

CRUISE REPORT: IRISH SEA AND BELFAST LOUGH

3rd July – 11th July 2008

RV Prince Madog Cruise

Iain Ridgway

School of Ocean Sciences, Bangor University

ABSTRACT

This report details a scientific research cruise undertaken in the Northern Irish Sea in July 2008. The principle aims of the cruise were to: 1) collect *Arctica islandica* from a location near to the Sellafield outflow; 2) collect 300 live *A. islandica* from Belfast Lough which cover a range of size classes; 3) quantitatively study the distribution and abundance of the *A. islandica* population in Belfast Lough and 4) collect *A. islandica* shells from the Isle of Man area. The Belfast Lough population is to be used in a Research into Ageing project, while the shells collected from the Isle of Man are to be used for a sclerochronology of the Irish Sea.

All *A. islandica* were obtained with a custom made ‘Arctica dredge’ and quantitative sampling was undertaken using a Day Grab.

In total 12 stations were identified for the collection of *A. islandica*. These included 2 sites off Sellafield, 7 sites comprising a depth transect from the mouth to the inner Belfast Lough, and 4 sites between the Mull of Galloway and the NW Isle of Man. The numbers of live (undamaged and damaged) and dead *A. islandica* obtained from each tow and each station are provided in the report.

PERSONNEL

All the scientific crew involved were from the School of Ocean Sciences, Bangor University.

1. Dr Iain Ridgway (PSO)
2. Dr Alan Wanamaker
3. Dr Jim Bennell
4. Paul Butler
5. Will Brocas

SCHEDULE

- 8th July:** Cruise begins at Barrow, SOS staff embark
15:30 Depart Barrow
18:45 Arrive Station U (Off Sellafield)
18:45-19:10 Deployment of sidescan sonar
19:10 – 20:05 Sampling at Station U, 3 Arctica dredges.
Overnight transit to Station C, Belfast Lough.
- 9th July:** 07:00 Arrive at Station C2, Belfast Lough.
07:48 – 08:03 Deployment of sidescan sonar
08:07 – 10:55 Sampling station C2, 9 Arctica dredges.
11:08 Deployment of CTD
11:34 – 11:50 Sampling at Station C2, 9 Day grabs.
Transit to Station C1
12:33 – 12:45 Deployment of sidescan sonar
12:57 – 13:09 Sampling station C1, 1 Arctica dredge
Transit to Station C4
13:37 – 13:51 Deployment of sidescan sonar
13:56 – 14:00 Sampling station C4, 1 Arctica dredge
Transit to Station C3
14:16 – 14:28 Deployment of sidescan sonar
14:36 – 14:49 Sampling station C3, 1 Arctica dredge
Transit to Station C6
15:10 – 15:21 Deployment of sidescan sonar
15:30 – 15:35 Sampling station C6, 1 Arctica dredge
Transit to Station C5
16:05 – 16:16 Deployment of sidescan sonar
16:22 – 16:32 Sampling station C5, 1 Arctica dredge
Transit to Bangor Marina, Northern Ireland
18:00 Catch inspected by Fish Health Inspector and health certificate obtained.
- 10th July:** Transit to Station C7
08:13 – 08:25 Deployment of sidescan sonar
08:32 – 16:42 Sampling station C7, 1 Arctica dredge
Transit to Station V1, Mull of Galloway
12:09 – 12:16 Deployment of sidescan sonar
Transit to Station V2
12:59 – 13:09 Deployment of sidescan sonar

10th July (Cont.) 13:18 – 14:03 Sampling station V2, 2 *Arctica* dredges
Transit to Station D12
14:48 – 15:01 Deployment of sidescan sonar
15:15 – 15:28 Sampling station D12, 1 *Arctica* dredge
Transit to Station D11
16:02 – 16:09 Deployment of sidescan sonar
15:15 – 20:41 Sampling station D11, 9 *Arctica* dredges
Transit to Station D7
22:24 Deployment of CTD
Overnight transit to Menai Bridge

11th July: 08:30 Arrive at Menai Bridge and demobilize

OBJECTIVES:

The cruise had 4 distinct objectives, which were to:

1. Obtain live and dead *Arctica islandica* (L.) with the *Arctica* dredge from the vicinity of the Sellafield outflow pipe (Station U);
2. Collect 300 live *A. islandica* (L.) with the *Arctica* dredge covering a range of sizes/ages from the mouth of Belfast Lough (Station C) for later use in an ageing research project;
3. Quantitatively sample the *A. islandica* populations at location C using a day grab;
4. Collect *Arctica* shells at Station D-11 off the NW coast of the Isle of Man using the *Arctica* dredge.

STATIONS

The dredge was deployed at 3 stations identified in the original cruise plan; stations U, C and D11. A further 3 stations (V1, V2 and D12) were sampled between the Isle of Man and the Mull of Galloway. At station D7 only CTD measurements were undertaken. At all stations a sidescan sonar survey was undertaken prior to dredging to minimise the possibility of damaging the dredges.

Station	Location	Latitude		Longitude		No. of <i>A. islandica</i> collected					
						Live undamaged	Live damaged	Dead (single)	Dead paired		
U	Sellafield	54°	24.3	N	3°	34.3	W	-	-	-	-
C	Belfast Lough	54°	42.10	N	5°	35.25	W	326	235	402	39
V1	North of IOM	54°	36.50	N	4°	53.32	W	-	-	-	-
V2	North of IOM	54°	31.69	N	4°	47.86	W	-	-	-	-
D7	West of IOM	54°	8.30	N	4°	54.00	W	-	-	-	-
D11	West of IOM	54°	24	N	4°	50	W	40	-	148	-
D12	West of IOM	54°	24	N	4°	50	W	-	-	-	-

Table 1: Station positions and number of specimens collected from each location.

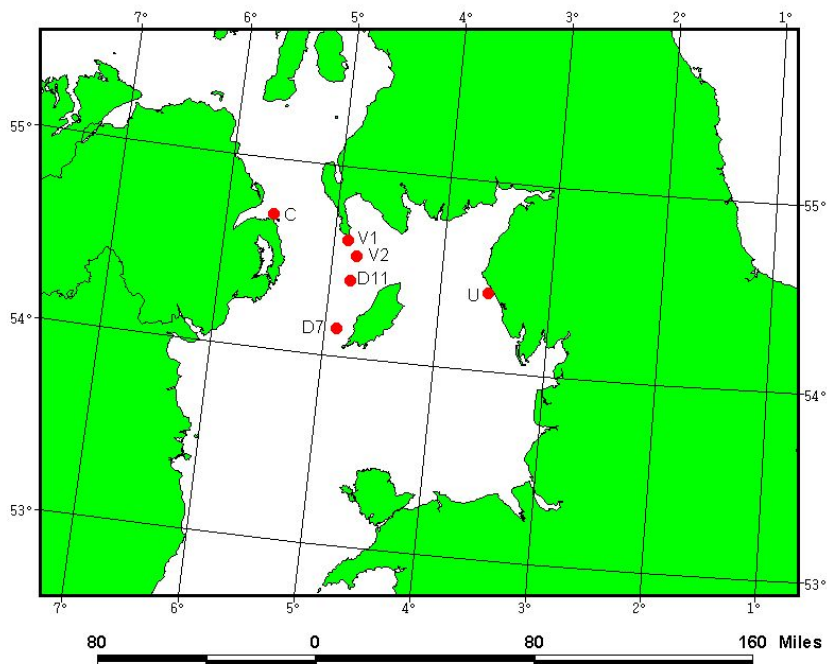


Figure 1: Chart of the Northern Irish Sea area showing the position of the stations visited during the cruise.

The coordinates, depth, duration of each of the tows and the number and state of *A. islandica* collected is provided in Appendix A and B at the end of the document.

STATION U

The general position of station U was identified from references in the scientific literature and personal communication with staff at SOS. The literature contains descriptions of locations that *A. islandica* were obtained but unfortunately no GPS coordinates were provided. 2 locations were identified using descriptions provided in the literature combined with study of the admiralty charts. According to the admiralty charts the ground identified was ~ 20-25m deep consisting of fine sand or mud or mud, fine sand and broken shells. In 3 tows no shells were obtained at station U, it was concluded that the sediment type was unsuitable for *A. islandica*, consisting of mud, no sand, and few shells.

Figure 2 illustrates the 2 separate locations and 3 tows undertaken at Station U.

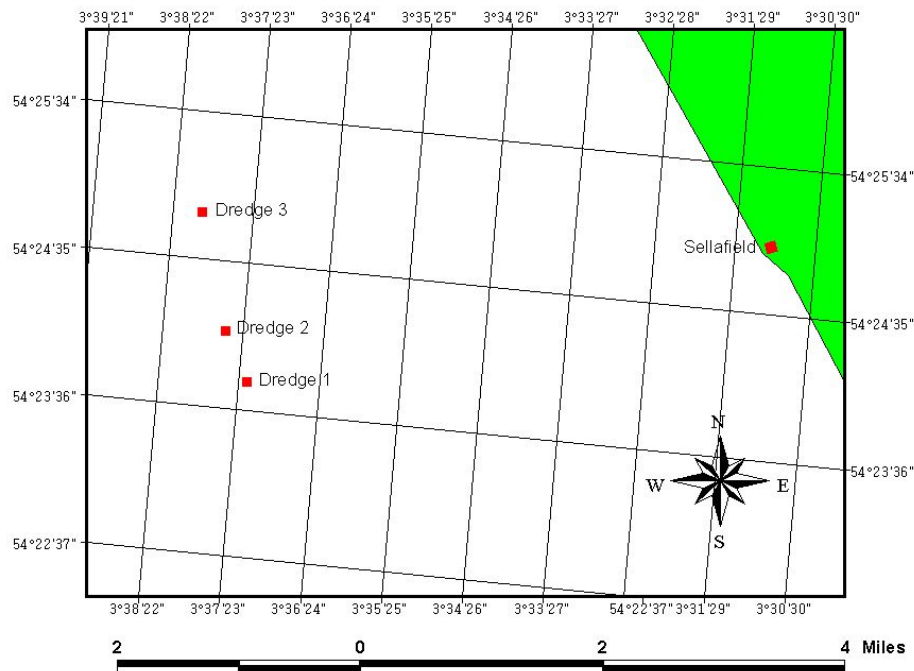


Figure 2: *Arctica* dredge tows at station U.

STATION C

The position of Station C was initially identified during Northern Ireland Scallop surveys and a visit by the Madog in 2005 collected 147 live *A. islandica* in 6 tows of the *Arctica dredge*. The site was of specific interest due to the high population density and a large size range previously obtained.

At station C there were 2 objectives; first to collect 300 live specimens and secondly to quantitatively assess the population density and distribution. The first objective was achieved with 9 x 10 minute *Arctica* dredge tows. To achieve the second objective 7 sub-stations surrounding station C were identified and a sampling strategy was fashioned. This was to firstly dredge the site for the presence of *A. islandica* and if present undertake 8 Day grabs as the research vessel drifted to provide a randomised transect.

Despite the high numbers of live *A. islandica* obtained in the dredges no live animals were collected during the grab sampling.

The location of all the substations (Cg1-Cg7) are provided in Figure 3. The initial live *A. islandica* collection was undertaken at Cg2. The other 6 stations were identified to cover a range of geographical locations with different depths and positions within the Lough. Figure 4 provides the location of the 9 dredge tows undertaken at Cg2.

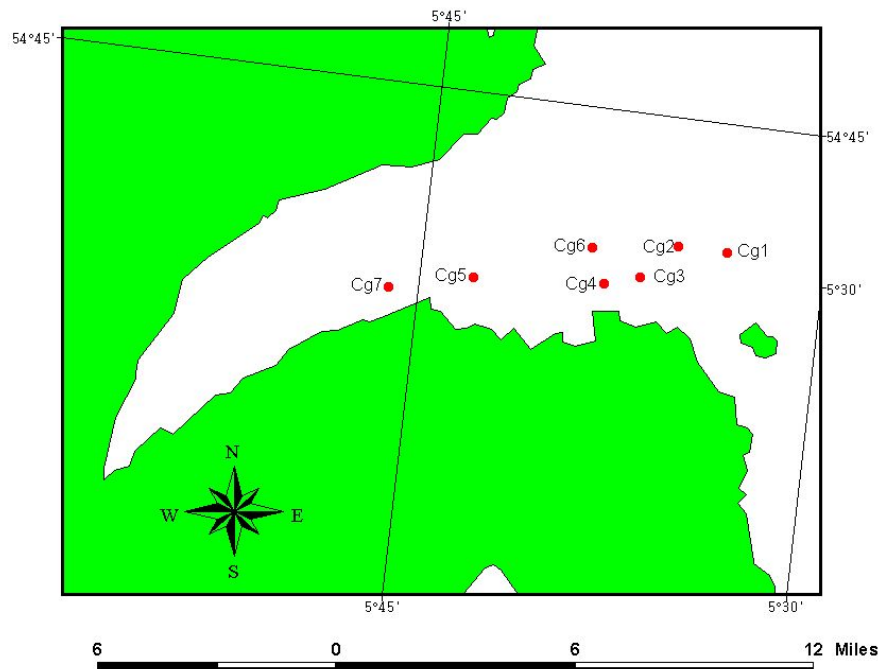


Figure 3: Location of the 7 sub-stations within Belfast Lough.

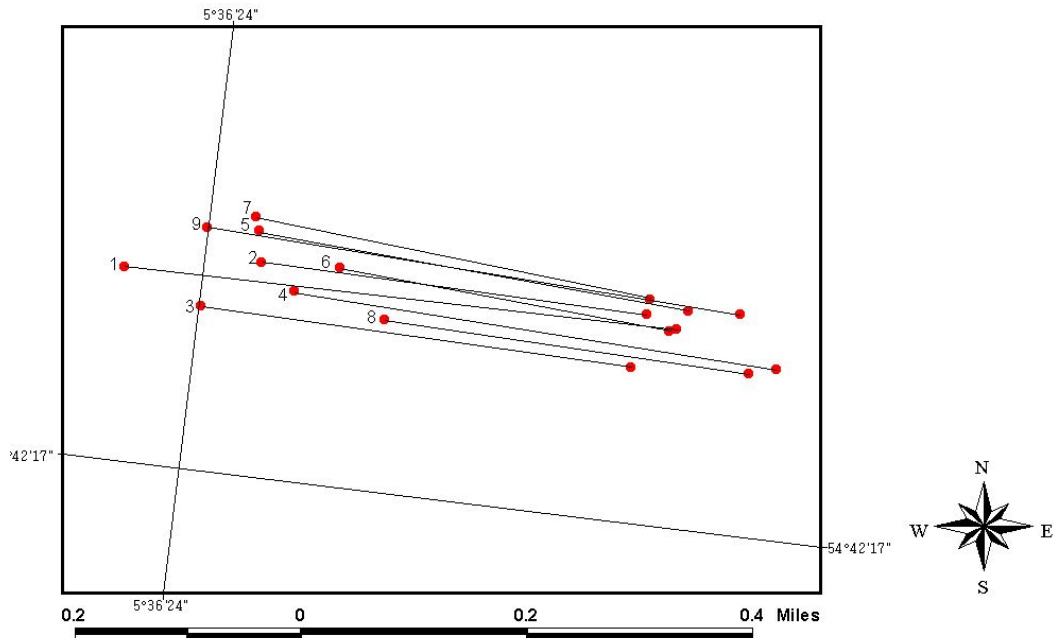


Figure 4: Location of the 9 dredge tows at sub-station Cg2.

The quantitative assessment of the *A. islandica* populations at the 6 other sub-stations throughout station C demonstrated that the population appeared to be restricted to that one location, Cg2, initially identified. At the other locations no other live animals were obtained. Considerable fossil shell lags were obtained during the tows at Cg3 and Cg6, however the substrate type (rocks) and apparent age of the shells suggested no live specimens existed in the area.

The coordinates, depth, duration of each of the tows and the number and state of *A. islandica* collected is provided in Appendix A and B at the end of the document.

Station C: Size structure of the population

In total 328 live *A. islandica* were returned to the School of Ocean Sciences, with a mean maximum height of 80.82mm (min: 34mm; max: 102mm; St Dev: 9.20) (see Fig. 5 and Table 2).

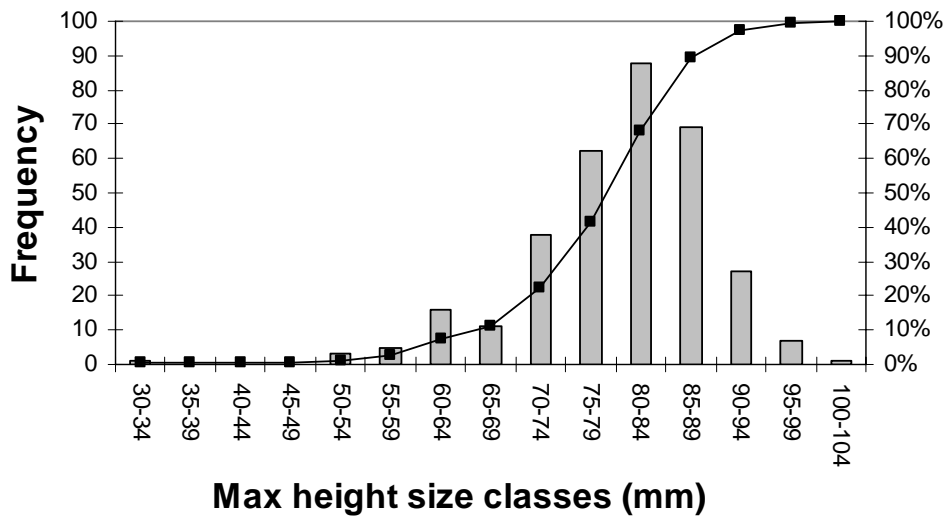


Figure 5: Cumulative histogram illustrating the size (maximum height) distribution of the live caught *A. islandica* from Belfast Lough, station C.

Age Classes (mm)	Frequency
30-34	1
35-39	0
40-44	0
45-49	0
50-54	3
55-59	5
60-64	16
65-69	11
70-74	38
75-79	62
80-84	88
85-89	69
90-94	27
95-99	7
100-104	1

Table 2: Size class distribution of *A. islandica* caught live in Belfast Lough and returned to School of Ocean Sciences.

STATION V

The 2 northern sub-stations at V were chosen with the aim of creating a continual line of *Arctica* populations linking the Isle of Man with Scotland. The locations were selected after study of the relevant admiralty charts. A sidescan sonar study of V1 suggested the location was unsuitable to use the *Arctica* dredge. V2 was a suitable location for the *Arctica* dredge, during 2 dredges (see Figure 6) no *A. islandica* shells were obtained, however some *Glycimeris* shells were collected from the coarse sand gravel substrate.

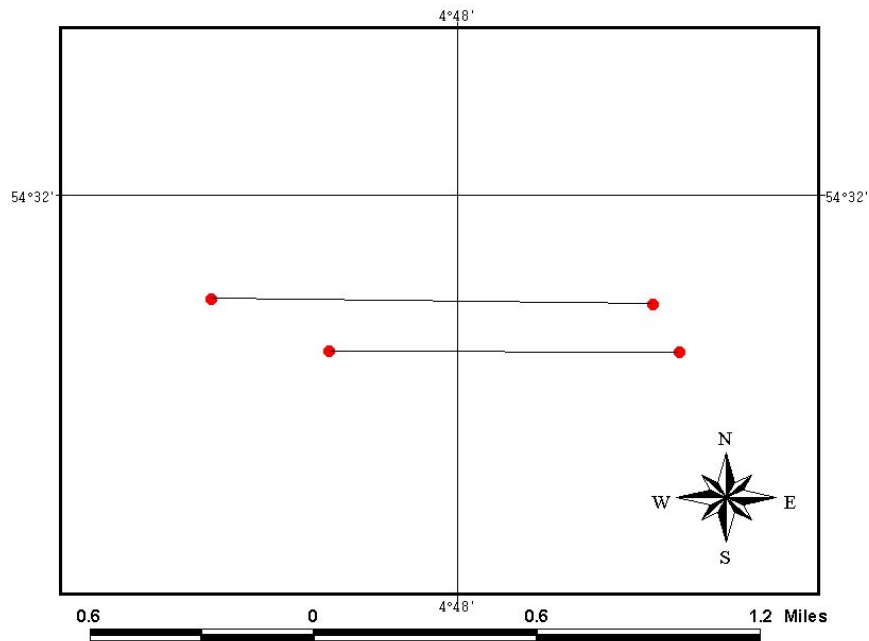


Figure 6: Location of the 2 dredge tows at sub-station V2.

STATION D12

One *Arctica* dredge tow was undertaken at station D12, again no *A. islandica* were collected, however many other shells were landed including live (covering a range of size classes) and dead glycimeris, but the majority of the catch was horse mussel shells.

STATION D11

Site D11 is the northward continuation of a transect of sites at which *A. islandica* has been found off the west coast of the Isle of Man. Cruise 23/05 (June 2005) found 20 live specimens at D7 and 1 at D3. Cruise 30/06 (September 2006) found 6 at D7.

On the hypothesis that *A. islandica* populations might exist around the eastern edge of the western Irish Sea gyre at depth contours between 40m and 60m, cruise 04/07 (end of April 2007) sampled 3 stations and found 10 at D7, 11 at D2 and 11 at D8.

In total 9 *Arctica* dredge tows were undertaken at D11 obtaining 40 live *A. islandica* and 148 dead shells. The location of each individual tow is provided in Figure 7.

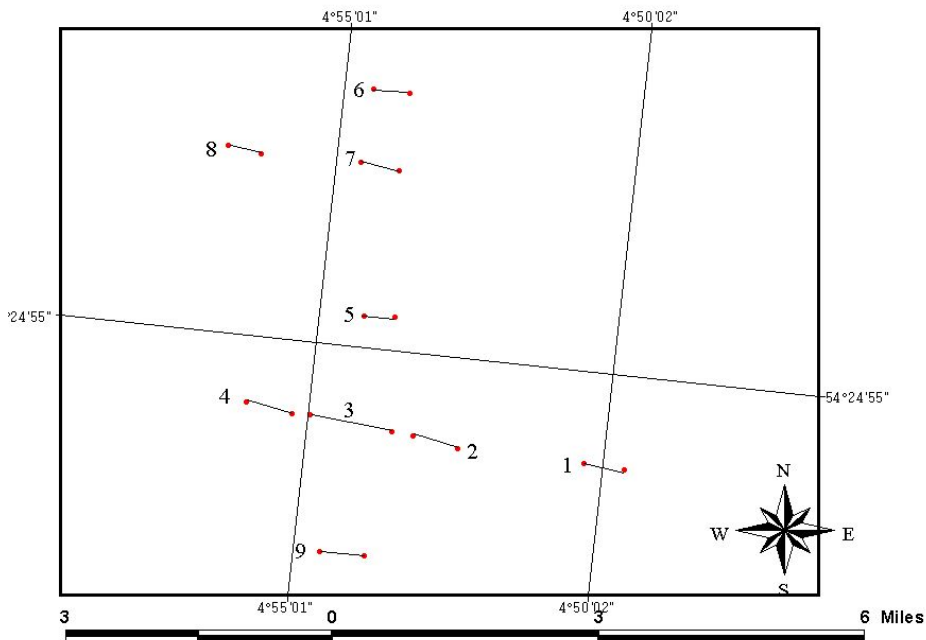


Figure 7: The locations of the 9 tows undertaken at station D11.

STATION D7

At station D7 no *Arctica* collection was undertaken, the objective of visiting this station was to obtain a CTD profile.

Appendix A – Position time and Depth of tows and grabs

Two rows are shown for each tow, representing the start and finish of dredging or trawling, from the end of the deployment process to the start of the recovery process.

Insert coordinates and info

Station U

Date	Tow #	Time	Depth (m)	54	Latitude		Longitude	
08/07/2008	1	19:09	26	54	24.162 N	3	37.584	W
08/07/2008	1	19:19	26	54	23.856 N	3	37.304	W
08/07/2008	2	19:22	26	54	23.813 N	3	37.271	W
08/07/2008	2	19:32	26	54	23.472 N	3	36.947	W
08/07/2008	3	19:55	26	54	24.988 N	3	38.003	W
08/07/2008	3	20:05	26	54	25.385 N	3	38.278	W

Station C: Live collection

Date	Tow #	Time	Depth (m)	54	Latitude		Longitude	
09/07/2008	1	08:07	22.3	54	42.491 N	5	36.487	W
09/07/2008	1	08:17	22.3	54	42.495 N	5	35.753	W
09/07/2008	2	08:33	22.3	54	42.503 N	5	35.795	W
09/07/2008	2	08:43	22.3	54	42.507 N	5	36.308	W
09/07/2008	3	08:52	22.3	54	42.468 N	5	36.380	W
09/07/2008	3	09:02	22.3	54	42.462 N	5	35.807	W
09/07/2008	4	09:11	24	54	42.468 N	5	35.651	W
09/07/2008	4	09:21	24	54	42.488 N	5	36.260	W
09/07/2008	5	09:33	22	54	42.531 N	5	36.316	W
09/07/2008	5	09:43	22	54	42.510 N	5	35.740	W
09/07/2008	6	09:53	22	54	42.493 N	5	35.762	W
09/07/2008	6	10:03	22	54	42.510 N	5	36.204	W
09/07/2008	7	10:12	22	54	42.541 N	5	36.323	W
09/07/2008	7	10:22	22	54	42.515 N	5	35.793	W
09/07/2008	8	10:28	22	54	42.474 N	5	35.616	W
09/07/2008	8	10:38	22	54	42.475 N	5	36.138	W
09/07/2008	9	10:45	22	54	42.528 N	5	36.385	W
09/07/2008	9	10:55	22	54	42.512 N	5	35.672	W

Station C: CTD measurements

Date	CTD #	Time	Depth (m)	54	Latitude		Longitude	
09/07/2008	1	11:08	22.6	54	42.542 N	5	36.111	W

Station C: 8 Grab Transect at sub-station Cg2

Date	Grab #	Time	Depth (m)	Latitude	Longitude
09/07/2008	1	11:34	22.6	54 42.574 N 5	35.970 W
09/07/2008	2	11:36	22.6	54 42.578 N 5	35.924 W
09/07/2008	3	11:39	22.6	54 42.588 N 5	35.890 W
09/07/2008	4	11:41	22.6	54 42.537 N 5	35.865 W
09/07/2008	5	11:43	22.6	54 42.513 N 5	35.847 W
09/07/2008	6	11:46	22.6	54 42.481 N 5	35.826 W
09/07/2008	7	11:47	22.6	54 42.462 N 5	35.816 W
09/07/2008	8	11:49	22.6	54 42.439 N 5	35.805 W
09/07/2008	9	11:50	22.6	54 42.423 N 5	35.790 W

Station C: Tows for the quantitative assessment of *A. islandica* population distribution and density

Date	Tow #	Time	Depth (m)	Latitude	Longitude
09/07/2008	Cg1	12:57	23.7	54 42.507 N 5	34.166 W
09/07/2008	Cg1	13:09	31.6	54 42.495 N 5	33.265 W
09/07/2008	Cg3	14:36	20.1	54 41.712 N 5	36.024 W
09/07/2008	Cg3	14:49	19.4	54 41.772 N 5	26.996 W
09/07/2008	Cg4	13:56	12.6	54 41.534 N 5	38.884 W
09/07/2008	Cg4	14:00	12.0	54 41.518 N 5	38.570 W
09/07/2008	Cg5	16:22	14.4	54 41.309 N 5	42.675 W
09/07/2008	Cg5	16:32	14.4	54 41.316 N 5	42.225 W
09/07/2008	Cg6	15:30	14.4	54 42.249 N 5	38.666 W
09/07/2008	Cg6	15:35	14.4	54 42.255 N 5	38.425 W
10/07/2008	Cg7	08:32	12	54 40.880 N 5	46.110 W
10/07/2008	Cg7	08:42	12	54 41.031 N 5	45.576 W

Station V2:

Date	Tow #	Time	Depth (m)	Latitude	Longitude
10/07/2008	1	13:18	60.1	54 31.744 N 4	47.546 W
10/07/2008	1	13:33	63.5	54 31.756 N 4	48.573 W
10/07/2008	2	13:49	60.1	54 31.633 N 4	47.484 W
10/07/2008	2	14:03	61.2	54 31.634 N 4	48.300 W

Station D12:

Date	Tow #	Time	Depth (m)	Latitude	Longitude
10/07/2008	1	15:15	44.1	54 26.979 N 4	46.616 W
10/07/2008	1	15:28	48.5	54 26.964 N 4	47.439 W

Station D11:

Date	Tow #	Time	Depth (m)	Latitude	Longitude
10/07/2008	1	16:21	45.7	54 24.027 N	4 49.649 W
10/07/2008	1	16:32	46.2	54 24.048 N	4 50.327 W
10/07/2008	2	16:44	53.9	54 24.054 N	4 52.438 W
10/07/2008	2	16:56	59.8	54 24.128 N	4 53.208 W
10/07/2008	3	17:01	64	54 24.144 N	4 53.575 W
10/07/2008	3	17:19	88	54 24.219 N	4 54.949 W
10/07/2008	4	17:24	89.6	54 24.218 N	4 55.257 W
10/07/2008	4	17:37	92.2	54 24.274 N	4 56.041 W
10/07/2008	5	18:10	72	54 25.239 N	4 54.248 W
10/07/2008	5	18:20	72	54 25.257 N	4 53.735 W
10/07/2008	6	18:42	75	54 27.445 N	4 54.513 W
10/07/2008	6	18:52	75	54 27.445 N	4 53.903 W
10/07/2008	7	19:06	70	54 26.686 N	4 53.932 W
10/07/2008	7	19:18	70	54 26.727 N	4 54.581 W
10/07/2008	8	19:35	78	54 26.700 N	4 56.266 W
10/07/2008	8	19:45	78	54 26.737 N	4 56.825 W
10/07/2008	9	20:20	77	54 22.914 N	4 53.793 W
10/07/2008	9	20:41	77	54 22.909 N	4 54.549 W

Appendix B – Numbers of *A. islandica* recovered in each dredge.

Station C

Station	Tow #	Method	<i>A. islandica</i>			
			Live		Dead	
			Damaged	Undamaged	Paired	Single valves
C	1	Arctica Dredge	65	27	57	2
C	2	Arctica Dredge	34	19	32	8
C	3	Arctica Dredge	39	19	49	1
C	4	Arctica Dredge	35	29	56	6
C	5	Arctica Dredge	32	26	30	6
C	6	Arctica Dredge	29	36	24	3
C	7	Arctica Dredge	40	32	59	3
C	8	Arctica Dredge	15	16	18	0
C	9	Arctica Dredge	37	31	77	10
		Total	326	235	402	39

Station D11

Station	Tow #	Method	<i>A. islandica</i>				
			Live	Paired	Dead		Fragments
					LV	RV	
D11	1	Arctica Dredge				1	
D11	2	Arctica Dredge			3		1
D11	3	Arctica Dredge	30*		11	13	3
D11	4	Arctica Dredge	1		1	1	2
D11	5	Arctica Dredge	3		13	14	4
D11	6	Arctica Dredge					
D11	7	Arctica Dredge	6	2	29	32	17
D11	8	Arctica Dredge			3	2	1
D11	9	Arctica Dredge			1		
		Total	31	2	61	63	28

* 3 small live caught were kept alive