NBP03-04a Service Group Bottle Data Documentation

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Dutch Harbor, Alaska to Barrow, Alaska

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Data Set Overview
329 CTD stations were occupied. Eight of these stations had aborted casts, Cast 1 on stations 027, 175, 227, 282, 310and 313. Station 132 had 3 aborted casts and Station 032 cast 1 was a special cast for C13, N15 and is not reported in the CTD data set. Stations 69, 70 and 329 did not have any water samples. **Also note that an ADDENDUM with data quality notes based on a post-cruise QA analysis is appended to this report.**

INSTRUMENTATION

CTD casts were performed with the Raytheon Polar Services Company's (RPSC) rosette system consisting of a 24-place rosette frame with 10-Liter Niskin-type bottles equipped with internal plastic coated springs and a 24-place SBE-32 Carousel pylon. Underwater electronic components included the following:

- Sea-Bird Electronics, Inc. (SBE) 911plus CTD,
- WetLabs C-Star transmissometer with a 25cm pathlength and 660nm wavelength,
- Biospherical Instruments, Inc. Photosynthetically Active Radiation (PAR) sensor,
- Chelsea MkIII Aquatracka fluorometer, and
- Simrad, 5 volt = 500 meters altimeter.

Additionally a Dr. Haardt fluorometer designed to detect colored organic matter (CDOM) and a Woods Hole Oceanographic Institution (WHOI) Lowered ADCP pair were mounted on the rosette. The CTD, transmissometer and fluorometers were mounted horizontally along the bottom of the rosette frame. The PAR sensor was located at the top of the rosette. All sensors except the LADCP were interfaced with the CTD system. This instrument package provided pressure, dual temperature and dual conductivity channels as well as light transmissivity and fluorometric signals at a sample rate of 24 scans per second. The CDOM fluorometer was removed from the package at Station 020 after it was finally deemed inoperative. At Station 137, a WetLabs fluorometer was added for an additional fluorometric trace.

The rosette system was suspended from a standard UNOLS 3-conductor 0.322" electromechanical cable.

CTD serial number 09P4857-0232 with a 401K-105 pressure sensor, S/N 43528, was used for Stations 1 through 132, cast 3. For the remainder of the expedition CTD serial number 09P10716-0377 with 401K-105, S/N 58949, was used. Serial numbers for other sensors are listed in Table 1. Mounting heights for sensors are listed in Table 2.

TABLE 1. Instrument/Sensor Serial Numbers

Primary Temperature	Primary Conductivity	Secondary Temperature	Secondary Conductivity	Pressure	Transmissometer
SBE 3plus	SBE 4C	SBE 3plus	SBE 4C	401K-105	C-Star
03-2367	04-2513	03-2299	04-2067	43528/58949	CST-397DR

Dissolved Oxygen	Fluorometer	PAR	Altimeter	Auxiliary Fluorometer
SBE 43	Chelsea Aqua 3	QSP-200	Simrad	WetLabs AFL
0080/ 0139	88080	4361	9704077	AFLD-016

Equipment Positions

TABLE 2. Instrument mounting heights

Sensor	Height above base of rosette	Sensor	Height above base of rosette
Altimeter	15 cm	Pressure	17 cm
Transmissometer	8 cm	T (pri)	15 cm Sta. 1-213
Fluorometer (Chelsea)	9 cm	T (sec)	12 cm Sta. 214+
Fluorometer (Haardt)	18 cm Sta. 1-20	Par	180 cm Sta. < 1000m
Fluorometer (Wetlabs)	18 cm Sta.< 1000m	"Zero"	253 cm

The temperature, conductivity, and oxygen sensors were mounted on a panel on the rosette frame. The horizontal separation between primary and secondary intakes was ~50 cm on Stations 1-204. For Stations 205-213, the separation was reduced to ~33 cm. After Station 213 the mounting was changed again, positioning the intakes ~10cm apart. The vertical distance between the TC duct intakes and the pressure sensor was 2 cm on Stations 1-213. Starting with Station 214, the intakes were 5 cm below the pressure sensor.

The distance of the mid-points of the 10-Liter Niskin bottles from the bottom-mounted sensors was ~0.97 m. The PAR sensor was ~0.66m above the mid-point of the Niskin bottles. The distance between the PAR sensor and the pressure sensor was ~1.64m. The 10-Liter Niskin bottles are ~0.87m long.

The 10-Liter Niskin-type bottles were equipped with Buna-N O-rings and the springs were coated with epoxy to minimize the occurrence of rust. They were inspected before the cruise. Problems with the bottles were reported to the RPSC MTs, who inspected and made repairs as required. Any necessary touch-ups were done with Scotch-Kote and allowed to air dry for 24 hours before being put back into service.

Problems & Changes to Instrumentation

The Haardt Fluorometer was removed after Station 20. This instrument did not respond to the water column.

CTD -0232 failed at Station 132 during cast 03. CTD -0377 was installed before Station 132 cast 04.

 A WetLabs AFL fluorometer was attached at Station 137 to confirm the response of the Chelsea fluorometer

Dissolved Oxygen sensor #0080 (SBE 43) failed at Station 318. Another SBE 43, #0139, replaced it for the remaining stations.

CTD Data

CTD Laboratory Calibration Procedures

Pre-cruise laboratory calibrations of CTD pressure, temperature and conductivity sensors were used to generate coefficients for the calculation of these parameters from their respective sensor frequencies. The conductivity and temperature calibrations were performed at Sea-Bird Electronics, Inc. in Bellevue, Washington. Calibration of the pressure sensors was performed by SIO/STS/ODF personnel. The laboratory temperature calibrations were referenced to the International Temperature Scale of 1990 (ITS-90).

CTD Data Acquisition

The CTD 911plus was operated generally as suggested in the Sea-Bird CTD Operating and Repair Manual, which contains a description of the system, its operation and functions (Sea-Bird Electronics, Inc., 2002). Unlike Sea-Bird's suggested procedure, data acquisition was started on deck. This allows a check of the pressure offset and an unblocked reading from the transmissometer. The SeaSave acquisition program, (SeaSave WIN32 Version 5.28e,) provided a real-time graphical display of selected parameters adequate to monitor CTD performance and information for the selection of bottle-tripping depths. Raw data from the CTD were archived on the PC's hard disk at the full 24 Hz sampling rate.

A CTD Station Sheet form was filled in for each deployment, providing a record of times, positions, bottom depth, bottle sampling depths, and every attempt to trip a bottle, as well as any pertinent comments. When the equipment and personnel were ready, data acquisition was started.

After activation, the rosette/CTD system was lowered into the water and held at 5 meters for 3-5 minutes to permit activation of the CTD pumps and equilibration of the sensors. Then, the operator requested that the CTD be brought to the surface. Once at the surface, usually 2-3 meters depending on sea-state, the operator requested that the winch operator start the package down to a desired target depth, usually within 5-10 meters of the EM-120 Multibeam depth reading. Just as the winch operator started the package down, the CTD operator created a flag in the "inventory" file. The operator also created a flag at the deepest point of the cast. Bottom depths were calculated by combining the distance above bottom, reported by the altimeter, and the maximum depth of the CTD package when bottom altimeter readings were available. If there was no altimeter reading, then the bottom depth is reported from the ship's Seatex Seapath 200 depth recorder. This depth, corrected for the draft of the transducer, was logged in uncorrected meters (assuming a sound velocity of 1500 m/sec). If the altimeter and depth recorder data were unavailable, the final resort was to use depth data from the Multibeam system (corrected sound velocities). The CTD operators were instructed to wait for the sensor readings to stabilize, at least 30 seconds, before tripping the bottle.

The depth of each bottle trip was written on the station log and flagged in the data file. The performance of all sensors was monitored during the cast. Prior to recovering the rosette, the operator created a flag marking the end of cast. When rosette recovery was complete, the operator ended data acquisition. Any faulty equipment or exceptionally noisy data were noted on the log sheet.

Problems and Procedural changes

Prior to station 114, position information was not being appended to every scan.

At Station 132, cast 3, the primary CTD blew a fuse. For some stations preceding there had been an inconsistent number of modulo errors, dropping of bytes in the data stream.

After Station 174, a procedure of using a detergent solution to flush the sensors after every third shallow station was adopted.

After Station 284, the equilibration depth was increased to 20 meters.

(At Station 284, after detergent cleaning, a ~20 minute clean water flush, and clearing the air bleed, the sensors failed to clear. The CTD was sent down to 20 meters and the problem cleared. We suspect that bubbles were being trapped within the conductivity cell, and pressure and agitation were required to dislodge them.)

CTD Data Processing

Pressure

CTD values determined on deck before and after each cast were compared to determine a pressure offset correction. The comparison suggested that no pressure offset was necessary.

Temperature

The primary temperature sensor was calibrated just before the expedition. The dual temperature sensors were monitored during the expedition and exhibited good agreement. It appears that no additional corrections need to be applied.

Conductivity

Corrected CTD pressure and temperature values were used with bottle salinities to back-calculate bottle conductivities. Comparison of these bottle values with the CTD primary conductivity values indicated that a slope and offset needed to be applied to the data from the beginning of the expedition. The sensors drifted over the length of the expedition and an additional slope and offset should be applied to the data. This has not been done as there was not enough time to finish this process. It is anticipated that the correction would not be more than 0.003 and may be applied to the data after Station 121.

Transmissometer

A WetLab calibrated Transmissometer was utilized throughout the cruise. An on deck calibration check was performed and even though there was little degradation from the last calibration the new coefficients were applied to the data set.

Oxygen, Fluorometer, and PAR

The CTD oxygen data are intended only for qualitative use. Similarly, the fluorometric and PAR data are not calibrated.

Data Processing Procedure

Sea-Bird Seasoft CTD processing software was employed. The processing programs are outlined below. A more complete description may be found in the Sea-Bird Software Manual which is available from the Sea-Bird website (www.seabird.com).

The sequence of programs that were run in processing CTD data from this cruise are as follows:

- *DATCNV* - Converts data from raw frequencies and voltages to corrected engineering units
- *WILDEDIT* - Eliminates large spikes
- *CELLTM* - Applies conductivity cell thermal mass correction
- *FILTER* – A low pass filter to smooth pressure for LOOPEDIT
- *LOOPEDIT* - Marks scans where velocity is less than selected value to avoid pressure reversals from ship roll
- *DERIVE* - Computes calculated parameters
- *BINAVG* - Average data into desired pressure bins

The quality control steps included:

- *Sensor verification* consisted of rechecking CTD sensor serial numbers and locations after initial entry into the computer to verify that there were no tabulation errors.
- *Seasoft Configuration File* was reviewed to verify that individual sensors were represented correctly, with the correct coefficients.
- *Temperature* was verified by comparing primary and secondary sensor data.
- *Conductivity* was checked by comparison of the two sensors with each other and with bottle salinity samples.
- *Position Check* consisted of producing a chart of the ship's track which was reviewed for any serious problems. The positions were acquired from the ship's Trimble P-code navigation system.
- *Visual Check* consisted of producing plots for each usable cast. These were reviewed for any noise and spikes that may have been missed by the processing programs.
- The density profile was checked for inversions which might have been produced by sensor noise or response mismatches. Additional Sea-Bird programs were run on all or some stations to maximize the data quality.

CTD Data Footnoting

WHP water bottle quality flags were assigned as defined in the WOCE Operations Manual (Joyce and Corry, 1994). These flags and interpretation are tabulated in the CTD and Bottle Data Distribution, Quality Flags section of this document.

Data Comments

Fine structure including minor density inversions that may appear in approximately the upper 10 meters of the profiles is most likely caused by ship discharges/turbulence. To minimize the ship

effect, engine cooling water discharges were restricted to the port side of the ship. The ship's draft is 6.7 meters; it is suspected that the ship's thrusters and props disturb the water to 20 meters depth.

All salinity, nutrient and dissolved oxygen data collected have gone through several stages of editing and are not likely to change significantly. The chlorophyll observations reported are, however, preliminary and may undergo significant post-cruise editing. Due to a lack of necessary solvent, some chlorophyll data were not able to be processed during the cruise. These data will be submitted later.

Bottle Data

Generally speaking, the sampling order for each cast was as follows, but there was some cast-to-cast variation.
- **Hydrographic**
  - *Oxygen,*
  - *Chlorophyll/Phaeophytin*
  - *Phytoplankton*
  - *Nutrients*
  - *Salinity*
  - *O18/O16*
  - *C13, N15*
  - *Particulate Organic Matter*
  - *Dissolved Organic Matter*

The correspondence between individual sample containers and the rosette bottle from which the sample was drawn was recorded on the sample log for the cast. This log also included any comments of anomalous conditions noted about the rosette and bottles. Normal sampling practice included opening the drain valve before the air vent on the bottle, to check for air leaks. The valve was then shut and the vent opened to check for water leaks. These observations, together with other diagnostic comments (e.g., "lanyard caught in lid", "valve left open") that might later prove useful in determining sample integrity, were routinely noted on the sample log. Drawing oxygen samples also involved taking the sample draw temperature from the bottle.

Bottle Data Processing

After the samples were drawn and analyzed, the next stage of processing involved merging the different data streams into a common file. The rosette cast and bottle numbers were the primary identification for all ODF-analyzed samples taken from the bottle, and were used to merge the analytical results with the CTD data associated with that bottle.

Diagnostic comments from the sample log, and notes from analysts and/or bottle data processors were entered into a computer file associated with each station (the "quality" file) as part of the quality control procedure. Sample data from bottles suspected of leaking were checked to see if the properties were consistent with the profile for the cast, with adjacent stations, and, where applicable, with the CTD data. Direct inspection of the tabular data, property-property plots and vertical sections were all employed to check the data. Revisions were made whenever there was an objective reason to delete, annotate or re-calculate a datum. WHP water sample codes were selected to indicate the reliability of the individual parameters affected by the comments. WHP bottle codes

were assigned where evidence showed the entire bottle was affected, as in the case of a leak, or a bottle trip at other than the intended depth.

Bottle Data Footnoting

WHP water bottle quality flags were assigned as defined in the WOCE Operations Manual [Joyce]. These flags and interpretation as tabulated in the Data Distribution, Bottle Data, Quality Flags section of this document.

Pressure and Temperatures

All pressures and temperatures for the bottle data tabulations were obtained by averaging CTD data for a brief interval at the time the bottle was closed and then applying the appropriate calibration data. The temperatures are reported using the International Temperature Scale of 1990.

Salinity

There were a total of 1438 salinity samples analyzed.

Sampling and Data Processing

Salinity samples were drawn into 200 ml high-alumina borosilicate bottles, which were rinsed three times with sample prior to filling. The bottles were sealed with custom-made plastic insert thimbles and Nalgene screw caps This container provides very low container dissolution and sample evaporation.

Equipment and Techniques

Both a SIO/STS/ODF Guildline Autosal 8400A, #55-654, and the RVIB N.B.Palmer's Guildline Autosal 8400B, #59-213, standardized with IAPSO Standard Seawater (SSW), batch P-141, were used to measure the salinities. Prior to the analyses, the samples were stored in the temperature regulated analysis room to permit equilibration to laboratory temperature, usually 8-20 hours. Both salinometers were outfitted with an ODF-developed interface for computer-aided measurement. The salinometer was standardized with a fresh vial of standard seawater at the beginning of each analysis run. Instrument drift was determined by running a SSW vial after the last sample was run through the autosal. The salinometer cell was flushed twice, and readings taken until two readings met software criteria for consistency; these were then averaged for a final result. The estimated accuracy of bottle salinities run at sea is usually better than 0.002 PSU relative to the particular standard seawater batch used.

Laboratory Temperature

Temperature stability in the salinometer laboratory was good. Salinity analysis was performed in a converted refrigeration room that has been modified to maintain a consistent ambient temperature within a range of ±2ºC centered around 22ºC. Autosal bath temperature of 24ºC was used for analysis.

Comments

Autosal #55-654 Thermistor #1 failed. The unit was used with circuit #2 for the first 2 "runs" (Stations 1-21). Bath repaired at Station 213.

Autosal #59-213 used from Station 22 until the cruise ended.

Oxygen Analysis

There were a total of 3457 oxygen samples analyzed.

Sampling and Data Processing

Samples were collected for dissolved oxygen analysis soon after the rosette was brought on board. Using a Tygon drawing tube, nominal 125ml volume-calibrated iodine flasks were rinsed, then filled and allowed to overflow for at least 3 flask volumes. The sample draw temperature was measured with a small platinum resistance thermometer embedded in the drawing tube. Reagents were added to fix the oxygen before stoppering. The flasks were shaken twice to assure thorough dispersion of the precipitate, once immediately after drawing, and then again after about 20 minutes. Thiosulfate normalities were calculated from each standardization and corrected to 20ºC. The 20ºC normalities and the blanks were plotted versus time and reviewed for possible problems. Oxygen concentrations were converted from milliliters per liter to micromoles per kilogram using the sampling temperature ("draw temperature") and the salinity to calculated the density of the sample at atmospheric pressure.

Equipment and Techniques

Dissolved oxygen analyses were performed with an ODF-designed automated oxygen titrator using photometric end-point detection based on the absorption of 365nm wavelength ultra-violet light. The titration of the samples and the data logging were controlled by PC software. Thiosulfate was dispensed by a Dosimat 665 buret driver fitted with a 1.0ml buret. The ODF method used a whole-bottle modified-Winkler titration following the technique of Carpenter (1965) with modifications by Culberson (1991), but with higher concentrations of potassium iodate standard (approximately 0.012N) and thiosulfate solution (55-65 g/l). Standard KIO3 solutions prepared ashore were run at the beginning of each run. Reagent and distilled water blanks were determined, to account for presence of oxidizing or reducing materials.

Volumetric Calibration

Oxygen flask volumes were determined gravimetrically with degassed deionized water to determine flask volumes at ODF's chemistry laboratory. This is done once before using flasks for the first time and periodically thereafter when a suspect bottle volume is detected. The volumetric flasks used in preparing standards were volume-calibrated by the same method, as was the 10ml Dosimat buret used to dispense standard iodate solution.

Standards

Potassium Iodate was obtained from Johnson Matthey Chemical Co. and was reported by the supplier to be >99.4% pure.

Comments

Beginning at Station 27, a new procedure was adopted for casts deeper than ~ 250 meters. Sampling began at the deepest bottle to be sampled for chlorophyll and continued up to the surface bottle, then resumed with the deepest bottle.

The primary sampling thermometer failed during Station 25. The secondary was then used. This thermometer read 0.4ºC low (e.g. 0ºC read as –0.4ºC). The primary had no offset at the beginning of the cruise.

Nutrient Analysis

There were 3476 nutrient samples analyzed.

Sampling and Data Processing

Nutrient samples were drawn into 45ml polypropylene, screw-capped "oak-ridge type" centrifuge tubes. The tubes were cleaned with 10% HCl and rinsed with sample three times before filling. Samples were refrigerated, for up to 16 hours, between collection and analysis.

Standardizations were performed at the beginning and end of each group of analyses (typically 24-30 samples) with an intermediate concentration mixed nutrient standard prepared prior to each run from a secondary standard in a low-nutrient seawater matrix. Sets of 6-7 different standard concentrations covering the range of sample concentrations were analyzed periodically to determine the deviation from linearity, if any, as a function of concentration for each nutrient analysis. A correction for non-linearity was applied to the final nutrient concentrations when necessary. After each group of samples was analyzed, the raw data file was processed to produce another file of response factors, baseline values, and absorbances. Computer-produced absorbance readings were spot checked for accuracy against values taken from a strip chart recording.

Nutrients, when reported in micromoles per kilogram, were converted from micromoles per liter by dividing by sample density calculated at 1 atm pressure (0 db), *in situ* salinity, and an assumed laboratory temperature of 25ºC.

Equipment and Techniques

Nutrient analyses (phosphate, silicate, nitrate+nitrite, urea, ammonium, and nitrite) were performed on an ODF-modified 6-channel Technicon AutoAnalyzer II. The analog outputs from each of the six channels were digitized and logged automatically by computer (PC) at 2-second intervals.

Silicate was analyzed using the technique of Armstrong *et al.*, (Armstrong, 1967). The sample was passed through a 15mm flowcell and the absorbance measured at 660nm.

A modification of the Armstrong *et al.* (Armstrong 1967) procedure was used for the analysis of nitrate and nitrite. For the nitrate plus nitrite analysis, the seawater sample was passed through a cadmium reduction column where nitrate was quantitatively reduced to nitrite. The stream was then passed through a 15mm flowcell and the absorbance measured at 540nm. The same technique was employed for nitrite analysis, except the cadmium column was bypassed, and a 50mm flowcell was used for measurement. Periodic checks of the column efficiency were made by running alternate equal concentrations of NO2 and NO3 through the NO3 channel to ensure that column efficiencies were high (> 95%). Nitrite concentrations were subtracted from the nitrate+nitrite values to obtain nitrate concentrations.

Phosphate was analyzed using a modification of the Bernhardt and Wilhelms (Bernhardt 1967) technique. The reaction product was heated to ~55ºC to enhance color development, then passed through a 50mm flowcell and the absorbance measured at 820m.

Ammonium was determined by the Berthelot reaction (Patton and Crouch 1977) in which sodium hypochlorite and phenol react with ammonium ion to produce indophenol blue, a blue compound, with an absorption maximum at 637nm. The solution was heated to 55°C and passed through a 50mm flowcell at 640nm.

Urea was analyzed via a modification of the method of Rahmatullah and Boyde (1980), which is based on the classic diacetyl monoxime method. A solution of diacetyl monoxime, thiosemicarbizide and acetone is followed by the addition of ferric chloride, which acts as a catalyst. The resultant solution is heated to 90°C and passed through a 50mm flowcell. The absorbance is measured at 520nm.

Nutrient Standards

Na_2SiF_6, the silicate primary standard, was obtained from Johnson Matthey Company and was reported by the supplier to be >98% pure.

Primary standards for nitrite ($NaNO_2$) were obtained from Johnson Matthey Chemical Company. The supplier reported purities of 97%.
Primary standards for nitrate (KNO3) were obtained from Fisher Scientific. The supplier reported purities of 99.999%.

Primary standards for phosphate (KH_2PO_4) were obtained from Fisher Scientific. The supplier reported purities of 99.999%.

Ammonia, (NH4(SO4)2), and Urea primary standards were obtained from Fisher Scientific and reported to be >99% pure.

The secondary standards were prepared aboard ship by dilution from primary standard solutions. Dry standards were pre-weighed at the laboratory at ODF, and transported to the vessel for dilution to the primary standard.

Data Distribution

The CTD and bottle data can be obtained through NCAR's Earth Observing Laboratory web-site, www.eol.ucar.edu/project/sbi. The data are reported using the WHP-Exchange (WOCE Hydrographic Program) format and the quality coding follows those outlined by the WOCE program (Joyce, 1994). In addition, the format can be obtained through the WOCE Hydrographic Program web-site, WHPO.ucsd.edu. The descriptions in this document have been edited from the reference to annotate the format specific to this data distribution. ASCII files for each station were created with comments recorded on the CTD Station Logs during data acquisition. These ASCII files include data processing comments noting any problems, the resolution, and footnoting that may have occurred. A separate ASCII file was also created with the comments from the Sample Log Sheets that include problems with the Niskin bottles that could compromise the samples. Comments arising from inspection and checking of the data are also included in the ASCII file. These comment files are also in the EOL/JOSS database. Raw (unprocessed) CTD data are located in the EOL/JOSS database as well. The file nbp03_ctd_raw.zip contains ssscc.cfg, ssscc.con, ssscc.dat and ssscc.hdr (where sss = station number and cc = cast number) files as acquired by the SeaBird SeaSave acquisition program, sbscan.sum file and calibration information for all sensors. The *.cfg file is datcnv.cfg with the beginning scan number and *.con files may include a correction based on the bottle salinity samples. The sbscan.sum file is a list of stations and beginning scan number. Configuration files for the various SeaBird CTD processing programs are also included where applicable.

General rules for WHP-exchange:

1. Each line must end with a carriage return or end-of-line.

2. With the exception of the file type line, lines starting with a "#" character, or including and following a line which reads "END_DATA", each line in the file must have exactly the same number of commas as do all other lines in that file.

3. The name of a quality flag always begins with the name of the parameter with which it is associated, followed by an underscore character, followed by "FLAG", followed by an underscore, and then followed by an alphanumeric character, W.

4. The "missing value" for a data value is always defined as -999, but written in the decimal place format of the parameter in question. For example, a missing salinity would be written -999.0000 or a missing phosphate -999.00.

5. The first four characters of the EXPOCODE are the U.S. National Oceanographic Data Center (NODC) country-ship code, then followed by up to an 8 characters expedition name of cruise number, i.e. 3206NBP0304A.

CTD Data

CTD data is located in file 3206NBP0304a_ct1.zip. This file contains ssscc_ct1.csv files for each station and cast where sss=3 digit station identifier and cc=2 digit cast identifier.

Description of ssscc_ct1.csv file layout.

1st line   File type, here CTD, followed by a comma and a DATE_TIME stamp

                  YYYYMMDDdivINSwho

                  YYYY   4 digit year
                  MM   2 digit month
                  DD   2 digit day
                  div   division of Institution
                  INS   Institution name
                  who   initials of responsible person

lines   A file may include 0-N optional lines at the start of a data file, each beginning with a "#" character and each ending with carriage return or end-of-line. Information relevant to file change/update history may be included here, for example.
2nd line   NUMBER_HEADERS = n (n = 10 in this table and the example_ct1.csv file.)
3rd line   EXPOCODE = [expocode] The expedition code, assigned by the user.
4th line   SECT_ID = [section] The SBI station specification. *Optional.*
5th line   STNNBR = [station] The originator's station number
6th line   CASTNO = [cast] The originator's cast number
7th line   DATE = [date] Cast date in YYYYMMDD integer format.
8th line   TIME = [time] Cast time that CTD was at the deepest sampling point.
9th line   LATITUDE = [latitude] Latitude as SDD.dddd where "S" is sign (blank or missing is positive), DD are degrees, and dddd are decimal degrees. Sign is positive in

	northern hemisphere, negative in southern hemisphere
10th line	LONGITUDE = [longitude] Longitude as SDDD.dddd where "S" is sign (blank or missing is positive), DDD are degrees, and dddd are decimal degrees. Sign is positive for "east" longitude, negative for "west" longitude
11th line	DEPTH = [bottom] Reported depth to bottom. Preferred units are "meters" and should be specified in Line 2. In general, corrected depths are preferred to uncorrected depths. Documentation accompanying data includes notes on methodology of correction. *Optional.*
next line	Parameter headings.
next line	Units.
data lines	A single _ct1.csv CTD data file will normally contain data lines for one CTD cast.
END_DATA	The line after the last data line must read END_DATA, and be followed by a carriage return or end of line.
other lines	Users may include any information they wish in 0-N optional lines at the end of a data file, after the END_DATA line.

Parameter names, units, format, and comments

Parameter	Units	Format	Comments
CTDPRS	DB	F7.1	CTD pressure, decibars
CTDPRS_FLAG_W		I1	CTDPRS quality flag
CTDTMP	ITS-90	F8.3	CTD temperature, degrees C (ITS-90)
CTDTMP_FLAG_W		I1	CTDTMP quality flag
CTDSAL		F8.3	CTD salinity
CTDSAL_FLAG_W		I1	CTDSAL quality flag
CTDOXY	UMOL/KG	F7.1	CTD oxygen, micromoles/kilogram
CTDOXY_FLAG_W		I1	CTDOXY quality flag
XMISS	%TRANS	F7.1	Transmissivity, percent transmittance
XMISS_FLAG_W		I1	XMISS quality flag
FLUOR	VOLTS	F8.3	Fluorometer, voltage
FLUOR_FLAG_W		I1	Fluorometer quality flag
PAR	VOLTS	F8.3	PAR, voltage
PAR_FLAG_W		I1	PAR quality flag
SPAR	VOLTS	F8.3	Surface PAR, voltage
SPAR_FLAG_W		I1	Surface PAR quality flag

Quality Flags

CTD data quality flags were assigned to the CTDTMP (CTD temperature), CTDSAL (CTD salinity) and XMISS (Transmissivity) parameters as follows:

2   Acceptable measurement.

3   Questionable measurement. *The data did not fit the station profile or adjacent station comparisons (or possibly bottle data comparisons). The data could be acceptable, but are open to interpretation.*

4   Bad measurement. *The CTD data were determined to be unusable.*

5   Not reported. *The CTD data could not be reported, typically when CTD salinity is flagged 3 or 4.*

9   Not sampled. *No operational sensor was present on this cast*

WHP CTD data quality flags were assigned to the CTDOXY (CTD O_2), FLUORO (Fluorometer), PAR (PAR), SPAR (Surface PAR), and HAARDT (Haardt Fluorometer CDOM) parameter as follows:

1   Not calibrated. *Data are uncalibrated.*

9   Not sampled. *No operational sensor was present on this cast. Either the sensor cover was left on or the depth rating necessitated removal.*

Bottle Data

<div align="center">

Description of 3206NBP0304A_hy1.csv file layout.

</div>

1st line	File type, here BOTTLE, followed by a comma and a DATE_TIME stamp YYYYMMDDdivINSwho
	YYYY 4 digit year
	MM 2 digit month
	DD 2 digit day
	div division of Institution
	INS Institution name
	who initials of responsible person
#lines	A file may include 0-N optional lines, typically at the start of a data file, but after the file type line, each beginning with a "#" character and each ending with carriage return or end-of-line. Information relevant to file change/update history of the file itself may be included here, for example.
2nd line	Column headings.
3rd line	Units.
data lines	As many data lines may be included in a single file as is convenient for the user, with the proviso that the number and order of parameters, parameter order, headings, units, and commas remain absolutely consistent throughout a single file.
END_DATA	The line after the last data line must read END_DATA.
other lines	Users may include any information they wish in 0-N optional lines at the end of a data file, after the END_DATA line.

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Header columns

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Parameter	Format	Description notes
EXPOCODE	A12	The expedition code, assigned by the user.
SECT_ID	A7	The SBI station specification. *Optional.*
STNNBR	A6	The originator's station number.

CASTNO	I3	The originator's cast number.	
BTLNBR	A7	The bottle identification number.	
BTLNBR_FLAG_W	I1	BTLNBR quality flag.	
DATE	I8	Cast date in YYYYMMDD integer format.	
TIME	I4	Cast time (UT) as HHMM	
LATITUDE	F8.4	Latitude as SDD.dddd where "S" is sign (blank or missing is positive), DD are degrees, and dddd are decimal degrees. Sign is positive in northern hemisphere, negative in southern hemisphere	
LONGITUDE	F9.4	Longitude as SDDD.dddd where "S" is sign (blank or missing is positive), DDD are degrees, and dddd are decimal degrees. Sign is positive for "east" longitude, negative for "west" longitude	
DEPTH	I5	Reported depth to bottom. Preferred units are "meters" and should be specified in Line 2. In general, corrected depths are preferred to uncorrected depths. Documentation accompanying data includes notes on methodology of correction. *Optional.*	

Parameter names, units, and comments:

Parameter	Units	Format	Comments
CTDPRS	DB	F9.1	CTD pressure, decibars
CTDPRS_FLAG_W		I1	CTDPRS quality flag
SAMPNO		A7	Cast number *100+BTLNBR. *Optional*
CTDTMP	ITS-90	F9.4	CTD temperature, degrees C, (ITS-90)
CTDTMP_FLAG_W		I1	CTDTMP quality flag
CTDCOND	MS/CM	F9.4	CTD Conductivity, milliSiemens/centimeter
CTDCOND_FLAG_W		I1	CTDCOND quality flag
CTDSAL		F9.4	CTD salinity
CTDSAL_FLAG_W		I1	CTDSAL quality flag
SALNTY		F9.4	bottle salinity
SALNTY_FLAG_W		I1	SALNTY quality flag
SIGMA	THETA	F9.4	Sigma Theta
SIGMA_FLAG_W		I1	Sigma Theta quality flag
CTDOXY	UMOL/KG	F9.1	CTD oxygen, micromoles/kilogram
CTDOXY_FLAG_W		I1	CTDOXY quality flag
CTDOXY	ML/L	F9.3	CTD oxygen, milliliters/liter
CTDOXY_FLAG_W		I1	CTDOXY quality flag
OXYGEN	UMOL/KG	F9.1	bottle oxygen
OXYGEN_FLAG_W		I1	OXYGEN quality flag
OXYGEN	ML/L	F9.3	bottle oxygen, milliliters/liter
OXYGEN_FLAG_W		I1	OXYGEN quality flag

O2TEMP	DEGC	F6.1	Temperature of water from spigot during oxygen draw, degrees C
O2TEMP_FLAG_W		I1	O2TEMP quality flag
SILCAT	UMOL/KG	F9.2	SILICATE, micromoles/kilogram
SILCAT_FLAG_W		I1	SILCAT quality flag
SILCAT	UMOL/L	F9.2	SILICATE, micromoles/liter
SILCAT_FLAG_W		I1	SILCAT quality flag
NITRAT	UMOL/KG	F9.2	NITRATE, micromoles/kilogram
NITRAT_FLAG_W		I1	NITRAT quality flag
NITRAT	UMOL/L	F9.2	NITRATE, micromoles/liter
NITRAT_FLAG_W		I1	NITRAT quality flag
NITRIT	UMOL/KG	F9.2	NITRITE, micromoles/kilogram
NITRIT_FLAG_W		I1	NITRIT quality flag
NITRIT	UMOL/L	F9.2	NITRITE, micromoles/liter
NITRIT_FLAG_W		I1	NITRIT quality flag
PHSPHT	UMOL/KG	F9.2	PHOSPHATE, micromoles/kilogram
PHSPHT_FLAG_W		I1	PHSPHT quality flag
PHSPHT	UMOL/L	F9.2	PHOSPHATE, micromoles/liter
PHSPHT_FLAG_W		I1	PHSPHT quality flag
NH4	UMOL/KG	F9.2	AMMONIUM, micromoles/kilogram
NH4_FLAG_W		I1	NH4 quality flag
NH4	UMOL/L	F9.2	AMMONIUM, micromoles/liter
NH4_FLAG_W		I1	NH4 quality flag
UREA	UMOL/KG	F9.2	UREA, micromoles/kilogram
UREA_FLAG_W		I1	UREA quality flag
UREA	UMOL/L	F9.2	UREA, micromoles/liter
UREA_FLAG_W		I1	UREA quality flag
FLUORO	VOLTS	F8.3	Fluorometer, voltage
FLUORO_FLAG_W		I1	Fluorometer quality flag
PAR	VOLTS	F8.3	PAR, voltage
PAR_FLAG_W		I1	PAR quality flag
SPAR	VOLTS	F8.3	Surface PAR, voltage
SPAR_FLAG_W		I1	Surface PAR quality flag
HAARDT	VOLTS	F8.3	CDOM Fluorometer, voltage
HAARDT_FLAG_W		I1	CDOM Fluorometer quality flag
N**	UMOL/L	F9.2	N**, micromoles/liter
N**_FLAG_W		I1	N** quality flag

CHLORO	UG/L	F8.2	Chlorophyll, micrograms/liter
CHLORO_FLAG_W		I1	Chlorophyll quality flag
PHAEO	UG/L	F8.2	Phaeophytin, micrograms/liter
PHAEO_FLAG_W		I1	Phaeophytin quality flag
BTL_DEP	METERS	F5.0	bottle depth, meters
BTL_LAT		F8.4	Latitude at time of bottle trip, decimal degrees
BTL_LONG		F9.4	Longitude at time of bottle trip, decimal degrees
JULIAN		F8.4	Julian day and time as fraction of day of the bottle trip.

Quality Flags

CTD data quality flags were assigned to CTDPRS (CTD pressure), CTDTMP (CTD temperature), CTDCOND (CTD Conductivity), and CTDSAL (CTD salinity) as defined in Data Distribution, CTD Data, Quality Flags section of this document. CTDOXY (CTD O$_2$), FLUORO (Fluorometer), PAR (PAR), and SPAR (Surface PAR) parameters are flagged with either a 2, acceptable or 9, not drawn.

Bottle quality flags were assigned to the BTLNBR (bottle number) as defined in the WOCE Operations Manual [Joyce] with the following additional interpretations:

2   No problems noted.

3   Leaking. *An air leak large enough to produce an observable effect on a sample is identified by a flag of 3 on the bottle and a flag of 4 on the oxygen. (Small air leaks may have no observable effect, or may only affect gas samples.)*

4   Did not trip correctly. *Bottles tripped at other than the intended depth were assigned a flag of 4. There may be no problems with the associated water sample data.*

9   The samples were not drawn from this bottle.

WHP water sample quality flags were assigned to the water samples using the following criteria:

1   The sample for this measurement was drawn from the water bottle, but the results of the analysis were not (*yet*) received.

2   Acceptable measurement.

3   Questionable measurement. *The data did not fit the station profile or adjacent station comparisons (or possibly CTD data comparisons). No notes from the analyst indicated a problem. The data could be acceptable, but are open to interpretation.*

4   Bad measurement. *The data did not fit the station profile, adjacent stations or CTD data. There were analytical notes indicating a problem, but data values were reported. Sampling and analytical errors were also flagged as 4.*

5   Not reported. *The sample was lost, contaminated or rendered unusable.*

9   The sample for this measurement was not drawn.

Not all of the quality flags are necessarily used on this data set.

APPENDIX A: Bottle Quality Comments

Remarks for deleted samples, missing samples, PI data comments, and WOCE codes other than 2 from NBP03-04A, SBI Survey. Comments from the Sample Logs and the results of ODF's investigations are included in this report. Investigation of data may include comparison of bottle salinity and oxygen data with CTD data, review of data plots of the station profile and adjoining stations, and rereading of charts (i.e. nutrients). Units stated in these comments are degrees Celsius for temperature, Practical Salinity Units for salinity, and unless otherwise noted, milliliters per liter for oxygen and micromoles per liter for Silicate, Nitrate, Nitrite, Phosphate and Urea and Ammounium, if appropriate. The first number before the comment is the cast number (CASTNO) times 100 plus the bottle number (BTLNBR).

Station 001.001
101 Salinity analysis: "Three tries for good reading." PI: "Salinity is acceptable."
102 SampleLog: "Samples were only drawn for DOM/POM."
103 Salinity analysis: "Three tries for good reading." PI: "Salinity is acceptable."
103-105
Cast 1 Nuts: NH4 not reported due to equipment malfunction for this channel.

Station 002.001
101 Samples were only drawn for DOM/POM.
105 Sample Log: "First two draws had small bubbles. O2 draw was taken after 3 draws." High oxygen; could have been degassing. PI: "Oxygen is acceptable." Salinity analysis: "Three tries for good reading." PI: "Salinity is acceptable."
106 PI: "PO4 low, not in good agreement with bottle 109." DQ: "Density inversion and poor CTD vs. bottle salinity agreement, probably a gradient." This is a gradient, primary and secondary agree with one another, but the 1 meter bottle difference makes a difference in the bottle salinity. Nutrients: "Rechecked po4 = real."
107-108 Samples were only drawn for C13/N15.
109 PI: "PO4 high, not in good agreement with bottle 106." Nutrients: "Rechecked po4 = real."

Station 003.001
101 SampleLog: "Tentacles on spigots."
106-107 Samples were only drawn for C13/N15.

Station 004.001
101 Samples were only drawn for DOM/POM.
104 PI: "02 may be a little high, compared to CTD. Also nuts, but leave as is."
107 Oxygen: "Long delay between unstoppering and analysis." PI: "Oxygen is acceptable."

Station 005.001
101 Samples were only drawn for DOM/POM.
102 Oxygen: "3 small bubbles." PI: "Oxygen agrees well with nuts but not so well with CTD. Oxygen is acceptable." CTDO-bottle difference is ~0.05, but bottle O2 could be low by ~0.02 as compared with Station 004. DQ: "Oxygen is acceptable".
103 SampleLog: "O2 drawn twice." PI: "Oxygen is acceptable."
104 Sample Log: "O2 drawn twice. Still small bubble on third try." PI: "Oxygen is acceptable."
106-107 Samples were only drawn for C13/N15.
109 SampleLog: "O2 drawn twice; still small bubble." PI: "Oxygen is acceptable."

Station 006.001
101 Samples were only drawn for DOM/POM.
105 Fromlooking more closely at data (nutrient data in particular), looks like sample 105 is from slightly deeper water than sample 106. There does not appear to be a problem with the CTD bottle trip files. It may be that this was a flushing problem, and that there was still deeper water being carried along when the bottle was tripped. Bottle 106 would have had time to be completely flushed. Data should be marked as questionable. Salinity analysis: "Four tries for good reading." Agreement with CTD is reasonable, but will still leave coding as questionable.
105-106 PI: "105 and 106 have identical pressures. Were they really both tripped at 18.7db?" See 105 comments.
107-108 Sample Log: "C13/N15 only drawing 7 liters of water per bottle; 3 rinses on bottle, but no water left when spigot pushed in. MT's checking bottles; found slow leak on 108. Bottom o-ring, bottle changed between stas 6 & 7." Samples were only drawn for C13/N15.
Cast 1 Sample Log: "10 meter bottle not tripped; missed during acquisition."
Station 007.001
101 Samples were only drawn for DOM/POM.
104-105 Samples were only drawn for C13/N15.
107 Bottle salinity is high compared with CTD. Footnote bottle salinity questionable.
108-109 Samples were only drawn for C13/N15.
Station 008.001
102 DQ:"CTD salinity seems high." Primary and secondary temperature and conductivity agree with one another. Temperature is lower than duplicate trip which could account for higher salinity. Since agreement between the sensors is reasonable, leave data as is. Samples were only drawn for DOM/POM.
103,106 Sample Log: "Phyto (Flint) sample taken at 12m & surf bottles."
104-105 Samples were only drawn for C13/N15.
Station 009.001
101 Nuts:NH4: not reported due to equipment malfunction for this channel.
102 Samples were only drawn for DOM/POM.
105 PI:"Salt difference larger than usual, 0.127."
Station 010.001
101 DQ: "Disagreement between CTD vs. bottle salinity." CTD primary and secondary agree with one another, could possibly be shed-wake effect, less saline water from shallower in the water column. However, other data do not indicate this phenomenon. Footnote salinity bad.
101,103-107 Nuts: NH4: not reported due to equipment malfunction for this channel.
102 Samples were only drawn for DOM/POM.
103 DQ:"Disagreement between CTD vs. bottle salinity." Gradient, leave as is.
103-107
105 PI:"O2 a little low compared to CTD and nutrient profiles."
Station 011.001
101 DQ: "CTD questionable." Primary and secondary conductivity agree with one another. account for higher salinity. Since agreement between the sensors is reasonable and bottle salinity and oxygen agrees with CTD, leave data as is.

102 Samples were only drawn for DOM/POM.

103-104 Samples were only drawn for C13/N15.

107 Large Bottle-CTD difference, 0.04, gradient, leave as is.

108 Bottle-CTD difference, 0.01, gradient, leave as is, also within data tolerance.

109-110 Samples were only drawn for C13/N15.

Station 012.001

102 Samples were only drawn for DOM/POM.

103 Oxygen: "1 tiny bubble." PI: "Oxygen is acceptable."

104 Oxygen: "small bubble." PI: "Oxygen is acceptable."

Station 013.001

102 Samples were only drawn for DOM/POM.

106 Oxygen: "bubble." PI: "Oxygen sample missing. No explanation." Corrected bottle number entered incorrectly.

Cast 1 PI: "No problem seen in oxygen data."

Station 014.001

101 Samples were only drawn for DOM/POM.

102-103 Samples were only drawn for C13/N15.

109-110 Samples were only drawn for C13/N15.

Station 015.001

101 Samples were only drawn for DOM/POM.

104-105 Samples were only drawn for C13/N15.

Station 016.001

101 Samples were only drawn for DOM/POM.

Station 017.001

102 Samples were only drawn for DOM/POM.

105 PI:"Urea seems very high." Nutrients: "Rechecked urea = real." PI: "Large salt difference." Package came through large gradient, could be a flushing problem. Salinity is ˜0.3 higher than CTD.

Station 018.001

102 Samples were only drawn for DOM/POM.

Station 019.001

102 Samples were only drawn for DOM/POM.

Station 020.001

102 Samples were only drawn for DOM/POM.

107 PI: "Large salt difference." Gradient, even a difference between primary and secondary sensors, -0.02, data are acceptable.

Station 021.001

102 Samples were only drawn for DOM/POM.

106 Oxygen: "Check endpoint" PI: "Oxygen is acceptable."

Station 022.001

102 Samples were only drawn for DOM/POM.

107 SampleLog: "Air vent open." PI: "Oxygen is acceptable."

Station 023.001

102 Samples were only drawn for DOM/POM.

108,110,112 Salinity was not drawn.

114 PI: "Oxygen may be a little low. Compare to CTD." DQ: "Double check O2 scan. "

Oxygen trace looks reasonable at 9.1ml/l, value reported is 9.2. Reported value of 9.2 could be a little high, 0.18, because of drift that occurs at bottle trip. DQ: "Values are acceptable." Salinity was not drawn.
Cast 1 Sample Log: "Oxygen sensor has a jellyfish in it-on top of rosette, too."
Station 024.001
102 Oxygen, Salinity, and Nutrients were not drawn.
104 PI:"NO2 a little low, and oxygen a little low, compare to CTD." Oxygen agrees with CTD. Nutrients: "Rechecked no2 = real."
109,111,113 Salinity was not drawn.
115,119 Salinity was not drawn.
116-117 Samples were only drawn for C13/N15.
Cast 1 Sample Log: "Tentacles on rosette frame and bottles."
Station 025.001
101 Oxygen: "large bubble." PI: "Oxygen is acceptable."
101-109 Nuts: NH4: not reported due to equipment malfunction for this channel.
106,109,111 Salinity was not drawn.
108 PI:"NO3 a little low." Nutrients: "Rechecked no3 = real."
113 SampleLog: "Air leak." PI: "Oxygen is acceptable." Salinity was not drawn.
114,118-119 Salinity was not drawn.
116 Sample Log: "Sampler thought there may be an air leak, reported small dripping." No problem reported on Station 26. No modification made to the bottle." CTD and bottle oxygen agreement is reasonable. Salinity was not drawn.
120 Oxygen: "tentacle?." CTD and bottle oxygen agreement is reasonable. Salinity was not drawn.
Station 026.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
115 Sample Log: "Air leak." Bottle tested after the cast. No leak found could have been the jellyfish tentacle caught in lid." PI: "Oxygen is acceptable."
121 Sample Log: "C13 started sampling before nutrients and salinity. Sampler stopped sampling and there was enough water for nutrients and salinity.
Cast 1 Sample Log: "Jellyfish on rosette and bottles."
Station 027.002
Cast 1 Sample Log: "Cast 1 aborted - bottle tripped at surface."
201 Oxygen value looks low - no comments. Noted that nutrients also show something; probably real. Looks real. PI: "Oxygen is acceptable."
201-224 No PAR sensor, sampling too deep for instrument depth rating.
208 SampleLog: "Very small top cap leak."
210,212-216 Salinity was not drawn.
218-223 Salinity was not drawn.
Station 028.001
110,112-116 Salinity was not drawn.
117 Salinity is high compared with CTD, 0.5. There appears to be a difference in the electronics of the instrument on this sample. It was run after a higher sample, but suspect the analyst took this into consideration during flushing. Code salinity bad.
118 PI:"NO3 a little low." Nutrients: "Rechecked no3 = real."
118-123 Salinity was not drawn.

Station 029.001
101-124 No PAR data, sensor removed, sampling depth too deep.
107 PI:"Urea high." Nutrients: "Rechecked urea = peak changed."
110-117 Salinity was not drawn.
115 SampleLog: "Air leak." Oxygen agrees with CTD and appears reasonable.
118 CTDOappears low, code CTDO questionable.
119-122 Salinity was not drawn.
Station 030.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
110-114 Salinity was not drawn.
115 DQ: "Bottle salt has same value as 119 and it looks way off." Rechecked data, no obvious indication that this was a analytical error, could have been a sampling error or analyst could have run the sample twice. Code bottle salinity bad.
116-118 Salinity was not drawn.
120-122 Salinity was not drawn.
Station 031.001
110-115 Salinity was not drawn.
112 PI:"NO2 a little high." Nutrients: "Rechecked no2 = real."
113 DQ: "CTD O2 scan questionable." CTDO agrees with bottle oxygen as well as the rest of the profile.
117-120 Salinity was not drawn.
122-123 Salinity was not drawn.
123 SampleLog: "Tentacles." Data appears reasonable, SiO3 could be a little low.
Station 032.002
201-224 No PAR sensor, sampling too deep for instrument depth rating.
210,212-220 Salinity was not drawn.
211 PI: "Fairly large salt difference." There does appear to be a difference between the down trace and up trace in this gradient area and the primary and secondary sensors have a larger than usual difference, 0.01. Since it is such a large difference, code salinity questionable, The sample should not have been taken in the gradient.
219 Oxygen: "Strange end point, added 1ml to try a new reading." PI: "Oxygen is acceptable."
222-223 Salinity was not drawn.
Station 033.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
105 PI:"Urea high." Nutrients: "Rechecked urea = real."
109 PI: "No O2 data in file." Wrong bottle number was assigned, was entered as 11 instead of 9. Corrected data files.
111-115 Salinity was not drawn.
117-123 Salinity was not drawn.
118 Oxygen: "Overtitrate and backtitrate, 0.86952. Added 1 ml after first titration to get better reading. PI: "Oxygen is acceptable."
Station 034.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
108 SampleLog: "Air leak." PI: Oxygen is acceptable."
110-112 Salinity was not drawn.
114-116 Salinity was not drawn.

115 SampleLog: "Air leak." PI: "Oxygen is acceptable."

118-123 Salinity was not drawn.

121,123 Oxygen: "First titer had bad slope, added 1ml KIO3 to get good reading." PI: "Oxygen is acceptable."

Station 035.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

102 Oxygen: "+10ml KIO3,+o2Raw." Oxygen: "Invalid Endpoint .... Error . . . verror= 806 Illegal Function Call"; decided to add 10ml KIO3 and redo titration so we could subtract std value & possibly get O2 value for sample. PI: "No oxygen value in file." Oxygen was lost.

109,111-114 Salinity was not drawn.

115 SampleLog: "Air leak." PI: "Oxygen is acceptable."

116-119 Salinity was not drawn.

118 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."

121-123 Salinity was not drawn.

Station 036.001

101 Oxygen: "Check endpoint; 1 division high." PI: "Oxygen is acceptable."

101-124 No PAR sensor, sampling too deep for instrument depth rating.

102 Oxygen: "No endpoint; wanted to do overtitrate and backtitrate, but hit wrong button, so added 1ml of KIO3 and did titration, calling it cast 91, bottle 1." PI: "Oxygen is acceptable."

105 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."

110-115 Salinity was not drawn.

113 Nuts:"Bottle tripped but no water in nuts sample tube."

115 SampleLog: "Air leak." PI: "Oxygen is acceptable."

117-119 Salinity was not drawn.

121-123 Salinity was not drawn.

Station 037.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

112-123 Salinity was not drawn.

115 SampleLog: "Very small vent or top cap leak on bottle." Oxygen: "Tiny bubble." PI: "Oxygen is acceptable."

Cast 1 Sample Log: "Sodium Hydroxide dispenser is sticking."

Station 038.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

110,112 Salinity was not drawn.

114-123 Salinity was not drawn.

115 SampleLog: "No air leak."

120-121 Sample Log: "No bottle samples for 20 and 21, this was for C13, N15."

121-122 Samples were only drawn for C13/N15.

122 DQ: "CTD O2 scan questionable" CTDO trace agrees with Stations 37-40. Bottle oxygen is low, ˜0.3, compared with Station 040. Code bottle oxygen questionable.

Station 039.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

103 PI:"NO3 a little low." Nutrients: "Rechecked no3 looks ok."

109,111 Salinity was not drawn.

111 Nuts:"Bottle tripped but no water in nuts sample tube." Footnote nutrients lost.
113 Sample Log: "Air leak." PI: "Oxygen is acceptable." PI: "NO3 is high." Nutrients: "Rechecked no3 looks good."
113-118 Salinity was not drawn.
120-123 Salinity was not drawn.
121 Samplewas only drawn for C13/N15.

Station 040.001
101 Oxygen: "Long delay." PI: "Oxygen is acceptable."
101-124 No PAR sensor, sampling too deep for instrument depth rating.
108 Large bottle-CTD salinity difference, 0.015. Conductivity sensors agree with each other, gradient, leave as is.
109 Oxygen: "Added acid after stirrer bar." PI: "Oxygen is acceptable."
110 Oxygen: "Check endpoint. PI: "Oxygen is acceptable."
110-111 Salinity was not drawn.
112 Large bottle-CTD salinity difference, 0.03. Conductivity sensors agree with each other, gradient, leave as is.
113-115 Salinity was not drawn.
115 SampleLog: "Air leak." PI: "Oxygen is acceptable.
116 DQ: "Check CTD and bottle salinity." Primary and secondary conductivity sensor agreement is very good. No analyses problems, oxygen could be high, SiO3 low, NO3 low and PO4 low. DQ: "Bottle oxygen looks high. Analyst notes no problem"
117-123 Salinity was not drawn.
124 Oxygen: "Big copepod whirling around in flask during titration." PI: "Oxygen is acceptable."

Station 041.001
101 Oxygen: "Check endpoint." PI: "Oxygen is acceptable."
101-124 No PAR sensor, sampling too deep for instrument depth rating.
102 Oxygen: "Lost sample."
103 PI:"O2 a little high."
111-116 Salinity was not drawn.
118-123 Salinity was not drawn.

Station 042.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
112-123 Salinity was not drawn.
122 Samples were only drawn for C13/N15.
124 Salt: "Yes! Bottle (salt) 24-Niskin 24 reads 0.66154." Bottle salinity is high compared with CTD. No analyses problem, this was a real measurement; probably came from fresh water lens from melt water which didn't go as deep as CTD on rosette when bottle tripped. Deck crew talked about how CTD only halfway into "lens". DQ: "Do refractive index need adjustment for surface salinity of 10.343. NOTE: Needs to be corrected CTD salt greater than bottle salinity."

Station 043.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
112-123 Salinity was not drawn.

Station 044.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.

102 Bottle salinity is low compared with CTD. Salinity appears to have been misdrawn from bottle 4. Footnote bottle salinity bad. PI: "Agree with salinity determination, bottle salinity looks bad."
112-123 Salinity was not drawn.
119 Oxygenflask was broken during "second shake". No O2 sample.
121 Samples were only drawn for C13/N15, no other samples taken.
Station 045.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
112-123 Salinity was not drawn.
Station 046.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
102 Oxygen, Salinity, and Nutrients were not drawn.
113-123 Salinity was not drawn.
Station 047.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
112 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable." PI: ""Oxygen a little low, but okay as is."
112-123 Salinity was not drawn.
Station 048.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
106 Oxygen: "Noticed filament streaming from thio burette tip." PI: "Oxygen is acceptable."
107 Oxygen: "Long delay." PI: "Oxygen may be high, but is okay as is."
110-113 Salinity was not drawn.
113 Oxygen: "Check endpoint." PI: "Oxygen is acceptable."
115-116 Salinity was not drawn.
117 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."
118-123 Salinity was not drawn.
121 Samples were only drawn for C13/N15.
Station 049.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
112-123 Salinity was not drawn.
119 Oxygen: "Lost sample" No explanation why the sample was lost.
123 Oxygen: "Tiny bubble." DQ: "Bottle O2 questionable. Density inversion between 123 and 122. Check CTD SCAN." Bottle oxygen agrees well with CTDO. Salinity does become much saltier in the CTD trace, does not look like a spike in the data. The density inversion is ˜0.03, leave as is.
Station 050.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
112-123 Salinity was not drawn.
Cast 1 1st occupation of Station 300. Sample Log: "10-min delay in sampling while searched for O2 draw tubes."
Station 051.001
103 Sample Log: "Niskin 3 came off its mounting during recovery with some leakage due to cap being jarred." PI: "Oxygen is acceptable." PI: "NO2 is very high, may be real. Trend also seen on station 052.001." Nutrients: "Rechecked no2 = real."
107-111 Salinity was not drawn.

113-119 Salinity was not drawn.
Station 052.001
107-112 Salinity was not drawn.
108 Sample Log: "Very small air leak - probably the top cap." PI: "Oxygen is acceptable."
114-119 Salinity was not drawn.
Cast 1 1st occupation of Station 302. Sample Log: "Niskin 3 replaced prior to 05201. (NB 3 is mislabelled as 5.) Needs to be relabeled to 3."
Station 053.001
103 SampleLog: "Bottle has a very slow spigot."
103-106 Salinity was not drawn.
108-113 Salinity wad not drawn.
114-115 Samples were only drawn for C13/N15.
116 PI: "No nutrients, but no note here why." Nutrient data indicates sample from bottle 14, but Sample Log indicates that sample was drawn from bottle 16. Nutrients: "Rechecked, labeled wrong, changed the file."
Station 054.001
102-106 Salinity was not drawn.
103 SampleLog: "Replacement bottle is very slow."
108-109 Salinity was not drawn.
Station 055.001
103 SampleLog: "Original bottle back in place on rosette."
103-107 Salinity was not drawn.
Station 056.001
102-105 Salinity was not drawn.
Station 057.001
102-105 Salinity was not drawn.
Station 058.001
102-103 Salinity was not drawn.
Station 059.001
102,105 Salinity was not drawn.
103-104 Samples were only drawn for C13/N15 and DOM/POM.
Station 060.001
103-104 Salinity not drawn.
104 PI:"Urea seems high." Nutrients: "Rechecked urea = real."
105-106 Samples were only drawn for C13/N15.
109 DQ: "Urea was off-scale and suspiciously high (3.8 micromolar), check peaks, etc. At a minimum this would be questionable because it is outside the calibration range."
Station 061.001
102-104 Salinity was not drawn.
104 PI:"Urea seems high." Nutrients: "Rechecked urea = real."
Station 062.001
102-110 Salinity was not drawn.
105 Nuts: NH4 and urea: bad measurement due to possible sample contamination. Footnote nh4 and urea bad.
108 Oxygen: "Small airleak." Oxygen agrees with CTDO and is acceptable.
111 DQ: "Poor agreement between CTD and bottle salinity = poor flushing or bad CTD

scan or bottle salinity. Please check." Large surface gradient. No real problem seen in the CTD profile, but obvious mixing. Deeper more saline water could have been dragged up with the package. There is a fairly large, 0.4, difference between primary and secondary sensors. Leave as is.

Station 063.001

101 Salt: "Thimble was full of water and loose in bottle; suspect this spiked the sample." PI: "Salt is acceptable."

103-106 Salinity was not drawn.

108-112 Salinity was not drawn.

113 DQ: "No footnote about missing nutrient data from 113 and 112." Nutrient data claims bottles 14 and 15 instead of 12 and 13. Corrected data files.

Station 064.001

101 DQ:"No footnote about missing nutrients, also could be a mis-trip. Bottle salt looks like it came from 102 instead of 101. Mis-trip, mis-sample, or wrong data entry. Check bottle salinity! Bottle O2 also looks suspicious. Results in density inversion." Corrected data entry of bottle, station assignment in nutrient data tabulated as Station 066 bottle 1. Appears to be a drawing error on salinity, Bottle-CTD is -0.094. Code salinity bad. DQ: "Poor agreement between CTD and bottle salinity and oxygen."

102-105 Salinity was not drawn.

106 DQ: "Does not fit profile. Analyst notes no problems" Urea questionable.

107-114 Salinity was not drawn.

112-113 Samples were only drawn for C13/N15.

Station 065.001

101 PI:"Large salinity difference, these are all in high salinity bottom layers. May not be possible to get better salinity agreement." DQ: "Bottle salinity suggests poor flushing." Primary and secondary conductivity sensor agreement is reasonable. Bottle salinity was run after a lower value, 5 units lower. Although salinity analyses values do not indicate a problem, it could be that the previous sample influenced the readings on this sample.

102-109 Salinity was not drawn.

110 Oxygen: "Flask order wrong." Salinity: "very fresh value - analyst says a real measurement; probably came from melt water fresh water lens which did not go as deep as CTD on rosette when bottle tripped."

Station 066.001

102-108 Salinity was not drawn.

Station 067.001

101 PI:"Large salinity difference, this is in high salinity bottom layer; may not be possible to get better salinity agreement."

102-108 Salinity was not drawn.

Station 068.001

101 PI:"Large salinity difference, this is in high salinity bottom layer; may not be possible to get better salinity agreement."

102-109 Salinity was not drawn.

107-108 Samples were only drawn for C13/N15.

Station 071.001

102-103 Salinity was not drawn.

Station 072.001
102-105 Salinity was not drawn.
106-107 Samples were only drawn for C13/N15.
Station 073.001
102-109 Salinity was not drawn.
Station 074.001
101 PI: "Large salt difference." DQ: "Suspect this was a mis-trip. Need to check O2's
and salts against CTD profile." Even though both pair of sensors show the same
higher temperature, higher salinity, the agreement between the conductivity is high,
0.05, and the primary conductivity, -0.29. DQ: "Poor bottle flushing"
103-109 Salinity was not drawn.
106 Nutrients: NH4 off-scale, same when re-ran sample. Nutrients may have been contaminated.
Concentration is greater than what could be recorded. Could be real or
could be a contaminated sample. Discussed coding this value as questionable,
decided it may be a high value and may be higher than what is actually reported,
leave this as is. PI: "Suspect NH4 is contaminated." Footnote questionable as per PI
and DQ. DQ: "Mark NH4 as off-scale and questionable. Not enough PO4 to justify."
107 Agreement between bottle and CTDO is about 0.4 lower than the rest of the profile.
No real problem seen in CTD profile, but it does indicate oxygen minimum which can
be seen a little higher in the water column on the down cast. DQ: "Values are acceptable".
Station 075.001
101 DQ:"Bottle salinity seems low. Poor flushing sampled from 102 instead of 101? Also
note that no nutrients were sampled. Could there be confusion here?" CTD-bottle
salinity difference is -0.011, salinity does appear to be from bottle 2. This is the same
sampler as previous large difference salinity samples at this level. Oxygen agreement
is reasonable and nutrients appear reasonable. Code salinity questionable. Corrected
data entry of bottle, station assignment in nutrient data tabulated as Station 077.
102-109 Salinity was not drawn.
106-107 Samples were only drawn for C13/N15.
Station 076.001
101 DQ:"Why no nutrient samples?" Station assignment error in nutrient data tabulated
as Station 078. Entry corrected.
102 PI:"Oxygen is low." No analytical problem noted, code oxygen questionable.
102-106 Salinity was not drawn.
Station 077.001
102-103,107 Salinity was not drawn.
104-105 Samples were only drawn for C13/N15.
107 SampleLog: "Top vent not closed." Oxygen does appear a little high, there were only
7 bottles so sampling went quickly. Code oxygen questionable. Console Log: "Deck
crew requested CTD be brought on board as quickly as possible. Ice was closing in on
rosette."
Cast 1 Sample Log: "Ice on top of rosette."
Station 078.001
102 PI:"SiO3 may be low." Nutrients: "Rechecked sil = real."
102,103,105 Salinity was not drawn.
Station 079.001

102 Salinity was not drawn.

103-104 Samples were only drawn for C13/N15.

Cast 1 DQ: "Sigma theta values suggest that this station was entered upside down! Highest sigma theta at surface and lowest at bottom. The differences are small but..." Bottle trip information is machine generated and the bottle number assignment is correct. Primary and secondary sensors agree, data is acceptable.

Station 080.001

102-103 Salinity was not drawn.

Cast 1 DQ: "Highest sigma theta for mid-depth sample; check data entry as for Station 79 and check CTD scan data." There is a difference between the down and up cast. The surface is significantly different even as the bottle is being tripped. Data are acceptable.

Station 081.001

102-104 Salinity was not drawn.

Station 082.001

102-105 Salinity was not drawn.

Station 083.001

102-106 Salinity was not drawn.

Station 084.001

101 DQ:"Poor flushing indicated by bottle salinity. Was this the evil watch? We seem to vacillate between good bottle salinity agreement and bad agreement. Sure it could be random error, but I think that we should find the evil watchstanders!" The machines diagnostics indicate a slight electronics difference. Other than that there does not appear to be any problem, if the. salinity agreement was better this signal would not even have been questioned. The sampler is not the same as the last series of questionable bottom salts. Code salinity questionable.

102-104 Salinity was not drawn.

Station 085.001

102-104 Salinity was not drawn.

Station 086.001

101 DQ: "Another station where bottle salinity agrees poorly with CTD scan." Primary and secondary sensor agreement is reasonable. Bottle salinity was run after a lower value, 5 units lower. Although salinity analyses values do not indicate a problem, it could be that the previous sample influenced the readings on this sample. There appears to be a slight offset, 0.1, at the bottom of the cast. The bottle-CTDO is 0.9 higher than normal. Code CTDO questionable.

102 DQ:"Poor agreement between CTD and bottle O2 after adjusting for O2 probe offset. Both values are questionable unless we can identify what happened." The CTD profile indicates a drift of over 1.0 while the package sat at this level for the bottle trip. The trip data could have averaged the lower CTDO values. Code CTDO questionable.

102-103 Salinity was not drawn.

Station 087.001

101 DQ: "All samples seem questionable. Bottle and CTD salts don't agree. Bottle O2 went up, but CTD O2 went down and nutrients look low, all bottle data questionable." Code bottle leaking, and all samples bad.

102-103 Salinity was not drawn.

104-105 Samples were only drawn for C13/N15.

Station 088.001
104-105 Samples were only drawn for C13/N15.
106 Salinity was not drawn.
Cast 1 Sample Log: "Tentacles on sensors."
Station 089.001
103 SampleLog: "Bottle did not close." After this cast the carousel was checked and position 3 was cleaned." No samples were drawn.
104 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable." Salinity was not drawn.
Station 090.001
101-105 Salinity was not drawn.
104 See103 bottle firing comment, no samples were drawn from this bottle.
107-108 Salinity was not drawn.
108 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen difficult to judge, leave as is."
Cast 1 Sample Log: "All bottle tripped, carousel was cleaned and checked prior to this station." DQ: "No print-out. Were there bottle data from this station?"
Station 091.001
101 Oxygen: flask 1156 has flask 1592 stopper. Oxygen: checked and flask volumes very different - coding as questionable. PI: "Oxygen looks okay." Removed questionable footnote based on PI comments. Oxygen is acceptable.
102 Oxygen: flask 1192 has flask 1556 stopper. Oxygen: checked and flask volumes very different - coding as questionable. Oxygen is acceptable. Removed questionable footnote based on PI comments.
102-110 Salinity was not drawn.
106 PI:"Oxygen is acceptable."
109-109 Samples were only drawn for C13/N15.
111 Oxygen: "Check endpoint." bad endpoint, decided to backtitrate, but program prompted for next sample, then didn't switch to O2UVLO so second try lost. Diagnostic program used to check and adjust enpoint. Oxygen: Changed sample flask to 1528 from 1148 (duplicated from sample above for 110). Went back and checked box: flask no. 1528 is correct. PI: "Oxygen is acceptable."
Station 092.001
101 DQ:"Once again bottle salinity suggests little or no soak time; although diff is within error bounds."
103-108 Salinity was not drawn.
106 PI: "Oxygen is high, but is in an oxygen gradient, is acceptable." DQ: "Check CTD O2."
109-111 No samples were drawn.
Cast 1 Sample Log: "3 bottles tripped at the surface; jellyfish were around the rosette as reported by MT's. Tripped bottles until the jellyfish went away, then sample from last bottle tripped."
Station 093.001
101 DQ: "Once again bottle salinity suggests poor flushing/little soak time although the absolute difference is small. Created a slight density inversion. Could be offset between autosal and CTD, but I am suspicious."

102-105 Salinity was not drawn.

103 Oxygen: "Sample was overtitrated and backtitrated."

Station 094.001

102-107 Salinity was not drawn.

104-105 Samples were only drawn for C13/N15.

Cast 1 Oxygen: Sampler did not put water in tops of flask after 2nd shake. As per analyst, all flasks had small bubbles around edges.

Station 095.001

101 PI:"Large salt difference." DQ: "This is a mis-trip!"

102-104 Salinity was not drawn.

105 Salts: "Salt bottle 11 thimble came out with cap - bottle filled solid - no air space."

Station 096.001

101 PI:"Large salt difference." DQ: "Once again bottle salinity suggests poor flushing (or sampling from wrong bottle)."

102-104 Salinity was not drawn.

Station 097.001

101 Nuts: NH4: not reported due to equipment malfunction for this channel. DQ: "Once again bottle salinity and apparent density inversion suggest very poor bottle flushing."

102 Nuts: NH4 reported as questionable as single readable peak in the middle of bubble trouble, but this one looked like a real peak as per analyst. PI: "NH4 looks reasonable."

102-104 Salinity was not drawn.

103-104,107 Nuts: NH4: not reported due to equipment malfunction for this channel.

105-106 Samples were only drawn for C13/N15.

Station 098.001

101-105 Nuts: NH4: not reported due to equipment malfunction for this channel.

102 PI: "Large oxygen difference, reexamine CTDO trace and the titration; may just be large gradient."

102-104 Salinity was not drawn.

Station 099.001

102-104 Salinity was not drawn.

Station 100.001

102-108 Salinity was not drawn.

106-107 Samples were only drawn for C13/N15.

109 DQ:"Large density inversion. Could be that salinity and temps increased towards surface and that shallow depth of bottle relative to CTD created this apparent inversion, but check CTD scan and bottle salinity. Note sigma theta as questionable."

Rechecked CTD trip information, no obvious problem in the CTD data. Agreement between the two sensors is reasonable, -0.008, for a surface trip. Temperature is a little cooler and salinity does increase. There are some different features that the CTD is sensing, so there could be ship's influence. Cannot footnote the sigma theta as suggested by DQ.

Cast 1 Console Log: "Near bottom: observed temperature increase with O2 decrease."

Station 101.001

101-103,105 Salinity was not drawn.

103 Oxygen: "sample spilled" PI: "Oxygen is acceptable." DQ: "Notes say oxygen sample spilled, but a value is reported."

107-111 Salinity was not drawn.
108 SampleLog: "Bottle leaking from top vent." PI: "Oxygen is acceptable."

Station 102.001
102-112 Salinity was not drawn.
104,107,108 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."
110 Samples were not drawn.
113 DQ:"Poor CTD and bottle agreement, but could be strong gradient." This is a gradient area, no problem with either pair of sensors.

Station 103.001
101 DQ:"Slight density inversion." Primary and secondary sensors agree very well with one another. Water is well-mixed for 10-15 meters before this trip. No problems seen in salinity analyses, except that it was analyzed after a much fresher sample.
101-106 Nuts: NH4: not reported due to equipment malfunction for this channel.
102-116 Salinity was not drawn.
105 DQ:"CTD O2 scan questionable?" CTDO agrees well with the down trace. No problem in the CTD data.
112 DQ:"Density inversion, check CTD scans." Three bottles were tripped at this depth. There appears to be ship roll which could be influencing the sensors. Okay, leave as is.
113-114 Samples were only drawn for C13/N15.

Station 104.001
102 Oxygen: "LONG delay" - started stirring before entered bottle and flask information. PI: "Oxygen is acceptable."
102-111 Salinity was not drawn.
106 DQ: "Check CTD scans." Primary and secondary agree with one another. Gradient, sensing water from deeper in the water column which has either caught up with the package or from ship roll.
113-114 Salinity was not drawn.

Station 105.001
102 Oxygen: "Delay between stirring & titration." started stirring before entering bottle/ flask info. PI: "Oxygen are acceptable."
105-113 Salinity was not drawn.
108 SampleLog: "Very small top cap leak." PI: "Oxygen are acceptable."
114 Nuts:NH4: bad measurement - strange peak. Footnote NH4 bad.
Cast 1 DQ: "Salinities suggest poor bottle flushing for this station." There were modulo word errors, 8, on this cast. Most of them were on the down cast, the other two do not affect the trip data. Tried reextracting the trip data using a different timing criteria, this made the primary and secondary agreement better, but made the CTD-salinity difference worse.

Station 106.001
106-114,117 Salinity was not drawn.
115-116 Samples were only drawn for C13/N15.
Cast 1 Sample Log: "Note: Nutrient tubes are split between TWO racks - Lite & Dark Blue."

Station 107.001
101 Salts: "note blue thread found lodged under thimble salt btl 18." PI: "Salinity is acceptable."

105-116 Salinity was not drawn.

110 SampleLog: "Air vent leak as vent was loose." PI: "Oxygen is acceptable."

117 Salts: "note thimble came out with cap salt btl 22 - no air gap." DQ: "Density inversion due to bottle salinity looking like it comes from > 10m. Notes suggest that there was a problem with this sample. Should be noted as questionable." Code salinity questionable.

Station 108.001

101-121 No PAR sensor, sampling too deep for instrument depth rating.

110-120 Salinity was not drawn.

115,121 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."

Station 109.001

105-119 Salinity was not drawn.

122 Samples was only drawn for C13/N15.

123-124 Salinity was not drawn.

Station 110.001

101 Console Log: "Instead of making a mark at the surface, accidentally fired bottle 1." No data from bottle 1 is being reported.

101-123 No PAR sensor, sampling too deep for instrument depth rating.

102 PI:"Oxygen is acceptable."

103 Sample Log: "Flasks 1504 & 775 may have been reversed in box." 775 may be for 103, and vice versa. Oxygen: "Flask had 1504 top." when? before sampling or with sample? sample drawer sure flasks & stoppers were matched when sampling - possible mix-up when analyzing? flasks have very different volumes (775 vol: 136.9544) & O2 values look ok PI: "Oxygen is okay, but maybe a little bit low." DQ: "Could be a mis-trip; bottle values look the same as bottle 104." Salinity bad. Code bottle did not trip as scheduled and water samples bad. Although CTD data files do not indicate any problem the water samples are a perfect match for bottle 4.

111-115 Salinity was not drawn.

117-120 Salinity was not drawn.

122-123 Salinity was not drawn.

Station 111.001

111-116 Salinity was not drawn.

118-123 Salinity was not drawn.

Station 112.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

111-115 Salinity was not drawn.

113 Sample Log: "Bottle was not tripped when brought to surface; then No samples were drawn. it tripped when it hit the side of the ship during recovery."

117-121,124 Salinity was not drawn.

122 Samples were only drawn for C13/N15.

Station 113.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

107 SampleLog: "Top vent leak." PI: "Data are acceptable."

108 SampleLog: "Top cap leak, not certain if cap or vent." PI: "Data are acceptable."

111-123 Salinity was not drawn.

115 SampleLog: "Leaking; top vent closed water issuing from spigot."

Station 114.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
108 SampleLog: "Air leak." PI: "Oxygen is acceptable."
110-123 Salinity was not drawn.
117 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."
Cast 1 DQ: "No apparent flushing problems. This must be the good watch."
Station 115.001
111-123 Salinity was not drawn.
Station 116.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
111 DQ: "Check bottle O2." No analytical problems noted. CTDO at bottle trips are questionable. Oxygen agrees weill with Station 114, 113 and 117. Station 115 did not sample at this depth. Code CTDO questionable.
112-123 Salinity was not drawn.
Station 117.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
109 Oxygen: "Check endpoint." PI: "Oxygen is acceptable."
112-123 Salinity was not drawn.
Cast 1 Sample Log: "MnCl2 dispenser is NOT working smoothly."
Station 118.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
105 Oxygen: "Check endpoint ~1 division high." PI: "Oxygen is acceptable."
108 Sample Log: "Leak in top vent." Oxygen: "Check endpoint, 5 divisions low." PI: "Oxygen is acceptable." Large bottle-CTD difference, 0.03, gradient area, CTD sensors agree with one another.
109-120 Salinity was not drawn.
111 Oxygen: "Check endpoint 1 division high." PI: "Oxygen is acceptable."
120 Oxygen: "Many mini bubbles." PI: "Oxygen is acceptable."
121 Large bottle-CTD difference, 0.21, gradient area, CTD sensors agree with one another.
122-123 Salinity was not drawn.
123 Oxygen: "Check endpoint 8 divisions high." Oxygen data rechecked and corrected appropriately. PI: "Oxygen is acceptable."
Cast 1 DQ: "Flushing not so good - bad watch?"
Station 119.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
107 PI:"NO3 a little low?" Nutrients: "Rechecked no3 = real."
108 SampleLog: "leaky (top?)."
109-123 Salinity was not drawn.
118 SampleLog: "Leak from top end cap, when vent opened."
118-119 PI: "Identical nutrients. Suggest sampler drew two nuts from same niskin-cannot tell which depth is correct. (The NO2 data are clincher.) No isolayer in salinity or oxygen."
120-121 Samples were only drawn for C13/N15.
Station 120.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
105 Oxygen: "Overtitrate and backtitrate, (No EP)."

108 Sample Log: "Small leak, air vent, but sampler not certain if endcap or vent." Oxygen flask on Sample Log should be 1520, not 520 - double-checked.

110-123 Salinity was not drawn.

Station 121.001

101 Oxygen: "Sample Lost; forgot to add acid before addition of thio and starting stirring.

107 PI: "Urea is much higher than adjacent stations, footnote questionable." Nutrients: "Rechecked urea = peak changed."

112-123 Salinity was not drawn.

119 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."

Station 122.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

112-123 Salinity was not drawn.

121 Samples were only drawn for C13/N15.

Station 123.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

112-123 Salinity was not drawn.

116 Oxygen: "Overtitrate and backtitrate, 0.60049." PI: "Oxygen is acceptable."

119 Oxygen: "Overtitrate and backtitrate, 0.75938." PI: "Oxygen is acceptable."

Station 124.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

111-123 Salinity was not drawn.

Station 125.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

112-122 Salinity was not drawn.

118,119 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."

123 Nuts: Silicate peak is really lower than surface one on charts. Rest of nutrients look reasonable, so leave as is. PI: "Silicate is acceptable." Nutrients: "Rechecked sil low but real."

Station 126.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

111-121,123 Salinity was not drawn.

122 Samples were only drawn for C13/N15.

Station 127.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

108 Oxygen: changed flask no to 1520 from 150 as per Sample Log and after checking flasks in box R.

110 PI: "Urea, 0.13, is higher than adjacent stations, code questionable." Nutrients: "Rechecked urea peak changed." DQ: "Value is acceptable"

112-123 Salinity was not drawn.

113 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."

Cast 1 Oxygen: standardization run with samples showed bad thio - used standardization results from previous day's run

Station 128.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

106 Oxygen: "Check endpoint 1 division high." PI: "Oxygen is acceptable."

112-123 Salinity was not drawn.

120 DQ:"O2 scan, double check for spikes." No problem seen in CTDO.

Station 129.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

110 Oxygen: "Check endpoint." PI: "Data are acceptable."

112-123 Salinity was not drawn.

113 Oxygen: "Check endpoint 2 div hi." ran o2chk and adjusted endpoint vol from 0.60126 to 0.60102 (skip 4 pts) PI: "Data are acceptable."

Station 130.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

102 Oxygen: "Endpoint?" Ran diagnostic program and adjusted endpoint. PI: "Oxygen is acceptable."

110 Oxygen: "check endpoint 3 divisions high." Ran diagnostic program and adjusted endpoint. PI: "Oxygen is acceptable."

110-120,123 Salinity was not drawn.

112 Oxygen: "Check endpoint 3 divisions high hi." Ran diagnostic program and adjusted endpoint. PI: "Oxygen is acceptable."

121-122 Samples were only drawn for C13/N15.

Station 131.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

105 Oxygen: "Overtitrate and backtitrate. (No endpoint) over-over-over titrate." analyst reported program kept asking to overtitrate but graph showed lines had gone off to begin with. O2 sample lost.

107 Oxygen: "Overtitrate and backtitrate, (No endpoint)" PI: "Data are acceptable."

109-123 Salinity was not drawn.

Station 132.003

Cast 1 Sample Log: "Cast aborted after first 3 bottles were tripped." Console Log: "Lost power, short in cable possible. Cast aborted on up way up, three bottles were tripped." ODF tech reported deck unit error light was on.

301-303 No PAR sensor, sampling too deep for instrument depth rating.

303 Oxygen: "Overtitrate and backtitrate, (No endpoint)."

Station 132.004

401-403 No samples were drawn.

401-424 No PAR sensor, sampling too deep for instrument depth rating.

408,409 Oxygen: "Overtitrate and backtitrate, (No endpoint)" PI: "Data are acceptable."

409-420,423 Salinity was not drawn.

416-417 PI: "There is a chance that both nutrient tubes were filled from the same bottle, but gradients are small so leave as is."

421-422 Samples were only drawn for C13/N15.

424 Sample Log: "Leak at bottom end cap when top vent open, tried reseating, no relief." PI: "O2 D-C is high, Code bottle oxygen bad."

Station 133.001

101-122 No PAR sensor, sampling too deep for instrument depth rating.

108 SampleLog: "Air Leak." PI: "Data are acceptable."

108-121 Salinity was not drawn.

111 Oxygen: "Overtitrate and backtitrate, 0.63911 bad value, overtitrate fail." Value looks okay from property-property plot. PI: "Data are acceptable."

Station 134.001
101-119 No PAR sensor, sampling too deep for instrument depth rating.
106 Ureais higher than adjacent values. Code urea questionable."
107-118 Salinity was not drawn.
Station 135.001
101-117 No PAR sensor, sampling too deep for instrument depth rating.
105-114,116 Salinity was not drawn.
107 PI:"O2 D-C a little low, but okay for gradient if bottle not flushed well. Leave as is."
115 Samples were only drawn for C13/N15.
Station 136.001
101-115 No PAR sensor, sampling too deep for instrument depth rating.
104-114 Salinity was not drawn.
Station 137.001
103-113 Salinity was not drawn.
110 PI:"Oxygen difference, bottle-CTD, is a little low, but nuts match bottle O2. CTDO2
is too high? Leave as is."
Station 138.001
101-103 Salinity was not drawn.
106-110,113 Salinity was not drawn.
111-112 Samples were only drawn for C13/N15.
114 Oxygen: "Endpoint ˜ 1 division high." PI: "Oxygen is acceptable." PI: "Oxygen difference,
bottle-CTD, is a little low, but nuts match bottle O2. CTDO2 is too high?
Leave as is."
Station 139.001
101-104 Salinity was not drawn.
106-110 Salinity was not drawn.
110 DQ:"Density inversion bottles 111 and 110. Suspect CTD salinity. No problem seen
in CTD salinity or temperature trace. However, the agreement between the two sensors
is high even for surface value. Review indicates that the CTD operator held the
package longer than other bottle trips, which indicates there was a difference between
the two sensors. Leave as is.
111 Oxygen: "Endpoint ˜ 2 divisions high." PI: "Oxygen is acceptable."
Station 140.001
101 DQ: "Bottle salinity looks like it came from 102 - poor flushing? Causes a density
inversion between 101 and 102." CTD Operator held the package at the bottom for
quite awhile, the shallower, less salty water could have caught up with the package.
Leave as is.
102 Oxygen: "1 division high." PI: "Oxygen is acceptable."
102-106 Salinity was not drawn.
Station 141.001
108 Bottle not sampled for chl, pha according to sample log however data received from
analyst Bottle not sampled for chl, pha according to sample log however data received
from analyst
108-109 Tripped two extra bottles at 11 meters, thought chl max was changed. Chl person said
sampling for C13, N15 should stay at the 18 meters.
Station 142.001

102-104 Salinity was not drawn.
Cast 1 CTD conductivity and oxygen sensor are not usable from the down cast, suspect biological fouling. Will use the secondary sensors and eliminate the CTD oxygen. The bottle trip information is probably okay.
Station 143.001
102-104 Salinity was not drawn.
Station 144.001
102-103,106 Salinity was not drawn.
104-105 Samples were only drawn for C13/N15.
Station 145.001
102,103,105 Oxygen: "Overtitrate and backtitrate, (No endpoint)"
102-104 Salinity was not drawn.
Station 146.001
102-103 Salinity was not drawn.
Station 147.001
102 Salinity was not drawn.
Station 148.001
102 Salinity was not drawn.
Station 149.001
102 Salinity was not drawn.
Station 150.001
103 Console Log: "Bottle 3 did not close, so we sent the CTD back to the surface to collect the surface sample." Bottle 3 closed when bottle 4 was tripped. Bottle not sampled for chl, pha according to sample log however data received from analyst Bottle not sampled for chl, pha according to sample log however data received from analyst
Station 151.001
101-102 Samples were only drawn for C13/N15.
104-105 Salinity was not drawn.
Station 152.001
102 Salinity was not drawn.
Station 153.001
102 Salinity was not drawn.
Station 154.001
102-103 Salinity was not drawn.
Station 155.001
102,104 Salinity was not drawn.
103 Samples were only drawn for C13/N15.
Station 156.001
101-102 DQ: "Density inversion between bottles 101 and 102. Bottle salinity looks low, either bad salinity or poor flushing OR extreme gradients or some combination."
102-103 Salinity was not drawn.
103 Oxygen: "copepod" PI: "Oxygen is acceptable."
Station 157.001
102 Salinity was not drawn.
Station 158.001
102 Salinity was not drawn.

Station 159.001
102 Salinity was not drawn.
103-104 Samples were only drawn for C13/N15.
Station 160.001
102 Salinity was not drawn.
Station 161.001
102 Salinity was not drawn.
Station 162.001
102-103 Salinity was not drawn.
104 Oxygen: "bubble" PI: "Oxygen is acceptable."
Station 163.001
103 Sample Log: "Did not trip; bottom end cap hung up on sensors tygon tubing; very freak incident. CHL stated this was an extra bottle and there was no need to recast." Bottle not sampled for chl, pha according to sample log however data received from analyst Bottle not sampled for chl, pha according to sample log however data received from analyst
Station 164.001
101 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."
102,104 Salinity was not drawn.
103 Samples were only drawn fo C13/N15.
Station 165.001
102-103 Salinity was not drawn.
Station 166.001
101 DQ:"Possible mis-trip. Poor agreement between CTD and bottle salinity and bottom nutrients slightly lower than nutrients on 102. Another possibility is that they tripped bottle too soon because of proximity to bottom. Density inversion between 101 and 102." Temperature and conductivity sensors agree with one another. There are no notes indicating any anyalytical problem for salinity or nutrients. DQ: "poor flushing. Note all samples as questionable".
102-103 Salinity was not drawn.
Station 167.001
102-104 Salinity was not drawn.
Station 168.001
102-104 Salinity was not drawn.
Station 169.001
102-104 Salinity was not drawn.
Station 170.001
102 Samples were only drawn for C13/N15.
103 Salinity was not drawn.
Station 171.001
102-103 Salinity was not drawn.
Station 172.001
102-104 Salinity was not drawn.
103 PI: "PO4 high by about 0.5; no match in NO3. Code PO4 questionable." DQ: "PO4 seems high. Check peak." Nutrients: "Rechecked po4 peak changed." DQ: "Still high. Note as questionable"

104 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."

Station 173.001

102-104 Salinity was not drawn.

Station 174.001

102,105-106 Salinity was not drawn.

103-104 Samples were only drawn for C13/N15.

Station 175.002

202-204 Salinity was not drawn.

Station 176.001

102-104 Salinity was not drawn.

Station 177.002

101,103-104 Salinity was not drawn.

Cast 1 Sample Log: "All top vents were found open, redid the cast as Cast 2."

Station 178.001

102-103,105 Salinity was not drawn.

103 Oxygen: "copepod" PI: "Oxygen is acceptable."

104 Samples were only drawn for C13/N15.

Station 179.001

101 Salt: "bubble in cell which would not clear - lost sample - cell required cleaning" - "sample lost on last run due to dirty sample cell from algae" Sample not reported, lost.

102-104 Salinity was not drawn.

103 PI:"Oxygen bottle-CTD low, but okay for gradient."

Station 180.001

102 PI:"Oxygen bottle-CTD low, but okay for gradient."

102-103 Salinity was not drawn.

Station 181.001

102-103 Salinity was not drawn.

103 Oxygen: ">10ml, right flask!" PI: "Oxygen bottle-CTD low, but okay for gradient."

Station 182.001

101 DQ:"Mis-trip; CTD and bottle salinity and O2 do not agree, bottom nutrients a little lower than 102 data, density inversion, etc." Temperature and conductivity sensors agree with one another. There are no notes indicating any anyalytical problem for salinity or nutrients. DQ: "Mis-trip or very poor flushing. All samples questionable"

102-104 Salinity was not drawn.

105 Samples were only drawn for C13/N15.

Station 183.001

102-104 Salinity was not drawn.

Station 184.001

102-104 Salinity was not drawn.

Station 185.001

102 Oxygen: "copepods?" PI: "Oxygen is acceptable."

102-104 Salinity was not drawn.

Station 186.001

101 Oxygen: "Endpoint 2 division high, biological?" PI: "Oxygen is acceptable."

103-105 Salinity was not drawn.

104 Oxygen: "2 black bits" PI: "Oxygen bottle-CTD low, but okay for gradient."
106-107 Samples were only drawn for C13/N15.
108 Oxygen: "Endpoint 1 division high." PI: "Oxygen is acceptable."
Station 187.001
102-104 Salinity was not drawn.
Station 188.001
101 Salt: "Take 1st reading - sample continuously increasing - suspect salt crystal; bottle overfull to the rim." PI: "Salinity is acceptable."
102-106 Salinity was not drawn.
Station 189.001
103 PI: "Bottle oxygen high, nutrients low, looks like water from 20 meters. But, down CTD trace shows thin layer matching the oxygen layer. Leave as is." DQ: "Mis-trip." DQ: "Further review indicates mis-trip"
103-106 Salinity was not drawn.
106 Oxygen: "Sample was overtitrated and backtitrated."
107 Oxygen: "Brown deposit, may be high. Flask was used at 177-1 to draw sample, but was an aborted cast & so sample not run and just dumped out; probably residue on flask walls - flask and others used were thoroughly cleaned out." Code oxygen bad.
Station 190.001
102 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."
102-105 Salinity was not drawn.
Station 191.001
102-105 Salinity was not drawn.
Station 192.001
102-107 Salinity was not drawn.
106 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."
Station 193.001
102-104 Salinity was not drawn.
106-107 Salinity was not drawn.
Station 194.001
102-108 Salinity was not drawn.
104 DQ:"CTD O2 bad??" There is a spike in the CTD data on the up trace. Code CTD oxygen bad.
Station 195.001
102-107 Salinity was not drawn.
Station 196.001
102-108 Salinity was not drawn.
Station 197.001
102-109 Salinity was not drawn.
Station 198.001
102-110,112 Salinity was not drawn.
104 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."
108 Console Log: "Surface scratch repaired upper seal surface." PI: "Data are acceptable."
111 Samples were only drawn for C13/N15.
Station 199.001
103-112 Salinity was not drawn.

110 Sample Log: "Bottle was tripped think it was chl max, instead max was at bottle 11 and subsequent bottle tripped to capture the feature. Bottle 10 was not sampled."

Cast 1 Sample Log: "Sea tentacles on bottles." PI: "Data are acceptable."

Station 200.001

102 DQ:"Probably a mis-trip. Density inversion, poor CTD-bottle salt agreement, nutrients look like they come from a shallower depth, etc." Temperature and conductivity sensors agree with one another. There are no notes indicating any anyalytical problem for salinity or nutrients. Water is well-mixed and should have been similar to deeper waters. Code bottle leaking and samples bad.

103-lll Salinity was not drawn.

114 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."

Station 201.001

104-114 Salinity was not drawn.

110 Oxygen: "Sample was overtitrated and backtitrated." DQ: "Nutrients and O2 look funny. Possible mis-trip. Bottle 11 did not close because of rosette malfunction which increases my suspicion that 110 was a mis-trip." Oxygen, nitrate, and phosphate agree with Stations 200-203. SIO3 appears low compared with adjoining stations. DQ: "Data acceptable"

111 Sample Log: "Bottle did not trip, latch on carousel was half tripped." Footnote no samples drawn from this bottle.

Station 202.001

103 Oxygen: "Sample was overtitrated and backtitrated."

105-116 Salinity was not drawn.

111 Sample Log: "Bottle did not trip, even though MT's cleaned it, the ET's will replace the latch." Footnote bottle did not trip as scheduled, no samples.

Station 203.001

105-119 Salinity was not drawn.

112 Nosamples were drawn.

116 Samples were only drawn for C13/N15.

Station 204.001

103 SampleLog: "Bottle got hung-up on primary vent, therefore, there is NO sample."

105-114,116 Salinity was not drawn.

113 PI: "Urea, 0.28, approximately 0.24 higher than above or below no matching feature at nearby stations, but near pycnocline." Nutrients: "Rechecked urea = real." DQ: "Urea value acceptable"

115 Samples were only drawn for C13/N15.

Station 205.001

103-113 Salinity was not drawn.

Station 206.001

103-110 Salinity was not drawn.

Station 207.001

103 Oxygen: "Endpoint 2,5 5 divisions high." Ran diagnostic program and adjusted endpoint. PI: "Oxygen is acceptable."

103-109 Salinity was not drawn.

108 Oxygen: "strand on tip" PI: "Oxygen is acceptable."

110 DQ:"Poor agreement between CTD and bottle salt and between CTD and O2 temps.

Gradients? No objective reason to question data." This is a gradient.

111 Oxygen: "copepods" PI: "Oxygen is acceptable." DQ: "Poor agreement between CTD and O2 temps Gradients? No objective reason to question data."

112 CTDoperator tripped two bottles at the surface, thinking that bottle 11 was still having a tripping problem. No samples were taken. CTD data is reported, but no samples were taken.

Station 208.001

101 Sample Log: "Redrew O2, NAOH dispenser had a deposit on it that was not noticed until sample was taken." PI: "Oxygen is acceptable."

102-106 Salinity was not drawn.

107,108 Oxygen: "copepods" PI: "Oxygen is acceptable."

Station 209.001

102-107 Salinity was not drawn.

104 Oxygen: "Endpoint 3 high, copepods." Ran diagnostic program, rechecked endpoint, okay. PI: "Oxygen is acceptable."

108 Oxygen: "Endpoint 2 high, copepods." Ran diagnostic program, rechecked endpoint, okay. PI: "Oxygen is acceptable."

Station 210.001

101-104 Salinity was not drawn.

102 Oxygen: "Check endpoint, copepods." Ran diagnostic program and adjusted endpoint. PI: "Oxygen is acceptable."

104 Oxygen: "Check endpoint 4 divisions high." Ran diagnostic program and to recheck endpoint, okay. PI: "Oxygen is acceptable."

Station 211.001

102-105 Salinity was not drawn.

103 PI:"O2 bottle-CTD high, but nutrients agree with O2. Probably flushing problem."

Station 212.001

102-105 Salinity was not drawn.

106 DQ:"Poor agreement between bottle and CTD salinity. Suspect bad bottle salt analysis. Check autosal run for problems? Density inversion." CTD sensors agree with one another. No problems indicated during salinity analyses.

Station 213.001

101 DQ:"Poor agreement between bottle and CTD salt. Salinity coded questionable. Density inversion due to poor bottle/CTD salt agreement. Check autosal run. " No analytical problems noted for salinity. Water is well mixed, agreement between bottle and CTD is within accuracy. Leave as is.

102-105 Salinity was not drawn.

104 Samples were only drawn for C13/N15.

106 DQ:"CTD O2 scan is questionable." CTD oxygen looks good, well mixed at the surface and agrees with down trace. Bottle oxygen is 0.1 ml/l higher than adjacent stations. Leave as is.

Station 214.001

102-104 Salinity was not drawn.

106-107 Samples were only drawn for C13/N15.

Station 215.001

101 DQ: "Check bottle and CTD salinities." No analytical or sampling problems noted.

Sample was analyzed after a much lower sample, 0.15 conductivity units. Should not have effected the sample, but this is the only thing of any mentionable difference.
102-103 Salinity was not drawn.

Station 217.001
101 DQ: "Bottle salinity leading to density inversion. CTD 32.6133, bottle 32.257. Suspect bad bottle salt." No analytical or sampling problems noted. Sample was analyzed after a much lower sample, 0.14 conductivity units. Should not have effected the sample, but this is the only thing of any mentionable difference. Much lower than adjoining stations, CTD sensor agreement is reasonable. Code salinity questionable.
102-104 Salinity was not drawn.

Station 218.001
101 DQ:"Poor agreement between bottle and CTD salinity leading to density inversion." No analytical or sampling problems noted. Within accuracy, leave as is.
102-105 Salinity was not drawn.

Station 219.001
101 DQ:"Suspect bad bottle salinity; density inversion." No analytical or sampling problems noted. Sample was analyzed after a much lower sample, 0.17 conductivity units. Should not have effected the sample, but this is the only thing of any mentionable difference. Much lower than adjoining stations, CTD sensor agreement is reasonable. Code salinity questionable.
102-105 Salinity was not drawn.

Station 220.001
102-105 Salinity was not drawn.

Station 221.001
102-105 Salinity was not drawn.
Cast 1 Console Log: "After cast, found significant jellyfish tentacles in both secondary sensors; no change in differences during cast." Data does not appear to have been affected, no unusual differences other than down and up cast differences. PI: "Data are acceptable."

Station 222.001
102-106 Salinity was not drawn.
106 DQ:"Suspect bad CTD scan; density inversion. Check CTD scan salinity." Offset in primary conductivity sensor at ˜50 meters on the up cast. Report the secondary conductivity data for entire cast.

Station 223.001
102-106 Salinity was not drawn.
107 SampleLog: "Top vent was not closed." PI: "Oxygen is acceptable."

Station 224.001
103-108 Salinity was not drawn.
109-110 Samples were only drawn for C13/N15.
111 Oxygen: "Endpoint 2 divisions high." PI: "Oxygen is acceptable."

Station 225.001
101 Console Log: "Fired bottle 1 at surface instead of making a mark. No samples drawn.
106-110 See Cast 1 Sample Log comment. Salinity from primary sensor bad on the up cast. Offset in primary conductivity sensor at ˜43 meters on the up cast. Report the secondary conductivity data for entire cast.

108 SampleLog: "Leak from spigot." PI: "Data are acceptable."

Cast 1 Sample Log: "Jellyfish tentacles in primary sensor, drew all salinities." Temperature looks okay, secondary sensors may be okay. MT's took tubing off after the cast, the tentacle of jellyfish was through the intake and out the outflow of the sensors. Console Log: "46 meters wire out, something is wrong with salinity (coming up), jumped from 32 to 29, then at 35 meters wire out jumped from 29 to 30."

Station 226.001

102-108 Salinity was not drawn.

109 Oxygen: "copepod" PI: "Oxygen is acceptable."

Cast 1 Sample Log: "Prior to this cast, tubes were removed and cleaned, sensors were flushed with fresh water for 20 minutes."

Station 227.002

Cast 1 Sample Log: "Cast 1 was aborted, CTD was at 100 meters, primary conductivity sensor was "stuck"."

201-209 Salinity was not drawn.

219 Oxygen: "Copepods." PI: "Oxygen is acceptable."

Station 228.001

101 Oxygen: "Copepod" PI: "Oygen is acceptable."

102-113 Salinity was not drawn.

108 SampleLog: "Did not trip."

113 SampleLog: "Leak on bottle, top seal did not seat properly."

Station 229.001

102-113 Salinity was not drawn.

109 Bottle not sampled for chl, pha according to sample log however data received from analyst Bottle not sampled for chl, pha according to sample log however data received from analyst

110 Oxygen: "Bubble" PI: "Oxygen is acceptable."

Station 230.001

103 Oxygen: "Tiny bubble" PI: "Oxygen is acceptable."

103-114 Salinity was not drawn.

104 Oxygen: "Streamers on probe" Not certain what oxygen analyst meant, but PI accepted oxygen data.

Station 231.001

103-114 Salinity was not drawn.

105 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable." PI: "Urea, 0.19, approximately 0.13 higher than other samples and Maximum not seen at neighboring stations. Footnote urea questionable."

112 Samples were only drawn for C13/N15.

Station 232.001

103-111 Salinity was not drawn.

Station 233.001

102-109 Salinity was not drawn.

Station 234.001

102-107 Salinity was not drawn.

103 PI:"Oxygen bottle-CTD high, but okay for gradient."

Cast 1 DQ: "Very poor CTD-bottle salinity agreement causing apparent density inversions.

Looks like a bad station vis a vis flushing, on salts or CTD readings. Flushing offsets
> 10m" CTD sensors agree will with one another.

Station 235.001
102-106 Salinity was not drawn.

Station 236.001
102-105 Salinity was not drawn.

Station 237.001
101 DQ: "Looks like a mis-trip or poor flushing. Poor bottle and CTD salinity and O2
agreement. Density inversion, nutrient inversions." The water is well-mixed for about
7 meters, this could have been a late closure on the bottle, where the lanyard released
or hungup. See PI comment on Station 238. DQ: "Data questionable due to mis-trip
or poor flushing"
102-104 Salinity was not drawn.
105 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."

Station 238.001
101 Oxygen value seems high; salinity and nutrients seem low; no obvious problems;
leave as is. Note that sta 249.001 at same isobath is almost identical PI: "Data is
acceptable." DQ: "Bad station; mis-trip or poorly flushed. Bad CTD and salinity
agreement, density inversion, nutrient inversion, O2% sat inversion, etc."
102-104 Salinity was not drawn.
105 DQ:"Also terrible agreement between bottle and CTD salinity causing apparent density
inversion, but nutrients look ok. Same possibilities, mis-trip or poorly flushed."
No analytical or sampling problems noted. Sample was analyzed after a much lower
sample, 0.11 conductivity, 2.1 salinity units. Should not have effected the sample, but
this is the only thing of any mentionable difference. CTD sensor agreement is reasonable.
Code salinity questionable.

Station 239.001
101 DQ:"Another station where incomplete flushing creates inversions between 101 and
102." No analytical or sampling problems noted. Sample was analyzed after a much
lower sample, 0.14 conductivity, 2.4 salinity units. Should not have effected the sample,
but this is the only thing of any mentionable difference. CTD sensor agreement is
reasonable and water is well-mixed for about 10 meters. Code salinity questionable.
102-104 Salinity was not drawn.

Station 240.001
102-103 Salinity was not drawn.
104-105 Sample Log: "2 extra bottles tripped at chl max for C13, N15, found out that samples
were not requested and therefore not sampled." No samples drawn from these bottles.

Station 241.001
101 Noanalytical or sampling problems noted. Sample was analyzed after a much lower
sample, 0.15 conductivity, 3.0 salinity units. Should not have effected the sample, but
this is the only thing of any mentionable difference. CTD sensor agreement is reasonable.
Water is well-mixed for about 10 meters. Code salinity questionable.
102-104 Salinity was not drawn.

Station 242.001
102-103 Salinity was not drawn.

Station 243.001

101 DQ:"Looks like a mis-trip. Again, bad CTD and bottle salinity agreement, same for CTD and bottle O2, slight NO3 and Si inversions, density inversion could be due to strong gradients and only fair flushing." No analytical or sampling problems noted. Sample was analyzed after a much lower sample, 0.15 conductivity, 3.1 salinity units. Should not have effected the sample, but this is the only thing of any mentionable difference. CTD sensor agreement is reasonable. Water is well-mixed for 10 meters. Code salinity questionable.

103 Salinity ws not drawn.

104 Large Bottle-CTD salinity difference. Water is well-mixed for 5 meters. No analytical or sampling problems noted. Sample was analyzed after a much lower sample, 0.11 conductivity, 2.3 salinity units. Should not have effected the sample, but this is the only thing of any mentionable difference. CTD sensor agreement is reasonable. Code salinity questionable.

Station 244.001

102-103 Salinity was not drawn.

104-105 Samples were only drawn for C13/N15.

Station 245.001

102-103 Salinity was not drawn.

103 Oxygen: "Copepods" PI: "Oxygen is acceptable."

Station 246.001

102-105 Salinity was not drawn.

Station 247.001

102-104 Salinity was not drawn.

105 Oxygen: "Copepods" PI: "Oxygen is acceptable."

Station 248.001

101 DQ: "Could be a mis-trip. Again, poor bottle and CTD salinity and O2 agreement, apparent density inversions slight Si inversion, etc. Could be ok - strong gradient." No analytical or sampling problems noted. Sample was analyzed after a much lower sample, 0.15 conductivity, 2.8 salinity units. Should not have effected the sample, but this is the only thing of any mentionable difference. CTD sensor agreement is reasonable. Code salinity questionable.

102-104 Salinity was not drawn.

103 PI:"Oxygen bottle-CTD low, but okay if bottle flushing was not ideal."

Station 249.001

101 Oxygen value seems high; salinity and nutrients seem low; no obvious problems; leave as is. Note that sta 238.001 at same isobath is almost identical DQ: "A clear mis-trip - no brainer." Samples coded questionable.

102-104 Salinity was not drawn.

Station 250.001

102-105 Salinity was not drawn.

105 Oxygen: "biota" PI: "Oxygen is acceptable."

106 DQ:"Poor CTD-bottle salinity agreement leading to density inversion. Mis-trip? Bad salt? CTD problem?" No analytical or sampling problems noted. Sample was analyzed after a much higher sample, 0.18 conductivity, 3.5 salinity units. Should not have effected the sample, but this is the only thing of any mentionable difference. CTD sensor agreement is reasonable.

Station 251.001
102-106 Salinity was not drawn.
105 Samples were only drawn for C13/N15.
Station 252.001
102-107 Salinity was not drawn.
103 PI:"Oxygen bottle-CTD differences are larger, but okay for flushing and gradient."
105 PI:"Oxygen bottle-CTD differences are larger, but okay for flushing and gradient."
Station 253.001
102-109 Salinity was not drawn.
109 Oxygen: "biota" PI: "Oxygen is acceptable."
Station 254.001
101-104 Salinity was not drawn.
108-113 Salinity was not drawn.
111-112 Samples were only drawn for C13/N15.
113 Oxygen: "Red colored precipitate." PI: "Oxygen is acceptable."
Station 255.001
101-111 Salinity was not drawn.
105 Oxygen: "copepod?" PI: "Oxygen is acceptable."
Station 256.001
102 DQ: "Could be a mistrip, note values for this samples as questionable." Nutrients:
"Checked charts, no problem noted." DQ: "Values acceptable"
102-110 Salinity was not drawn.
103 Oxygen: "ABORT, Overtitrate, cracked flask leak." Oxygen: sample lost; not
reported.
Station 257.001
102-111 Salinity was not drawn.
Station 257.002
Cast 2 Samples were only drawn for C13/N15.
Station 257.003
Cast 3 Pigments only, cast 01 samples dumped in error.
Station 258.001
101 Sample Log: "Oxygen was drawn 3 times due to faulty MnCl2 dispenser (serial no
1031033), which was finally replaced. DQ: "Could be a mis-trip, but more likely that
poor flushing leads to apparent density inversion." No analytical or sampling problems
noted. Sample was analyzed after a much lower sample, 0.11 conductivity, 2.3
salinity units. Should not have effected the sample, but this is the only thing of any
mentionable difference. CTD sensor agreement is reasonable. Code salinity questionable.
102-104 Salinity was not drawn.
105 Sample Log: "Bottle was closed before winch stopped at surface; no samples." Only
C13/N15 were drawn.
Station 259.001
102-104 Salinity was not drawn.
Station 260.001
101 while oxygen and nutrients may be OK due to smaller gradients. Note bottle salt 101
as questionable."
101-102 DQ: "Density and PO4 inversions probably due to incomplete flushing." No analytical

problems noted. CTD sensors agreement is reasonable. Bottle and CTD oxygen
are also lower on 102. Not sure how this could be a flushing problem. Pressure is
39-32db. 050406 DQ: "Tis is a case where a strong salinity gradient causes bottle salt
to be questionable,
102-103,105 Salinity was not drawn.
104 Samples were only drawn for C13/N15.

Station 261.001
101 DQ: "Bad bottle salinity != bad sigma theta." No analytical or sampling problems
noted. Sample was analyzed after a much lower sample, 0.15 conductivity, 3.0 salinity
units. Should not have effected the sample, but this is the only thing of any mentionable
difference. CTD sensor agreement is reasonable, 3 meter mixed area after
gradient. Code salinity questionable.
102 PI:"Unusual oxygen bottle-CTD is caused by bottle sample missing thin layer seen in
CTD. Nutrients and bottle oxygen agree, okay."
102-104 Salinity was not drawn.

Station 262.001
101 DQ:"Bad bottle salinity." Do not know how this could be such a high value, 34.63.
Last time this salinity bottle was used, the value was 32.xx, so it could not have been
a sampling issue. Code salinity bad.
102-104 Salinity was not drawn.

Station 263.001
102-103,105 Salinity was not drawn.
104 Samples were only drawn for C13/N15.

Station 264.002
Cast 1 Console Log: "Cast 1 aborted at the bottom, thought there was biological debris in the
sensors.
202-204 Salinity was not drawn.

Station 265.001
102-105 Salinity was not drawn.

Station 266.001
102-104 Salinity was not drawn.

Station 267.001
102-104 Salinity was not drawn.

Station 268.001
102 DQ: "CTD O2 scan Spike?" CTD oxygen is reasonable, no spikes, "equilibrated"
close to down cast.
102-104 Salinity was not drawn.
103 PI:"High oxygen bottle-CTD caused by thin low O2 layer (CTDO) missed by bottle,
okay."

Station 269.001
102-103 Salinity was not drawn.

Station 270.001
101 Oxygen: "<1mm bubble" PI: "Oxygen is acceptable."
102-104 Salinity was not drawn.
103 Oxygen: "biota" PI: "Oxygen is acceptable."
104 Oxygen: "biota" PI: "Oxygen is acceptable."

Station 271.001
102-104 Salinity was not drawn.
Cast 1 Sample Log: "Top of rosette has a lot of biological matter." PI: "Data are acceptable."
Station 272.001
102-104 Salinity was not drawn.
104 Oxygen: "<1mm bubble" PI: "Oxygen is acceptable."
105 DQ: "Poor agreement between CTD and bottle salinity-poor flushing? Check data.
Poor agreement between CTD and bottle O2 also. CTD spikes?" CTD sensors agree
well with one another. There is a spike in the data, but it was deleted in the averaging.
Station 273.001
102-105 Salinity was not drawn.
Station 274.001
101 Oxygen: "biota" PI: "Oxygen is acceptable."
102-105 Salinity was not drawn.
106 Oxygen: "copepod" PI: "Oxygen is acceptable."
Station 275.001
102-107 Salinity was not drawn.
105 Oxygen: "biota" PI: "Oxygen is acceptable."
106 Gradient, large difference between the two conductivity sensors.
108 DQ:"Slight density inversion due to incomplete flushing and strong gradient."
Station 276.001
101 Oxygen: "<1mm bubble." PI: "Oxygen is acceptable."
102-108 Salinity was not drawn.
107 Oxygen: "big copepod." PI: "Oxygen is acceptable."
108 Oxygen: "copepod." PI: "Oxygen is acceptable."
109 Samples were only drawn for C14/N15.
Station 277.001
102 Oxygen: "Endpoint 1 division high." PI: "Oxygen is acceptable."
102-111 Salinity was not drawn.
Station 278.001
102 Oxygen: "Endpoint 1 division high." PI: "Oxygen is acceptable."
102-111 Salinity was not drawn.
111 Oxygen: "copepod" PI: "Oxygen is acceptable."
Station 279.001
103-111 Salinity was not drawn.
112 Oxygen: "biota" PI: "Oxygen is acceptable."
Station 280.001
101 Oxygen: "copepod" PI: "Oxygen is acceptable."
102-111 Salinity was not drawn.
111 Oxygen: "Endpoint 1 division high." PI: "Oxygen is acceptable."
Station 281.001
102-111 Salinity was not drawn.
110 Oxygen: "Endpoint 4 divisions high." Diagnostic program used to adjust endpoint.
PI: "Oxygen is acceptable."
Station 282.002
Cast 1 Sample Log: "Cast 1 aborted, conductivity sensor difference was 1.+. After in ocean

flushing did not resolve this issue, the CTD was brought on board to clean and force DI water through the sensors. This did not resolve the problem. The MT reported that they found during the cleaning a lot of sticky biological matter around the sensors. The CTD was taken to ˜50 meters, a yoyo was done and eventually the "bubble" came out.

202-213 Salinity was not drawn.

210,212 Pigments only. No other samples drawn.

211 Oxygen: "Stir bar added first." PI: "Oxygen is acceptable."

213 Oxygen: "1-in long bug" PI: "Oxygen is acceptable."

Station 283.001

102-108 Salinity was not drawn.

103 DQ: "PO4 data (peaks, etc) from this station should be double checked. Are PO4 maxima and N** minima for bottles 103 and 107 real?" PO4 agrees with Station 67, 107 depth not sampled at 67. Nutrients: "Rechecked po4 peak changed."

Station 284.001

102-107 Salinity was not drawn.

Station 285.001

102-104 Salinity was not drawn.

Station 286.001

102-111 Salinity was not drawn.

105 Oxygen: "Overtitrate and backtitrate, 0.71081. Bad Overtitrate, data bad." coding as 4: Bad Measurement PI: "Oxygen looks okay and and fits nutrients."

113 Samplefor DOM only.

Station 287.001

102-113 Salinity was not drawn.

113-115 DQ: "Check CTD scan; Density inversion near surface ship effect?" No problem seen in CTD sensors.

114 Samplefor DOM only.

Station 288.001

102-110 Salinity was not drawn.

111 Samplefor DOM only.

Station 289.001

102-105 Salinity was not drawn.

Station 290.001

102-103 Salinity was not drawn.

104 Samplefor DOM only.

Station 291.001

101-124 No PAR sensor, sampling too deep for instrument depth rating.

106 DQ:"Check urea peak." Nutrient analyst: "Rechecked charts, no analytical problem found."

115-123 Salinity was not drawn.

124 Sample Log: "Bottom cap began to leak when opened." Oxygen: "<1mm bubble" PI: "Footnote oxygen questionable."

Station 292.001

103-111 Salinity was not drawn.

106 PI:"Urea high, also seen at Station 293." DQ: "Slightly high urea again. Check peak:

contaminated? No objective reason to question value unless peak is funny." Nutrients: "Rechecked urea = real."

Station 293.001

103-111 Salinity was not drawn.

106 PI: "Urea high, also seen at Station 292." DQ: "High urea peak again. Same ˜ depth as at station 292, so it could be real, but was this bottle changed or worked on prior to station 291?" Nutrients: "Rechecked urea = real."

Station 294.001

103-111 Salinity was not drawn.

104 Oxygen: "Endpoint 1 division high." PI: "Oxygen is acceptable."

105 DQ:"Check NO3 peaks, etc. NO3 looks low, NH4 looks high, no objective reason to question data." Nutrients: "Rechecked no3, nh4 = real."

Station 295.001

102-112 Salinity was not drawn.

Station 296.001

101 PI: "Urea high, 0.90, certainly an error. Footnote urea bad." DQ: "Check urea data." Nutrient analyst: "Rechecked charts, no analytical problem found." The data did not fit the station profile or adjacent station comparisons. The data could be acceptable, but are open to interpretation. Coded Questionable.

102-112 Salinity was not drawn.

107 DQ:"Check CTD O2 scans." CTD O2 did "change' during the bottle trip, but there are no spikes in the O2 trace and during the equilibration the oxygen values became higher.

Station 297.001

102-111 Salinity was not drawn.

Station 298.001

102-111 Salinity was not drawn.

112 PI: "Urea high, 0.26, likely an error. Footnote urea questionable." Nutrients: "Rechecked urea = real." DQ: "Urea value acceptable"

Station 299.001

103-112 Salinity was not drawn.

Station 300.001

103-111 Salinity was not drawn.

Station 301.001

103-112 Salinity was not drawn.

104-105 Sample Log: "Bottle 4 was repaired prior to cast. Bottle 5 fired to ensure sample at depth in the event that 4 failed to close."

105 See104-105 comment. No samples drawn from this bottle.

111 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."

Station 302.001

103-111 Salinity was not drawn.

Station 303.001

103-110 Salinity was not drawn.

Cast 1 Repeat of Station 53. DQ: "I am guessing that this station was taken by the 'bad watch'." The bottom two salinities do have poor agreement with the CTD. However, there does not seem to be consistent problem for one watch vs. the other.

Station 304.001
103-108 Salinity was not drawn.
Station 305.001
102-105,107 Salinity was not drawn.
104 PI: "Urea, 0.26, high, may be okay, or questionable?" Nutrients: "Rechecked urea = real."
106 Oxygen: "Sample was overtitrated and backtitrated."
Cast 1 Repeat of Station 55. The secondary conductivity was offset from the primary. Footnote secondary conductivity as bad so it won't come out in the difference reports.
Station 306.001
102-103,105 Salinity was not drawn.
103 SampleLog: "Small leak on bottom end cap. Lots of biological matter on rosette, suspect caught in cap." PI: "Data are acceptable."
Station 307.001
101-102 Salinity not drawn.
103-105 See sample log comment, footnote CTD temp, sal and oxygen bad. Data from secondary sensors.
Station 308.001
103 Salinity was not drawn.
Station 310.002
202-203 Salinity was not drawn.
204-205 Samples were only drawn for C13/N15.
Cast 2 Cast 1, aborted due to biological fouling.
Station 311.001
103-105 Use secondary conductivity sensor data for entire cast for CTD salinity and CTD oxygen bad. This could be another occurrence of biological fouling.
104 PI:"CTD salinity low; unstable. Footnote CTD salinity/conductivity questionable."
Station 312.001
101-117 No PAR sensor, sampling too deep for instrument depth rating.
106-116 Salinity was not drawn.
Station 313.002
201-213 No PAR sensor, sampling too deep for instrument depth rating.
202-212 Salinity was not drawn.
210 DQ: "Poor agreement between CTD and bottle O2." There is an oxygen minimum seen in both down and up cast. No problem seen in CTD oxygen. Bottle oxygen could be a little high as compared with Stations 311-315. No analytical problems noted.
Cast 2 Cast 1 aborted due to biological fouling.
Station 314.001
106-116 Salinity was not drawn.
Station 315.001
101-120 No PAR sensor, sampling too deep for instrument depth rating.
107-116 Salinity was not drawn.
111 Oxygen: "copepod" PI: "Oxygen is acceptable."
117-118 Samples were only drawn for C13/N15.
Station 316.001
101-121 No PAR sensor, sampling too deep for instrument depth rating.

109-120 Salinity was not drawn.
Station 317.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
111-123 Salinity was not drawn.
119 PI:"Large oxygen bottle-CTD, okay for gradient."
123-124 Bottles appear to have bottom cap leaks after the vents are opened. PI: "Oxygens are acceptable."
Station 318.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.
111-123 Salinity was not drawn.
Station 319.001
103 Nosamples were drawn.
104-112 Salinity was not drawn.
Station 320.001
101-114 No PAR sensor, sampling too deep for instrument depth rating.
102 Oxygen: "Sample was overtitrated and backtitrated." PI: "Oxygen is acceptable."
103-108 Salinity was not drawn.
109-110 Samples were only drawn for C13/N15.
111-113 Salinity was not drawn.
Station 321.001
103-111 Salinity was not drawn.
Station 322.001
102-110 Salinity was not drawn.
Station 323.001
102-110 Salinity was not drawn.
Station 324.001
101-112 No PAR sensor, sampling too deep for instrument depth rating.
102-111 Salinity was not drawn.
104 Sample Log: "Slow leak, bottom end cap, reseated still leaking." PI: "Oxygen is acceptable."
Station 325.001
101-114 No PAR sensor, sampling too deep for instrument depth rating.
103 Oxygen: "Sample was overtitrated and backtitrated. Last 5 division high?, noisy." PI: "Oxygen is acceptable."
103-109 Salinity was not drawn.
110-111 Samples were only drawn for C13/N15.
112-113 Salinity was not drawn.
113 SampleLog: "Upper cap leak." PI: "Oxygen is acceptable."
Station 326.001
101-112 No PAR sensor, sampling too deep for instrument depth rating.
103-111 Salinity was not drawn.
Station 327.001
101-112 No PAR sensor, sampling too deep for instrument depth rating.
103-111 Salinity was not drawn.
Station 328.001
101-124 No PAR sensor, sampling too deep for instrument depth rating.

108-124 Salinity was not drawn.
115 Sample Log: "Leak on top cap." Oxygen appears slightly low, but acceptable. Leave as is.
119-124 DQ: "CTD O2 data looks weird." Oxygen sensor appears to have a poor to no response at about 90 meters on the up cast. Code CTD oxygen bad. Sensor could have a poor response from about 160 meters up. The profile seems to be close to the down cast, but deviates by strange amounts.
121 Oxygen: "crash 21(1168) lost" Oxygen: lost sample due to computer crash.
122 PI: "Large oxygen bottle-CTD. Bottle oxygen does not match gradient or possible flushing problem. But, CTD oxygen trace does show the oxygen maximum. Oxygen is acceptable."

References

Armstrong, F. A. J., Stearns, C. R., and Strickland, D. H., "The measurement of upwelling and subsequent biological processes by means of the Technicon Autoanalyzer and associated equipment," *Deep-Sea Research*, 14, pp. 381-389, (1967).

Bernhardt, Wilhelms A., "The continuous determination of low level iron, soluble phosphate and total phosphate with the AutoAnalyzer", *Technicon Symposia*, **I**, pp. 385-389 (1967).

Carpenter, J. H., "The Chesapeake Bay Institute technique for the Winkler dissolved oxygen method," *Limnology and Oceanography*, 10, pp. 141-143 (1965).

Culberson, C. H., Knapp, G., Stalcup, M., Williams, R.T., and Zemlyak, F., "A comparison of methods for the determination of dissolved oxygen in seawater," Report WHPO 91-2, WOCE Hydrographic Programme Office (Aug 1991).

Gordon, L.I., Jennings, J.C., Ross, A.A. and J.M. Krest, "A Suggested Protocol for Continuous Flow Automated Analysis of Seawater Nutrients in the WOCE Hydrographic Program and the Joint Global Ocean Fluxes Study". 1993. WOCE Hydrographic Programs Office, Methods Manual WHPO 91-1.

Intergovernmental Oceanographic Commission, Scientific Committee on Oceanic Research Manual and Guides 29 Protocols for the Joint Global Ocean Flux Study (JGOFS) Core Measurements. UNESCO, 170pp., (1994).

Joyce, T. ed., and Corry, C. ed., "Requirements for WOCE Hydrographic Programme Data Reporting," Report WHPO 90-1, WOCE Report No. 67/91 3.1, pp. 52-55, WOCE Hydrographic Programme Office, Woods Hole, MA, USA (May 1994, Rev. 2), UNPUBLISHED MANUSCRIPT

Macdonald, R.W., F. A. McLaughlin and C.S. Wong, "The storage of reactive silicate samples by freezing," *Limnology and Oceanography,* 31, pp. 1139-1142 (1986).

Patton, C.J. and Crouch, S.R., "Spectrophotometric and kinetics investigation of the Berthelot reaction for the determination of ammonia," *Analytical Chemistry*, 49(3), pp.464-469 (1977).

Rahmatullah, Mohammed, and Boyde, T.R.C, "Improvements in the determination of urea using diacetyl monoxime; methods with and without deproteinisation," *Clinica Chimica Acta, 107, pp.3-9 1980.*

Sea-Bird Electronics, Inc, CTD Data Acquisition Software Manual, March 2001

Sea-Bird Electronics, Inc., CTD Operating and Repair Manual, February 2002

ADDENDUM

Additional Notes on Bottle Data and CTD Oxygen Sensor Data for
the Palmer 2003 SBI Survey Cruise (NBP03-04A)

L. A. Codispoti

23 May 2005

At the conclusion of this cruise, the SBI Service Team prepared a cruise report detailing the methods and equipment employed, data formats, etc. that are included with the metadata from this cruise. Further editing of the data continued at Scripps and then the data were sent to L.A. Codispoti for a final review of the bottle salinity, nutrient and dissolved oxygen data. Specific comments on individual measurements arising from LAC's inspection and from data editing during the cruise and by the staff at Scripp's Ocean Data Facility have been incorporated as quality control flags in the data tables following a WOCE format described in the Service Team's cruise report. LAC's review suggests that the following additional comments may be an aid to some users.

1. In general, the data from this cruise appear to be of high quality, but note that the dissolved oxygen data from the CTD's oxygen sensor are uncalibrated and should only be employed for qualitative purposes, such as inferring the shape of oxygen gradients.

2. A comparison of bottle and CTD salinity data showed generally excellent agreement, but there was a tendency for the bottom bottle salinity to be slightly less than the CTD salinity, and for the rest of the bottle salinities to be slightly higher. These results suggest insufficient flushing of the CTD's sample bottles in some cases. In the upper ~200m salinities tend to increase strongly with depth, so a bottom bottle "contaminated" by waters from above the sampling depth would have salinities less than indicated by the CTD and vice versa for the subsequent bottles that would be tripped as the cast ascended. In general the apparent depth offsets caused by incomplete flushing were small, and values > 5 m are rare, but the user interested in fine differences with depth should compare bottle and CTD salts to assess the possibility of incomplete bottle flushing.

3. Normally, our protocols call for storing nutrients samples (in the dark and in a refrigerator) for no longer than 12 hrs before the samples are run, but there was only one nutrient analyst on this cruise, so many samples were stored for more than 12 hours before being run. The data do not display, any obvious problems arising from the undesirably long storage periods.

4. We do not make explicit corrections for "carryover" in our nutrient analyses. In a typical AutoAnalyzer system, sample to sample carryover is ~ 1-2% of the concentration difference between samples. We minimize this effect by running samples in order of increasing depth such that concentration differences between samples are minimized. We also run initial surface samples twice or run a low nutrient sea water sample ahead of the surface sample

since these samples generally follow standard peaks or a high nutrient value from a preceding cast.

5. The ammonium and urea analyses are not described in WOCE/JGOFS protocols, and they are the least reliable of our nutrient determinations. In addition, they are the analyses most likely to be effected by differences between sample salinities and the salinity of our standard matrix (S ~30) and by storage. One cannot assign, a precise uncertainty, to these data, over the complete sampling, storage and analysis cycle, but a practical suggestion would be that a robust difference in values for these variables is ~ 0.25 µM.

6. Comments or questions about these data can be addressed to:
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