

**National Oceanography Centre, Southampton**

**Cruise Report No. 29**

**RV Ronald H. Brown Cruise RB0701**

21 MAR-10 APR 2007

RAPID mooring cruise report

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## DOCUMENT DATA SHEET

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<b>ABSTRACT</b> <p>This report describes the mooring operations conducted during RV <i>Ronald H. Brown</i> Cruise RB0701 conducted between 21 March 2007 and 10 April 2007.</p> <p>These mooring operations were completed as part of the United Kingdom Natural Environment Research Council (NERC) funded RAPID Programme to monitor the Atlantic Meridional Overturning Circulation at 26.5°N. The primary purpose of this cruise was to service the Western Boundary section of the 26.5°N mooring array first deployed in 2004 during RRS <i>Discovery</i> cruises D277 and D278 (SOC cruise report number 53), and serviced in 2005 during RRS <i>Charles Darwin</i> Cruise CD170 and RV <i>Knorr</i> Cruise KN182-2 (NOCS cruise report number 2), RRS <i>Charles Darwin</i> Cruise CD177 (NOCS cruise report number 5), and in 2006 on RV <i>Ronald H. Brown</i> Cruise RB0602, RRS <i>Discovery</i> Cruise D304 (NOCS cruise report number 16) and FS <i>Poseidon</i> Cruises P343 and P345 (NOCS cruise report number 28).</p> <p>Cruise RB0701 was from Charleston, SC to San Juan, Puerto Rico, and covered the Western Boundary moorings deployed on RB0602 (along with two landers deployed on KN182-2). This cruise is the third annual refurbishment of the Western Boundary section of an array of moorings deployed across the Atlantic in order to set up a pre-operational prototype system to continuously observe the Atlantic Meridional Overturning Circulation (MOC). This array will be further refined and refurbished during subsequent years.</p> <p>The instrumentation deployed on the array consists of a variety of current meters, bottom pressure recorders, CTD loggers and Inverted Echosounders, which, combined with time series measurements of the Florida Channel Current and wind stress estimates, will be used to determine the strength and structure of the MOC at 26.5°N. (<a href="http://www.noc.soton.ac.uk/rapidmoc">http://www.noc.soton.ac.uk/rapidmoc</a>)</p>	
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## TABLE OF CONTENTS:

1. SCIENTIFIC PERSONNEL .....	6
2. ITINERARY .....	7
3. ACKNOWLEDGMENTS.....	7
4. INTRODUCTION.....	7
5. MOORING OPERATIONS .....	10
5.1 DIARY OF EVENTS .....	10
5.2 ACOUSTIC RELEASES FAILURE REPORT .....	15
6. MOORING ARRAY DESIGN CHANGES.....	19
7. INSTRUMENTS .....	19
7.1 SUMMARY OF INSTRUMENTS RECOVERED AND DEPLOYED .....	19
7.2 INSTRUMENT PROBLEMS .....	20
8. INSTRUMENT CALIBRATION USING CTD CASTS .....	21
APPENDIX A: ADDITIONAL FIGURES	
APPENDIX B: INSTRUMENT SETUP DETAILS	
APPENDIX C: DETAILS OF INSTRUMENTS LOWERED ON CTD CALIBRATION CASTS	
APPENDIX D: INSTRUMENT RECORD LENGTHS	
APPENDIX E: MOORING LOGSHEETS	
APPENDIX F: NOC SENSORS & MOORINGS CRUISE REPORT FROM WB2 DEPLOYMENT FROM RV SEWARD JOHNSON 25 SEPTEMBER – 12 OCTOBER 2006	

## LIST OF TABLES:

TABLE 1.1: DETAILS OF SCIENTIFIC PERSONNEL (NON-SHIP STAFF).....	6
TABLE 5.1: MOORING DEPLOYMENT POSITIONS, TIMES AND ARGOS BEACON DETAILS.....	18
TABLE 7.1: SUMMARY OF INSTRUMENTS RECOVERED AND DEPLOYED.....	19
TABLE C.1: DETAILS OF INSTRUMENTS LOWERED ON CTD CALIBRATION CASTS .C1	
TABLE D.1: INSTRUMENT RECORD LENGTHS DETAILED BY MOORING.....	D1

## LIST OF FIGURES:

FIGURE A.1: WESTERN BOUNDARY MOORING LOCATIONS FROM 2007 DEPLOYMENT .....	A1
FIGURE A.2: WESTERN BOUNDARY MOORING ARRAY AS DEPLOYED 2007 .....	A2
FIGURE A.3: WBADCP AS DEPLOYED 2007 .....	A3
FIGURE A.4: WB1 AS DEPLOYED 2007 .....	A4
FIGURE A.5: WB2 AS DEPLOYED 2007 .....	A5
FIGURE A.6: WB4 AS DEPLOYED 2007 .....	A6
FIGURE A.7: WBL1 AS DEPLOYED 2007.....	A7
FIGURE A.8: WBL2 AS DEPLOYED 2007.....	A8
FIGURE A.9: WB6 AS DEPLOYED 2007 .....	A9

## 1. Scientific Personnel

**Table 1.1: Details of scientific personnel (non-ship staff)**

Name	Affiliation
Martha (Molly) Baringer	NOAA-AOML
Pedro Pena	NOAA-AOML
Carlos Fonseca	CIMAS – University of Miami
Andrew Stefanick	NOAA-AOML
Lisa Beal	RSMAS – University of Miami
Jonathan Molina	RSMAS – University of Miami
Shari Yvon-Lewis	Texas A&M University
Julia O'Hern	Texas A&M University
Lindsey Visser	Texas A&M University
Laura Rubiano-Gomez	Texas A&M University
Jaime Steichen	Texas A&M University
Torsten Kanzow	OOC – NOCS
Darren Rayner	OOC – NOCS
Harry Bryden	SOES – NOCS
Tycho Nout Huussen	SOES – NOCS
Angela Hibbert	POL - University of Liverpool
David Childs	NMFSS – NOCS
Christian Crowe	NMFSS – NOCS
Colin Hutton	NMFSS – NOCS
Stephen Whittle	NMFSS – NOCS
Robert McLachlan	NMFSS – NOCS

## 2. Itinerary

Depart Charleston, South Carolina, USA, 21<sup>st</sup> March 2007 – Arrive San Juan, Puerto Rico, 10<sup>th</sup> April 2007.

## 3. Acknowledgments

The officers and crew of the *RV Ronald H. Brown* were helpful throughout the cruise and with many being present on the previous Western Boundary cruise (NOCS Cruise Report, No. 16) the good relationships founded the previous year were continued on this cruise.

## 4. Introduction

Stuart Cunningham and Darren Rayner

RAPID-MOC is a joint UK/US programme to monitor the Atlantic Meridional Overturning Circulation at 26.5°N. There are three partners each contributing key observations. The Atlantic Oceanographic and Meteorological Laboratory (AOML) – part of the USA National Oceanic and Atmospheric Administration (NOAA) – leads a programme to monitor Florida Current transport using telephone cables. Frequent cruises are used to calibrate the cable measurements.

AOML also complete an annual CTD section across the Deep Western Boundary Current (DWBC) east of the Bahamas along 26.5°N to monitor long-term property changes.

The Rosenstiel School of Marine and Atmospheric Sciences (RSMAS), University of Miami maintains three moorings in the DWBC for transport measurements. The National Oceanography Centre, Southampton manages a transatlantic array of moorings to monitor the interior Atlantic circulation.

The goal of RAPID-MOC is to develop a pre-operational array to monitor the Atlantic Meridional Overturning Circulation at 26.5°N (<http://www.noc.soton.ac.uk/rapidmoc>). The programme is funded to make four years of continuous observations between 2004 and 2008.

This report describes the mooring operations conducted on cruise **RB0701** onboard the US RV *Ronald H. Brown*. The CTD section completed on RB0701 is not included.

RB0701 is the thirteenth cruise on which staff from the NOC have completed mooring operations as part of the Rapid-MOC project (see table 4.1). The array was first deployed in Spring 2004 with subsequent service cruises in Spring 2005, Autumn 2005, Spring 2006 and Autumn 2006. Details of previous cruise reports are given in Table 4.1.

Cruise RB0701 was led by Chief Scientist Molly Baringer and co-chief scientist Lisa Beal (as per cruise RB0602 the previous year). The three main objectives were to refurbish the UK western boundary moorings, complete an annual CTD

section across the DWBC and complete a Florida Current section for cable calibration.



**Table 4.1: Summary of previous RAPID-MOC cruises**

Cruise	Vessel	Date	Objectives	Cruise Report
D277	RRS Discovery	February - March 2004	Initial Deployment of Eastern Boundary and Mid-Atlantic Ridge moorings	RRS <i>Discovery</i> Cruise D277 and D278. Southampton Oceanography Centre Cruise Report, No 53, 2005
D278	RRS Discovery	March 2004	Initial Deployment of UK and US Western Boundary Moorings	RRS <i>Discovery</i> Cruise D277 and D278. Southampton Oceanography Centre Cruise Report, No 53, 2005
P319	RV Poseidon	December 2004	Emergency deployment of replacement EB2 following loss	Appendix in RRS <i>Charles Darwin</i> Cruise CD170 and RV <i>Knorr</i> Cruise KN182-2. National Oceanography Centre Southampton Cruise Report, No. 2, 2006
CD170	RRS Charles Darwin	April 2005	Service and redeployment of Eastern Boundary and Mid-Atlantic Ridge moorings	RRS <i>Charles Darwin</i> Cruise CD170 and RV <i>Knorr</i> Cruise KN182-2. National Oceanography Centre Southampton Cruise Report, No. 2, 2006
KN182-2	RV Knorr	May 2005	Service and redeployment of UK and US Western Boundary Moorings and Western Boundary Time Series (WBTS) hydrography section	RRS <i>Charles Darwin</i> Cruise CD170 and RV <i>Knorr</i> Cruise KN182-2. National Oceanography Centre Southampton Cruise Report, No. 2, 2006
CD177	RRS Charles Darwin	November 2005	Service and redeployment of key Eastern Boundary moorings	RRS <i>Charles Darwin</i> Cruise CD177. National Oceanography Centre Southampton Cruise Report, No. 5, 2006
WS05018	RV F.G. Walton Smith	November 2005	Emergency recovery of drifting WB1 mooring	No report published
RB0602	RV Ronald H. Brown	March 2006	Service and redeployment of UK Western Boundary moorings and WBTS hydrography section	RV <i>Ronald H. Brown</i> Cruise RB0602 and RRS <i>Discovery</i> Cruise D304. National Oceanography Centre Southampton Cruise Report, No. 16, 2007
D304	RRS Discovery	May - June 2006	Service and redeployment of Eastern Boundary and	RV <i>Ronald H. Brown</i> Cruise RB0602 and RRS <i>Discovery</i> Cruise D304. National Oceanography Centre Southampton Cruise Report, No. 16, 2007
P343	FS Poseidon	October 2006	Service and redeployment of key Eastern Boundary moorings	FS Poseidon Cruises P343 and P345. National Oceanography Centre Southampton Cruise Report No. 28, 2008.
P345	FS Poseidon	December 2006	Emergency redeployment of EB1 and EB2 following problems on P343	FS Poseidon Cruises P343 and P345. National Oceanography Centre Southampton Cruise Report No. 28, 2008.
SJ06	RV Seward Johnson	September – October 2006	Recovery and redeployment of WB2 and US Western Boundary moorings, and WBTS hydrography section	Appendix G in this report
RB0701	RV Ronald H. Brown	March - April 2007	Service and redeployment of UK Western Boundary moorings and WBTS hydrography section	This report

## 5. Mooring Operations

**Rob McLachlan & Chris Crowe**

All deployed mooring diagrams can be found in Appendix A, and mooring deployment and recovery logsheets can be found in Appendix E.

### 5.1 Diary of events

#### Monday 19<sup>th</sup> March

Arrived at the ship to start mobilisation at 08:30 local time.

The lorries with our kit arrived late, actually started mobilisation at 13:30.

#### Tuesday 20<sup>th</sup> March

Arrived at the ship at 09:00, signed on and then continued and completed the mobilisation. Meals were not catered for onboard so we had to go into town. All air freight, shipments from Seabird and Flotation Technologies arrived in good time.

#### Wednesday 21<sup>st</sup> March

First meal on board was breakfast.

Continued getting all our equipment in to a ready for sea state.

Double barrel winch, diverter sheave and counting sheave all welded down to deck plates.

Started getting instrumentation out and checked over, and started putting new batteries in the Seabirds Microcats.

Sailing was delayed by the ship until 18:30.

At 18:30 sailing was delayed again until 11:30am on 22/3/2007.

#### Thursday 22<sup>nd</sup> March

Continued with instrumentation preparation and sorting out deck equipment.

We sailed at 18:30 local time, again a delayed sailing time.

#### Friday 23<sup>rd</sup> March

All of the releases we sent out had their batteries installed and were tested: AR861 SN 253, AR861 SN 354, AR861 SN 364, RT661 SN 216, RT661 SN 223, AR861 SN 322, AR861 SN 327, AR861 SN 316, AR861 SN 264, and AR861 SN 687 (new unit).

Started hardware preparation, clumped anchors together, cut chain to lengths, roped Trymsyn buoys together, and spliced polypropylene rope on to new syntactic eyes.

Continued with instrumentation preparation, new batteries, checking of O rings, checking wire clamp sizes and bush/shackle sizes.

#### Saturday 24<sup>th</sup> March

Started sorting through wire and wound on WB2 ready for deployment.

Had a meeting with the captain to formulate a plan for the moorings, plan is to arrive at the ADCP sight at 18:00 local, we should have enough day light left for recovery.

The plan is then to do 2 CTD casts with instrumentation on as well as 3 releases (for

ADCP and WB1). The CTD's will take place regardless if we have time for the ADCP recovery.

The plan is to then continue with the recovery of WB1 and WB2 the following morning, then to commence with the deployments.

Made up BPR battery pack and looked in to building a new design 53 pack, checking configuration with Seabird.

#### Sunday 25<sup>th</sup> March

Wound on WB1 and WB4.

So far no problems reported with instruments.

#### Monday 26<sup>th</sup> March

Prepared machinery and deck ready for recovery operations.

Assembled Trimsyn floats, Stauff clamps for Argos beacons and assembled masts.

We cleared Bahamian immigration today.

Serviced and tested all lights, Novatech Argos beacons and SMM 500's.

Prepared CTD frame for Microcats and 3 off releases for wire test and calibration dip and continued preparation of RCM11's.

The serial numbers of the releases wire tested overnight are – SN687 (861), SN223 (661), SN253 (861). Test down to 3500m planned.

We trained Torsten to use the TT301 deck unit.

#### Tuesday 27<sup>th</sup> March

All of the releases worked OK on the wire test down to 5000m.

All Seabirds apart from one had a successful cal dip overnight.

#### **WBADCP Recovery**

We started interrogating the releases of WBADCP at 07:30 local time, we received good ranges and a confirmed release at 07:48. All on deck and secured at 08:45.

#### **WB1 Recovery**

We then headed to WB1 site and started interrogation of the releases at 09:27, SN245 gave good ranges but we received no reply from SN244. The mooring was released at 09:32. There was bad fouling on the top 24" steel and the 48" had very bad blistering of the paint. All on deck and secured at 11:20.

#### **WB2 Recovery**

We then headed to WB2 site and started interrogation of releases at 12:15. SN281 gave good ranges but SN369 gave no reply, we thought it would be worth trying to see if SN244 (failed release from recovered WB1) was actually on the wrong mooring, and we got ranges from it. THIS NEEDS INVESTIGATING AT A QUIETER TIME.

The mooring was released at 12:21. All went reasonably well and everything was on deck and secured at 15.03, local time.

Two of the RCM11s recovered had problems with the battery connectors coming off, one almost straight after deployment the other after a month. The problem is with the third party supplied battery packs. Foam has been placed in the units to deploy to prevent this from happening again.

The new layout of the glass spheres, having them in a single line and a meter apart, proved problematic with them coming up badly twisted and in big tangles. We had a

discussion and decided to stick with the layout but to reduce the distance between the spheres.

### **WBL1 Recovery**

We then made the decision to go and recover WBL1, we arrived at the site and started communicating with the releases at 15:40, communication was established giving good ranges and the lander was released at 15:42. It took around 50 minutes to surface and upon recovery the lines were badly twisted. Both of the BPRs had a full data set.

### Wednesday 28<sup>th</sup> March

For the WB1 deployment we will be using the following beacons:

30" syntactic: SMM 500, SN286, ID22442. Light SN NO8-O27.

41" steel: SMM 500, SN 285, ID60211. Light SN U11-O18.

Acoustic releases: AR861 SN687, RT661 SN223.

The overnight Cal dip for the Seabirds was successful all have full data sets.

We wire tested 4 releases over night, SNs 327, 316, 322 and 264 (all AR861 units), and all went down to 5000m. SN264 was not actually fired as there was some confusion about its presence on the frame. SNs 327 and 316 did not work. We had no response at all from the releases. So only SN322 worked, we will bench test the units and dip them again..

We recovered a lander for Bill Johns first thing.

There appears to be a problem with the batteries for the RCM11s: they drain too quickly on a continuous sample rate, as used on a cal dip. Investigation revealed that the cells used by the third party supplier in making the battery packs were not the same specification as those supplied previously, nor as the Aanderaa batteries. We made some packs up with spares we have with us and have asked Aanderaa to confirm if the third party supplied packs would be OK.

### **WBADCP Deployment**

We then prepared the ADCP for deployment; the ADCP was deployed in good time and we had to tow the mooring for around half a mile before releasing.

### **WB1 Deployment**

We then got everything ready for the deployment of WB1. The deployment went well and we had to tow the mooring for around an hour. A slip rope was used for the deployment of the long packs of 10 glass spheres. The ship chased the top sphere after anchor release and observed it submerge. The anchor position was then triangulated before we headed off to the next site.

Tonight's CTD cast will have on it the three releases that failed last night, we tried these on the deck and they worked fine, so we will give them one more chance. We will also send down SN364 (861). The dip is to 3500m.

Some seabirds will be on the frame as well.

### Thursday 29<sup>th</sup> March

The releases 264, 316 and 364 fired ok on the wire test. SN327 failed again, the deck unit indicated that it had received the release command but we never got a confirmed release indication.

We had to make our own RCM11 battery packs with the spares we have with us because Aanderaa confirmed that the third party supplied packs will not be sufficient.

### **WB2 Deployment**

We got everything ready and started the WB2 deployment. All went well. We used the ships air tugger to aid the slipping out of the large sphere packs, this worked really well. We had to tow for an hour or so again before releasing.

Whilst we were towing we built the lander for WBL1.

WB2's anchor was finally released and we followed the top buoy through the water and observed it go under.

### **WBL1 Deployment**

We deployed WBL1, mostly by hand, and using the ships winch and "A" frame to lift up the tripod and anchor assembly, all went well.

We then went back and triangulated the actual WB2 anchor position.

There was a cal dip for some Microcats overnight; we had also put on the frame two more releases, SNs 216 (661) and 354 (861), and gave SN327 another chance.

### Friday 30<sup>th</sup> March

Only SN216 (661) worked on the wire test. 354 and 327 both failed.

### **WBL2 Recovery**

Torsten released WBL2 early this morning, giving us time to get up and have breakfast before we started recovery as it took around an hour to surface.

Recovery went OK, there was a bit of a mess to contend with due to the ropes being all tangled but we got round it all fine.

### **WB4 Attempted Recovery**

We then headed to the WB4 site and began interrogating the releases. No communication could be established with the releases, trying all of the three deck units we had with us (one old and two new ones).

We tried communication and "blind" release firing for around three hours, manoeuvring the ship and trying different deck units all to no avail. We had three ranges from the releases during this time, one giving 10800m (rubbish), one giving 1459m (rubbish) and one giving 4862m, this one was the only believable range received.

It was then decided we should prepare for the deployment of WB4, first of all we had to service, re-battery and wire test an 861 release to go with the 661 that we wire tested last night. We decided to service, re-battery and wire test two releases, one extra for WBL2. SN 251 (from the WBL2 we recovered this morning) and SN 248 (from the ADCP we recovered the other day) were tested. Both units are 861s.

We decided to leave on the frame the releases that had failed last night, SNs 354 and 327 (327 hasn't worked on about three dips now).

All of the releases worked on deck, though there was some effort involved to get them to.

The wire test went down to 4500m, we were not getting anything back from any of the releases, eventually SN251 gave some ranges and then confirmed it had released. We switched to the other side of the ship and had a little success with ranges but no confirmation of them releasing.

We decided to call it a day and bring the releases back up.

We then tried again as the package was coming up and had success at around 3500 – 3700m. All of the releases gave confirmation of releasing.

The deck unit used to release them was one of the older ones and it was noted that we were now running it off of the 240V supply in the container and not in the lab where it was on 110V, and the low voltage light had gone out for the first time, (it had been permanently on whilst in the lab). Whether this was the difference we are not sure as we were having no luck with two other deck units as well and they hadn't been used until this point and so were fully charged.

We have also now been told that the 150 and 300 kHz ADCP's that are on the CTD frame, whilst not operating at a frequency near what we are using, do emit a low frequency noise whilst they are operating that we believe may be close to the frequency we are operating on. There is a possibility that this could be interfering with the signals.

Whilst the wire testing was going on we also readied WB4 for deployment.

We also decided to try and get the releases from WB1, (SN244, 861) and WB2, (SN369, 861) that had failed to communicate to work on deck. We couldn't get them going so we opened up SN244 and checked the batteries. They were not at full voltage but should have been good enough. We decided to try new batteries but we still could not get it to release, there were no obvious signs of damage.

We will do the same for SN369 when we get time.

The wire test has given us mixed results; SNs 251 and 248 had both fired and SNs 354 and (of course) 327 had both failed.

We have decided to pair up SN248 with the already tested 216 (661) for the WB4 deployment and use SN251 for the lander deployment.

#### **WB4 Deployment**

We then deployed the new WB4, all went well. We could not chase the top sphere through the water and observe it submerge as it was now dark.

The mooring anchor position was triangulated.

The plan was to search for the old WB4 overnight.

#### Saturday 31<sup>st</sup> March

The search for WB4 overnight was unsuccessful.

We then concentrated on building the lander, WBL2, ready for deployment tomorrow.

We had a general sort out on the deck and in the lab.

Sunday 1<sup>st</sup> April

**WBL2 Deployment**

Finished off getting the lander ready by clamping in the BPR and the light and VHF. We deployed the lander and all went well.

Monday 2<sup>nd</sup> April

We started by getting everything ready for WB6, coiled ropes in to baskets, readied glass and arranged hardware.

Two releases were also serviced and new batteries installed as well as bench tested. SN281 and 315 are now ready for a wire test; one of the two will be used on WB6.

Tuesday 3<sup>rd</sup> April

We started packing recovered kit away, dismantling buoys and steel spheres.

Wednesday 4<sup>th</sup> April

We continued with the packing away of kit that we don't need. We started caging up kit on deck.

Thursday 5<sup>th</sup> April

We carried out a wire test of the following releases – SNs 281, 315 and 354, all of the releases are 861 units.

The LADCP on the CTD frame was off.

SN 354 gave good ranges and indicated that the release command had been received but never gave a confirmation of release.

SN 315 gave no response until we switched deck units; we then started getting good ranges and confirmation of release.

SN 281 gave consistent good ranges and confirmation of release; it looks like we will be using this release for the WB6 deployment.

Upon recovery of the releases it was found that SN354 had failed, SN315 had fired and SN281 had also fired, we have decided to use SN281 as we had the best communication with this release.

**WB6 Deployment**

We then got everything ready for the WB6 deployment. The mooring was deployed by hand up to the tripod and anchor assembly where we used the "A" frame and the double barrel winch, and all went well.

That was the end of the UK mooring work for this cruise.

**5.2 Acoustic releases failure report**

**Mooring recovery release failures**

Releases from WB2:

SN369 (861), failed to respond to interrogation. SN281 (861), communicated well and was used to release the mooring.

SN369 (861) was tried on deck and would not respond, we opened the unit up and it was found to have leaked with corrosion evident.

Both of the releases on this mooring had new batteries installed and wire tested to 3500m on the Seward Johnson during the Bill Johns cruise in September/October 2006.

Releases from WB1:

SN244 (861), failed to respond to interrogation. SN245 (861), communicated well and was used to release the mooring.

SN244 was tried on deck and would not respond, we opened the unit up and measured the voltage, the three packs gave readings of 8.46V, 8.46V and 8.41V, they should have been 9.5V, so whilst there was a drop in voltage, this should have been more than enough to activate the release as it also has the 9V PP3 (measured at 9V) as backup.

The batteries were replaced and tried again, it still didn't work. There were no signs of any damage to the internals; the unit needs to be sent back to IXSEA for a complete investigation.

Release from WB4:

No communications. Unsure if release failure or mooring loss.

#### **Failure of releases on wire test.**

Overnight on the 26/3/2007 three releases were wire tested down to 3500m, SN687 (861), 223 (661) and 253 (861). All of the releases worked fine

Overnight on the 27/3/2007 four releases were wire tested to 5000m. The serial numbers were 327, 316, 322 and 264, all are 861 type releases.

Only SN322 worked.

SN264 was not fired – due to mistakenly thinking it wasn't on the cast.

SN327 and 316 did not work.

SN327, 316 and 264 were all tested on deck on the 28/3/2007 and all worked.

On the night of the 28/3/2007, SN327, 316, 264 and 364, all 861 units, were wire tested down to 3500m, all worked fine apart from SN327, this being the second time it has failed a wire test and it was tried on deck and worked fine. I believe that the LADCP was on.

Overnight on the 29/3/2007 a wire test of releases was carried out with SN216 (861), 354 (861) and 327 (861, third attempt). This time only SN216 worked. As previous we tried the failures on deck and they worked fine. I believe that the LADCP was on.

Overnight on the 30/3/2007, on a wire test to 4500m, SN354 and 327 were to be tried again along with SN251 and 248, all 861 units. All of the releases worked on deck. Only SN251 gave ranges and then confirmed it had released. At about 3500 – 3700m all of the releases gave confirmation of releasing.

SN251 and 248 both worked and SN327 and 354 both failed. SN327 for the fourth time and SN354 for the second. Both of these units require further investigation.



A final wire test on the night of the 5/4/07 tested the following releases – SNs 281, 315 and 354, all 861 units.

The LADCP on the CTD frame was off.

SN354 gave good ranges and indicated that the release command had been received but never gave a confirmation of release.

SN315 gave no response until we switched deck units; we then started getting good ranges and confirmation of release.

SN281 gave consistent good ranges and confirmation of release.

SN354 failed for the second time, SN315 and 281 worked ok.

### **Summary**

We have experienced two releases that have failed a wire test; both of them work fine on deck. Both of the units are the 861 type and were sent to the Brown from NOC where they were serviced and function tested. They had new batteries installed on the Brown and another function test on each was successful, so for some reason these units are not working under pressure.

We have had two releases from moorings that we have recovered that have failed, one from WB1 and one from WB2. The one from WB1 (SN244, 861) does not appear to have any visible damage, yet it does not respond to communication. The release from WB2 (SN369, 861) was opened up and found to have leaked.

It has been quite a struggle to communicate with releases on the CTD frame during wire tests. It is possible that we were experiencing bad acoustics. One problem that has presented itself is that the LADCPs emit a sound during the wire test, not the 300 kHz that they operate but an audible sound that the CTD operator believes may be an issue.

Failure of establishing communication with WB4 is our biggest worry. At the moment there are three possible explanations, one is that the mooring isn't there any longer, possibly dragged or caught in fishing gear, this is hard to believe as the chances are the mooring would have parted rather than being moved (1600kg anchor). We did receive an Argos alert about a month after deployment but there was no position so we are unsure if it was valid. The second possibility is that both releases have failed which is also unlikely. The third possibility is that the anchor was under weight for the high currents that can pass through this area.

**Table 5.1: Mooring deployment positions, times and Argos beacon details**

Mooring	NMFD mooring number	Deployment Cruise	Anchor Drop Position		Anchor Seabed Position		Corrected Water Depth (m)	Deployment Date	Deployment Time (GMT)	Argos ID *
			Latitude N	Longitude W	Latitude N	Longitude W				
WB6	2007/07	RB0701	26° 30.020'	70° 31.213'			5498	5/4/07	17:57	
WB4	2007/03	RB0701	26° 32.262'	76° 08.643'	26° 32.268'	76° 08.892'	4824	31/3/07	01:34	42749 & 22443
WBL4	2006/05	RB0602	26° 30.02'	76° 02.95'			4810	22/3/06	22:22	
WBL2	2007/06	RB0701	26° 31.039'	76° 08.856'			4821	1/4/07	18:16	
WB2	2007/02	RB0701	26° 30.568'	76° 44.418'	26° 30.618'	76° 44.604'	3892	29/3/07	19:37	24329 & 11443
WBL3	2006/08	RB0602	26° 30.42'	76° 44.66'				24/3/06	01:18	
WBL1	2007/05	RB0701	26° 30.383'	76° 44.675'			3888	29/3/07	20:42	
WB1	2007/01	RB0701	26° 29.971'	76° 49.151'	26° 29.940'	76° 49.248'	1403	28/3/07	22:02	22442 & 60211
WBADCP	2007/04	RB0701	26° 31.483'	76° 52.169'			601	28/3/07	17:37	11033

\* If 2 Argos IDs, first is upper beacon

## 6. Mooring Array Design Changes

Darren Rayner

The designs of the moorings deployed on this cruise have evolved through the Rapid-MOC programme in response to mooring losses and changes in the scientific objectives of each individual mooring. Prior to this cruise the changes have been summarised in NOCS Cruise Report No. 16.

For the tall moorings deployed on this cruise, there have been changes in the buoyancy distribution to provide a support depth of around 1000m should the top buoyancy be lost.

WB2 had a redistribution of the current meters to provide a better vertical resolution above 800m. This meant the instruments at 3000m and 3750m were removed and inserted at 175m and 400m. Following results from the first year of the array it was realised that the bottom of WB2 may have been shielded from the main currents by an outcrop of bathymetry, so the current meters at this depth would be more useful elsewhere.

Following assessment of the data obtained during the project and discussions over the effect of the Antarctic Bottom Water (AABW) flow along the western flank of the Mid-Atlantic ridge, it was decided to extend the Western Boundary sub-array further offshore and, on the subsequent Eastern Boundary/Mid-Atlantic service cruise, extend the Mid-Atlantic Ridge sub-array to the west. In the Western Boundary sub-array WB6 was deployed at a depth of 5500m to allow the density driven geostrophic flow in the western basin to be measured deeper, when combining measurements with the planned MAR0 mooring to be deployed in Autumn 2007.

## 7. Instruments

Darren Rayner

### 7.1 Summary of Instruments Recovered and Deployed

Table 7.1 gives a summary of the instruments recovered and deployed on cruise RB0701. Appendix D gives more detailed information on which instruments were recovered from each mooring along with a summary of the length of record obtained. Complete setup details of deployed instruments can be found in Appendix B.

**Table 7.1: Summary of instruments recovered and deployed.**

Instrument type	Manufacturer and model	Total intended for recovery	Total recovered	Total lost	Total deployed
CTD	Seabird SBE37 SMP Microcat	46	31	15	31
	Seabird SBE37 IMP Microcat	0	n/a	n/a	18
Single point current meter	Aanderaa RCM11	13	8	5	17
	Interocean S4	4	2	2	0
Current profiler	RD Instruments 75kHz Longranger ADCP	1	1	0	1
BPR	Seabird SBE26	2	2	0	4
	Seabird SBE53	2	2	0	0

## 7.2 Instrument Problems

This section details problems encountered with instruments both recovered and deployed, and builds on previous problems detailed in SOC Cruise Report No. 53 (D277/278), NOCS Cruise Report No. 2 (CD170/KN182-2), NOCS Cruise Report No. 5 (CD177), NOCS Cruise Report No.16 (RB0602/D304) and NOCS Cruise Report No. 28 (P343/P345).

### Recovered Instruments

There were very few problems with recovered instruments on this cruise; one flooded Microcat (serial number 3909 from WB1), two short RCM11 records on WB2 (serial numbers 445 – approx 42 days, and 303 – no data), and four Microcats from WB1 that stopped approximately three months early due to depleted batteries (serial numbers 3905, 3906, 3907 and 3908).

The short Microcat records were expected following the change in SMP Microcat firmware discovered on D304 (two months after the RB0602 deployments). The short RCM11 records were caused by the battery connectors popping off the terminals. This was due to the third party supplied battery packs being slightly shorter than the original Aanderaa packs, meaning the terminal connections could be pushed off by the base of the electronics section. For the subsequent deployments all RCM11s had a piece of foam padding taped behind the battery and the battery securely taped in place. This should prevent any movement and keeps the vulnerable terminals away from the electronics.

Otherwise there were only minor problems with some Microcat conductivity sensors but this was caused by heavy fouling of the instruments.

### Deployed Instruments

A significant problem was found with the battery packs supplied from a third party for the Aanderaa RCM11s. When downloading data from a pre-deployment calibration cast, several of the instruments were seen to have very short records. The battery packs were new and at first it was thought a bad cell in the packs could be causing the problem. However subsequent inspection found that when the instruments were set to log continuously they would only log data for a few records and then the DSU would stop updating.

Peeling back the heat-shrink battery covering revealed the individual cells were not as previously supplied, nor the same as used in the Aanderaa packs. The D-cells used in the new packs were of type SAFT LS33600 instead of SAFT LSH-20. Although the LS33600 cells have a higher nominal capacity, they have a much lower maximum current drain. This lower power rating meant that the continuous sampling of the RCM11 was not allowing the battery to recover between samples and subsequently the DSU could not draw enough power to record measurements.

Aanderaa were contacted to check if these packs could be used for a normal mooring deployment where the battery may slightly recover between the 30-minute sampling interval, but their reply confirmed our thoughts that the battery packs were unusable. Luckily sufficient spare lithium D-cells (SAFT LSH-20) had been sent to the cruise and packs were made on board using the spare cells with diodes and connectors stripped from the unusable packs.

Had this change in the cell specifications not been spotted there would have been complete data loss from current meters on this deployment. This combined with the problem of battery connectors being knocked off the terminals, mean that no third-party battery packs should be used in the future.

## 8. Instrument Calibration Using CTD Casts

Darren Rayner

The Ship's CTD system was used to lower instruments, both prior to deployment and following recovery of previously deployed moorings. New instruments or those sent from stock were primarily "dipped" to perform a functionality check, but also to provide a start-point calibration for conductivity and temperature. When a recovered instrument is redeployed the post-deployment cast also acts as the pre-deployment calibration for the subsequent data set.

Recovered instruments are sometimes affected by bio-fouling, and also have their own inherent drift in sensor performance. By obtaining end-point calibrations and combining these with the start-point calibrations obtained from the deployment cruise, the drift of the conductivity and temperature sensors can be corrected.

The calibration is of most use for the Seabird Microcat CTDs, but the same procedure can be used on the RCM11 current meters as pre-deployment functionality checks. This was found to be especially important on this cruise as problems with the battery packs would not have been found if this lowering on the CTD frame was not conducted (see details in section 7.2).

Instruments were set to the fastest possible sampling rate, attached to the CTD frame and lowered to depth as per a normal CTD cast – post deployment casts were only conducted once the data had been downloaded and checked. Bottle stops on the upcast were extended to 5 minutes to provide time for the instruments to stabilise relative to the faster responding ship's CTD.

12 bottles were removed from the CTD rosette to accommodate the instruments which for this cruise were attached on ratchet straps (Microcats) or clamped in place of the bottle using hose clamps (RCM11s). All instruments were also lashed by safety lines to the CTD frame. Details of which instruments were lowered on each CTD cast are given in Appendix C.

## Appendix A: Additional Figures

Figure A.1: Western Boundary Mooring Locations from 2007 Deployment

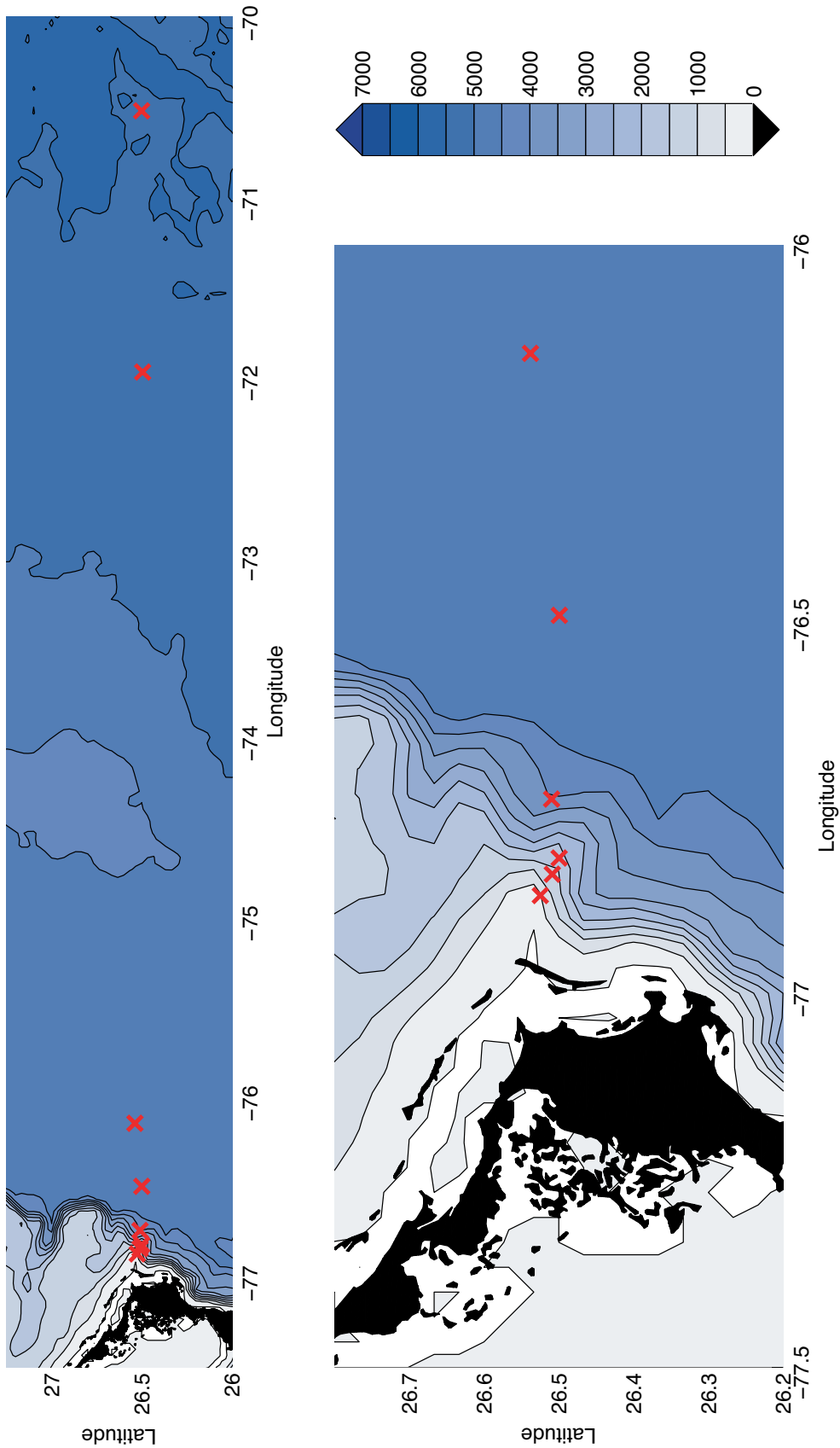


Figure A.2: Western Boundary Mooring Array as Deployed 2007

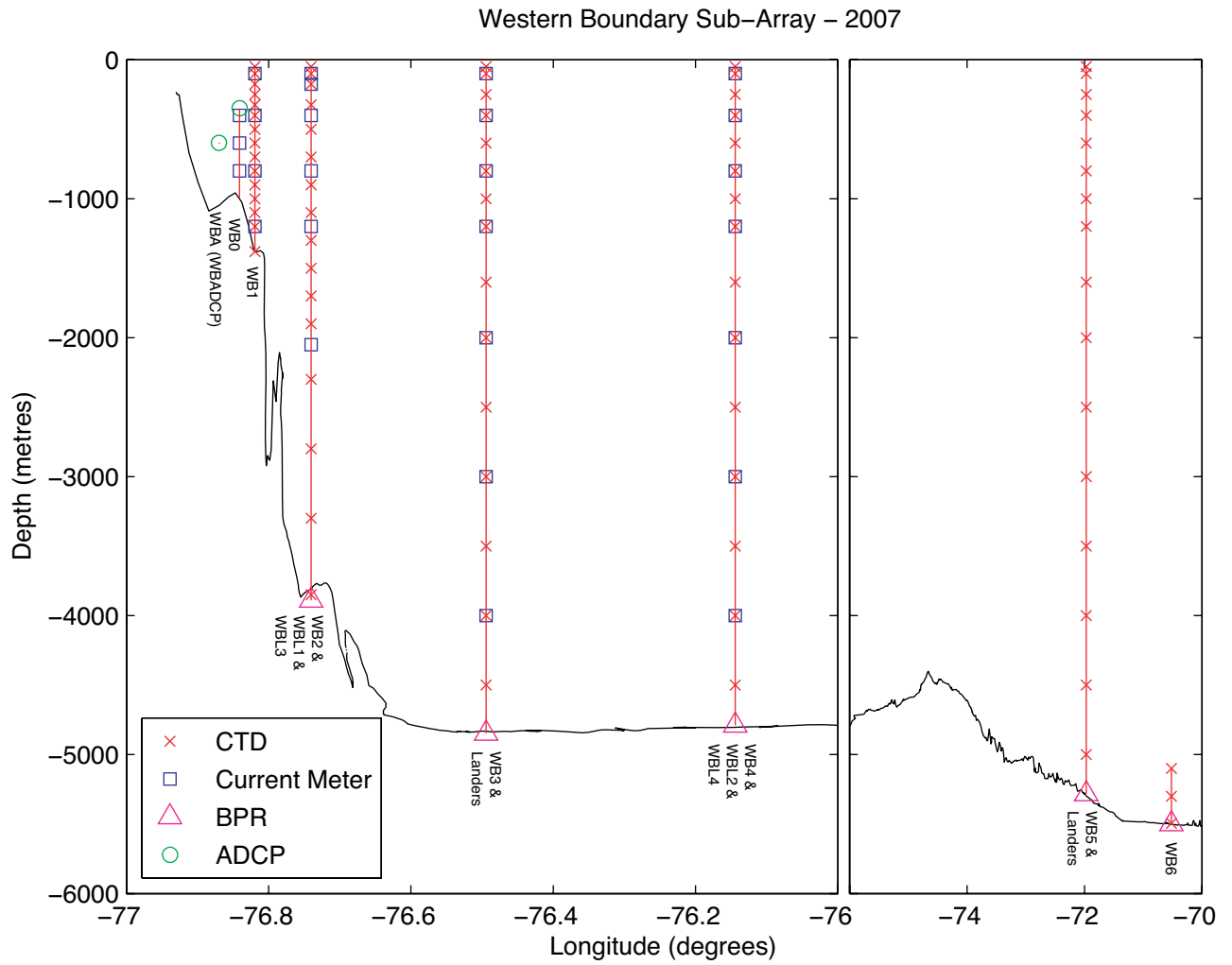


Figure A.3: WBADCP as Deployed 2007

ADCP WEST  
2007/04  
AS DEPLOYED  
RON BROWN  
2007



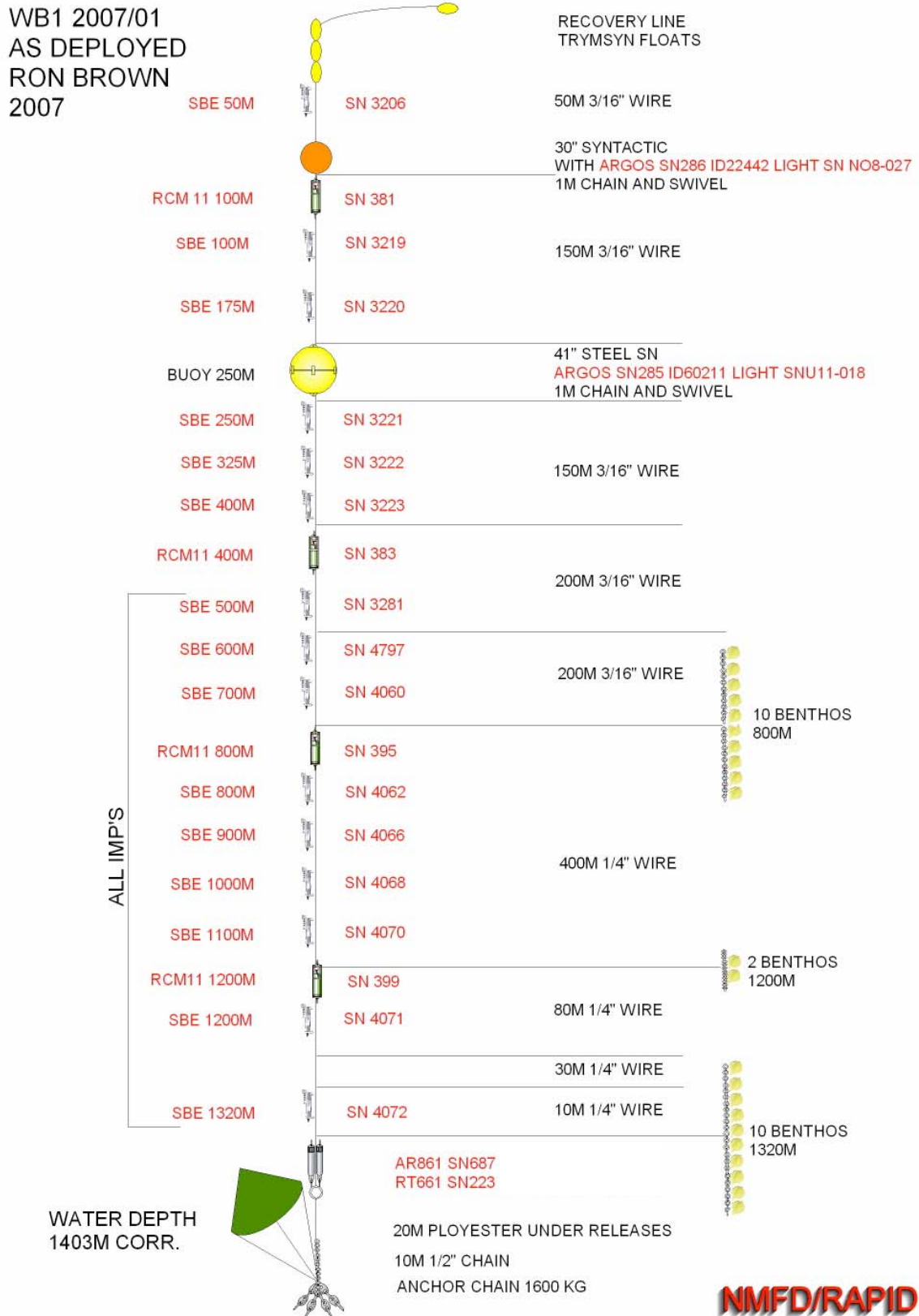
All shackles 3/4 pin

WATER DEPTH  
601M CORR.

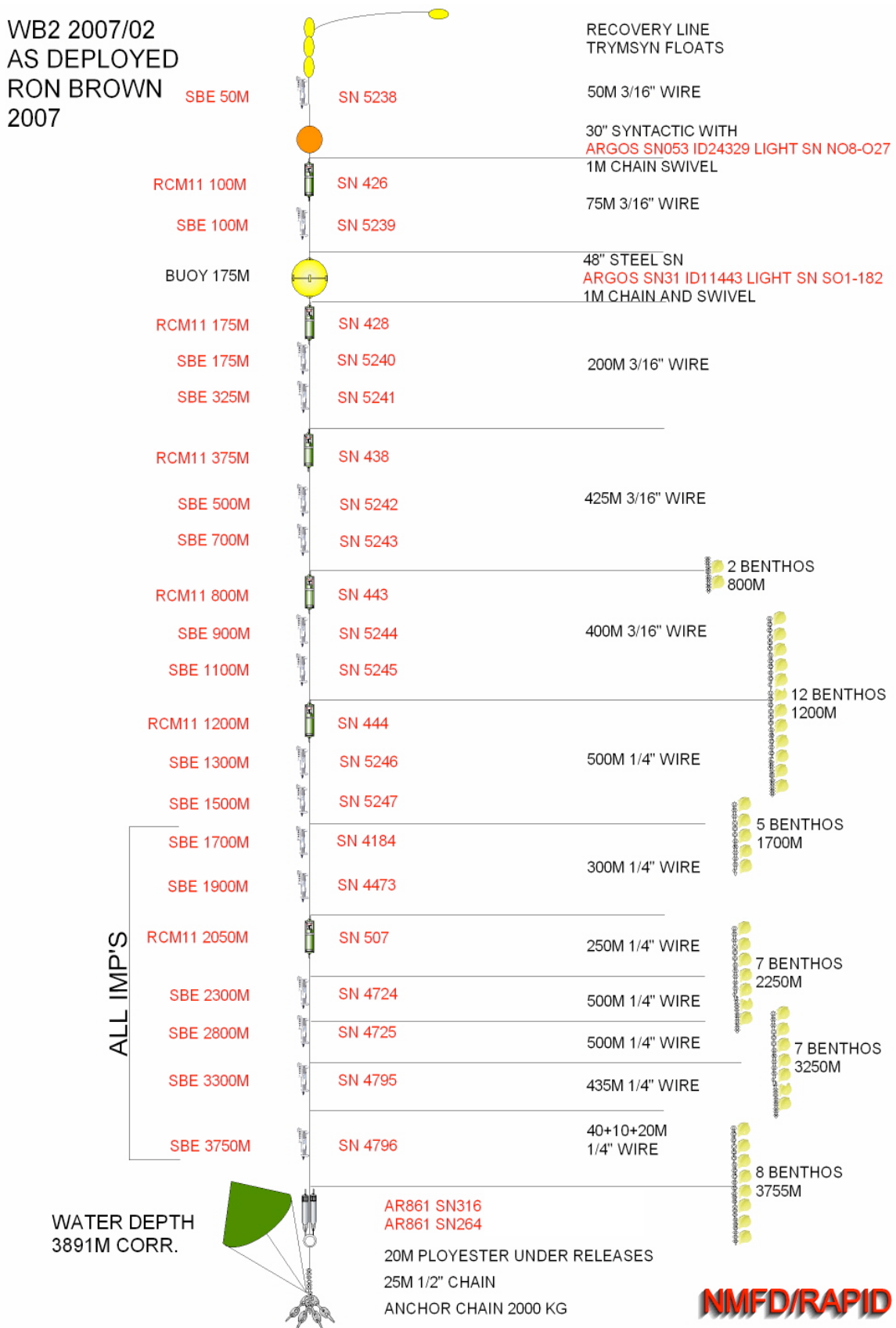
**NMFD/RAPID**



**Figure A.4: WB1 as Deployed 2007**



**Figure A.5: WB2 as Deployed 2007**



**Figure A.6: WB4 as Deployed 2007**

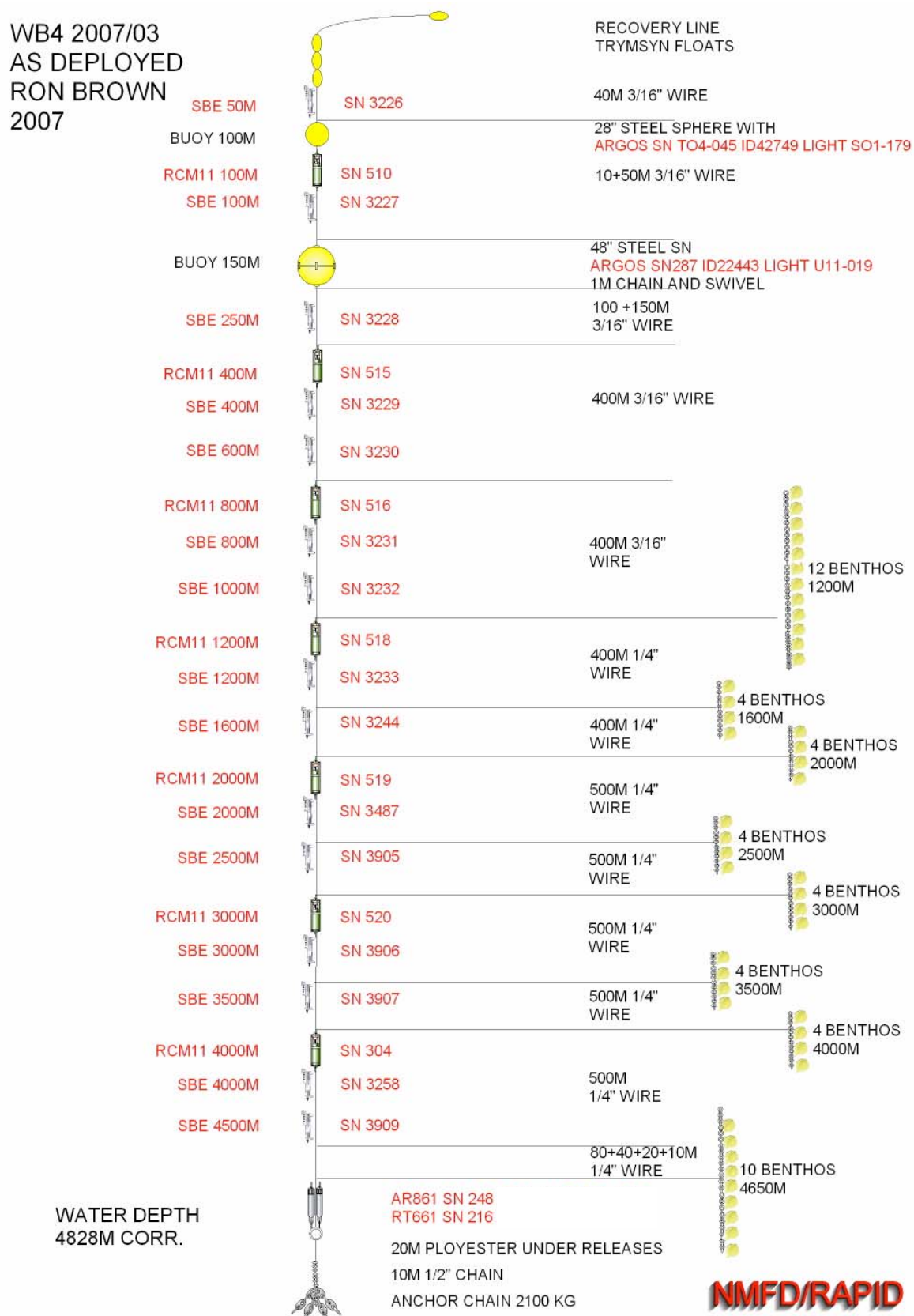
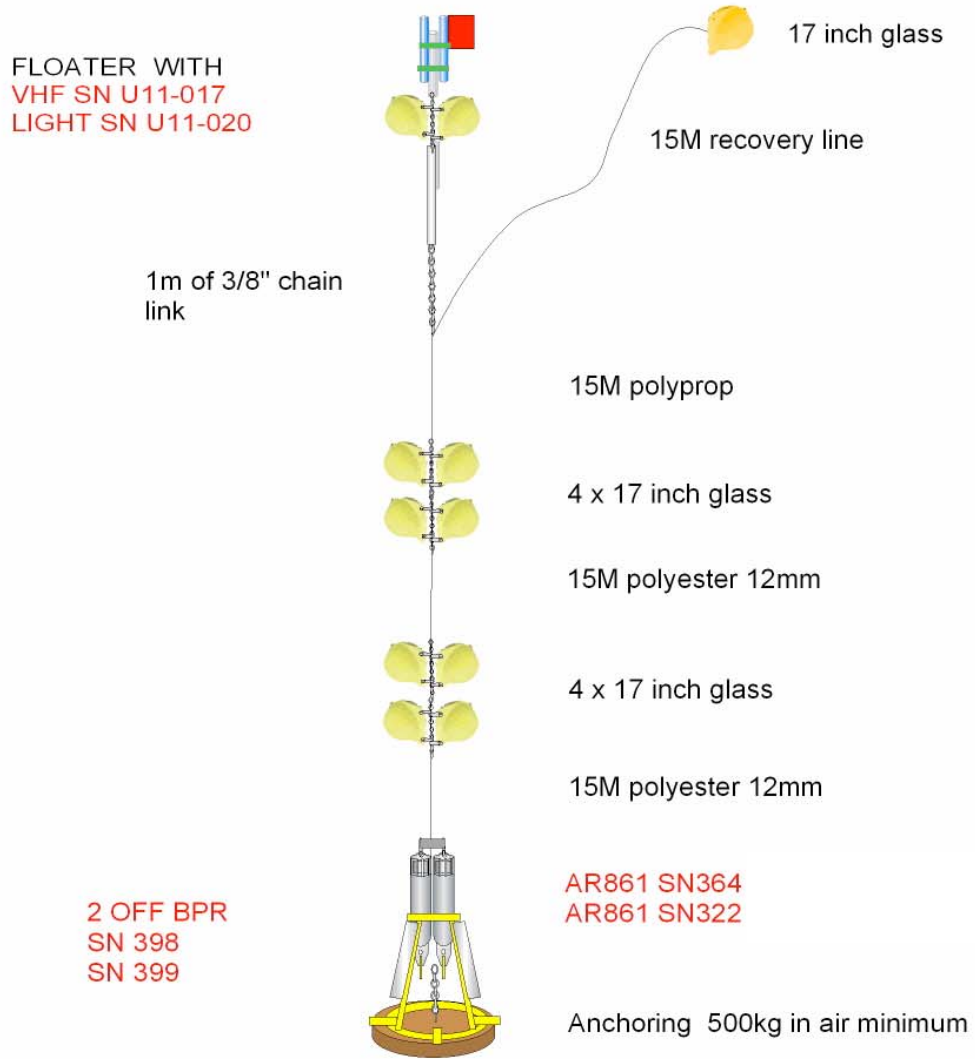


Figure A.7: WBL1 as Deployed 2007

**WBL1 2007/05  
AS DEPLOYED  
RON BROWN**



WATER DEPTH  
3882M CORR.

**NMFD/RAPID**

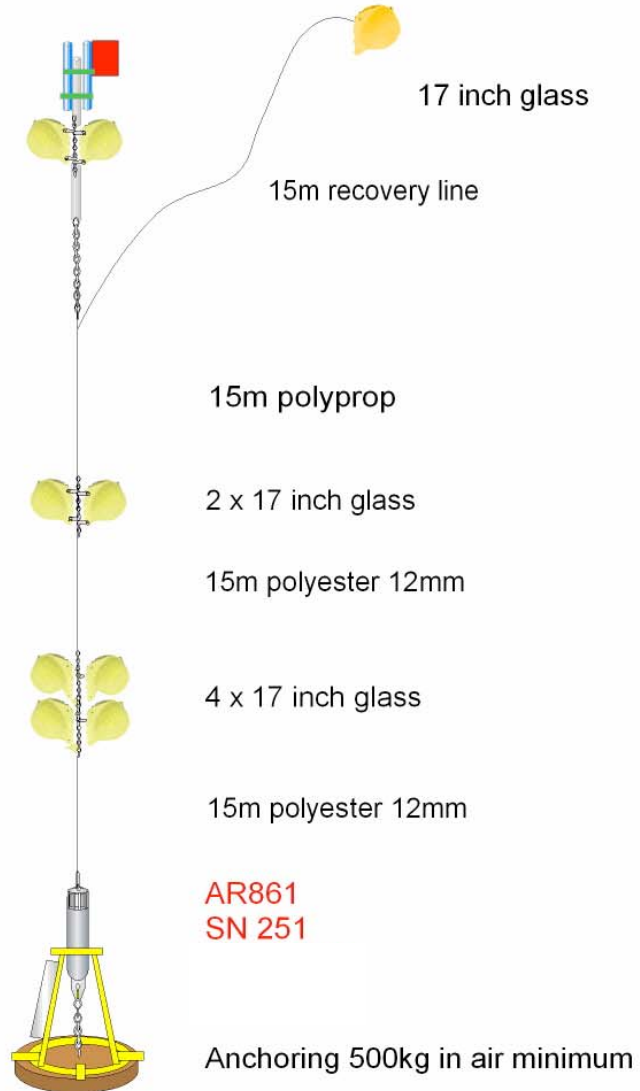
Figure A.8: WBL2 as Deployed 2007

**WBL2 2007/06  
AS DEPLOYED  
RON BROWN**

FLOATER WITH  
VHF SN TO1-140  
LIGHT SN UO1-027

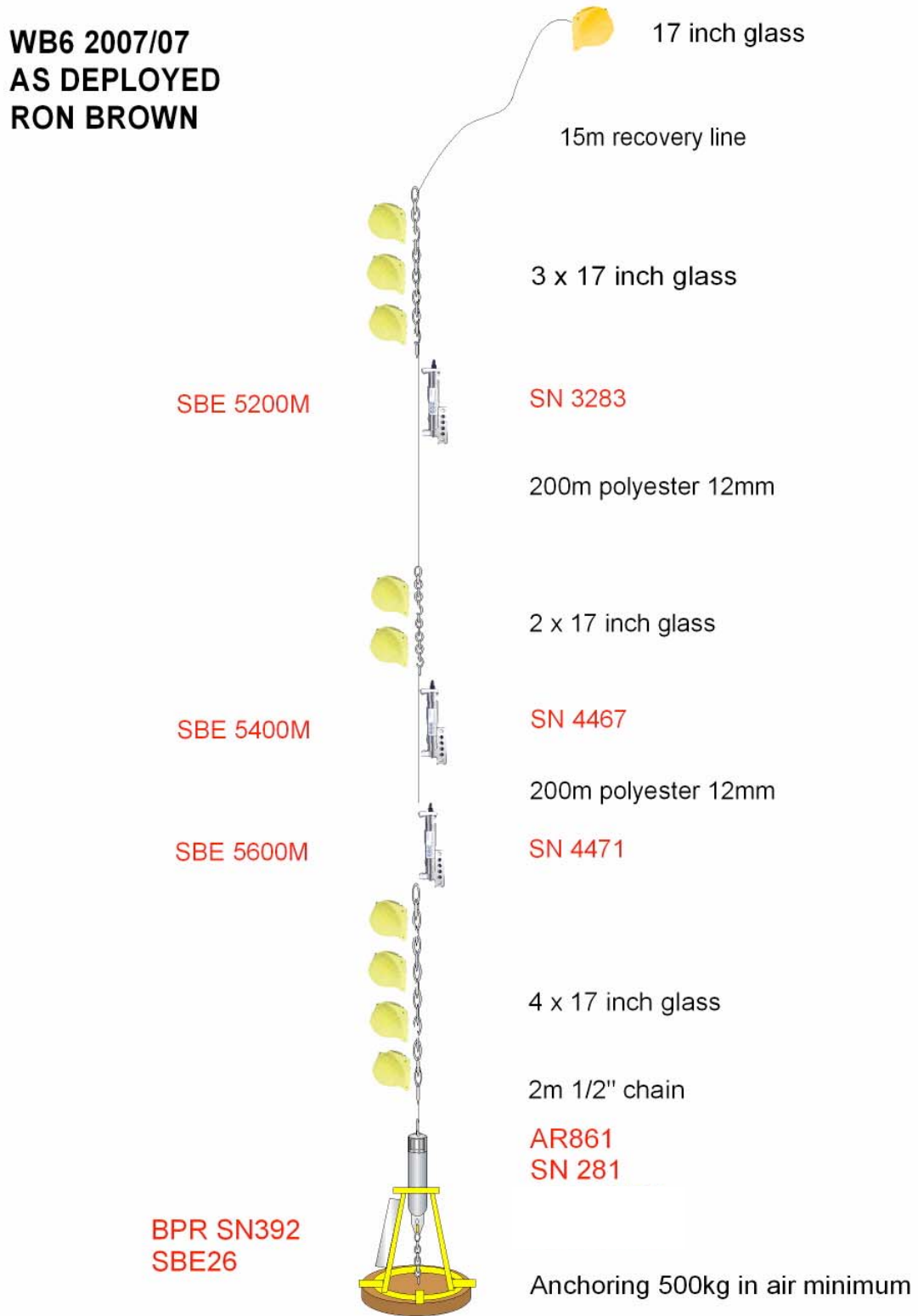
1m of 3/8" chain  
link

BPR SN 0393



**NMFD/RAPID**

**Figure A.9: WB6 as Deployed 2007**



**NMFD/RAPID**

## Appendix B: Instrument Setup Details

### WBADCP

RD Instruments 75kHz Workhorse Longranger ADCP – Serial Number **5817**

System frequency	76.8kHz
Beam angle	20 degrees
Transmit power	High
Water salinity	36ppt
Depth of transducer	600m
Heading alignment	0
Heading bias	0
Mode 1 bandwidth	Narrow
WT Pings per ensemble	10
Depth cell size	16.00m
Number of depth cells	40
Blank after transmit	7.04m
Pings per ensemble	10
Ambiguity velocity	170cm/s
Time between ping groups	3 mins
Time per ensemble	00:30:00
Start date	26/03/07
Start time	16:30:00
Deployment name	Dpl2

### WB1

Seabird SBE37 SMP CTD – serial number **3206**

Sample interval	1800 seconds
Start date	28/03/07
Start time	13:00:00
Number of samples to average	1

Aanderaa RCM11 – serial number **381**

Pings per ensemble	600
Temperature range	High
Conductivity range	48-57
Recording interval	30
No of channels	8
Mode	Burst
DSU serial number	14377
Instrument started	28/03/07 17:31:00

Seabird SBE37 SMP CTD – serial number **3219**

Sample interval	1800 seconds
Start date	28/03/07
Start time	13:00:00
Number of samples to average	1

Seabird SBE37 SMP CTD – serial number **3220**

Sample interval	1800 seconds
Start date	28/03/07
Start time	13:00:00
Number of samples to average	1

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Rapid Mooring Cruise Report for RB0701 – March-April 2007

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Seabird SBE37 SMP CTD – serial number **3221**

Sample interval 1800 seconds  
Start date 28/03/07  
Start time 13:00:00  
Number of samples to average 1

Seabird SBE37 SMP CTD – serial number **3222**

Sample interval 1800 seconds  
Start date 28/03/07  
Start time 13:00:00  
Number of samples to average 1

Seabird SBE37 SMP CTD – serial number **3223**

Sample interval 1800 seconds  
Start date 28/03/07  
Start time 13:00:00  
Number of samples to average 1

Aanderaa RCM11 – serial number **383**

Pings per ensemble 600  
Temperature range High  
Conductivity range 44-51  
Recording interval 30  
No of channels 8  
Mode Burst  
DSU serial number 14379  
Instrument started 28/03/07 17:45:00

Seabird SBE37 IMP CTD – serial number **3281**

Inductive ID 38  
Sample interval 1800 seconds  
Start date 28/03/07  
Start time 17:00:00

Seabird SBE37 IMP CTD – serial number **4797**

Inductive ID 37  
Sample interval 1800 seconds  
Start date 28/03/07  
Start time 17:00:00

Seabird SBE37 IMP CTD – serial number **4060**

Inductive ID 67  
Sample interval 1800 seconds  
Start date 28/03/07  
Start time 13:00:00

Seabird SBE37 IMP CTD – serial number **4062**

Inductive ID 22  
Sample interval 1800 seconds  
Start date 28/03/07  
Start time 13:00:00

Aanderaa RCM11 – serial number **395**

Pings per ensemble 600  
Temperature range Low



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Rapid Mooring Cruise Report for RB0701 – March-April 2007

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Conductivity range 34-41  
Recording interval 30  
No of channels 8  
Mode Burst  
DSU serial number 7871  
Instrument started 28/03/07 18:00:00

Seabird SBE37 IMP CTD – serial number **4066**

Inductive ID 07  
Sample interval 1800 seconds  
Start date 28/03/07  
Start time 13:00:00

Seabird SBE37 IMP CTD – serial number **4068**

Inductive ID 09  
Sample interval 1800 seconds  
Start date 28/03/07  
Start time 13:00:00

Seabird SBE37 IMP CTD – serial number **4070**

Inductive ID 01  
Sample interval 1800 seconds  
Start date 28/03/07  
Start time 13:00:00

Aanderaa RCM11 – serial number **399**

Pings per ensemble 600  
Temperature range Low  
Conductivity range 32-35  
Recording interval 30  
No of channels 8  
Mode Burst  
DSU serial number 14383  
Instrument started 28/03/07 18:00:00

Seabird SBE37 IMP CTD – serial number **4071**

Inductive ID 12  
Sample interval 1800 seconds  
Start date 28/03/07  
Start time 13:00:00

Seabird SBE37 IMP CTD – serial number **4072**

Inductive ID 13  
Sample interval 1800 seconds  
Start date 28/03/07  
Start time 13:00:00

**WB2**

Seabird SBE37 SMP CTD – serial number **5238**

Sample interval 1800 seconds  
Start date 29/03/07  
Start time 13:30:00  
Number of samples to average 1

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Rapid Mooring Cruise Report for RB0701 – March-April 2007

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Aanderaa RCM11 – serial number **426**

Pings per ensemble	600
Temperature range	High
Conductivity range	47-58
Recording interval	30
No of channels	8
Mode	Burst
DSU serial number	14696
Instrument started	29/03/07 14:00:00

Seabird SBE37 SMP CTD – serial number **5239**

Sample interval	1800 seconds
Start date	29/03/07
Start time	13:30:00
Number of samples to average	1

Aanderaa RCM11 – serial number **428**

Pings per ensemble	600
Temperature range	High
Conductivity range	46-55
Recording interval	30
No of channels	8
Mode	Burst
DSU serial number	7872
Instrument started	29/03/07 14:00:00

Seabird SBE37 SMP CTD – serial number **5240**

Sample interval	1800 seconds
Start date	29/03/07
Start time	13:30:00
Number of samples to average	1

Seabird SBE37 SMP CTD – serial number **5241**

Sample interval	1800 seconds
Start date	29/03/07
Start time	13:30:00
Number of samples to average	1

Aanderaa RCM11 – serial number **438**

Pings per ensemble	600
Temperature range	High
Conductivity range	41-50
Recording interval	30
No of channels	8
Mode	Burst
DSU serial number	11047 M3 / 6766
Instrument started	29/03/07 14:19:00

Seabird SBE37 SMP CTD – serial number **5242**

Sample interval	1800 seconds
Start date	29/03/07
Start time	13:30:00
Number of samples to average	1

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Rapid Mooring Cruise Report for RB0701 – March-April 2007

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Seabird SBE37 SMP CTD – serial number **5243**

Sample interval 1800 seconds  
Start date 29/03/07  
Start time 13:30:00  
Number of samples to average 1

Aanderaa RCM11 – serial number **443**

Pings per ensemble 600  
Temperature range Low  
Conductivity range 33-41  
Recording interval 30  
No of channels 8  
Mode Burst  
DSU serial number 13430  
Instrument started 29/03/07 14:19:00

Seabird SBE37 SMP CTD – serial number **5244**

Sample interval 1800 seconds  
Start date 29/03/07  
Start time 13:30:00  
Number of samples to average 1

Seabird SBE37 SMP CTD – serial number **5245**

Sample interval 1800 seconds  
Start date 29/03/07  
Start time 13:30:00  
Number of samples to average 1

Aanderaa RCM11 – serial number **444**

Pings per ensemble 600  
Temperature range Low  
Conductivity range 32-36  
Recording interval 30  
No of channels 8  
Mode Burst  
DSU serial number 14723  
Instrument started 29/03/07 14:53:00

Seabird SBE37 SMP CTD – serial number **5246**

Sample interval 1800 seconds  
Start date 29/03/07  
Start time 13:30:00  
Number of samples to average 1

Seabird SBE37 SMP CTD – serial number **5247**

Sample interval 1800 seconds  
Start date 29/03/07  
Start time 13:30:00  
Number of samples to average 1

Seabird SBE37 IMP CTD – serial number **4184**

Inductive ID 24  
Sample interval 1800 seconds  
Start date 29/03/07

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Rapid Mooring Cruise Report for RB0701 – March-April 2007

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Start time	15:30:00
<b>Seabird SBE37 IMP CTD – serial number 4473</b>	
Inductive ID	41
Sample interval	1800 seconds
Start date	29/03/07
Start time	15:00:00
<b>Aanderaa RCM11 – serial number 507</b>	
Pings per ensemble	600
Temperature range	Arctic
Conductivity range	32-34
Recording interval	30
No of channels	8
Mode	Burst
DSU serial number	7869
Instrument started	29/03/07 14:53:00
<b>Seabird SBE37 IMP CTD – serial number 4724</b>	
Inductive ID	17
Sample interval	1800 seconds
Start date	29/03/07
Start time	15:00:00
<b>Seabird SBE37 IMP CTD – serial number 4725</b>	
Inductive ID	18
Sample interval	1800 seconds
Start date	29/03/07
Start time	15:00:00
<b>Seabird SBE37 IMP CTD – serial number 4795</b>	
Inductive ID	35
Sample interval	1800 seconds
Start date	29/03/07
Start time	15:30:00
<b>Seabird SBE37 IMP CTD – serial number 4796</b>	
Inductive ID	02
Sample interval	1800 seconds
Start date	29/03/07
Start time	15:00:00
<b><u>WB4</u></b>	
<b>Seabird SBE37 SMP CTD – serial number 3226</b>	
Sample interval	1800 seconds
Start date	30/03/07
Start time	20:30:00
Number of samples to average	1
<b>Aanderaa RCM11 – serial number 510</b>	
Pings per ensemble	600
Temperature range	High
Conductivity range	47-58
Recording interval	30

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Rapid Mooring Cruise Report for RB0701 – March-April 2007

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No of channels	8
Mode	Burst
DSU serial number	14381
Instrument started	30/03/07 20:06:00
<b>Seabird SBE37 SMP CTD – serial number 3227</b>	
Sample interval	1800 seconds
Start date	30/03/07
Start time	20:30:00
Number of samples to average	1
<b>Seabird SBE37 SMP CTD – serial number 3228</b>	
Sample interval	1800 seconds
Start date	30/03/07
Start time	20:30:00
Number of samples to average	1
<b>Aanderaa RCM11 – serial number 515</b>	
Pings per ensemble	600
Temperature range	High
Conductivity range	43-54
Recording interval	30
No of channels	8
Mode	Burst
DSU serial number	14698
Instrument started	30/03/07 20:17:00
<b>Seabird SBE37 SMP CTD – serial number 3229</b>	
Sample interval	1800 seconds
Start date	30/03/07
Start time	20:30:00
Number of samples to average	1
<b>Seabird SBE37 SMP CTD – serial number 3230</b>	
Sample interval	1800 seconds
Start date	30/03/07
Start time	20:00:00
Number of samples to average	1
<b>Aanderaa RCM11 – serial number 516</b>	
Pings per ensemble	600
Temperature range	Low
Conductivity range	36-42
Recording interval	30
No of channels	8
Mode	Burst
DSU serial number	14699
Instrument started	30/03/07 21:10:00
<b>Seabird SBE37 SMP CTD – serial number 3231</b>	
Sample interval	1800 seconds
Start date	30/03/07
Start time	20:30:00
Number of samples to average	1

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Rapid Mooring Cruise Report for RB0701 – March-April 2007

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Seabird SBE37 SMP CTD – serial number **3232**

Sample interval 1800 seconds  
Start date 30/03/07  
Start time 20:30:00  
Number of samples to average 1

Aanderaa RCM11 – serial number **518**

Pings per ensemble 600  
Temperature range Low  
Conductivity range 32-36  
Recording interval 30  
No of channels 8  
Mode Burst  
DSU serial number 14695  
Instrument started 30/03/07 21:20:00

Seabird SBE37 SMP CTD – serial number **3233**

Sample interval 1800 seconds  
Start date 30/03/07  
Start time 20:30:00  
Number of samples to average 1

Seabird SBE37 SMP CTD – serial number **3244**

Sample interval 1800 seconds  
Start date 30/03/07  
Start time 20:30:00  
Number of samples to average 1

Aanderaa RCM11 – serial number **519**

Pings per ensemble 600  
Temperature range Arctic  
Conductivity range 32-34  
Recording interval 30  
No of channels 8  
Mode Burst  
DSU serial number 14389  
Instrument started 30/03/07 21:33:00

Seabird SBE37 SMP CTD – serial number **3487**

Sample interval 1800 seconds  
Start date 30/03/07  
Start time 20:30:00  
Number of samples to average 1

Seabird SBE37 SMP CTD – serial number **3905**

Sample interval 1800 seconds  
Start date 30/03/07  
Start time 20:30:00  
Number of samples to average 1

Aanderaa RCM11 – serial number **520**

Pings per ensemble 600  
Temperature range Arctic  
Conductivity range 32-34  
Recording interval 30

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Rapid Mooring Cruise Report for RB0701 – March-April 2007

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No of channels	8
Mode	Burst
DSU serial number	14730
Instrument started	30/03/07 21:46:00
<b>Seabird SBE37 SMP CTD – serial number 3906</b>	
Sample interval	1800 seconds
Start date	30/03/07
Start time	20:30:00
Number of samples to average	1
<b>Seabird SBE37 SMP CTD – serial number 3907</b>	
Sample interval	1800 seconds
Start date	30/03/07
Start time	20:30:00
Number of samples to average	1
<b>Aanderaa RCM11 – serial number 304</b>	
Pings per ensemble	600
Temperature range	Arctic
Conductivity range	32-34
Recording interval	30
No of channels	8
Mode	Burst
DSU serial number	14730
Instrument started	30/03/07 22:04:00
<b>Seabird SBE37 SMP CTD – serial number 3908</b>	
Sample interval	1800 seconds
Start date	30/03/07
Start time	20:30:00
Number of samples to average	1
<b>Seabird SBE37 SMP CTD – serial number 3258</b>	
Sample interval	1800 seconds
Start date	30/03/07
Start time	20:30:00
Number of samples to average	1
<b><u>WB6</u></b>	
<b>Seabird SBE37 IMP CTD – serial number 3283</b>	
Inductive ID	36
Sample interval	1800 seconds
Start date	05/04/07
Start time	16:00:00
<b>Seabird SBE37 IMP CTD – serial number 4467</b>	
Inductive ID	47
Sample interval	1800 seconds
Start date	05/04/07
Start time	16:00:00
<b>Seabird SBE37 IMP CTD – serial number 4471</b>	
Inductive ID	43
Sample interval	1800 seconds

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Rapid Mooring Cruise Report for RB0701 – March-April 2007

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Start date 05/04/07  
Start time 16:00:00

Seabird SBE26 BPR – serial number **0392**

Tide sample interval 30 minutes  
Tide measurements per wave burst 9999  
Wave samples/burst 68  
No. of 0.25s periods to integrate waves 33  
Start date 05/04/07  
Start time 16:10:00

**WBL1**

Seabird SBE26 BPR – serial number **0398**

Tide sample interval 30 minutes  
Tide measurements per wave burst 9999  
Wave samples/burst 68  
No. of 0.25s periods to integrate waves 33  
Start date 29/03/07  
Start time 17:06:00

Seabird SBE26 BPR – serial number **0399**

Tide sample interval 30 minutes  
Tide measurements per wave burst 9999  
Wave samples/burst 68  
No. of 0.25s periods to integrate waves 33  
Start date 29/03/07  
Start time 17:02:00

**WBL2**

Seabird SBE26 BPR – serial number **0393**

Tide sample interval 30 minutes  
Tide measurements per wave burst 9999  
Wave samples/burst 68  
No. of 0.25s periods to integrate waves 33  
Start date 01/04/07  
Start time 15:15:00



## Appendix C: Details of Instruments Lowered on CTD Calibration Casts.

**Table C.1: Details of Instruments Lowered on CTD Calibration Casts**

Cast	Instrument details		
	Type	Serial numbers	Calibration type
26	Microcat	3206	Pre-deployment
	Microcat	3219	Pre-deployment
	Microcat	3220	Pre-deployment
	Microcat	3221	Pre-deployment
	Microcat	3222	Pre-deployment
	Microcat	3223	Pre-deployment
	Microcat	4070	Pre-deployment
	Microcat	4071	Pre-deployment
	Microcat	4072	Pre-deployment
	Microcat	4060	Pre-deployment
	Microcat	4062	Pre-deployment
	Microcat	4066	Pre-deployment
	Microcat	4068	Pre-deployment
27	Microcat	5238	Pre-deployment
	Microcat	5239	Pre-deployment
	Microcat	5240	Pre-deployment
	Microcat	5241	Pre-deployment
	Microcat	5242	Pre-deployment
	Microcat	4797	Pre-deployment
	Microcat	3281	Pre-deployment
	RCM11	381	Pre-deployment
	RCM11	383	Pre-deployment
	RCM11	395	Pre-deployment
	RCM11	399	Pre-deployment
RCM11	428	Pre-deployment	
28	Microcat	5243	Pre-deployment
	Microcat	5244	Pre-deployment
	Microcat	5245	Pre-deployment
	Microcat	5246	Pre-deployment
	Microcat	5247	Pre-deployment
	Microcat	4184	Pre-deployment
	Microcat	4473	Pre-deployment
	Microcat	4724	Pre-deployment
	Microcat	4725	Pre-deployment
	Microcat	4795	Pre-deployment
	Microcat	4796	Pre-deployment
	RCM11	426	Pre-deployment
	29	Microcat	3226
Microcat		3227	Post- and pre-deployment
Microcat		3228	Post- and pre-deployment
Microcat		3229	Post- and pre-deployment
Microcat		3230	Post- and pre-deployment

Rapid Mooring Cruise Report for RB0701 – March-April 2007

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	Microcat	3231	Post- and pre-deployment
	Microcat	3232	Post- and pre-deployment
	Microcat	3233	Post- and pre-deployment
	Microcat	3244	Post- and pre-deployment
	Microcat	3487	Post- and pre-deployment
	Microcat	3905	Post- and pre-deployment
	Microcat	3906	Post- and pre-deployment
30	Microcat	3247	Post-deployment
	Microcat	3254	Post-deployment
	Microcat	3255	Post-deployment
	Microcat	3256	Post-deployment
	Microcat	3258	Post- and pre-deployment
	Microcat	3265	Post-deployment
	Microcat	3266	Post-deployment
	Microcat	3907	Post- and pre-deployment
	Microcat	3908	Post- and pre-deployment
	Microcat	4467	Post- and pre-deployment
	Microcat	4471	Post- and pre-deployment
	Microcat	3283	Post- and pre-deployment
31	Microcat	3269	Post-deployment
	Microcat	3270	Post-deployment
	Microcat	3271	Post-deployment
	Microcat	3274	Post-deployment
	Microcat	3277	Post-deployment
	Microcat	3482	Post-deployment
	Microcat	3484	Post-deployment
67	Microcat	3225	Post-deployment
	Microcat	3234	Post-deployment

## Appendix D: Instrument Record Lengths

**Table D.1: Instrument record lengths detailed by mooring**

Mooring	Instrument	Serial Number	Approx depth (m)	Recovered?	Date of first useable record	Date of last useable record
WBADCP	RDI Longranger ADCP	1767	600	Yes	19/03/06	27/03/07
WB1	Seabird SBE37 IMP CTD	3487	50	Yes	23/3/06	27/03/07
	Seabird SBE37 IMP CTD	3905	100	Yes	23/3/06	26/01/07*
	Aanderaa RCM11	306	100	Yes	23/3/06	27/03/07
	Seabird SBE37 IMP CTD	3906	175	Yes	23/3/06	23/01/07*
	Seabird SBE37 IMP CTD	3907	250	Yes	23/3/06	15/01/07*
	Seabird SBE37 IMP CTD	3908	325	Yes	23/3/06	12/01/07*
	Seabird SBE37 IMP CTD	3909	400	Yes - flooded	N/A	N/A
	Aanderaa RCM11	305	400	Yes	23/3/06	27/03/07
	Seabird SBE37 IMP CTD	3226	500	Yes	23/3/06	27/03/07
	Seabird SBE37 IMP CTD	3227	600	Yes	23/3/06	27/03/07
	Seabird SBE37 IMP CTD	3228	700	Yes	23/3/06	27/03/07
	Seabird SBE37 IMP CTD	3229	800	Yes	23/3/06	27/03/07
	Interocean S4AD	35612565	800	Yes	23/3/06	27/03/07
	Seabird SBE37 IMP CTD	3230	900	Yes	23/3/06	27/03/07
	Seabird SBE37 IMP CTD	3231	1000	Yes	23/3/06	27/03/07
	Seabird SBE37 IMP CTD	3232	1100	Yes	23/3/06	27/03/07
	Seabird SBE37 IMP CTD	3233	1200	Yes	23/3/06	27/03/07
	Interocean S4AD	35612568	1200	Yes	23/3/06	27/03/07
Seabird SBE37 IMP CTD	3244	1380	Yes	23/3/06	27/03/07	
WB2	Seabird SBE37 IMP CTD	3225	50	Yes	11/10/07	27/03/07
	Aanderaa RCM11	302	100	Yes	11/10/07	27/03/07
	Seabird SBE37 IMP CTD	3269	100	Yes	11/10/07	27/03/07
	Aanderaa RCM11	303	175	Yes	No data	No data‡
	Seabird SBE37 IMP CTD	3234	175	Yes	11/10/07	27/03/07
	Seabird SBE37 IMP CTD	3247	325	Yes	11/10/07	27/03/07
	Aanderaa RCM11	445	400	Yes	11/10/07	20/11/06‡
	Seabird SBE37 IMP CTD	3254	500	Yes	11/10/07	27/03/07
	Seabird SBE37 IMP CTD	3255	700	Yes	11/10/07	27/03/07
	Aanderaa RCM11	448	800	Yes	11/10/07	27/03/07
	Seabird SBE37 IMP CTD	3256	900	Yes	11/10/07	27/03/07
	Seabird SBE37 IMP CTD	3258	1100	Yes	11/10/07	27/03/07
	Aanderaa RCM11	449	1200	Yes	11/10/07	27/03/07
	Seabird SBE37 IMP CTD	3265	1300	Yes	11/10/07	27/03/07
	Seabird SBE37 IMP CTD	3266	1500	Yes	11/10/07	27/03/07
	Seabird SBE37 IMP CTD	3270	1700	Yes	11/10/07	27/03/07
	Seabird SBE37 IMP CTD	3271	1900	Yes	11/10/07	27/03/07
	Aanderaa RCM11	300	2050	Yes	11/10/07	27/03/07
	Seabird SBE37 IMP CTD	3274	2300	Yes	11/10/07	27/03/07
	Seabird SBE37 IMP CTD	3277	2800	Yes	11/10/07	27/03/07
Seabird SBE37 IMP CTD	3482	3300	Yes	11/10/07	27/03/07	
Seabird SBE37 IMP CTD	3484	3850	Yes	11/10/07	27/03/07	
WB4	Seabird SBE37 SMP CTD	3920	50	No	N/A	N/A
	Seabird SBE37 SMP CTD	3921	100	No	N/A	N/A
	Aanderaa RCM11	307	100	No	N/A	N/A
	Seabird SBE37 SMP CTD	3922	250	No	N/A	N/A
	Seabird SBE37 SMP CTD	3923	400	No	N/A	N/A
	Aanderaa RCM11	308	400	No	N/A	N/A
	Seabird SBE37 SMP CTD	3924	600	No	N/A	N/A
	Seabird SBE37 SMP CTD	3925	800	No	N/A	N/A
	Aanderaa RCM11	309	800	No	N/A	N/A
	Seabird SBE37 SMP CTD	3926	1000	No	N/A	N/A
	Seabird SBE37 SMP CTD	3927	1200	No	N/A	N/A
	Aanderaa RCM11	310	1200	No	N/A	N/A
	Seabird SBE37 SMP CTD	3245	1600	No	N/A	N/A
	Seabird SBE37 SMP CTD	3246	2000	No	N/A	N/A
	Aanderaa RCM11	446	2000	No	N/A	N/A
	Seabird SBE37 SMP CTD	3260	2500	No	N/A	N/A
	Seabird SBE37 SMP CTD	3261	3000	No	N/A	N/A
	Interocean S4AD	35612569	3000	No	N/A	N/A
	Seabird SBE37 SMP CTD	3262	3500	No	N/A	N/A
Seabird SBE37 SMP CTD	3263	4000	No	N/A	N/A	
Interocean S4AD	35612570	4000	No	N/A	N/A	
Seabird SBE37 SMP CTD	3917	4500	No	N/A	N/A	
WBL1	Seabird SBE53 BPR	0002	3880	Yes	14/05/05	27/03/07

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Rapid Mooring Cruise Report for RB0701 – March-April 2007

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	Seabird SBE26 BPR	393	3880	Yes	14/05/05	27/03/07
WBL2	Seabird SBE53 BPR	0003	4790	Yes	22/05/05	30/03/07
	Seabird SBE26 BPR	392	4790	Yes	22/05/05	30/03/07

\* Batteries depleted due to change in firmware altering default number of individual samples to average per record

‡ Battery terminals dislodged

**Appendix E: Mooring Logsheets**

<b>RAPID MOORINGS</b>		<b>CRUISE RB-07-01</b>		<b>MRG ID:</b>	WBADCP
Western Atlantic 26N		<b>RECOVERY</b>		<b>UKORS ID</b>	2006/03
<b>LATITUDE</b>	N	26 31.483		<b>DATE</b>	27/03/07
<b>LONGITUDE</b>	W	76 52.142		<b>DAY</b>	Tuesday
<b>NOTE ALL TIMES RECORDED IN GMT</b>					
<b>COMMENCE TIME</b>	11:48	Depth 592m uncorrected, 601m corrected		<b>Protocol taken by:</b>	Torsten Kanzow
<b>COMPLETION TIME</b>	12:37				
<b>ITEM</b>	<b>SER NO</b>	<b>COMMENT</b>		<b>TIME</b>	
17" glass pickup	n/a			12:35	
ADCP buoy with ADCP	1767			12:37	
Argos beacon on ADCP buoy		ID11033		12:37	
Swivel	5817	Elkins 2T		12:37	
Acoustic release (AR861)	248			12:37	
<b>COMMENTS</b>					
Released: 11:48 Recovery took a long time, because vessel failed to get hold of recovery line.					

<b>RAPID MOORINGS</b>		<b>CRUISE RB-07-01</b>		<b>MRG ID: WB1</b>	
Western Atlantic 26N		<b>RECOVERY</b>		<b>UKORS ID</b>	2006/07
<b>LATITUDE</b>	26 29.81N			<b>DATE</b>	27/03/07
<b>LONGITUDE</b>	76 49.01W	Depth 1395m u/c, 1403 corrected		<b>DAY</b>	Tuesday
<b>NOTE ALL TIMES RECORDED IN GMT</b>					
<b>COMMENCE TIME</b>	13:27	(First sound pulse)		<b>Protocol taken by:</b>	Tycho Huussen
<b>COMPLETION TIME</b>	15:19				
<b>ITEM</b>	<b>SER NO</b>	<b>COMMENT</b>	<b>TIME</b>		
1 x 17" pickup floats	n/a	Orange hard hat	13:58		
28" steel sphere	n/a	Bio fouling	14:02		
Argos beacon	264	PTT 46242 no light. Heavy biofouling	14:02		
SBE37 microcat	3487	On keel. Heavy biofouling	14:02		
Swivel	n/a		14:02		
SBE37 microcat	3905	Heavy biofouling	14:08		
RCM11	306	Heavy biofouling	14:08		
SBE37 microcat	3906	Light biofouling. Mooring cable tangled up around microcat mount	14:15		
48" steel sphere	n/a		14:23		
Argos beacon	255	PTT 42747	14:23		
Swivel	n/a		14:23		
SBE37 microcat	3907	Clean	14:24		
SBE37 microcat	3908		14:31		
SBE37 microcat	3909	Probably flooded	14:34		
RCM11	305		14:35		
SBE37 microcat	3226		14:38		
SBE37 microcat	3227		14:43		
SBE37 microcat	3228		14:46		
Swivel	n/a		14:56		
Raft of 14 17" glass	n/a		14:56		
S4	35612565		14:56		
SBE37 microcat	3229	Cable tangled up around SBE	14:56		
SBE37 microcat	3230		15:02		
SBE37 microcat	3231		15:05		
SBE37 microcat	3232		15:08		
SBE37 microcat	3233		15:11		
S4	35612568		15:11		
SBE37 microcat	3244		15:18		
Swivel	n/a		15:19		
Raft of 6 x 17" glass	n/a		15:19		
Dual release (AR661)	244		15:19		
(AR861)	245		15:19		
<b>COMMENTS</b>	<ol style="list-style-type: none"> <li>1. Low power release, check unit</li> <li>2. Only one release responded</li> <li>3. 13:32 released 13:35 mooring spotted from bridge 13:56 line picked up</li> <li>4. Pickup line almost broken</li> </ol>				

<b>RAPID MOORINGS</b>		<b>CRUISE RB-07-01</b>		<b>MRG ID:</b>	<b>WB2</b>	
Western Atlantic 26N		<b>RECOVERY</b>		<b>UKORS ID</b>	2006/36	
<b>LATITUDE</b>	N	26 31.262 at recovery		<b>DATE</b>	27/03/07	
<b>LONGITUDE</b>	W	74 44.527 at recovery		<b>DAY</b>	Tuesday	
<b>NOTE ALL TIMES RECORDED IN GMT</b>					<b>Protocol taken by:</b>	Angela Hibbert
<b>COMMENCE TIME</b>	16:58	Depth 3890m u/c. 3909m corr.				
<b>COMPLETION TIME</b>	19:03					
<b>ITEM</b>	<b>SER NO</b>	<b>COMMENT</b>		<b>TIME</b>		
17" glass pickup float	n/a	Heavy fouling (algae)		16:58		
24" yellow steel sphere	n/a			16:58		
SBE37 Microcat	3225	Heavy fouling (algae)		16:58		
24" steel sphere		Coating perished - very patchy		17:04		
RCM11	302	Anodes almost entirely worn. Paintwork on base unit v. corroded		17:04		
SBE37 Microcat	3269	Light fouling (algae)		17:05		
48" steel sphere with swivel	n/a			17:12		
RCM11	303	Paintwork corroded on base unit.		17:12		
SBE37 Microcat	3234			17:15		
SBE37 Microcat	3247			17:18		
RCM11	445	Bubbling to paintwork on base unit		17:20		
SBE37 Microcat	3254			17:25		
SBE37 Microcat	3255			17:30		
2 x benthos	n/a			17:33		
RCM11	448	Bubbling to paintwork on frame		17:34		
SBE37 Microcat	3256			17:41		
SBE37 Microcat	3258			17:47		
10 x benthos		Mooring line tangled with RCM11 no. 449		17:50		
RCM11	449	Inverted due to tangled wire		17:50		
SBE37 Microcat	3265	Mounting block chipped		18:12		
SBE37 Microcat	3266			18:14		
SBE37 Microcat	3270			18:15		
SBE37 Microcat	3271			18:17		
4 x benthos	n/a			18:20		
RCM11	300	Kevlar line coating perished at contact with shackle		18:20		
SBE37 Microcat	3274			18:32		
8 x benthos		Deployed in series, recovered in parallel		18:40		
SBE37 Microcat	3277			18:44		
5 x benthos		Bolts corroded on floats		18:50		
SBE37 Microcat	3482			18:50		
SBE37 Microcat	3484			19:02		
10 x benthos	n/a	Tangled		19:03		
Dualled acoustic release	281	AR861		19:03		
Dualled acoustic release	369	AR861		19:03		
<b>COMMENTS</b>		Released: 16:21. No reply from 369 Kevlar line coating perished between 1270m and 1370m				

<b>RAPID MOORINGS</b>		<b>CRUISE RB-07-01</b>		<b>MRG ID:</b>	WBL1
Western Atlantic 26N		<b>RECOVERY</b>		<b>UKORS ID</b>	2005/29
<b>LATITUDE</b>	N	26 31.158 at recovery		<b>DATE</b>	27/03/07
<b>LONGITUDE</b>	W	76 44.614 at recovery		<b>DAY</b>	Tuesday
<b>NOTE ALL TIMES RECORDED IN GMT</b>					
<b>COMMENCE TIME</b>	20:45			<b>Protocol taken by:</b>	Angela Hibbert
<b>COMPLETION TIME</b>	21:00				
<b>ITEM</b>	<b>SER NO</b>	<b>COMMENT</b>	<b>TIME</b>		
17" glass pickup float	n/a		20:50		
Billings float	n/a	Tangled with spheres, therefore float was recovered upside down	20:53		
Light on float			20:53		
6 x 17" glass	n/a		20:53		
1 <sup>st</sup> SBE26	0393		21:00		
2 <sup>nd</sup> SBE53	002		21:00		
Acoustic release	315		21:00		
<b>COMMENTS</b>		Released: 19:41. Estimated ascent rate ~84m/min Polyester rope connecting billings float to spheres was very tangled			

<b>RAPID MOORINGS</b>		<b>CRUISE RB-07-01</b>		<b>MRG ID:</b>	WBL2
Western Atlantic 26N		<b>RECOVERY</b>		<b>UKORS ID</b>	2005/31
<b>LATITUDE</b>	N			<b>DATE</b>	30/03/07
<b>LONGITUDE</b>	W			<b>DAY</b>	Friday
<b>NOTE ALL TIMES RECORDED IN GMT</b>					
<b>COMMENCE TIME</b>	10:53			<b>Protocol taken by:</b>	Torsten Kanzow
<b>COMPLETION TIME</b>	12:31				
<b>ITEM</b>	<b>SER NO</b>	<b>COMMENT</b>	<b>TIME</b>		
17" glass pickup float	n/a		12:20		
Billings float	n/a	Traces of corrosion on lower end of billings float	12:23		
Radio beacon on float			12:23		
6 x 17" glass	n/a	Mooring rope entangled with rope connected to vessel	12:23		
1 <sup>st</sup> SBE26	0392		12:31		
2 <sup>nd</sup> SBE53	003		12:31		
Acoustic release	251		12:31		
<b>COMMENTS</b>		Released: 10:53 At surface: 11:49			



<b>RAPID MOORINGS</b>		<b>CRUISE RB-07-01</b>		<b>MRG ID:</b> WBADCP
Western Atlantic 26N		<b>DEPLOYMENT</b>		<b>UKORS ID</b> 2007/04
<b>LATITUDE</b>	N	26 31.483 at anchor down	<b>DATE</b>	28/03/07
<b>LONGITUDE</b>	W	76 52.169 at anchor down	<b>DAY</b>	Wednesday
<b>NOTE ALL TIMES RECORDED IN GMT</b>				
<b>COMMENCE TIME</b>	17:02	Depth 601m (corrected) at anchor down	<b>Protocol taken by:</b>	Angela Hibbert
<b>COMPLETION TIME</b>	17:37:14	at anchor down		
<b>ITEM</b>	<b>SER NO</b>	<b>COMMENT</b>	<b>TIME</b>	
2 x TRIMSYN	N/A		17:03	
15M POLYPROP 24mm	N/A		17:03	
SYNTACTIC ADCP BUOY	N/A		17:03	
75 KHZ ADCP	5817		17:03	
ARGOS IOS	SN/ID1103 3		17:03	
Titanium swivel	N/A		17:03	
10M 5/8" chain	N/A		17:37	
Release	AR861	SN253 ARM14AA REL1455	17:37	
Anchor 850 KG	N/A	Anchor chains used	17:37:14	
<b>DEPLOYMENT METHOD COMMENTS</b>	Freefall anchor last Mooring assembly time was ~5mins, but deployment was delayed by 30 mins as ship was found to be 0.6 nmi from station and had to steam to correct location.			

<b>RAPID MOORINGS</b>		<b>CRUISE RB-07-01</b>		<b>MRG ID: WB1</b>
Western Atlantic 26N		<b>DEPLOYMENT</b>		<b>UKORS ID</b> 2007/01
<b>LATITUDE</b>	N	26 29.971 at anchor down		<b>DATE</b> 28/03/07
<b>LONGITUDE</b>	W	76 49.151 at anchor down		<b>DAY</b> Wednesday
<b>NOTE ALL TIMES RECORDED IN GMT</b>				
<b>Triangulated latitude</b>	N	26.499		<b>DATE</b> 28/03/07
<b>Triangulated longitude</b>	W	76.8208		<b>Protocol</b> Angela <b>Day by:</b> Wednesday
<b>COMMENCE TIME</b>	19:10			
<b>COMPLETION TIME</b>	22:02:45 at anchor down			
Depth at anchor down 1395m uncorrected 1403m corrected				
<b>ITEM</b>	<b>SER NO</b>	<b>COMMENT</b>		<b>TIME</b>
Recovery line	n/a			19:23
TRYMSYN floats	n/a			19:23
SBE	3206			19:23
30" SYNTACTIC	286	22442ID		19:27
ARGOS				19:27
1M chain and swivel				19:27
RCM11	381			19:27
SBE	3219			19:27
SBE	3220			19:30
41" steel buoy	285	60211ID		19:42
1M chain and swivel				19:42
SBE	3221			19:42
SBE	3222			19:43
SBE	3223			19:47
RCM11	383			19:47
SBE	3281			19:50
SBE	4797			19:57
SBE	4060			19:59
10 BENTHOS				20:13
RCM11	395			20:13
SBE	4062	Deployed 3-4m down from join		20:13
SBE	4066			20:17
SBE	4068			20:19
SBE	4070			20:21
SBE	4071	Positions reversed - deployed below RCM11 no. 399		20:32
2 BENTHOS				20:30
RCM11	399	Positions reversed - deployed above SBE 4071		20:30
SBE	4072	Deployed below join with benthos		20:42
10 BENTHOS				20:50
Dual release	SN687			20:57
	SN223			20:57
20M polyester				20:59
10M 1/2" chain				22:02:45
Anchor chain 1600 KG		and parachute		22:02:45

Rapid Mooring Cruise Report for RB0701 – March-April 2007

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<b>DEPLOYMENT METHOD</b>	Freefall anchor last		
<b>COMMENTS</b>	Mooring assembly time was ~1hr 40 mins. However, there was an additional 1hr wait whilst the mooring was towed to the correct location.		

<b>RAPID MOORINGS</b>		<b>CRUISE RB-07-01</b>		<b>MRG ID:</b>	<b>WB2</b>
Western Atlantic 26N		<b>DEPLOYMENT</b>		<b>UKORS ID</b>	2007/02
<b>LATITUDE</b>	N	26 30.568 at anchor down		<b>DATE</b>	29/03/07
<b>LONGITUDE</b>	W	76 44.418 at anchor down		<b>DAY</b>	Thursday
<b>Triangulated latitude</b>	N	26.5103		<b>DATE</b>	29/03/07
<b>Triangulated longitude</b>	W	76.7434		<b>DATE</b>	7
<b>NOTE ALL TIMES RECORDED IN GMT</b>				<b>DATE</b>	29/03/07
Depth at anchor down 3872.9m uncorrected, 3891.9m corrected.				<b>DATE</b>	7 Angela
<b>COMMENCE TIME</b>	16:05			<b>taken by:</b>	Hibbert
<b>COMPLETION TIME</b>	19:37:54	at anchor down			

ITEM	SER NO	COMMENT	TIME
Recovery line			16:06
TRYMSYN floats			16:06
SBE	5238		16:06
30" SYNTACTIC			16:08
ARGOS	SN053	ID24329 LIGHT SN N08-027	16:08
1M chain		Float connected to swivel by polyester rope	16:08
Swivel			16:08
RCM11	426		16:08
SBE	5239		16:08
48" steel buoy			16:15
Argos	SN31	ID11443 LIGHT SN S01-182	16:15
1M chain			16:15
Swivel			16:15
RCM11	428		16:15
SBE	5240	Deployed several metres down from join	16:16
SBE	5241		16:20
RCM11	438		16:23
SBE	5242		16:27
SBE	5243		16:32
2 BENTHOS			16:35
RCM11	443		16:35
SBE	5244		16:38
SBE	5245		16:43
12 BENTHOS			16:47
RCM11	444	Deployed above join with benthos	16:47
SBE	5246		16:53
SBE	5247		16:55
5 BENTHOS			17:11
SBE	4184	Deployed 2-3m below join	17:12
SBE	4473		17:14
RCM11	507		17:16
7 BENTHOS			17:28
SBE	4724	Deployed 2-3m below join	17:29
SBE	4725		17:40
7 BENTHOS			17:55

Rapid Mooring Cruise Report for RB0701 – March-April 2007

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SBE	4795	Deployed 2-3m below join	18:00
SBE	4796		18:29
8 BENTHOS			18:33
Dual release	AR861	SN316 ARM14CC REL1455	18:36
	AR861	SN264 ARM14BS REL1455	18:36
20M polyester			18:37
25M 1/2" chain			19:37
Anchor chain 2000 KG		and parachute	19:37:54

**DEPLOYMENT METHOD** Freefall anchor last  
**COMMENTS** 1. Depth at anchor down taken from high precision echo sounder.  
 2. Top buoy submerged at 19:56 at position 26 34.56 N 07 44.42 W. Depth not recorded by bridge.  
 3. Mooring assembly time was ~1 hr 30mins. Towing to the correct location took 1hr.

<b>RAPID MOORINGS</b>		<b>CRUISE RB-07-01</b>		<b>MRG ID:</b>	WB4
Western Atlantic 26N		<b>DEPLOYMENT</b>		<b>UKORS ID</b>	2007/03
<b>LATITUDE</b>	N	26 32.262 at anchor down	<b>DATE</b>	30/03/07	
<b>LONGITUDE</b>	W	76 08.643 at anchor down	<b>DAY</b>	Friday	
<b>Triangulated latitude</b>	N	26.5378			
<b>Triangulated longitude</b>	W	76.1482			
<b>NOTE ALL TIMES RECORDED IN GMT</b>					
<b>COMMENCE TIME</b>	22 ;10	Depth at anchor down: 4785.2m uncorrected, 4828.2m corrected	<b>Protocol taken by:</b>	Angela Hibbert	
<b>COMPLETION TIME</b>	01:34:32	at anchor down			
<b>ITEM</b>	<b>SER NO</b>	<b>COMMENT</b>	<b>TIME</b>		
Recovery line		17" glass recovery buoy used, not trymsyn float shown on diagram	22:17		
TRYMSYN floats			22:17		
SBE	3226		22:17		
28" steel buoy			22:19		
ARGOS	SNT04-045	ID42749 Light S01-179	22:19		
RCM11	510		22:19		
SBE	3227		22:19		
28" steel buoy			22:26		
ARGOS	SN287	ID22443 Light U11-019	22:26		
1M chain			22:26		
Swivel			22:26		
SBE	3228		22:33		
RCM11	515		22:40		
SBE	3229	Deployed 3-4m down from join	22:40		
SBE	3230		22:45		
RCM11	516		22:50		
SBE	3231	Deployed 2-3m down from join	22:51		
SBE	3232		23:02		
12 BENTHOS			23:13		
RCM11	518	Deployed above 12 benthos floats at join	23:10		
SBE	3233	Deployed 2-3m down from join	23:14		
4 BENTHOS			23:26		
SBE	3244	Deployed ~3m down from join	23:27		
4 BENTHOS			23:39		
RCM11	519		23:40		
SBE	3487	Deployed 3-4m down from join	23:41		
4 BENTHOS			23:50		
SBE	3905	Deployed few metres down from join	23:51		
4 BENTHOS			00:07		
RCM11	520		00:07		
SBE	3906	Deployed few metres down from join	00:08		
4 BENTHOS			00:21		
SBE	3907	Deployed 3-4m down from join	00:22		
4 BENTHOS			00:36		

Rapid Mooring Cruise Report for RB0701 – March-April 2007

RCM11	304		00:36
SBE	3258	Deployed 3-4m down from join	00:38
SBE	3909		00:55
10 BENTHOS		1 <sup>st</sup> float had light biofouling	01:17
Dual release	AR861	SN248 ARM14A5 REL1455	01:17
	AR661	SN216 ARMEC47 RELEC83	01:17
20M polyester			01:17
10M 1/2" chain			01:34:32
Anchor chain 2100 KG		No parachute	01:34:32
<b>DEPLOYMENT METHOD</b> Freefall anchor last			
<b>COMMENTS</b> Mooring was deployed in darkness, therefore, submerging of top buoy could not be observed			

<b>RAPID MOORINGS</b>		<b>CRUISE RB-07-01</b>		<b>MRG ID:</b>	WBL1
Western Atlantic 26N		<b>DEPLOYMENT</b>		<b>UKORS ID</b>	2007/05
<b>LATITUDE</b>	N	26 30.383 at anchor down		<b>DATE</b>	29/03/07
<b>LONGITUDE</b>	W	76 44.675 at anchor down		<b>DAY</b>	Thursday
<b>NOTE ALL TIMES RECORDED IN GMT</b>					
<b>COMMENCE TIME</b>	20:33	Depth at anchor down: 3868.9m uncorrected, 3882.9m corrected		<b>Protocol taken by:</b>	Angela Hibbert
<b>COMPLETION TIME</b>	20:42:25	at anchor down			
<b>ITEM</b>	<b>SER NO</b>	<b>COMMENT</b>	<b>TIME</b>		
Floater with VHF and Light	U11-017		20:36		
	U11-020		20:36		
1M of 3/8" chain			20:36		
Recovery line			20:33		
17" glass			20:33		
15M polyprop			20:36		
4 x 17" glass			20:37		
15M polyester 12mm			20:37		
4 x 17" glass			20:37		
15M polyester 12mm			20:37		
BPR	398		20:42		
BPR	399		20:42		
Dual release	RT861	SN364 ARM14F4 REL1455	20:42		
	RT861	SM322 ARM1402 REL1455	20:42		
Anchor min. 500 KG			20:42:25		
<b>DEPLOYMENT METHOD</b>					
<b>COMMENTS</b> Recovery line and buoy deployed first					

<b>RAPID MOORINGS</b>		<b>CRUISE RB-07-01</b>		<b>MRG ID:</b> WBL2
Western Atlantic 26N		<b>DEPLOYMENT</b>		<b>UKORS ID</b> 2007/06
<b>LATITUDE</b>	26 31.039'N			<b>DATE</b> 01/04/2007
<b>LONGITUDE</b>	76 08.856'W			<b>DAY</b> Sunday
<b>NOTE ALL TIMES RECORDED IN GMT</b>				
<b>COMMENCE TIME</b>	18:13			Depth 4782.3 4821.3m u/c corr
<b>COMPLETION TIME</b>	18:16:10			
<b>ITEM</b>	<b>SER NO</b>	<b>COMMENT</b>	<b>TIME</b>	
Floater with VHF and	T01-140		18:14	
Light	U01-027			
1M of 3/8" chain			18:14	
Recovery line			18:13	
17" glass			18:13	
15M polyprop			18:14	
2 x 17" glass			18:14	
15M polyester 12mm			18:14	
4 x 17" glass			18:15	
15M polyester 12mm			18:15	
BPR	0393		18:16:10	
Single release	251	Arm: 14A8, Rel 1455	18:16:10	
			18:16:10	
Anchor min. 500 KG				
<b>DEPLOYMENT METHOD</b>				
<b>COMMENTS</b>				



<b>RAPID MOORINGS</b>		<b>CRUISE RB-07-01</b>		<b>MRG ID:</b>	WB6
Western Atlantic 26N		<b>DEPLOYMENT</b>		<b>UKORS ID</b>	2007/07
<b>LATITUDE</b>	N	26 30.020 at anchor down		<b>DATE</b>	05/04/07
<b>LONGITUDE</b>	W	70 31.213 at anchor down		<b>DAY</b>	Thursday
<b>NOTE ALL TIMES RECORDED IN GMT</b>					
<b>COMMENCE TIME</b> 17:46				<b>Protocol taken by:</b>	Angela Hibbert
<b>COMPLETION TIME</b> 17:57:32 at anchor down					
Depth at anchor down: 5437.8m uncorrected, 5497.8m corrected					
ITEM	SER NO	COMMENT	TIME		
Pick Up float			17:46		
15m polyprop			17:46		
3 x 17" glass			17:48		
Microcat at join	3283		17:49		
200m polyester			17:49		
2 x 17" glass			17:51		
Microcat at join	4467		17:51		
200m polyester			17:51		
Microcat at join	4471		17:53		
4 x 17" glass			17:53		
BPR on tripod	0392	SBE26.	17:57		
Single release in tripod	AR281	ARM14B9 REL1455	17:57		
Anchor min. 250 KG			17:57:32		
<b>DEPLOYMENT METHOD</b> Freefall anchor last					
<b>COMMENTS</b>					

## Appendix F: NOC Sensors & Moorings Cruise Report from WB2 deployment from RV Seward Johnson 25 September – 12 October 2006

J. Benson 12 October 2006

### WB2 instrument set-up

1) Sixteen Sea-Bird 37 SMP Microcats with full calibrations were received prior to the cruise, and all but three had new pressure sensors installed. The initial sensor configuration was as follows:

37SMP sn: 3225 ( <i>new</i> 3500 dbar Druck)	79m
37SMP sn: 3234 ( <i>new</i> 3500 dbar Druck)	210m
37SMP sn: 3247 ( <i>new</i> 10,000 psi Paine)	361m
37SMP sn: 3254 ( <i>new</i> 10,000 psi Paine)	537m
37SMP sn: 3255 (10,000 psi Paine, complete instrument replacement)	738m
37SMP sn: 3256 ( <i>new</i> 10,000 psi Paine)	941m
37SMP sn: 3258 ( <i>new</i> 10,000 psi Paine)	1141m
37SMP sn: 3265 ( <i>new</i> 10,000 psi Paine)	1361m
37SMP sn: 3266 ( <i>new</i> 10,000 psi Paine)	1563m
37SMP sn: 3269 ( <i>new</i> 10,000 psi Paine)	131m
37SMP sn: 3270 ( <i>new</i> 10,000 psi Paine)	1766m
37SMP sn: 3271 (10,000 psi Paine, complete instrument replacement)	1968m
37SMP sn: 3274 ( <i>new</i> 10,000 psi Paine)	2330m
37SMP sn: 3277 ( <i>new</i> 10,000 psi Paine)	2836m
37SMP sn: 3484 ( <i>new</i> 10,000 psi Paine, clean & re-platinisation of conductivity cell)	3843m
37SMP sn: 3482 (10,000 psi Paine, complete instrument replacement)	3342m

All Sea-Bird Microcats had a pre-deployment calibration CTD cast to 3500 metres for comparison purposes.

2) Six Aanderaa RCM11 with full calibrations completed prior to the trip were assigned to the re-deployment. The initial sensor configuration was as follows:

sn: 300, DSU sn: 13860	2076m
sn: 302, DSU sn: 13884	130m
sn: 303, DSU sn: 13885	209m
sn: 445, DSU sn: 14572	411m
sn: 448, DSU sn: 14571	840m
sn: 449, DSU sn: 14568	1259m

### Other instruments

1) Two ARGOS beacons were supplied with new batteries prior to the deployment. Instrument details are as follows:

sn: 274, transmission ID 60202, attached to upper 24 inch diameter buoy	78m
sn: 254, transmission ID 42746, attached to large 48 inch diameter buoy	207m

2) Two IXSEA/Oceano releases/transponders were assigned for the re-deployment, in dual release configuration. Both releases were fitted with new batteries prior to deployment. Instrument details are as follows:

AR861 B2S Acoustic Release sn: 281	3877m
AR861 B2S Acoustic Release sn: 369	3877m

Both releases were checked pre-deployment by means of a CTD cast to 3500 metres. The releases were interrogated and sent commands to release at depth, and both responded on the first attempt.

### Mooring analysis & changes to configuration

#### **WB2 instrument recovery**

1) Six Sea-Bird 37 SMP Microcats and eight Sea-Bird 37 IMP Microcats were deployed on NOAA research vessel Ron Brown, cruise 06 02, 23 March 2006. The sensor configuration was as follows:

37SMP sn: 3206 (3500 dbar Druck)	1500m
37SMP sn: 3219 (3500 dbar Druck)	1700m
37SMP sn: 3220 (3500 dbar Druck)	1900m
37SMP sn: 3221 (3500 dbar Druck)	2250m
37SMP sn: 3222 (3500 dbar Druck)*	2750m
37SMP sn: 3223 (3500 dbar Druck)	1300m
37IMP sn: 4060 (3500 dbar Druck; potential pressure problem)*	50m
37IMP sn: 4062 (3500 dbar Druck; potential pressure problem)*	175m
37IMP sn: 4066 (3500 dbar Druck; potential pressure problem)	325m
37IMP sn: 4068 (3500 dbar Druck; potential pressure problem)	500m
37IMP sn: 4070 (3500 dbar Druck; potential pressure problem)	700m
37IMP sn: 4071 (3500 dbar Druck; potential pressure problem)	900m
37IMP sn: 4072 (3500 dbar Druck; potential pressure problem)	1100m
37IMP sn: 4184 (7000 dbar Druck)*	3250m

Upon recovery the Microcats were stopped logging and the data downloaded. All performed as expected with the exception of sn: 4072, which contained several 'spikes' to negative values for periods lasting days.

The Sea-Bird Microcats were scheduled for post-recovery calibration CTD casts to 3500 metres; because of time constraints however only the sensors *not* marked with an \* above were post-recovery calibrated on the CTD cast. In addition, sn: 4072 continued to exhibit 'spiking' problems on the CTD cast, and the data could not be applied to correct the sensor successfully.

2) Two Aanderaa RCM11 instruments were deployed on NOAA research vessel Ron Brown, cruise 06 02, 23 March 2006. The sensor configuration was as follows:

sn: 301, DSU sn: unknown:	100m
sn: 451, DSU sn: unknown:	3000m

Both current meters were downloaded upon recovery, and the initial examination of the data showed expected size of the files, and minimal clock drift.

3) Four Sontek Argonaut MD 1.5 MHZ instruments in non-inductive mode were deployed on NOAA research vessel Ron Brown, cruise 06 02, 23 March 2006. The sensor configuration was as follows:

sn: D203	2000m
sn: D272	800m
sn: D274	1200m
sn: D298	3750m

All the instruments were downloaded upon recovery, and the initial examination of the data showed similar file size, and minimal clock drift.

### **Other instruments**

1) Two ARGOS beacons were deployed on NOAA research vessel Ron Brown, cruise 06 02, 23 March 2006. Instrument details are as follows:

sn: 274, transmission ID 60202, attached to upper 24 inch diameter buoy	50m
sn: 254, transmission ID 42746, attached to large 50 inch diameter buoy	240m

The beacons were checked for transmission to the ARGOS satellite via communications with NOC, and were found to be operating properly.

2) Two IXSEA/Oceano releases/transponders were deployed on NOAA research vessel Ron Brown, cruise 06 02, 23 March 2006. Instrument details are as follows:

RT661 B1S Release Transponder sn: 184	3890m
AR861 B2S Acoustic Release sn: 369	3890m

Upon arrival at the recovery site both release transponders were interrogated, and responded as expected with confirmation acknowledgements. Release sn: 184 was sent command to release, but did not confirm. Release sn: 369 was then sent command to release, and confirmation was received. Once recovered, the transponders were examined, and sn: 184 displayed some minor surface corrosion on the hook, as well as on the coupling bars. Serial number 184 was also observed to have released, and therefore the pear link/chain was not recovered. The same release had twisted to a small degree, and the hook was jammed into the jaws. Because of these two problems, it was decided to re-deploy sn: 369 paired with sn: 281.