# *R/V Hugh R. Sharp* May 25-31, 2010

# Cruise Report for NSF Project: 0961942 Hypoxia in Coastal Ecosystems: Implications for Neritic Copepods (DeZoZoo: <u>Dead Zone Zoopalnkton</u>)

*Area of Operations*: Middle Chesapeake Bay between the Chesapeake Bay Bridge (northern end) and the Rappahannock Shoals in the (southern end).

	Nome Institution		Watak	Boarding location	Departure location
	Name, Institution	Watch	5/25	5/25	
1	James Pierson	PI	N, CS	Cambridge	Cambridge
2	Michael Roman	PI	D	Cambridge	Cambridge
3	Diane Stoecker	PI	-	Cambridge	Cambridge
4	Mary Beth Decker	PI	D	Solomons	Solomons
5	Ginger Jahn	FRA	D, WL	Cambridge	Cambridge
6	Aidan Fischer	FRA	N	Cambridge	Cambridge
7	Ali Barba	Student	N	Cambridge	Cambridge
8	Allison Chandler-Shideler,	Student	D	Solomons	Solomons
9	Jim Seuberling	FRA	N	Solomons	Solomons
10	Allison Weigel	FRA	-	Cambridge	Cambridge
	Ed Houde	PI		Not On Boa	ard

Table 1. Scientific personnel. CS: chief scientist, WL: watch leader, D: day watch 06:00 – 18:00, N: night watch 18:00 – 06:00.

#### Activities

The objective of this cruise was to determine the effects of hypoxia on the behavior and fitness of planktonic organisms in the middle reaches (mesohaline portion) of Chesapeake Bay (see the cruise track, Fig. 1). Although the focus is on copepods, we sampled phytoplankton, microzooplankton, ichthyoplankton, and jellyfish in addition to copepods.

The cruise was largely successful, though a number of technical problems arose with various pieces of equipment that caused delay. In addition, episodic thunderstorms caused some delay and cancellation of certain operations.

#### Loading and Mobilization

The *R/V Hugh R. Sharp* arrived in Cambridge, MD at 21:30 and docked at Sailwinds Park. Loading was completed by approximately 23:00. Roman and Pierson had to return to HPL to retrieve a deck box for the Scanfish OPC, so the ship departed Sailwinds at approximately 00:30 on 25 May 2010.

#### Scanfish survey

The ship proceeded to the start of the Scanfish survey, located in the approximate vicinity of Chesapeake Bay Program monitoring station CB3.3C (38° 59.8, 76° 22.1'W). The Scanfish was deployed on 25 May 2010 at approximately 06:00 and the survey proceeded southward in the deep channel of the Chesapeake Bay to a location west of the Patuxent River (38° 20.5'N, 76° 18.7'W). At 13:00 the Scanfish was retrieved and the ship proceeded to dock at the Chesapeake Biological Laboratory to pick up three scientists and ichthyoplankton-sampling equipment. At 15:20 the Scanfish was redeployed (38° 20.4'N, 76°18.3'W) and the survey continued to the south, ending at 00:30 on 26 May 2010, at a location west of the Rappahannock River mouth (37° 33.5'N, 76° 09.7'W).

#### South Anchor Station

Following the Scanfish survey we proceeded to a station north of the Rappahannock River mouth 37° 43.7'N, 76° 11.9'W), and set the anchor in approximately 25 m of water. An initial CTD cast was conducted on 26 May 2010 at 02:19, from which we collected water samples for chlorophyll and microplankton analysis. Periodically through the 24 hour anchor station, samples were again collected for these analyses. Following the initial

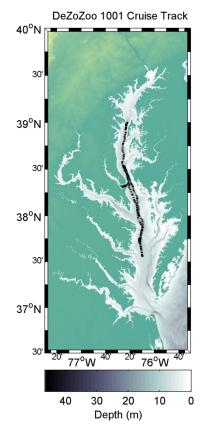


Figure 1. Cruise track from DZZ 1001.

CTD cast, we commenced a 24 hour period of repeated CTD casts and Z-Trap series. Z-Trap series consisted of a CTD cast, followed by two net tows using the Z-Traps as closing nets, sampling above and below the pycnocline, followed by a deployment of the Z-Trap as a trap for 45 minutes. Two Z-Trap series were conducted shortly after anchor, two more bracketing midday, and four more commenced at 21:00 and continued into 27 May. Individual *Acartia tonsa* females were sorted from selected Z-Trap deployments at night, and the animals were imaged and placed into acetone for shore-based gut pigment analyses.

After the second Z-Trap series, we conducted a grazing experiment with individual *Acartia tonsa* sorted and placed into 500 ml polycarbonate jars. The jars were placed on a rotating wheel in the dark in a water bath, and were sampled after 24 hours.

An egg production experiment was also conducted by sorting individual females into six-well tissue culture plates, fitted with polycarbonate towers having 200 µm mesh floors. These towers allowed eggs to fall through the mesh, separated from the females.

During the South anchor station, we tested the MOCNESS and found that we were unable to communicate with it. We were able to arrange replacement parts to be shipped to Chesapeake Biological Laboratory (CBL) in Solomons, MD. In addition, we found a problem with the Percival incubator – it was low on refrigerant, which we purchased during our stop at CBL.

#### South Trawl Survey

After completing the anchor station, we began a 27-hour period of trawling. Due to problems communicating with the 0.25 m<sup>2</sup> MOCNESS, we were unable to use it at this station. Instead of the MOCNESS, we deployed a 1 m<sup>2</sup> Tucker Trawl fitted with 280 µm mesh. This net was unable to sample the smallest stages of copepods, but was the best possible option under the circumstances. Every three hours for 27 hours, we did four Tucker trawls to sample four separate depths; each depth interval was sampled twice. The first four samples were preserved in 4% formaldehyde and the second four samples were preserved in 95% ethanol. We had a 45-minute delay at 02:15 due to a passing lightning storm, but we were able to collect all samples.

#### Intermission

Although we had a second Scanfish survey scheduled, we took the time instead to dock at CBL to pick up replacement parts for the MOCNESS and repair the Percival incubator. Unfortunately we did not have the correct tools to fix the Percival, but we were able to get it working well enough for our purposes. The MOCNESS parts arrived safely and we were able to use the MOCNESS again with an underwater unit that was borrowed from BESS, the manufacturer of the MOCNESS system. Subsequent analysis by BESS Inc. showed that we caused some damage to the underwater unit when it was plugged into the sea cable with some charge still in the cable – likely from the Seabird deck unit still turned on.

#### North Anchor Station

Sampling commenced at the North anchor station on 28 May at 13:05. CTDs were completed every hour for nearly 20 hours. During that time the wind was variable, causing some high angles for the Z-Traps during the afternoon of 28 May. Trapping was conducted but the data may not be of the highest quality. The remainder of the anchor station proceeded without many incidents, and more grazing experiments were conducted.

#### North Trawl Survey

The MOCNESS was repaired and operating for the second trawl survey, at the North station, and we were able to complete 9 tows throughout the survey, with six nets fished for each deployment. The deployment scheme was such that net 0 was the drogue, nets 1 and 2 were fished in approximately equal depth layers from the bottom the pycnocline, net 3 was fished from the pycnocline to bottom and back to the pycnocline, net 4 was fished in the pycnocline, net 5 was fished above the pycnocline to the surface, and net 6 was fished from surface to the pycnocline and back to the surface. Samples from nets 3 and 6 were preserved in EtOH for fish larvae otolith analysis, and nets 1-2 and 4-5 were preserved in 4% formaldehyde for zooplankton taxonomic analysis and fish larvae stomach analysis. In addition, two Tucker trawls were conducted for each MOCNESS tow, with nets fished over 4 depths (bottom layer; bottom layer to pycnocline; pycnocline, pycnocline to surface). No major problems occurred during the trawling at the North station.

#### Unloading and Demobilization

The scientific crew that embarked from the CBL dock at Solomons, MD were disembarked there at approximately 05:00 on 31 May, and the ship arrived at Sailwinds Park in Cambridge, MD at approximate 09:00 on 31 May. Unloading was completed within 2 hours.

#### **Preliminary Findings**

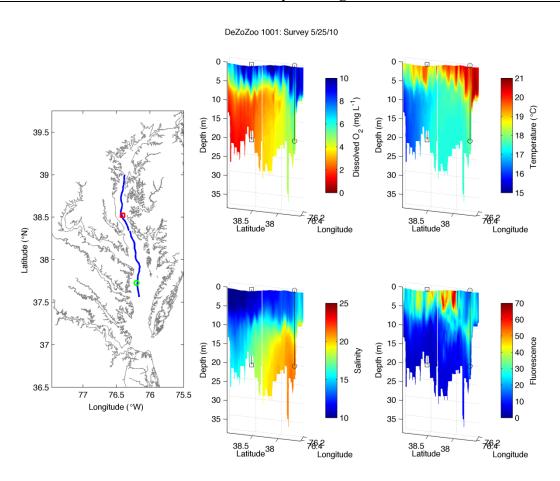


Figure 2. Map of the Scanfish survey (blue line) during DeZooZo 1001 (left panel) with South (green circle) and North (red square) station locations marked. Hydrographic data from the Scanfish survey are also shown in the four panels at right: dissolved oxygen (mg  $L^{-1}$ , upper left), temperature (°C, upper right), salinity (lower left), and fluorescence (RFU, lower right panel). On each of these four panels the station locations are also plotted.

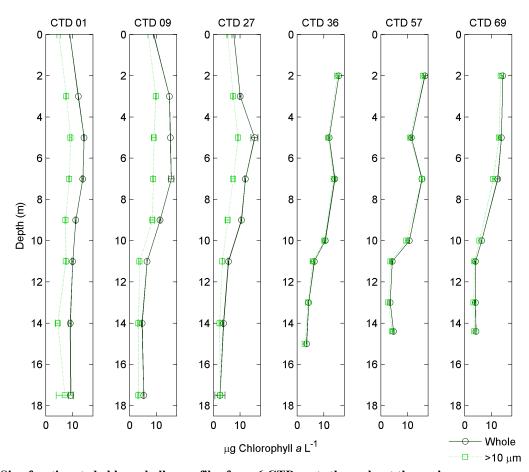


Figure 3. Size-fractionated chlorophyll a profiles from 6 CTD casts throughout the cruise.

#### DeZoZoo Scanfish Survey, May 2010

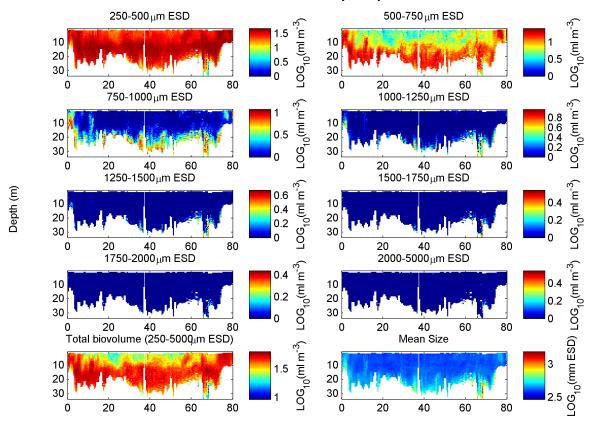


Figure 4. Particle distributions in various size classes, as calculated from the OPC mounted on the Scanfish. In addition, total particle counts from the OPC and the mean size of particles in each bin is shown in the lower two panels. All data are averaged into 0.5 m vertical and 0.5 km horizontal bins. Data are all shown as  $\log_{10}(x+1)$  transformed.

Distance (km)

# **Operations and Objectives List**

# Adjusted from the proposal

	Behavior / Abundance / Distribution	Organismal Fitness	Copepod Mortality	PI
Field Samples				
SCANFISH	X			Roman/Pierson
CTD	X	X	X	Pierson
Niskin	X	X	X	Stoecker
MOCNESS	X	X	X	Roman/Decker
Tucker trawl	X	X	X	Houde/Decker
Pumps	X	X	X	Roman
Traps	X	X	X	Pierson
Experiments and Analyses				
Copepod grazing		X		Roman/Stoecker
Copepod gut fullness		X	X	Pierson
Neutral Red	X		X	Roman/Pierson
Egg development rate		X	X	Pierson
Egg hatching and mortality		X	X	Pierson
Egg production rate		X	X	Roman/Pierson
Condition factor		X		Roman
Gelatinous gut contents			X	Decker
Fish larvae gut contents			X	Houde
Fish larvae growth and condition		X	X	Houde

# **Consecutive Station Log**

Station #	Instrument	Cast #	Month	Day	hhmm	DoY	Degrees (N)	Minutes	Degrees (W)	Minutes	Depth (m)	Depth (m)	Campaign
1	Scanfish	1	5	25	06:13	144.25903	38	59.8	76	22.1			Survey
1	Scanfish	1	5	25	12:54	144.53750	38	20.5	76	18.7			Survey
2	Scanfish	2	5	25	15:23	144.64097	38	20.4	76	18.3			Survey
2	Scanfish	2	5	26	00:34	145.02361	37	33.5	76	9.7			Survey
South	CTD	1	5	26	02:19	145.09653	37	43.7	76	11.9	23.0	17.5	Anchor
South	CTD	2	5 5	26	04:06	145.17083	37	43.7	76 76	11.9	22.9	17	Anchor
South	Z-Net Z-Net	1 2	5 5	26 26	04:35 04:48	145.19097	37 37	43.7	76 76	12.0 12.0	23.0	17 10	Anchor
South South	Z-Net Z-Trap	1	5	26	04.48	145.20000 145.20833	37	43.7 43.7	76 76	12.0	23.0 23.0	10	Anchor Anchor
South	CTD	3	5	26	05:54	145.24583	37	43.7	76	12.0	23.5	18.6	Anchor
South	Z-Net	3	5	26	06:04	145.25278	37	43.7	76	12.0	23.5	17	Anchor
South	Z-Net	4	5	26	06:22	145.26528	37	43.7	76	12.0	23.5	6	Anchor
South	Z-Trap	2	5	26	06:32	145.27222	37	43.7	76	12.0	23.5	6	Anchor
South	CTD	4	5	26	07:28	145.31111	37	43.7	76	12.0	23.3	18.4	Anchor
South	Z-Net	5	5	26	07:40	145.31944	37	43.7	76	12.0	23.3	3	Anchor
South	CTD	5	5	26	08:33	145.35625	37	43.7	76	12.0	23.0	17.9	Anchor
South	Z-Net	6	5	26	09:08	145.38056	37	43.7	76	12.0	23.0	15	Anchor
South	CTD	6	5	26	09:33	145.39792	37	43.7	76	12.0	23.1	18.5	Anchor
South	CTD	7	5	26	10:30	145.43750	37	43.7	76	12.0	22.9		Anchor
South	CTD	8	5	26	11:28	145.47778	37	43.8	76	12.0	23.1	17.2	Anchor
South	Z-Net	7	5	26	11:38	145.48472	37	43.8	76	12.0	23.1	17	Anchor
South	Z-Net	8	5	26	11:45	145.48958	37	43.8	76 76	12.0	23.0	8	Anchor
South	Z-Trap CTD	3 9	5 5	26	11:52	145.49444	37 37	43.8	76 76	12.0	23.0	8	Anchor
South South	Z-Net	9	5	26 26	12:33 12:48	145.52292 145.53333	37 37	43.7 43.7	76 76	12.0 12.0	23.0 23.0	17	Anchor Anchor
South	Z-Net	10	5	26	12:56	145.53889	37	43.7	76	12.0	23.7	8	Anchor
South	Z-Trap	4	5	26	13:02	145.54306	37	43.7	76	12.0	23.7	8	Anchor
South	CTD	10	5	26	13:40	145.56944	37	43.8	76	12.0	23.7	18	Anchor
South	Z-Net	11	5	26	13:55	145.57986	37	43.8	76	12.0	24.1	17	Anchor
South	Z-Net	12	5	26	14:03	145.58542	37	43.8	76	12.0	23.7	8	Anchor
South	CTD	11	5	26	14:32	145.60556	37	43.7	76	12.0	24.1	17.2	Anchor
South	CTD	12	5	26	15:31	145.64653	37	43.7	76	12.0	23.7	17.9	Anchor
South	CTD	13	5	26	16:30	145.68750	37	43.7	76	12.0	23.6	18.2	Anchor
South	CTD	14	5	26	17:32	145.73056	37	43.7	76	12.0	23.7	19.9	Anchor
South	CTD	15	5	26	18:28	145.76944	37	43.7	76	11.9	23.3		Anchor
South	CTD	16	5	26	19:25	145.80903	37	43.7	76	11.9	23.5	19.5	Anchor
South	CTD	17	5	26	20:23	145.84931	37	43.8	76	11.9	24.4	19.7	Anchor
South	Z-Net	13 14	5 5	26	20:48	145.86667	37	43.8	76 76	11.9	27.4	22	Anchor
South	Z-Net	5	5	26 26	20:55 21:00	145.87153	37 37	43.8 43.8	76 76	11.9	27.4 27.4	20 10	Anchor
South South	Z-Trap CTD	18	5	26	21:00	145.87500 145.89444	37	43.8	76 76	11.9 11.9	27.4	10	Anchor Anchor
South	Z-Net	15	5	26	21:50	145.90972	37	43.8	76	11.9	27.4	20	Anchor
South	Z-Net	16	5	26	21:59	145.91597	37	43.8	76	11.9	27.4	10	Anchor
South	Z-Trap	6	5	26	22:08	145.92222	37	43.8	76	11.9	27.4	10	Anchor
South	CTD	19	5	26	22:25	145.93403	37	43.8	76	11.9	27.5	22.8	Anchor
South	CTD	20	5	26	23:26	145.97639	37	43.8	76	11.9	27.6	22.8	Anchor
South	Z-Net	17	5	27	23:12	146.96667	37	43.8	76	11.9	27.6	20	Anchor
South	Z-Net	17	5	27	00:08	146.00556	37	43.8	76	11.9	27.6	20	Anchor
South	Z-Net	18	5	27	00:21	146.01458	37	43.8	76	11.9	27.6	10	Anchor
South	Z-Trap	7	5	27	00:33	146.02292	37	43.8	76	11.9	27.6	10	Anchor
South	CTD	21	5	27	00:42	146.02917	37	43.8	76	11.9	27.5	24.8	Anchor
South	Z-Net	19	5	27	01:30	146.06250	37	43.8	76 76	11.8	27.7	20	Anchor
South	Z-Net	20	5 5	27	01:40 01:48	146.06944	37 37	43.8	76 76	11.8	27.7	10	Anchor
South South	Z-Trap CTD	8 22	5	27 27	01:48	146.07500 146.08125	37	43.8 43.8	76 76	11.8 11.8	27.7 27.7	10 24.8	Anchor Anchor
South	CTD	23	5	27	02:37	146.10903	37	43.6	76	11.9	26.6	24.7	Anchor
South	Z-Net	21	5	27	02:48	146.11667	37	43.6	76	11.9	26.6	20	Anchor
South	Z-Net	22	5	27	02:54	146.12083	37	43.6	76	11.9	26.6	10	Anchor
South	TT	S1	5	27	04:37	146.19236	37	43.6	76	12.0	24.0	20	Trawl
South	CTD	24	5	27	06:55	146.28819	37	43.6	76	12.0	22.0	16.8	Trawl
South	TT	S2	5	27	07:15	146.30208	37	43.6	76	12.0	22.0	19	Trawl
South	CTD	25	5	27	09:10	146.38194	37	43.6	76	12.0	22.1	17	Trawl
South	CTD	26	5	27	10:01	146.41736	37	43.5	76	12.0	25.2	20.4	Trawl
South	TT	S3	5	27	10:13	146.42569	37	43.5	76	12.0	25.2	21	Trawl
South	CTD	27	5	27	12:43	146.52986	37	43.5	76	12.0	24.2	19.3	Trawl
South	CTD	28	5	27	13:04	146.54444	37	43.4	76 76	11.9	25.2	19.5	Trawl
South	TT	S4	5	27	13:15	146.55208	37	43.4	76 76	11.9	25.2	20	Trawl
South	CTD TT	29 85	5	27	15:55	146.66319	37	43.5	76 76	12.0	24.8	17.6	Trawl
South South	CTD	S5 30	5 5	27 27	16:10 18:54	146.67361 146.78750	37 37	43.5 43.7	76 76	12.0 11.9	24.8 24.2	20 19	Trawl Trawl
South	CID	50	5	41	10.34	170./0/30	31	43./	70	11.7	24.2	17	11aWl

South   TT   So   S   22   19-97   145/9653   37   43-9   76   12-1   20-2   17   Tirsel   South   TT   ST   ST   27   21-10   146/9261   37   44-5   76   11-9   22-4   18   Tirsel   South   TT   ST   ST   ST   27   22-10   146/9261   37   44-5   76   11-9   22-4   18   Tirsel   Trong   Tron	Station #	Instrument	Cast #	Month	Day	hhmm	DoY	Degrees (N)	Minutes	Degrees (W)	Minutes	Depth (m)	Depth (m)	Campaign
South	-													
South			31		27			37	43.7	76	11.9		22	
South   TT   S8   5   28   0125   147,05903   37   415   76   11.9   26.2   18   Travel   South   TT   S0   5   28   0310   147,15278   37   414   76   11.9   25.0   20   18   Travel   Trave	South	TT	S7	5	27	22:10	146.92361	37	44.5	76	11.9	25.4	18	Trawl
South	South	CTD	32	5	28	01:11	147.04931	37	43.7	76	12.0	22.8	19.5	Trawl
Seath   Trans    Tr	South						147.05903							
Tamast														
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North   Z-Net   27   5   29   0.343   148,14792   38   31.3   76   24.3   20.3   15   Anchor North   Z-Trap   11   5   29   0.345   148,15764   38   31.3   76   24.3   20.3   15   Anchor North   Z-Trap   11   5   29   0.455   148,16319   38   31.3   76   24.3   20.3   15   Anchor North   Z-Net   29   5   29   0.456   148,20556   38   31.3   76   24.3   20.3   15   Anchor North   Z-Net   30   5   29   0.515   148,16319   38   31.3   76   24.3   20.3   15   Anchor North   Z-Net   30   5   29   0.515   148,16216   38   31.3   76   24.3   20.3   15   Anchor North   Z-Trap   12   5   29   0.515   148,20556   38   31.3   76   24.3   20.3   15   Anchor North   CTD   50   5   29   0.517   148,22014   38   31.3   76   24.3   20.2   15   Anchor North   Z-Trap   12   5   29   0.517   148,22014   38   31.3   76   24.3   20.2   15   Anchor North   Z-Net   31   5   29   0.610   148,25694   38   31.3   76   24.3   20.1   14.8   Anchor North   Z-Net   31   5   29   0.610   148,25694   38   31.3   76   24.3   20.1   15   Anchor North   Z-Trap   13   5   29   0.626   148,26806   38   31.3   76   24.3   20.1   15   Anchor North   Z-Net   33   5   29   0.626   148,26806   38   31.3   76   24.3   20.1   10   Anchor North   Z-Net   33   5   29   0.675   148,3686   38   31.3   76   24.3   20.0   15   Anchor North   Z-Net   33   5   29   0.675   148,3686   38   31.3   76   24.3   20.0   15   Anchor North   Z-Net   34   5   29   0.675   148,3686   38   31.3   76   24.3   20.0   15   Anchor North   CTD   53   5   29   0.675   148,3646   38   31.3   76   24.3   20.0   15   Anchor North   CTD   53   5   29   0.675   148,3646   38   31.3   76   24.3   20.0   15   Anchor North   CTD   55   5   29   0.658   148,30972   38   31.3   76   24.3   20.0   15   Anchor North   CTD   55   5   29   0.658   148,30972   38   31.3   76   24.4   19.7   15   Anchor North   CTD   56   5   29   0.658   148,30972   38   31.3   76   24.4   19.7   15   Anchor North   CTD   56   5   29   0.658   148,30972   38   31.3   76   24.4   19.7   15   Anchor North   CT														
North Z-Net 28 5 29 03-47 148.15764 38 31.3 76 24.3 20.3 15 Anchor North CTD 49 5 29 03-55 148.16319 38 31.3 76 24.3 20.3 15 Anchor North Z-Net 29 5 29 04-56 148.20556 38 31.3 76 24.3 20.3 15 Anchor North Z-Net 30 5 29 05-03 148.21042 38 31.3 76 24.3 20.3 15 Anchor North Z-Net 30 5 29 05-03 148.21042 38 31.3 76 24.3 20.3 18 Anchor North Z-Net 30 5 29 05-15 148.21875 38 31.3 76 24.3 20.2 15 Anchor North CTD 50 5 29 05-15 148.21875 38 31.3 76 24.3 20.2 15 Anchor North CTD 51 5 29 05-16 148.22578 38 31.3 76 24.3 20.2 14 Anchor North CTD 51 5 29 06-10 148.25694 38 31.3 76 24.3 20.1 14.8 Anchor North Z-Net 31 5 29 06-10 148.25694 38 31.3 76 24.3 20.1 15 Anchor North Z-Net 31 5 29 06-11 148.22618 38 31.3 76 24.3 20.1 15 Anchor North Z-Net 31 5 29 06-11 148.26181 38 31.3 76 24.3 20.1 15 Anchor North Z-Net 32 5 29 06-17 148.2014 38 31.3 76 24.3 20.1 15 Anchor North Z-Net 32 5 29 06-17 148.2014 38 31.3 76 24.3 20.1 15 Anchor North Z-Net 33 5 29 06-26 148.26806 38 31.3 76 24.3 20.1 15 Anchor North Z-Net 33 5 29 06-26 148.26806 38 31.3 76 24.3 20.1 10 Anchor North Z-Net 33 5 29 07-26 148.26806 38 31.3 76 24.3 20.0 15 Anchor North Z-Net 34 5 29 07-26 148.26806 38 31.3 76 24.3 20.0 15 Anchor North CTD 52 5 29 08-58 148.29028 38 31.3 76 24.3 20.0 15 Anchor North CTD 54 5 29 08-57 148.31992 38 31.3 76 24.3 20.0 15 Anchor North CTD 54 5 29 08-57 148.31992 38 31.3 76 24.3 20.0 15 Anchor North CTD 54 5 29 08-57 148.31992 38 31.3 76 24.3 20.0 15 Anchor North CTD 56 5 29 08-57 148.31992 38 31.3 76 24.3 20.0 15 Anchor North CTD 56 5 29 10.57 148.3502 38 31.3 76 24.3 20.0 15.5 Anchor North CTD 56 5 29 10.57 148.4505 38 31.3 76 24.3 20.0 15.5 Anchor North CTD 56 5 29 10.57 148.4505 38 31.3 76 24.3 20.0 15.5 Anchor North CTD 56 5 29 10.57 148.4505 38 31.3 76 24.3 20.0 15.5 Anchor North CTD 56 5 29 10.57 148.4505 38 31.3 76 24.3 19.9 14.7 Anchor North CTD 56 5 29 10.58 148.3506 38 31.3 76 24.3 19.9 14.7 Anchor North CTD 56 5 29 11.51 148.46111 38 31.2 76 24.4 19.7 15 Anchor North CTD 60 5 29 11.51 148.46111 38 31.2 76 24.4 19.9 15 Anch														
North CTD 49 5 29 04:05 148.16319 38 31.3 76 24.3 20.3 15 Anchor North CTD 49 5 29 04:05 148.16806 38 31.3 76 24.3 20.3 15 Anchor North Z-Net 29 5 29 04:56 148.20556 38 31.3 76 24.3 20.3 15 Anchor North Z-Trap 12 5 29 05:15 148.21875 38 31.3 76 24.3 20.2 15 Anchor North CTD 50 5 29 05:17 148.221875 38 31.3 76 24.3 20.2 15 Anchor North CTD 51 5 29 05:17 148.221875 38 31.3 76 24.3 20.2 14 Anchor North Z-Trap 11 5 29 06:10 148.25694 38 31.3 76 24.3 20.2 14 Anchor North Z-Net 31 5 29 06:10 148.25694 38 31.3 76 24.3 20.1 15 Anchor North Z-Net 31 5 29 06:10 148.25694 38 31.3 76 24.3 20.1 15 Anchor North Z-Trap 13 5 29 06:26 148.26806 38 31.3 76 24.3 20.1 16.4 Anchor North Z-Trap 13 5 29 06:26 148.26806 38 31.3 76 24.3 20.1 10 Anchor North Z-Net 31 25 29 06:26 148.26806 38 31.3 76 24.3 20.1 10 Anchor North Z-Net 31 25 29 06:26 148.26806 38 31.3 76 24.3 20.1 10 Anchor North Z-Net 33 5 29 06:26 148.30486 38 31.3 76 24.3 20.0 15 Anchor North Z-Net 33 5 29 07:19 148.30486 38 31.3 76 24.3 20.0 15 Anchor North Z-Net 34 5 29 07:59 148.33244 38 31.3 76 24.3 20.0 15 Anchor North CTD 53 5 29 07:59 148.33244 38 31.3 76 24.3 20.0 15 Anchor North CTD 53 5 29 07:59 148.3324 38 31.3 76 24.3 20.0 15 Anchor North CTD 53 5 29 07:59 148.3324 38 31.3 76 24.3 20.0 15 Anchor North CTD 55 5 29 08:57 148.3729 38 31.3 76 24.3 20.0 15 Anchor North CTD 55 5 29 08:57 148.34529 38 31.3 76 24.3 20.0 15 Anchor North CTD 55 5 29 08:57 148.3526 38 31.3 76 24.3 20.0 15 Anchor North CTD 55 5 29 08:57 148.3526 38 31.3 76 24.3 20.0 15 Anchor North CTD 55 5 29 08:57 148.3526 38 31.3 76 24.3 20.0 15 Anchor North CTD 55 5 29 08:57 148.3526 38 31.3 76 24.3 20.0 15 Anchor North CTD 56 5 29 11:51 148.44986 38 31.3 76 24.4 19.9 15 Anchor North CTD 56 5 29 11:51 148.44986 38 31.3 76 24.4 19.9 15 Anchor North CTD 57 5 29 11:31 148.44986 38 31.3 76 24.4 19.9 15 Anchor North CTD 59 5 29 11:56 148.35260 38 31.2 76 24.4 19.9 15 Anchor North CTD 59 5 29 11:56 148.35260 38 31.3 76 24.4 19.9 15 Anchor North CTD 60 5 29 12:56 148.35260 38 31.3 76 24.4 19.9 15 Anchor Nort														
North   Z-Net   30   5   29   04-56   148-20556   38   31.3   76   24.3   20.3   15   Anchor	North	Z-Trap	11	5	29	03:55	148.16319	38	31.3	76	24.3	20.3	15	
North   Z-Net   30   5   29   05:03   148,21042   38   31.3   76   24.3   20.3   8   Anchor North   Z-Trap   12   5   29   05:15   148,21875   38   31.3   76   24.3   20.2   15   Anchor North   CTD   50   5   29   05:17   148,22014   38   31.3   76   24.3   20.2   14   Anchor North   CTD   51   5   29   06:04   148,25694   38   31.3   76   24.3   20.1   14.8   Anchor North   Z-Net   31   5   29   06:01   148,25694   38   31.3   76   24.3   20.1   14.8   Anchor North   Z-Net   32   5   29   06:10   148,25694   38   31.3   76   24.3   20.1   15   Anchor North   Z-Net   32   5   29   06:06   148,26086   38   31.3   76   24.3   20.1   18   Anchor North   Z-Trap   13   5   29   06:26   148,26086   38   31.3   76   24.3   20.1   10   Anchor North   Z-Net   33   5   29   07:26   148,30972   38   31.3   76   24.3   20.0   15   Anchor North   Z-Net   34   5   29   07:26   148,30972   38   31.3   76   24.3   20.0   15   Anchor North   Z-Net   34   5   29   07:26   148,30972   38   31.3   76   24.3   20.0   8   Anchor North   CTD   53   5   29   08:57   148,37292   38   31.3   76   24.3   20.0   15   Anchor North   CTD   54   5   29   08:57   148,37292   38   31.3   76   24.3   20.0   15.5   Anchor North   CTD   55   5   29   08:57   148,41458   38   31.3   76   24.4   19.9   15   Anchor North   CTD   55   5   29   11:04   148,46511   38   31.2   76   24.4   19.9   15   Anchor North   Z-Net   36   5   29   11:04   148,46511   38   31.2   76   24.4   19.7   15   Anchor North   Z-Net   36   5   29   11:31   148,47986   38   31.2   76   24.4   19.7   15   Anchor North   Z-Net   36   5   29   11:31   148,46507   38   31.2   76   24.4   19.7   15   Anchor North   Z-Net   38   5   29   11:31   148,46507   38   31.2   76   24.4   19.7   15   Anchor North   Z-Net   38   5   29   12:36   148,5007   38   31.2   76   24.4   19.9   15.4   Anchor North   CTD   57   5   29   11:38   148,46507   38   31.2   76   24.4   19.8   15   Anchor North   CTD   60   5   29   12:26   148,5007   38   31.3   76   24.3   19.9   14.4   Anchor North	North	CTD	49	5	29	04:02	148.16806	38	31.3	76	24.3	20.3	16	Anchor
North   Z-Trap   12   5   29   05:15   148.21875   38   31.3   76   24.3   20.2   15   Anchor North   CTD   50   5   29   06:17   148.22614   38   31.3   76   24.3   20.1   14.8   Anchor North   Z-Net   31   5   29   06:10   148.25878   38   31.3   76   24.3   20.1   14.8   Anchor North   Z-Net   31   5   29   06:10   148.25818   38   31.3   76   24.3   20.1   15   Anchor North   Z-Net   31   5   29   06:10   148.25818   38   31.3   76   24.3   20.1   15   Anchor North   Z-Net   31   5   29   06:26   148.25806   38   31.3   76   24.3   20.1   10   Anchor North   Z-Trap   13   5   29   06:26   148.26806   38   31.3   76   24.3   20.1   10   Anchor North   Z-Net   33   5   29   07:26   148.30902   38   31.3   76   24.3   20.0   15   Anchor North   Z-Net   33   5   29   07:26   148.30972   38   31.3   76   24.3   20.0   15   Anchor North   Z-Net   33   5   29   07:26   148.30972   38   31.3   76   24.3   20.0   15   Anchor North   CTD   53   5   29   07:59   148.33264   38   31.3   76   24.3   20.0   15   Anchor North   CTD   54   5   29   07:59   148.34168   38   31.3   76   24.3   20.0   15.5   Anchor North   CTD   54   5   29   07:59   148.4158   38   31.3   76   24.4   19.7   15.4   Anchor North   CTD   56   5   29   09:57   148.4158   38   31.3   76   24.4   19.7   15.4   Anchor North   CTD   56   5   29   10:57   148.45625   38   31.2   76   24.4   19.7   15.4   Anchor North   Z-Net   36   5   29   11:11   148.45625   38   31.2   76   24.4   19.7   15.4   Anchor North   Z-Net   36   5   29   11:31   148.47986   38   31.2   76   24.4   19.7   8   Anchor North   Z-Net   37   5   29   11:31   148.47986   38   31.2   76   24.4   19.7   8   Anchor North   Z-Net   37   5   29   11:31   148.47986   38   31.2   76   24.4   19.8   8   Anchor North   Z-Net   37   5   29   11:35   148.5806   38   31.2   76   24.4   19.8   8   Anchor North   CTD   58   5   29   11:58   148.6987   38   31.2   76   24.4   19.8   8   Anchor North   CTD   60   5   29   11:58   148.6987   38   31.3   76   24.4   19.8   15   Anchor North	North						148.20556							Anchor
North         CTD         50         5         29         05:17         148.22014         38         31.3         76         24.3         20.2         14         Anchor           North         CTD         51         5         29         06:10         148.25594         38         31.3         76         24.3         20.1         15         Anchor           North         Z-Net         32         5         29         06:17         148.26684         38         31.3         76         24.3         20.1         15         Anchor           North         Z-Teq         13         5         29         06:56         148.26806         38         31.3         76         24.3         20.1         18         Anchor           North         CTD         52         5         29         06:58         148.29028         38         31.3         76         24.3         20.0         15         Anchor           North         CTD         52         9         07:26         148.39072         38         31.3         76         24.3         20.0         15         Anchor           North         CTD         53         5         29         07:5														
North         CTD         51         5         29         06:04         148,25278         38         31.3         76         24.3         20.1         14.8         Anchor           North         Z-Net         31         5         29         06:17         148,2694         38         31.3         76         24.3         20.1         15         Anchor           North         Z-Trap         13         5         29         06:26         148,26806         38         31.3         76         24.3         20.1         10         Anchor           North         CTrap         13         5         29         06:58         148,20928         38         31.3         76         24.3         20.0         15         Anchor           North         Z-Net         33         5         29         07:26         148,30972         38         31.3         76         24.3         20.0         15         Anchor           North         CTD         53         5         29         07:59         148,33264         38         31.3         76         24.3         20.0         15.5         Anchor           North         CTD         54         5		•												
North   Z-Net   31   5   29   06:10   148.25694   38   31.3   76   24.3   20.1   15   Anchor North   Z-Trap   13   5   29   06:26   148.26806   38   31.3   76   24.3   20.1   10   Anchor North   Z-Trap   13   5   29   06:26   148.26806   38   31.3   76   24.3   20.1   10   Anchor North   Z-Trap   13   5   29   06:26   148.26806   38   31.3   76   24.3   20.0   15   Anchor North   Z-Net   33   5   29   07:26   148.30486   38   31.3   76   24.3   20.0   15   Anchor North   Z-Net   34   5   29   07:26   148.30486   38   31.3   76   24.3   20.0   15   Anchor North   Z-Net   34   5   29   07:29   148.33264   38   31.3   76   24.3   20.0   8   Anchor North   CTD   53   5   29   07:59   148.33264   38   31.3   76   24.3   20.0   8   Anchor North   CTD   54   5   29   08:57   148.37292   38   31.3   76   24.3   20.0   15.5   Anchor North   CTD   55   5   29   09:57   148.41458   38   31.3   76   24.4   19.9   14.7   Anchor North   CTD   56   5   29   09:57   148.44585   38   31.3   76   24.4   19.9   15   Anchor North   Z-Net   35   5   29   11:04   148.46111   38   31.2   76   24.4   19.7   15.4   Anchor North   Z-Net   36   5   29   11:04   148.46111   38   31.2   76   24.4   19.7   15   Anchor North   Z-Net   36   5   29   11:31   148.47986   38   31.2   76   24.4   19.7   8   Anchor North   Z-Net   37   5   29   12:26   148.51806   38   31.2   76   24.4   19.8   Anchor North   Z-Net   38   5   29   12:36   148.54697   38   31.2   76   24.4   19.8   8   Anchor North   Z-Net   38   5   29   12:36   148.54697   38   31.3   76   24.4   19.8   8   Anchor North   Z-Net   38   5   29   12:36   148.54697   38   31.3   76   24.4   19.8   15   Anchor North   Z-Net   38   5   29   12:36   148.54697   38   31.3   76   24.4   19.8   8   Anchor North   Z-Net   38   5   29   12:36   148.54697   38   31.3   76   24.4   19.8   15   Anchor North   Z-Net   38   5   29   12:36   148.54697   38   31.3   76   24.4   19.8   15   Anchor North   Z-Net   38   5   29   12:36   148.54697   38   31.3   76   24.4   19.8   15   Anchor North														
North   Z-Net   32   5   29   06:17   148.26181   38   31.3   76   24.3   20.1   10   Anchor North   Z-Trap   13   5   29   06:26   148.26806   38   31.3   76   24.3   20.0   15   Anchor North   CTD   52   5   29   06:58   148.29028   38   31.3   76   24.3   20.0   15   Anchor North   Z-Net   33   5   29   07:19   148.30486   38   31.3   76   24.3   20.0   15   Anchor North   Z-Net   34   5   29   07:26   148.3072   38   31.3   76   24.3   20.0   8   Anchor North   CTD   53   5   29   07:59   148.33064   38   31.3   76   24.3   20.0   8   Anchor North   CTD   54   5   29   07:59   148.33264   38   31.3   76   24.3   20.0   15.5   Anchor North   CTD   54   5   29   09:57   148.37292   38   31.3   76   24.3   19.9   14.7   Anchor North   CTD   56   5   29   09:57   148.41458   38   31.3   76   24.4   19.9   15   Anchor North   CTD   56   5   29   10:57   148.45625   38   31.2   76   24.4   19.9   15.4   Anchor North   Z-Net   35   5   29   11:04   148.46111   38   31.2   76   24.4   19.7   15.4   Anchor North   Z-Net   36   5   29   11:11   148.46597   38   31.2   76   24.4   19.7   18   Anchor North   Z-Trap   14   5   29   11:31   148.47986   38   31.2   76   24.4   19.7   8   Anchor North   Z-Net   37   5   29   11:28   148.49861   38   31.2   76   24.4   19.8   Anchor North   Z-Net   37   5   29   12:26   148.51806   38   31.2   76   24.4   19.8   15   Anchor North   Z-Net   37   5   29   12:26   148.51806   38   31.2   76   24.4   19.8   15   Anchor North   Z-Net   37   5   29   12:26   148.51806   38   31.2   76   24.4   19.8   15   Anchor North   Z-Net   37   5   29   12:59   148.54097   38   31.3   76   24.4   19.8   14.2   Anchor North   Z-Net   38   5   29   12:59   148.54097   38   31.3   76   24.4   19.8   14.2   Anchor North   CTD   58   5   29   12:59   148.54097   38   31.3   76   24.4   19.8   14.2   Anchor North   CTD   60   5   29   15:59   148.54097   38   31.3   76   24.3   19.9   15.2   Anchor North   CTD   61   5   29   15:59   148.54097   38   31.3   76   24.3   19.9   15.5   Anchor North														
North Z-Trap 13 5 29 06:26 148:26806 38 31.3 76 24.3 20.1 10 Anchor North CTD 52 5 29 06:58 148:29028 38 31.3 76 24.3 20.0 15 Anchor North Z-Net 33 5 29 07:19 148:30486 38 31.3 76 24.3 20.0 15 Anchor North Z-Net 34 5 29 07:26 148:30972 38 31.3 76 24.3 20.0 8 Anchor North CTD 53 5 29 07:59 148:33264 38 31.3 76 24.3 20.0 8 Anchor North CTD 54 5 29 08:57 148:37292 38 31.3 76 24.3 19.9 14.7 Anchor North CTD 55 5 29 08:57 148:37292 38 31.3 76 24.3 19.9 14.7 Anchor North CTD 55 5 29 09:57 148:41458 38 31.3 76 24.4 19.9 15 Anchor North CTD 56 5 29 10:57 148:46525 38 31.2 76 24.4 19.7 15.4 Anchor North Z-Net 35 5 29 11:04 148:4611 38 31.2 76 24.4 19.7 15.4 Anchor North Z-Net 35 5 29 11:11 148:46597 38 31.2 76 24.4 19.7 15 Anchor North Z-Trap 14 5 29 11:31 148:47986 38 31.2 76 24.4 19.7 8 Anchor North Z-Trap 14 5 29 11:31 148:47986 38 31.2 76 24.4 19.7 8 Anchor North Z-Net 37 5 29 12:26 148:51806 38 31.2 76 24.4 19.8 Anchor North Z-Net 38 5 29 12:26 148:51806 38 31.2 76 24.4 19.8 Anchor North Z-Net 38 5 29 12:36 148:51806 38 31.2 76 24.4 19.8 15 Anchor North Z-Net 38 5 29 12:39 148:5806 38 31.2 76 24.4 19.8 15 Anchor North Z-Net 38 5 29 12:39 148:5806 38 31.2 76 24.4 19.8 15 Anchor North CTD 58 5 29 13:57 148:58125 38 31.3 76 24.3 19.9 15.5 Anchor North CTD 58 5 29 13:57 148:58125 38 31.3 76 24.3 19.9 14.4 Anchor North CTD 60 5 29 15:59 148:66597 38 31.3 76 24.3 19.9 15.25 Anchor North CTD 61 5 29 15:59 148:66597 38 31.3 76 24.3 19.9 15.25 Anchor North CTD 62 5 29 16:58 148:70694 38 31.3 76 24.3 19.9 15.4 Anchor North CTD 64 5 29 15:58 148:66597 38 31.3 76 24.3 19.9 15.4 Anchor North CTD 64 5 29 15:58 148:66597 38 31.3 76 24.3 19.9 15.4 Anchor North CTD 66 5 29 15:58 148:66597 38 31.3 76 24.3 19.9 15.4 Anchor North CTD 64 5 29 15:58 148:68597 38 31.3 76 24.3 19.9 15.4 Anchor North CTD 66 5 29 15:58 148:89431 38 31.3 76 24.3 19.9 15.5 Anchor North CTD 64 5 29 15:58 148:89431 38 31.3 76 24.3 19.9 15.5 Anchor North CTD 66 5 29 20.23 148:84838 38 31.3 76 24.3 19.9 15.5 Anchor North CTD 66 5 29 20.23 148:84838 38 31.3 76 24.														
North         CTD         52         5         29         06:58         148.29028         38         31.3         76         24.3         20.0         15         Anchor           North         Z-Net         34         5         29         07:19         148.30486         38         31.3         76         24.3         20.0         15         Anchor           North         CTD         53         5         29         07:26         148.30272         38         31.3         76         24.3         20.0         15.5         Anchor           North         CTD         54         5         29         08:57         148.31222         38         31.3         76         24.3         19.9         14.7         Anchor           North         CTD         55         5         29         08:57         148.41458         38         31.2         76         24.4         19.9         15         Anchor           North         CTD         56         5         29         11:04         148.456111         38         31.2         76         24.4         19.7         15         Anchor           North         Z-Net         35         5 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>														
North Z-Net 33 5 29 07:19 148.30486 38 31.3 76 24.3 20.0 15 Anchor North Z-Net 34 5 29 07:26 148.30972 38 31.3 76 24.3 20.0 18 Anchor North CTD 53 5 5 29 07:59 148.37292 38 31.3 76 24.3 20.0 15.5 Anchor North CTD 54 5 29 08:57 148.37292 38 31.3 76 24.3 19.9 14.7 Anchor North CTD 55 5 29 09:57 148.37292 38 31.3 76 24.3 19.9 15 Anchor North CTD 55 5 29 10:57 148.47458 38 31.3 76 24.4 19.9 15 Anchor North CTD 56 5 29 10:57 148.47625 38 31.2 76 24.4 19.7 15.4 Anchor North Z-Net 35 5 29 11:04 148.46111 38 31.2 76 24.4 19.7 15.4 Anchor North Z-Net 35 5 29 11:04 148.46111 38 31.2 76 24.4 19.7 15 Anchor North Z-Trap 14 5 29 11:31 148.47986 38 31.2 76 24.4 19.7 8 Anchor North Z-Trap 14 5 29 11:31 148.47986 38 31.2 76 24.4 19.7 8 Anchor North Z-Net 37 5 29 11:26 148.51806 38 31.2 76 24.4 19.7 8 Anchor North Z-Net 37 5 29 11:26 148.51806 38 31.2 76 24.4 19.8 Anchor North Z-Net 38 5 29 12:36 148.51806 38 31.2 76 24.4 19.8 15 Anchor North Z-Net 38 5 29 12:36 148.54907 38 31.2 76 24.4 19.8 15 Anchor North CTD 58 5 29 12:59 148.54097 38 31.3 76 24.3 19.8 14.2 Anchor North CTD 59 5 29 13:57 148.58125 38 31.3 76 24.3 19.8 14.2 Anchor North CTD 60 5 29 14.56 148.6222 38 31.3 76 24.3 19.8 14.2 Anchor North CTD 61 5 29 15:59 148.66597 38 31.3 76 24.3 19.8 14.2 Anchor North CTD 62 5 29 16:58 148.70694 38 31.3 76 24.3 19.9 15.25 Anchor North CTD 63 5 29 15:59 148.66597 38 31.3 76 24.3 19.9 15.25 Anchor North CTD 64 5 29 16:58 148.70694 38 31.3 76 24.3 19.9 15.25 Anchor North CTD 64 5 29 16:58 148.70694 38 31.3 76 24.3 19.9 15 Anchor North CTD 64 5 29 16:58 148.70694 38 31.3 76 24.3 19.9 15 Anchor North CTD 64 5 29 16:58 148.70694 38 31.3 76 24.3 19.9 15 Anchor North CTD 64 5 29 16:58 148.70694 38 31.3 76 24.3 19.9 15 Anchor North CTD 65 5 29 16:58 148.70694 38 31.3 76 24.3 19.9 15 Anchor North CTD 65 5 29 16:58 148.89481 38 31.3 76 24.3 19.9 15 Anchor North CTD 64 5 29 21:28 148.89481 38 31.3 76 24.3 19.9 15 Anchor North CTD 65 5 29 20:23 148.89481 38 31.3 76 24.3 19.9 15 Anchor North CTD 66 5 2 29 20:23 148.89481 38 31.3 76 24.3 19														
North         Z-Net         34         5         29         07:26         148,30972         38         31.3         76         24.3         20.0         8         Anchor           North         CTD         53         5         29         07:59         148,332264         38         31.3         76         24.3         19.9         14.7         Anchor           North         CTD         54         5         29         08:57         148,41458         38         31.3         76         24.4         19.9         15         Anchor           North         CTD         56         5         29         10:57         148,45625         38         31.2         76         24.4         19.7         15.4         Anchor           North         Z-Net         36         5         29         11:11         148,46597         38         31.2         76         24.4         19.7         15         Anchor           North         Z-Net         36         5         29         11:31         148,49861         38         31.2         76         24.4         19.7         8         Anchor           North         Z-Net         37         5         <														
North         CTD         53         5         29         07:59         148,33264         38         31.3         76         24.3         20.0         15.5         Anchor           North         CTD         54         5         29         08:57         148,37292         38         31.3         76         24.4         19.9         14.7         Anchor           North         CTD         56         5         29         09:57         148,45625         38         31.2         76         24.4         19.9         15.4         Anchor           North         CTD         56         5         29         11:04         148,46111         38         31.2         76         24.4         19.7         15.4         Anchor           North         Z-Trap         14         5         29         11:31         148,47986         38         31.2         76         24.4         19.7         8         Anchor           North         Z-Trap         14         5         29         11:58         148,47986         38         31.2         76         24.4         19.8         Anchor           North         C-TD         57         5         29														
North         CTD         55         5         29         09:57         148.41458         38         31.3         76         24.4         19.9         15         Anchor           North         CTD         56         5         29         11:04         148.45625         38         31.2         76         24.4         19.7         15.4         Anchor           North         Z-Net         36         5         29         11:11         148.46511         38         31.2         76         24.4         19.7         18         Anchor           North         Z-Net         36         5         29         11:31         148.47986         38         31.2         76         24.4         19.7         8         Anchor           North         Z-Trap         14         5         29         11:58         148.49861         38         31.2         76         24.4         19.8         4         Anchor           North         CTD         57         5         29         12:26         148.51806         38         31.2         76         24.4         19.8         14         Anchor           North         CTD         58         5         2		CTD	53	5	29	07:59	148.33264	38	31.3	76	24.3	20.0	15.5	
North         CTD         56         5         29         10:57         148.45625         38         31.2         76         24.4         19.7         15.4         Anchor           North         Z-Net         35         5         29         11:11         148.46517         38         31.2         76         24.4         19.7         15         Anchor           North         Z-Trap         14         5         29         11:31         148.47986         38         31.2         76         24.4         19.7         8         Anchor           North         Z-Trap         14         5         29         11:58         148.49861         38         31.2         76         24.4         19.8         Anchor           North         Z-Net         37         5         29         12:26         148.51806         38         31.2         76         24.4         19.8         Anchor           North         Z-Net         37         5         29         12:36         148.52500         38         31.2         76         24.4         19.8         4         Anchor           North         CTD         58         5         29         12:59	North	CTD	54	5	29	08:57	148.37292	38	31.3	76	24.3	19.9	14.7	Anchor
North         Z-Net         35         5         29         11:04         148.46111         38         31.2         76         24.4         19.7         15         Anchor           North         Z-Net         36         5         29         11:11         148.46597         38         31.2         76         24.4         19.7         8         Anchor           North         Z-Trap         14         5         29         11:31         148.47986         38         31.2         76         24.4         19.7         8         Anchor           North         Z-Net         37         5         29         11:26         148.51806         38         31.2         76         24.4         19.8         Anchor           North         Z-Net         38         5         29         12:26         148.51806         38         31.2         76         24.4         19.8         8         Anchor           North         CTD         58         5         29         12:36         148.52907         38         31.3         76         24.4         19.8         14.2         Anchor           North         CTD         58         5         29 <t< td=""><td>North</td><td></td><td>55</td><td></td><td></td><td>09:57</td><td></td><td>38</td><td></td><td></td><td></td><td>19.9</td><td></td><td>Anchor</td></t<>	North		55			09:57		38				19.9		Anchor
North         Z-Net         36         5         29         11:11         148.46597         38         31.2         76         24.4         19.7         8         Anchor           North         Z-Trap         14         5         29         11:31         148.47986         38         31.2         76         24.4         19.7         8         Anchor           North         CTD         57         5         29         11:58         148.49861         38         31.2         76         24.4         19.8         Anchor           North         Z-Net         37         5         29         12:26         148.51806         38         31.2         76         24.4         19.8         15         Anchor           North         Z-Net         38         5         29         12:36         148.52500         38         31.2         76         24.4         19.8         8         Anchor           North         CTD         58         5         29         12:35         148.54097         38         31.3         76         24.3         19.8         14.2         Anchor           North         CTD         60         5         29														
North         Z-Trap         14         5         29         11:31         148.47986         38         31.2         76         24.4         19.7         8         Anchor           North         CTD         57         5         29         11:38         148.49861         38         31.2         76         24.4         19.8         Anchor           North         Z-Net         37         5         29         12:26         148.51806         38         31.2         76         24.4         19.8         8         Anchor           North         Z-Net         38         5         29         12:36         148.52500         38         31.2         76         24.4         19.8         8         Anchor           North         CTD         58         5         29         12:59         148.54097         38         31.3         76         24.4         19.8         8         Anchor           North         CTD         60         5         29         14:56         148.54097         38         31.3         76         24.3         19.8         14.2         Anchor           North         CTD         60         5         29         15:														
North         CTD         57         5         29         11:58         148.49861         38         31.2         76         24.4         19.8         Anchor           North         Z-Net         37         5         29         12:26         148.51806         38         31.2         76         24.4         19.8         15         Anchor           North         CTD         58         5         29         12:59         148.54007         38         31.3         76         24.4         19.8         8         Anchor           North         CTD         58         5         29         12:59         148.54007         38         31.3         76         24.3         19.8         14.2         Anchor           North         CTD         59         5         29         13:57         148.58125         38         31.3         76         24.3         19.8         14.5         Anchor           North         CTD         60         5         29         145.66         148.62222         38         31.3         76         24.3         19.9         15.25         Anchor           North         CTD         61         5         29 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>														
North         Z-Net         37         5         29         12:26         148.51806         38         31.2         76         24.4         19.8         15         Anchor           North         Z-Net         38         5         29         12:36         148.52500         38         31.2         76         24.4         19.8         8         Anchor           North         CTD         58         5         29         12:59         148.54097         38         31.3         76         24.3         19.9         14.2         Anchor           North         CTD         60         5         29         13:57         148.54125         38         31.3         76         24.3         19.9         15.25         Anchor           North         CTD         60         5         29         15:59         148.66597         38         31.3         76         24.3         19.9         15.25         Anchor           North         CTD         61         5         29         15:59         148.66597         38         31.3         76         24.3         19.9         15.25         Anchor           North         CTD         63         5													8	
North         Z-Net         38         5         29         12:36         148.52500         38         31.2         76         24.4         19.8         8         Anchor           North         CTD         58         5         29         12:59         148.54097         38         31.3         76         24.3         19.8         14.2         Anchor           North         CTD         59         5         29         13:57         148.58125         38         31.3         76         24.3         19.8         14.5         Anchor           North         CTD         60         5         29         14:56         148.62222         38         31.3         76         24.3         19.9         15.25         Anchor           North         CTD         61         5         29         15:59         148.66597         38         31.3         76         24.3         19.9         14.4         Anchor           North         CTD         62         5         29         16:58         148.70694         38         31.3         76         24.3         19.9         15         Anchor           North         CTD         63         5 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>15</td><td></td></t<>													15	
North         CTD         58         5         29         12:59         148.54097         38         31.3         76         24.3         19.8         14.2         Anchor           North         CTD         59         5         29         13:57         148.58125         38         31.3         76         24.3         19.8         14.5         Anchor           North         CTD         60         5         29         14:56         148.62222         38         31.3         76         24.3         19.9         15.25         Anchor           North         CTD         61         5         29         15:59         148.66597         38         31.3         76         24.3         19.9         15.25         Anchor           North         CTD         62         5         29         16:58         148.70694         38         31.3         76         24.3         19.9         14.4         Anchor           North         CTD         63         5         29         17:56         148.74722         38         31.3         76         24.3         19.9         15         Anchor           North         CTD         64         5														
North         CTD         59         5         29         13:57         148:58125         38         31.3         76         24.3         19.8         14.5         Anchor           North         CTD         60         5         29         14:56         148:62222         38         31.3         76         24.3         19.9         15:25         Anchor           North         CTD         61         5         29         15:59         148:66597         38         31.3         76         24.3         20.0         14.7         Anchor           North         CTD         62         5         29         16:58         148:70694         38         31.3         76         24.3         19.9         14.4         Anchor           North         CTD         63         5         29         17:56         148:74722         38         31.3         76         24.3         19.9         15         Anchor           North         CTD         64         5         29         18:54         148:78750         38         31.3         76         24.3         19.9         15         Anchor           North         Z-Net         39         5         <														
North         CTD         60         5         29         14:56         148.62222         38         31.3         76         24.3         19.9         15:25         Anchor           North         CTD         61         5         29         15:59         148.66597         38         31.3         76         24.3         20.0         14.7         Anchor           North         CTD         62         5         29         16:58         148.70694         38         31.3         76         24.3         19.9         14.4         Anchor           North         CTD         63         5         29         17:56         148.74722         38         31.3         76         24.3         19.9         15         Anchor           North         CTD         64         5         29         19:53         148.82847         38         31.3         76         24.3         19.9         15         Anchor           North         CTD         65         5         29         19:53         148.83889         38         31.3         76         24.3         19.9         15         Anchor           North         Z-Net         40         5 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>														
North         CTD         61         5         29         15:59         148.66597         38         31.3         76         24.3         20.0         14.7         Anchor           North         CTD         62         5         29         16:58         148.70694         38         31.3         76         24.3         19.9         14.4         Anchor           North         CTD         63         5         29         17:56         148.74722         38         31.3         76         24.3         19.9         15         Anchor           North         CTD         64         5         29         18:54         148.78750         38         31.3         76         24.3         19.9         15         Anchor           North         CTD         65         5         29         19:53         148.82847         38         31.3         76         24.4         19.8         15         Anchor           North         Z-Net         39         5         29         20:08         148.83889         38         31.3         76         24.4         19.8         15         Anchor           North         Z-Net         40         5														
North         CTD         62         5         29         16:58         148.70694         38         31.3         76         24.3         19.9         14.4         Anchor           North         CTD         63         5         29         17:56         148.74722         38         31.3         76         24.3         19.9         15         Anchor           North         CTD         64         5         29         18:54         148.78750         38         31.3         76         24.3         19.9         15         Anchor           North         CTD         65         5         29         19:53         148.82847         38         31.3         76         24.4         19.8         15         Anchor           North         Z-Net         39         5         29         20:08         148.83889         38         31.3         76         24.4         19.8         15         Anchor           North         Z-Net         40         5         29         20:18         148.84583         38         31.3         76         24.3         19.8         8         Anchor           North         Z-Trap         15         5														
North         CTD         64         5         29         18:54         148.78750         38         31.3         76         24.3         19.9         15         Anchor           North         CTD         65         5         29         19:53         148.82847         38         31.3         76         24.4         19.8         15         Anchor           North         Z-Net         39         5         29         20:08         148.83889         38         31.3         76         24.3         19.8         15         Anchor           North         Z-Net         40         5         29         20:18         148.8453         38         31.3         76         24.3         19.8         8         Anchor           North         Z-Trap         15         5         29         20:23         148.84931         38         31.3         76         24.3         19.8         8         Anchor           North         CTD         66         5         29         20:59         148.87431         38         31.3         76         24.3         19.7         15         Anchor           North         Z-Net         41         5         29	North	CTD	62	5	29	16:58	148.70694	38	31.3	76	24.3	19.9	14.4	Anchor
North         CTD         65         5         29         19:53         148.82847         38         31.3         76         24.4         19.8         15         Anchor           North         Z-Net         39         5         29         20:08         148.83889         38         31.3         76         24.3         19.8         15         Anchor           North         Z-Net         40         5         29         20:18         148.84583         38         31.3         76         24.3         19.8         8         Anchor           North         Z-Trap         15         5         29         20:23         148.84931         38         31.3         76         24.2         19.8         8         Anchor           North         CTD         66         5         29         20:59         148.87431         38         31.3         76         24.2         19.8         8         Anchor           North         Z-Net         41         5         29         21:22         148.89028         38         31.2         76         24.3         19.7         15         Anchor           North         Z-Net         42         5	North	CTD	63	5	29	17:56	148.74722	38	31.3	76	24.3	19.9	15	Anchor
North         Z-Net         39         5         29         20:08         148.83889         38         31.3         76         24.3         19.8         15         Anchor           North         Z-Net         40         5         29         20:18         148.84583         38         31.3         76         24.3         19.8         8         Anchor           North         Z-Trap         15         5         29         20:23         148.84931         38         31.3         76         24.2         19.8         8         Anchor           North         CTD         66         5         29         20:59         148.87431         38         31.3         76         24.3         19.7         15         Anchor           North         Z-Net         41         5         29         21:22         148.89028         38         31.2         76         24.3         19.7         15         Anchor           North         Z-Net         42         5         29         21:28         148.89444         38         31.2         76         24.3         19.7         8         Anchor           North         Z-Trap         16         5         <														
North         Z-Net         40         5         29         20:18         148.84583         38         31.3         76         24.3         19.8         8         Anchor           North         Z-Trap         15         5         29         20:23         148.84931         38         31.3         76         24.2         19.8         8         Anchor           North         CTD         66         5         29         20:59         148.87431         38         31.3         76         24.3         19.7         15         Anchor           North         Z-Net         41         5         29         21:22         148.89028         38         31.2         76         24.3         19.7         15         Anchor           North         Z-Net         42         5         29         21:28         148.89444         38         31.2         76         24.3         19.7         15         Anchor           North         Z-Trap         16         5         29         21:32         148.89444         38         31.2         76         24.3         19.7         8         Anchor           North         Z-Trap         16         5														
North         Z-Trap         15         5         29         20:23         148.84931         38         31.3         76         24.2         19.8         8         Anchor           North         CTD         66         5         29         20:59         148.87431         38         31.3         76         24.3         19.7         15         Anchor           North         Z-Net         41         5         29         21:22         148.89028         38         31.2         76         24.3         19.7         15         Anchor           North         Z-Net         42         5         29         21:28         148.89444         38         31.2         76         24.3         19.7         8         Anchor           North         Z-Trap         16         5         29         21:32         148.89722         38         31.2         76         24.3         19.7         8         Anchor           North         CTD         67         5         29         21:55         148.91319         38         31.2         76         24.3         19.7         8         Anchor           North         CTD         67         5         29														
North         CTD         66         5         29         20:59         148.87431         38         31.3         76         24.3         19.7         15         Anchor           North         Z-Net         41         5         29         21:22         148.89028         38         31.2         76         24.3         19.7         15         Anchor           North         Z-Net         42         5         29         21:28         148.89444         38         31.2         76         24.3         19.7         8         Anchor           North         Z-Trap         16         5         29         21:32         148.89722         38         31.2         76         24.3         19.7         8         Anchor           North         CTD         67         5         29         21:35         148.91319         38         31.2         76         24.3         19.7         8         Anchor           North         CTD         67         5         29         21:55         148.91319         38         31.2         76         24.3         19.5         15         Anchor           North         CTD         68         5         29 </td <td></td>														
North         Z-Net         41         5         29         21:22         148.89028         38         31.2         76         24.3         19.7         15         Anchor           North         Z-Net         42         5         29         21:28         148.89444         38         31.2         76         24.3         19.7         8         Anchor           North         Z-Trap         16         5         29         21:32         148.89722         38         31.2         76         24.3         19.7         8         Anchor           North         CTD         67         5         29         21:55         148.91319         38         31.2         76         24.3         19.5         15         Anchor           North         CTD         68         5         29         22:56         148.95556         38         31.1         76         24.3         19.8         15         Trawl           North         MOCNESS         1         5         29         23:15         148.96875         38         33.4         76         20.6         20.4         20         Trawl		•												
North         Z-Net         42         5         29         21:28         148.89444         38         31.2         76         24.3         19.7         8         Anchor           North         Z-Trap         16         5         29         21:32         148.89722         38         31.2         76         24.3         19.7         8         Anchor           North         CTD         67         5         29         21:55         148.91319         38         31.2         76         24.3         19.5         15         Anchor           North         CTD         68         5         29         22:56         148.95556         38         31.1         76         24.3         19.8         15         Trawl           North         MOCNESS         1         5         29         23:15         148.96875         38         33.4         76         20.6         20.4         20         Trawl														
North         Z-Trap         16         5         29         21:32         148.89722         38         31.2         76         24.3         19.7         8         Anchor           North         CTD         67         5         29         21:55         148.91319         38         31.2         76         24.3         19.5         15         Anchor           North         CTD         68         5         29         22:56         148.95556         38         31.1         76         24.3         19.8         15         Trawl           North         MOCNESS         1         5         29         23:15         148.96875         38         33.4         76         20.6         20.4         20         Trawl														
North         CTD         67         5         29         21:55         148.91319         38         31.2         76         24.3         19.5         15         Anchor           North         CTD         68         5         29         22:56         148.95556         38         31.1         76         24.3         19.8         15         Trawl           North         MOCNESS         1         5         29         23:15         148.96875         38         33.4         76         20.6         20.4         20         Trawl														
North CTD 68 5 29 22:56 148.95556 38 31.1 76 24.3 19.8 15 Trawl North MOCNESS 1 5 29 23:15 148.96875 38 33.4 76 20.6 20.4 20 Trawl														
North MOCNESS 1 5 29 23:15 148.96875 38 33.4 76 20.6 20.4 20 Trawl														
	North	CTD	69	5	30	00:11	149.00764	38	33.4	76	20.6	19.9	15	Trawl

Station		Cast					Degrees		Degrees		Depth	Depth	
#	Instrument	#	Month	Day	hhmm	DoY	(N)	Minutes	(W)	Minutes	(m)	(m)	Campaign
North	TT	10	5	30	00:15	149.01042	38	31.1	76	20.6	19.9	17	Trawl
North	CTD	70	5	30	01:58	149.08194	38	31.1	76	24.3	20.0	15	Trawl
North	TT	11	5	30	02:08	149.08889	38	31.1	76	24.4	19.9	17	Trawl
North	MOCNESS	2	5	30	02:50	149.11806	38	31.3	76	24.4	19.8		Trawl
North	CTD	71	5	30	05:00	149.20833	38	31.5	76	24.6	19.7	14	Trawl
North	TT	12	5	30	05:15	149.21875	38	31.5	76	24.3	19.7		Trawl
North	MOCNESS	3	5	30	05:45	149.23958	38	30.9	76	24.4	20.3		Trawl
North	CTD	72	5	30	07:56	149.33056	38	31.4	76	24.4	19.8	14.6	Trawl
North	TT	13	5	30	08:11	149.34097	38	31.4	76	24.4	19.8	15	Trawl
North	MOCNESS	4	5	30	08:38	149.35972	38	31.4	76	24.6	19.8	16	Trawl
North	CTD	73	5	30	10:58	149.45694	38	31.3	76	24.6	20.8	15.4	Trawl
North	TT	14	5	30	11:11	149.46597	38	31.3	76	24.4	20.8	18	Trawl
North	MOCNESS	5	5	30	11:46	149.49028	38	30.9	76	24.5	20.0	18	Trawl
North	CTD	74	5	30	13:59	149.58264	38	31.3	76	24.5	20.0	15.2	Trawl
North	TT	15	5	30	14:19	149.59653	38	31.3	76	24.4	20.0	18	Trawl
North	MOCNESS	6	5	30	14:51	149.61875	38	31.3	76	25.2	20.5	18	Trawl
North	MOCNESS	6B	5	30	16:05	149.67014	38	32.1	76	24.3	22.0	16	Trawl
North	CTD	75	5	30	17:00	149.70833	38	31.1	76	24.3	19.9	15.5	Trawl
North	TT	16	5	30	17:15	149.71875	38	31.1	76	24.3	19.9		Trawl
North	MOCNESS	7	5	30	18:05	149.75347	38	31.2	76	24.8	22.0		Trawl
North	CTD	76	5	30	20:01	149.83403	38	31.6	76	24.7	19.5	14.5	Trawl
North	TT	17	5	30	20:10	149.84028	38	31.6	76	24.7	19.5		Trawl
North	MOCNESS	8	5	30	20:45	149.86458	38	31.6	76	24.2	19.5		Trawl
North	CTD	77	5	30	22:53	149.95347	38	30.9	76	24.2	19.9	15.5	Trawl
North	TT	18	5	30	23:03	149.96042	38	31.1	76	24.5	19.9		Trawl
North	MOCNESS	9	5	30	23:56	149.99722	38	31.0	76	24.3	20.0	17	Trawl

# Sample Logs

Z-Ne	ts							
Cast #	Date	Time	Depth (m	) Red Codend	Green Code	nd	Commer	nts
1	26-May	4:35	17-10	5% Form	EPR			
2	26-May	4:45	10-0	5% Form	EPR			
3	26-May	6:04	17-6	5% Form	None			
4	26-May	6:22	6-0	5% Form	None		~ .	
5	26-May	7:40	3-0	Graze	Graze			Experiment
6	26-May	9:08	15-10	Graze	Graze		Grazing	Experiment
7 8	26-May	11:38	17-8 8-0	5% Form 5% Form	None			
9	26-May 26-May	11:48	8-0 17-8	5% Form	None None			
10	26-May	12:48 12:56	8-0	5% Form	None			
11	26-May	13:55	17-8	5% Form	None			
12	26-May	14:03	8-0	5% Form	None			
13	26-May	20:48	20-10	5% Form	None			
14	26-May	20:55	10-0	5% Form	None			
15	26-May	21:50	20-10	5% Form	None			
16	26-May	21:59	10-0	5% Form	None			
17	27-May	0:08	20-10	Didn't work	5% Form		Red Traj	p was open
18	27-May	0:21	10-0	5% Form	None			
19	27-May	1:30	20-10	5% Form	None			
20	27-May	1:40	10-0	5% Form	Live Sort			
21	27-May	2:48	20-10	5% Form	Live Sort			
22	27-May	2:54	10-0	5% Form	Live Sort			
23	28-May	20:16	15-7	None	5% Form			
24	28-May	20:25	7-0	5% Form	None			
25	28-May	21:47	15-7	None	5% Form			
26	28-May	21:58	7-0	5% Form	None			
27 28	29-May 29-May	3:33 3:37	15-8 8-0	5% Form 5% Form	None None			
29	29-May	4:55	15-8	None	5% Form			
30	29-May	5:03	8-0	5% Form	None			
31	29-May	6:10	15-8	None	5% Form			
32	29-May	6:17	8-0	None	5% Form			
33	29-May	7:19	15-8	None	5% Form			
34	29-May	7:26	8-0	5% Form	None			
35	29-May	11:04	15-8	None	5% Form			
36	29-May	11:11	8-0	5% Form	None			
37	29-May	12:26	15-8	None	5% Form			
38	29-May	12:36	8-0	5% Form	None		Holes fo	und in Green net
39	29-May	20:12	15-8	5% Form	Live Sort	_		
40	29-May	20:18	8-0	None	Live Sort ->		2 mls of	70 mls removed
41	29-May	21:22	15-8	5% Form	Live Sort/ R			
42	29-May	21:28	8-0	5% Form	Live Sort/ R	NA later		
43 44	29-May 29-May	22:08 22:14	15-8 8-0	None 5% form	5% Form None			
44	29-1VIay	22.14	0-0	3 /0 101111	None			
_								
Z-Tra	aps							
Cast #	Date		ime	Time End	Depth (m)	Red Cod		Green Codend
		May	5:00	5:45	10	Formalir	` /	Pictures/Acetone
		May	6:32	7:17	6	Formalir	` /	Pictures/Acetone
		May	11:52	12:37	8	Formalir	· /	None
		May	13:02	13:47	8	Formalin	` /	None
		May	21:00	21:45	10	Formalir	` /	None
		May	22:08 0:33	22:53 1:17	10 10	Didn't C Didn't C		Formalin (5%)
		May May	0:33 1:48	2:33	10	Formalir		Formalin (5%) Live Sort
		May	20:37	21:22	7	None	1 (3/0)	Formalin (5%)
1		May	22:04	22:49	10	Live Sor	t	Formalin (5%)
		May	3:55	4:40	15	None	•	Live Sort/preserve remaining
		May	5:14	5:59	15	Formalir	ı (5%)	Formalin (5%)
		May	6:26	7:11	10	None	()	Formalin (5%)
		May	11:31	12:16	8	Formalir	ı (5%)	None
1		May	20:23	21:08	8	Formalir		Live Sort
1	16 29-	May	21:32	22:02	8			

Tucke	r Traw	l Tows								
Date	Tow#	Net#	Start Time	Depths (m)	_	Date	Tow		Start Time	Depths (m)
27-May	T1	1	4:37	17-13		29-May	T10	1 2	23:00	17-14 14-11
		2		12-9				3		11-10
		3 4		13-8.5 8.5-0				4		9-0
27-May	Т2	1	7:15	19-15		30-May	T11	1	2:00	
27-May	12	2	7.13	15-13		,		2		
		3		11-7				3		
		4		7-0				4		
27-May	Т3	1	10:13	18-15		30-May	T12	1	5:00	
,		2		15-13				2		
		3		13-8				3		
		4		8-0				4		
27-May	T4	1	13:15	22-15		30-May	T13	1	8:08	
		2		15-11				2		
		3		11-5				3		
		4		5-0				4		
27-May	T5	1	16:10	20-15		30-May	T14	1	11:02	
		2		15-10				2		
		3		10-5				3		
		4		5-0				4		
27-May	T6	1	19:07	18-15		30-May	T15	1	14:00	
		2		15-10				2		
		3		10-7				3		
		4		7-0		20.14	T1.6	4	17.20	
27-May	T7	1	22:10	22-15		30-May	T16	1	17:20	
		2		15-10				2		
		3		10-6				3 4		
20.37	TT0	4		6-0		30-May	T17	1	20:00	
28-May	T8	1	1:25	25-14		30-iviay	11/	2	20.00	
		2		14-8				3		
		3		8-4 4-0				4		
28-May	Т9	1	3:40	22-12		30-May	T18	1	23:00	
20 May	1)	2	5.40	12-7		Ţ		2		
		3		7-4				3		
		4		4-0				4		
MOC		Net Tov	VS							
Date 29-May	Tow #	Net #	Start Time 23:16	End Time	Depths (m) 15	Wire Out (	(m)	Start Angle	End Angle	Vol. Filtered
29-May	1	1	25.10		15-12	23-17		49	45	39.3
		2 3			12-8 15-8	17-13 13-22		49	51 51	61.4
		4		23:36	8-4	12-8		51	54	34.3
		5 6			4-0 8-0	8-1 1-12-0		52 46		27.7 60.1
20.37			2 -					.0		00.1
30-May	2	0 1	2:51	2:58	15 15-12	18				37.2

Date	Tow#	Net # 2 3	Start Time 2:58 3:02	End Time 3:02 3:08	Depths (m) 12-9 15-9	Wire Out (m) 12.7 12.2	Start Angle 55 52	End Angle	Vol. Filtered 30.9 66.4
		4 5 6	3:08 3:11 3:14	3:11 3:14 3:20	9-6 6-0 9-0	11 1 14	51 45		34.9 34.1 60.5
30-May	3	0 1 2	5:45 5:51 5:55	5:51 5:55 5:58	15 15-12 12-10	18 12	50	39	32.7 35
		3	5:58 6:03	6:03 6:06	15-10 10-5	12 6	51 49		55 32.1
		5 6	6:06 6:10	6:10 6:15	5-0 10-0	0 12-0	45 48		34.3 60.8
30-May	4	0	8:38 8:43	8:43 8:46	16 16-12	25-19	51	53	36.1
		2	8:46	8:50	12-9	19-14	52	50	32.8
		3 4	8:50 8:55	8:55 8:59	16-9 9-4	14-25-15 15-8	52-51 52	56 56	60 36.8
		5	8:59	9:02	4-0	8-0	57	50	30.7
		6	9:02	9:07	9-0	0-15-0	50-54	48	57.4
30-May	5	0	11:46	11:52	18		4.0		
		1	11:52	11:55	18-14	25-21	48	52	35.7
		2 3	11:55 11:58	11:58 12:04	14-11 18-11	20-17 16-25-16	51 51-48	50 49	35.8 60
		4	12:04	12:04	11-6	15-10	50	50	37.5
		5	12:07	12:10	6-0	9-0	50	50	33.7
		6	12:10	12:16	11-0	0-17-0	50-55	46	60.6
30-May	6	0	14:51	15:03	18				
		1	15:03	15:06	18-15	26-23	58	50	34.4
		2	15:06	15:10	15-12	22-19	50	52	34.1
		3	15:10	15:15 15:18	18-12	18-25-20 19-14	52-50 57	57 56	57.6 34.5
		4 5	15:15 15:18	15:18	12-7 7-0	13-0	56	56 54	33.2
		6	15:21	15:27	12-0	0-18-0	54-58	53	58.8
30-May	6B	0	16:05	16:12	16				
		1	16:12	16:15	16-14	25-24	55	56	34
		2	16:15	16:18	14-10	23-19	56	50	30.6
		3 4	16:18 16:21	16:21 16:25	10-5 5-0	18-8 7-0	50 54	46 52	34.3 31.8
30-May	7	0	18:05	18:11	0-17	20		-	2 3.0
30 11149	,	1	18:11	18:14	17-12	20			32.2
		2	18:14	18:17	12-9	16-14	51		31.9
		3 4	18:17	18:22	17-9	14-20	48		52.2
		4	18:22	18:25	9-4	14-6	52-46		33.7
		5 6	18:25 18:34	18:34	4-0 9-0	1 12	45		32.2 60.6
30-May	8	0	20:45	20:49	0-17	20			22.1
		1	20:49	20:52	17-12	16	56		33.1
		2 3	20:52 20:55	20:55 21:00	12-9 17-9	14 20-14	48		30.1 60
		4	21:00	21:03	9-4	14	49		33.6
		5	21:03	21:06	4-0	6-0	46		30.1
		6	21:06	21:12	9-0	0-14	50		58.5
30-May	9	0	23:56	0:00	17	18	49		2.1
		1	0:00	0:03	17-11	20	49		34
		2 3	0:03	0:06	11-7 17-7	14-11	46 55		33 (?)
		3 4	0:06 0:11	0:11 0:15	17-7 7-4	11-20 10-7	55 53		57.5 33.1
		5	0:15	0:13	4-0	5-0	55		28.5
		6	0:18	0:23	7-0	10-0	50		56.8

Pump Casts

Date	Time	CTD#	Depths
28-May	16:00	37	14.4
-			1
29-May	15:00	60	15.25
-			1

Niskin Bottle Samples for Zooplankton

Niskir	Bottle	Sample	es for Z	ooplankton
Date	Time			# samples per depth
27-May	7:00	24	16.7	1
			11	1
			6	1
25.1	10.00	2.	2	1
27-May	10:00	26	20	1
			11	1
			6 2	1 1
27-May	13:00	28	19.5	1
27-iviay	13.00	20	17.3	1
			6	1
			2	1
27-May	16:00	29	18	1
			11	1
			6	1
			2	1
27-May	19:00	30	19	1
			11	1
			6	1
27-May	22.00	31	2	1 1
27-May	22:00	31	22 11	1
			6	1
			2	1
28-May	1:00	32	19.5	1
			11	1
			6	1
			2	1
28-May	3:30	33	20	1
			11	1
			6	1
20.37	22.55	4.5	2	1
28-May	23:55	45	14	1
			9	1 1
29-May	3:00	48	1 15	1
29-iviay	3.00	40	7	1
			2	1
29-May	13:00	58	14	2
			9	2
			1	2
30-May	2:00	70	15	1
			11	1
			6	1
20.14	5.00	71	2	1
30-May	5:00	71	15	1
			11	1 1
			6 2	1
30-May	8:00	72	15	1
50 1 <b>114</b>	0.00	, 2	11	1
			6	1
			2	1
30-May	11:00	73	15	1
-			12	1
			6	1
20.7.5			2	1
30-May	14:00	74	15	5
			10	1

Date	Time	CTD#	Depths	# samples per depth
			6	1
			2	1
30-May	17:00	75	15	1
-			10	1
			6	1
			2	1
30-May	20:00	76	13	1
			10	1
			6	1
			2	1
30-May	23:00	77	13	1
,			10	1
			6	1
			2	1