# BERING STRAIT MOORING CRUISE REPORT - RUSALCA 2009 LEG 1

Russian Research Vessel Professor Khromov (also called Spirit of Enderby) Nome, 23<sup>rd</sup> August 2009 – Nome, 2<sup>nd</sup> September 2009

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(Photo by Aleksey Ostrovskiy)



(Photo by R Woodgate)

**Expedition Leader:** Vladimir Bakhmutov, State Research Navigational Hydrographical Institute, RF. **Science Coordinators:** Kathleen Crane, NOAA, USA; Mikhail Zhdanov, Group Alliance, Russia (RF) and Aleksey Ostrovsky, Group Alliance, Russia. **US Expedition Leader:** Terry Whitledge, University of Alaska, Eairbanks (UAE), USA

US Expedition Leader: Terry Whitledge, University of Alaska, Fairbanks (UAF), USA Chief Scientist: Rebecca Woodgate, University of Washington (UW), USA. Science Liaison at Sea: Kevin Wood, NOAA/UW, USA.

As part of the joint US-Russian RUSALCA (Russian US Long-term Census of the Arctic Ocean) Program, a team of US and Russian scientists undertook two oceanographic cruises in August/September 2009 on board the Russian vessel 'Khromov', operated by Heritage Expeditions (under the name of Spirit of Enderby). This report concerns the first of these cruises, Leg 1, in August 2009.

The major objective of the Leg 1 cruise was mooring work in the Bering Strait region, i.e., the recovery and redeployment of 8 moorings, a joint project by the University of Washington (UW), the University of Alaska, Fairbanks (UAF), and the Arctic and Antarctic Research Institute (AARI). The US portion of the mooring recoveries are supported by an NSF-OPP IPY grant (PIs: Woodgate, Weingartner, Whitledge and Lindsay). The US portion of the mooring deployments are supported by a NOAA-RUSALCA grant (PIs: Woodgate, Weingartner, Whitledge and Lindsay). The us portion, ice thickness (crudely) and some bio-optics.

Although the start of the cruise was delayed by a day due to bad weather in Nome (and the off-load was delayed by 2 days, again for bad weather), the majority of the cruise goals were met, viz., recovery and redeployment of the 8 moorings, and the occupation of 2 high resolution CTD lines, one in the Bering Strait proper and one just north of the strait (see map below). These sections were also sampled for nutrients, chlorophyll and other water properties. For details of the water measurements and of opportunistic benthic grab work done at various locations during the cruise, please contact the US Expedition Leader, Terry Whitledge. Cruise time was also used to set-up equipment for Leg 2 RUSALCA. This included a CTD water sampler, run by Marshall Swartz of the Woods Hole Oceanographic Institution (WHOI). For details for the CTD set up and explicit parameters of the CTD, see the Leg 2 cruise report.

The Leg 1 cruise was scheduled to on-load in Nome on 22<sup>nd</sup> August 2009, with the ship docking on 21<sup>st</sup> or early 22<sup>nd</sup> August. However strong south winds and the ensuing high seas prevented the ship coming into Nome until early on the 23<sup>rd</sup> August 2009. An efficient on-load allowed us to sail on the evening of the 23<sup>rd</sup> August, and arrive on site in the strait on the afternoon of the 24<sup>th</sup> August. Fair weather and the long daylight of this time of year greatly expedited our operations for the next 6 days, during which we completed the mooring operations and 2 high resolution CTD lines. On the morning of the 30<sup>th</sup> August, we concluded the CTD operations for this leg to allow for further testing/set up of Leg 2 equipment and steamed for Nome, in anticipation of possibly getting dock space on 31<sup>st</sup> August. Although we were off Nome from early on 31<sup>st</sup> August, strong south winds on 31<sup>st</sup> August and winds/swell on 1<sup>st</sup> Sept prevented us coming to dock until early on 2<sup>nd</sup> September. Offload of the mooring equipment was complete by about midday, allowing for an afternoon on-load of Leg 2.



#### **RUSALCA 2009 LEG 1 - MAP OF STATIONS**

Map of the Bering Strait region (left) and detail of the strait (right) showing Khromov RUSALCA 2009 Leg 1 CTD sites (small green dots) and mooring locations for the eight moorings recovered in 2009 (A12-08, A11-08, A13-08, A2W-08, A2-08, A4-08, A4R-08, and A3-08) and the eight moorings deployed in 2009 (A12-09, A11-09, A13-09, A3-09, A2W-09, A2-09, A4W-09, A4-09, and A3-09). Blue dots with red center indicate a site of recovery and deployment. Blue dot (A4W) indicates deployment only. Depth contours are every 10m from the International Bathymetric Chart of the Arctic Ocean [Jakobsson et al., 2000].

Woodgate 2009 RUSALCA Leg 1 Khromov Mooring report

# **RUSALCA 2009 LEG 1 CRUISE PARTICIPANTS**

# - US

- 1. Terry Whitedge (M), UAF, USA US Expedition Leader, nutrients, moored nutrient sampler
- 2. Kathleen Crane (F), NOAA Program Manager, NOAA;
- 3. Kevin Wood (M), NOAA/UW Science Liaison
- 4. Rebecca Woodgate (F), UW US Chief Scientist, Moorings, UW Mooring lead
- 5. Wendy Ermold (F), UW Moorings
- 6. David Leech (M), UAF Moorings, UAF Mooring lead
- 7. Kevin Taylor (M), UAF Moorings
- 8. Dan Naber (M), UAF Mooring, moored nutrient sampler, nutrients
- 9. Mike Kong (M), UAF UAF graduate student, nutrients, mooring assistance
- 10. Marshall Swartz (M), WHOI CTD
- 11. Jeff Jones (M), Reuters, Canada Media

# - Russian (directly part of RUSALCA 2009 Leg 1mooring work)

- 12. Vladimir Bakhmutov (M), State Research Navigational Hydro. Institute, RF Expedition Leader
- 13. Aleksey Ostrovskiy (M), Group Alliance Liaison and translator
- 14. Elena Bondareva (F), Arctic and Antarctic Research Institute (AARI), RF Moorings

## - Other Russian Scientists:

Alex Savvichev, Boris Smirnov, Alexey Sazonov, Natalia Chernova, Evgeny Vekhov, Iouri Pashchenko, Konstanin Kramchanin, Alexander Kolesnik, Stanislav Denisenko, Petr Strelkov, Daria Petrova, Elizaveta Ershova, Elena Zakharova, Alexey Sherbinin, Valentina Pimenova, Sergey Yarosh, Dmitry Korshunov, Alexander Bosin, Valentina Pimenova.

# **RUSALCA 2009 LEG 1 CRUISE SCHEDULE**

Tuesday 18 <sup>th</sup> Aug 2009 Wednesday 19 <sup>th</sup> Aug 2009 Thursday 20 <sup>th</sup> Aug 2009 Friday 21 <sup>st</sup> Aug 2009 Saturday 22 <sup>nd</sup> Aug 2009 Sunday 23 <sup>rd</sup> Aug 2009	UW mooring team (Woodgate, Johnson, Stewart) arrive Nome UW mooring team (Ermold) arrive Nome, prep mooring gear prep mooring gear prep mooring gear, other scientists arrive, on-load meeting with agent prep mooring gear, waiting for weather Khromov docks ~8am, customs & USCG inspection, onload, sail 8:30pm
Monday 24 <sup>th</sup> Aug 2009	(Johnson and Stewart return to Seattle)
	arrive A11 ~ 3pm, recover A11-08, A12-08, A13-08, download iscats
Tuesday 25 <sup>th</sup> Aug 2009	Recover A2W-08, A2-08, A4R-08, A4-08 by lunchtime (1pm),
	Stearn to A3, Recover A3-08 (by dragging) just before dinner (7:30pm)
Wednesday 26 <sup>th</sup> Aug 2009	Deploy A3-09 A2-09 A4-09 and A4W-09
	Download SBEs
Thursday 27 <sup>th</sup> Aug 2009	Deploy A2W-09, A13-09, A11-09, A12-08,
	Download ADCPs
Friday 28 <sup>th</sup> Aug 2009	Run BStrait CTD line with mud (10am-6am, 45min per station with transit) Finish Russian downloads
Saturday 29 <sup>th</sup> Aug 2009	Run A3L CTD line (noon – 6am), Fix CTD salinity problem (see below)
	Transfer of Russian Mooring Data, finish US downloads
Sunday 30 <sup>th</sup> Aug 2009	Run for Nome, packing. Stewart arrives Nome to assist offload.
Monday 31 <sup>st</sup> Aug 2009	Off Nome, waiting for weather to dock.
Tuesday 1 <sup>st</sup> Sep 2009	Off Nome, waiting for weather to dock.
Wednesday 2 <sup>nd</sup> Sep 2009	Dock ~ 9am, offload by noon, air cargo by 4pm, UW team leave Nome.
Thursday 3 <sup>rd</sup> Sep 2009	Return to Seattle

## Total: 9.5 days at sea

## BACKGROUND TO MOORING AND CTD PROGRAM

**Moorings:** The moorings serviced on this cruise are part of a multi-year time-series (started in 1990) of measurements of the flow through the Bering Strait. This flow acts as a drain for the Bering Sea shelf, dominates the Chukchi Sea, influences the Arctic Ocean, and can be traced across the Arctic Ocean to the Fram Strait and beyond. The long-term monitoring of the inflow into the Arctic Ocean via the Bering Strait is important for understanding climatic change both locally and in the Arctic. Data from 2001 to 2004 suggest that heat and freshwater fluxes are increasing through the strait [*Woodgate et al.*, 2006]. The work completed this summer should tell us if this is a continuing trend.

An overview of the Bering Strait mooring work (including access to mooring and CTD data) is available at <a href="http://psc.apl.washington.edu/BeringStrait.html">http://psc.apl.washington.edu/BeringStrait.html</a>.

Eight moorings were recovered on this cruise. These moorings (three in Russian waters – A11-08, A12-08, A13-08; five in US waters – A2W-08, A2-08, A4R-08, A4-08, A3-08) were deployed in another joint US-Russian cruise supported by NSF-OPP (*Woodgate, Weingartner, Whitledge, Lindsay, NSF-OPP-ARC-0632154*) with ship-time from the NOAA-led RUSALCA (Russian-American Long-term Census of the Arctic, <u>http://www.arctic.noaa.gov/aro/russian-american/</u>) program. This same NSF grant, an International Polar Year (IPY) project, funded the 2009 recoveries described here and data work up.

Eight moorings were deployed on this cruise under funding from NOAA-RUSALCA. These moorings (three in Russian waters – A11-09, A12-09, A13-09; five in US waters – A2W-09, A2-09, A4W-09, A4-09, A3-09) are almost entirely direct replacements of the recoveries, with one exception - site A4W, which was deployed on this cruise, was not deployed in 2008. (Note A4R-08 and A4-08 were at essentially the same position, and only 1 mooring was placed at this location in 2009.) To correct for a gradual shift of mooring positions over the last years, A11-09, A12-09, A13-09 and A2-09 were placed at their design positions established in the RUSALCA agreement started in 2004.

This is the 3<sup>rd</sup> year of the highest resolution array ever deployed in the Bering Strait (see map above). Three moorings were deployed across the western (Russian) channel of the strait (from west to east - A12-09, A11-09, A13-09). Four moorings were deployed across the eastern (US) channel of the strait (from west to east - A2W-09, A2-09, A4W-09, A4-09). A final 8<sup>th</sup> mooring (A3-09) was deployed ca. 35 nm north of the strait at a site proposed as a "climate" site, hypothesized to measure a useful average of the flow through both channels [*Woodgate et al.*, 2007]. Testing this hypothesis is one of the main aims of this work. All moorings (recovered and deployed) measure water velocity, temperature and salinity near bottom (as per historic measurements). Additionally, 6 of the 8 moorings (i.e., all eastern channel moorings, the climate site mooring A3, and the mooring central in the western channel, A11) also carried upward-looking ADCPs (measuring water velocity in 1-2 m bins up to the surface, ice motion, and medium quality ice-thickness) and ISCATS (upper level temperature-salinity-pressure sensors in a trawl resistant housing designed to survive impact by ice keels). Bottom pressure gauges were also deployed on the moorings at the edges of the eastern channel (A2W-09 and A4-09). Two moorings (A2-09, central eastern channel; and A12-09, western part of western channel) also carried ISUS nitrate sensors. For a full instrument listing, see the table below.

This coverage should allow us to assess year-round stratification in the strait and also to study the the physics of the Alaskan Coastal Current, a warm, fresh current present seasonally in the eastern channel, and suggested to be a major part of the heat and freshwater fluxes [*Woodgate and Aagaard*, 2005; *Woodgate et al.*, 2006]. The current meters and ADCPs (which give an estimate of ice thickness and ice motion) allow the quantification of the movement of ice and water through the strait. The nutrient sampler, the transmissometer and fluorometer time-series measurements should advance our understanding of the biological systems in the region.

*CTD:* The moorings are usually supported by annual CTD sections, with water samples for nutrients. This year, two high resolution CTD sections were run – one across the Bering Strait (BSL), and one through mooring site A3 (A3L line) – using the WHOI CTD setup, described in the cruise report for Leg 2. The third proposed line (CSL line) is due to be run on RUSALCA Leg 2.

**International links:** Maintaining the time-series measurements in Bering is important to several national and international programs, e.g., the Arctic Observing Network (AON) started as part of the International Polar Year (IPY) effort; NSF's Freshwater Initiative (FWI) and Arctic Model Intercomparison Project (AOMIP), and the international Arctic SubArctic Ocean Fluxes (ASOF) program. The mooring work also supports regional studies in the area, by providing key boundary conditions for the Chukchi Shelf/Beaufort Sea region; a measure of integrated change in the Bering Sea, and an indicator of the role of Pacific Waters in the Arctic Ocean. Furthermore, the Bering Strait inflow may play a role in Arctic Ocean ice retreat and variability (especially in the freshwater flux) is considered important for the Atlantic overturning circulation and possibly world climate [*Woodgate et al.*, 2005].

## MOORING OPERATIONS DURING RUSALCA 2009 LEG 1 KHROMOV CRUISE

Much of the efficiency of this mooring cruise is attributable to the excellent weather and long daylight available by doing the cruise in August. That said, although there was a 6-day weather window which allowed us to service the moorings and complete the CTD lines, both on-load and off-load were delayed by weather preventing docking in Nome, losing a total of 3 days of ship-time. This reinforces our standard conclusion that at any time of year, it is essential to include several weather days in the cruise planning.

For mooring recoveries, acoustics were done from the aft lab on the main deck, with the hydrophone deployed just forward of the aft starboard A-frame. Once released, the ship brought the floating mooring along the starboard side where it was hooked with a detachable hook on a long pole. Grapples were used to hold the mooring for hooking. Also a top-float catching noose (a ~ 2 m of chain suspended from 2 hand-held lines, thrown over the top float) was used to hold moorings for hooking. Once hooked, line was tied off to the hook of the starboard crane and lifted aboard. As soon as possible the lscat was recovered by hand as the rest of the mooring was being lifted. Many moorings could be brought aboard with 1 pick, but as necessary a stopper line was used on the aft-starboard rail. Although there was a learning curve to bringing the mooring along side and hooking the mooring with the detachable hook, once the method was established, it could work very time-efficiently, and thus we chose not to deploy a small boat to capture the top of the mooring. Once recovered, moorings were

cleaned and rinsed with freshwater by hand. (Preliminary attempts were unsuccessful in connecting the electric power washer to the ship's water and electric supplies, however, since biofouling was very light this year, no more strenuous efforts were pursued.)

Deployments were done off the aft-deck, using the ship's trawl wire and stern A-frame for lifting, with the ship steaming slowly (1.5 knots) into the wind, and the mooring being deployed anchor last from the aft deck. As the weather was good and the moorings were short, this operation did not require stopper points on the aft deck, although tag lines were used on the picking of the anchor.

Overall, mooring operations went exceptionally smoothly. A few points are noteworthy:

1) One mooring, A3-08, required dragging, possibly due to a starfish on the release hook. Other moorings previously with release issues due to biofouling had been painted with antifouling. This proved effective. A3-09 was redeployed without antifouling but with extra floatation and with a spring on the release hook of the mooring. Other US moorings were redeployed with anti-fouling. **Prepare for dragging on all Bering Strait mooring cruises. Use Antifouling measures on releases.** 

2) Mooring A2W-08 confirmed release but did not surface for 8 minutes. The suspicion is that this was hung-up on the bottom pressure gauge, possibly held by the plastic wrap used to inhibit biofouling on the pressure gauge, although A4-08 exhibited no problems in this regard. However, the plastic wrap solution was abandoned for the redeployments. The rubber piping connecting the gauge to the anchor was loosened as in previous years. Be prepared for a delay in the mooring surfacing.

**3)** Other (non-Bering Strait) cruises this year experienced significant release problems. UW uses dual releases on all moorings, pairing new releases with old. This year, all the new releases were used for recoveries and all functioned without hitch.

**4)** Biofouling was remarkably light this year. Discussions with Peter Strelkov (who took samples of biofouling from the moorings) suggest this is due to the late timing of the deployments. In previous years, barnacle larvae may establish themselves on the moorings before winter. In particularly warm years, there may be 2 seasons of this per year. A CD was made of all mooring fouling pictures since 2003, which shows substantial interannual variability. **Investigate.** 

**5)** Of the 5 lscats deployed in 2008, 2 of the upper layer sensors were lost (those on A11-08 and A3-08) in mid Feb 2009 and early March 2009. In both cases, loggers returned good data up to the time of loss. The remained 3 iscats gave good data all year round. **This yields the first ever year-round record of stratification in the eastern channel of the Bering Strait.** (Although 1 logger experienced logging problems, the data was successfully recovered from the microcat itself. The problematic logger had significant corrosion on the pins of the tether connected to the logger. This may be responsible for logger battery being low voltage on recovery.) The 2008 deployments were targeted at 17-18m depth, and the losses were not from the shallowest deployments. Thus 17-18m was taken as the target depth for the iscats for 2009 also. It is perhaps a coincidence that both of the lost iscats were on the ADCPs deployed in syntactic foam floats. Note that downloading of the iscats via the modem takes around 8 hours each. Also, in preparation, issues were found with the memory battery of the logger failing to connect. **Investigate logger issues.** 

6) The 2008 deployments experienced problems with weak chain. No further problems were encountered on recovery.

7) During this cruise, all deck operations were assisted by Russian personnel from RosHydroMet. We are extremely grateful for their expert assistance, which greatly facilitated operations. Particular thanks go to Alexey Sherbinin, who twice used a grappling hook to catch a mooring that had evaded the hooking technique.

Very preliminary analysis of the mooring data show very good data return from all instrumentation, with the exception of the ISUS on A12-08, which returned no data, likely due to a fault in the battery cable. Preliminary plots are given below.

The data show the **usual large annual cycle in temperature and salinity.** Many of the usual features are present, i.e. high variability in autumn, generally with freshening and cooling; salting (at the freezing point) in the winter; freshening and warming in the spring [*Woodgate et al.*, 2005].

As usual A4R (sampling the Alaskan Coastal Current) is warmer and fresher than the rest of the strait. Yet, it seems that this mooring showed less Iscat-SBE salinity difference than last year. It needs

to be investigated if this reflects a change in the ACC or the fact that the recent iscat was deployed around 17m compared to 14.5m in the first year.

Very **unusually, all salinity sensors at A4R show a strong freshening in midwinter**, around mid March. This freshening turns up also at A2 (to a lesser extent), but is only weakly present at A2W at depth. A possibly related mid March freshening is seen at A3 at depth (by this time, the A3 iscat was lost). This curious phenomenon (at a time when we expect salinities to be increasing due to ice formation) requires more investigation.

Very preliminary comparisons suggest that **2008 and 2009 are cold years compared to 2007**. Also, interestingly, **A3 maximum salinities in these 2008-2009 deployments are ~ 0.5 psu fresher than in the previous year**. Does this relate to a significant freshening in the strait?

Velocity data also show the typical high correlation both across the strait and in the vertical. As in previous years, the ACC is present in the eastern channel as evidenced by seasonal velocity shear. As in previous recent years, southward flow events are rare.

The flow through the strait is believed to be driven by a sea-level difference between the Pacific and the Arctic, which drives a flow northwards towards the Arctic. Local winds (usually southward in the annual mean) tend to oppose this flow and may reverse it on timescales of days [*Woodgate et al.*, 2005b]. However, the recovered data suggest that reversals have been unusually uncommon this summer, as other recent data. Since the variability of northward fluxes of heat and freshwater are dominantly dependent on the variability of the volume transport [*Woodgate et al.*, 2006], this may imply further increases in this fluxes, with possible implications for the Arctic and beyond.

Details of mooring positions and instrumentation are given below, along with schematics of the moorings, photos of the mooring fouling, and preliminary plots of the data.

#### CTD AND WATER SAMPLING DURING RUSALCA 2009 LEG 1 KHROMOV CRUISE

Two high resolution CTD lines were completed during the cruise, using the WHOI Seabird CTD system with water sampling rosette. The CTD was deployed through the aft A-frame, and bottles were fired at regular depths.

Unprocessed data should be treated with some caution. The first cast (BSL-1) was taken without the instrument soaking at depth. Anomalous salinity signals suggested that air had not been sufficiently purged from the system, and subsequent to this cast, all CTD casts started with soaking the CTD at 10m depth until the pumps came on. However, as the lines progressed, this problem reemerged, although it was not fully recognized until late in the A3L line (A3L Line, also possibly named AL Line in some CTD documentation), since it was initially (erroneously) considered to be a problem with the sharp temperature gradients in the vertical. Yo-yo-ing part of one cast confirmed that temperature was not the culprit, and further investigation showed the small hole that vented air from the CTD piping was blocked. This resulted in the pump pumping air rather than water, and thus the time lag between the temperature and conductivity sensors was not as expected, resulting in anomalous salinity signals. Once the vent hole was cleaned (secondary sensors cleaned on consecutive casts) the anomalous salinity signals disappeared. The upcasts did not experience this issue, presumably since once the CTD had descended to depth all the air was finally purged from the system.

## On data processing, be prepared to use upcasts instead of downcasts.

#### During operation, be alert to this problem, and prepared to clean the vent frequently.

Since the CTD operations were taken by WHOI, who had other priorities on this leg of the cruise, calibrated CTD data are not available for this report. However, impressions gained during CTDing suggest that in the Bering Strait line, only the first cast (BSL-01) appeared to sample the Siberian Coastal water. Add extra stations at the Russian Coast.

Water samples were taken for a variety of parameters, including nutrients. For details please see the cruise report for the second leg, or contact Terry Whitledge.

# **RUSALCA 2009 LEG 1 BERING STRAIT MOORING POSITIONS AND INSTRUMENTATION**

ID	LATITUDE (N) (WGS-84)	LONGITUDE (W) (WGS-84)	WATER DEPTH /m (corrected)	INST.
09 Recoveries				
- Russian EEZ				
A11-08	65 54.033	169 26.174	52	ISCAT, ADCP, SBE37
A12-08	65 56.060	169 36.738	51	ISUS, SBE/TF, RCM9
A13-08	65 51.897	169 16.907	50	AARI, RCM9, SBE37
- US EEZ				
A2W-08	65 48.124	168 48.371	53	ISCAT, ADCP, SBE16, BPG
A2-08	65 47.195	168 34.691	56	ISCAT, ADCP, SBE/TF, ISUS
A4R-08	65 44.946	168 15.964	50	ISCAT, ADCP, SBE16
A4-08	65 44.882	168 15.761	50	SBE16, BPG
A3-08	66 19.595	168 57.875	58	ISCAT, ADCP, SBE37

ID	LATITUDE (N)	LONGITUDE (W)	WATER DEPTH	INST.
	(WGS-84)	(WGS-84)	/m (corrected)	
09 Deployments				
- Russian EEZ				
A11-09	65 54.002	169 25.984	52	ISCAT, ADCP, SBE37
A12-09	65 55.993	169 37.005	51	ISUS, SBE/TF, RCM9
A13-09	65 52.006	169 16.987	51	AARI, RCM9T, SBE37
- US EEZ				
A2W-09	65 48.062	168 47.957	54	ISCAT, ADCP, SBE16, WR, BPG
A2-09	65 46.870	168 34.044	57	ISCAT, ADCP, SBE/TF, ISUS
A4W-09	65 45.424	168 21.937	56	ISCAT, ADCP, SBE16
A4-09	65 44.762	168 15.746	50	ISCAT, ADCP, SBE16, BPG
A3-09	66 19.601	168 57.928	58	ISCAT, ADCP, SBE37, WR

AARI = AARI Current meter and CTD ADCP = RDI Acoustic Doppler Current Profiler BPG=Seabird Bottom Pressure Gauge ISCAT = near-surface Seabird TS sensor in trawl resistant housing, with near-bottom data logger ISUS= Nutrient Analyzer WR=Whale Recorder RCM9= Aanderaa Acoustic Recording Current Meter RCM9T = Aanderaa Acoustic Recording Current Meter with Turbidity SBE/TF = Seabird CTD recorder with transmissometer and fluorometer

SBE16 = Seabird CTD recorder SBE37 = Seabird Microcat CTD recorder

# RUSALCA 2009 LEG 1 TARGET CTD POSITIONS (For actual, see Leg 2 report)

<pre>% - 24 stations just north of the Bering Strait % Lat (N) Long (W) Station</pre>	8=	==== Bei	ring Strait	: Line						
<pre>% Lat (N) Long (N) Lat (N) Long (N) Station 65.980 169.643 65 58.01 169 38.56 %1 %BS1 65.963 169.498 65 56.71 169 28.7 %3 %BS3 65.927 169.425 65 55.65 169 25.52 %4 %BS4 65.927 169.425 65 54.59 169 21.11 %5 %BS5 65.892 169.280 65 53.55 169 16.77 %6 %BS6 65.802 169.142 65 51.72 169 %49 %8 %BS8 65.801 169.314 65 52.78 169 12.83 %7 %BS7 65.862 169.142 65 51.72 169 %49 %8 %BS8 65.881 169.072 65 50.47 169 4.31 %9 %BS9 65.825 169.000 65 49.50 169 0.00 %10 %BS10 65.805 168.933 65 48.31 168 55.96 %11 %BS13 65.708 168.860 65 47.26 168 51.62 %12 %BS12 65.772 168.794 65 45.28 168 43.29 %14 %BS14 65.773 168.63 65 44.31 168 47.64 %13 %BS13 65.772 168.794 65 45.28 168 43.29 %14 %BS14 65.772 168.691 65 43.29 168 35.46 %16 %BS16 65.702 168.591 65 43.29 168 35.46 %16 %BS16 65.702 168.391 65 40.35 168 2.344 %19 %BS19 65.625 168.318 65 39.29 168 12.8 %17 %BS17 65.686 168.449 65 41.18 168 26.94 %18 %BS18 65.672 168.391 65 40.35 168 2.344 %19 %BS19 65.652 168.171 65 35.96 168 0.03 %22 %BS20 65.642 168.250 65 38.53 168 14.97 %21 %BS21 65.652 168.171 65 34.91 168 7.00 %24 %BS24 %*==== A3L 1ine * = -24 stations heading Southwest=northeast through mooring site A3 % Lat (N) Long (W) Lat (N) Long (W) Station % deg min deg min Num Name 66.1190 169.5931 66 7.1400 169 35.5850 %25 %AL1 66.1380 169.5362 66 3.2800 169 22.1700 %26 %AL2 66.1700 169.4223 66 10.5600 169 23.7550 %27 %AL3 66.1300 169.5362 66 13.9800 169 23.21700 %26 %AL2 66.1700 169.4223 66 10.5600 169 23.550 %27 %AL3 66.1190 169.3085 66 17.4000 169 23.500 %33 %AL6 66.2100 169.3085 66 12.8400 169 13.6800 %33 %AL6 66.2100 169.32516 66 13.9800 169 13.0500 %33 %AL6 66.2100 169.32516 66 13.9800 169 13.0500 %33 %AL6 66.2300 169.233 66 10.5000 169 23.7500 %33 %AL14 66.3300 169.233 66 10.5000 169 23.550 %33 %AL14 66.3300 169.233 66 10.5000 169 23.550 %33 %AL14 66.3300 169.233 66 10.5000 169 23.500 %33 %AL14 66.3300 169.233 66 10.5000 169 23.500 %33 %AL14 66.3300 169.233 66 10.5000 169 23.500 %33 %AL14 66.3300 169.233 66 10.5000 169 13.6300 %33 %AL14 66.3300 169.233 66 23.9200 168 %3.70</pre>	%	- 24 sta	ations just	north	of	the Be	ring St	trait		
<pre>     deg min deg min Num Num Nume     65.980 169.511 65 58.81 169 38.56 %1 %BS1     65.945 169.498 65 56.71 169 34.24 %2 %BS2     65.945 169.498 65 56.71 169 29.87 %3 %BS3     65.945 169.498 65 56.75 169 25.52 %4 %BS4     65.910 169.352 65 55.65 169 25.52 %4 %BS4     65.802 169.280 65 53.55 169 16.77 %6 %BS6     65.825 169.20 65 53.55 169 16.77 %6 %BS6     65.880 169.214 65 52.78 169 12.83 %7 %BS7     65.881 169.024 65 51.72 169 8.49 %8 %BS9     65.841 169.072 65 50.47 169 4.31 %9 %BS9     65.825 168.000 65 49.50 169 0.00 %10 %BS10     65.805 168.933 65 48.31 168 55.96 %11 %BS11     65.781 168.860 65 47.26 168 51.62 %12 %BS12     65.772 168.794 65 46.33 168 47.64 %13 %BS13     65.781 168.663 65 47.26 168 39.80 %15 %BS15     65.721 168.794 65 44.35 168 39.80 %15 %BS15     65.721 168.521 65 43.29 168 31.28 %17 %BS17     65.668 168.449 65 41.18 168 26.94 %18 %BS18     65.672 168.391 65 43.32 168 31.28 %17 %BS17     65.665 168.138 65 39.29 168 19.09 %20 %BS20     65.642 168.149 65 41.18 168 26.94 %18 %BS18     65.675 168.318 65 39.29 168 19.09 %20 %BS21     65.655 168.177 65 37.48 168 10.63 %22 %BS22     65.599 168.161 65 35.96 168 9.66 %23 %BS23     65.652 168.177 65 37.48 168 10.63 %22 %BS22     65.659 168.177 65 37.48 168 10.63 %22 %BS22     65.599 168.161 65 35.96 168 9.66 %23 %BS23     65.170 169.4793 66 9.4200 169 32.7700 %26 %AL1     66.1700 169.5931 66 7.1400 169 35.5850 %27 %AL3     66.1700 169.4233 66 10.5600 169 25.3400 %28 %AL4     66.1950 169.3656 66 12.8400 169 18.5100 %30 %AL6     66.2500 169.9236 66 15.200 169 18.5100 %33 %AL4     66.3160 169.4233 66 10.8600 169 32.770 %33 %AL4     66.330 169.512 00 %33 %AL4     66.330 169.512 66 13.9800 169 32.5850 %27 %AL3     66.1700 169.4233 66 10.2600 169 25.3400 %28 %AL4     66.1950 169.3656 66 12.8400 169 32.5850 %27 %AL3     66.1700 169.4233 66 10.2600 169 32.5850 %27 %AL3     66.1700 169.4233 66 10.2600 169 32.5300 %27 %AL3     66.330 169.5216 66 13.9800 169 32.5850 %27 %AL3     66.330 169.5216 66 13.9800 169 32.5300 %28 %AL4     66.330 169.5316 66 2.2</pre>	%	Lat (N)	Long (W)	Lat (	N)	Lon	q (W)	Stat	cion	
65.980       169.571       65       58.81       160       38.56       %1       %BS1         65.943       169.459       65       57.75       169       34.24       %2       %BS2         65.945       169.425       65       55.65       169       25.52       %4       %BS3         65.927       169.425       65       55.65       169       12.83       %7       %BS5         65.801       169.224       65       53.55       169       16.77       %6       %BS6         65.802       169.124       65       51.72       169       8.49       %BS10         65.825       169.007       65       50.47       169       4.31       %9       %BS10         65.825       168.933       65       48.31       168       55.96       %11       %BS11         65.788       168.80       65       44.35       168       39.80       %15       %BS15         65.712       168.721       65       43.29       168       39.424       %14       %BS14         65.722       168.931       65       43.29       168       31.88       %15       %555         65.625       168.318	00			dea m	in	deq	min	Num	Name	
65.963       169.571       65       57.75       169       34.24       %2       %BS3         65.945       169.498       65       56.56       169       29.87       %3       %BS3         65.945       169.426       55.56       169       25.52       %4       %BS4         65.801       169.214       65       53.55       169       16.77       %6       %BS6         65.801       169.214       65       51.72       169       8.49       %8       %BS3         65.811       169.000       65       49.50       169       0.00       %10       %BS10         65.825       168.900       65       47.26       168       51.62       %11       %BS11         65.772       168.794       65       46.33       168       47.64       %13       %BS14         65.721       168.591       65       41.29       168       31.28       %17       %BS17         65.621       168.391       65       49.29       168       1.90       %20       %BS20         65.721       168.591       65       32.92       168       1.91       %BS24       %BS24         65.622       168.116 <td></td> <td>65.980</td> <td>169.643</td> <td>65 58</td> <td>.81</td> <td>169</td> <td>38.56</td> <td>81</td> <td>%BS1</td> <td></td>		65.980	169.643	65 58	.81	169	38.56	81	%BS1	
65.945         169.498         65         56.71         169         29.87         %3         %BS1           65.927         169.425         65         55.65         169         25.52         %4         %BS4           65.921         169.280         65         53.55         169         16.77         %6         %BS5           65.821         169.142         65         51.72         169         8.49         %8         %BS7           65.825         169.072         65         50.47         169         4.31         %9         %BS10           65.825         168.933         65         48.31         168         55.62         %11         *BS10           65.772         168.791         65         45.28         168         39.80         %15         *BS15           65.772         168.591         65         41.28         168         39.80         %15         *BS17           65.662         168.491         65         41.28         168         16.4         *BS17           65.672         168.391         65         41.28         168         169.92         *BS20           65.652         168.117         65         37.92		65.963	169.571	65 57	.75	169	34.24	82	%BS2	
65.927       169.425       65       55.65       169       25.52       %4       %BS4         65.910       169.322       65       54.59       169       21.11       %5       %BS5         65.820       169.214       65       52.78       169       12.83       %7       %BS7         65.841       169.072       65       50.77       169       4.31       %9       %BS9         65.825       169.000       65       47.26       168       51.62       %11       %BS11         65.825       168.933       65       44.31       168       55.96       %11       %BS14         65.772       168.794       65       42.23       168       31.28       %17       %BS14         65.772       168.591       65       42.23       168       31.28       %17       %BS14         65.721       168.318       65       32.29       168       32.44       %19       %BS19         65.655       168.318       65       32.29       168       9.420       %BS22         65.655       168.117       65       32.29       168       9.64       %22       %BS24         %=====       A31		65.945	169.498	65 56	.71	169	29.87	83	%BS3	
65.910 169.352 65 54.59 169 21.11 %5 %B35 65.892 169.280 65 53.55 169 16.77 %6 %B36 65.880 169.214 65 52.78 169 12.83 %7 %B57 65.862 169.142 65 51.72 169 %.49 %8 %B58 65.841 169.072 65 50.47 169 4.31 %9 %BS9 65.825 169.000 65 49.50 169 0.00 %10 %BS10 65.805 168.933 65 48.31 168 55.96 %11 %BS11 65.788 168.860 65 47.26 168 51.62 %12 %BS12 65.772 168.794 65 46.33 168 47.64 %13 %BS13 65.755 168.721 65 45.28 168 43.29 %14 %BS14 65.759 168.663 65 44.35 168 39.80 %15 %BS15 65.722 168.591 65 43.29 168 35.46 %16 %BS16 65.704 168.521 65 42.23 168 31.28 %17 %BS17 65.665 168.349 65 41.18 168 26.94 %18 %BS18 65.672 168.318 65 39.29 168 19.09 %20 %BS20 65.642 168.250 65 38.53 168 14.97 %21 %BS21 65.655 168.318 65 39.29 168 19.09 %20 %BS20 65.642 168.250 65 34.91 168 7.00 %24 %BS24 %*==== A3L line * - 24 stations heading Southwest-northeast through mooring site A3 % Lat (N) Long (W) Lat (N) Long (W) Station % deg min deg min Mum Name 66.1190 169.5931 66 7.1400 169 35.5850 %25 %AL1 66.1570 169.4723 66 7.1400 169 32.1700 %26 %AL2 % *==== A3L line * - 24 stations heading Southwest-northeast through mooring site A3 % Lat (N) Long (W) Lat (N) Long (W) Station % deg min deg min Mum Name 66.1190 169.5931 66 7.1400 169 35.5850 %25 %AL1 66.1570 169.4723 66 10.5600 169 28.7550 %27 %AL3 66.2140 169.3085 66 12.8400 169 18.5100 %30 %AL6 66.2300 169.2516 66 13.9800 169 18.5100 %30 %AL6 66.2300 169.2516 66 13.9800 169 18.5100 %30 %AL6 66.2300 169.0239 66 15.200 169 18.5100 %33 %AL9 66.2100 169.0239 66 12.8400 169 18.5100 %33 %AL9 66.220 169.1478 66 16.2600 169 8.2650 %33 %AL9 66.2300 169.0239 66 12.8400 169 18.5100 %32 %AL11 66.333 168.7515 66 22.0067 168 49.393 %AL14 66.333 168.7515 66 22.007 168 45.0875 %39 %AL13 66.3369 168.6078 66 22.007 168 45.0875 %39 %AL13 66.3391 168.6078 66 22.007 168 45.0875 %39 %AL13 66.4300 168.3244 66 22.0407 168 49.333 %		65.927	169.425	65 55	.65	169	25.52	84	%BS4	
65.892       169.280       65       53.55       169       16.77       %6       %836         65.800       169.214       65       52.78       169       12.83       %7       %BS7         65.861       169.142       65       51.72       169       8.49       %88       %858         65.811       169.072       65       50.47       169       0.00       %10       %BS10         65.825       169.000       65       49.50       169       0.00       %10       %BS10         65.788       168.933       65       43.1       168       51.62       %11       %BS11         65.771       168.794       65       45.28       168       43.29       %14       %BS14         65.772       168.521       65       42.23       168       31.28       %17       %BS17         65.642       168.449       65       41.18       168       20.44       %18       %BS14         65.655       168.318       65       37.29       168       14.97       %21       %BS21         65.642       168.177       65       37.48       168       10.63       %22       %BS24         %===== <td></td> <td>65.910</td> <td>169.352</td> <td>65 54</td> <td>.59</td> <td>169</td> <td>21.11</td> <td>%5</td> <td>%BS5</td> <td></td>		65.910	169.352	65 54	.59	169	21.11	%5	%BS5	
65.880 169.214 65 52.78 169 12.83 %7 %BS7 65.862 169.142 65 51.72 169 8.49 %8 %BS8 65.841 169.072 65 50.47 169 4.31 %9 %BS9 65.825 169.000 65 49.50 169 0.00 %10 %BS10 65.805 168.933 65 48.31 168 55.96 %11 %BS11 65.782 168.721 65 45.28 168 43.29 %14 %BS13 65.755 168.721 65 45.28 168 43.29 %14 %BS14 65.722 168.591 65 43.29 168 31.28 %17 %BS17 65.686 168.449 65 41.18 168 26.94 %18 %BS18 65.672 168.391 65 42.23 168 31.28 %17 %BS17 65.686 168.449 65 41.18 168 26.94 %18 %BS18 65.672 168.391 65 42.23 168 19.09 %20 %BS20 65.642 168.250 65 38.53 168 14.97 %21 %BS19 65.652 168.318 65 39.29 168 19.09 %20 %BS20 65.642 168.250 65 38.53 168 14.97 %21 %BS21 65.625 168.318 65 39.29 168 10.63 %22 %BS22 65.582 168.117 65 34.91 168 7.00 %24 %BS24 % *==== A3L line % - 24 stations heading Southwest-northeast through mooring site A3 % Lat (N) Long (W) Lat (N) Long (W) Station % deg min deg min Num Name 66.1190 169.5931 66 7.1400 169 35.5850 %25 %AL1 66.1570 169.4723 66 9.4200 169 28.7550 %27 %AL3 66.170 169.4723 66 11.700 169 28.7550 %27 %AL3 66.170 169.4793 66 9.4200 169 28.7550 %27 %AL3 66.170 169.4793 66 12.8400 169 18.5100 %30 %AL6 66.2300 169.2516 66 13.9400 169 18.5100 %30 %AL6 66.2300 169.2516 66 13.9400 169 18.5100 %30 %AL6 66.220 169.1737 66 15.1200 169 18.5100 %30 %AL6 66.220 169.1747 66 15.1200 169 18.5100 %31 %AL7 66.220 169.1947 66 15.1200 169 18.5100 %33 %AL9 66.220 169.1947 66 15.1200 169 18.5100 %33 %AL9 66.220 169.039 66 17.4000 169 8.2650 %33 %AL9 66.220 169.039 66 17.4000 169 8.2650 %33 %AL14 66.338 168.7515 66 21.8000 169 15.0950 %31 %AL7 66.320 169.0239 66 12.8000 169 15.0950 %31 %AL7 66.320 169.039 66 17.4000 169 4.8500 %34 %AL10 66.330 169.039 66 17.4000 169 4.8500 %34 %AL10 66.330 168.9570 66 19.6800 168 58.0200 %36 %AL12 66.331 168.6751 66 21.0933 168 49.393 %AL14 66.333 8168.7515 66 21.0933 168 49.393 %AL14 66.333 8168.7515 66 21.0933 168 49.393 %AL14 66.334 168.7676 66 29.000 168 45.0875 %39 %AL14 66.3351 168.6078 66 22.5076 18 40.7767 %40 %AL16 66.4300 168.3204		65.892	169.280	65 53	.55	169	16.77	%6	%BS6	
65.862       169.142       65       51.72       169       8.49       %8       %858         65.841       169.072       65       50.47       169       4.31       %9       %859         65.825       168.933       65       48.31       168       55.96       %11       %8510         65.805       168.933       65       48.31       168       55.96       %11       %8513         65.788       168.860       65       47.26       168       \$1.62       %12       %8513         65.771       168.721       65       45.28       168       33.98       %15       %8516         65.739       168.63       65       44.35       168       35.46       %16       %8517         65.72       168.391       65       40.35       168       31.28       %17       %8517         65.655       168.318       65       39.29       168       19.09       %20       %8520         65.651       168.117       65       35.96       168       14.97       %21       %8523         65.562       168.117       65       35.96       168       9.66       %23       %8523         65.579		65.880	169.214	65 52	.78	169	12.83	%7	%BS7	
65.841       169.072       65       50.47       169       4.31       \$9       \$BS9         65.825       169.000       65       49.50       169       0.00       \$10       \$BS10         65.825       168.933       65       48.31       168       55.66       \$11       \$10       \$10       \$10         65.772       168.794       65       46.33       168       47.64       \$13       \$12       \$12       \$13       \$16         65.772       168.63       65       44.35       168       39.80       \$15       \$18515         65.722       168.591       65       42.23       168       31.28       \$17       \$15       \$151         65.664       168.449       65       41.18       168       20.44       \$19       \$151       \$151         65.655       168.318       65       39.29       168       10.63       \$22       \$BS22       \$25       \$26       \$168       \$168       \$16.62       \$188       \$153       \$168       \$17       \$1852       \$168       \$168       \$16.62       \$188       \$155       \$152       \$1821       \$1555       \$1822       \$165       \$1831       \$168		65 862	169 142	65 51	72	169	8 49	%8	%BS8	
65.825       169.000       65       49.50       169       0.00       %10       %BS10         65.805       168.933       65       48.31       168       55.96       %11       %BS11         65.772       168.794       65       46.33       168       47.64       %13       %BS13         65.755       168.721       65       44.35       168       39.80       %15       %BS14         65.722       168.591       65       43.29       168       35.46       %16       %BS14         65.722       168.591       65       43.29       168       31.28       %17       %BS17         65.665       168.391       65       40.35       168       24.4       %19       %BS18         65.655       168.318       65       39.29       168       19.09       %20       %BS20         65.655       168.117       65       37.48       168       10.63       %22       %BS23         65.599       168.117       65       34.91       168       7.00       %24       %BS24         %=====       A3L       line       %       Max       Max       Max         66.1190       169.5931 <td></td> <td>65 841</td> <td>169 072</td> <td>65 50</td> <td>47</td> <td>169</td> <td>4 31</td> <td>8 Q</td> <td>%BS9</td> <td></td>		65 841	169 072	65 50	47	169	4 31	8 Q	%BS9	
65.805       168.933       65       48.31       168       55.960       \$11       \$BS11         65.788       168.860       65       47.26       168       51.62       \$12       \$BS12         65.772       168.794       65       46.33       168       47.64       \$13       \$BS13         65.755       168.721       65       44.35       168       39.80       \$15       \$BS16         65.739       168.663       65       44.32       168       31.28       \$17       \$BS16         65.721       168.521       65       42.23       168       23.44       \$19       \$BS19         65.655       168.318       65       39.29       168       19.09       \$20       \$BS22         65.651       168.177       65       37.48       168       10.63       \$22       \$BS23         65.582       168.117       65       34.91       168       7.00       \$24       \$BS24         \$*====       A3L       1ine       \$\$       \$\$       \$\$       \$\$       \$\$       \$\$         \$*====       A3L       1ine       \$\$       \$\$       \$\$       \$\$       \$\$       \$\$       \$\$		65 825	169 000	65 49	50	169	0 00	%10	%BS10	
65.788       168.860       65       47.26       168       51.62       \$12       \$BS12         65.772       168.794       65       46.33       168       47.64       \$13       \$BS13         65.755       168.721       65       45.28       168       32.9       \$14       \$BS15         65.739       168.663       65       44.35       168       32.9       \$12       \$17.7       \$BS16         65.722       168.521       65       42.23       168       35.46       \$16       \$BS16         65.721       168.321       65       40.35       168       23.44       \$19       \$BS19         65.655       168.318       65       30.29       168       10.63       \$22       \$BS21         65.652       168.177       65       37.48       168       10.63       \$22       \$BS23         65.525       168.117       65       34.91       168       7.00       \$24       \$BS24         *====       A31       1ne       *       4       \$BS24       \$BS24       \$AL1         *===       A31       1on       66       7.1400       169       35.5850       \$25       \$AL1 <td></td> <td>65 805</td> <td>168 933</td> <td>65 48</td> <td>31</td> <td>168</td> <td>55 96</td> <td>%11</td> <td>%BS11</td> <td></td>		65 805	168 933	65 48	31	168	55 96	%11	%BS11	
65.772       168.794       65       46.33       168       47.64       %13       %BS13         65.775       168.721       65       45.28       168       32.29       %14       %BS15         65.739       168.663       65       44.35       168       39.80       %15       %BS15         65.721       168.521       65       42.23       168       31.28       %17       %BS17         65.672       168.391       65       40.35       168       23.44       %19       %BS19         65.655       168.318       65       39.29       168       19.09       %20       %BS21         65.655       168.177       65       37.48       168       10.63       %22       %BS23         65.552       168.177       65       34.91       168       7.00       %24       %BS24         %=====       A3L       11me       %       4       Mum       Num       Name         66.1190       169.5931       66       7.1400       169       35.5850       %25       %AL1         66.1190       169.4793       66       7.1400       169       35.5850       %25       %AL1         66.119		65 788	168 860	65 47	26	168	51 62	%12	%BS12	
65.755 168.721 65 45.28 168 43.29 %14 %BS14 65.739 168.663 65 44.35 168 39.80 %15 %BS15 65.722 168.591 65 43.29 168 35.46 %16 %BS16 65.704 168.521 65 42.23 168 31.28 %17 %BS17 65.666 168.449 65 41.18 168 26.94 %18 %BS19 65.655 168.318 65 39.29 168 19.09 %20 %BS20 65.642 168.250 65 38.53 168 14.97 %21 %BS19 65.655 168.318 65 39.29 168 19.09 %20 %BS20 65.642 168.250 65 38.53 168 14.97 %21 %BS21 65.652 168.177 65 37.48 168 10.63 %22 %BS22 65.599 168.161 65 35.96 168 9.66 %23 %BS23 65.582 168.117 65 34.91 168 7.00 %24 %BS24 % *==== A3L line %		65.772	168.794	65 46	.33	168	47.64	%13	%BS13	
65.739       168.663       65       44.35       168       39.80       %15       %BS15         65.722       168.591       65       43.29       168       35.46       %16       %BS17         65.6704       168.521       65       42.23       168       31.28       %17       %BS17         65.664       168.449       65       41.18       168       23.44       %19       %BS19         65.655       168.318       65       39.29       168       19.09       %20       %BS20         65.652       168.177       65       37.48       168       10.63       %22       %BS21         65.652       168.117       65       34.91       168       7.00       %24       %BS23         65.559       168.117       65       34.91       168       7.00       %24       %BS24         %=====       A3L       line        deg       min       Num       Name         66.1190       169.5931       66       7.1400       169       35.5850       %27       %AL3         66.1190       169.5362       66       12.800       169       21.700       %26       %AL2         66.119		65 755	168 721	65 45	2.8	168	43 29	%14	%BS14	
65.722       168.591       65       43.29       168       35.46       %16       %BS16         65.704       168.521       65       42.23       168       31.28       %17       %BS17         65.686       168.449       65       41.18       168       26.94       %18       %BS19         65.672       168.318       65       39.29       168       19.09       %20       %BS20         65.655       168.18       65       37.48       168       14.97       %21       %BS22         65.552       168.161       65       35.96       168       9.66       %23       %BS23         65.582       168.117       65       34.91       168       7.00       %24       %BS24         %        deg       min       deg       min       Num       Name         66.1190       169.5931       66       7.1400       169       35.5850       %25       %AL1         66.1380       169.4223       66       0.5600       169       25.3400       %28       %AL4         66.1950       169.4793       66       9.25.3400       \$28       %AL4         66.12760       169.4223		65.739	168,663	65 44	.35	168	39.80	%15	%BS15	
65.704       168.521       65       42.23       168       31.28       %17       %BS17         65.666       168.449       65       41.18       168       23.44       %19       %BS19         65.672       168.391       65       40.35       168       23.44       %19       %BS20         65.655       168.381       65       39.29       168       19.09       %20       %BS20         65.625       168.177       65       37.48       168       10.63       %22       %BS23         65.525       168.117       65       34.91       168       7.00       %24       %BS24         %       =====       A3L       line       %       -24       station       Num       Name         66.1190       169.5931       66       7.1400       169       35.5850       %25       %AL1         66.1190       169.5362       66       8.2800       169       32.7700       %26       %AL2         66.1170       169.4723       66       10.5600       169       25.3400       %28       %AL4         66.1260       169       38.510       %30       %AL5       66.2140       169.3085       66		65 722	168 591	65 43	29	168	35 46	%16	%BS16	
65.666       168.449       65       41.18       168       26.94       %18       %BS18         65.672       168.391       65       40.35       168       19.09       %20       %BS20         65.655       168.318       65       39.29       168       19.09       %20       %BS21         65.652       168.177       65       37.48       168       10.63       %22       %BS21         65.559       168.161       65       35.96       168       9.66       %23       %BS24         %=====       A3L       line       %       22       %BS24       %BS24         %=====       A3L       line       %       Lat (N)       Long (W)       Station         % Lat (N)       Long (W)       Lat (N)       Long (W)       Station         % 66.1760       169.4793       66       7.1400       169       32.5750       %27       %AL3         66.1760       169.4223       66       10.5600       169       21.9250       %27       %AL3         66.1260       169.3085       66       12.8400       169       18.5100       %30       %AL6         66.2140       169.3085       66       12.8400 </td <td></td> <td>65.704</td> <td>168.521</td> <td>65 42</td> <td>.23</td> <td>168</td> <td>31.28</td> <td>%17</td> <td>%BS17</td> <td></td>		65.704	168.521	65 42	.23	168	31.28	%17	%BS17	
65.672       168.391       65       40.35       168       23.44       %19       %BS19         65.652       168.318       65       39.29       168       19.09       %20       %BS20         65.642       168.250       65       38.53       168       14.97       %21       %BS21         65.652       168.177       65       37.48       168       0.63       %22       %BS23         65.582       168.117       65       34.91       168       7.00       %24       %BS24         %       ====       A3L       line       *       -       24       station       hume         %		65.686	168.449	65 41	.18	168	26.94	%18	%BS18	
65.655       168.318       65       39.29       168       19.09       %20       %BS20         65.642       168.250       65       38.53       168       14.97       %21       %BS21         65.625       168.177       65       37.48       168       10.63       %22       %BS23         65.599       168.101       65       35.96       168       9.66       %23       %BS24         %       =       A3L       11ne       %       -       24       \$stations       heading       Southwest-northeast       through mooring site A3         %       Lat (N)       Long (W)       Lat (N)       Long (W)       Station         %       66.1190       169.5931       66       7.1400       169       35.5850       %25       %AL1         66.1570       169.4793       66       9.4200       169       25.750       %27       %AL3         66.1760       169.4223       66       10.5600       169       25.3400       %28       %AL4         66.2170       169.4223       66       12.8400       169       15.0950       %31       %AL7         66.2250       169.1378       66       12.8400       169		65.672	168.391	65 40	.35	168	23.44	%19	%BS19	
65.642       168.250       65       38.53       168       14.97       %21       %BS21         65.642       168.177       65       37.48       168       10.63       %22       %BS23         65.599       168.161       65       35.96       168       9.66       %23       %BS23         65.582       168.117       65       34.91       168       7.00       %24       %BS24         %=====       A3L       line         deg       min       deg       min       Num       Name         66.1190       169.5931       66       7.1400       169       35.5850       %25       %AL1         66.1190       169.5931       66       7.1400       169       35.5850       %25       %AL1         66.1190       169.5931       66       7.1400       169       32.1700       %26       %AL2         66.1570       169.4793       66       9.4200       169       28.7550       %27       %AL3         66.1760       169.4223       66       10.500       169       28.8AL4       66.2140       169.3085       66       12.8400       169       18.5100       %30       %AL5		65 655	168 318	65 39	29	168	19 09	\$20	%BS20	
65.625       168.177       65       37.48       168       10.63       %22       %BS22         65.599       168.161       65       35.96       168       9.66       %23       %BS23         65.582       168.117       65       34.91       168       7.00       %24       %BS24         %       =====       A3L       line       %         Kation         %       = 24       stations heading       Southwest-northeast       through mooring site A3         %       Lat (N)       Long (W)       Lat (N)       Long (W)       Station         %       deg       min       deg       min       Num       Name         66.1190       169.5931       66       7.1400       169       35.5850       %25       %AL1         66.1380       169.4223       66       10.5600       169       28.7550       %27       %AL3         66.1760       169.4223       66       10.5600       169       28.3400       %28       %AL4         66.2330       169.2516       66       13.9800       169       15.9500       %31       %AL7         66.2210       169.1947       66       15.1200		65.642	168.250	65 38	.53	168	14.97	\$21	%BS21	
65.599       168.161       65       35.96       168       9.66       %23       %BS23         65.582       168.117       65       34.91       168       7.00       %24       %BS24         %       =====       A3L       line       %       ====       A3L       ine         %       Lat (N)       Long (W)       Lat (N)       Long (W)       Station         %       deg       min       deg       min       Num       Name         66.1190       169.5931       66       7.1400       169       35.5850       %25       %AL1         66.1380       169.5931       66       7.1400       169       32.1700       %26       %AL2         66.1760       169.4793       66       9.4200       169       28.7550       %27       %AL3         66.1760       169.4223       66       10.5600       169       25.3400       %28       %AL4         66.1950       169.3085       66       12.8400       169       18.5100       %30       %AL6         66.22100       169.1947       66       15.1200       169       11.6800       %32       %AL8         66.2710       169.1947       66<		65.625	168.177	65 37	.48	168	10.63	822	%BS22	
		65.599	168.161	65 35	.96	168	9.66	823	%BS23	
<pre>% %===== A3L line % - 24 stations heading Southwest-northeast through mooring site A3 % Lat (N) Long (W) Lat (N) Long (W) Station %</pre>		65.582	168.117	65 34	.91	168	7.00	824	%BS24	
<pre>%===== A3L line % - 24 stations heading Southwest-northeast through mooring site A3 % Lat (N) Long (W) Lat (N) Long (W) Station % deg min deg min Num Name 66.1190 169.5931 66 7.1400 169 35.5850 %25 %AL1 66.1380 169.5362 66 8.2800 169 32.1700 %26 %AL2 66.1570 169.4793 66 9.4200 169 28.7550 %27 %AL3 66.1760 169.4223 66 10.5600 169 25.3400 %28 %AL4 66.1950 169.3654 66 11.7000 169 21.9250 %29 %AL5 66.2140 169.3085 66 12.8400 169 18.5100 %30 %AL6 66.2300 169.2516 66 13.9800 169 15.0950 %31 %AL7 66.2520 169.1947 66 15.1200 169 11.6800 %32 %AL8 66.2710 169.1378 66 16.2600 169 8.2650 %33 %AL9 66.2900 169.0808 66 17.4000 169 4.8500 %34 %AL10 66.3280 168.9670 66 19.6800 168 58.0200 %36 %AL12 66.3398 168.8952 66 20.3867 168 53.7092 %37 %AL13 66.3516 168.8233 66 21.0933 168 49.3983 %38 %AL14 66.3633 168.7515 66 21.8000 168 45.0875 %39 %AL15 66.3751 168.6796 66 22.5067 168 40.7767 %40 %AL16 66.3869 168.6078 66 23.2133 168 49.3983 %38 %AL14 66.3639 168.6796 66 23.2133 168 49.3983 %38 %AL14 66.3987 168.5359 66 23.9200 168 22.1550 %42 %AL18 66.4104 168.4641 66 24.6267 168 27.8442 %43 %AL19 66.4222 168.3922 66 23.9200 168 27.8442 %43 %AL19 66.4222 168.3922 66 25.3333 168 23.5333 %44 %AL20 66.4340 168.3204 66 26.0400 168 19.2225 %45 %AL21 66.4340 168.3204 66 26.0400 168 19.2225 %45 %AL21 66.4458 168.2485 66 26.7467 168 14.9117 %46 %AL22 66.4576 168.1767 66 27.4533 168 14.9117 %46 %AL22 66.4576 168.1767 66 27.4533 168 14.9117 %46 %AL22 66.4576 168.1767 66 27.4533 168 10.6008 %47 %AL23 66.4576 168.1767 66 27.4533 168 10.6008 %47 %AL23</pre>	%									
<ul> <li>24 stations heading Southwest-northeast through mooring site A3</li> <li>Lat (N) Long (W) Lat (N) Long (W) Station</li> <li>deg min deg min Num Name</li> <li>66.1190 169.5931 66 7.1400 169 35.5850 %25 %AL1</li> <li>66.1380 169.5362 66 8.2800 169 32.1700 %26 %AL2</li> <li>66.1760 169.4793 66 9.4200 169 28.7550 %27 %AL3</li> <li>66.1760 169.4223 66 10.5600 169 25.3400 %28 %AL4</li> <li>66.1950 169.3654 66 11.7000 169 21.9250 %29 %AL5</li> <li>66.2140 169.3085 66 12.8400 169 18.5100 %30 %AL6</li> <li>66.2300 169.2516 66 13.9800 169 15.0950 %31 %AL7</li> <li>66.2520 169.1947 66 15.1200 169 11.6800 %32 %AL8</li> <li>66.2710 169.1378 66 16.2600 169 8.2650 %33 %AL9</li> <li>66.3090 169.0239 66 18.5400 169 1.4350 %35 %AL11</li> <li>66.3280 168.9670 66 19.6800 168 58.0200 %36 %AL12</li> <li>66.3516 168.8233 66 21.0933 168 49.3983 %38 %AL14</li> <li>66.3633 168.7515 66 21.8000 168 45.0875 %39 %AL15</li> <li>66.3751 168.6796 66 23.2103 168 32.1550 %42 %AL8</li> <li>66.369 168.6078 66 23.2133 168 36.4658 %41 %AL17</li> <li>66.3987 168.5359 66 23.2200 168 32.1550 %42 %AL18</li> <li>66.4104 168.4641 66 24.6267 168 27.8442 %43 %AL19</li> <li>66.4222 168.3922 66 25.3333 168 23.5333 %44 %AL20</li> <li>66.4340 168.3204 66 26.0400 168 19.2225 %45 %AL21</li> <li>66.4458 168.2485 66 26.7467 168 14.9117 %46 %AL22</li> <li>66.4576 168.1767 66 27.4533 168 10.6008 %47 %AL23</li> <li>66.4576 168.1767 66 27.4533 168 10.6008 %47 %AL23</li> <li>66.4576 168.1767 66 27.4533 168 10.6008 %47 %AL23</li> </ul>	8:	==== A.	3L line							
Lat (N)         Long (W)         Lat (N)         Long (W)         Station           %         deg         min         deg         min         Num         Name           66.1190         169.5931         66         7.1400         169         35.5850         %25         %AL1           66.1380         169.5362         66         8.2800         169         32.1700         %26         %AL2           66.1570         169.4793         66         9.4200         169         28.7550         %27         %AL3           66.1760         169.4793         66         10.5600         169         21.9250         %29         %AL4           66.1950         169.3654         66         11.7000         169         18.5100         %30         %AL6           66.2330         169.2516         66         13.9800         169         11.6800         %32         %AL8           66.2710         169.1378         66         16.2600         169         8.2650         %33         %AL9           66.2900         169.0808         66         17.4000         169         1.4350         %35         %AL11           66.3280         168.9670         66         19.6800	%	- 24 sta	ations head	ling So	uth	west-no	rtheast	t through	mooring	site A3
deg         min         deg         min         Num         Name           66.1190         169.5931         66         7.1400         169         35.5850         %25         %AL1           66.1380         169.5362         66         8.2800         169         32.1700         %26         %AL2           66.1570         169.4793         66         9.4200         169         28.7550         %27         %AL3           66.1760         169.4223         66         10.5600         169         25.3400         %28         %AL4           66.1950         169.3654         66         11.7000         169         18.5100         %30         %AL6           66.2330         169.2516         66         13.9800         169         15.0950         %31         %AL7           66.2520         169.1947         66         15.1200         169         11.6800         %32         %AL8           66.2710         169.0808         66         17.4000         169         4.8500         %34         %AL10           66.3090         169.0239         66         18.5400         168         58.0200         %36         %AL12           66.3751         168.89670	%	Lat (N	) Long (W)	L	at	(N)	Long	(W)	Stat	ion
66.1190169.5931667.140016935.5850%25%AL166.1380169.5362668.280016932.1700%26%AL266.1570169.4793669.420016928.7550%27%AL366.1760169.42236610.560016925.3400%28%AL466.1950169.36546611.700016921.9250%29%AL566.2140169.30856612.840016918.5100%30%AL666.2330169.25166613.980016915.0950%31%AL766.2520169.19476615.120016911.6800%32%AL866.2710169.13786616.26001698.2650%33%AL966.2900169.08086617.40001691.4350%35%AL1166.3090169.02396618.540016858.0200%36%AL1266.3398168.89526621.093316849.3983%38%AL1466.3633168.75156621.800016845.0875%39%AL1566.3751168.67966622.506716840.7767%40%AL1666.3869168.60786623.920016832.1550%42%AL1866.4104168.46416624.626716827.8442%43%AL1966.4222168.39226625.333316823.5	%			deg		min	deg	min	Num	Name
$66.1380$ $169.5362$ $66$ $8.2800$ $169$ $32.1700$ $\$26$ $\$AL2$ $66.1570$ $169.4793$ $66$ $9.4200$ $169$ $28.7550$ $\$27$ $\$AL3$ $66.1760$ $169.4223$ $66$ $10.5600$ $169$ $25.3400$ $\$28$ $\$AL4$ $66.1950$ $169.3654$ $66$ $11.7000$ $169$ $21.9250$ $\$29$ $\$AL5$ $66.2140$ $169.3085$ $66$ $12.8400$ $169$ $18.5100$ $\$30$ $\$AL6$ $66.2330$ $169.2516$ $66$ $13.9800$ $169$ $15.0950$ $\$31$ $\$AL7$ $66.2520$ $169.1947$ $66$ $15.1200$ $169$ $11.6800$ $\$32$ $\$AL8$ $66.2710$ $169.1378$ $66$ $16.2600$ $169$ $8.2650$ $\$33$ $\$AL9$ $66.2900$ $169.0808$ $66$ $17.4000$ $169$ $4.8500$ $\$34$ $\$AL10$ $66.3090$ $169.0239$ $66$ $18.5400$ $168$ $58.0200$ $\$36$ $\alephAL12$ $66.3398$ $168.9670$ $66$ $21.0933$ $168$ $49.3983$ $\$38$ $\alephAL14$ $66.3516$ $168.8233$ $66$ $21.0933$ $168$ $49.3983$ $\$38$ $\alephAL14$ $66.3633$ $168.7515$ $66$ $23.2133$ $168$ $40.7767$ $\$40$ $\$AL16$ $66.4104$ $168.6078$ $66$ $23.2133$ $168$ $23.5333$ $\$44$ $8AL17$ $66.4222$ $168.3924$ $66$ $24.6267$ $168$ $27.8442$ <td></td> <td>66.1190</td> <td>0 169.5931</td> <td>L 66</td> <td></td> <td>7.1400</td> <td>169</td> <td>35.5850</td> <td>%25</td> <td>%AL1</td>		66.1190	0 169.5931	L 66		7.1400	169	35.5850	%25	%AL1
66.1570 $169.4793$ $66$ $9.4200$ $169$ $28.7550$ $$27$ $$AL3$ $66.1760$ $169.4223$ $66$ $10.5600$ $169$ $25.3400$ $$28$ $$AL4$ $66.1950$ $169.3654$ $66$ $11.7000$ $169$ $21.9250$ $$29$ $$AL5$ $66.2140$ $169.3085$ $66$ $12.8400$ $169$ $18.5100$ $$30$ $$AL6$ $66.2330$ $169.2516$ $66$ $13.9800$ $169$ $15.0950$ $$31$ $$AL7$ $66.2520$ $169.1947$ $66$ $15.1200$ $169$ $11.6800$ $$32$ $$AL8$ $66.2710$ $169.1378$ $66$ $16.2600$ $169$ $8.2650$ $$33$ $$AL9$ $66.2900$ $169.0808$ $66$ $17.4000$ $169$ $4.8500$ $$34$ $$AL10$ $66.3090$ $169.0239$ $66$ $18.5400$ $169$ $1.4350$ $$35$ $$AL11$ $66.3280$ $168.9670$ $66$ $19.6800$ $168$ $58.0200$ $$36$ $$AL12$ $66.3398$ $168.8952$ $66$ $21.0933$ $168$ $49.3983$ $$38$ $$AL14$ $66.3633$ $168.7515$ $66$ $21.0933$ $168$ $49.3983$ $$38$ $$AL14$ $66.3669$ $168.6078$ $66$ $23.2133$ $168$ $40.7767$ $$40$ $$AL15$ $66.3751$ $168.6078$ $66$ $23.9200$ $168$ $32.1550$ $$42$ $$AL16$ $66.4104$ $168.4641$ $66$ $24.6267$ $168$ $27.8442$ <td></td> <td>66.1380</td> <td>0 169.5362</td> <td>2 66</td> <td></td> <td>8.2800</td> <td>169</td> <td>32.1700</td> <td>%26</td> <td>%AL2</td>		66.1380	0 169.5362	2 66		8.2800	169	32.1700	%26	%AL2
66.1760 $169.4223$ $66$ $10.5600$ $169$ $25.3400$ $$28$ $$AL4$ $66.1950$ $169.3654$ $66$ $11.7000$ $169$ $21.9250$ $$29$ $$AL5$ $66.2140$ $169.3085$ $66$ $12.8400$ $169$ $18.5100$ $$30$ $$AL6$ $66.2330$ $169.2516$ $66$ $13.9800$ $169$ $15.0950$ $$31$ $$AL7$ $66.2520$ $169.1947$ $66$ $15.1200$ $169$ $11.6800$ $$32$ $$AL8$ $66.2710$ $169.1378$ $66$ $16.2600$ $169$ $8.2650$ $$33$ $$AL9$ $66.2900$ $169.0808$ $66$ $17.4000$ $169$ $4.8500$ $$34$ $$AL10$ $66.3090$ $169.0239$ $66$ $18.5400$ $169$ $1.4350$ $$35$ $$AL11$ $66.3280$ $168.9670$ $66$ $19.6800$ $168$ $58.0200$ $$36$ $$AL12$ $66.3398$ $168.8952$ $66$ $20.3867$ $168$ $53.7092$ $$37$ $$AL13$ $66.3516$ $168.8233$ $66$ $21.0933$ $168$ $49.3983$ $$38$ $$AL14$ $66.3633$ $168.7515$ $66$ $22.5067$ $168$ $40.7767$ $$40$ $$AL16$ $66.3869$ $168.6078$ $66$ $23.2133$ $168$ $36.4658$ $$41$ $$AL17$ $66.3987$ $168.3924$ $66$ $23.9200$ $168$ $32.1550$ $$42$ $$AL18$ $66.4104$ $168.4641$ $66$ $24.6267$ $168$ $23.5333$ <		66.1570	0 169.4793	3 66		9.4200	169	28.7550	827	%AL3
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66.2520169.19476615.120016911.6800%32%AL866.2710169.13786616.26001698.2650%33%AL966.2900169.08086617.40001694.8500%34%AL1066.3090169.02396618.54001691.4350%35%AL1166.3280168.96706619.680016858.0200%36%AL1266.3398168.89526620.386716853.7092%37%AL1366.3516168.82336621.093316849.3983%38%AL1466.3633168.75156621.800016845.0875%39%AL1566.3751168.67966622.506716840.7767%40%AL1666.3869168.60786623.213316836.4658%41%AL1766.3987168.53596623.920016832.1550%42%AL1866.4104168.46416624.626716827.8442%43%AL1966.4222168.39226625.333316823.5333%44%AL2066.4458168.24856626.746716814.9117%46%AL2266.4576168.17676627.453316810.6008%47%AL2366469316810.486628160016862900%48		66.2330	0 169.2516	66	1	3.9800	169	15.0950	%31	%AL7
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66.2900169.08086617.40001694.8500%34%AL1066.3090169.02396618.54001691.4350%35%AL1166.3280168.96706619.680016858.0200%36%AL1266.3398168.89526620.386716853.7092%37%AL1366.3516168.82336621.093316849.3983%38%AL1466.3633168.75156621.800016845.0875%39%AL1566.3751168.67966622.506716840.7767%40%AL1666.3869168.60786623.213316836.4658%41%AL1766.3987168.53596623.920016832.1550%42%AL1866.4104168.46416624.626716827.8442%43%AL2066.4340168.32046626.040016819.2225%45%AL2166.4458168.17676627.453316810.6008%47%AL2366.4576168.17676627.453316810.6008%47%AL2366.469316810.486628160016862900%48%AL24		66.2710	0 169.1378	3 66	1	6.2600	169	8.2650	\$33	%AL9
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66.3280       168.9670       66       19.6800       168       58.0200       \$36       \$AL12         66.3398       168.8952       66       20.3867       168       53.7092       \$37       \$AL13         66.3516       168.8233       66       21.0933       168       49.3983       \$38       \$AL14         66.3633       168.7515       66       21.8000       168       45.0875       \$39       \$AL15         66.3751       168.6796       66       22.5067       168       40.7767       \$40       \$AL16         66.3869       168.6078       66       23.2133       168       36.4658       \$41       \$AL17         66.3987       168.5359       66       23.9200       168       32.1550       \$42       \$AL18         66.4104       168.4641       66       24.6267       168       27.8442       \$43       \$AL19         66.4222       168.3922       66       25.3333       168       23.5333       \$44       \$AL20         66.4340       168.3204       66       26.0400       168       19.2225       \$45       \$AL21         66.4458       168.1767       66       27.4533       168       10.6008		66.3090	0 169.0239	66	1	8.5400	169	1.4350	\$35	%AL11
66.3398       168.8952       66       20.3867       168       53.7092       %37       %AL13         66.3516       168.8233       66       21.0933       168       49.3983       %38       %AL14         66.3633       168.7515       66       21.8000       168       45.0875       %39       %AL15         66.3751       168.6796       66       22.5067       168       40.7767       %40       %AL16         66.3869       168.6078       66       23.2133       168       36.4658       %41       %AL17         66.3987       168.5359       66       23.9200       168       32.1550       %42       %AL18         66.4104       168.4641       66       24.6267       168       27.8442       %43       %AL19         66.4222       168.3922       66       25.3333       168       23.5333       %44       %AL20         66.4340       168.3204       66       26.0400       168       19.2225       %45       %AL21         66.4458       168.2485       66       26.7467       168       14.9117       %46       %AL22         66.4576       168.1767       66       27.4533       168       10.6008		66.3280	168.9670	) 66	1	9.6800	168	58.0200	\$36	%AL12
66.3516       168.8233       66       21.0933       168       49.3983       %38       %AL14         66.3633       168.7515       66       21.8000       168       45.0875       %39       %AL15         66.3751       168.6796       66       22.5067       168       40.7767       %40       %AL16         66.3869       168.6078       66       23.2133       168       36.4658       %41       %AL17         66.3987       168.5359       66       23.9200       168       32.1550       %42       %AL18         66.4104       168.4641       66       24.6267       168       27.8442       %43       %AL19         66.4222       168.3922       66       25.3333       168       23.5333       %44       %AL20         66.4340       168.3204       66       26.0400       168       19.2225       %45       %AL21         66.4458       168.2485       66       26.7467       168       14.9117       %46       %AL22         66.4576       168.1767       66       27.4533       168       10.6008       %47       %AL23         66.4693       168       1048       66       28       1600       168 <td></td> <td>66.3398</td> <td>8 168.8952</td> <td>2 66</td> <td>2</td> <td>0.3867</td> <td>168</td> <td>53.7092</td> <td>\$37</td> <td>%AL13</td>		66.3398	8 168.8952	2 66	2	0.3867	168	53.7092	\$37	%AL13
66.3633       168.7515       66       21.8000       168       45.0875       %39       %AL15         66.3751       168.6796       66       22.5067       168       40.7767       %40       %AL16         66.3869       168.6078       66       23.2133       168       36.4658       %41       %AL17         66.3987       168.5359       66       23.9200       168       32.1550       %42       %AL18         66.4104       168.4641       66       24.6267       168       27.8442       %43       %AL19         66.4222       168.3922       66       25.3333       168       23.5333       %44       %AL20         66.4340       168.3204       66       26.0400       168       19.2225       %45       %AL12         66.4458       168.2485       66       26.7467       168       14.9117       %46       %AL22         66.4576       168.1767       66       27.4533       168       10.6008       %47       %AL23         66       4693       168       1048       66       28.1600       168       6       2900       %48       %AL24		66.3510	6 168.8233	3 66	2	1.0933	168	49.3983	%38	%AL14
66.3751       168.6796       66       22.5067       168       40.7767       %40       %AL16         66.3869       168.6078       66       23.2133       168       36.4658       %41       %AL17         66.3987       168.5359       66       23.9200       168       32.1550       %42       %AL18         66.4104       168.4641       66       24.6267       168       27.8442       %43       %AL19         66.4222       168.3922       66       25.3333       168       23.5333       %44       %AL20         66.4340       168.3204       66       26.0400       168       19.2225       %45       %AL21         66.4458       168.2485       66       26.7467       168       14.9117       %46       %AL22         66.4576       168.1767       66       27.4533       168       10.6008       %47       %AL23         66       4693       168       1048       66       28       1600       168       6       2900       %48       %AL24		66.363	3 168.7515	5 66	2	1.8000	168	45.0875	\$39	%AL15
66.3869       168.6078       66       23.2133       168       36.4658       \$41       \$AL17         66.3987       168.5359       66       23.9200       168       32.1550       \$42       \$AL18         66.4104       168.4641       66       24.6267       168       27.8442       \$43       \$AL19         66.4222       168.3922       66       25.3333       168       23.5333       \$44       \$AL20         66.4340       168.3204       66       26.0400       168       19.2225       \$45       \$AL21         66.4458       168.2485       66       26.7467       168       14.9117       \$46       \$AL22         66.4576       168.1767       66       27.4533       168       10.6008       \$47       \$AL23         66       4693       168       1048       66       28       1600       168       6       2900       \$48       \$AL24		66.375	1 168.6796	b 66	2	2.5067	168	40.7767	840	%AL16
66.3987       168.5359       66       23.9200       168       32.1550       %42       %AL18         66.4104       168.4641       66       24.6267       168       27.8442       %43       %AL19         66.4222       168.3922       66       25.3333       168       23.5333       %44       %AL20         66.4340       168.3204       66       26.0400       168       19.2225       %45       %AL21         66.4458       168.2485       66       26.7467       168       14.9117       %46       %AL22         66.4576       168.1767       66       27.4533       168       10.6008       %47       %AL23         66       4693       168       1048       66       28       1600       168       6       2900       %48       %AL24		66.3869	9 168.6078	5 66	2	3.2133	168 160	30.4658	₹4⊥ ° 40	%AL17
66.4104       168.4641       66       24.6267       168       27.8442       \$43       \$AL19         66.4222       168.3922       66       25.3333       168       23.5333       \$44       \$AL20         66.4340       168.3204       66       26.0400       168       19.2225       \$45       \$AL21         66.4458       168.2485       66       26.7467       168       14.9117       \$46       \$AL22         66.4576       168.1767       66       27.4533       168       10.6008       \$47       \$AL23         66       4693       168       1048       66       28       1600       168       6       2900       \$48       \$AL24		66.398	/ 168.5359	66	2	3.9200	168 160	32.1550	₹42 ¢42	%ALl8
60.4222       108.3922       60       25.3333       168       23.5333       %44       %AL20         66.4340       168.3204       66       26.0400       168       19.2225       %45       %AL21         66.4458       168.2485       66       26.7467       168       14.9117       %46       %AL22         66.4576       168.1767       66       27.4533       168       10.6008       %47       %AL23         66       4693       168       1048       66       28       1600       168       6       2900       %48       %AL24		66.4104	4 168.464	L 66	2	4.6267	168	27.8442	₹43 °.44	%AL19 ®⊅t 20
60.4340       108.3204       60       20.0400       168       19.2225       %45       %AL21         66.4458       168.2485       66       26.7467       168       14.9117       %46       %AL22         66.4576       168.1767       66       27.4533       168       10.6008       %47       %AL23         66       4693       168       1048       66       28       1600       168       6       2900       %48       %AL23		66 4222	4 168.3922	4 66 1 66	2	5.3333	160	23.5333 10 2225	₹44 ≪⊿г	KALZU ©at 01
66.4576       168.1767       66       27.4533       168       10.6008       %47       %AL23         66       4693       168       1048       66       28       1600       168       6       2900       %48       %AL24		66 11-0	U 160.3204	± 00	2	0.0400 6 7/67	160 160	17.2225	640 916	⊚AL⊿⊥ ©⊼⊺ ЭЭ
66 4693 168 1048 66 28 1600 168 6 2900 \$48 \$AL23		66 157	5 160 1765		⊿ 2	0./40/ 7 /E22	160	10 6000	540 917	ъдыдд Дат оо
		66 4697	3 168 1049	, 00 3 66	∠ 2	8 1600	168	6 2900	∿±/ %48	∿л⊔∠э %дт.24

## **RUSALCA 2009 LEG 1 SCHEMATICS OF MOORING RECOVERIES**



## = in the eastern channel of the Bering Strait

= in the western channel of the Bering Strait



#### = at the climate site, ~ 60km north of the Strait



## **RUSALCA 2009 LEG 1 SCHEMATICS OF MOORING DEPLOYMENTS**



#### = in the eastern channel of the Bering Strait









# RUSALCA 2009 LEG 1 RECOVERY PHOTOS



Woodgate 2009 RUSALCA Leg 1 Khromov Mooring report

# **RUSALCA 2009 LEG 1 RECOVERY PHOTOS (continued)**



# RUSALCA 2009 LEG 1 RECOVERY PHOTOS (continued)



Woodgate 2009 RUSALCA Leg 1 Khromov Mooring report

# RUSALCA 2009 LEG 1 RECOVERY PHOTOS (continued)





## **RUSALCA 2009 PRELIMINARY ADCP RESULTS**

## **RUSALCA 2009 PRELIMINARY SEACAT RESULTS**



(A11-08, A12-08, A13-08 data not included.)

## **RUSALCA 2009 PRELIMINARY SEACAT RESULTS (continued)**



Bering Strait 2008-2009 SBE A3(blue) A2(red) A4R(magenta)A4(yellow) A2W(cyan) Prelim (WoodgateC

(A11-08, A12-08, A13-08 data not included.)

## **RUSALCA 2009 PRELIMINARY ISCAT RESULTS**



(A11-08 data not included.)

# RUSALCA 2009 PRELIMINARY ISCAT RESULTS (continued)

All recovered Microcat (within the top iscat float) data



(A11-08 data not included.)



(A11-08 data not included.)



## RUSALCA 2009 LEG 1 RUSSIAN DOCUMENTS FOR TRANSFER OF 2008-2009 BERING STRAIT MOORING DATA (from A11-08, A12-08 and A13-08), AND FOR 2009 MOORING DEPLOYMENTS (A11-09, A12-09 and A13-09)

#### АКТ

#### передачи первичных данных измерений с приборов, установленных на американских автономных буйковых станциях А1-1-08, А1-2-08, А1-3-08 в территориальном море Российской Федерации в Беринговом проливе в период с 9 октября 2008 г. по 25 августа 2009 г.

«29» августа 2009 г.

#### Берингов пролив

В Соответствии с Разрешением Федерального агентства по науке и инновациям от 26 июня 2009 года № 72 заявителем морских научных исследований – ОАО «ГНИНГИ» – на борту НИС «Профессор Хромов» был произведен съем информации на CD с иностранных приборов как указано ниже:

АБС А1-1-08

1) Акустический доплеровский профилограф течений ADCP «Sentinel», модель WHS300-I, с/н 3302BT.

2) Датчик проводимости и температуры SBE-37SM MicroCAT (с/н 4600).

3) Устройство записи данных ISCAT Logger (с/н 22).

АБС А1-2-08

1) Датчик нитратов Satlantic's ISUS, с/н 124 – датчик неисправен с момента постановки, данные не получены.

2) СТД-зонд SBE-16plus, с/н 4973 с комбинированным датчиком ECO Combination Meter, с/н FLNTUS-489.

4) Акустический измеритель течения RCM9 MKII, с/н 108.

АБС A1-3-08

1) Датчик проводимости-температуры SBE-37SMP MicroCAT, с/н 1429.

2) Акустический измеритель течения RCM9 MKII (с/н 107).

Файлы данных скопированы на носители информации ОАО «ГНИНГИ»:

1). A1108\_3302.000

2). A1108\_3302post.txt

3). A1108\_simlogger22.dat

4). A1108\_4600.asc

5). A1208\_RCM108.asc

6). A1208\_4973.hex

7). A1208\_4973.pre.cnv

8). RCM9 LW SN 108.pdf

9). A1308\_1429.asc

10). A1308\_RCM107.asc

11). RCM9 LW SN 107.pdf

Данные скопированы в пяти экземплярах. После копирования информации первичные данные удалены из модулей памяти приборов и с компьютеров, использованных для съема и передачи данных.

Начальник экспедиции	P P-	
	Aparany	В.Бахмутов
NOAA oversight	JUL Dec	
	Kathlen Name	K.Crane
Представитель компани	и «Групия Альянс»	
	Alcupateni	А.Островский
RUSALCA Coordinator	212220	
	- angen and a	T.Whitledge
Chief Scientist		
	All A Write.	R.Woodgate
Представитель ААНИИ	- 1	
	Dour-	Е Бондарева

## АКТ

# постановки автономной буйковой станции АБС-1 (А1-1-09)

«<u>29</u>» августа 2009 г.

Берингов пролив

В Соответствии с Разрешением Федерального агентства по науке и инновациям от 26 июня 2009 года № 72, заявитель морских научных исследований – ОАО «ГНИНГИ» – с борта НИС «Профессор Хромов» установил автономную буйковую станцию АБС-1 (А1-1-09) в следующей комплектации:

1) Акустический доплеровский профилограф течений ADCP «Sentinel» модель WHS300-I, серийный номер 11698;

2) Датчик проводимости-температуры «SBE-37SM MicroCAT» (серийный номер 5361);

3) Система измерений проводимости, температуры, давления с возможностью уклонения от воздействия льда ISCAT, в которую входят датчик измерения проводимости-температуры SBE 37-IM (серийный номер 7110), индуктивное соединительное устройство SBE Inductive Cable Coupler, модем SBE ICC и записывающее устройство ISCAT Logger (серийный номер 05);

4) Гидроакустический ответчик-размыкатель модель 8242XS (серийный номер 31400).

Дата постановки (МСК): 28 августа 2009 года.

Время постановки (МСК): 02.23.

Координаты постановки: 65°54,002' N 169°25,984' W (WGS-84 - корма) 65°53,996' N 169°26,075' W (СК-42 - мостик)

Глубина постановки: 53 м.

Высота станции над поверхностью дна: 35 м.

Приложение: схема постановки на 01 листе

Начальник экспедиции	Runnel	
	Hp unelign the	В.Бахмутов
NOAA oversight	1 this 7	
	Four Clance	K.Crane
Представитель компании	«Группа Альянс»	
	Allematicen	А.Островский
RUSALCA Coordinator	A ANI	
2	long Klitting 2	T.Whitledge
Chief Scientist		
CHARTEOPONOCHH HAM	John A Will	R.Woodgate
Капитан судна		
	Mann	А.Дьяченко
Staff (Tpodecup) Star		
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Woodgate 2009 RUSALCA Leg 1 Khromov Mooring report

Page 24:28

# АКТ

# постановки автономной буйковой станции АБС-2 (А1-2-09)

«29» августа 2009 г.

Берингов пролив

В Соответствии с Разрешением Федерального агентства по науке и инновациям от 26 июня 2009 года № 72, заявитель морских научных исследований – ОАО «ГНИНГИ» – с борта НИС «Профессор Хромов» установил автономную буйковую станцию АБС-2 (А1-2-09) в следующей комплектации:

1) Датчик нитратов Satlantic's ISUS (серийный номер 088);

2) CTD зонд SBE-16plus (серийный номер 4639);

3) Акустический измеритель течения RCM9 LW (серийный номер 636);

4) Гидроакустический ответчик-размыкатель модель 8242XS (серийный номер 31416).

Дата постановки (МСК): 28 августа 2009 года.

Время постановки (МСК): 03.40.

Координаты постановки: 65°55,993' N 169°37,005' W (WGS-84 - корма) 65°56,020' N 169°37,008' W (СК-42 - мостик)

Глубина постановки: 51 м.

Высота станции над поверхностью дна: 18 м.

Приложение: схема постановки на 01 листе

Начальник экспедиции	P D	
	Apanewy	В.Бахмутов
NOAA oversight	DII TO	
-	Kathlein Mane	K.Crane
Представитель компани	и «Групра Альянс»	
	Allempotencei	_ А.Островский
RUSALCA Coordinator	+ 2 11	
	- with Ruthye	T.Whitledge
Chief Scientist		
AND EOPONOTAN IN	feler A Wall	R.Woodgate
Капитан судна		
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## АКТ

## постановки автономной буйковой станции АБС-3 (А1-3-09)

« 29» августа 2009 г.

Берингов пролив

В Соответствии с Разрешением Федерального агентства по науке и инновациям от 26 июня 2009 года № 72, заявитель морских научных исследований – ОАО «ГНИНГИ» – с борта НИС «Профессор Хромов» установил автономную буйковую станцию АБС-3 (А1-3-09) в следующей комплектации:

1) Измеритель течений «Вектор-2» (серийный номер 50);

 Датчик проводимости-температуры «SBE-37SM MicroCAT» (серийный номер 4835);

3) Акустический измеритель течения RCM9 (серийный номер 1173);

4) Гидроакустический ответчик-размыкатель модель 8242XS (серийный номер 31417).

Дата постановки (МСК): 28 августа 2009 года.

Время постановки (МСК): 00.00.

Координаты постановки: 65°52,006' N 169°16,987' W (WGS-84 - корма) 65°51,982' N 169°17,038' W (СК-42 - мостик)

Глубина постановки: 50,5 м.

Высота станции над поверхностью дна: 21 м.

Приложение: схема постановки на 01 листе

Начальник экспедиции	thanwork -	PENNETOP
NOAA oversight	WI AR	B.Baxmy10B
Представитель компани	и «Группа Альянс»	K.Crane
	N Deupateau	А.Островский
RUSALCA Coordinator	- pomp. Hallelyc	T.Whitledge
Chief Scientist	plycan A windel	R.Woodgate
Капитан судна		
- Contracting Cont	Many	А.Дьяченко
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RUSALCA 2009 MAP OF STATIONS FROM LEG 1 AND LEG 2 (from Kathy Crane)

RUSALCA 2009 stations, bathymetry in meters

K. Crane NOAA

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