 19.640	55 27.372	197.9	215.3	1.5	0	
2		4.59	66 19.597	55 27.396	197.9	213.9			
3		5.01	66 19.558	55 27.415	197.9	209.1			
4		5.03	66 19.519	55 27.433	199.8	206			
5		5.05	66 19.481	55 27.451	199.2	206.4			
6		5.07	66 19.439	55 27.461	199	205.3			
7		5.08	66 19.400	55 27.472	197.9	204.4			
8		5.11	66 19.354	55 27.484	197.9	203.6			
9		5.13	66 19.311	55 27.500	198.2	204.7			
10		5.14	66 19.271	55 27.509	199	206			

Notes:

Trawl history - need to check

This station was chosen because it is the morning fishing station (due to start 05.30) and only place we can squeeze in one more set of photos
7 black bands on the ruler (5+2)

Tied a rope around the top of the camera framework to try to prevent the wire tangling on the hooks on the frame

Station 20; 15/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KF01707	18.47	66 41.109	54 15.903	219.2	220			
2		18.50	66 41.113	54 15.928	217	217			
3		18.52	66 41.109	54 15.950	216	216.2	0.5	0	in a 230 degree direction
4		18.54	66 41.095	54 15.987	214.2	215.2			
5		18.56	66 41.080	54 16.019	213.1	215			
6		18.58	66 41.058	54 16.054	212.5	215.3			
7		19.00	66 41.030	54 16.083	213.1	217.3			
8		19.02	66 40.992	54 16.104	215	215			
9		19.04	66 40.970	54 16.124	216.2	221			
10		19.06	66 40.951	54 16.145	217.1	219.9			

Notes:

This was a trawling station and my only option this morning; we will do hydrography stations tonight so I am very limited in choice

These images have 1 blue tape mark

Apparently there is a total lunar eclipse going on just now, but it's cloudy

Started charging battery at 20.38

Should take approx 5 hrs, then fully discharge and charge it again

(Total discharge capacity before charging was only 00003 A-hrs)

Should increase after a full charge/discharge - note it.

Station 21; 16/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	HBG3	1.36	66 46.060	55 35.774	115.9	121.7	0.4	0	
2		1.38	66 46.055	55 35.770	116	119.7			
3		1.41	66 46.048	55 35.766	115.9	119.2			
4		1.42	66 46.038	55 35.740	115.9	118.9			
5		1.44	66 46.031	55 35.710	115.9	119			
6		1.46	66 46.019	55 35.694	116.4	120.1	0.4		drifting south/southeast
7		1.48	66 46.012	55 35.688	115.7	119.6			
8		1.50	66 46.003	55 35.681	115.9	118.8			
9		1.51	66 45.994	55 35.668	115.3	118			
10		1.53	66 45.978	55 35.650	115.8	119.4			

Notes:

2 blue tape marks on these images

Approx 12 nm to next station

Station 22; 16/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	HBG4	3.18	66 43.157	56 06.439	164.8	172	0.4	0	
2		3.20	66 43.142	56 06.461	165	169			
3		3.22	66 43.126	56 06.460	164.2	168.3			
4		3.23	66 43.111	56 06.459	164.2	167.7			
5		3.25	66 43.098	56 06.463	164.2	167			
6		3.27	66 43.085	56 06.464	164.6	168.1	0.5		due south
7		3.29	66 43.066	56 06.465	164.2	167.8			
8		3.31	66 43.044	56 06.459	163.7	169.5			
9		3.33	66 43.024	56 06.458	164.1	167.7			
10		3.35	66 43.001	56 06.454	163.9	168.9			

Notes:

3 blue tape marks
Fully on deck and removed from winch wire at 3.40; this station took 22 minutes

Station 23; 16/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KL00503	19.33	67 21.272	56 47.165	211.7	224	1.4		direction of drift 210 degrees
2		19.36	67 21.223	56 47.259	214.1	226			
3		19.38	67 21.168	56 47.308	215.8	228			
4		19.40	67 21.154	56 47.335	215.8	220			
5		19.42	67 21.128	56 47.347	215.9	223			
6		19.43	67 21.111	56 47.347	215.9	222	0.8		150 deg drift (S-SE)
7		19.45	67 21.085	56 47.338	215.9	218			
8		19.47	67 21.060	56 47.332	216.5				
9		19.48	67 21.042	56 47.322	216.6	216	0.8		
10									

Notes:

Trawl history - L-M
A bit of rudder fixing delayed us starting ~1hr
Rearranged the station order to account for the southward drift
1 red tape mark in images
We are drifting in the right direction, towards the next station
1.5 nm, hoisting camera to sail - approx 10 min
Missed recording the exact position of the last image: get coffee

Station 24; 16/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KL00506	20.13	67 19.894	56 47.238	220	223.1			
2		20.15	67 19.875	56 47.385	220	222.9			
3		20.17	67 19.858	56 47.348	220.7	223.6			
4		20.19	67 19.841	56 47.418	220.2	224.8			
5		20.20	67 19.825	56 47.475	220.6	226			
6		20.22	67 19.808	56 47.543	220.7	227.1	1.1	0	240 deg
7		20.25	67 19.789	56 47.640	222.1	225.7			
8		20.26	67 19.780	56 47.671	222.3	224.2			
9		20.28	67 19.773	56 47.696	222.1	222.4			
10		20.30	67 19.765	56 47.699	222.7	219.4			

Notes:

Trawl history - L-M
2 red tape marks
2nm to next position

Station 25; 16/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KL00509	20.58	67 17.662	56 47.572	228	235.7			
2		20.59	67 17.644	56 47.589	228	236.3	0.8		200 deg drift
3		21.01	67 17.623	56 47.611	227.6	237.1			
4		21.03	67 17.608	56 47.643	228.2	239.7			
5		21.04	67 17.590	56 47.668	227.9	244.1			
6		21.07	67 17.563	56 47.707	228.3	291.9			
7		21.09	67 17.544	56 47.751	228.3	245.5	0.8		
8		21.11	67 17.523	56 47.780	228.3	244.4			
9		21.13	67 17.505	56 47.803	228.2	243.7			
10		21.15	67 17.483	56 47.832	228.3	244.1			

Notes:

Trawl history - L-H
3 red tape marks
2nm to next station, approx 15 min

Station 26; 16/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KL00512	21.46	67 15.693	56 48.317	236.5	245.4			
2		21.47	67 15.682	56 48.341	236.6	247.5			
3		21.49	67 15.666	56 48.368	236.6	252.1	0.7		200 deg drift
4		21.51	67 15.648	56 48.395	236.5	253			
5		21.53	67 15.635	56 48.430	236.6	257			
6		21.55	67 15.617	56 48.464	235.7	256.3			
7		21.56	67 15.603	56 48.490	236.9	260.3			
8		21.59	67 15.588	56 48.523	236	257.6			
9		22.00	67 15.571	56 48.552	236	255.7			
10		22.02	67 15.558	56 48.579	236	259.8			

Notes:

Trawl history - H

4 red tape marks

1.5 nm to next station, approx 30 min

Station 27; 16/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KL00505	22.58	67 19.509	56 53.184	226.9	244	0.8		140 deg drift
2		23.00	67 19.489	56 53.129	227.6	248			
3		23.04	67 19.454	56 53.036	226.9	269.4			
4		23.07	67 19.432	56 52.952	227.5	270			
5		23.08	67 19.415	56 52.912	226.9				
6		23.13	67 19.374	56 52.840	227.6	240	0.6		150 deg drift
7		23.15	67 19.354	56 52.812	227.6	308			didn't feel bottom contact*
8		23.17	67 19.330	56 52.782	228.3	268.6			
9		23.20	67 19.308	56 52.755	228.3	270.4			
10		23.22	67 19.283	56 52.737	228.3	273			

Notes:

*slacked a little too much wire out here

Mistaken reading of the coordinates on the bridge

I designated coordinates of KL00511 but this position is actually closer to KL00505, probably a handwriting issue

Consequently this is a totally randomly chosen station: medium fishing history

Make note to insert coordinates into nav system myself to avoid this

Between images 5 and 6 we raised the apparatus completely to pull in the excess wire

Current is strong and each time it is raised/lowered we must let out a little more

Pull it all in and start again (quicker in the long run)

Lots of decision making at this point - new stations 7-9 chosen based on our current (mistaken) location

Station 28; 17/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KL00508	1.03	67 17.687	56 52.909	231.3	254			
2		1.05	67 17.661	56 53.013	231	266.3			
3		1.07	67 17.638	56 53.121	231	275.3	1.3		220 deg drift
4		1.09	67 17.612	56 53.243	231.2	281			
5		1.12	67 17.585	56 53.383	231.1	283			
6		1.14	67 17.565	56 53.484	232.4	283			
7		1.16	67 17.543	56 53.572	232.9	283.4			
8		1.18	67 17.525	56 53.657	233.1	286.9			
9		1.20	67 17.506	56 53.729	233.1	289.1			
10		1.22	67 17.484	56 53.824	233.1	290.6			

Notes:

Trawl history - H

6 red tape marks

1.5nm, 10 min to next station

Station 29; 17/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KL00511	1.46	67 16.010	56 52.508	235.2	251.8			
2		1.48	67 15.982	56 52.578	235.1	256			
3		1.50	67 15.961	56 52.654	235.7	264			
4		1.52	67 15.940	56 52.708	235.3	261.8			
5		1.54	67 15.919	56 52.774	235.3	264.6			
6		1.56	67 15.904	56 52.831	235.9	259.4			
7		1.58	67 15.883	56 52.884	235.9	260.1			
8		1.59	67 15.866	56 52.934	236.3	287.2			
9		2.02	67 15.838	56 53.002	237	262			
10		2.04	67 15.816	56 53.063	237.8	295.5	0.9	s-se	

Notes:

Trawl history - H

7 red tape marks (5+2)

2.5nm to next position, ~15min

Station 30; 17/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KL00507	2.33	67 17.637	56 57.694	235	241.2			
2		2.34	67 17.626	56 57.728	234.7	241.7			
3		2.36	67 17.612	56 57.767	235.2	245.6			
4		2.37	67 17.597	56 57.806	234.5	244.6	0.9		
5		2.39	67 17.580	56 57.855	234.2	248.6			
6		2.40	67 17.564	56 57.902	233.8	244.5			
7		2.41	67 17.550	56 57.940	233.7	245.5			
8		2.43	67 17.533	56 57.992	233.3	245.3			
9		2.44	67 17.522	56 58.028	233.8	247.5			
10		2.46	67 17.503	56 58.084	233.8	247.3	0.9		

Notes:

Trawl history - H
8 red tape marks
~8nm to next station - 1 hr

Station 31; 17/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KM00410	4.16	67 22.994	57 11.982	218.5	225			
2		4.18	67 22.976	57 12.020	219.3	252.3	0.5		
3		4.22	67 22.948	57 12.041	219	218			
4		4.23	67 22.945	57 12.039	219.3	240			
5		4.25	67 22.937	57 12.043	219.3	218.7			
6		4.27	67 22.931	57 12.044	219.3	219.2			
7		4.29	67 22.924	57 12.043	219.3	219.3			
8		4.30	67 22.919	57 12.041	219.3	218.6			
9		4.32	67 22.916	57 12.023	219.3	218.4			
10		4.34	67 22.912	57 12.020	219.3	218.2			

Notes:

Trawl history - M
Doing this station 0.5nm from the intended location because of ice
Very low current: possibility of some issue with mud clouds in the images

Station 32; 17/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KS00312	18.46	67 54.298	57 16.736	287.5	292.4	0.7		south (190 deg)
2		18.50	67 54.248	57 16.740	286.9	286.7			
3		18.52	67 54.225	57 16.748	287.1	286.2			
4		18.54	67 54.205	57 16.759	287.5	288			
5		18.55	67 54.188	57 16.769	287.3	289.5			
6		18.58	67 54.155	57 16.791	287.4	290			
7		18.59	67 54.131	57 16.806	287.2	292			
8		19.01	67 54.104	57 16.819	287.5	292.8	0.8		south
9		19.03	67 54.081	57 16.816	287.1	293			
10		19.04	67 54.058	57 16.815	286.8	292.4			
11		19.06	67 54.030	57 16.807	286.8	293.7			

Notes:

1 green tape mark
Best conditions we have had since we started; flat calm, virtually no current
Can see 4 trawlers, all are trawling with twin trawls
This position is not what I designated to the bridge; not clear why
These coordinates are closer to:
KS00312 V low 0.00 0 5 281m 67 53.4 57 17.5
KS00309 V low 0.00 0 10 275m 67 55.3 57 17.5
Flash not working upon recovery
Camera fixing
Checked everything; diagnosis: there was a loose connection in the battery pack
Visual check of flash, removed and replaced tape and it was good (thank goodness - no spare flash unit)
Download cable is squashed and not connecting properly inside the camera housing
Reviewed position choices for the remainder of the night based on this delay, did all checks as we were underway to new station designation

Station 33; 18/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KT00412	4.49	68 03.375	57 01.127	132.4	134.6			
2		4.51	68 03.347	57 01.188	133.1	132			
3		4.53	68 03.350	57 01.229	134.4	132.8			
4		4.54	68 03.344	57 01.270	133.2	135.7			
5		4.56	68 03.337	57 01.307	133.4	132.4			
6		4.57	68 03.331	57 01.329	133.8	141.8			
7		4.59	68 03.323	57 01.341	134.3	134.7	0.3		
8		5.01	68 03.312	57 01.348	133.8	133.7			
9		5.02	68 03.296	57 01.345	133.1	137			
10		5.04	68 03.270	57 01.340	133.8	133.5			

Notes:

2 green tape marks

Station 34; 18/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	LD00710	18.54	68 45.838	56 29.166	282.4	279.4			
2		18.55	68 45.838	56 29.147	281.4	281			
3		18.56	68 45.839	56 29.130	280.9	281			
4		18.58	68 45.842	56 29.117	280	279	0.3		
5		19.01	68 45.853	56 29.082	282.8				
6		19.03	68 45.857	56 29.068	278.3				
7		19.05	68 45.863	56 29.059	282.2	278.2			
8		19.07	68 45.870	56 29.045	281.1	279.5			
9		19.90	68 45.879	56 29.030	281.4	280.5			
10		19.10	68 45.878	56 29.022	281.2	280			
11		19.12	68 45.885	56 29.012	280	279			

Notes:

Trawl history - H

1 yellow tape mark

moved from 56deg27 (my position) to 56deg29 because of an iceberg occupying 56deg27

2.5nm to next station, plus engine fixing

Station 35; 18/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	LD00711	20.38	68 45.488	56 22.077	266.6	263			
2		20.41	68 45.508	56 22.035	263.5	264.1	0.5		east drift, wind from south
3		20.43	68 45.528	56 22.001	260.5	263			
4		20.46	68 45.548	56 21.977	258.4	260			
5		20.47	68 45.561	56 21.958	260.1	258			
6		20.49	68 45.574	56 21.938	259.4	256			
7		20.50	68 45.588	56 21.922	257.4	259			
8		20.52	68 45.608	56 21.895	257.2	258.6			
9		20.53	68 45.618	56 21.872	256.6	256.9			
10		20.55	68 45.633	56 21.855	255.3	257.4			

Notes:

Trawl history - H

2 yellow marks

Lots of fog, apparently common in June with southerly winds

Station 36; 18/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	LD00712	21.20	68 45.247	56 16.810	246.9	246	0.5		60 deg drift
2		21.21	68 45.258	56 16.781	245.1	244.2			
3		21.23	68 45.278	56 16.759	244.4	243.2			
4		21.25	68 45.289	56 16.754	244.6	243			
5		21.26	68 45.301	56 16.745	242.7	243			
6		21.28	68 45.317	56 16.723	239.4	244			
7		21.29	68 45.330	56 16.728	238	241.2			
8		21.31	68 45.344	56 16.720	238	238.4			
9		21.32	68 45.358	56 16.704	237.9	239.9			
10		21.33	68 45.369	56 16.696	238.6	237.2			

Notes:

Trawl history - H

3 yellow marks

Station 37; 18/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	LB00801	22.02	68 44.148	56 12.455	271.7	279.4	0.6		SE
2		22.03	68 44.161	56 12.462	273	273			
3		22.05	68 44.183	56 12.473	272.2	270.6			
4		22.06	68 44.195	56 12.481	272	269			
5		22.08	68 44.215	56 12.493	272.5	270			
6		22.09	68 44.231	56 12.505	271.5	270			
7		22.10	68 44.246	56 12.512	269.1	271.5			
8		22.12	68 44.261	56 12.523	267.6	271			
9		22.13	68 44.275	56 12.531	267.7	270.9			
10		22.14	68 44.293	56 12.539	266.3	270.5			

Notes:

Trawl history - H

4 yellow marks

fog fog fog

12 nm to next station

Station 38; 18-19/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	LB01002	23.57	68 44.071	55 37.247	198.7	202			
2		23.59	68 44.081	55 37.197	201.5	199			
3		0.00	68 44.092	55 37.164	200	201			
4		0.02	68 44.105	55 37.135	198.7	203.3			
5		0.03	68 44.119	55 37.105	198.4	201	0.6		40 deg drift
6		0.04	68 44.128	55 37.082	197.8	198.4			
7		0.06	68 44.142	55 37.050	198	198			
8		0.07	68 44.153	55 37.020	196.6	197			
9		0.09	68 44.166	55 36.981	195.2	197.5			
10		0.10	68 44.176	55 36.949	196.3	197.6			

Notes:

Trawl history - Z

5 yellow marks

approx 45 min to next station

Station 39; 19/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	LB01103	1.06	68 44.272	55 16.162	269.7	276			
2		1.07	68 44.280	55 16.150	269.7	273.5			
3		1.09	68 44.287	55 16.112	269.7	270.8			
4		1.10	68 44.293	55 16.078	270.4	269.4			
5		1.11	68 44.299	55 16.054	271	267.2			
6		1.13	68 44.306	55 16.030	271.1	267.9			
7		1.16	68 44.325	55 16.998	271.1	266.7	0.4		NE
8		1.17	68 44.333	55 15.982	271.8	267			wire is at angle ~40 deg, odd
9		1.19	68 44.342	55 15.974	271.8	268			
10		1.20	68 44.349	55 15.975	271.8	267.8			

Notes:

Trawl history - Z

30 min to next station

6 yellow marks

Station 40; 19/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	LD01204	2.10	68 49.723	55 12.055	244.2	246	0.6		Northward drift
2		2.12	68 49.744	55 12.041	243.5	246			
3		2.13	68 49.748	55 12.038	241.8	243.6			
4		2.14	68 49.762	55 12.027	244	242.8			
5		2.15	68 49.771	55 12.016	243.8	242.9			
6		2.17	68 49.782	55 12.008	243.5	242			
7		2.18	68 49.796	55 11.998	243.5	242.7			
8		2.20	68 49.810	55 11.984	243.5	243.2			
9		2.21	68 49.829	55 11.970	244.2	243.5			
10		2.23	68 49.844	55 11.958	244.2	244.4			

Notes:

Trawl history - Z

Very calm weather

Still fog but lighter

7 yellow marks

Station 41; 19/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	LD01306	3.40	68 49.557	54 47.420	207.6	208.5			
2		3.42	68 49.570	54 47.410	205.7	208.1			
3		3.43	68 49.585	54 47.403	205.7	207.6			
4		3.45	68 49.599	54 47.391	205.7	205.4			
5		3.46	68 49.613	54 47.381	205.4	203.6	0.6 to 0.7		Northward
6		3.47	68 49.629	54 47.367	205.1	205			
7		3.49	68 49.645	54 47.357	205	204			
8		3.50	68 49.662	54 47.341	204.9	204.3			
9		3.52	68 49.676	54 47.330	205	203.8			
10		3.53	68 49.692	54 47.312	205	203.9			

Notes:

Trawl history - H

8 yellow marks

Station 42; 19/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	LF01310	5.11	69 01.337	54 57.256	209.3	219.6	0.9		Northward
2		5.13	69 01.364	54 57.246	207.4	223.5			
3		5.15	69 01.390	54 57.233	209.9	226.9			
4		5.17	69 01.416	54 57.211	209.2	229			
5		5.19	69 01.441	54 57.189	207.1	228.4			
6		5.20	69 01.466	54 57.197	206	227.2			
7		5.22	69 01.491	54 57.188	207.1	226.7			
8		5.24	69 01.521	54 57.167	206.4	223.4			
9		5.26	69 01.541	54 57.151	205	226.4			
10		5.29	69 01.583	54 57.090	208.8	223			

Notes:

Trawl history - Z

9 yellow marks

This is the morning's first fishing station; took it as an extra camera station because just enough time

Station 43; 19/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KZ00903	19.10	68 29.298	55 46.196	443.6	458.8	0.7		
2		19.13	68 29.315	55 46.144	441.1	456			
3		19.16	68 29.339	55 46.077	437.7	452			
4		19.17	68 29.356	55 46.043	435.6	453			
5		19.21	68 29.395	55 45.953	423.3	451.2			
6		19.23	68 29.406	55 45.920	420.5	448.6			
7		19.27	68 29.443	55 45.828	418.4	443			
8		19.29	68 29.455	55 45.792	417	431			
9		19.31	68 29.469	55 45.761	413.9	428			
10		19.33	68 29.496	55 45.719	412.9	427.3			
11		19.36	68 29.515	55 45.693	412.8	431.2			

Notes:

Blue and green tape mark

Station 44; 19/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KZ00905	20.30	68 27.048	55 51.944	507	505	0.5		50 deg drift
2		20.35	68 27.085	55 51.862	507.3	512			
3		20.38	68 27.102	55 51.813	507.3	516.9			
4		20.41	68 27.118	55 51.780	507.1	505.2			
5		20.42	68 27.130	55 51.755	506	504.6			
6		20.45	68 27.147	55 51.728	505.8	504.8			
7		20.47	68 27.158	55 51.702	504.6	507.8			
8		20.49	68 27.168	55 51.679	504	503.7			
9		20.51	68 27.182	55 51.652	503.9	517.5			
10		20.53	68 27.194	55 51.627	503.5	502			

Notes:

Blue, green, red tape

Station 45; 19/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KX00906	22.05	68 20.075	55 46.925	500.5	515.6			
2		22.08	68 20.095	55 46.897	500.1	515.4			
3		22.11	68 20.111	55 46.858	500.4	520			
4		22.15	68 20.131	55 46.798	499.8	500			
5		22.17	68 20.141	55 46.772	500.1	513	0.4		20 degrees drift direction
6		22.20	68 20.158	55 46.763	499.2	499			
7		22.21	68 20.168	55 46.759	499.6	492			
8		22.22	68 20.173	55 46.756	499.8	491.8			
9		22.24	68 20.182	55 46.753	499.4	491.9			
10		22.25	68 20.189	55 46.737	499.6	491.1			
11		22.27	68 20.197	55 46.715	499.7	491.4			

Notes:

*Blue, green, red black tape***Station 46; 20/06/2011**

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KV01201	0.04	68 14.771	55 13.109	298.1	294			
2		0.06	68 14.792	55 13.104	303.5	297.5			
3		0.07	68 14.808	55 13.094	305.1	300.2			
4		0.10	68 14.836	55 13.077	307.8	304.8	0.7		15 deg drift direction
5		0.12	68 14.857	55 13.058	309.6	307.9			
6		0.14	68 14.880	55 13.027	311.4	311.8			
7		0.15	68 14.898	55 13.001	310.6	313.4			
8		0.17	68 14.922	55 12.967	310.7	314.4			
9		0.19	68 14.943	55 12.939	314	314.7			
10		0.23	68 14.976	55 12.891	320.9	316.4			

Notes:

*Blue, green, red, black, yellow tape**12-15 min to next station***Station 47; 20/06/2011**

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KV01202	0.51	68 14.614	55 08.024	273.3	276.3			
2		0.52	68 14.601	55 07.996	270.9	276.1			
3		0.54	68 14.580	55 07.992	267.8	272.7	0.7		northward drift
4		0.57	68 14.569	55 08.044	265.2	271.8			
5		0.59	68 14.589	55 08.061	269	266.8			
6		1.01	68 14.622	55 08.044	275.4	269.7			
7		1.03	68 14.647	55 08.059	280.7	274.5			
8		1.06	68 14.683	55 08.080	286.4	283.7			
9		1.08	68 14.703	55 08.077	288.1	285			
10		1.11	68 14.729	55 08.061	288.5	287.2			

Notes:

*Blue, green, red, black, yellow, blue tape**25-30 min to next station***Station 48; 20/06/2011**

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	KV01209	2.06	68 10.482	55 01.899	61.4	63			
2		2.06	68 10.493	55 01.886	61.3	63			
3		2.08	68 10.526	55 01.844	61.1	65			
4		2.11	68 10.583	55 01.805	61	63.2			
5		2.12	68 10.592	55 01.782	60.7	63.7			
6		2.14	68 10.623	55 01.753	62.1	64.1	1.1 to 1.2		northward drift
7		2.16	68 10.661	55 01.715	62.1	63.6			
8		2.19	68 10.704	55 0.676	61.2	63.8			
9		2.21	68 10.738	55 01.638	62.1	63.2			
10		2.23	68 10.771	55 01.612	62.1	61.9			

Notes:

*Blue, green, red, black, yellow, blue, green**This position in the logbook data is 270m: in reality it is 60m**Not a fishing area (which fits with the logbook data (average trawling zero))**This is the last position I can target before we have to sail to the hydrography station so we will take it**Rumour that there are walrus here when there is ice, so possibly scallops in images**1 hour 10 min to next station*

Station 49; 20/06/2011

Image	Fix Pos	Time	Latitude (N)	Longitude (W)	Depth (m)	Wire out	GPS (kn)	Log (kn)	Note
1	EGM2	3.48	68 02.091	55 26.618	67.9	71.7			
2		3.50	68 02.102	55 26.581	67.6	71.8			
3		3.51	68 02.114	55 26.542	66.9	71.1			
4		3.52	68 02.123	55 26.520	67.6	70.2			
5		3.53	68 02.134	55 26.497	67.7	70.1			
6		3.54	68 02.147	55 26.470	67.6	69.4			
7		3.55	68 02.160	55 26.447	67.6	69.5			
8		3.57	68 02.174	55 26.421	67.6	69.4			
9		3.58	68 02.192	55 26.393	67.6	69.5			
10		4.00	68 02.210	55 26.371	67.6	69.5			

Notes:
This is a fishing station - took this station as a photography station because we *just* had time; fishing to start at 4.00
Closest FixPos cell is KT01110 - no logbook data for this position

5. Data summary**5.1 Spread and balance of collected image data**

Table 4 is a summary of the trawl history categorization and depth of each survey station undertaken. Table 5 shows the spread of trawl history categories targeted within designated 100m depth ranges (150-250m, 250-350m, 350-450m, 450+m). The spread of data acquired is reasonable and amenable to statistical analysis.

Table 4. Station trawl history categorisations and depths

Station	Date	Fix Pos code	Latitude (N)	Longitude (W)	Depth (m)	Category	TRAWL HISTORY Annual distance trawled (nm) averaged over 5yr periods				PR
							1996-2000	2001-2005	2006-2010	SUM	
1	12/06/2011	JE01812	64 08.093	53 32.149	293.4	M	69	56	16	141	
2	12/06/2011	JH01209	64 30.016	54 67.302	321.0	M-L	14	1	0	15	PR
3	12-13/06/2011	JH01205	64 33.073	55 02.457	348.0	L	1	0	0	1	
4	13/06/2011	JH01310	64 34.858	55 07.351	402.0	M	66	1	0	67	PR
5	13/06/2011	JS01102	65 32.816	55 22.208	529.8	H	239	153	17	409	
6	13/06/2011	JS01105	65 34.653	55 22.489	458.0	M	45	8	0	53	PR
7	13/06/2011	JS01108	65 36.423	55 22.309	352.9	L	7	2	0	9	
8	14/06/2011	JS01106	65 34.689	55 18.090	314.4	H	216	225	28	469	
9	14/06/2011	JS01109	65 32.687	55 16.874	428.0	H-M	136	45	3	184	
10	14/06/2011	JS01210	65 30.736	55 12.192	392.9	H	236	159	16	411	
11	14/06/2011	JS01211	65 30.547	55 07.980	158.2	M	12	73	19	104	
12	14/06/2011	JS01212	65 30.606	55 02.808	154.2	L-M	0	1	17	18	
13	14/06/2011	KA00810	66 08.300	56 12.410	188.9	L-M	0	13	0	13	(PR)
14	14/06/2011	KB00907	66 17.747	55 56.498	171.2	Z	0	0	0	0	
15	14/06/2011	KA01002	66 14.079	55 37.822	207.6	M	1	32	11	44	
16	15/06/2011	KA01107	66 10.450	55 27.153	227.7	M-H	0	76	58	134	
17	15/06/2011	KA01104	66 12.430	55 26.809	203.9	M-H	0	70	36	106	
18	15/06/2011	KB01106	66 19.070	55 17.020	196.9	M	4	22	20	46	
19	15/06/2011	KB01104	66 19.781	55 27.292	197.7	M	1	26	9	36	
20	15/06/2011	KF01707	66 41.098	54 05.904	219.8	M-H	9	17	128	154	
21*	16/06/2011	HBG3 - hydro	66 46.075	55 35.785	115.7	Z	0	0	0	0	
22*	16/06/2011	HBG4 - hydro	66 43.179	56 06.409	164.8	Z	0	0	0	0	
23	16/06/2011	KL00503	67°21.6'	56°47.5'	211.0	HM	0	35	91	126	
24	16/06/2011	KL00506	67°19.7'	56°47.5'	220.0	HM	0	40	133	173	
25	16/06/2011	KL00509	67°17.8'	56°47.5'	227.0	H	1	105	154	260	
26	16/06/2011	KL00512	67°15.9'	56°47.5'	235.7	H	7	186	140	333	
27	16/06/2011	KL00505	67°19.7'	56°52.5'	226.2	H	0	81	148	229	
28	17/06/2011	KL00508	67°17.8'	56°52.5'	231.4	H	2	119	140	261	
29	17/06/2011	KL00511	67°15.9'	56°52.5'	234.8	H	12	195	110	317	
30	17/06/2011	KL00507	67°17.8'	56°57.5'	234.5	H	3	131	126	260	
31	17/06/2011	KM00410	67°23.4'	57°12.5'	220.6	HM	0	24	77	101	
32	17/06/2011	KS00312	67°53.4'	57°17.5'	287.5	L	0	0	5	5	
33	18/06/2011	KT00412	68°00.9'	57°02.5'	133.1	LM	0	6	15	21	
34	18/06/2011	LD00710	68°45.9'	56°27.5'	282.8	H	0	0	224	224	
35	18/06/2011	LD00711	68°45.9'	56°22.5'	264.9	H	0	0	279	279	
36	18/06/2011	LD00712	68°45.9'	56°17.5'	244.9	H	0	0	209	209	
37	18/06/2011	LB00801	68°44.1'	56°12.5'	279.4	H	0	0	237	237	
38	18-19/06/2011	LB01002	68°44.1'	55°37.5'	197.0	Z	0	0	0	0	
39	19/06/2011	LB01103	68°44.1'	55°17.5'	269.0	Z	0	0	0	0	
40	19/06/2011	LD01204	68°49.7'	55°12.5'	243.5	Z	0	0	0	0	
41	19/06/2011	LD01306	68°49.7'	54°47.5'	209.0	H	5	93	123	221	
42	19/06/2011	LF01310	69°00.9'	54°57.5'	211.0	Z	0	0	0	0	
43	19/06/2011	KZ00903	68°29.1'	55°47.5'	450.8	Z	0	0	0	0	
44	19/06/2011	KZ00905	68°27.2'	55°52.5'	507.4	Z	0	0	0	0	
45	19/06/2011	KZ00906	68°27.2'	55°47.5'	501.1	Z	0	0	0	0	
46	20/06/2011	KV01201	68°14.1'	55°12.5'	289.9	H	86	226	232	544	
47	20/06/2011	KV01202	68°14.1'	55°07.5'	271.2	H	75	233	224	532	
48	20/06/2011	KV01209	68°10.3'	55°02.5'	59.3	Z	0	0	0	0	
49*	20/06/2011	EGM2			69.3						

21* HBG3 - hydrographic station; closest fix pos is 66 46N, 55.37W

Z 0 0 0 0

22* HBG4 - hydrographic station; closest fix pos is 66 42N, 56 37W

Z 0 0 0 0

49* EGM2 (CLOSEST FIXPOS) KT01110 - no logbook data

Table 5. Trawl history categories within designated 100m depth ranges. Station 49 (EGM2) is not included as there is no logbook data associated with this position.

DEPTH CATEGORY			TRAWL HISTORY CATEGORISATION					PRIORITY
150-250m	Fix Pos code	Depth (m)	Z	L	LM	HM	H	TARGETS
	HBG3 - hydrographi	115.7	0					low (less than 15) PR sites
	HBG4 - hydrographi	164.8	0					
	LF01310	215	0					
	KB00907	171.2	0					
	KA00810	188.9		13				
	JS01212	154.2			18			
	KB01104	197.7			36			
	KA01002	207.6			44			
	KB01106	196.9			46			
	JS01211	158.2				104		
	KA01104	203.9				106		
	LKL00503	212				126		
	KA01107	227.7				134		
	KF01707	219.8				154		
	KL00506	218				173		
	KM00410	224				101		
	KL00505	222					229	
	KL00509	223					260	
	KL00507	233					260	
	KL00508	229					261	
	KL00511	238					317	
	KL00512	232					333	

DEPTH CATEGORY			TRAWL HISTORY CATEGORISATION					PRIORITY
250-350m	Fix Pos code	Depth (m)	Z	L	LM	HM	H	TARGETS
	LB01103	240	0					low (less than 15) Medium (15-200) PR sites
	LD01204	252	0					
	LB01002	255	0					
	KV01209	273	0					
	KZ00903	400	0					
	KZ00905	483	0					
	KZ00906	512	0					
	JH01205	348		1				
	JS01108	352.9		9				
	KS00312	281		5				
	JH01209	*321			15			
	KT00412	270			21			
	JE01812	293.4				141		
	JS01106	314.4					469	
	LD00711	262					279	
	LB00801	265					237	
	LD01306	266					221	
	LD00710	273					224	
	KV01202	236					532	
	KV01201	241					544	
	LD00712	248					209	

DEPTH CATEGORY			TRAWL HISTORY CATEGORISATION					PRIORITY
350-450m	Fix Pos code	Depth (m)	Z	L	LM	HM	H	TARGETS
	JS01105	*458			53			Zeros
	JH01310	*402			67			low (less than 15)
	JS01109	428				184		high (above 200)
	JS01210	392.9					411	PR sites

DEPTH CATEGORY			TRAWL HISTORY CATEGORISATION					PRIORITY
450m+	Fix Pos code	Depth (m)	Z	L	LM	HM	H	TARGETS
	JS01102	529.8					409	anything

5.2 Image quality and success ratio

Image quality was much better than expected from a camera-drop system operating at these depths. Images were consistently clear and the trigger mechanism reliable. Examples of some of the substrates photographed are shown in Figure 3.

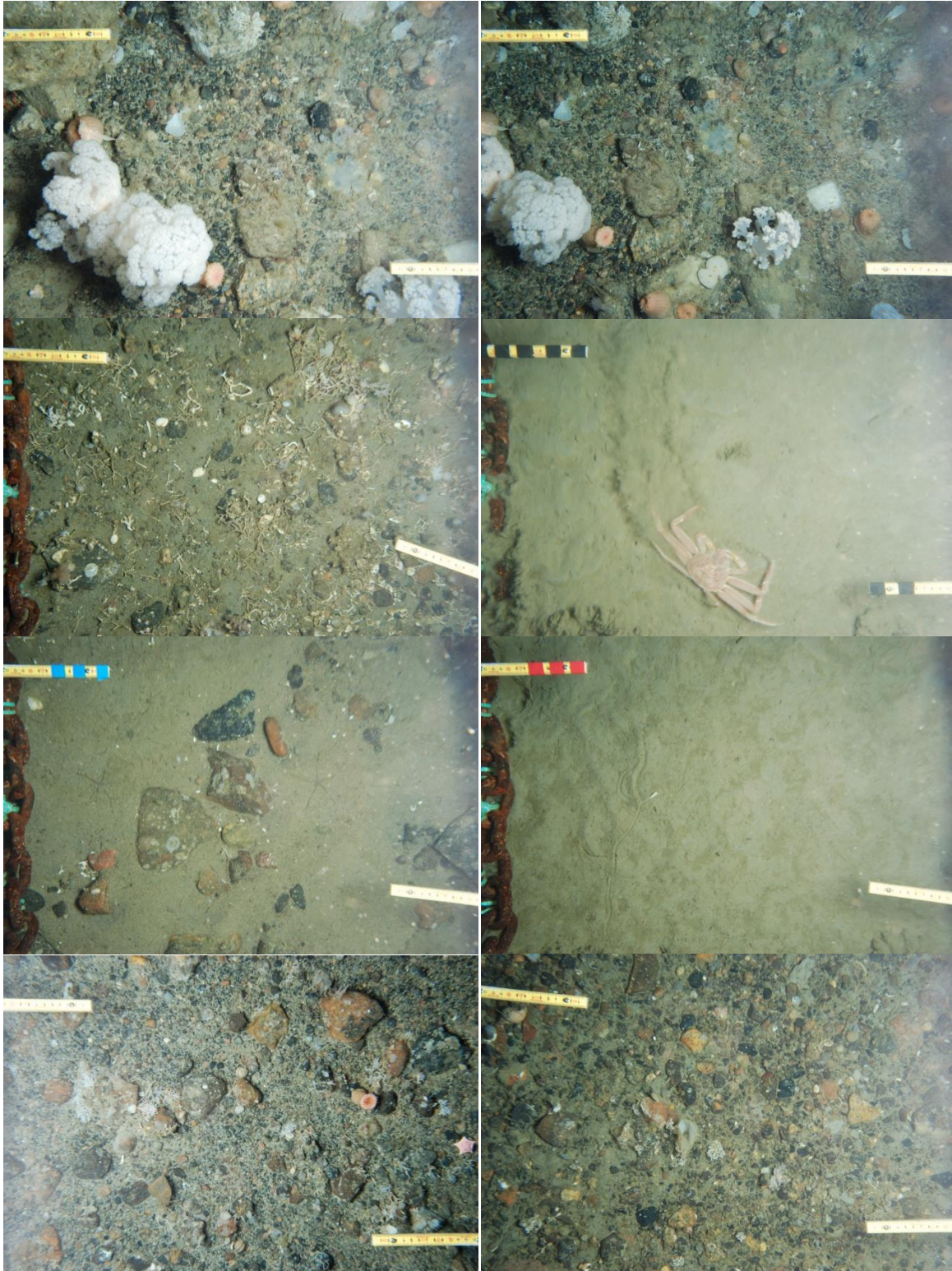


Figure 3. A variety of substrates encountered during surveying.

Image success rate was very high. 506 images were attempted. Because the camera takes an image each time the trigger brushes the seafloor, extra images were also unintentionally collected at most stations, particularly when the current was strong. The total number of seabottom images collected was 584. Of these 464 were of good quality. This is a success ratio (successful images over intentionally taken images) of 91%. Images were collected successfully at all stations except 44, 45 and 46. At these three stations images were taken, and the framework and calibration bar of the apparatus are in focus, but where seafloor should be there is only blackness (Figure 4). A satisfactory explanation for this has yet to be developed. It appears that the camera was somehow being triggered while still above bottom, though why this would happen remains a slightly intriguing mystery at present. Images at stations directly before and after these were normal.

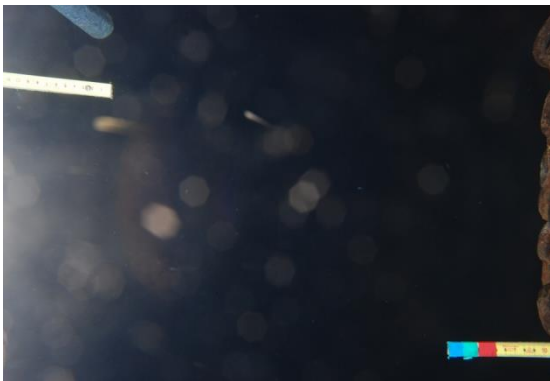


Figure 4. All images taken at stations 44, 45 and 46 were in focus (note the scale bars, eight and chain), but with no apparent seafloor in the frame. These were the deepest stations attempted, but the reasons for this remain unclear at present.

5.3 Recommendations for camera alterations

Some changes were made and other potential improvements noted during the use of the camera system. The camera system was subject to horizontal drag when deployed in high current conditions. This had the effect of incrementally increasing the length of wire that needed to be deployed for successive images, and also of reducing the likelihood that the camera would touch bottom in a vertical orientation. These issues were largely overcome by adding weight to the apparatus in the form of chains fixed to the bottom (details in Table 3, Stations 4 and 5).

The flash shade protrudes from the camera framework and is vulnerable to damage. A bar above or over the shade to protect it is recommended. It is also recommended that the flash shade be made more hydrodynamic by the addition of a round shield or enlargement of the holes in the top face of the shade. At present it works much like a parachute during deployment, catching water and slowing and altering the descent path of the apparatus.

Internal connections within the camera housing can work themselves loose. A clip could be fitted to hold the internal connection (between battery and unit) in place.

The camera system works extremely well and we are very grateful to the Climate Research Centre, Greenland Institute of Natural Resources for the use of it.

5.4 Weather and field conditions

Weather conditions were exceptionally good for most of the survey. Heavy ice flowing south later in the year than normal restricted the westward extend of some of the survey but did not effect camera operations in any notable way. Two stations (Station 31 and 34) were shifted slightly due to ice. The *M/T Paamiut* is a very suitable vessel for undertaking this type of work.

6. Summary

In terms of what was intended to be achieved, this was a highly successful undertaking. Though choice of survey stations was limited to within a reasonable range around pre-determined shrimp survey sites, and thus was not fully flexible, this did not impose any real limitation to data collection for this first camera survey as images from virtually any targetable site are useful at this stage and a good range was achieved. The limitations to these data will be in what can be inferred, in ecological terms, from what ultimately remains a small dataset (464 images from 49 locations). This will only become clear as the images are fully analysed.

Acknowledgements

I would like to fully acknowledge and gratefully thank the Greenland Institute of Natural Resources for the night-time use of the M/T Paamiut, and for accommodation onboard, and the ship's company and crew of the M/T Paamiut, for welcoming me into a warm and efficient working environment. In particular I would like to thank Jakup Mikkelsen and Jørgen Petersen who undertook the camera survey work with me, with enthusiasm and many helpful suggestions. Sincere thanks also to the Climate Research Centre at the Greenland Institute of Natural Resources for the use of the camera equipment, to Martin Bilcher for instruction in its use, and to Nanette Hammeken of the Greenland Institute of Natural Resources for excellent and efficient cruise planning and leadership.