Physical and Chemical Data from the Beaufort Sea and Western Canadian Arctic Archipelago, September 2 to 16, 2000

F. McLaughlin, E. Carmack, M. O'Brien, J. Bacle, G. Gatien,
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Canadian Data Report of Hydrography and Ocean Sciences

Data reports provide a medium for the documentation and dissemination of data in a form directly useable by the scientific and engineering communities. Generally, the reports will contain raw and/or analyzed data but will not contain interpretations of the data. Such compilations will commonly have been prepared in support of work related to the programs and interests of the Oceans and Science sectors of Fisheries and Oceans Canada.

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Data reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page.

Regional and headquarters establishments of the former Ocean Science and Surveys sector ceased publication of their various report series in December 1981. A complete listing of these publications and the last number issued under each title are published in the *Canadian Journal of Fisheries and Aquatic Sciences*, Volume 38: Index to Publications 1981. The current series began with Report Number 1 in January 1982.

Rapport statistique canadien sur l'hydrographie et les sciences océaniques

Les rapports statistiques servent de véhicule pour la compilation et la diffusion des données sous une forme directement utilisable par les scientifiques et les ingénieurs. En général, les rapports contiennent des données brutes ou analysées mais ne fournissent pas d'interprétations des données. Ces compilations sont préparées le plus souvent à l'appui de travaux reliés aux programmes et intérêts des secteurs des Océans et des Sciences de Pêches et Océans Canada.

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Les rapports statistiques sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page de titre.

Les établissements de l’ancien secteur des Sciences et Levés océaniques dans les régions et à l'administration centrale ont cessé de publier leurs diverses séries de rapports en décembre 1981. Vous trouverez dans l'index des publications du volume 38 du *Journal canadien des sciences halieutiques et aquatiques*, la liste de ces publications ainsi que le dernier numéro paru dans chaque catégorie. La nouvelle série a commencé avec la publication du rapport numéro 1 en janvier 1982.

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PHYSICAL AND CHEMICAL DATA FROM THE BEAUFORT SEA AND WESTERN CANADIAN ARCTIC ARCHIPELAGO, SEPTEMBER 2 TO 16, 2000

by

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ABSTRACT

McLaughlin, F., Carmack, E., O'Brien, M., Bacle, J., Gatien, G., Tuele, D., White, L., Moody, G., Balsom, A. and Corkum, M. 2009. Physical and Chemical Data from the Beaufort Sea and Western Canadian Arctic Archipelago, September 2 to 16, 2000. *Can. Data Rep. Hydrogr. Ocean Sci*. 180: viii + 167 p.

The physical and chemical water properties of the Beaufort Sea and Western Canadian Arctic Archipelago were measured during an expedition aboard the *CCGS Sir Wilfrid Laurier* from September 2 to September 16, 2000 (Institute of Ocean Sciences Mission Number 2000-22) as part of a program investigating climate change in Canada's western Arctic Ocean and circulation in the Southern Canadian Arctic Archipelago. The objective of this cruise was to study freshwater transport, the flux of carbon and nutrients and distributions of biota in the Southern Canadian Arctic Archipelago. Oceanographic data reported include conductivity-temperature-depth (CTD), salinity, dissolved oxygen, orthophosphate, silicate, nitrate (plus nitrite), chlorophyll a, alkalinity, dissolved inorganic carbon and oxygen isotope ratio. Geochemical data, including barium, are reported from various river samples located in the study area. Phytoplankton and zooplankton data reported include taxa abundance and biomass. Sampling and analysis methods are described for all data presented. Other samples collected during the expedition, not reported here, are also listed.

Résumé

McLaughlin, F., Carmack, E., O'Brien, M., Bacle, J., Gatien, G., Tuele, D., White, L., Moody, G., Balsom, A. and Corkum, M. 2009. Physical and Chemical Data from the Beaufort Sea and Western Canadian Arctic Archipelago, September 2 to 16, 2000. *Can. Data Rep. Hydrogr. Ocean Sci*. 180: viii + 167 p.

Les propriétés physiques et chimiques de l'eau dans la mer de Beaufort et dans la portion ouest de l'archipel Arctique canadien ont été évaluées lors d'une expédition à bord du NGCC *Sir Wilfrid Laurier*, du 2 au 16 septembre 2000 (mission numéro 2000-22 de l'Institut des sciences de la mer), dans le cadre d'un programme visant à étudier les changements climatiques dans le secteur ouest de l'océan Arctique situé du côté canadien et la circulation dans le sud de l'archipel Arctique. L'expédition avait pour objet l'étude du déplacement de l'eau douce, des flux de carbone et de nutriments ainsi que de la répartition du biote dans le sud de l'archipel Arctique. Les données océanographiques rapportées concernent la conductivité-température-profondeur (CTP), la salinité, l'alcalinité, la teneur en oxygène dissous, en orthophosphates, en silicates, en nitrates (et nitrites), en chlorophylle *a* et en carbone organique dissous, et le ratio des isotopes de l'oxygène. Des données géochimiques, y compris la teneur en baryum, sont rapportées pour divers échantillons prélevés dans des cours d'eau situés dans la zone d'étude. Les données sur le phytoplancton et le zooplancton touchent l'abondance des taxons et leur biomasse. Les méthodes d'échantillonnage et d'analyse sont décrites pour toutes les données présentées dans le document. D'autres échantillons prélevés au cours de l'expédition mais non traités dans ce rapport sont également mentionnés.

ACKNOWLEDGEMENTS

We would like to thank Captain Thomas for his efforts in helping us meet our science objectives. We would also like to thank the entire ship's crew including the officers and mates on the bridge who kept station and logs; the bosun and deck crew who operated the winches and cranes that deployed, recovered and most importantly safeguarded personnel and equipment; and the logistics and support crew who also assisted our work and made us feel most welcome.

This work was jointly supported by the NRCan Federal Panel on Energy Research and Development (PERD), the Ocean Climate Program (OCP), and Fisheries & Oceans Canada.

This cruise was dedicated to the memories of Malcolm Ramsey and Stuart Innes, colleagues who provided many of the ideas and concepts that this and subsequent expeditions will attempt to test. They will be missed.

1. INTRODUCTION

This project was carried out aboard the ice breaker *CCGS Sir Wilfrid Laurier*, Institute of Ocean Sciences (IOS) Mission Number 2000-22. The field work was performed from September 2nd to September 16th, 2000, in the Southwestern Canadian Arctic Archipelago, from Dease Strait in the east through Coronation Gulf and Amundsen Gulf to the Beaufort Sea in the west. The key scientific objectives of this mission were:

1. To study sub-basin circulation and transport of freshwater in and between Coronation Gulf and Amundsen Gulf.
2. To study buoyancy boundary currents.
3. To estimate the productivity and carbon flux in Amundsen Gulf.
4. To survey zooplankton and phytoplankton distributions.
5. To collect geochemical tracer samples from rivers flowing into the study area, time permitting.

Data from this program is part of a survey of CTD and geochemical stations linking Arctic Ocean waters with Baffin Bay waters to study water mass modification and Archipelago throughflow. Freshwater transport from the Arctic Ocean plays an important role in the global climate system and the Canadian Arctic Archipelago constitutes one of two possible routes that connect the Arctic Ocean with the North Atlantic. The objective of this cruise was to study freshwater transport via buoyancy boundary currents and the flux of carbon and nutrients in Amundsen Gulf. The Archipelago is also a biologically rich region and climate change will have a significant impact on productivity.

The scientific team was comprised of 14 researchers from IOS, the University of Victoria and colleagues from Japan and the United States (Appendix 4.1, Table 10 and Table 11). The data assembled in the present report include the standard supporting oceanographic determinations of conductivity-temperature-depth (CTD) data and measurements of salinity, nutrients, dissolved oxygen, chlorophyll a, alkalinity, dissolved inorganic carbon and oxygen isotope ratio ($\delta^{18}O$) from bottle samples. Geochemical data, including barium, are reported from river samples located in the study area. The phytoplankton and zooplankton data presented include taxa and numbers of individuals. Additional measurements, not detailed here, were made including sediment composition analyses and benthic fauna surveys from bottom sediment grabs, fish surveys from gill net tows, as well as the recovery and deployment of oceanographic moorings. Results of the sediment and benthic fauna surveys are available at http://etd.utk.edu/2003/BalsomArianne.pdf.

1.1 FIELD WORK SUMMARY

Mission #2000-22 activities and accomplishments are listed below. Data summarized in this report are outlined in **bold font**.

All scientific objectives were completed, including the occupation of 57 CTD stations, 30 rosette stations, 15 phytoplankton and 28 zooplankton vertical net hauls, 44 sediment grabs, the recovery of one mooring, deployment of two moorings and recovery/redeployment of one mooring. Specifically, we:

- **Completed CTD and geochemical sections across Coronation Gulf, Amundsen Gulf and into the Beaufort Sea for the study of sub-basin circulation.**

- **Completed a CTD and geochemical section across Dolphin and Union Strait, the western channel that controls flow in and out of Coronation Gulf, for freshwater and nutrient transport studies.**

- **Collected phytoplankton and zooplankton tows in Coronation Gulf, Amundsen Gulf and the Beaufort Sea to estimate sub-basin productivity and to identify population constituents.**

- Collected sediment grab samples in Coronation Gulf, Amundsen Gulf and the Beaufort Sea to examine benthic fauna and sediment composition. This data is available at http://etd.utk.edu/2003/BalsomArianne.pdf.

- Recovered and (re-) deployed instrumented moorings in Amundsen Gulf and the Beaufort Sea shelf to monitor seasonal and inter-annual changes in currents and water mass structure and to estimate seasonal productivity.

- **Collected geochemical tracer samples from two rivers to establish source water signature characteristics.**

1.2 STUDY AREA

Figure 1 shows the station locations in the Western Canadian Archipelago and the Beaufort Sea during the 2000-22 mission. The locations for CTD casts were taken from the ship's GPS navigation system on the bridge. Table 12 in Appendix 4.2 provides a chronological list of station locations at the start of the cast. Where more than one cast was done at a station, separate coordinates are given for each cast.

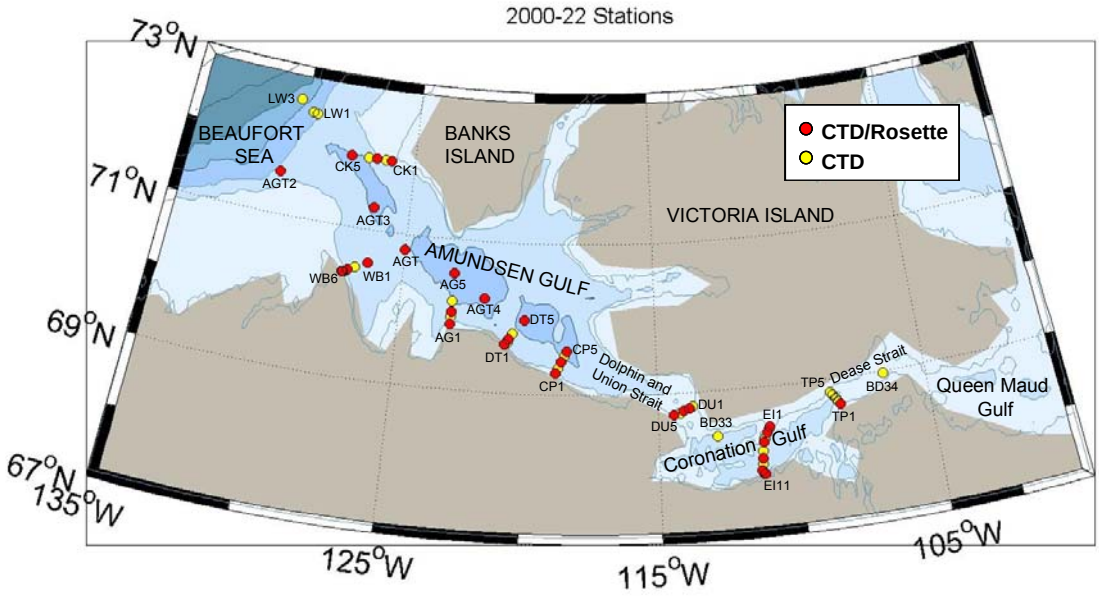

Figure 1. Mission 2000-22 station locations.

2. METHODS AND ANALYSIS

The ship was equipped with the necessary deck gear and work spaces to make her capable as a science platform: winches and an A-frame were installed on the well-deck for deployment and recovery of science moorings; a removable container was adapted as lab/workspace for science activities; a CTD winch and a smaller A-frame were installed on the boat deck near the former radio room. The latter served as a data processing and chemistry lab, which was further upgraded with expanded counter tops, improved lighting and an isolation transformer and UPS for conditioning the ship's power for science electronics. A Simrad EK-500 deep sounder provided the bottom depths needed during deeper CTD profiling and in the deployment and recovery of oceanographic moorings.

CTD and CTD/rosette casts were deployed from the boat deck using an A-frame and winch mounted on the port side. The bosun or mate operated the CTD winch throughout the cruise. Operation of the winch by ship's crew was invaluable because it allowed direct communication to occur between the boatdeck and the bridge. Such communication is mandatory because bridge personnel cannot see equipment over the side or the wire angle directly.

The recent conversion of the radio room into a fully operational oceanographic laboratory permitted oxygen and nutrients to be analyzed immediately onboard which provided the program with timely data, allowing the sampling program to be modified according to our findings. In addition, the close proximity of the lab and the rosette meant that station sampling could be performed quickly and efficiently.

Sediment grabs, phytoplankton and zooplankton net tows, and moorings were collected or deployed from the foredeck using the ship's crane, and IOS A-frame, and winch. The foredeck container provided a warm, dry workspace for assembling, cleaning, and testing instruments and for subsampling. All net deployments were directed by the bosun.

2.1 FIELD SAMPLING – CTD/ROSETTE CASTS

Profile data were taken with a Guildline 8715 CTD (S/N 43825), installed for use with a conducting sea cable for real-time data acquisition. This CTD was mounted on a Seabird SBE-32 Carousel sampling rosette which contained 12, 8 L Niskin bottles and with an internally recording Seabird SBE-19 CTD (S/N 2688) and a Seabird Auto Firing Module. A transmissometer (S/N 598) was attached to the Guildline. The SBE-19 CTD was primarily used to close the Niskin bottles by providing the pressure data to the Auto Firing module on the Carousel sampling rosette, which triggered Niskins at pre-selected depths.

Prior to each rosette cast, the auto-fire module was programmed with the bottle depths using Seabird software SeatermAF. The battery powered SBE-19 CTD was turned on prior to the cast deployment. The frame was lowered into the water and the Guildline CTD data acquisition was started with data recording to a PC in real time through the conducting cable. The frame was lowered and raised at slightly less than 1 m/s. All casts were lowered to within 20 m of the

ocean floor. The Niskin bottles were closed on the upcast without slowing the frame's ascent rate.

A science logbook was kept in the lab near the data acquisition computer to log the particulars at each station. The position coordinates for the station and the date and time (UTC) at the start of each cast were noted. Following each cast: the raw Guildline CTD temperature and salinity were plotted to ensure that the sensors were functioning properly; data from the SBE-19 CTD and the auto-fire module were downloaded to a PC computer; and a spread sheet file was updated with the cast information from the logbook.

2.2 PROCESSING AND VALIDATION OF CTD DATA

Two CTD instruments were used: the primary, due to better data quality and sensor stability, was a Guildline 8715 CTD attached to the conducting wire and real time data was recorded on the acquisition PC. The second CTD, the internally recording Sea-Bird SBE-19, was required to close the Niskin bottles. The SBE-32 water sampler responded via the auto-fire module to the SBE-19 pressure reading, closing bottles at pre-set depth criteria. The SBE-19 CTD data were of varying quality with occasional bad profiles and common hysteresis. The data from this CTD are not reported. A Sea-Tech transmissometer (S/N 598, 25 cm path) was attached to the Guildline 8715 CTD. Transmissometer data are not reported here but are available.

The main issues requiring attention in the data processing:

- Problems in the Guildline temperature data appeared as shifted values, either single or in groups, and were probably associated with a malfunction of the Range/Suppression encoding of temperature by the A/D converter in the CTD. Each cast needed editing to remove such bad points.
- Finding the correct CTD data associated with the Niskin bottle closures.

Table 1 lists the precision of the CTD sensors; Table 2 reports the casts where shifts in temperature and conductivity were noted. See Appendix 4.3.1 for CTD sensor calibration information.

Table 1. CTD accuracy.

Sensor	Accuracy	Applied Lab Calibration	Correction after Lab Calibration	Comment
Pressure	±0.5 db	Pre cruise	+0.6 db	
Temperature	±0.02 °C*	Pre cruise	None	
Salinity	±0.01 PSU**	Pre cruise	+0.0105 PSU	Deep CTD – salt difference

*When large errors occurred the temperature error could be up to +0.25 °C.

**Salinity should be considered to be ±0.01 PSU at best; errors as large as 0.25 PSU have been noted.

Table 2. Casts where shifts in temperature and conductivity were noted.

SH - Shifts noted in temperature and/or conductivity		
PV - Poor validation with bottles		
UD - Upcasts differ significantly from downcasts		
Cast #	**Station**	**Comment**
104		PV, SH
105	EI09	PV, UD, SH. Comparison improved considerably with editing so probably ok.
106		UD, SH. For the SBE-19 the upcast was used.
107	EI07	PV, UD, SH
111		SH
113		SH
117	DU03	SH
121	CP05	PV, UD, SH. Comparison good to 350 m; be very careful below 350 m as the data looks odd.
122		UD, SH. Looks ok to 150 m but very odd below that.
123	CP03	PV, UD, SH. Poor at all depths.
124		SH
136		SH
137		UD, SH
138	CK5	SH Shifts in both C and T
140		SH
141	CK03	PV, SH. Data of highly suspicious quality.
146	AGT3	SH – C has shifts.

2.2.1 Processing Steps

The steps outlined below were performed as required in processing data from each CTD cast. The protocols for processing the CTD data are documented in detail in an IOS internal document by Pearson (1995). Derived oceanographic quantities were calculated from the pressure, temperature and salinity data using the algorithms given by Fofonoff and Mallard (1983). Refer to Appendix 4.4 for plots of the CTD data and to Appendix 4.5 for maps of dynamic height and temperature and salinity sections.

Processing of the CTD data involved the following general steps:

- verification of calibration coefficients for all sensors
- verification against log sheets of data files produced by the acquisition programs
- checking and editing the header information

- conversion of the CTD data files from their acquired format into IOS HEADER format
- application of sensor calibrations to the “raw” data
- creation of profile plots throughout the processing
- removal of data spikes and corrupted data
- correction for differences in temperature and conductivity time responses (method used is dependent on CTD type)
- deletion of swells, upcast and unwanted surface records
- removal of salinity spikes
- manual editing of other data problems where required
- reduction of the data to one meter averaged values (data set has only one record per decibar)
- production of final test plots
- creation of overlay plots and comparison of CTD data with bottle data, other reference data and historical data
- adjustment of the processed CTD data to agree with reference data

2.2.2 Data Spikes in Temperature and Conductivity

Auto-despiking removed some of the bad data including most problems in conductivity. However, the temperature record was corrupted by bad points that tended to come in small groups where the sensor seemed to get stuck for a few records (typically 5 to 10 points); these had to be interpolated individually.

2.2.3 Pressure

Although surface pressure offsets are usually examined to determine if offsets should be applied, the Guildline CTD acquisition was begun and ended while the CTD was in the water so surface pressure information was not regularly available. It was determined an offset of +0.6 db should be applied to pressure (Table 3).

Table 3. Pressure information using all stations possible.

Value	SBE	SBE	SBE-GLD
	Start Pressure (db)	End Pressure (db)	Bottom Pressure Diff (db)
Average value	-1.40	-1.50	-0.58
STD value	0.40	0.48	0.32

2.2.4 Temperature

The data were processed with the pre-cruise calibration coefficients; no post-cruise calibration was done.

There were problems with the temperature data in the form of shifted values, either single points or groups of points. Each cast needed editing to remove the shifts. It is thought the shifting was due to a problem with the Range/Suppression encoding of temperature by the A/D converter in the CTD.

2.2.5 Salinity Calibration

After applying the pressure offsets, there remained a mean salinity offset between the CTD and the bottle data. Using bottles in the low salinity gradient water deeper than 280 db, and where the magnitude of the differences between CTD and bottle was less than 0.06 (chosen by visual inspection to remove outliers) the mean difference was found to be -0.0105 (CTD fresher than bottles) and the standard deviation was 0.0191. This was calculated from 24 bottles. The deepest casts in Amundsen Gulf, at Site AG5, from cruises between 1998 and 2002 were plotted to verify that a salinity correction was appropriate. The plots showed that the interannual variability, even in the deep central basin of Amundsen Gulf, was too large to be informative. Theta - salinity plots showed a salinity adjustment of ~0.01 would make 2000-22 saltier than the other years by 0.01 between 450 and 650 db but overlie 1998, 1999 and 2001 from 250 to 450 db and the correction was applied.

Figure 2 shows the 2000-22 profile after this correction. It should be noted that the correction applied is less than the standard deviation. Possible causes for this discrepancy were examined: shifting calibration from the CTD hitting the bottom; a problem with the salinity samples; problem with identifying the correct AFM bottles; or pre- to post-cruise shifts in temperature or conductivity. However, no clear explanation was found.

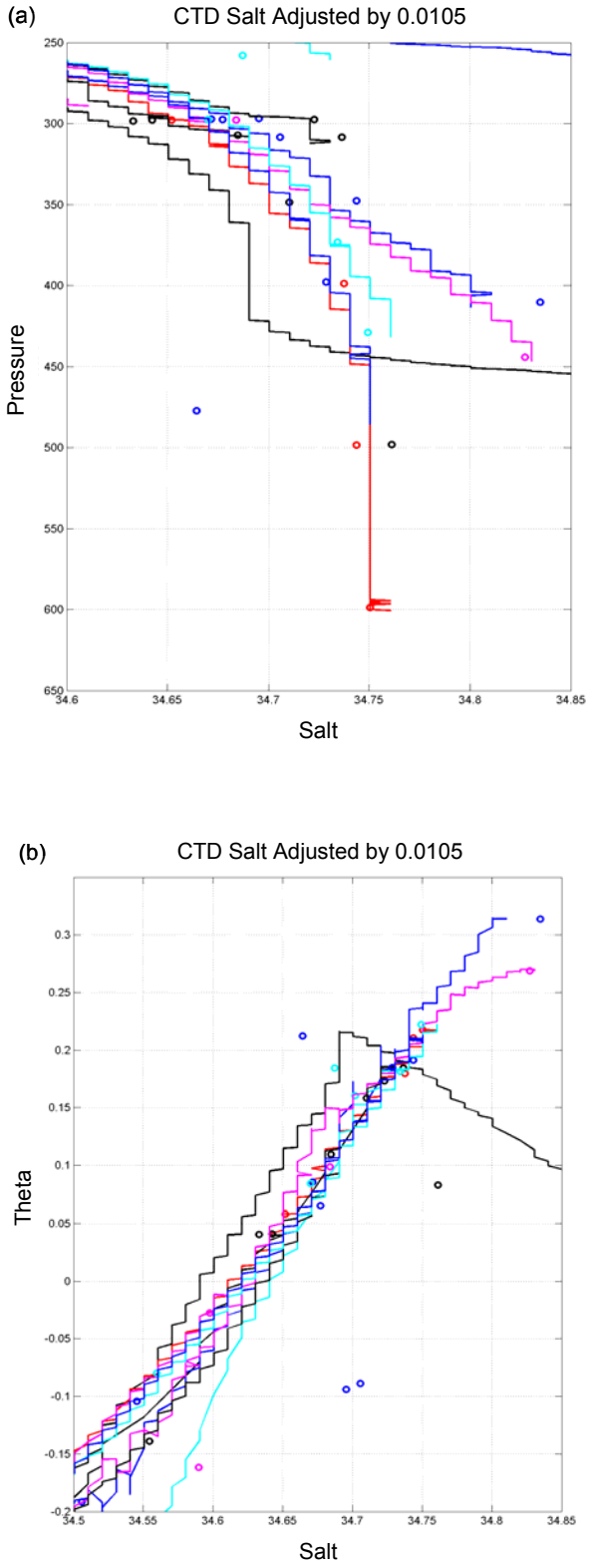

Figure 2. Bottle pressure adjusted and 0.0105 change to CTD salinity: (a) Salinity profile and (b) Theta vs Salinity.

2.2.6 CTD Data at Bottle Depths for Water Chemistry File

The CTD pressure, temperature and salinity associated with the water samples in the water chemistry file are from the downcast Guildline CTD (with the exception of 9 bottles which are from the upcast) and were obtained by matching the SBE-19 bottle trip pressure corrected by the +0.6 db offset to the Guildline pressure. The Guildline sensors are matched to the bottle center with a -1.1 db offset. Lastly, the offset due to bottle flushing and fluid dynamics around the package was corrected by applying a -2 db offset for the downcast bottles and +4 db offset for the upcast bottles. This decision was based on histograms of the differences between CTD and bottle salinities for casts that had bottle pressure records. Offsets of -1, -2 and -3 m were tested for the downcast and the histograms of -2 m offset (i.e. CTD data from 2 db higher) had the least skew (Figure 3). Offsets of +3 and +4 m were tested for the upcast and the histograms of +4 m offset (i.e. CTD data from 4 db deeper) had the least skew (Figure 4).

Refer to Appendix 4.3.2 for Germaine Gatien's detailed Guildline CTD processing notes.

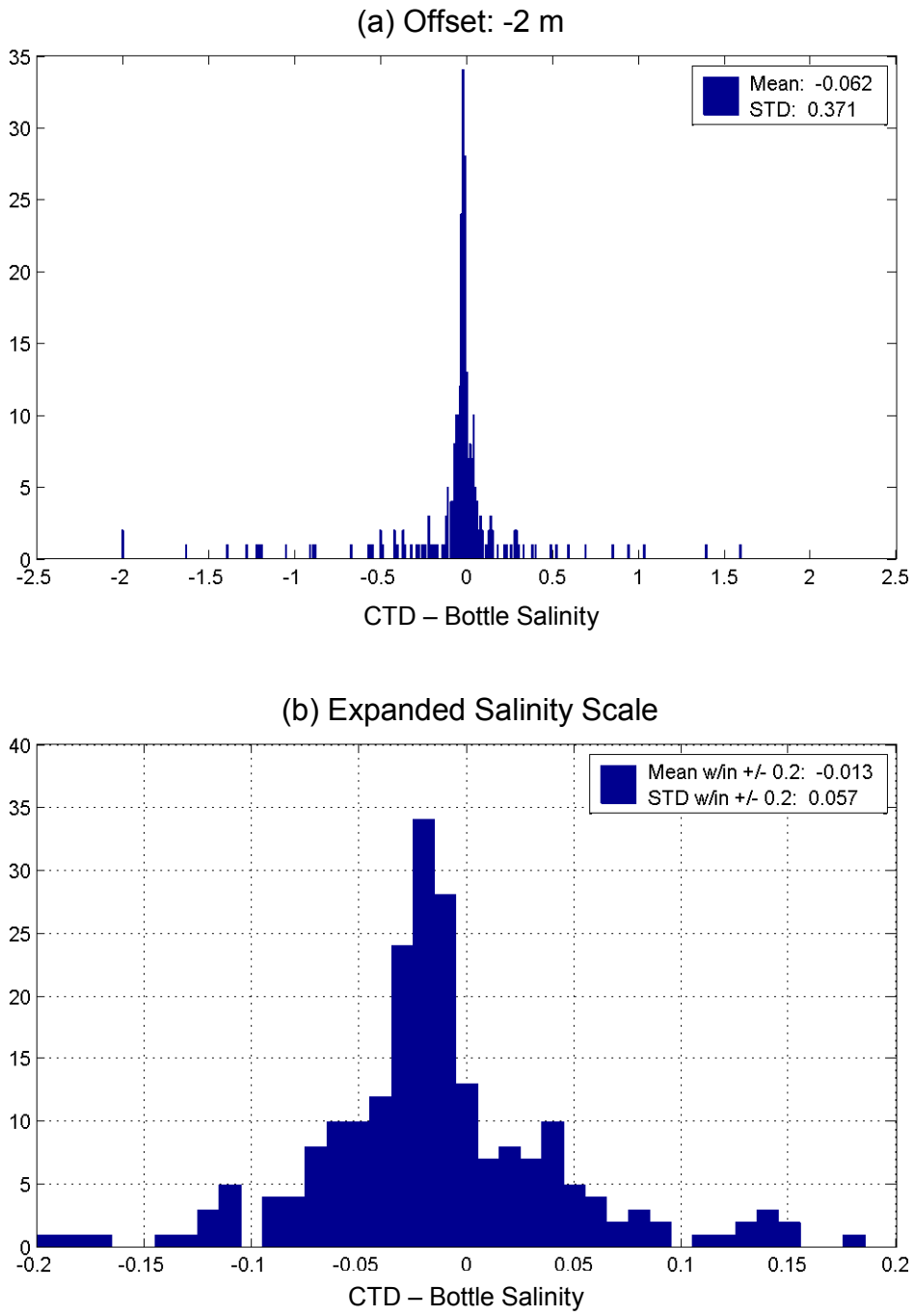

Figure 3. Histograms showing CTD-Bottle salinity differences with a -2 m offset applied to downcast bottles in (a) full and (b) expanded salinity scale.

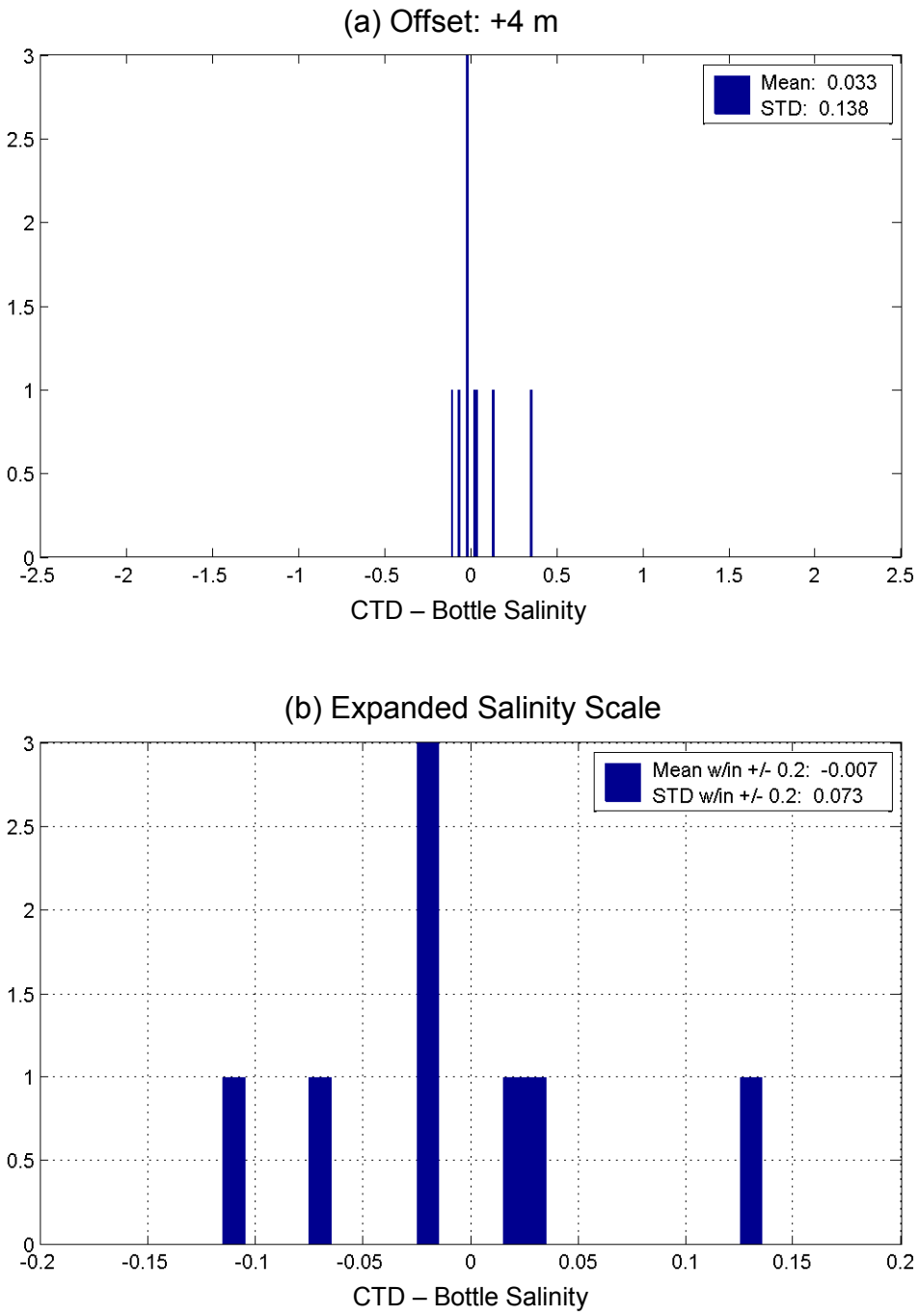

Figure 4. Histograms showing CTD-Bottle salinity differences with a +4 m offset applied to upcast bottles in (a) full and (b) expanded salinity scale.

2.3 CHEMISTRY SAMPLING AND ANALYSIS

Samples were drawn from 8 L BOT bottles on the 12 bottle rosette, outside on the deck with a tarpaulin rigged over the sampling area. The order of sampling was: dissolved oxygen; dissolved inorganic carbon and alkalinity; phytoplankton; nutrients; barium; oxygen isotopes; salinity; chlorophyll a; virus and bacteria. CTD casts and water sampling were coordinated and the data at bottle trip depths are illustrated in Appendix 4.4 together with water chemistry data; see Appendix 4.5 for oxygen and nitrate sections.

2.3.1 Laboratory Methods

The precision of the methods was estimated by analyzing replicates and expressed as the pooled standard deviation (s_p) using the equation:

$$s_p = \sqrt{\frac{\Sigma\ (c(1)-c(2))^2}{2n}}$$

where $c(1)$ and $c(2)$ are the concentrations of duplicate samples and n refers to the number of pairs (Table 4).

Table 4. Water sample precision

Chemistry Sample	Precision (s_p)	Number of Duplicate Pairs	Minimum Range	Maximum Range
Salinity	0.008 PSU	3	21.933	34.827 PSU
Dissolved Oxygen	0.02 mL/L	39	5.035 mL/L	9.432 mL/L
Nitrate+Nitrite	0.05 mmol/m^3	280	0 mmol/m^3	17.2 mmol/m^3
Silicate	0.06 mmol/m^3	278	1.97 mmol/m^3	33.3 mmol/m^3
Ortho-phosphate	0.02 mmol/m^3	281	0.32 mmol/m^3	1.91 mmol/m^3

2.3.2 Salinity

Salinity samples were drawn from Niskin bottles into 200 mL glass salinity bottles after 3 rinses. The samples were then tightly capped and transported back to IOS for analysis. Samples were analyzed by Doug Sieberg (IOS) on a Guildline Portasal (Model 8410; Serial number 59724). Data are reported in practical salinity units (PSU; Lewis and Perkin 1978). The salinometer was standardized using IAPSO standard seawater (Batch P138; conductivity = 0.99994; salinity = 34.998). Only three duplicate salinity samples were taken. Standard pooled deviation is 0.008 PSU. Duplicates were taken from the same niskin bottle.

2.3.3 Dissolved Oxygen

Water samples for dissolved oxygen were drawn through rubber tubing into a calibrated volume glass flask with attached stopper. The sample was immediately pickled with 1.0 mL of manganous chloride and 1.0 mL alkaline iodide, the stopper was inserted and the flask was shaken to mix the contents. Dissolved oxygen samples were analyzed on board by Mary O'Brien within 24 hrs of collection using an automated version of the Micro-Winkler Technique as described in Carpenter (1965). The titration was performed using a Metrohn Dosimat 665 and the end point was detected using a Brinkmann probe colorimeter PC900. The methodology is described in an internal IOS document (Minkley & Chase 1997). Standard pooled deviation for 39 duplicates was 0.02 mL/L. Range for all data is 5.035 to 9.432 mL/L. Only the first replicate of each duplicate pair is reported in the IOS data archive.

2.3.4 Nutrients

Water samples for nutrient determination were collected into glass and polystyrene test tubes (two glass and two polystyrene tubes per sample) after three rinses. Nutrients were analyzed onboard by Linda White using Technicon Autoanalyzer II components. The method is described by Barwell-Clarke and Whitney (1996). Samples were analyzed in duplicate and the pooled standard deviation for nitrate + nitrite is s_p = 0.05 µmol/L, where n = 280; silicate s_p = 0.06 µmol/L, where n = 278; and orthophosphate s_p = 0.02 µmol/L, where n = 281. Only the first replicate of each duplicate pair is reported in the IOS data archive.

Standards and blanks:

Nanopure water was analyzed at the beginning and end of each analysis day to verify the chemical blank. Standards (low, medium and high) were made using a freshly prepared 3.2% sodium chloride solution and analyzed at the start and close of each day and every ~ 60 samples. Concentrations of the standards bracket the expected nutrient levels in the samples.

Note: Nitrate plus nitrite values required correction for contamination of the salt wash water. The carboys used for storing the de-ionized water were the cause of the contamination. The salt wash water had a higher concentration of nitrate plus nitrite than surface water samples. Each day's correction was determined by averaging the negative peaks from the surface samples and adding the result to the sample values. Medium check standards were run along with the samples for quality control.

2.3.5 Oxygen Isotope Ratio ($\delta^{18}O$)

Samples were drawn into ~30 mL glass vials following three rinses of the vials. Once at room temperature, the caps were retightened and wrapped with parafilm for storage. Oxygen isotopes were analyzed in 2003 by Chi Meredith at the Stable Isotope Laboratory at Oregon State University (OSU) by the CO_2 equilibration method on the COAS Finnegan Mat 251 mass spectrometer.

Overview

The $^{18}O/^{16}O$ ratio of natural waters is determined using the common CO_2-H_2O equilibration technique (Epstein 1953; O'Neil et al. 1975) in which millimole quantities of CO_2 are equilibrated with water samples under constant temperatures. Subsequently, the CO_2 is cryogenically purified and analyzed mass spectrometrically for its $^{18}O/^{16}O$ ratio. Note that this technique measures the isotopic activity of ^{18}O and not the actual ^{18}O concentration. For dilute waters, differences between isotopic activity and concentration are negligible. For saline waters and brines, however, supplemental water chemistry data and longer equilibration times are needed to obtain true isotopic compositions (Horita 1993; Sofer 1972).

Mass spectrometric measurements

1. The obtained "raw" $\delta^{18}O_{H2O}$ values are drift corrected and normalized using internal laboratory standards.
2. Internal OSU laboratory standards are calibrated periodically using international standards [V-SMOW (Vienna-Standard Mean Ocean Water), V-SLAP, V-GISP].
3. Corrected $\delta^{18}O_{H2O}$ values are reported in the per mil (‰) notation relative to V-SMOW.

The oxygen isotope ratio is referenced to Vienna-Standard Mean Ocean Water (V-SMOW) and reported as follows:

$$\text{(V-SMOW):}\quad \delta^{18}O = ((H_2{}^{18}O/H_2{}^{16}O)_{sample} / (H_2{}^{18}O/H_2{}^{16}O)_{VSMOW} - 1) \times 10^3 \quad [‰].$$

Accuracy and precision for $\delta^{18}O$ values of natural waters are generally better than ±0.05‰. There were no duplicate samples. Precision from repeats of standards is: *SD* = 0.0495, *n* = 13 (LROSS); and *SD* = 0.04752, *n* = 16 (W9808-NB5).

2.3.6 Barium

Barium samples were drawn from the Niskin into small plastic vials following three rinses of the vials. Once at room temperature, the caps were retightened and wrapped with Parafilm for storage. Barium samples collected in rivers were analyzed at Oregon State University by Kelly Falkner using isotope-dilution and a VG Thermo Excel Inductively coupled quadrupole mass spectrometer. The method used is reported in Falkner et al. (1994) with minor modifications. Precision based on replicates is estimated to be 3% for this suite of Barium measurements. See Table 5 below for Barium standard calibration information and Table 14 (Appendix 4.2) for river sampling locations. Table 20 (Appendix 4.6) reports river geochemistry data including nutrients, oxygen isotope ratio and barium.

Table 5. Barium standard calibration for river samples.

Sample	Ba (µmol/m^3)		
Seawater consistency standard	107.51	Average of 54 runs	
	2.57	Standard Deviation	
	2.39	CV	
GEOSECS Samples	**Measured Ba (nmol/Kg)**	**Expected value (nmol/kg)**	**Percent Difference**
1C	110	112.9	-2.58
3C	41.6	42.4	-1.92
4C	61.7	63	-2.07
5C	92.8	93.6	-0.88

2.3.7 Dissolved Inorganic Carbon & Alkalinity

Sampling Instructions

Seawater was transferred to the appropriate glass bottles as soon as possible after collecting the sample to minimize gas exchange. The sampling tube was connected to the spigot of the Niskin sampler and with the tube held up, tubing was rinsed by flowing approximately one tube volume of sea water through the tube; any trapped air bubbles were dislodged by squeezing. The bottle was filled smoothly from the bottom (tubing touching the bottom of the bottle) and the bottle was overflowed by two times its volume. Tubing was withdrawn to the neck and either the spigot valve closed on sampler or the flow squeezed off before removing the tubing from bottle. One percent of the stoppered sample volume was removed to leave a headspace (about 1% of the bottle volume: i.e. 5 mL for a 500 mL bottle). The size of the headspace volume was not absolutely critical, but was consistent and not too large. Either a nylon plug designed to fit into the bottle and leave an appropriate headspace or plastic pipettes were included with the sampling equipment. Then 100 µL of saturated mercuric chloride solution was added to either 250 mL or 500 mL bottles. A greased stopper was inserted and sealed with elastic and a plastic clamp. Samples were stored at 4 °C. DIC followed by alkalinity were measured from the same sample.

DIC Analysis

Samples were analyzed at the Institute of Ocean Sciences (IOS) by Marty Davelaar using a SOMMA (Single-Operator Multi-Metabolic Analyzer) - Coulometer system to determine the concentration of dissolved inorganic carbon (or total carbon dioxide). The SOMMA is a sea-going, computer-controlled automated dynamic headspace analyzes, constructed at IOS by Ken Johnson (University of Rhode Island) and Keith Johnson (IOS). The current design of the SOMMA system is similar to the one described by Johnson et al. (1993). The SOMMA is interfaced with an IBM compatible computer and a coulometric detector (UIC Coulometrics, model 5011). The SOMMA dispenses and acidifies a known volume of seawater, strips the resultant CO_2 from solution, dries it and delivers it to the coulometric detector.

At the start of each day, seawater was run through the system to condition the cell. Once the system appeared to be working well, standard water or a known sample was run to confirm proper operation. For each analysis (standard or sample) CO_2 in nitrogen was used to push liquid out of the sample bottle and into the water-jacketed calibrated pipette. The water from the pipette was then drained into a scrubber compartment to which approximately 0.5 mL of 8.5% σ-phosphoric acid had been added. The CO_2 was stripped from the water by the acid and then passed into the coulometer cell where it was measured. The coulometer was operated in the µg C mode. Using the SOMMA software, this mode takes the coulometer's voltage to frequency converter output along with constants supplied by the user and calculates µmol *C* titrated. For each sample or standard, the analysis was run twice. The first analysis was considered a rinse and the second analysis the final value. The final concentrations are calibrated with the daily measured standard where:

$$\textit{corrected value} = \frac{\textit{(raw value * measured standard)}}{\textit{(standard value * correction for mercuric chloride volume)}}$$

The mercuric chloride correction is either 1.0002 or 1.0004, depending on whether the sample volume was 250 or 500 mL. DIC values are reported in units of µmol/kg.

DIC Standards, blanks and precision

The accuracy of DIC analysis was assured by daily analysis of IOS standard sea water (batch 11, concentration 2177.5 µmol/kg) which had been calibrated using certified reference material (batch 48 with a concentration of 1991.91 µmol/kg: DOE 1994; Dickson 2001; Dickson et al. 2003) supplied by Andrew Dickson (Scripps Institute of Oceanography, San Diego, USA). The difference between the measured value and calibrated value of the IOS standard seawater was less than ±1 (0.05%). No duplicate samples were collected.

Alkalinity Analysis

Samples were analyzed at the Institute of Ocean Sciences (IOS) by Marty Davelaar using an automated potentiometric titration system to determine the total alkalinity. The pH was measured using a Ross combination electrode acid

was dispensed with a Dosimat 665. A program written by the University of Hawaii was used to control the Dosimat.

At the start of each day, seawater was run through the system to condition the instruments. Once the system appeared to be working well, standard water was run to confirm proper operation. For each analysis (samples and standard), a known amount (~75 g) of sample was weighed in an open beaker. An initial amount of 0.7N (0.6N NaCl, 0.1N HCl) acid (IOS batch 3, concentration 0.09676), was added to the seawater to take its pH to approximately 3.5. After an eight minute period in which CO_2 was stripped from the seawater, 0.025 mL aliquots of acid were added to the seawater until a final pH of approximately 3.0 was obtained. The University of Hawaii program was used to calculate the alkalinity of the seawater by use of a Gran plot. The final concentrations are calibrated with the daily measured standard where:

$$\textit{corrected value} = \frac{\textit{(raw value * measured standard)}}{\textit{(standard value * correction for mercuric chloride volume)}}$$

The mercuric chloride correction is either 1.0002 or 1.0004, depending on whether the sample volume was 250 or 500 mL. Alkalinity values are reported in units of µmol/kg.

Alkalinity standards and precision

The accuracy of the alkalinity analysis was assured by daily analysis of certified reference material (batch 57, concentration of 2230.33 ± 0.66 µmol/kg) (DOE 1994; Dickson 2001; Dickson et al. 2003) supplied by Andrew Dickson (Scripps Institute of Oceanography, San Diego, USA). No duplicate samples were collected.

2.3.8 Chlorophyll-a

Samples to determine total Chlorophyll-a (>0.7 µm) were drawn from the rosette bottles for depths from the surface to a maximum of 100 m. The 250 mL samples were filtered onto 25 mm GF/F filters using low vacuum filtration. Filtration castles were rinsed to insure cells were not left on the castle walls. The filters were put into scintillation vials with 10 mL/L of 90% acetone, labeled and put into a 4 °C cooler for 24 hours. During filtration and extraction, the samples were kept dark as much as possible. After 24 hour extraction the samples were analyzed for chlorophyll-a in the presence of chlorophyll-b and phaeo-pigments by Arianne Balsom (University of Tennessee), using the Welschmeyer (1994) method. The fluorometer (a Turner Designs 40-AU configured for the non-acidification method) was calibrated using a Turner Design Part No. 10-850-calibrated chlorophyll standard before and after all sampling, with use of a secondary solid standard (Part No. 10-AU-904) during sampling to identify any possible instrument drift. No duplicate samples were collected.

2.3.9 Bacteria

Samples (25 mL) were collected and preserved in gluteraldehyde and stored at 4 °C in the heli room. Samples were collected by Arianne Balsom (University of Tennessee) for her MSc Thesis project supervised by Jackie Grebmeier. For complete details and data see: http://etd.utk.edu/2003/BalsomArianne.pdf.

2.3.10 Viruses

Dr. Jody Deming (University of Washington) and her graduate student, Llyd Wells, collected samples to investigate the deep nepheloid layers and surrounding waters for the presence of novel microbes and viruses. They succeeded in documenting the presence of unexpected numbers of Archaea in the nepheloid layers and in isolating numerous bacterial viruses from those layers. The virus that was studied in the lab extensively therafter proved to be the most cold-active virus yet known and still holds the low temperature record for infecting its bacterial host (at -12 °C and 16% salt). The following publications report their methods and findings:

Wells, L.E. and J.W. Deming. 2003. Abundance of Cytophaga-Flavobacterium-Bacteriodes and Archaea in cold surface-water and nepheloid layers of the Northwest Passage, Canadian Archipelago. *Aquat. Microb. Ecol.* 31: 19-31. doi:10.3354/ame031019.

Wells, L.E. and J.W. Deming. 2006. Characterization of a cold-active bacteriophage on two psychrophilic marine hosts. *Aquat. Microb. Ecol*. 45:15-29. doi:10.3354/ame045015.

2.3.11 Phytoplankton

Both phytoplankton net and rosette water samples were collected; see Table 15 in Appendix 4.2 for sample locations.

Net samples

Samples were collected by D. Tuele with the phytoplankton net (0.25 m diameter, approximately 60 cm long with cod-end opening approximately 6.5 cm wide to take a 250 mL glass jar, with a mesh size of 20 µm). The cod end container was straight sided and solid (no mesh-covered holes). This was lowered into the water to a depth of 5-10 m and gently pulled to the surface. This assembly was done several times until a brownish colour was seen around the top of the collecting container. These samples were preserved with 20% buffered formalin to approximately one-third the volume of the sample, shaken for rapid fixation and stored as above. See Appendix 4.7.1, Table 21 for taxonomic analysis of net samples.

Rosette water samples

Subsamples were collected by the water sampling team into a 250 mL jar immediately after sampling for oxygen to prevent cells from settling in the bottle; 5 mL of 20% buffered (hexamethylenetetramine) formalin was added. Samples were shaken gently and stored in a cool place away from vibration (NOT refrigerated or frozen). See Appendix 4.7.2, Table 22 for taxonomic analysis of rosette water samples.

Taxonomic analysis

All samples for phytoplankton and heterotrophic protists were viewed following Ütermohl sedimentation and were examined at 400X under both phase-contrast and DIC with a Zeiss Axiovert 100 inverted microscope by Marie-Josée Martineau. The net tow samples (approximately 40 mL) were allowed to sedi-ment for 24 hours prior to examination. There was little material in the samples.

2.4 OTHER FIELD SAMPLING

2.4.1 Vertical Net Tows

Field Sampling

Zooplankton sampling was conducted on board by John Nelson, University of Victoria, using a paired Bongo net assembly. Two large bongo frames held nets with mesh size 235 µm and the sampling area for each net is 0.2530 m^2. The two nets contained uni-directional flowmeters to measure the amount of water flowing through the nets (TSK flow meter Model 1201, S/N 4798, constant = 0.14718). The volume sampled per tow is determined by multiplying the net area (0.2530 m^2) by the constant (0.14718) and the volume recorded by the flowmeter.

Samples from one cod end were preserved in 10% buffered formalin and used for taxonomy. Not all samples collected were analyzed. Samples from the other net end were put into whirl-pak bags, double-bagged and stored immediately in the -80 °C freezer for later determination of biomass. Biomass samples were not analyzed but remain accessible; for more information contact John Nelson, IOS. A second cast was conducted and samples from both cod ends were combined, sieved, sorted by species and preserved in ethanol for DNA analysis.

Table 16, Appendix 4.2, provides details on bongo net cast locations, depths and samples collected. Note: the volume sampled for a given tow is reported only for those samples that were processed. Details about unprocessed samples will be on labels in the sample jars. Table 23 in Appendix 4.8 reports zooplankton taxonomic analysis as abundance; see Table 24 for a summary of zooplankton taxonomic analysis reported as biomass. Biomass was calculated by multiplying the abundance (number per m^3) of the specific organism by the weight of the organism taken either from the literature or determined at IOS. Note: biomass was calculated using a net diameter of 0.56 m (actual diameter was 0.568 m).

Zooplankton Taxonomic Analysis

Formalin preserved samples were poured over a 4 mm sieve stacked on a 0.2 mm sieve (bottom sieve was equal to or slightly finer than the mesh size from the net used) to remove the preservative and separate the ≥5 mm size fraction from the rest of the sample. Separation was never complete but it was a good start. Both fractions were examined to ensure that the separation was complete (Chaetognath often passed through the 4 mm headfirst) using a Wild M420 dissecting scope and Leitz Dialux 22 compound scope. Both microscopes had viewing tubes and adapters for camera or video hook up. When separation was verified, the sample was also examined for exotic or rare taxa which were removed and retained for external verification. The formalin/seawater mixture was captured for use when the sample was reconstituted after analysis. Filtered seawater was used for rinsing and sorting.

The ≥5 mm fraction was sorted into two categories as identification to species, stage, development and enumeration proceeds: ≥5 mm, <10 mm and ≥10 mm. In the database these were referred to as s1 <5 mm, s2 ≥ 5 mm <10 mm, s3 ≥10 mm. In the event of large numbers in these size classes, the ≥5 mm portion was subsampled to approximately 100 individuals. A calibrated Folsom splitter was used for all sub-sampling. It was sometimes necessary to split the Chaetognaths to a manageable subsample while the rest of the fraction could be enumerated and identified without subsampling. As each animal was identified it was removed from the sample and placed back into the original sample jar. The ≥5 mm were sorted in a Petri dish with a 1 cm grid on the bottom whose smallest demarcation was 1 mm. Rare animals of any size were identified, removed and counted on a 1 to 1 split.

The remaining size fraction, <5 mm, was split to produce a subsample of approximately 400 individuals, which were then enumerated to genus, species, sex, and developmental stage. The <5 mm animals were sorted in a 1 mm gridded Borgorov tray. Any animals that were not readily identifiable were put off to the side to be examined at the end of the sample sorting. This method was adopted to ensure that the greater ≥5 mm animals were represented. Usually the <5 mm portion overwhelmed the larger size categories in numbers, and subsampling reduced the chance of identifying the rarer species. Any animals that were unknowns (to the analyst) were set aside for outside verification of identification.

The portion of the sample that was not enumerated (the other half of the splitter) was then scanned for any rare species that would be underrepresented by the splitting and a general check on relative proportions of the counted side was performed. All subsampling was completed using a Folsom splitter, which was regularly calibrated by splitting a known sample.

In the database, s1, s2, s3, f and m (female and male) were used for almost all taxa except for copepods which were split into life stages i, ii, iii, iv, v, f, m where f and m represent the adult stage vi female or male. Data was usually presented as number of individuals of that species per cubic metre. All splits were kept to fractions, i.e. ½, ¼ ⅛, etc. When splitting with a Folsom splitter, sides were alternated; first side A then side B etc. to eliminate any prejudice.

2.4.2 Gill Netting

Gillnetting was carried out by setting one end of the net on the shore with an anchor and running the other end out perpendicular to the shore for the length of the net (50 ft) and anchoring it with another anchor marked with an orange float. Nets were left to soak for several hours. Three sets were tried with no fish encountered. In Cambridge Bay a contact was made with a local resident and several Arctic Char samples were taken from fish in his freezer. These samples were preserved in ethanol (J. Nelson, UVic).

2.4.3 Sediment Grabs

Four van Veen grabs (0.1 m^2) weighted with 32 kg of lead were taken at each station for replicate quantitative infaunal sampling. The sediment sample was then washed through 1 mm sieve screened boxes and transferred to plastic storage containers and preserved with 10% hexamethylenetetramine buffered formalin until land-based laboratory identification to family taxonomic level could be completed. Taxonomic groups were then both counted for the abundance of total individuals and weighed to determine wet weight biomass. Results were converted to carbon values using previously determined carbon conversion values. Samples were collected by Arianne Balsom (University of Tennessee) for her MSc Thesis project supervised by Jackie Grebmeier. For complete details and data see: http://etd.utk.edu/2003/BalsomArianne.pdf.

Surface sediment samples were collected from two stations on Banks Island shelf at water depths from 60 to 150 m using a van Veen grab. These samples were sent to Dennis Darby, Old Dominion University, Norfolk, VA.

2.4.4 Moorings and Buoys

The IOS sediment trap mooring AG99-24, deployed in Amundsen Gulf in 1999 during IOS Mission #9924, was recovered (see Figure 5 for mooring diagram). A newly configured sediment trap mooring AG5-2000 was deployed at 672 m and consisted of Aanderaa current meters RCM4, S/N 7917, at 77.8 m and RCM4, S/N 972, at 641.8 m; a Honjo sediment trap at 337.8 m; and a Baker trap at 245.8 m (see Figure 7 for mooring diagram).

JAMSTEC mooring J-CAD2 was deployed west of Banks Island in multi-year ice. JAMSTEC mooring AG-J-1999 was recovered and AG-J-2000 deployed west of Amundsen Gulf.

Table 13 in Appendix 4.2 summarizes all mooring recoveries and deployments for both Mission 9924 and 2000-22. Table 6 provides details on AG99-24 and AG-2000 sediment trap moorings.

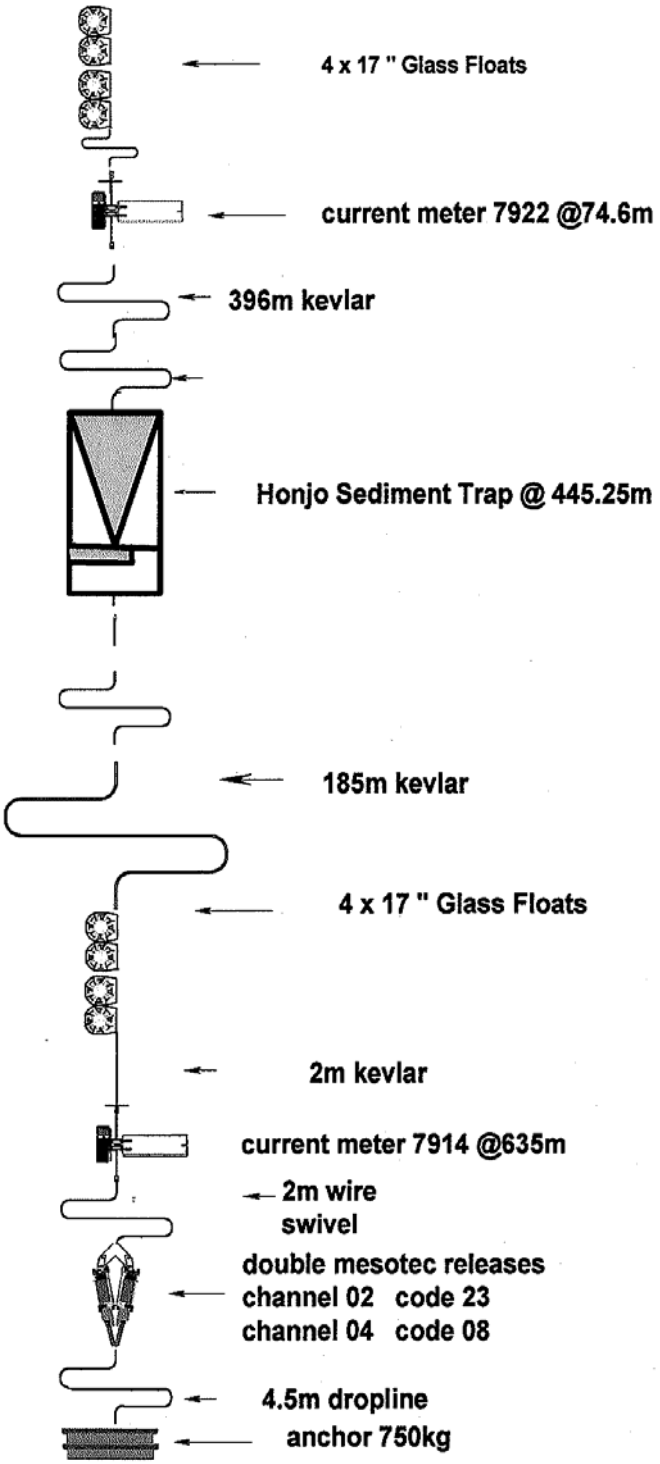

Figure 5. Sediment trap mooring AG99-24 diagram – deployed Sept. 4, 1999 and recovered Sept. 7, 2000.

Table 6. IOS Mission 9924 and 2000-22 sediment trap mooring details.

Station	AG99-24	AG-2000
Date/Time	September 4, 1999; 1910 GMT	September 8, 2000; 2235 GMT
Latitude	70 33 15 N	70 33.23 N
Longitude	122 54 34 W	122 53.59 W
Current meters	74.6 m; RCM4 S/N 7922	77.8 m; RCM4 S/N 7917
	635 m; RCM4 S/N 7914	641.8 m; RCM4 S/N 972
Honjo sediment trap	445.3 m	337.8 m
Baker sediment trap	—	245.8 m
Water Depth	663 m	650.8 m

Table 7 reports sampling schedule for HONJO trap deployed during Arctic Mission 1999-24 at station AG99; sample bottles from 1999-2000 illustrating relative amounts of sediment collected are shown in Figure 6.

Table 7. Sampling schedule for HONJO trap deployed during Arctic Mission 1999-24 at station AG99.

Event	Date	Time Zone	Sampling	Start	Finish	Cup #	Interval (days)	Interval mid-point
0	SETUP							
1	SETUP							
2	9/7/1999 0:00	CDT	start sampling cup#1	07-Sep-99	01-Oct-99	1	24	19-Sep-99
3	10/1/1999 0:00	CDT	start sampling cup#2	01-Oct-99	25-Oct-99	2	24	13-Oct-99
4	10/25/1999 0:00	CDT	start sampling cup#3	25-Oct-99	18-Nov-99	3	24	06-Nov-99
5	11/18/1999 0:00	CDT	start sampling cup#4	18-Nov-99	02-Jan-00	4	45	10-Dec-99
6	1/2/2000 0:00	CDT	start sampling cup#5	02-Jan-00	16-Feb-00	5	45	24-Jan-00
7	2/16/2000 0:00	CDT	start sampling cup#6	16-Feb-00	01-Apr-00	6	45	09-Mar-00
8	4/1/2000 0:00	CDT	start sampling cup#7	01-Apr-00	25-Apr-00	7	24	13-Apr-00
9	4/25/2000 0:00	CDT	start sampling cup#8	25-Apr-00	19-May-00	8	24	07-May-00
10	5/19/2000 0:00	CDT	start sampling cup#9	19-May-00	12-Jun-00	9	24	31-May-00
11	6/12/2000 0:00	CDT	start sampling cup#10	12-Jun-00	06-Jul-00	10	24	24-Jun-00
12	7/6/2000 0:00	CDT	start sampling cup#11	06-Jul-00	30-Jul-00	11	24	18-Jul-00
13	7/30/2000 0:00	CDT	start sampling cup#12	30-Jul-00	23-Aug-00	12	24	11-Aug-00
14	8/23/2000 0:00	CDT	start sampling cup#13	23-Aug-00	08-Sep-00	13	16	31-Aug-00
15	9/8/2000 0:00	CDT	finish sampling cup#13					

Figure 6. Sample bottles from 1999-2000 illustrating relative amounts of sediment collected.

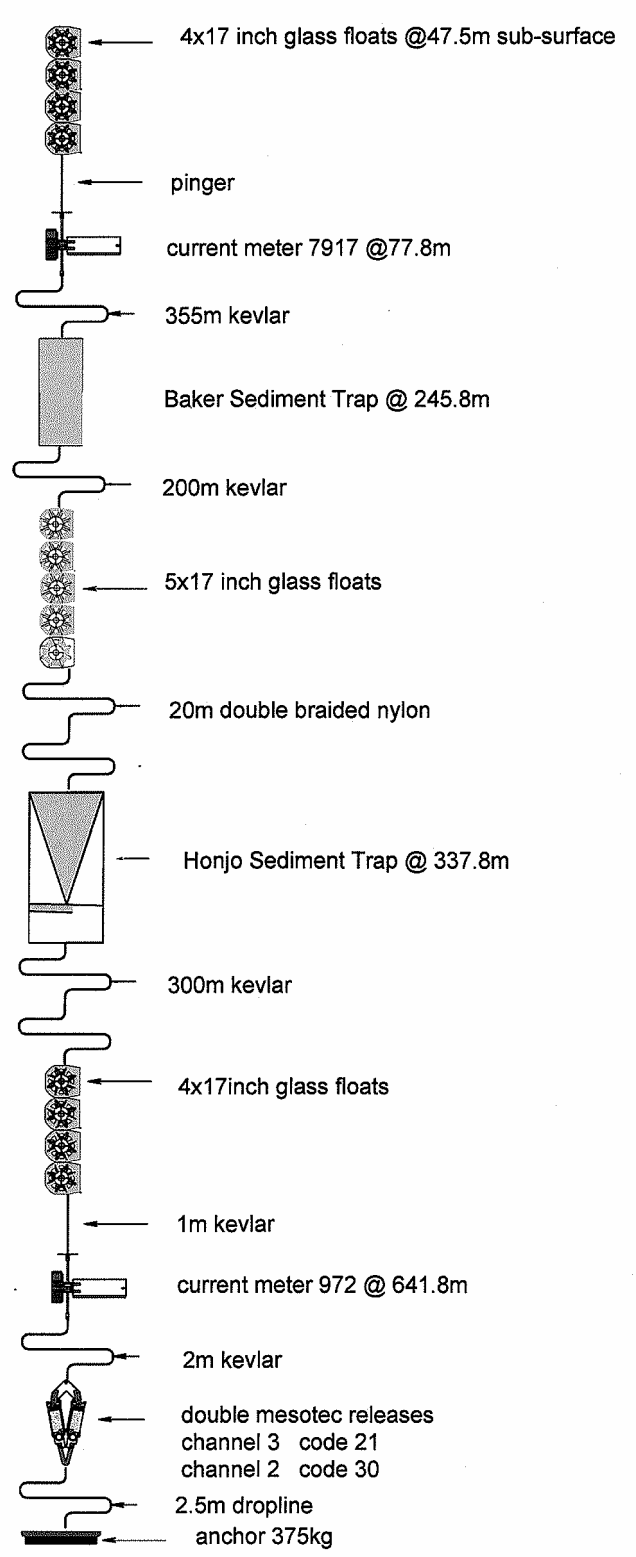

Figure 7. Sediment trap mooring AG-2000 diagram: deployed Sept. 8, 2000 during Mission 2000-22; recovered Sept. 19, 2001 during Mission 2001-22.

Preservative

AG-2000 HONJO trap

Prior to deployment, the preservative was prepared by adding 2 g Suprapur NaCl to each 250 mL bottle for 13 cups plus one blank: 14 x 2 = 28 g NaCl total. Next, 500 mg HgCl2 was added to each 250 mL ploybottle for 13 cups plus one blank: 14 x 0.5 g = 7 g HgCl2 total. The total volume of preservative was 14 x 270 mL = 3.78 L. Once onboard the Laurier, 28 g NaCl and 7 g HgCl2 were dissolved in seawater obtained from the site at the mooring depth. Preservative was dispensed to 14 x 250 mL WM polybottles. Bottles were topped up with seawater after being attached to the bottom plate of the Honjo trap.

Table 8 reports sampling schedule for HONJO trap deployed during Arctic Mission 2000-22 at station AG2000; sample bottles from 2000-2001 illustrating relative amounts of sediment collected are shown in Figure 8.

Table 8. Sampling schedule for HONJO trap deployed during Arctic Mission 2000-22 at station AG2000.

EVENT	DATE	TIME ZONE	SAMPLING	START	FINISH	CUP #	INTERVAL DAYS
0	9/7/2000 16:00	MDT	SETUP				
1	9/7/2000 16:15	MDT	SETUP				
2	9/10/2000 0:00	MDT	start sampling cup#1	10-Sep-00	02-Oct-00	1	22
3	10/2/2000 0:00	MDT	start sampling cup#2	02-Oct-00	24-Oct-00	2	22
4	10/24/2000 0:00	MDT	start sampling cup#3	24-Oct-00	15-Nov-00	3	22
5	11/15/2000 0:00	MDT	start sampling cup#4	15-Nov-00	30-Dec-00	4	45
6	12/30/2000 0:00	MDT	start sampling cup#5	30-Dec-00	13-Feb-01	5	45
7	2/13/2001 0:00	MDT	start sampling cup#6	13-Feb-01	30-Mar-01	6	45
8	3/30/2001 0:00	MDT	start sampling cup#7	30-Mar-01	21-Apr-01	7	22
9	4/21/2001 0:00	MDT	start sampling cup#8	21-Apr-01	13-May-01	8	22
10	5/13/2001 0:00	MDT	start sampling cup#9	13-May-01	04-Jun-01	9	22
11	6/4/2001 0:00	MDT	start sampling cup#10	04-Jun-01	26-Jun-01	10	22
12	6/26/2001 0:00	MDT	start sampling cup#11	26-Jun-01	18-Jul-01	11	22
13	7/18/2001 0:00	MDT	start sampling cup#12	18-Jul-01	09-Aug-01	12	22
14	8/9/2001 0:00	MDT	start sampling cup#13	09-Aug-01	31-Aug-01	13	22
15	8/31/2001 0:00	MDT	finish sampling cup#13				

Figure 8. Sample bottles from 2000-2001 illustrating relative amounts of sediment collected.

Preservative

AG2000 Baker trap

0.84 L of 20% Formalin (7.5% formaldehyde) was made up to 2.2 L with seawater collected at the site of the deployment and at the intended depth of the trap. 2.2 g Suprapur NaCl was dissolved in the solution. Final concentration of Formaldehyde was 7.5% x 0.84/2.2 = 2.86% (approximately 3%). The desired formaldehyde concentration was 4% but there was a limited supply of the 7.5% formaldehyde.

Table 9 reports sampling schedule for Baker trap deployed during Arctic Mission 2000-22 at station AG2000.

Table 9. Sampling schedule for Baker trap deployed during Arctic Mission 2000-22 at station AG2000.

Event	Start date	End date	Interval	Julian day start	Julian day end
delay - 0	6-Sep-00 22:00	10-Sep-00 0:00	3.08	57.7	64.0
1	10-Sep-00 0:00	15-Oct-00 12:00	35.5	64.0	74.5
2	15-Oct-00 12:00	20-Nov-00 0:00	35.5	74.5	85.0
3	20-Nov-00 0:00	25-Dec-00 12:00	35.5	85.0	95.5
4	25-Dec-00 12:00	30-Jan-01 0:00	35.5	95.5	106.0
5	30-Jan-01 0:00	6-Mar-01 12:00	35.5	106.0	116.5
6	6-Mar-01 12:00	11-Apr-01 0:00	35.5	116.5	127.0
7	11-Apr-01 0:00	16-May-01 12:00	35.5	127.0	137.5
8	16-May-01 12:00	21-Jun-01 0:00	35.5	137.5	148.0
9	21-Jun-01 0:00	26-Jul-01 12:00	35.5	148.0	158.5
10	26-Jul-01 12:00	31-Aug-01 0:00	35.5	158.5	169.0

Aanderaa Compass Calibrations

The magnetic declination is needed to correct Aanderaa current meter compasses in order to determine the absolute direction of water velocity. They are generally calibrated (spun) as close to the intended geographical location as possible so as to mimic the magnetic field at the mooring site. RCM-4 current meters employ a magnetic compass with an electric coil embedded in its wall where a clamping voltage is applied causing the wiper to contact a potentiometer thus giving a reading. The raw units given range from 0 – 1023 and engineering units are derived by the equation:

$$\textbf{Engineering Units} = 360/1023 \times N$$

where *N* represents the raw output count from the instrument.

A wide based plexi-glass turntable divided into 20 degree increments was used for the calibration. An Aanderra Digi-print was used to display data real time and record the calibration on the magnetic tape that will record the current meter data once deployed. Two wooden stakes were driven into the tundra 100 feet apart and lined up with True North established by the ship's helicopter which did three fly-by's on a true north heading using the helicopters gyro compass. The ships gyro compass was used to verify the accuracy of the helicopters gyro prior to leaving the ship.

The ship's helicopter was used to get the equipment to the shore and set up for the calibrations. The compass spins were performed at 68 35.419 N and 114 18.413 W at 1250 local ship time. The turntable and RCM-4 current meter were lined up with true north prior to beginning the calibration. The protocol was to spin the current meters in a clockwise direction every 20 degrees for 360 degrees and then back spin it in the opposite direction. The current meter was left at each position until stable readings for direction were obtained. A deviation table was created showing the True compass bearing versus the perceived RCM-4 compass bearing and corrections were performed during data processing steps.

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4. APPENDIX

4.1 SCIENCE PARTICIPANTS

Table 10. Science team

Name	Affiliation	Responsibility
Fiona McLaughlin	IOS	Chief Scientist
Ed Carmack	IOS	Physics
Julie Bacle	IOS	CTD, Data Acquisition
David Walsh	UA	CTD, Microstructure
Darren Tuele	IOS	Mooring, Biology
Mary O'Brien	IOS	Oxygen Analysis
Linda White	IOS	Nutrient Analysis
Gillian Moody	IOS	Water Column Samples
John Nelson	UVIC	Biology
Jody Deming	UW	Microbial Biomass
Llyd Wells	UW	Microbial Biomass
Arianne Balsom	UTN	Sediment Sampling; Chlorophyll
Kiyoshi Hatakeyama	JAMSTEC	Mooring Specialist
Hirokatso Uno	JAMSTEC	Mooring Technician

Table 11. Affiliation abbreviations

IOS	DFO, Institute of Ocean Sciences, BC
JAMSTEC	Japan Marine Science & Technology Center
UA	University of Alaska
UTN	University of Tennessee
UVIC	University of Victoria
UW	University of Washington

4.2 LOCATION OF SCIENCE STATIONS

Table 12. Mission 2000-22 CTD/Rosette cast locations.

Cast No.	Station	Date & Start Time			Latitude (°N)		Longitude (°W)		Depth (m)	Boatdeck Activity	Foredeck Activity
96	TP-5	Sep	2	16:14	68	49.04	108	36.18	78	CTD	
97	TP-4	Sep	2	17:10	68	47	108	31.94	122	CTD	
98	TP-3	Sep	2	18:07	68	44.05	108	25.95	130	CTD	
99	TP-2	Sep	2	19:55	68	41.01	108	20.86	73	CTD	
100	TP-1	Sep	2	20:40	68	39.02	108	17.03	29	CTD	
101	TP-1	Sep	2	20:51	68	39.02	108	17.03	29	CTD/R	SG
102	EI11	Sep	3	13:42	67	50.9	111	16.65	83	CTD	
103	EI11	Sep	3	13:49	67	50.9	111	16.59	84	CTD/R	SG/B
104	EI10	Sep	3	15:21	67	52.1	111	19.05	184	CTD	
105	EI09	Sep	3	15:45	67	52.28	111	21.52	392	CTD/R	SG/B
106	EI08	Sep	3	17:25	67	58.32	111	19.58	263	CTD	
107	EI07	Sep	3	18:17	68	3.22	111	17.86	311	CTD/R	SG/B
108	EI07	Sep	3	19:42	68	3.07	111	17.64	311	CTD	
109	EI06	Sep	3	20:36	68	8.63	111	15.8	146	CTD	
110	EI05	Sep	3	21:48	68	16.2	111	12.85	181	CTD/R	SG/B
111	EI04	Sep	3	23:13	68	18.79	111	9.61	252	CTD	
112	EI03	Sep	4	0:27	68	23.76	111	3.31	153	CTD/R	SG/B
113	EI02	Sep	4	1:33	68	26.34	110	59.89	108	CTD	
114	EI01	Sep	4	2:10	68	27.71	110	57.79	54	CTD/R	SG/B
115	DU1	Sep	4	16:11	68	49.18	113	42.53	26	CTD/R	B
116	DU2	Sep	4	16:59	68	47.32	113	50.45	48	CTD	
117	DU3	Sep	4	18:14	68	45.63	114	3.66	49	CTD/R	B
118	DU4	Sep	4	19:19	68	43.77	114	10.28	42	CTD	
119	DU5	Sep	4	20:14	68	42.68	114	25.14	29	CTD/R	B
120	DU5	Sep	5	0:06	68	42.68	114	25.16	28	CTD	
121	CP5	Sep	5	16:57	69	34.97	118	24.13	520	CTD/R	P/B
122	CP4	Sep	5	18:46	69	31.04	118	30.23	447	CTD	
123	CP3	Sep	5	19:57	69	26.28	118	36.08	315	CTD/R	P/B
124	CP2	Sep	5	21:41	69	21.04	118	43.01	165	CTD	
125	CP1	Sep	5	22:37	69	17.02	118	49.84	33	CTD/R	SG/P/B
127	AG5	Sep	7	13:59	70	32.97	122	55.55	672	CTD	
128	AG5	Sep	7	15:18	70	32.68	112	55.25	666	CTD/R	MR/P/B
129	AG1	Sep	7	21:50	69	52.24	122	56.45	51	CTD/R	SG/P/B
130	AG2	Sep	7	23:39	69	58.3	122	56.61	212	CTD	
131	AG3	Sep	8	0:38	70	2.43	122	56.32	294	CTD/R	P/B
132	AG4	Sep	8	2:49	70	10.81	122	56.44	404	CTD	
133	AG5	Sep	8	14:01	70	33.26	122	54.22	672	CTD	MD
134	AGT	Sep	9	3:29	70	47.93	125	0.22	319	CTD/R	P/B
135	LW1	Sep	9	17:50	72	23.96	129	30.76	450	*CTD/R	
136	LW2	Sep	9	20:03	72	24.49	129	40.72	596	*CTD/R	
137	LW3	Sep	10	22:18	72	33.28	130	17.57	1212	*CTD/R	P/B
138	CK5	Sep	12	16:50	71	56.5	127	44.99	419	CTD/R	B

Cast No.	Station	Date & Start Time			Latitude (°N)		Longitude (°W)		Depth (m)	Boatdeck Activity	Foredeck Activity
139	CK5	Sep	12	17:54	71	56.52	127	45.04	429	CTD	
140	CK4	Sep	12	19:13	71	56.5	126	59.94	360	CTD	
141	CK3	Sep	12	20:13	71	56.5	126	39	190	CTD/R	SG/B
142	CK2	Sep	12	22:15	71	56.54	126	16.05	52	CTD	
143	CK1	Sep	12	22:52	71	56.51	125	59.89	25	CTD/R	B
144	AGT2	Sep	13	21:14	71	33.87	130	35.22	269	CTD/R	P/B
145	AGT2	Sep	13	22:17	71	38.48	130	35.13	258	CTD	
146	AGT3	Sep	14	4:56	71	17.86	126	29.78	460	CTD/R	
147	WB1	Sep	14	13:00	70	33.54	129	26.05	320	CTD/R	P/B
148	WB2	Sep	14	14:40	70	28.63	126	56	284	CTD	
149	WB3	Sep	14	15:39	70	25.83	127	12.54	195	CTD	B
150	WB3	Sep	14	16:04	70	25.85	127	12.46	193	CTD/R	P
151	WB4	Sep	14	16:59	70	24.44	127	18.34	58	CTD	B
152	WB5	Sep	14	17:29	70	23.98	127	22.46	34	CTD/R	SG/P/B
153	WB6	Sep	14	18:43	70	23.95	127	24.57	24	CTD/R	
154	AGT4	Sep	15	15:34	70	15	121	40.05	439	CTD/R	
155	DT01	Sep	15	20:18	69	39.05	120	49.14	30	CTD/R	SG/P/B
156	DT02	Sep	15	21:22	69	40.98	120	42.04	236	CTD	
157	DT03	Sep	15	21:55	69	43.02	120	40.03	239	CTD/R	P/B
158	DT04	Sep	15	23:18	69	47.99	120	30.05	270	CTD	
159	DT05	Sep	16	1:28	69	58.86	120	4.69	489	CTD/R	P/B
160	BD33	Sep	17	0:38	68	23.44	112	52.16	165		SG
161	BD34	Sep	17	15:01	68	57.8	106	34	101		SG

** Collected for biomass only*

Key

CTD	Conductivity-Temperature-Depth
R	Rosette
SG	Sediment Grab
P	Phytoplankton Net
B	Bongo
MR	Mooring Recovery
MD	Mooring Deployment

Table 13. IOS Mission 9924 and 2000-22 mooring locations.

Activity	Station/ Mooring	Date & Start Time (GMT)	Latitude (°N)		Longitude (°W)		Depth (m)
Deployment	AG99-24	Sep 4/1999 19:10	70	33.15	122	54.34	
Recovery	AG99-24	Sep 7/2000 15:18	70	32.68	112	55.25	666
Deployment	AG5-2000	Sep 8/2000 14:01	70	33.26	122	54.22	672
Deployment	J-CAD2	Sep 10/2000	72	48.00	130	07.80	
Recovery	AG-J-99	Sep 13/2000 15:31	71	33.58	130	34.04	251
Deployment	AG-J-00	Sep 13/2000 9:55	71	33.82	130	34.87	271

Table 14. River sampling locations.

Station	Date	Latitude (°N)	Longitude (°W)	River
WZ	Sep/03/2000	67 50.40	110 33.60	Wenzel River
HR1	Sep/14/2000	69 54.00	127 03.60	Horton River
HR2	Sep/14/2000	69 57.00	127 07.20	Horton River
HR3	Sep/14/2000	00.00	127 07.80	Horton River

Table 15. Phytoplankton sampling locations.

Cast No.	Station	Date & Start Time			Latitude (°N)		Longitude (°W)		Depth (m)	Sampling
121	CP5	Sep	05	16:57	69	34.97	118	24.13	520	Net
123	CP3	Sep	05	19:57	69	26.28	118	36.08	315	Net/Water
125	CP1	Sep	05	22:37	69	17.02	118	49.84	33	Net/Water
128	AG5	Sep	07	15:18	70	32.68	112	55.25	666	Net/Water
129	AG1	Sep	07	21:50	69	52.24	122	56.45	51	Net/Water
131	AG3	Sep	08	00:38	70	02.43	122	56.32	294	Net/Water
134	AGT	Sep	09	03:29	70	47.93	125	00.22	319	Net
137	LW3	Sep	10	22:18	72	33.28	130	17.57	1212	Net
144	AGT2	Sep	13	21:14	71	33.87	130	35.22	269	Net
147	WB1	Sep	14	13:00	70	33.54	129	26.05	320	Net
150	WB3	Sep	14	16:04	70	25.85	127	12.46	193	Net/Water
152	WB5	Sep	14	17:29	70	23.98	127	22.46	34	Net/Water
155	DT01	Sep	15	20:18	69	39.05	120	49.14	30	Net/Water
157	DT03	Sep	15	21:55	69	43.02	120	40.03	239	Net
159	DT05	Sep	16	01:28	69	58.86	120	04.69	489	Net

Table 16. Zooplankton bongo net cast locations; net diameter was 0.2530 m with mesh size 235 µm.

Station Name	Cast No.	Date	Latitude (°N)	Longitude (°W)	Depth (m)	Volume (m^3)	ID	DNA	Biomass
EI11	103	9/3/2000	67 50.90	111 16.59	85			yes	yes
					85		yes		
EI9	105	9/3/2000	67 53.28	111 21.52	150		yes		yes
					50			yes	
EI7	107	9/3/2000	68 03.22	111 17.86	150		yes		yes
					150			yes	
EI5	110	9/3/2000	68 16.20	111 12.85	150			yes	
					150		yes		yes
EI3	112	9/4/2000	68 23.76	111 03.31	150		yes		yes
EI1	114	9/4/2000	68 27.71	110 57.79	40		yes		yes
DU1	115	9/4/2000	68 49.18	113 42.53	150		yes		yes
DU3	117	9/4/2000	68 45.63	114 03.66	30		yes		yes
								yes	
DU5	119	9/4/2000	68 42.68	114 25.14	19		yes		yes
								yes	
CP5	121	9/5/2000	69 34.97	118 24.13	150	31.40	yes		yes
								yes	
CP3	123	9/5/2000	69 26.28	118 36.08	150	31.40	yes		yes
								yes	
CP1	125	9/5/2000	69 17.02	118 49.83	20	4.19	yes		yes
								yes	
AG5	128	9/7/2000	70 32.68	122 55.25	150	49.48	yes		yes
								yes	
AG1	129	9/7/2000	69 52.24	122 56.45	40	8.37	yes		yes
								yes	
AG3	131	9/8/2000	70 02.43	122 56.32	150	16.06	yes		yes
								yes	
AGT	134	9/9/2000	70 47.93	125 00.22	150	41.69	yes		yes
								yes	
LW3	137	9/10/2000	72 33.28	130 17.57	150		yes		yes
								yes	
CK5	138	9/12/2000	71 56.50	127 44.99	150		yes		yes
								yes	
CK3	141	9/12/2000	71 56.50	126 39.00	150		yes		yes
								yes	
CK1	143	9/12/2000	71 56.51	125 59.89	10		yes		
AG99	144	9/13/2000	71 33.87	130 35.22	150	28.64	yes		yes
WB1	147	9/14/2000	70 33.54	126 26.05	150	30.27	yes		yes
								yes	
WB3	149	9/14/2000	70 25.85	127 12.46	150	27.73	yes		yes
								yes	
WB5	151	9/14/2000	70 23.98	127 22.46	25	5.44	yes		yes
WB6	152	9/14/2000	70 23.95	127 24.57	10	2.61	yes		yes
DT1	155	9/15/2000	69 39.05	120 49.14	20	4.19	yes		yes
								yes	
DT3	157	9/15/2000	69 43.02	120 40.03	150	31.40	yes		yes
								yes	
DT5	159	9/16/2000	69 58.86	120 04.69	150	47.85	yes		
					150			yes	

4.3 CTD Calibration and Processing Summary

4.3.1 CTD Calibration

Table 17. Calibration Information for Guildline CTD Model 8715, S/N 43825.

Sensor		Pre-Cruise		Post-Cruise	
Name	**Serial No.**	**Date**	**Location**	**Date**	**Location**
Pressure	114489	03 Feb 2000			
Temperature	57915	11 Feb 2000	IOS		
Conductivity	58814	June 1999			
Transmissometer	598	15 Jan 2000	IOS	16 Jan 2001	IOS

Table 18. Calibration Coefficients for Guildline CTD Model 8715, S/N 43825.

ChannelName	Formula Number	Coefficients	
		C1	**C2**
Pressure		-.227331	-5.57726E-4
Temperature	10	.0104305	.9999472
Conductivity	10	.001018911	.998756
Pre-cruise Transmissivity	10	-2.31422	115.6648101
Post-cruise Transmissivity	10	-2.37736	118.8203774

Table 19. Calibration Information for SEABIRD CTD Model 19 SEACAT, S/N 2688.

Sensor		Pre-Cruise		Post-Cruise	
Name	**Serial No.**	**Date**	**Location**	**Date**	**Location**
Temperature	2688	16 Dec 1999	Factory		
Conductivity	2688	16 Dec 1999	Factory		
Pressure Sensor	1920437-2688	28 Dec 1999	Factory		

4.3.2 CTD Processing Summary

Cruise: 2000-22
Agency: IOS
Project: Arctic 2000
Geographic Area: Arctic / Gulf of Alaska
Scientific Party Chief: Fiona McLaughlin
Platform: *CCGS Sir Wilfrid Laurier*
Date of Cruise: 2 September – 16 September, 2000
Processed by: Germaine Gatien
Date of Processing: 2 January 2001 – 31 March 2001
Number of original casts: 189
Number of casts processed: 174

Summary of Quality and Concerns

There are many problems with the temperature data. As was found in 1999, Guildline CTD data included the shifted values of temperature, either single points or groups of point; these were probably associated with a malfunction of the Range/Suppression encoding of temperature by the A/D converter in the CTD.

In the 2000 data there were also shifts in temperature (and a few shifts in conductivity) that did not occur during the 1999 season. These shifts are generally small, but the effect accumulates so that the errors are worst for some of the deepest casts; there may also be some direct pressure factor since some casts seem notably worse below 300 or 400 m. Note is made in the headers of casts which appear to be most suspect.

The pressures should be considered to be within ±0.5 db.

The salinity should be considered good to only ±0.01 units for the better casts, and is highly suspect for others. Errors as large as 0.25 units have been found in the bottle comparisons.

Transmissivity is unedited and problems were noted at sea for casts #138 to 152.

GUILDLINE CTD

1. Preliminary Steps
The data files (*.acq and *.hdr) were obtained.
The Log Book was obtained and note was made of problems that occurred during the cruise.
The cruise summary sheet was completed.
The header summary and header check were examined.
For all casts the year is given as 1999; this was done on purpose as the acquisition system did not work with the year as 2000. The years were corrected in the headers.

2. Conversion
The data was converted using the IOS SHELL program ACQCONV. HEADEDIT was used to add administration details to the headers. (The edited files were named RA1, then RAW was deleted and RA1 renamed RAW).

3. Calibration
The data was calibrated using file 2020cal.ccf which contained pre-cruise calibrations for pressure, temperature and conductivity. Salinity was calculated to aid editing, but will be recalculated later. There were both pre-cruise and post-cruise calibrations for transmissivity. The pre-cruise calibrations were used; the post-cruise calibrations produce values of about 1.03 times the pre-cruise values. Both sets of calibrations are given below.

4. Despiking
1) The routine ADD TIME CHANNEL was used to add a record number to each file. Plots were made on-screen of P, T and C vs record number and estimates were made of record # limits for the downcast. These limits were used in running CLIP to create smaller files for the rest of the processing. This made plotting much easier.
2) Profile plots of T, C and S vs. record number were then prepared and these were used to identify problem areas. In some cases CLIP was rerun to ensure the full downcast was obtained.
3) The data was then examined in VIEWEDIT and despiking done on P, T and C. The pressure and conductivity have a lot of fine-scale noise but little spiking. The temperature channel is corrupted by shifts in values. Sometimes the trace shifts back to expected values but in many cases does not appear to do so. Where possible the editor was used to shift blocks of data that were obviously wrong.
4) After this step the casts were put through CLEAN to fix the headers.

The question of shifts in temperature was investigated more closely at this stage. The temperature data suffers from corruption by bad points that come in small groups (typically 2 to 10 points); the Guildline data from the 1999 Arctic trips had the same problem. As was done in 1999, such bad points were removed by interpolation wherever they were obvious. This problem was not noticeable in the casts done in the Pacific Ocean (other missions), so low temperatures are presumably a factor.
More serious problems were noted in the temperature and conductivity records; there are many jumps in T (~0.02 °C) where the conductivity is smooth and some in conductivity where the temperature is smooth. This was noted in both oceans in deeper water. While shifts may occur in shallow water they may be masked by higher gradients. Also the shallow bottles suggest there is no problem, but the shifts were generally all in the same direction so the effect is cumulative leading to deteriorating quality as the cast proceeds. A few casts with such jumps were examined and the upcasts and downcasts looked quite different.

A preliminary comparison was done between the salinity from the Guildline CTD and the bottle salinities. It was found that some casts looked good, while others

showed very large differences. In general the casts with bad salinity values were also ones that had downcasts looking notably different from upcasts. In some cases there appears to be a block of data that is offset, and shifting such blocks seems to produce a reasonable result. In most cases there are a series of jumps in the same direction so that the effect is cumulative. Shifting data was attempted, but there are bound to be significant errors in this operation. There are a number of casts where bottles could be used to judge the effect of such editing. In two cases (casts #105 and 121) there is sufficient improvement to suggest that the data would be useful although for #121 it is still poor below 350 m. For most casts there was not sufficient improvement to recommend using the data.

5. Time Compensation
Temp. probe Dist (m): .00 Sample period (sec): .04

6. CELLTM
CLEAN was used to replace pad values with interpolated values. Then CELLTM was run with alpha = 0.08 and tau = 1.6 s.

7. Calculate Salinity
DERIVED QUANTITIES was used to recalculate salinity as a function of Temperature:Cell.

8. DELETE
The following DELETE parameters were used:
- Surface Record Removal: Last Press Min
- Maximum Surface Pressure (relative): 20.0
- Surface Swell Pressure Tolerance: 0.5
- Pressure not filtered.
- Swells deleted. Warning message if pressure difference of 2.00
- Drop rates < .30m/s (calculated over 15 points) will be deleted
- Sample interval = .04 seconds.

The DELETE log was examined to check that no useful data was lost.

9. Hand Editing and Test Plots
Page plots were produced to aid in editing.
2000-22: CTDEDIT was used to clean T & S in all casts except: #102-103, 115, 117, 142 and 157-161. Casts #96,100,101,116,118,119,125,129 and 143 were edited only in the top 20m and/or near the bottom.

10. Bin Average
The following Bin Average values were used:
Bin channel = pressure
Averaging interval = 0.500
Minimum bin value = 0.000
Average value will be used
Interpolated values are NOT used for empty bins

11. Comparison with Bottle Data

The rosette was attached to the SBE-19 CTD so the pressures recorded need to be adjusted to match those of the GUILDLINE CTD. The deepest pressures were noted for 25 casts in 2000-20 and the Guildline was found to have pressures 0.4 db higher on average. (See Pres_Diff.xls in Processing section of 2000-20). However, this included some deep casts where the pressure differences were smaller. For casts less than 200 m deep the average was 0.48 db probably reflecting the fact that the pressure sensor had not fully equilibrated. I chose to add 0.5 db to the SBE pressures in selecting Guildline salinity values. In fact, for some of the deep casts this gave a pressure higher than the deepest data point. In those cases the deepest Guildline data point was selected as long as the pressure was reasonably close to the SBE pressure. I believe that this method leads to the best possible match. However, since the salinity accuracy is at best ±0.01 units great precision in the pressure is not necessary. And since the SBE samples only twice per second there is an inherent error of the order of 0.5 db.

2000-22: The bottle salinities were compared with the Guildline salinities in the bin-averaged files. Some casts were found to be significantly worse than others. When all casts and all bottles below 50 m were included, the differences were found to be 0.041units with the CTD higher than the bottles. It was decided to remove from the comparison the dubious casts, bottles above 100 m and bottles near the bottom that had differences out of line with others in the same cast. The average differences were then 0.018 units of salinity.

12. Recalibration

A pressure offset of +1.0 was applied to the data. This was based on an examination of 18 casts looking for the pressure associated with the first non-zero conductivity value for the downcast and the last non-zero conductivity value of the upcast. There is a lot of variability and the upcasts did not generally include non-zero conductivity values. The range of values was –0.18 to –1.13. While there were few zero conductivity values available from the upcasts, the casts often stopped at about –1.0 db with very low conductivity. This is probably a reasonable estimate for the surface pressure. While there may be some hysteresis the errors associated with the downcast are probably more significant. For example the soak time was highly variable and the pressure may not have fully stabilized at the time the casts began. On balance using a value of +1.0 db for the pressure offset seems reasonable.

The results from 1999 showed the CTD to be high by 0.014 units which is reasonably close to the 0.018units found for 2000-22 (using none of the obviously bad casts). Given the uncertainties with the 2000 data it was decided to apply the corrections used in 1999.

December 8, 2003: The CTD salinity data was recalibrated by adding 0.01 units of salinity based on an analysis of the bottle flushing during 2000-22. The CTD data at bottle stops are from the downcast Guildline CTD; they were found by

matching the SBE-19 bottle trip pressures to the Guildline after correcting for the SBE-19 bottom offset with +0.6 db. Further pressure corrections were made for the physical offset between Guildline sensors and bottle centre (-1.1 db), and for the offset due to bottle flushing and fluid dynamics around the package, with -2 db correction for the downcast bottles and +4 db for the upcast bottles.

13. Final Plots
Page plots were prepared using the edited data.

14. Header Edit and Remove Channels
The following warning was added to all headers:

GENERAL WARNING: Due to intermittent problems with the temperature signal for the Guildline CTD the quality of temperature and salinity data is doubtful. Investigators are encouraged to read the processing report before using this data. Casts for which severe problems were noted have special warnings in the headers. The salinity should be considered to be ±0.01 units at best and errors as large as 0.25 units of salinity have been noted. This implies errors in temperature of up to 0.25 °C.

For casts in which particularly large errors are suspected a special warning was added to the headers.
The following channels were removed from all casts: record #, conductivity_ratio and temperature:cell. The salinity format was chosen as F9.2 to indicate to investigators that the confidence in salinity quality is not as high as usual.

15. Produce Final Files
a) The final files were renamed *.ctd.
b) A cross-reference listing was produced.

SEABIRD 19 CTD

Note: The SeaBird data was partly processed in order to obtain pressures for bottle comparisons and to compare with some Guildline casts where the quality was in doubt. The data has not been fully processed. None of the data has been recalibrated.

1. Seasave
This step was completed at sea; the raw data files are *.hex.

2. Preliminary Steps
The CTD Log sheets were obtained.
Salinity data was obtained.
The cruise summary sheet was completed.
The data files were identified by the names such as SBE-109; these were renamed in standard IOS format except that the number 9 was entered in the 5th place to identify the casts as Seabird as opposed to Guildline.

3. Conversion of Raw Data
The raw data was converted using conversion file SBE-101.con. The calibrations used for temperature and conductivity were from a calibration done in December 1999.

4. Filter
The conductivity was low-pass filtered with a time constant of 0.5 s to force it to have the same response as the temperature. The pressure was filtered with a time constant of 2 s to increase the pressure resolution.

5. ALIGNCTD
Temperature was advanced relative to pressure by 0.7 s using ALIGNCTD. This value was chosen as it produced the best results in spike reduction on a test cast and has been used in the past for SEACAT data.

6. DERIVE
Program DERIVE was run to calculate salinity.

7. Conversion to IOS Headers
The IOSSHELL routine for Sea Bird ASCII files was used to convert the Sea-Bird data to IOS Headers.

8. Checking Headers
Header checks and header summaries were run for only for 2000-22 and many errors found in times and positions. These were corrected.
The cruise track was plotted after the above-mentioned corrections and looked reasonable.

9. Test Plots
Profile plots were produced to check agreement of up and down casts and to look for any problems. Problems were found in cast #106 – From 65 to 180 db and near the bottom there are notably different up and downcasts. The upcast looks like adjacent casts, so that was used instead of the downcast.

10. DELETE
CLEAN was run to replace pad values with interpolated values and then DELETE was run.
The following DELETE parameters were used:
Surface Record Removal: Low Salt & Last Press Min
Maximum Surface Pressure (relative): 20.00
Surface Swell Pressure Tolerance: 0.5
Pressure NOT filtered (done in Step 4)
Swells deleted. Warning message if pressure difference of 2.00
Drop rates < .30 m/s (calculated over 5 points) were deleted.
Sample interval = .5 seconds.
The Delete log was examined; casts were examined where there were warnings other than those near the surface, bottom or in the upcast. For cast #99 there

was a problem caused by some bad data during the soak period which led to DELETE removing the top 30 m of the cast. A text editor was used to remove the bad data and DELETE was rerun.
Casts were also examined for which the last depth differed from the maximum sampling depth recorded in the CTD log.

11. Test Plots (Done for 2000-22 only)
Page plots were produced and were examined for spikes and instabilities to guide the use of CTDEDIT.

12. CTDEDIT (Done for 24 casts from 2000-22 only)
The SBE casts were edited only for the 2000-22 casts for which the Guildline data is suspicious. Note was made of the editing details in the relevant files

13. Intercomparisons

COMPARE – Spreadsheets were available with salinity bottle data. These spreadsheets were converted to individual cast files, which were given the extension HYD. Note that the headers were not corrected so that times and positions are incorrect in most cases. The ROS files were converted to IOS Header files which were renamed as BOT files. The COMPARE routines were then run treating the data separately to see if the 4 legs had significant differences. Only bottles from 100m down were included in the analysis. (See 2022comp.xls)
The CTD salinity was high for all four Arctic missions on the Laurier but the differences varied greatly, with average differences for the four legs being 0.013, -0.003, 0.029, 0.055. The second leg had only two bottles and the fourth leg only 6. While there is some suggestion of time dependence in the differences, this may well be a geographic effect. While the differences rise during Leg 3, they appear to go down during Leg 4, and there are casts that don't fit the pattern at all. All the data was combined and an average of the points below 100 db was 0.028 units. (See 2020ALL.xls).

Previous Use of CTD – The Guildline and SBE-19 were compared for some casts from 1999. During that season the Guildline gave satisfactory results and was recalibrated using bottles. The SBE-19 results suggest that the temperatures are too high and the salinity low. There was a lot of variation in the differences and there seems to be geographic aspect to the differences. Perhaps they reflect the local gradients or the weather (and resultant descent rate problems).
There is insufficient information to judge the accuracy of the calibration.
NOTE: The following steps have not been carried out and are listed only to indicate what further work should be done before archiving this data.

14. Recalibration (THIS STEP HAS NOT BEEN DONE ON ANY DATA)
The surface pressures were checked by looking at the first and last non-zero values. The pressures are fairly noisy and the sampling rate low, so this is

approximate, but a value of -1.6 db is estimated. So the pressure should be recalibrated by adding 1.6 db.
The SeaCat data should be recalibrated to lower the salinity by 0.028 units and the temperature by 0.015 °C.

Intercomparison of Guildline vs SBE and Choice of Data for Archive

A study was made of whether the SBE-19 data might be useful as a check on the Guildline CTD or as a replacement for bad Guildline casts. The data from 1999 (when the Guildline was believed to have performed reasonably well) were used to compare the two instruments. The Guildline data had been edited and recalibrated. The SBE data was unedited and uncalibrated. The differences were highly variable. In a repeat cast where the Guildline showed good repeatability, the SBE did not. In some areas the SBE and Guildline gave similar results with the SBE-19 temperatures high by about 0.015 °C and salinities low by about 0.03 units. The shape of the T-S curves were similar. The problems with the SBE-19 salinity are probably related to its poor response in areas of high temperature gradient; fairly heavy editing does lead to profiles that resemble the Guildline more closely. The worst results seem to be for casts with a noisy descent rate.
The conclusion is that if the Guildline and SBE look alike, the Guildline data is probably good. However, if they do not, it is not clear which CTD would have the better data.

A preliminary look at the 2000 data suggests that the SBE is not very reliable. Two casts were selected for which the Guildline data looked good with salinities close to bottles and upcasts and downcasts close. In one case (cast #128) the SBE has a similar shape to the Guildline and the differences in temperature are very small and the differences in salinity are about 0.06 units which is larger than in 1999. In 1999 the Guildline was 0.014 higher than the bottles and the SBE was about 0.026 units higher than the Guildline. So if the calibrations have not changed we expect the SBE to be about 0.04 higher than the bottles. For the other (cast #138) the differences at depth are of the opposite sign to those found at #128 and the sign changes with depth. It appears that the salinity is the problem with an excursion to values 0.15 units lower between 220 db & 350 db. The Guildline data looks smooth through this area.

A multi-step procedure was arrived at to determine the reliability of the Guildline casts. The results of these procedures will be noted in the headers of any casts for which the quality appears to be poor. Headers will be entered in all casts noting that for all the data the quality is limited with expected errors on the order of 0.01 units. Special note was made in the headers of casts for which one of the following conditions applied:

- if the upcast looked very different from the downcast.
- if steps in only T or only C were obvious in the downcast.
- if deep salinity bottles did not compare well with CTD data. (Not available for all casts).

PARTICULARS

In this section the following abbreviations will be used:

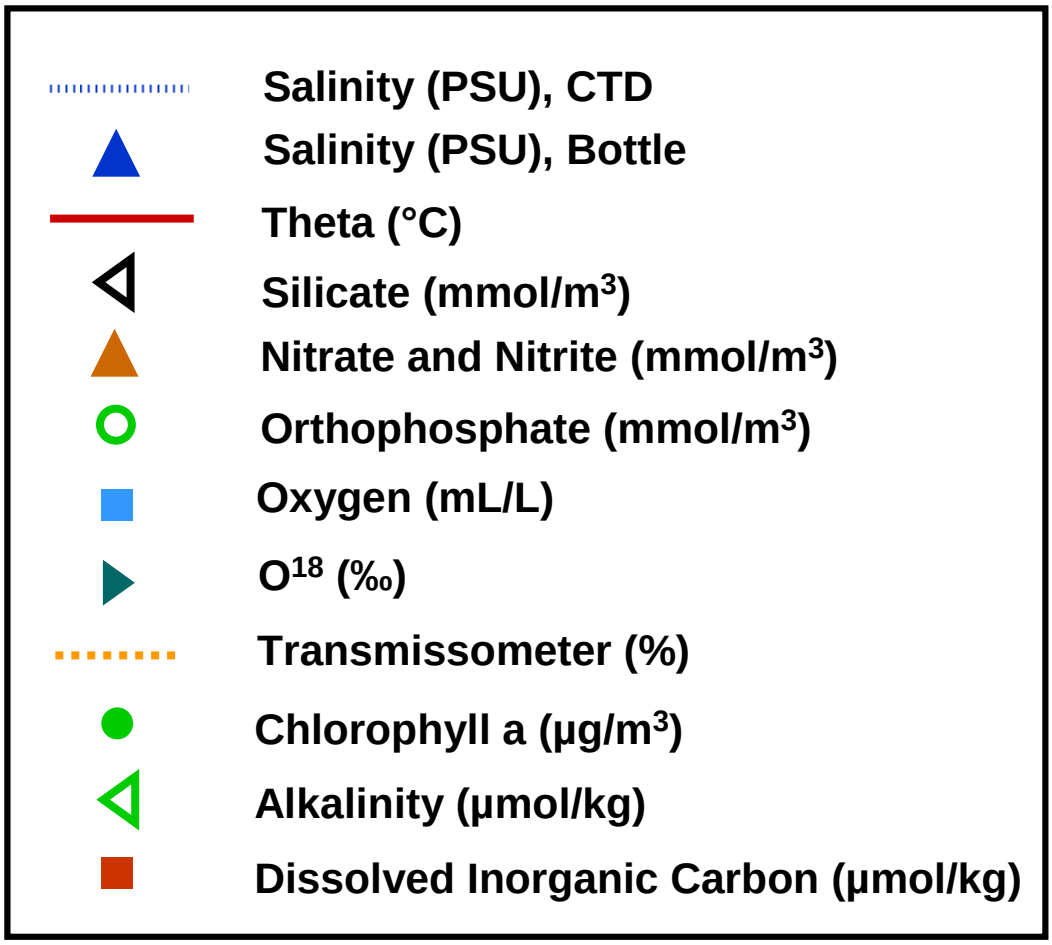
PV – Poor validation with bottles.
UD – Upcasts differ significantly from downcasts.
SH – Shifts noted in temperature and/or conductivity.

2000-22

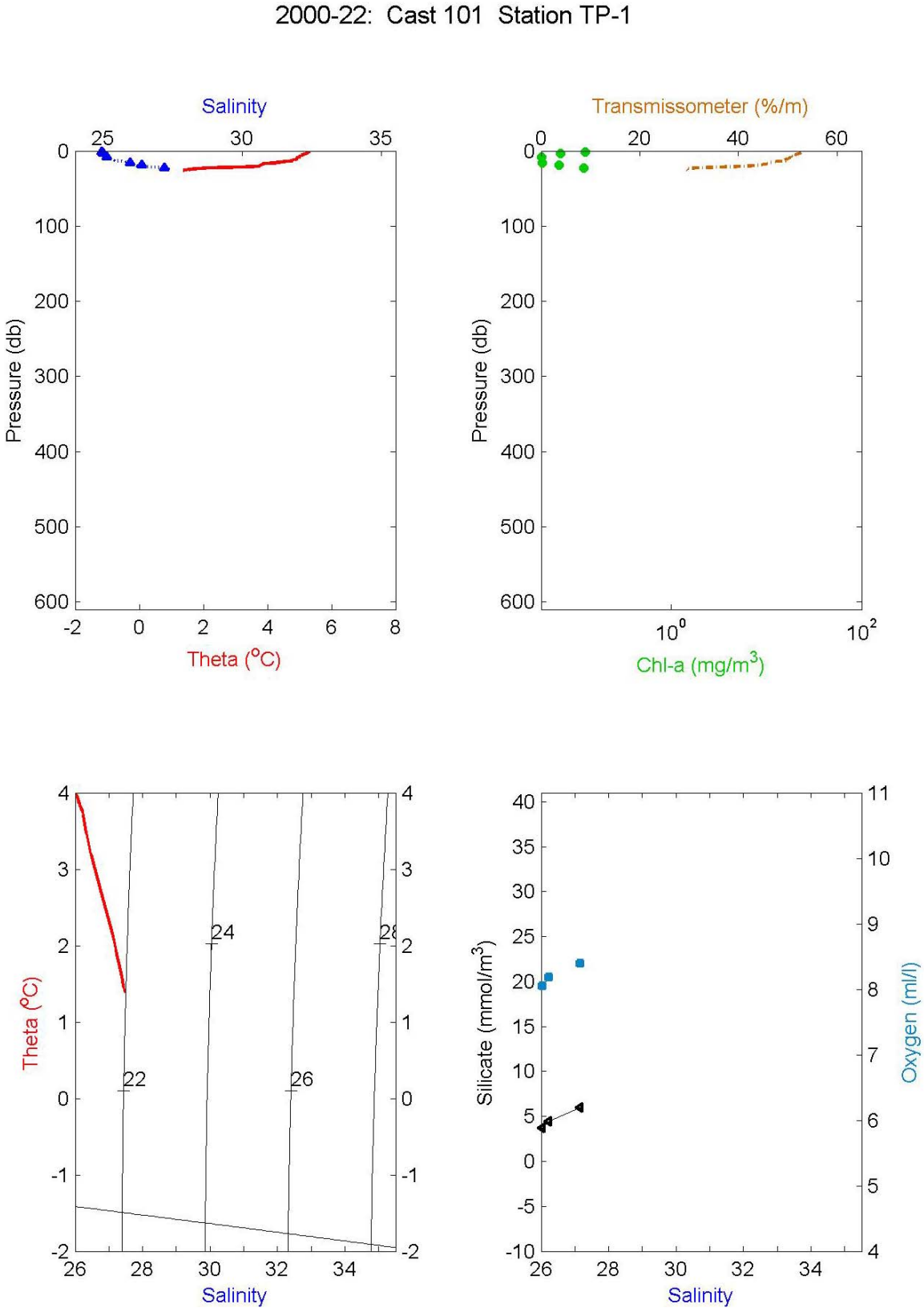
96 – SH
97 – SH
98 – CTD touched bottom. SH
99 – A text editor was used to remove bad data at the beginning of this cast.
101 – Descent at half-speed; interested in bottles only
103 – Descent at half-speed; interested in bottles only
104 – PV, SH
105 – PV, UD, SH. Comparison improved considerably with editing so probably ok.
106 – UD, SH. For the SBE-19 the upcast was used.
107 – PV, UD, SH
108 – Test cast only and quality bad. DELETE.
110 – CTD touched bottom.
111 – SH
113 – SH
117 – SH
121 – PV, UD, SH. Before editing bottle comparison good to 150 m. After editing comparison good to 350 m. Should be very careful below 350 m as the data looks very odd.
122 – UD, SH. Looks ok to 150 m but very odd below that.
123 – PV, UD, SH. Poor at all depths.
124 – SH
126 – Special cast. DELETE
133 – Special cast. DELETE
131 – CTD touched bottom
136 – SH
137 – UD, SH
138 – SH Shifts in both C and T
138 – 152 – problems with transmissivity noted in CTD log including noise and unbelievable values. Various fixes tried including adding a strap to transmissometer to reduce movement and entering new calibrations. The problems may have been due to a short that could have affected temperature and conductivity.
140 – SH
141 – PV, SH. Data of highly suspicious quality.
145 – Test cast and plug left on conductivity. DELETE.
146 – SH – C has shifts.
147 – C and T needed editing, but not heavily. Bottle comparison good.
150 – Repeat of cast 149
154 – Up and downcasts looked different. No obvious problems noted in downcast. Bottle comparison good. CHECK.
155 – CTD may have hit bottom. Up and downcasts different but cast is shallow. Probably ok.
159 – Small shifts in T and C. Bottle comparison good except at the bottom. CHECK.

4.4 INDIVIDUAL STATION PLOTS

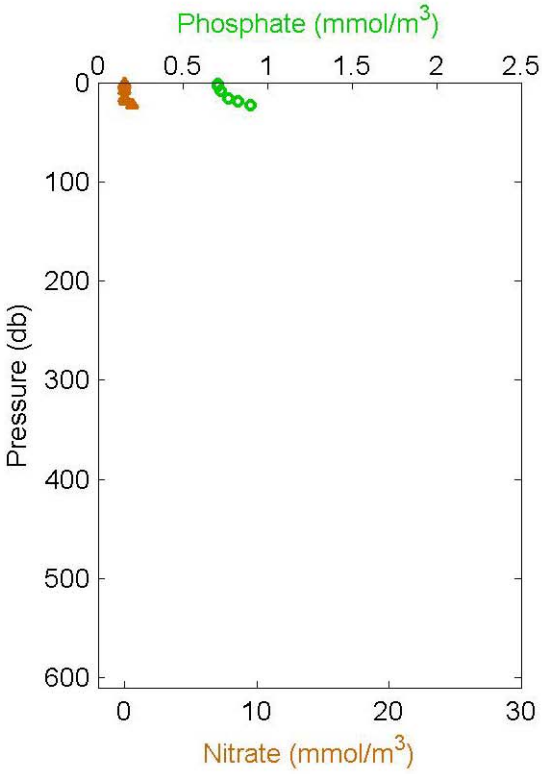
The following section contains data plots for each CTD cast taken on Cruise 2000-22. See below for property legend for the individual station plots.

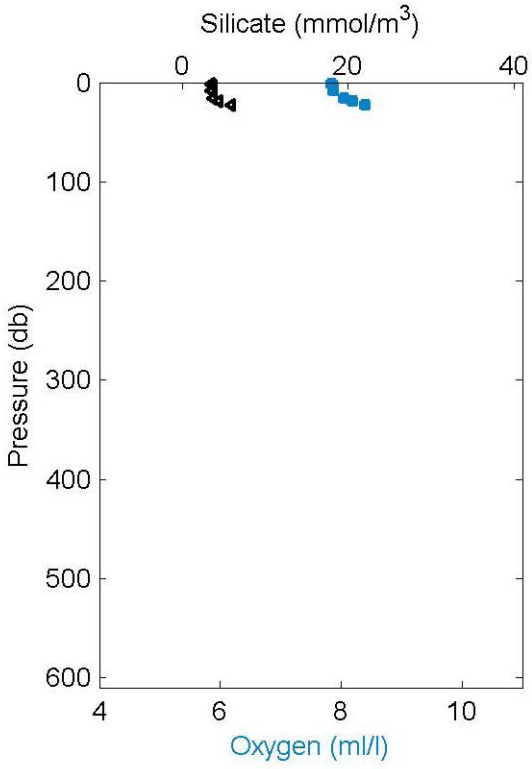


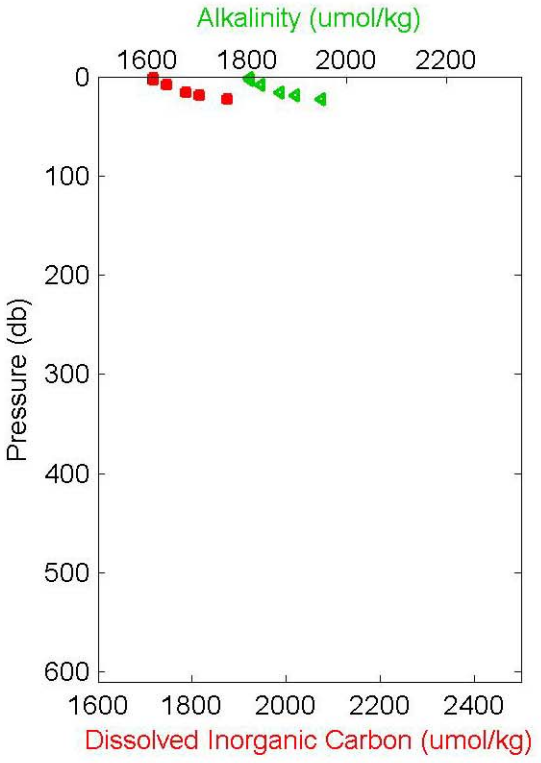
4.4.1 CTD/Rosette

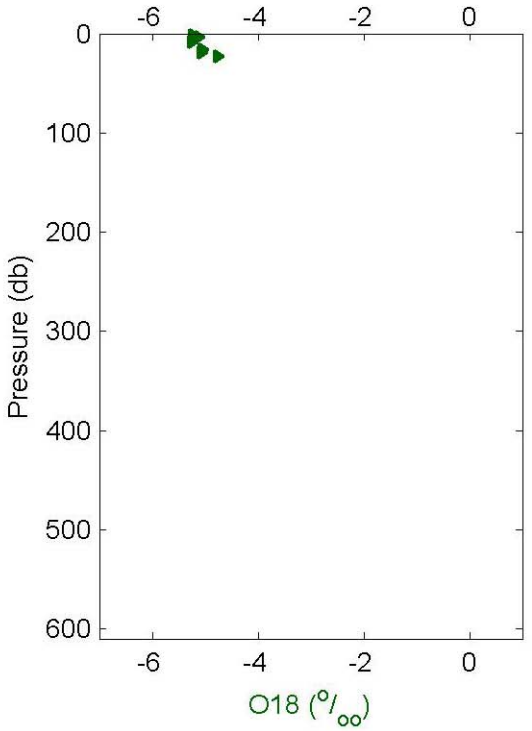


2000-22: Cast 101 Station TP-1

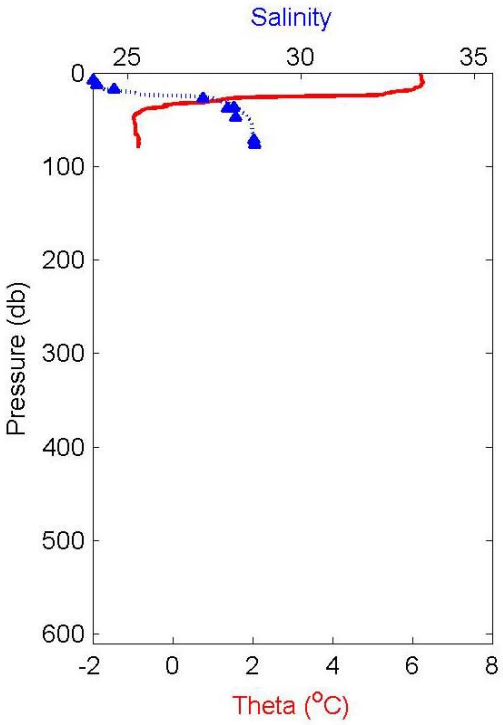


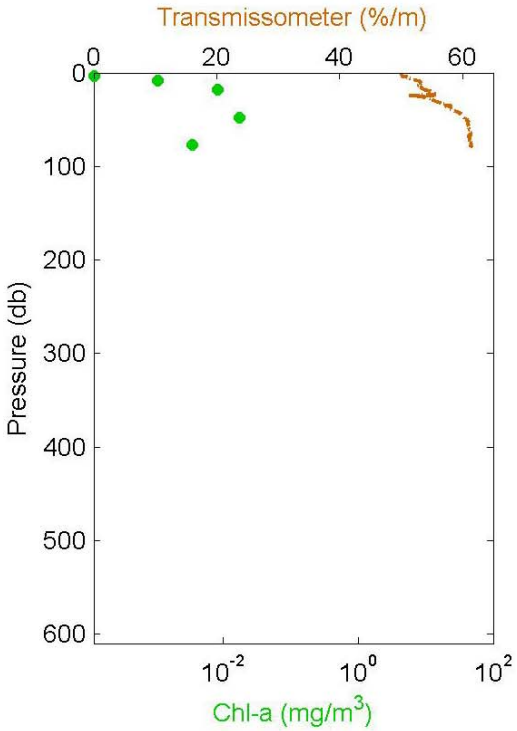


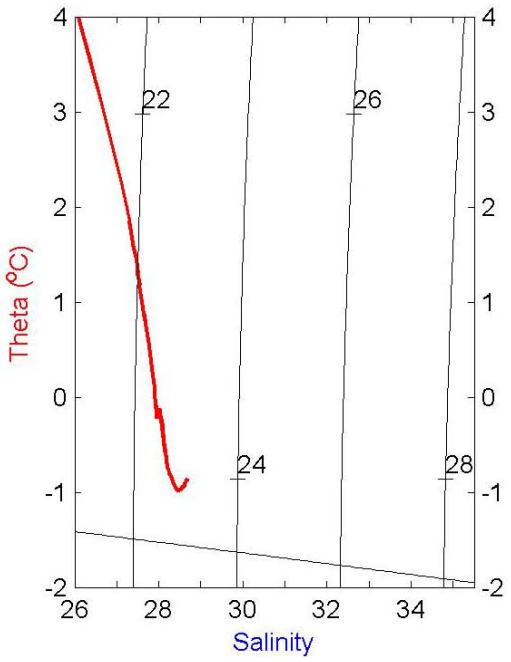


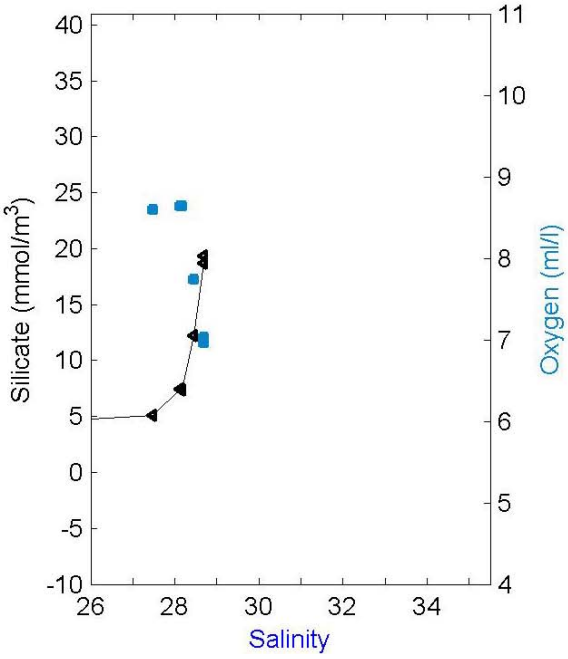


2000-22: Cast 103 Station EI11









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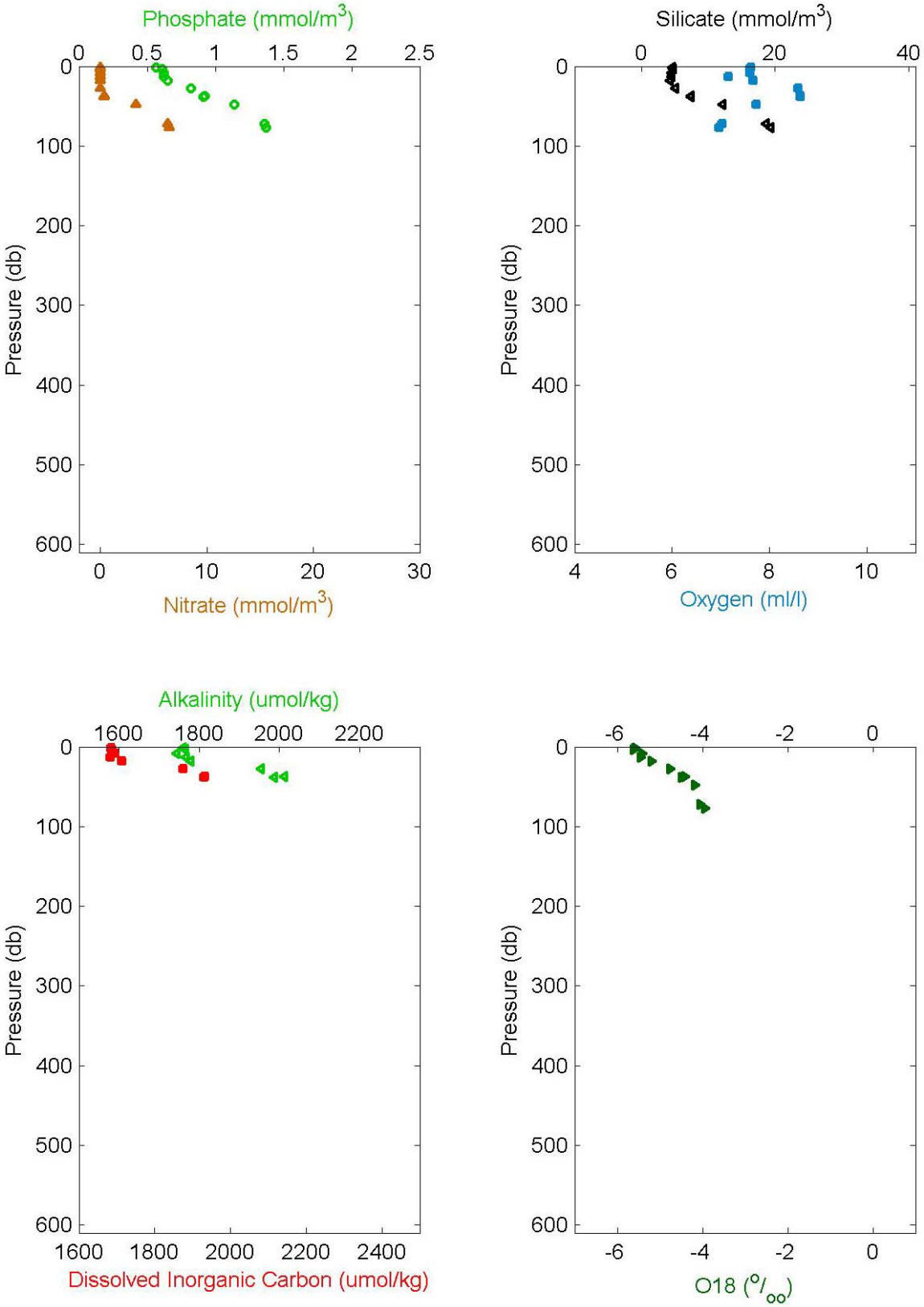
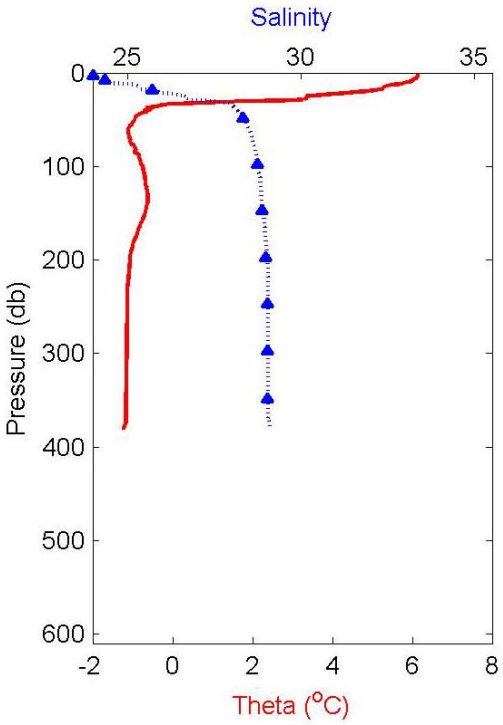
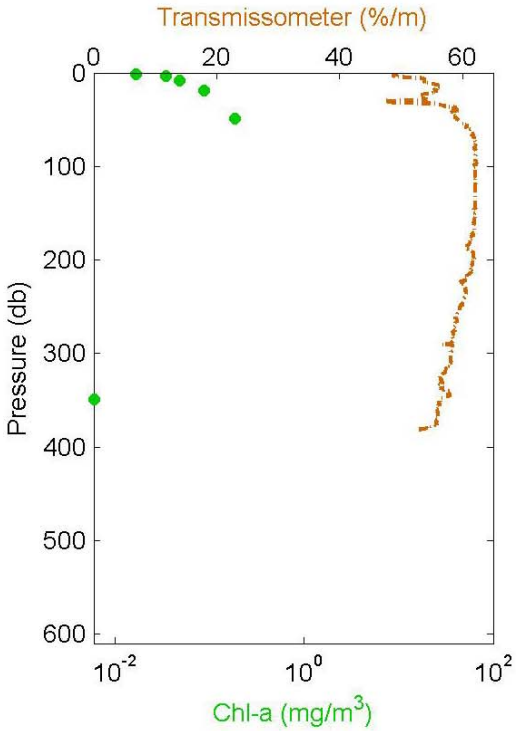
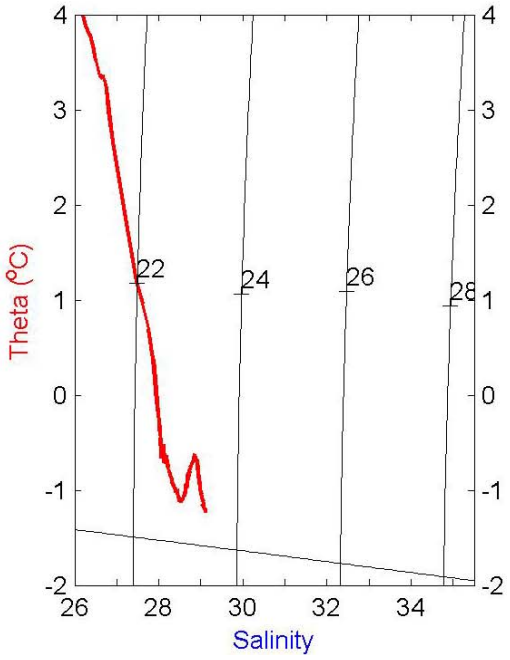
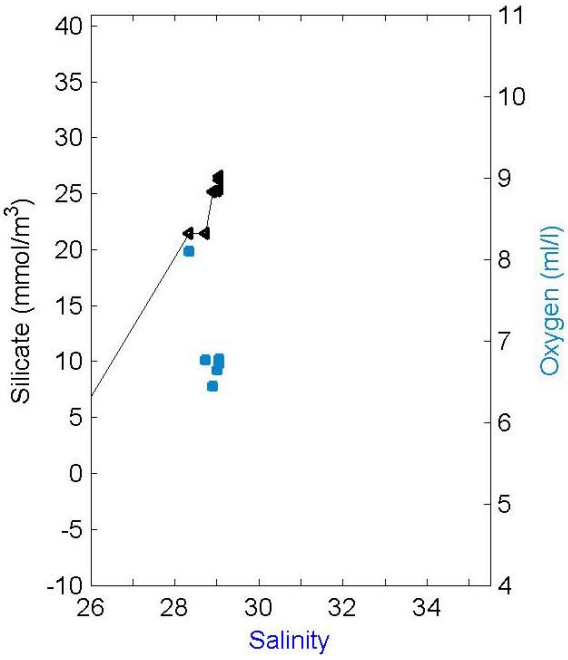


2000-22: Cast 105 Station EI09









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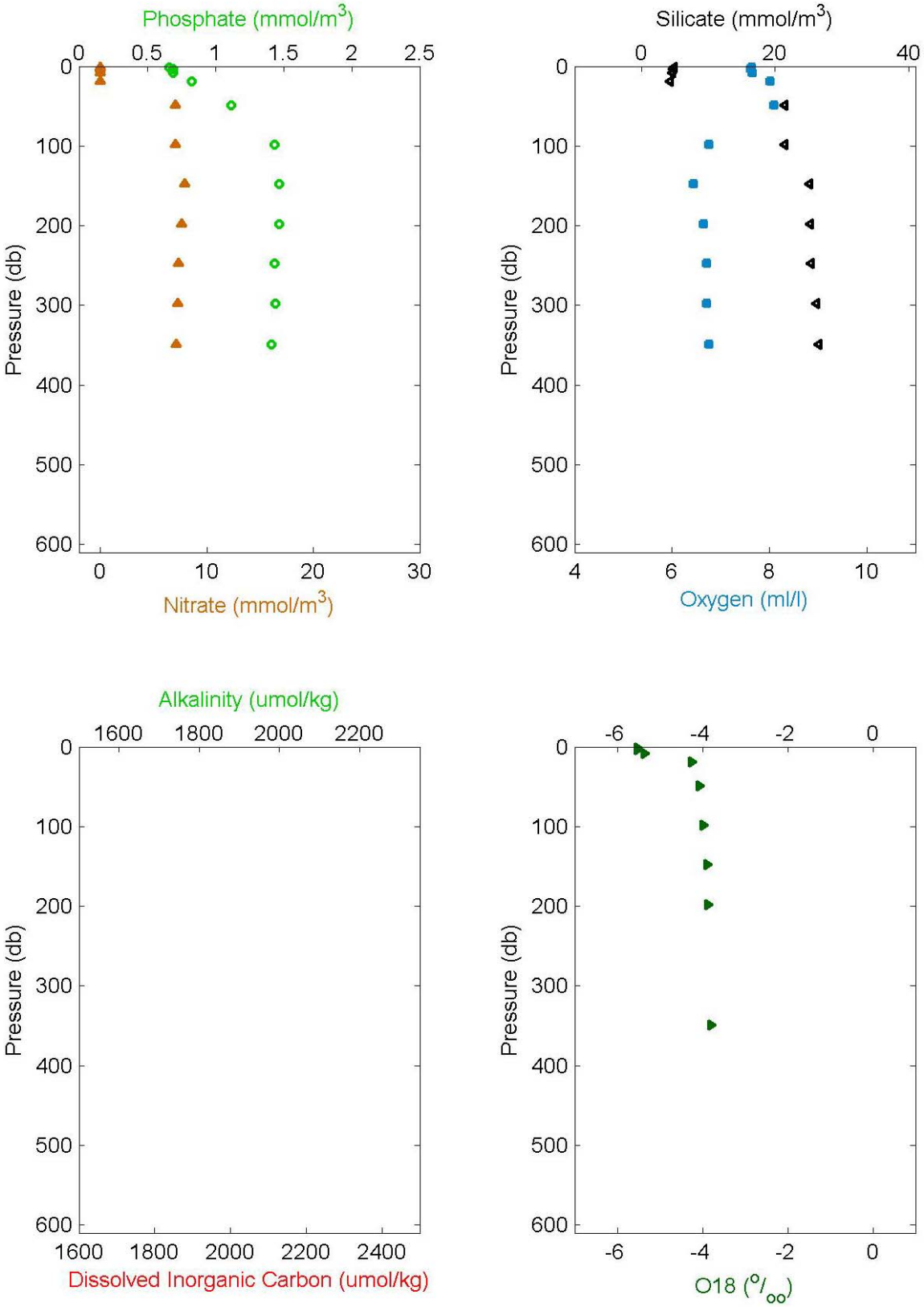
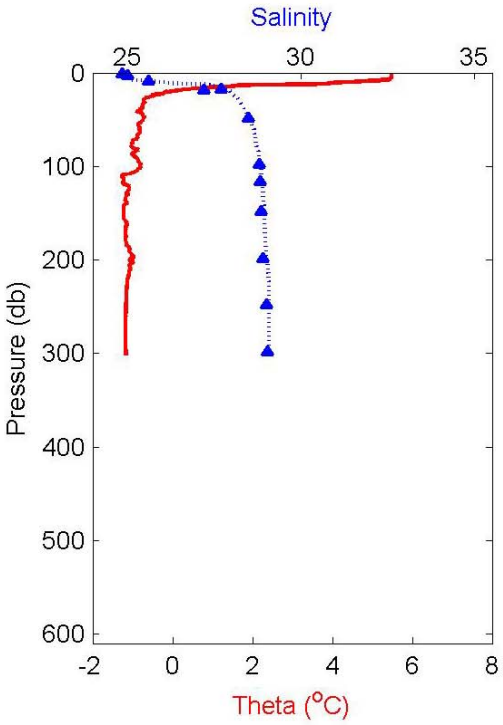
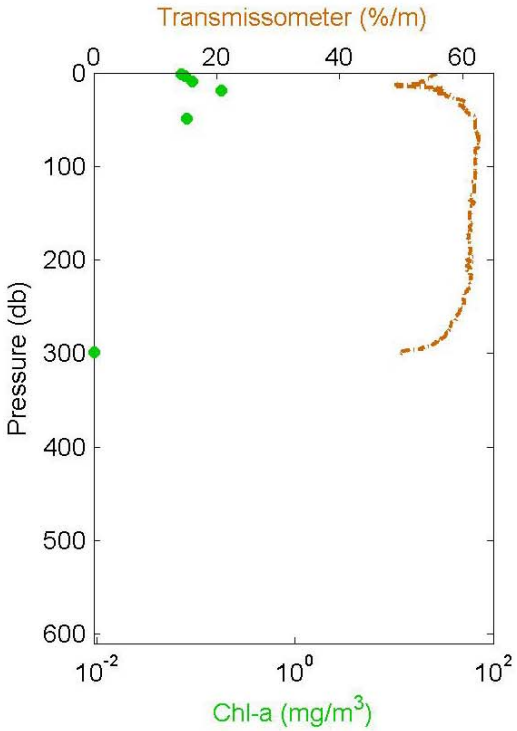
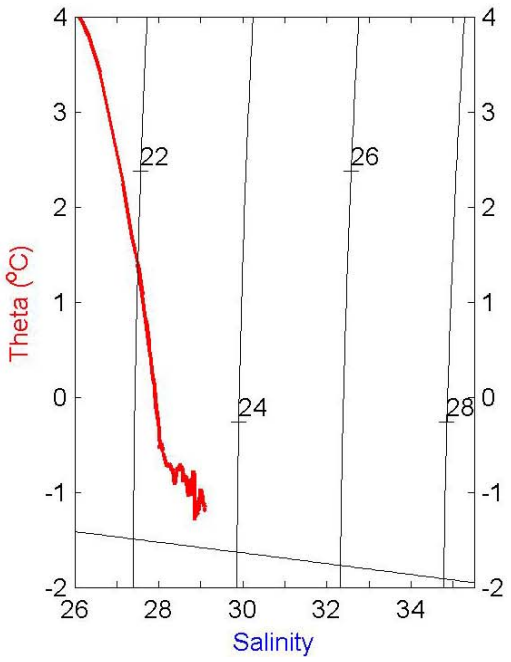
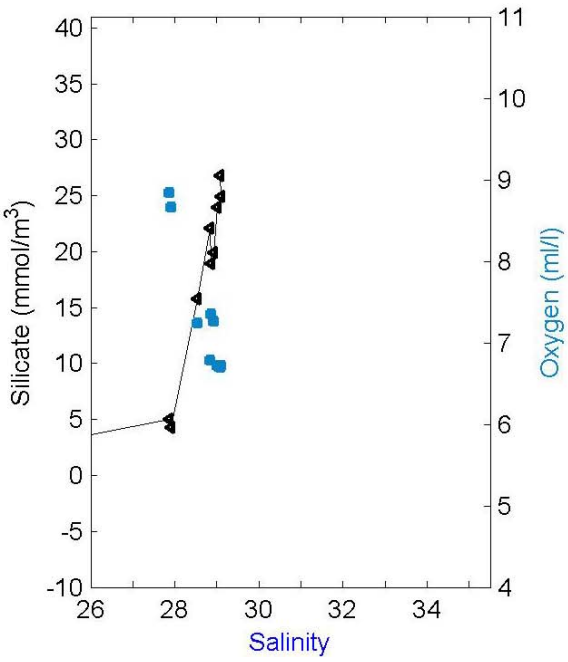


2000-22: Cast 107 Station EI07









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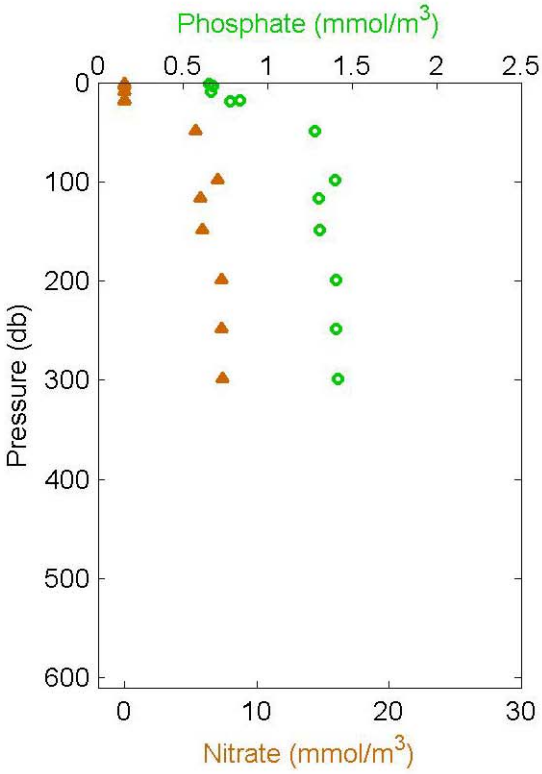
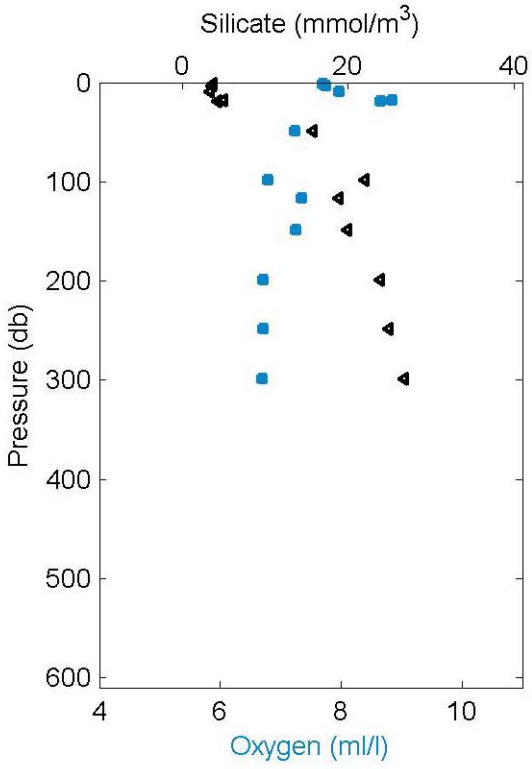
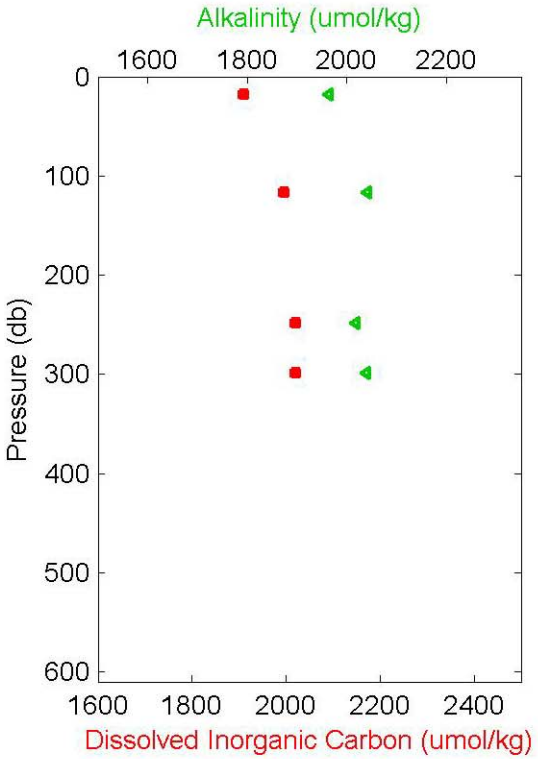
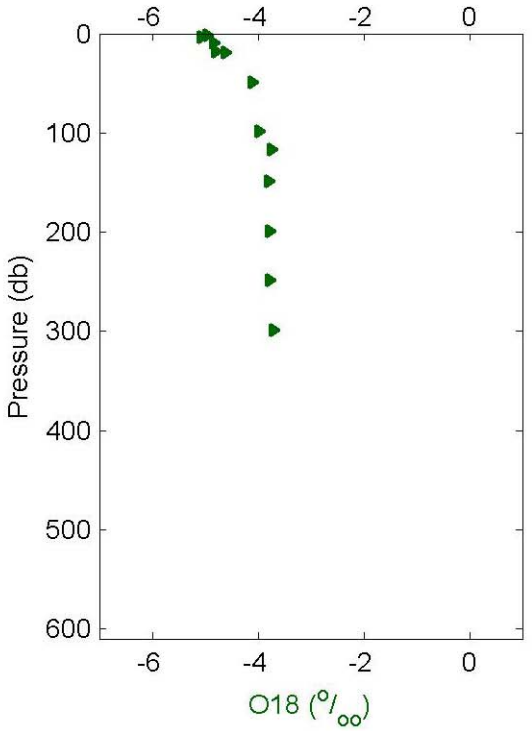
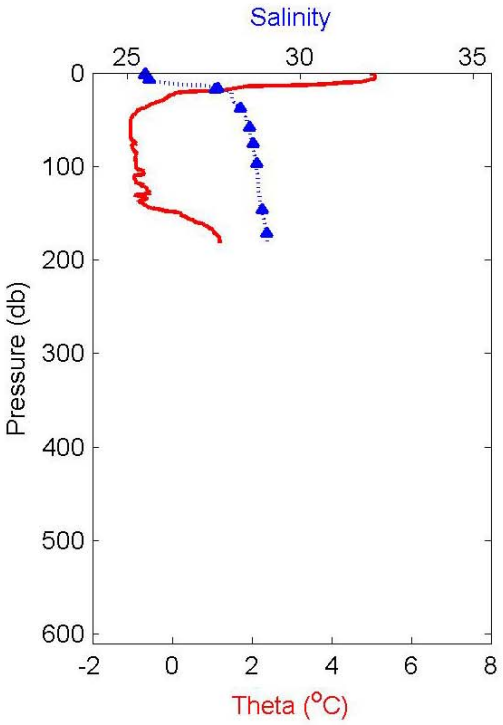


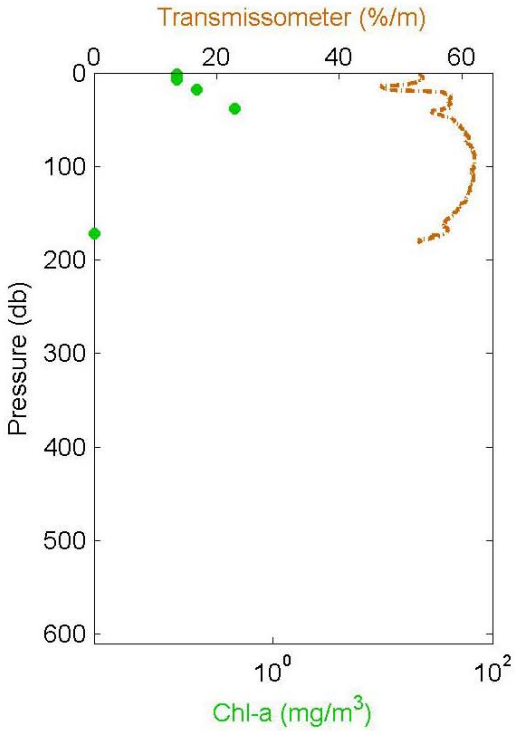


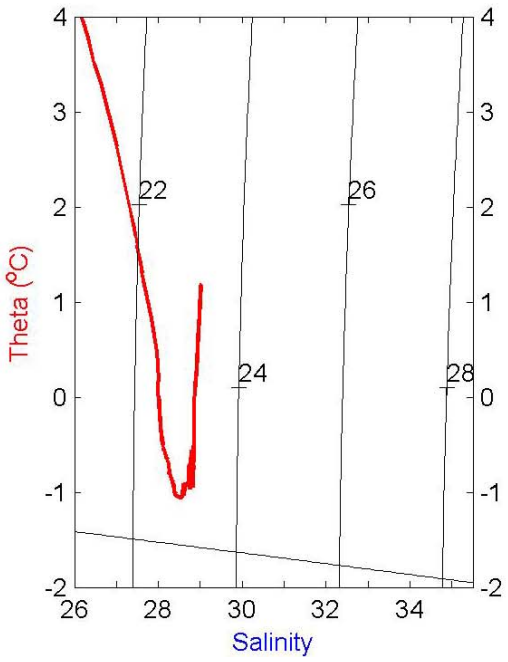


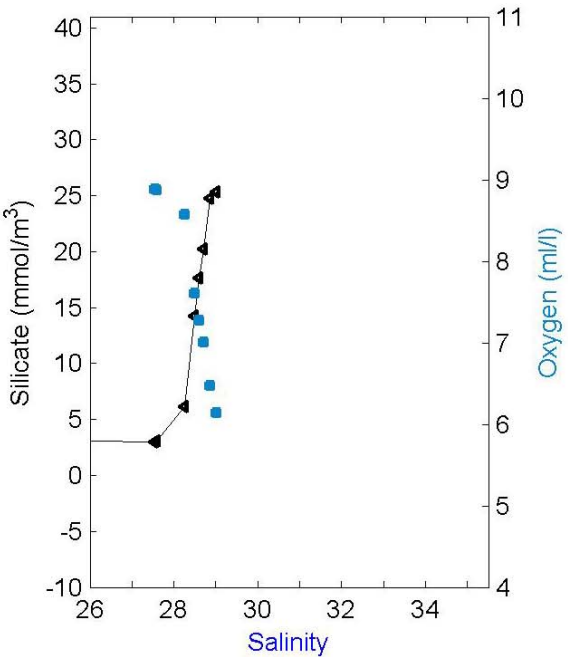


2000-22: Cast 110 Station EI05









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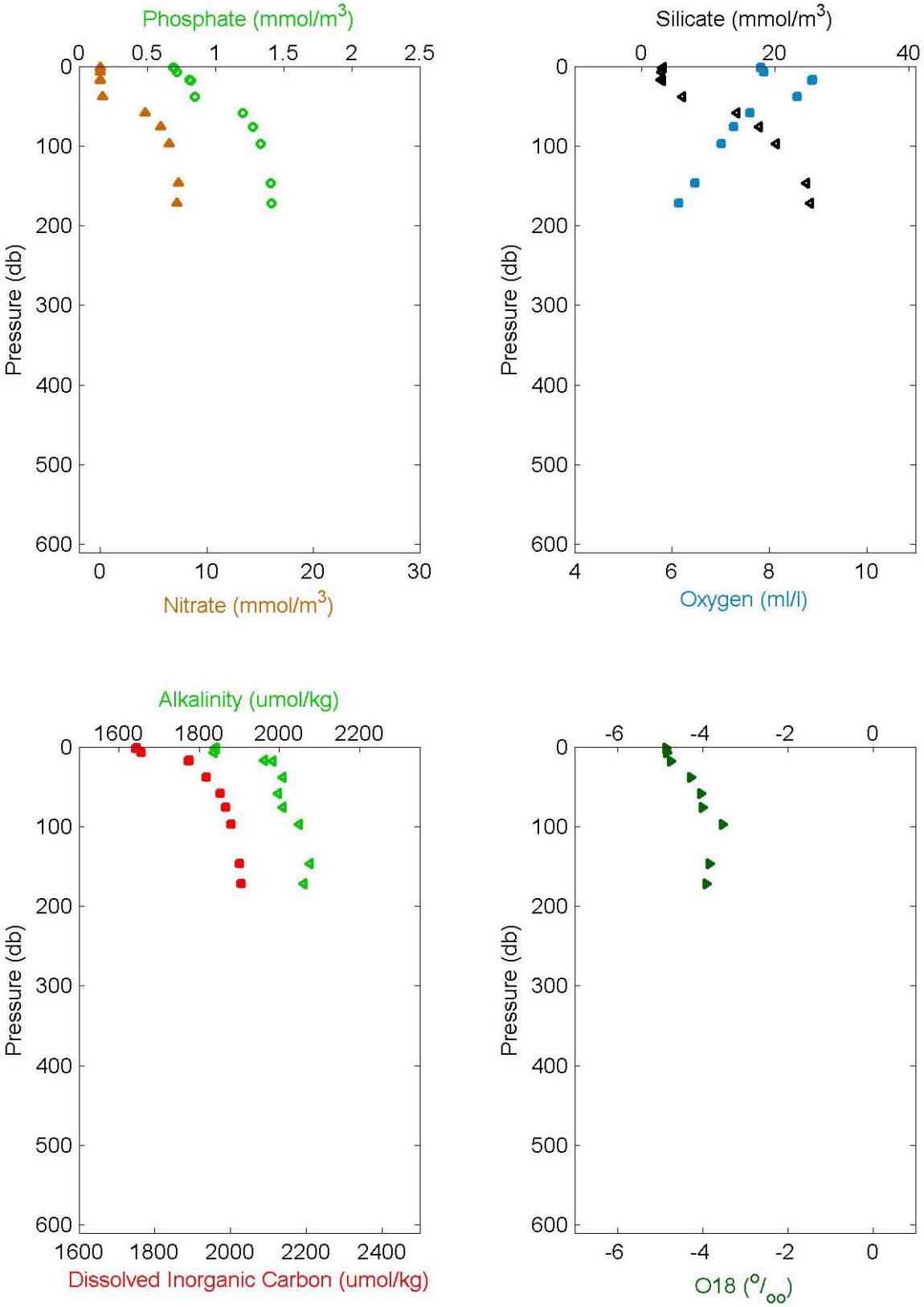
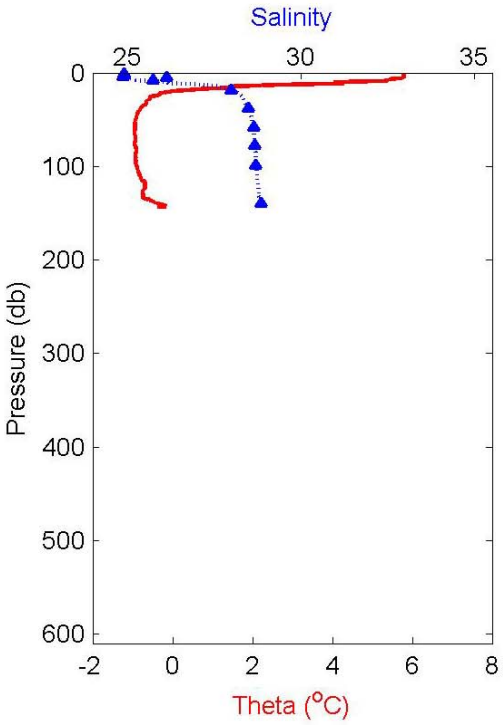
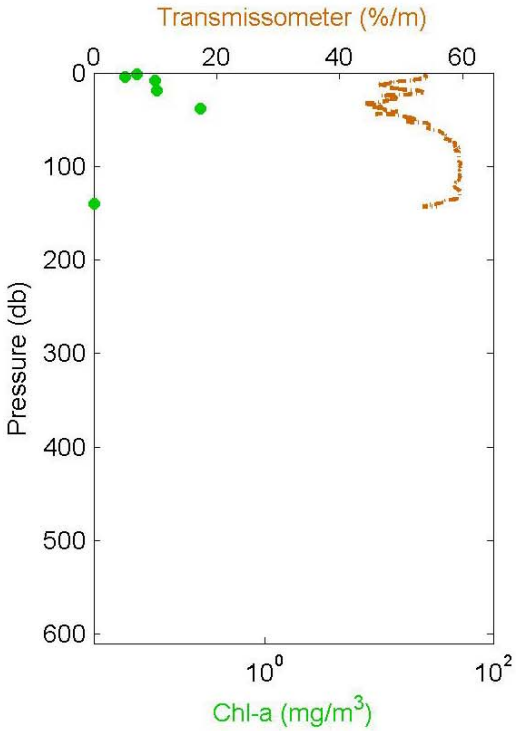
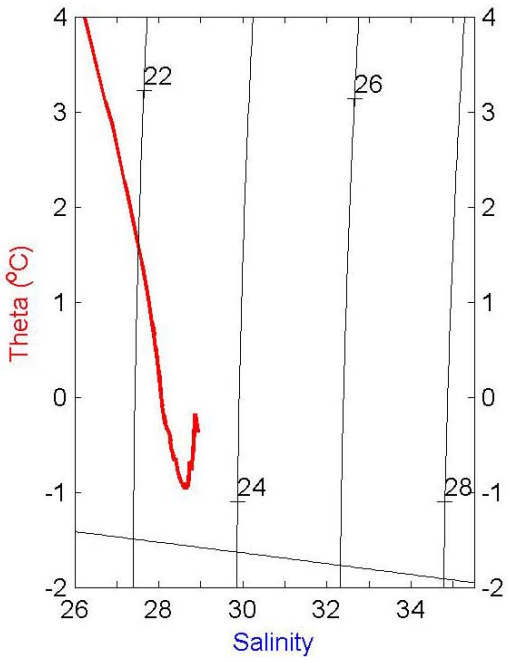
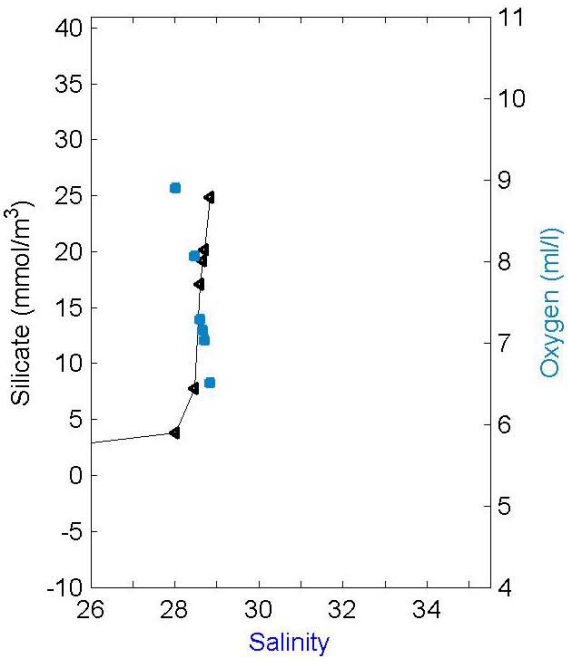


2000-22: Cast 112 Station EI03

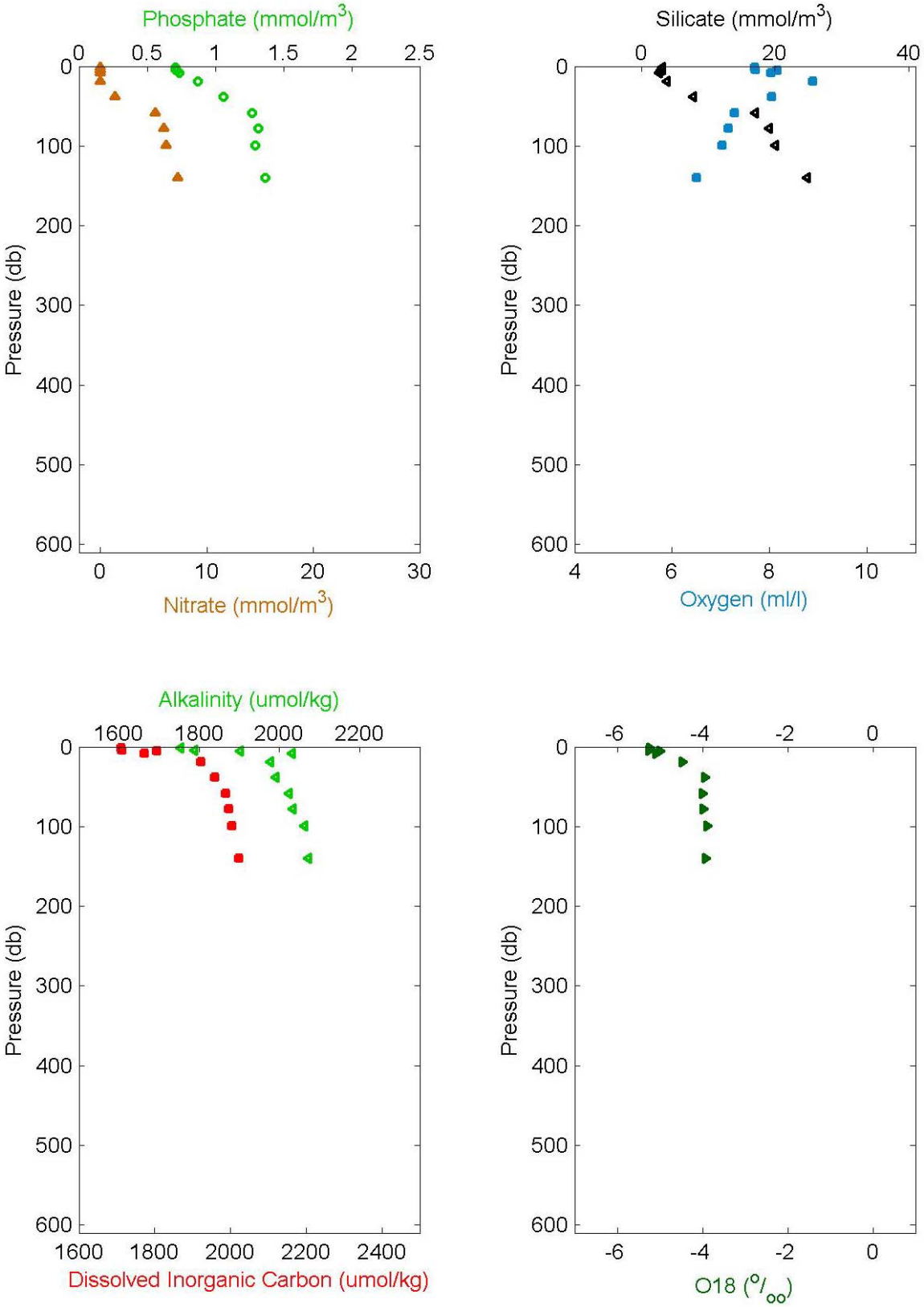




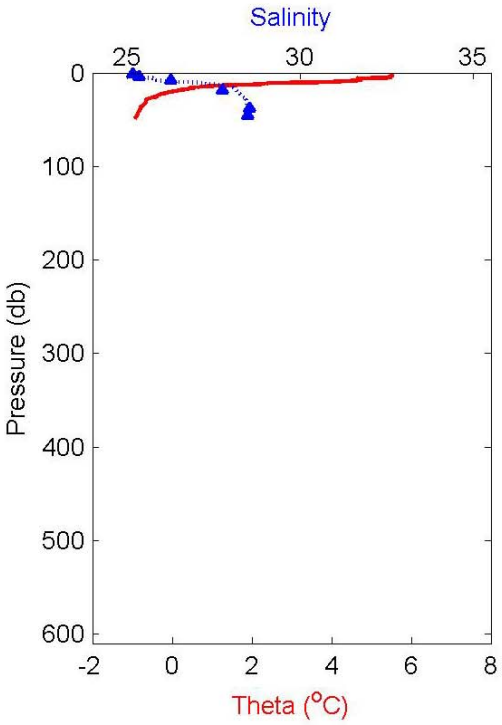


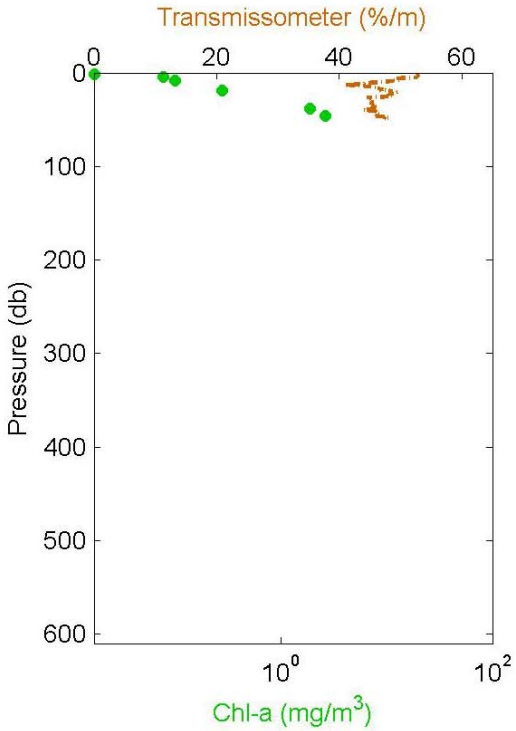


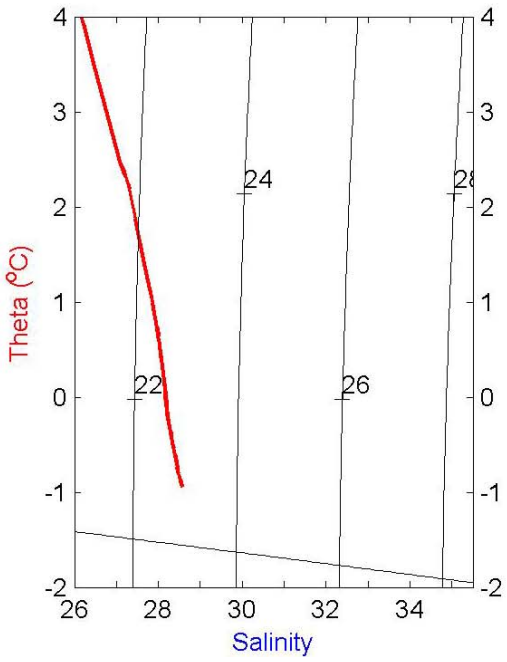
2000-22: Cast 112 Station EI03

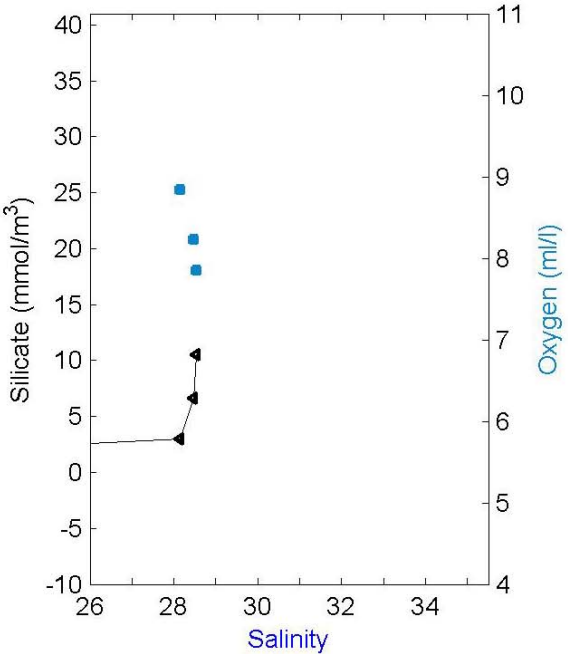


2000-22: Cast 114 Station EI01

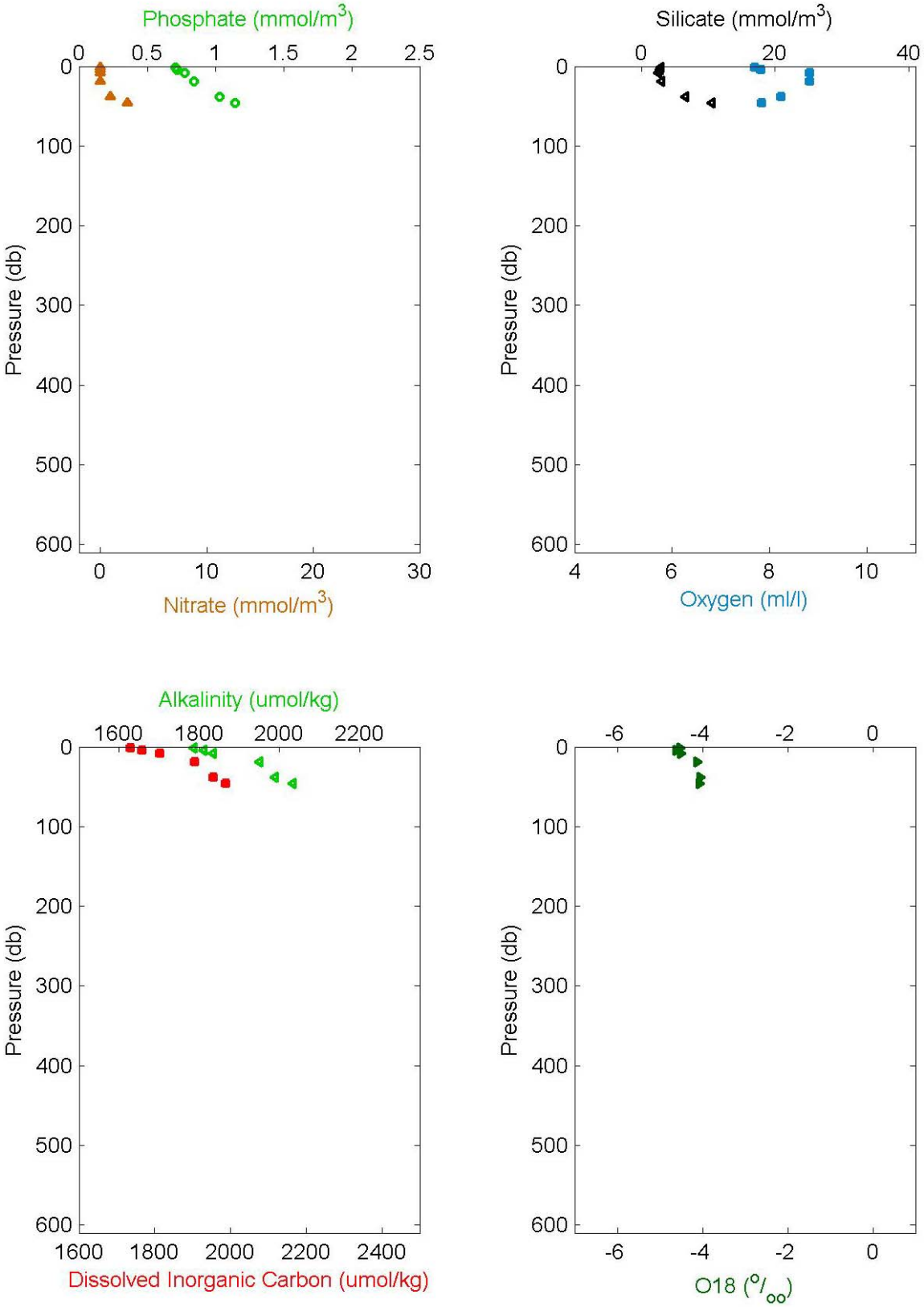




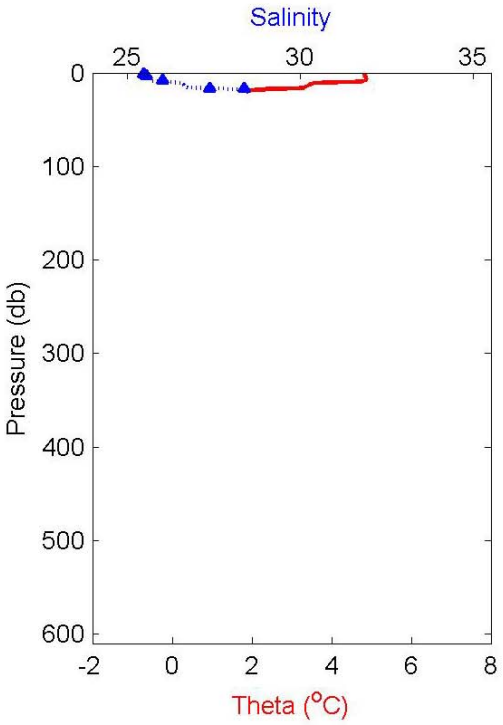


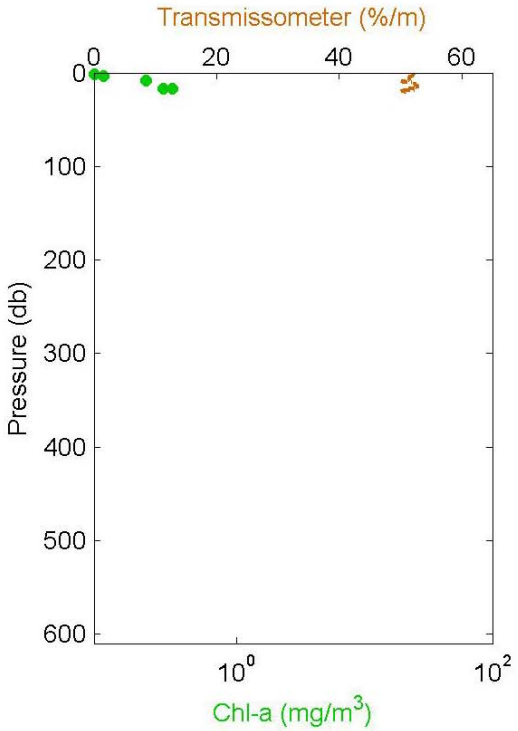


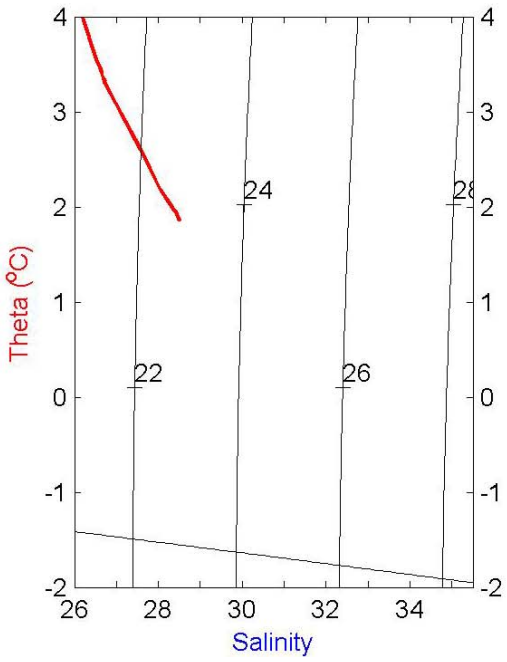
2000-22: Cast 114 Station EI01

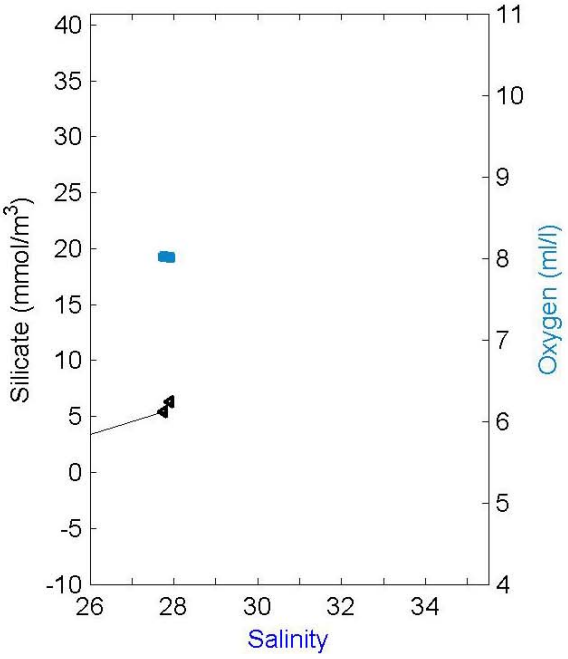


2000-22: Cast 115 Station DU1

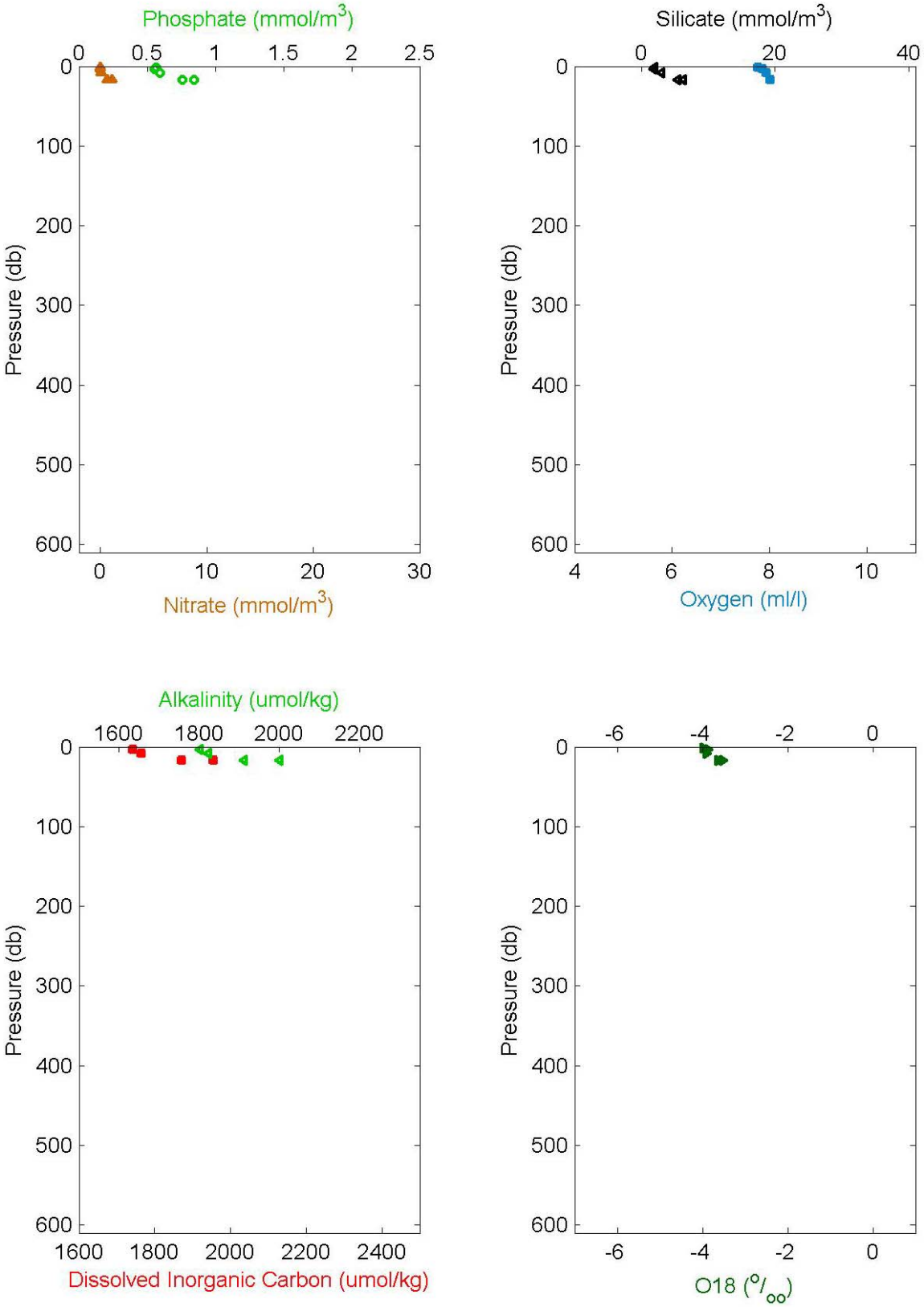




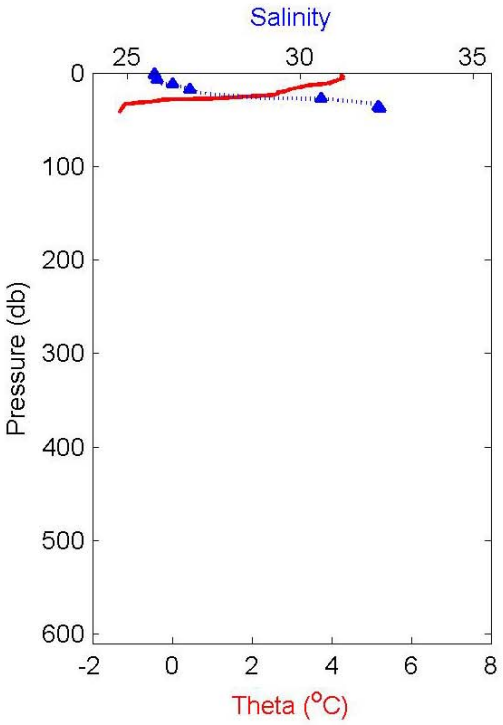


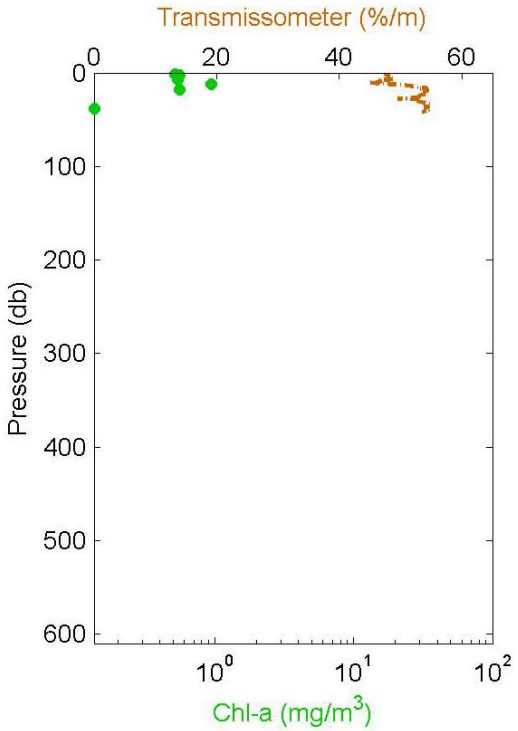


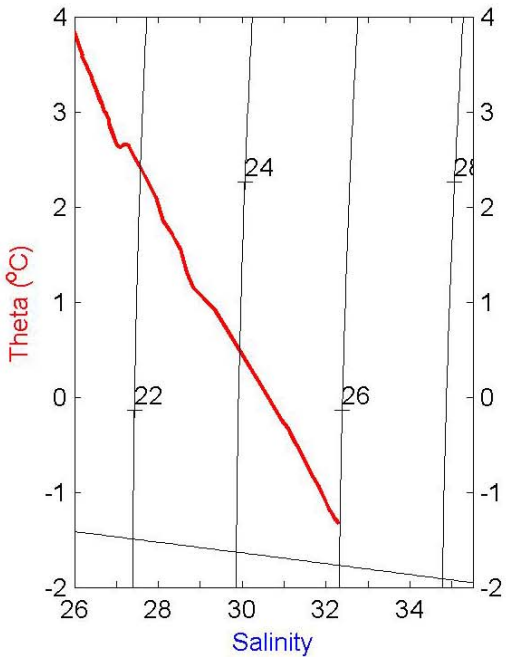
2000-22: Cast 115 Station DU1

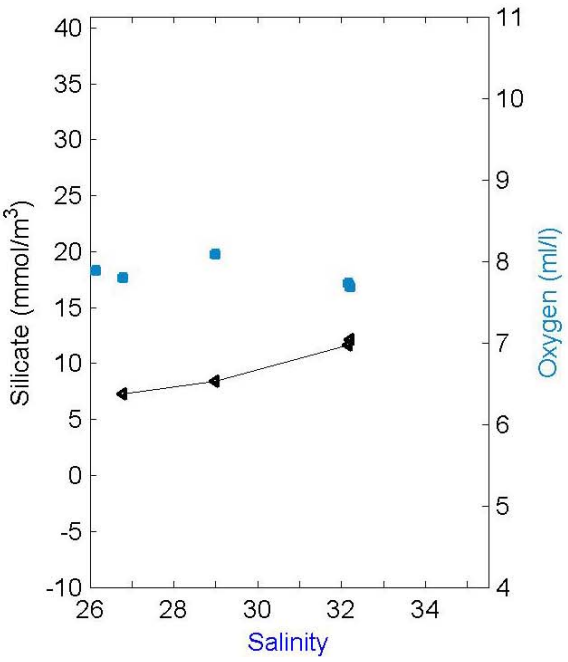


2000-22: Cast 117 Station DU3

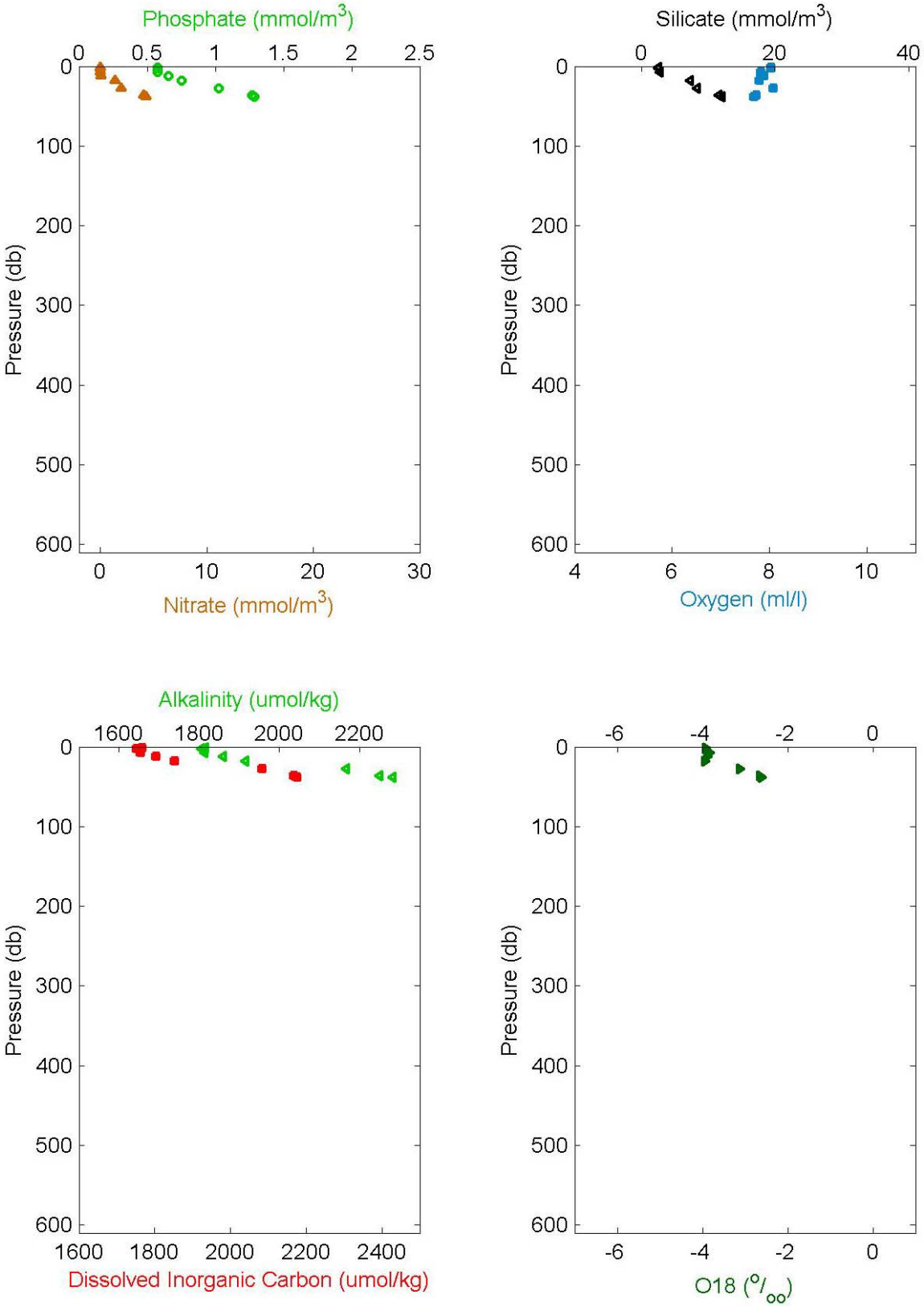




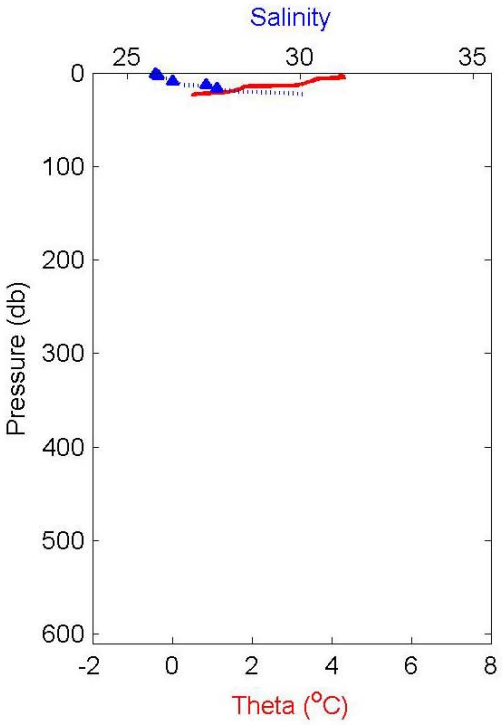


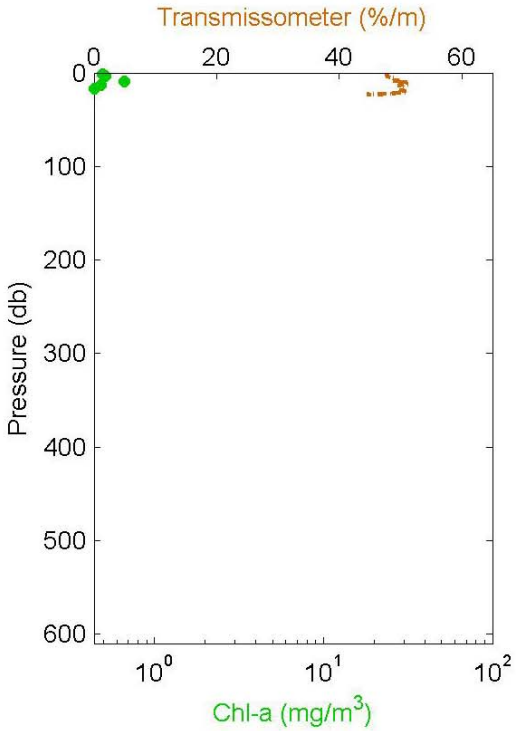


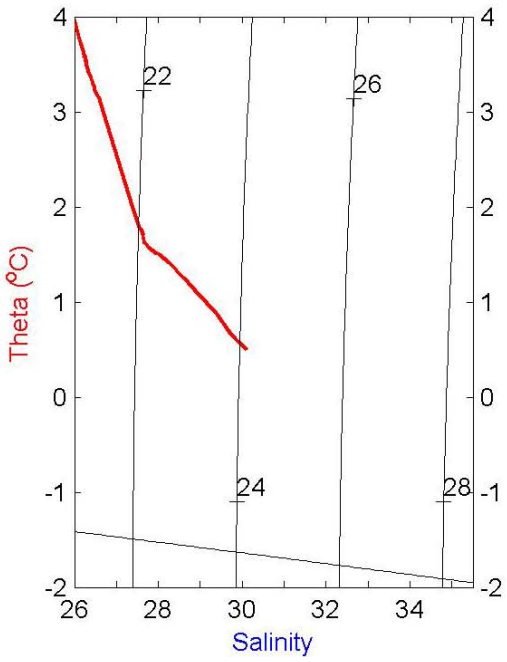
2000-22: Cast 117 Station DU3

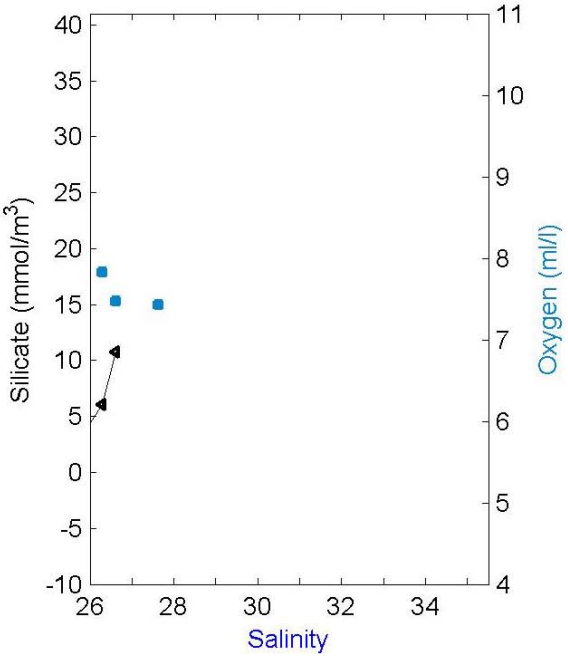


2000-22: Cast 119 Station DU5

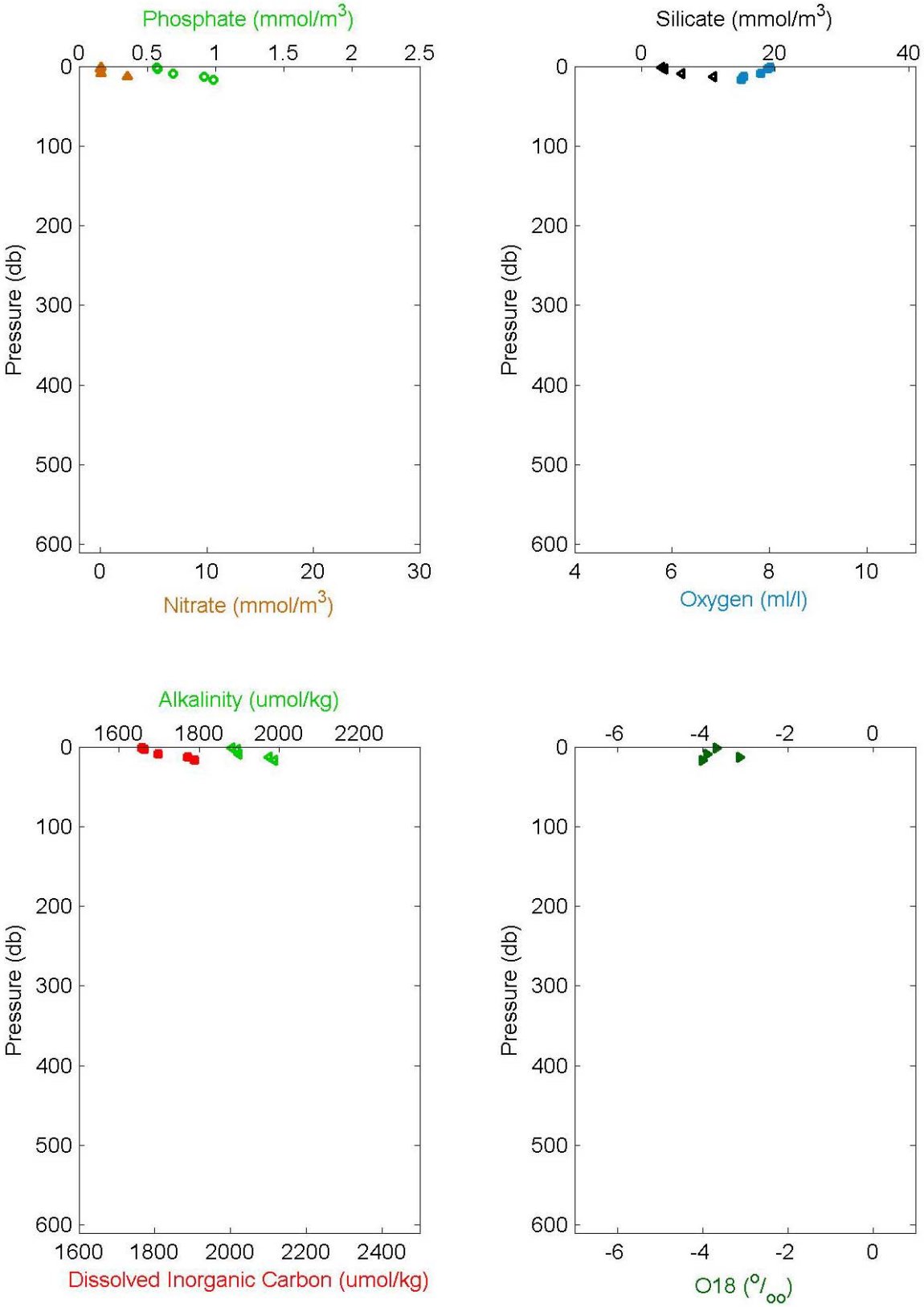




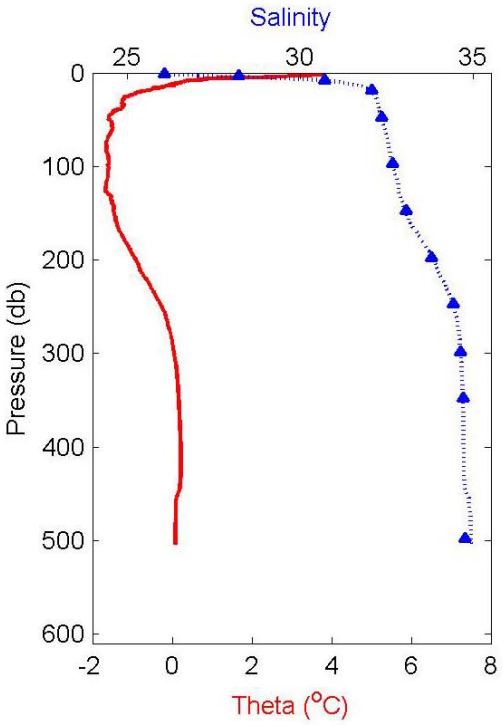


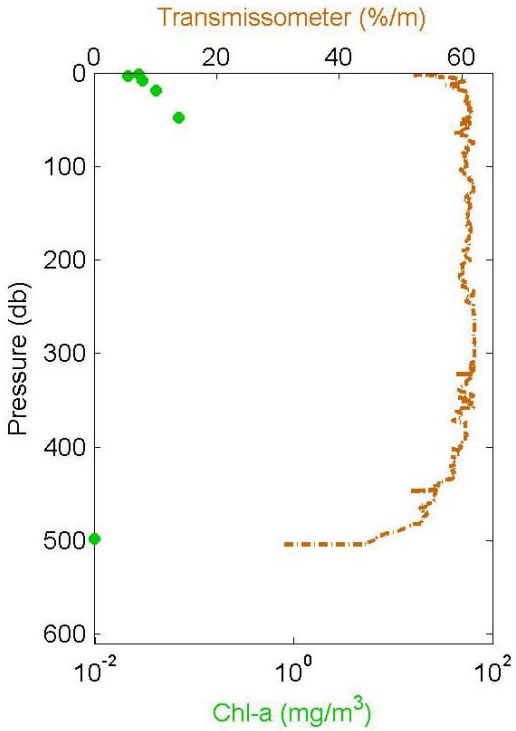


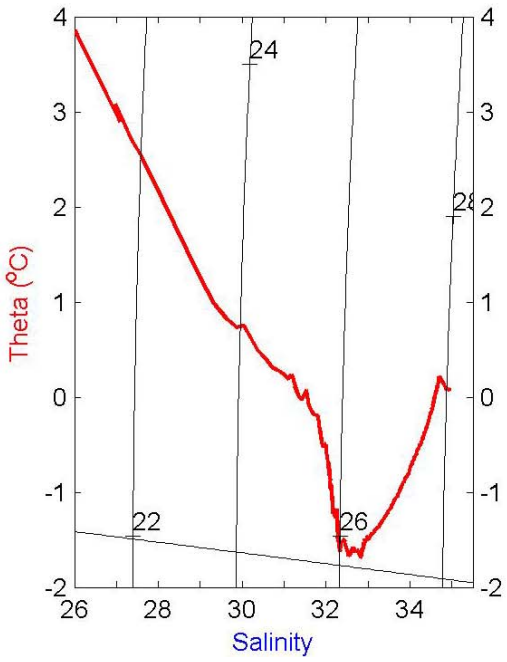
2000-22: Cast 119 Station DU5

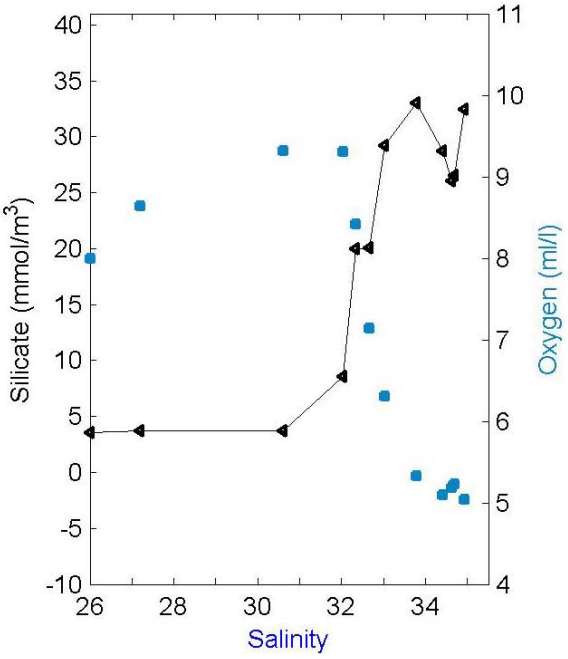


2000-22: Cast 121 Station CP5

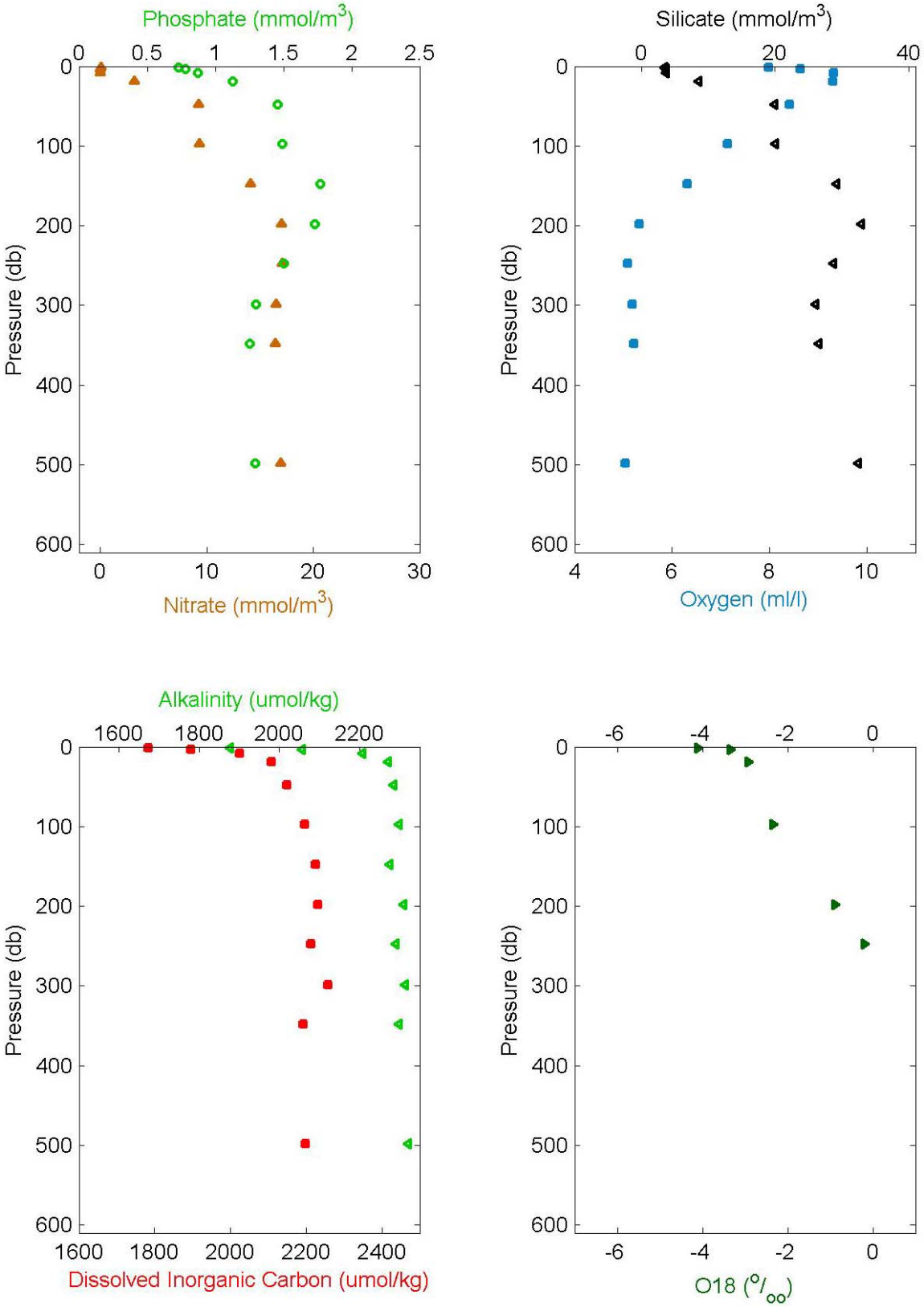




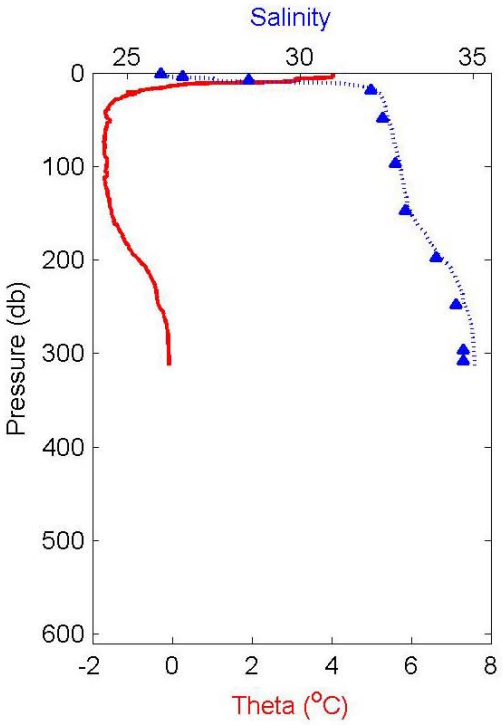


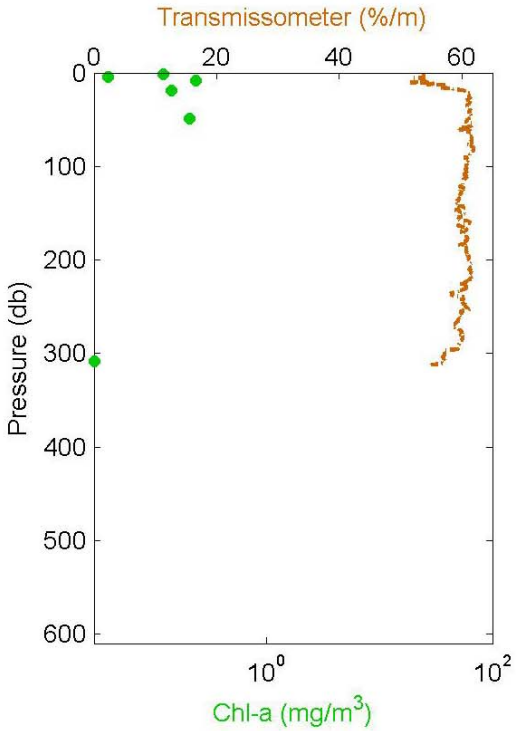


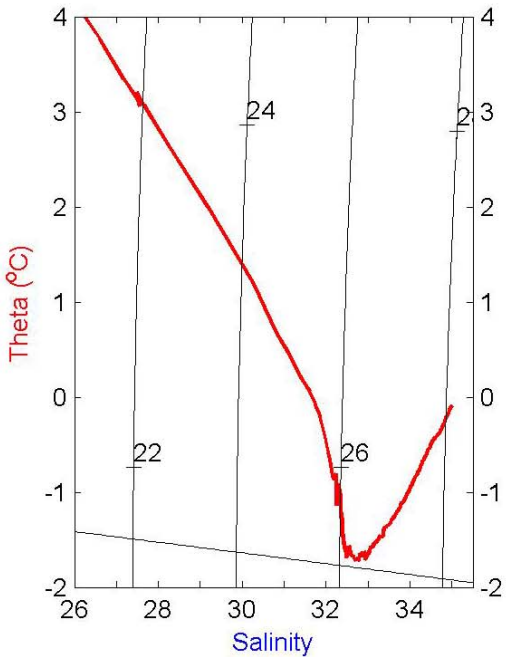
2000-22: Cast 121 Station CP5

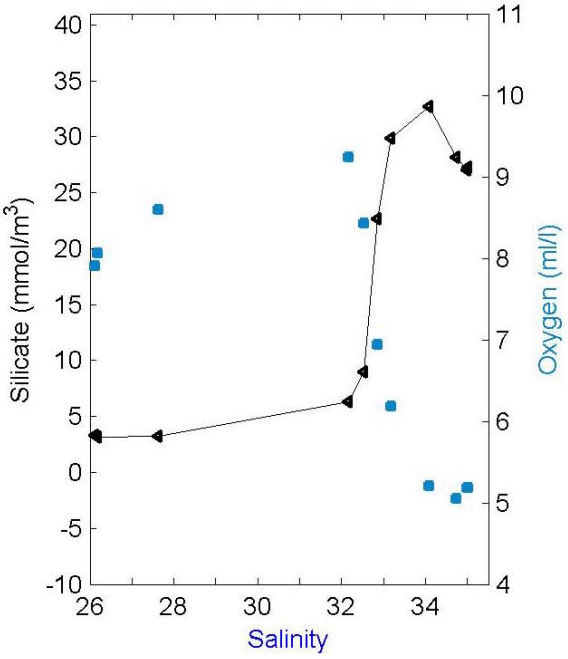


2000-22: Cast 123 Station CP3

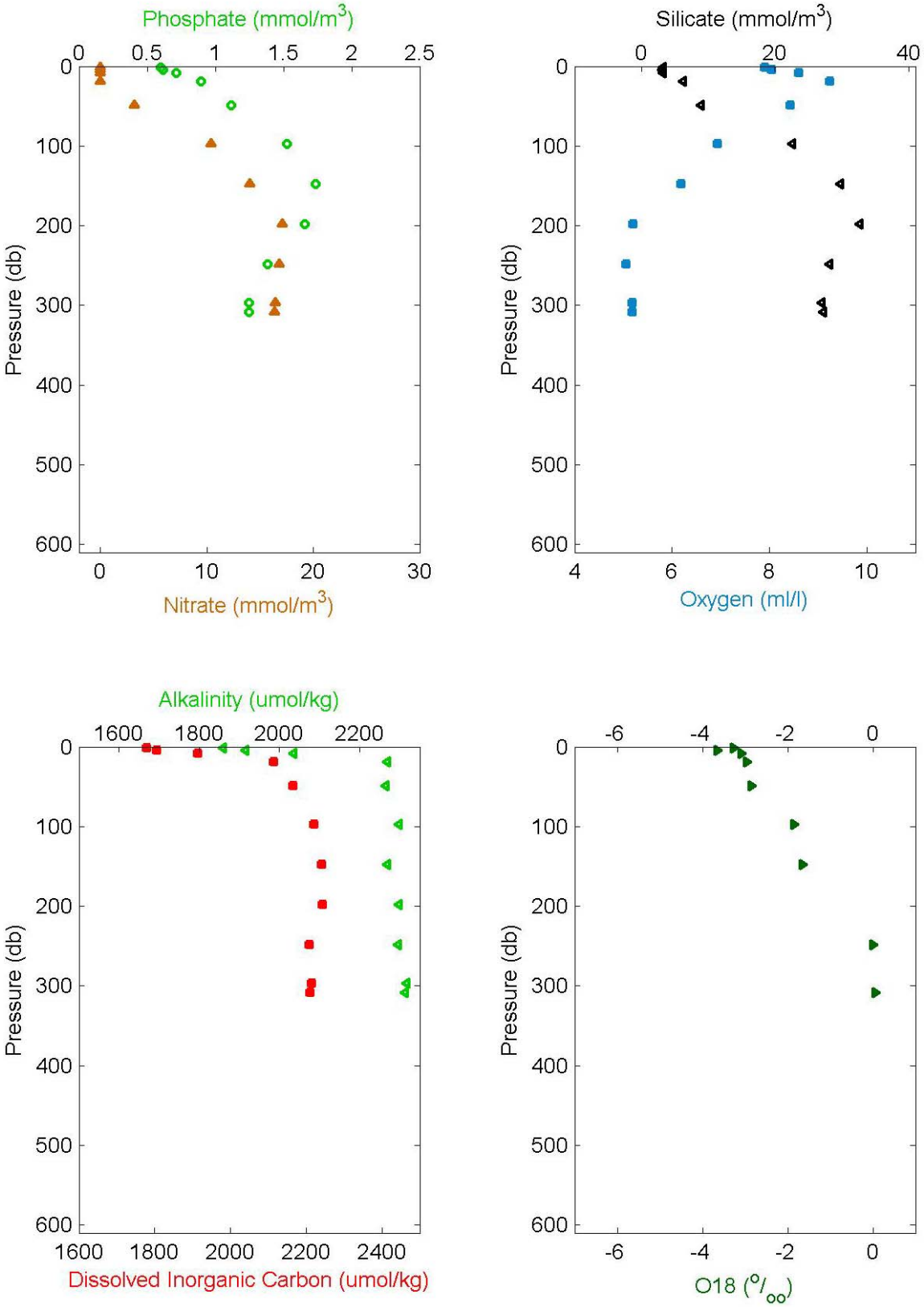




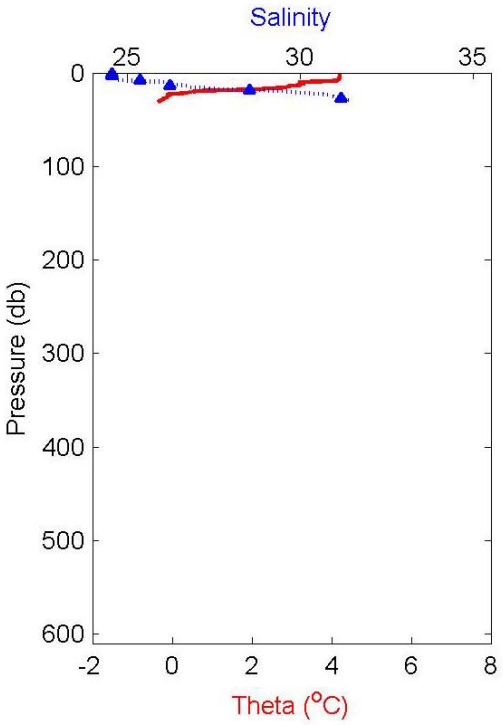


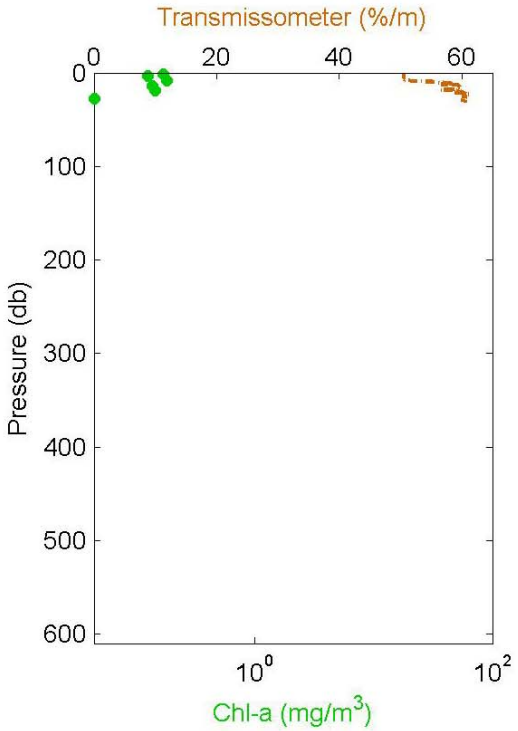


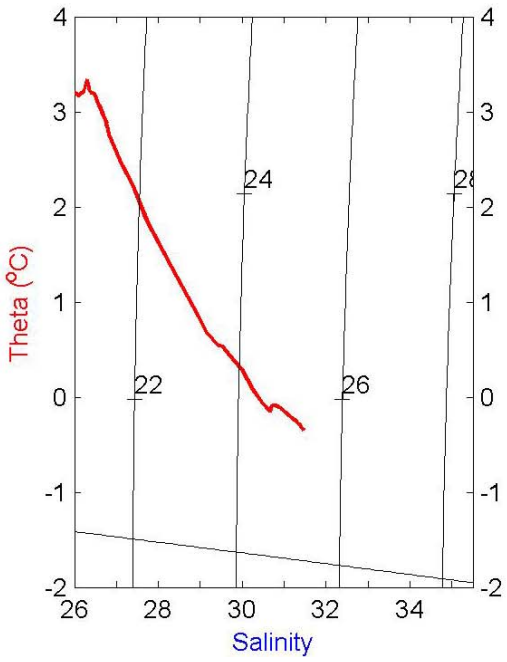
2000-22: Cast 123 Station CP3

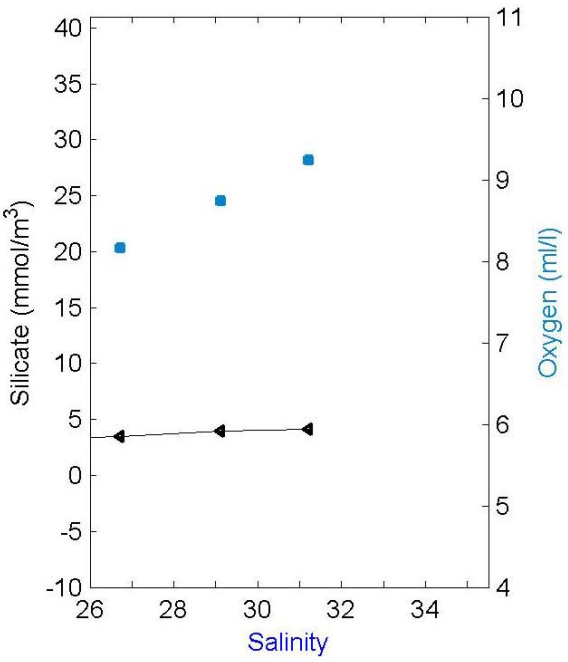


2000-22: Cast 125 Station CP1

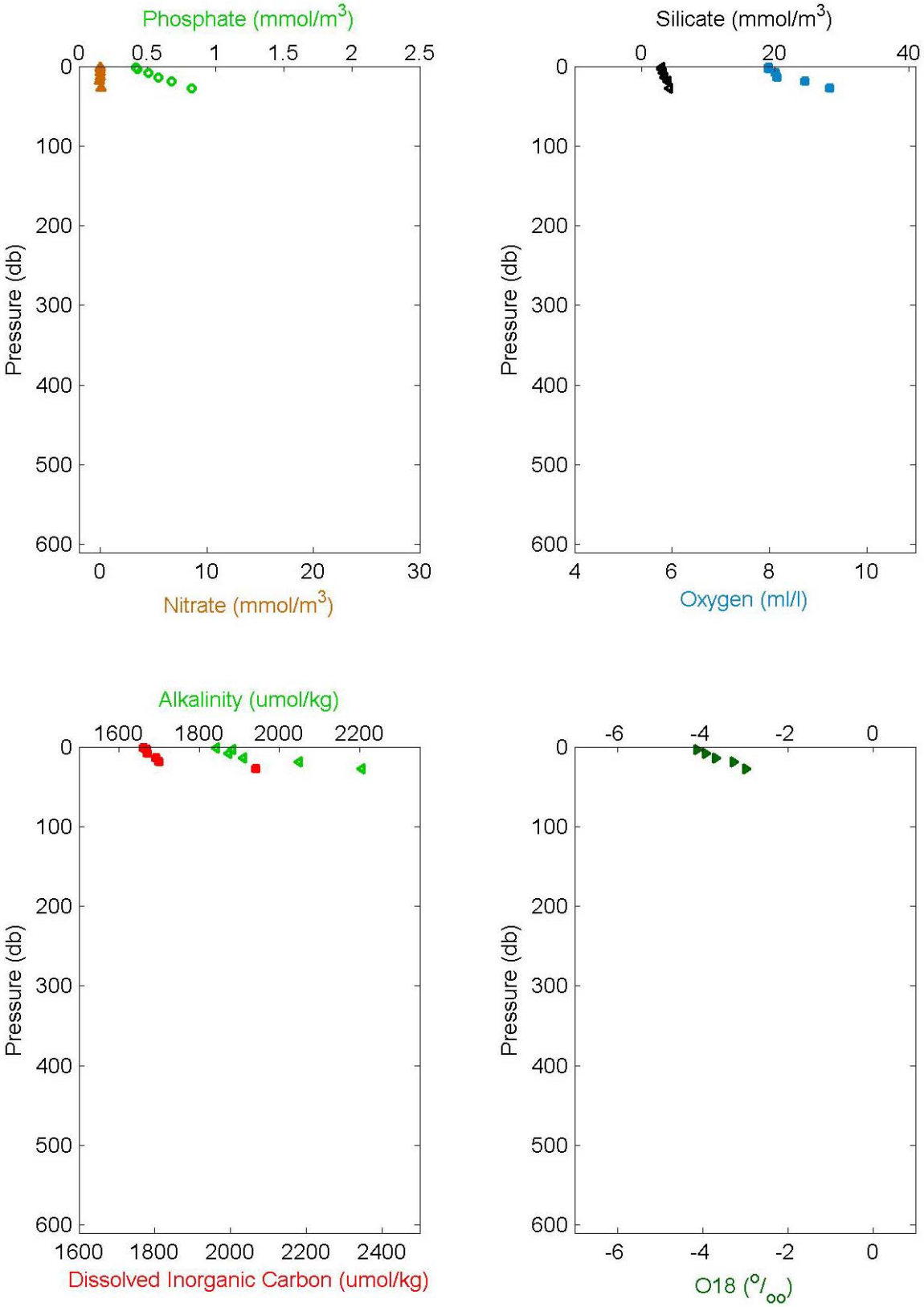




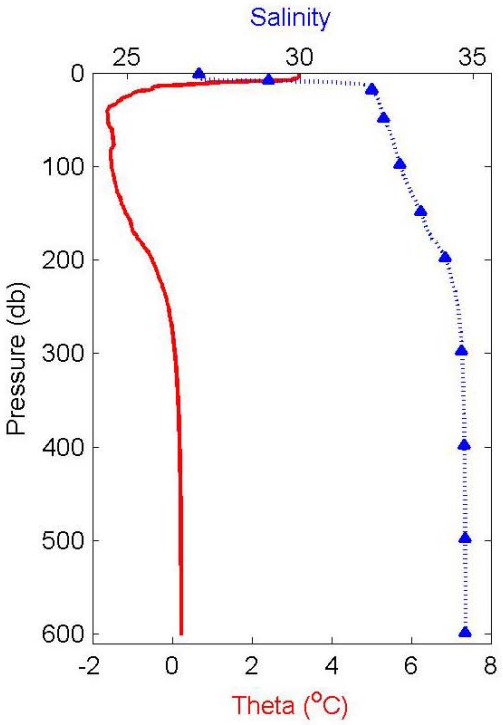


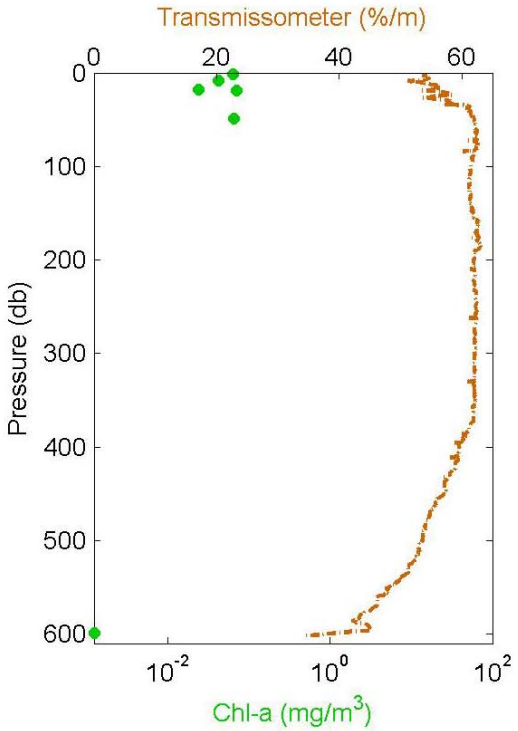


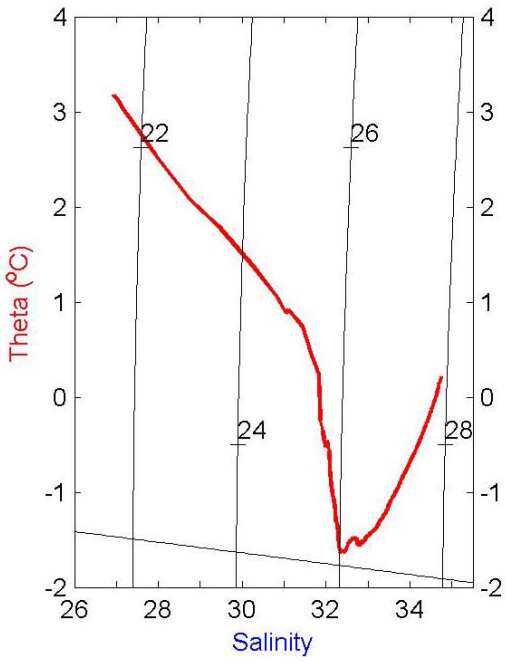
2000-22: Cast 125 Station CP1

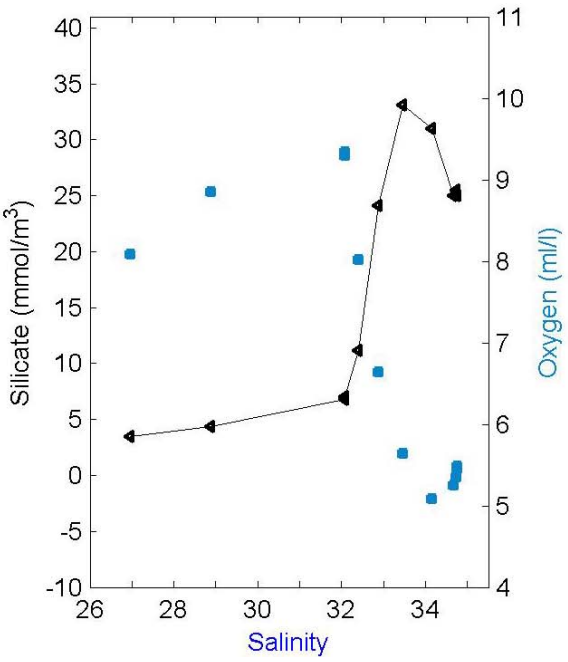


2000-22: Cast 128 Station AG5

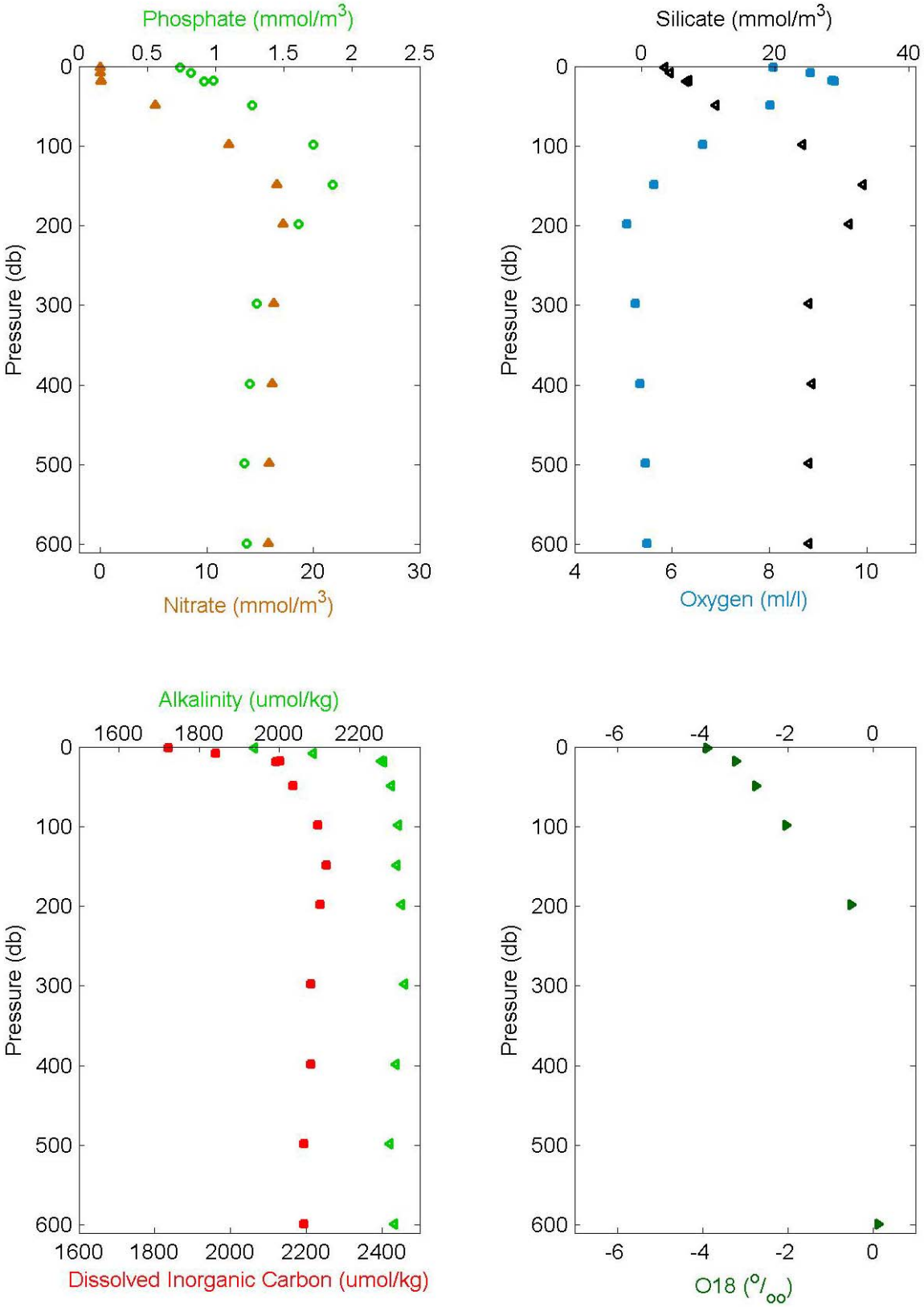




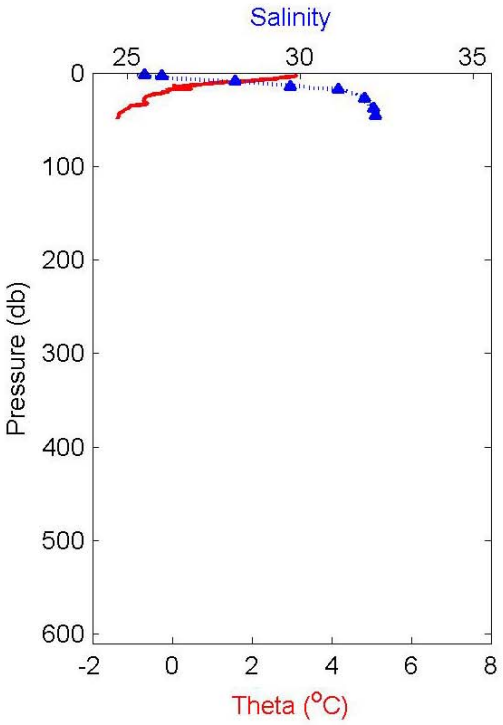


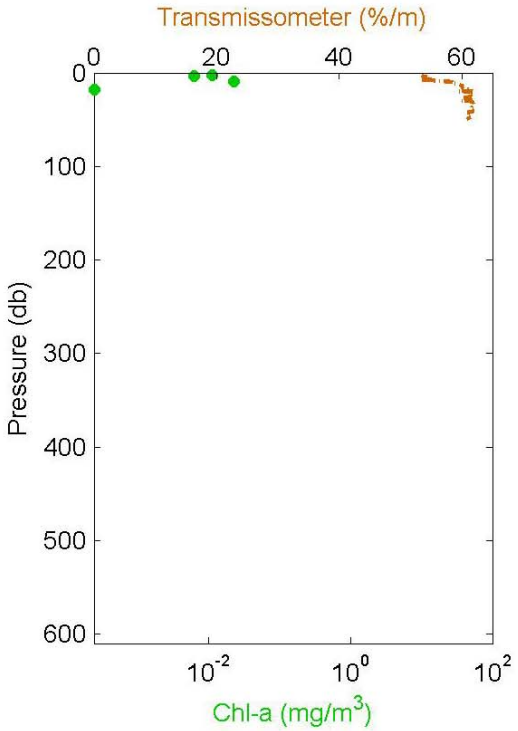


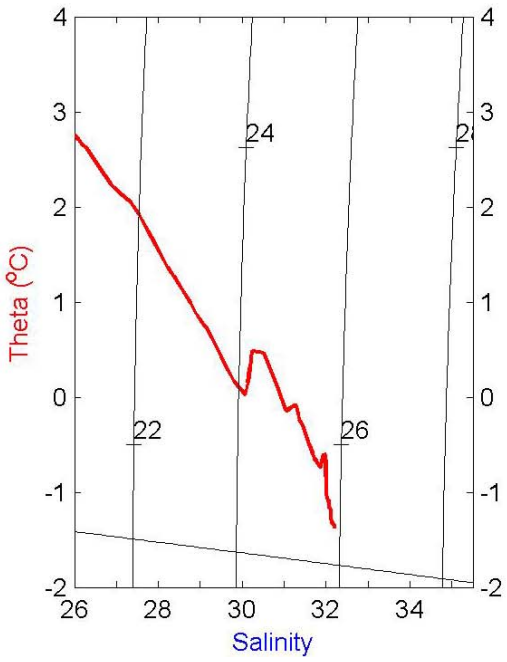
2000-22: Cast 128 Station AG5

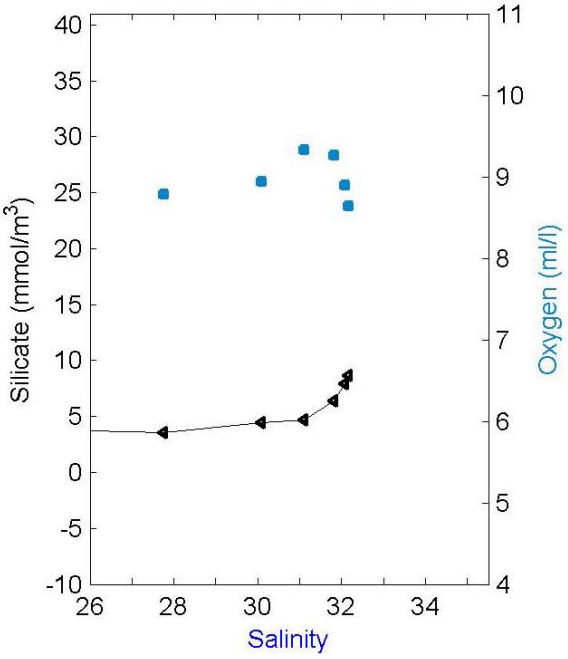


2000-22: Cast 129 Station AG1

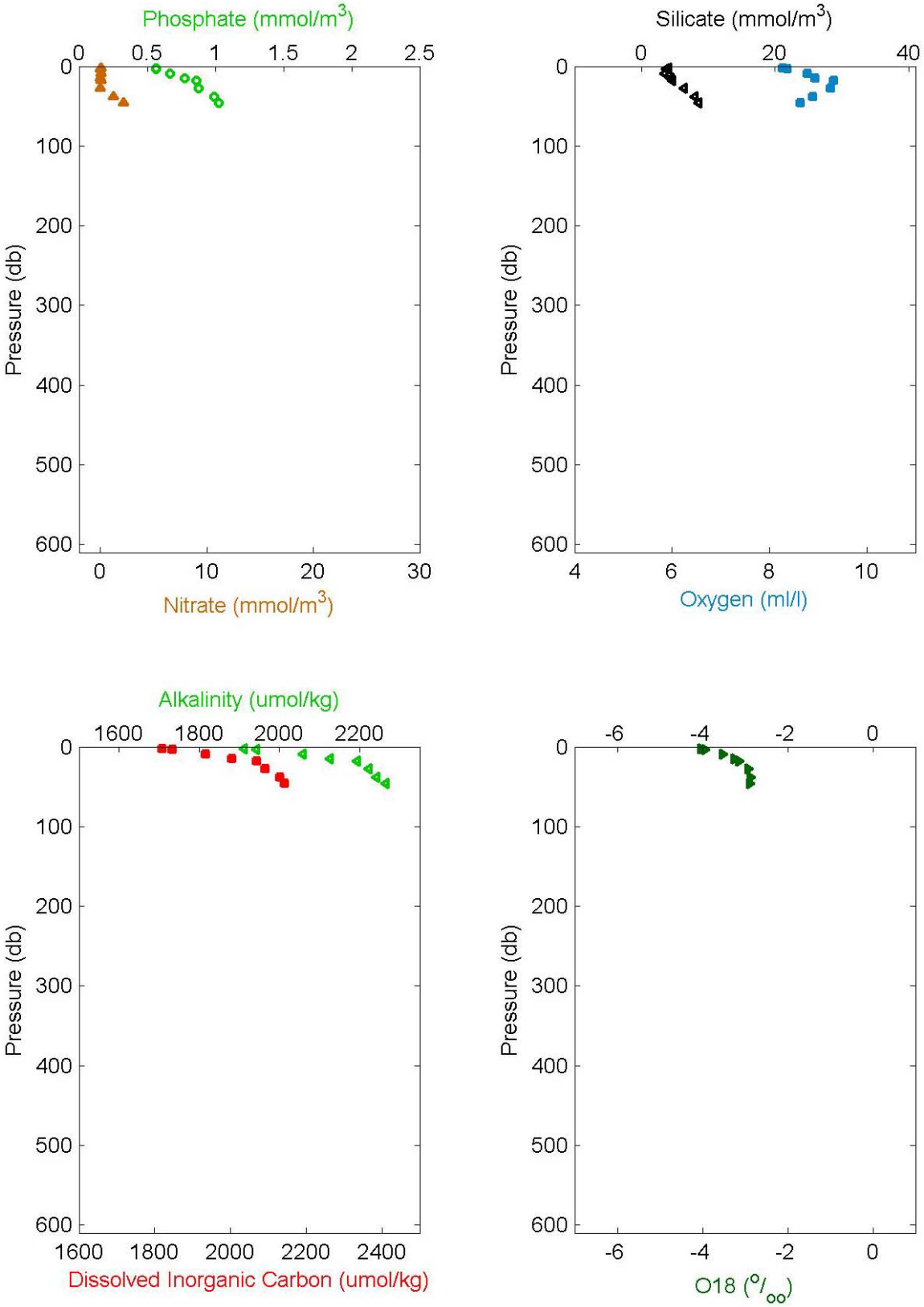




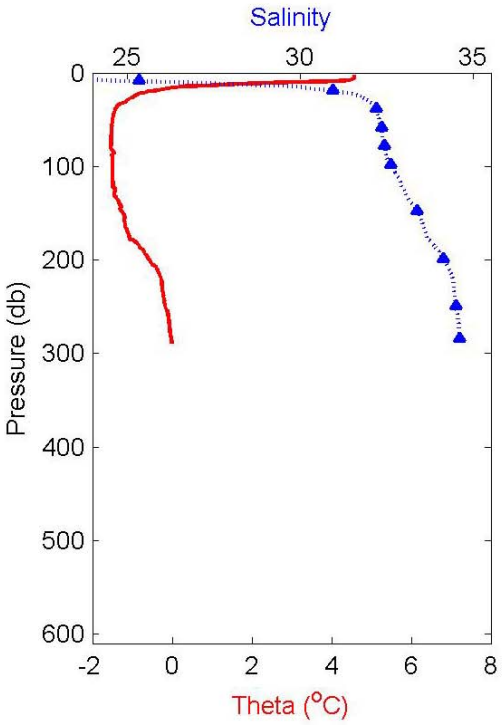


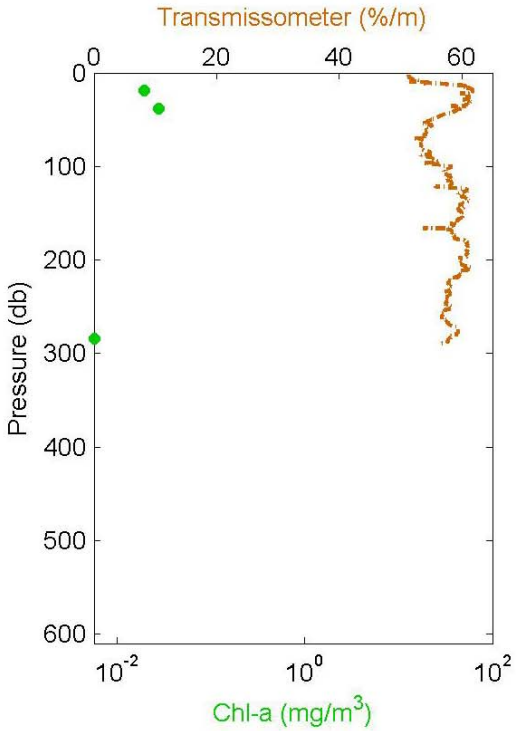


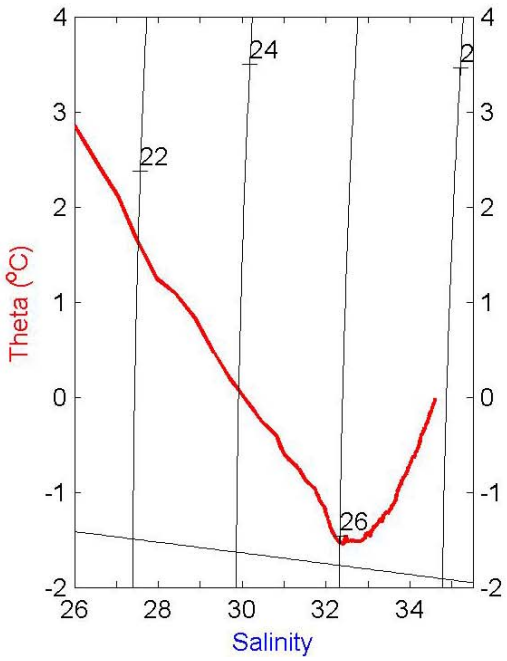
2000-22: Cast 129 Station AG1

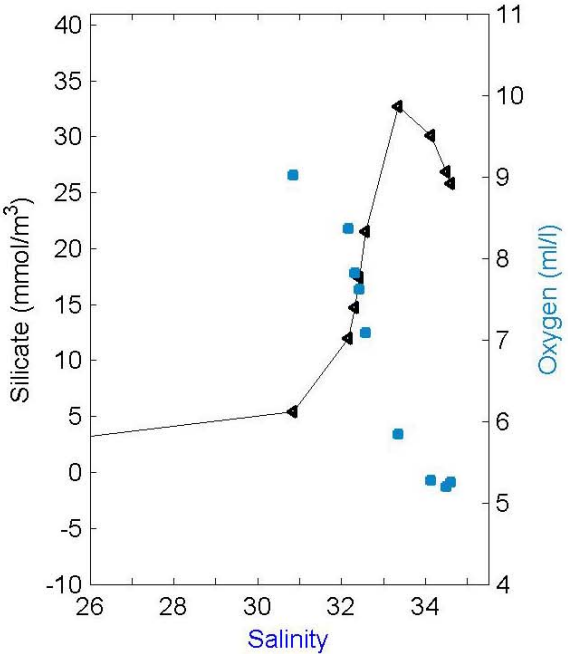


2000-22: Cast 131 Station AG3

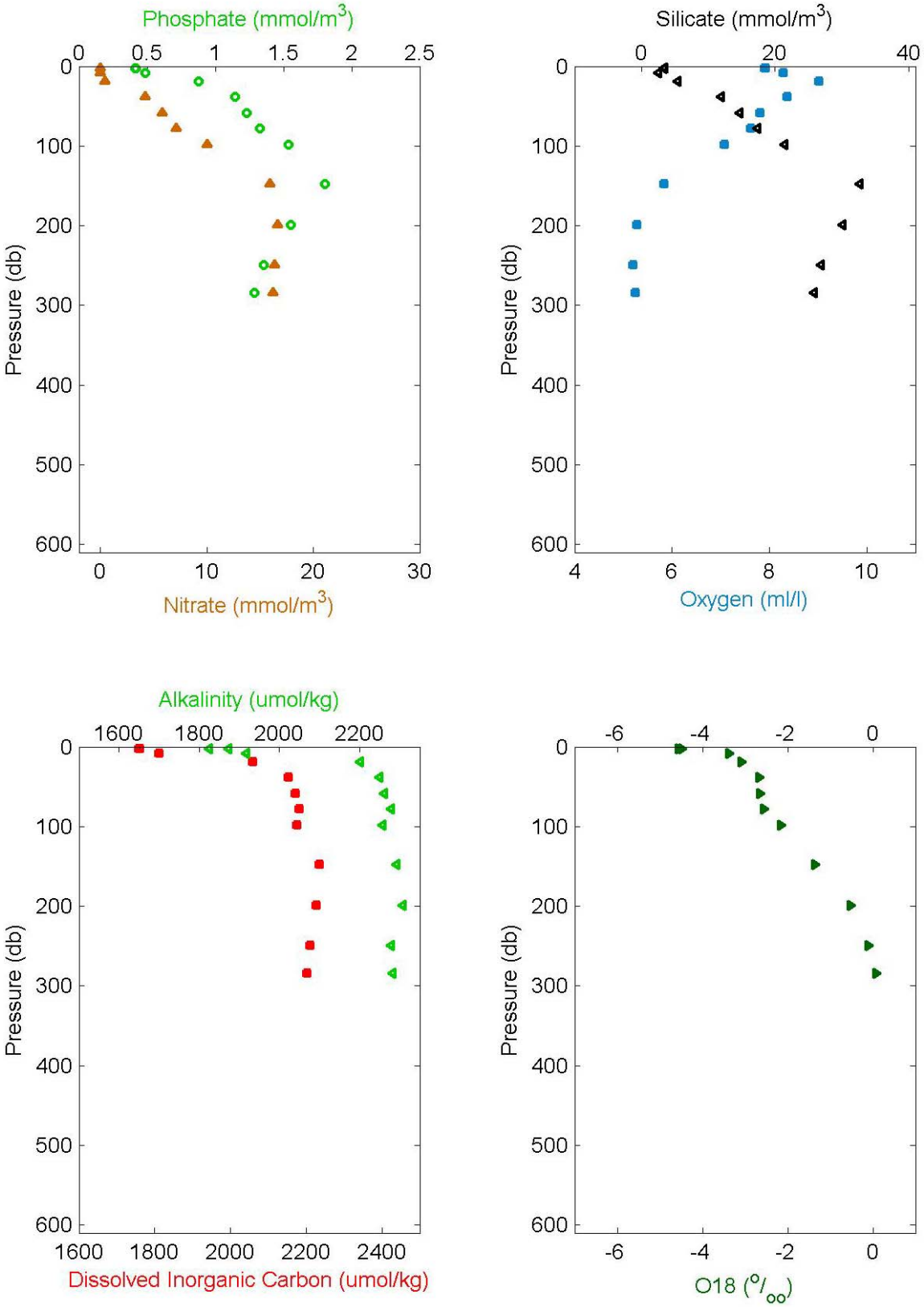




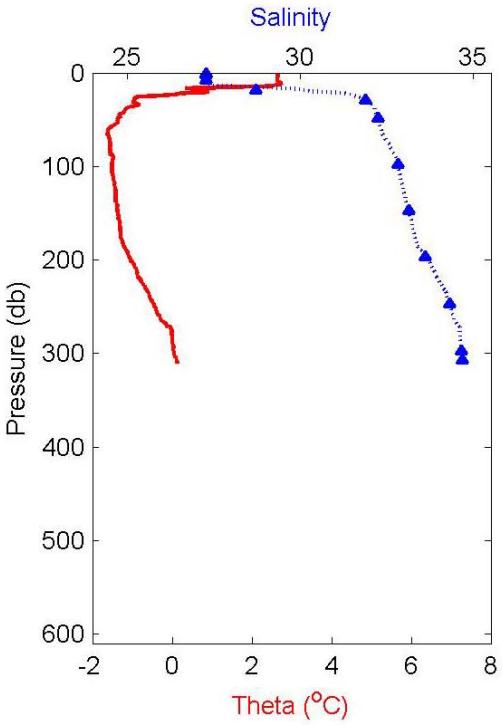


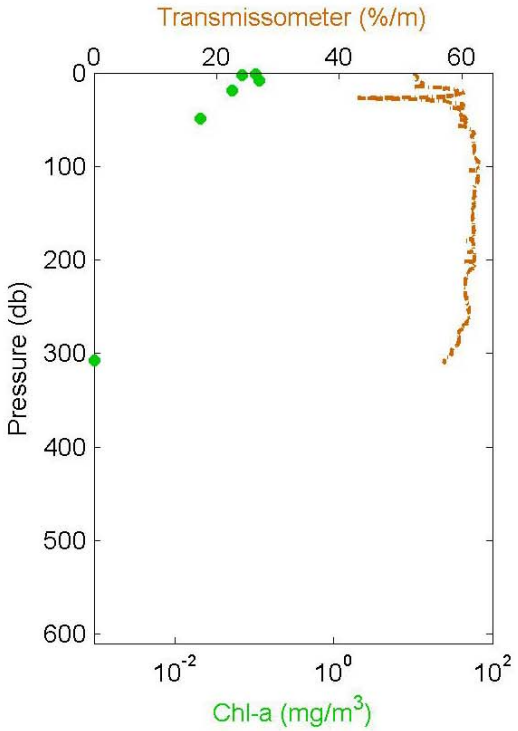


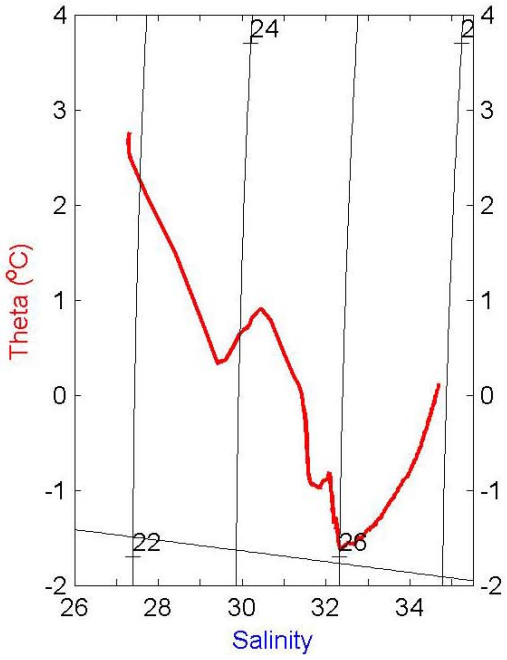
2000-22: Cast 131 Station AG3

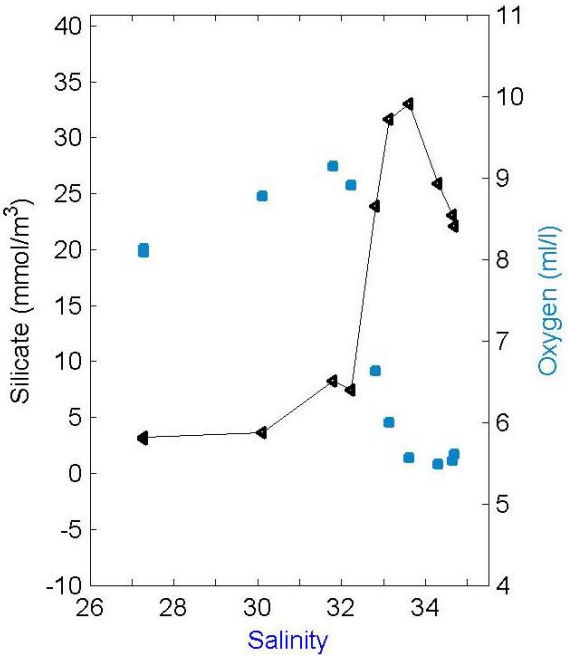


2000-22: Cast 134 Station AGT

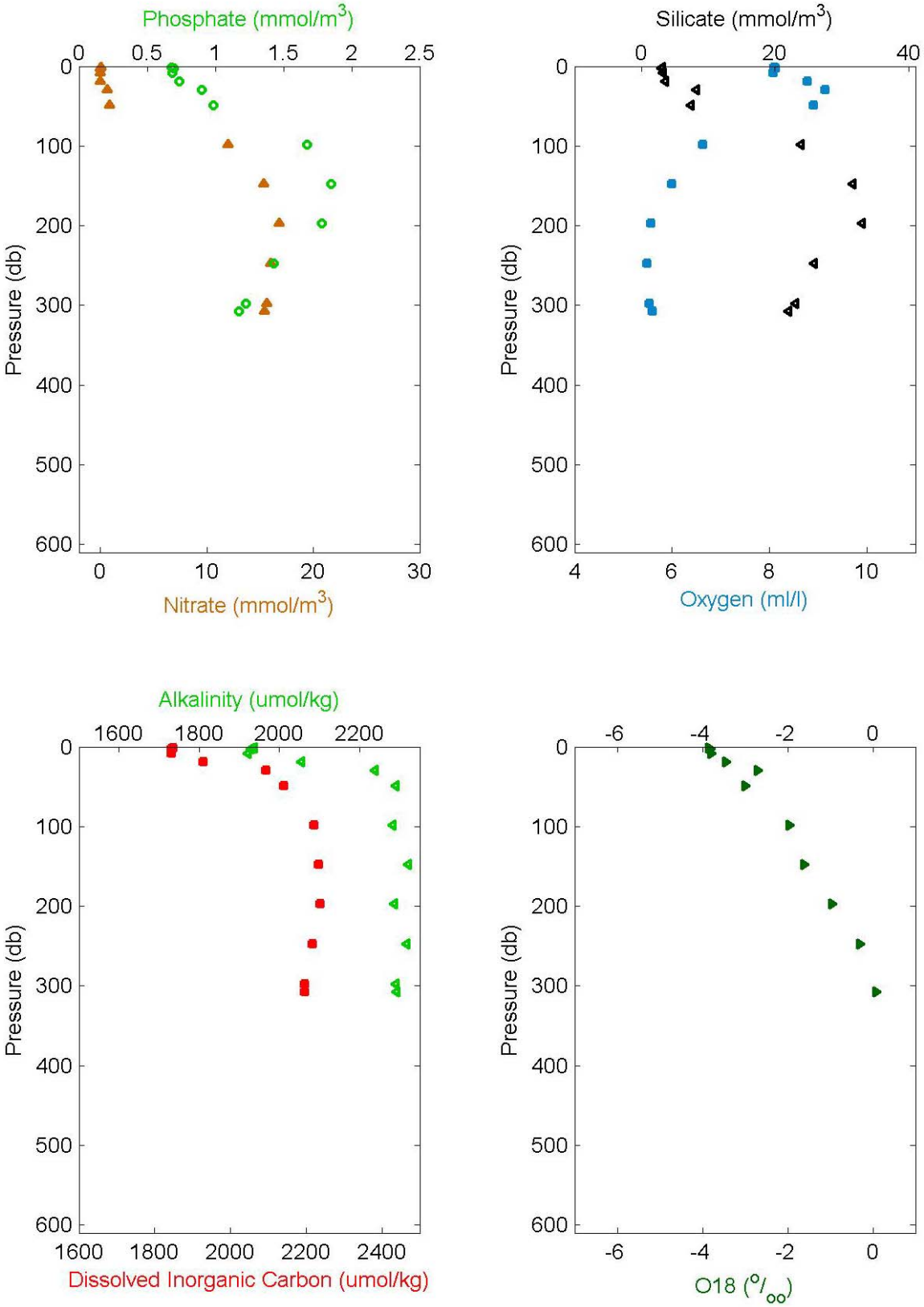




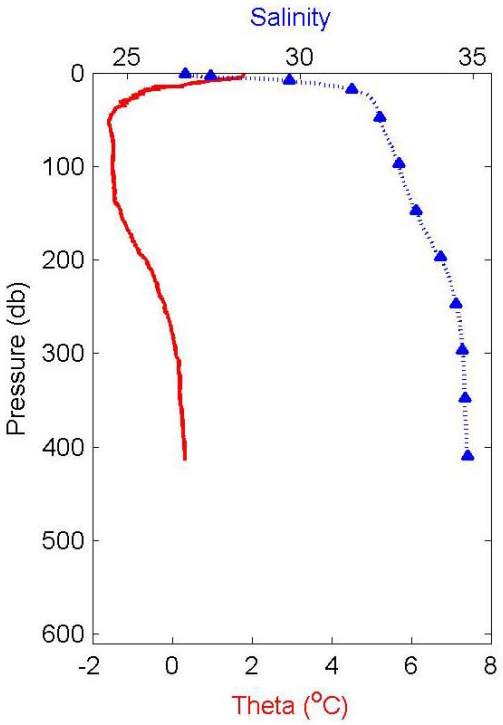


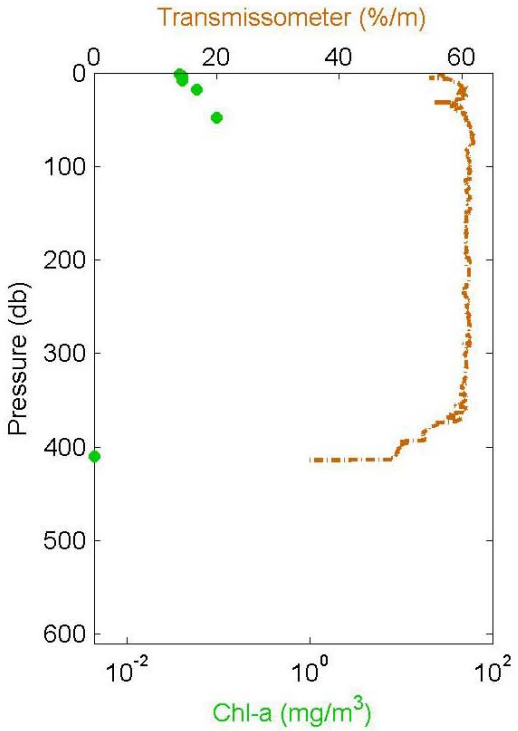


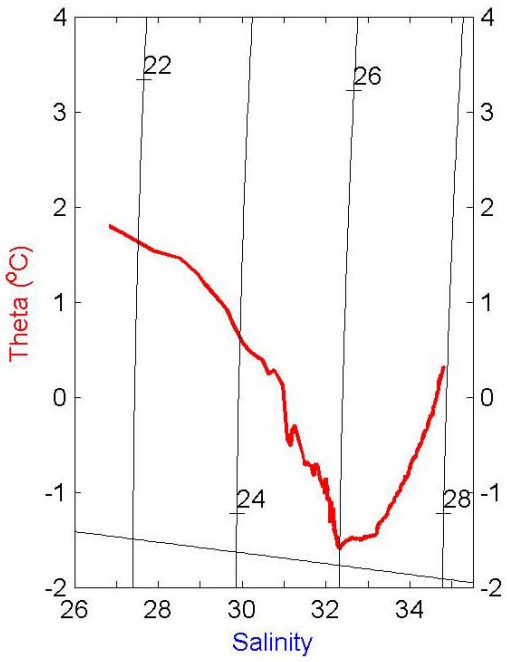
2000-22: Cast 134 Station AGT

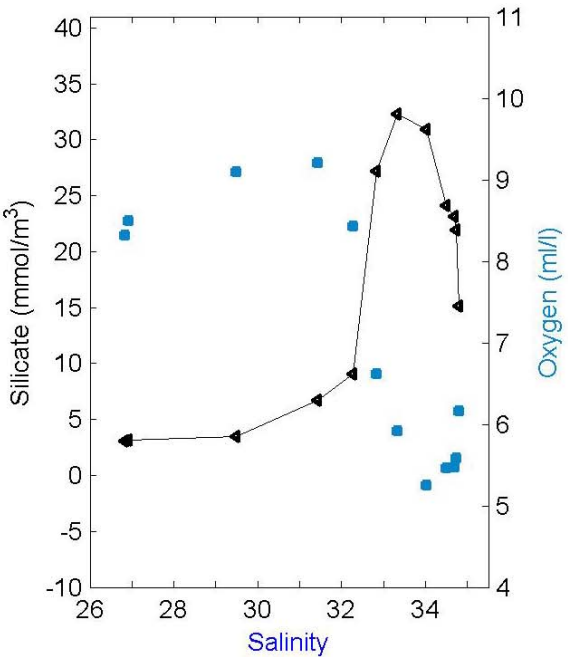


2000-22: Cast 138 Station CK5

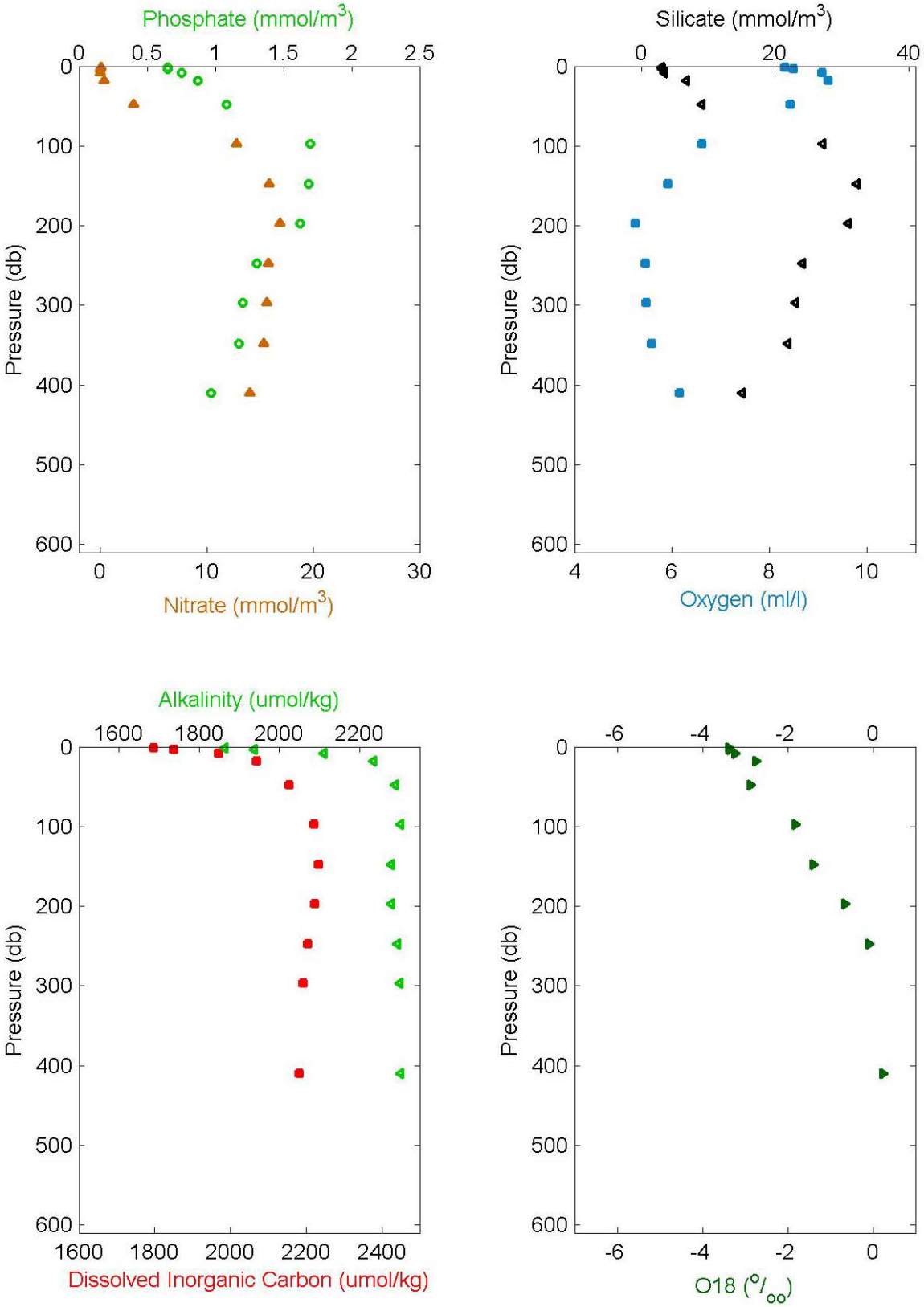




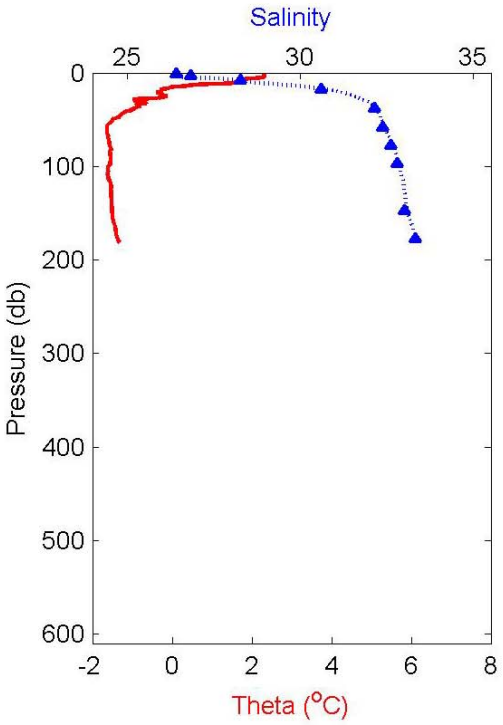


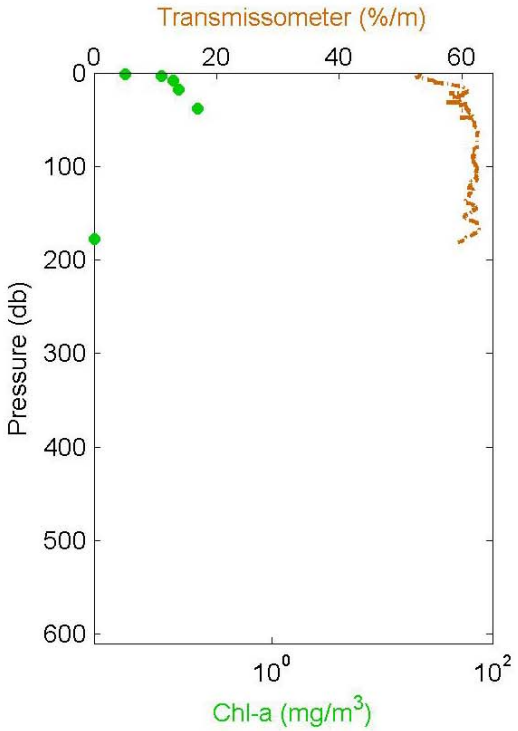


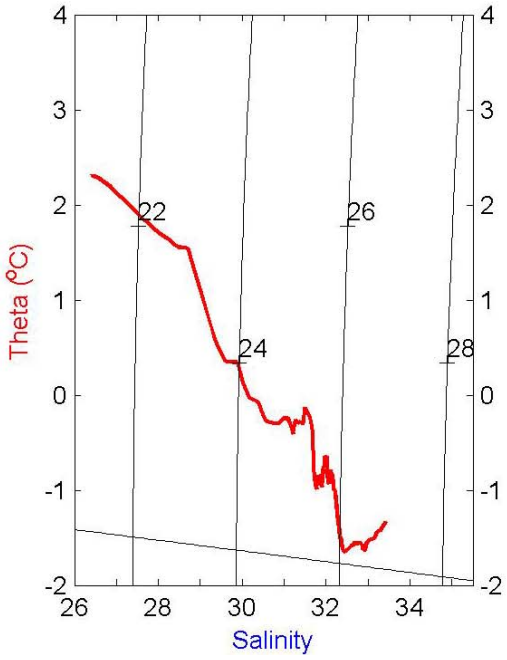
2000-22: Cast 138 Station CK5

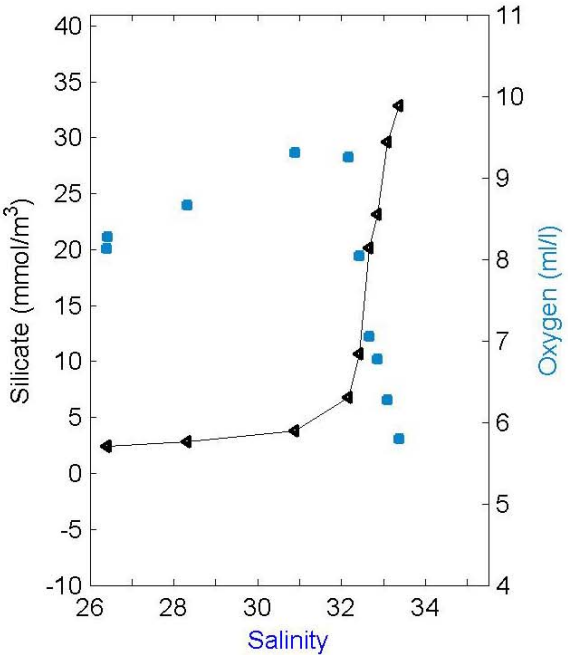


2000-22: Cast 141 Station CK3

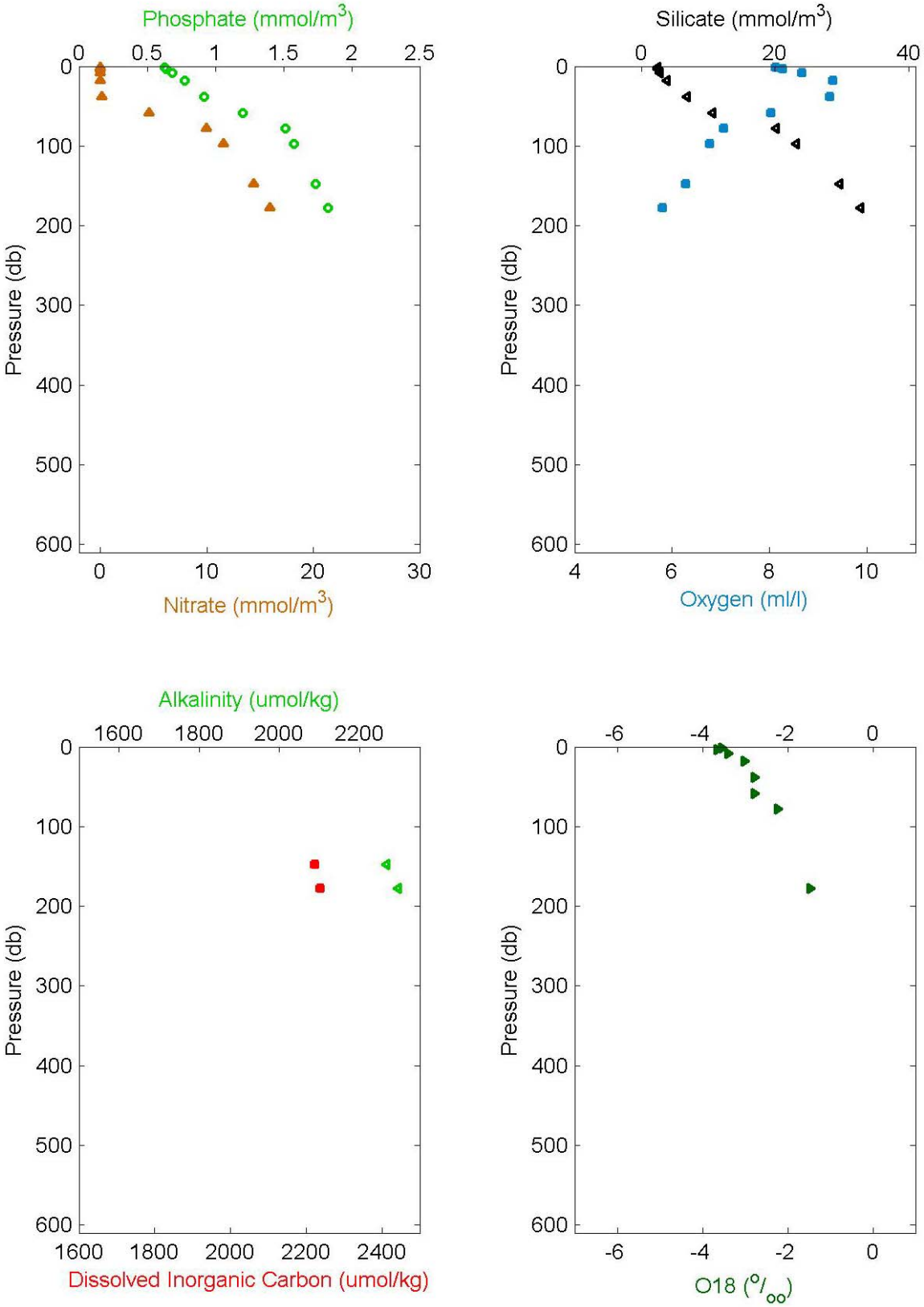




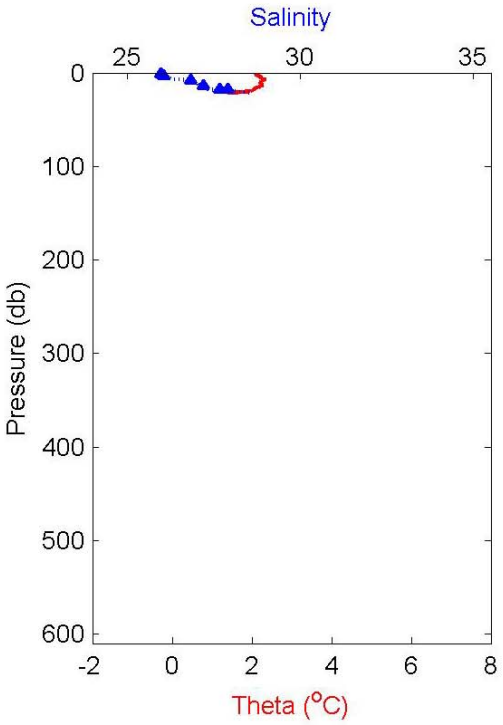


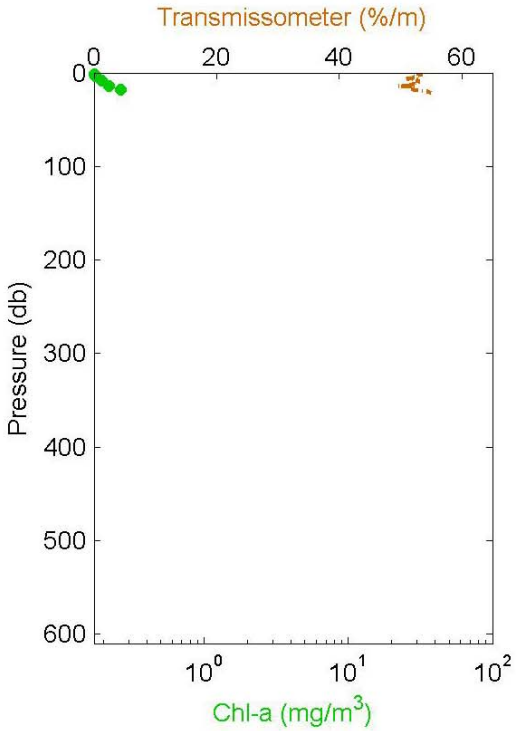


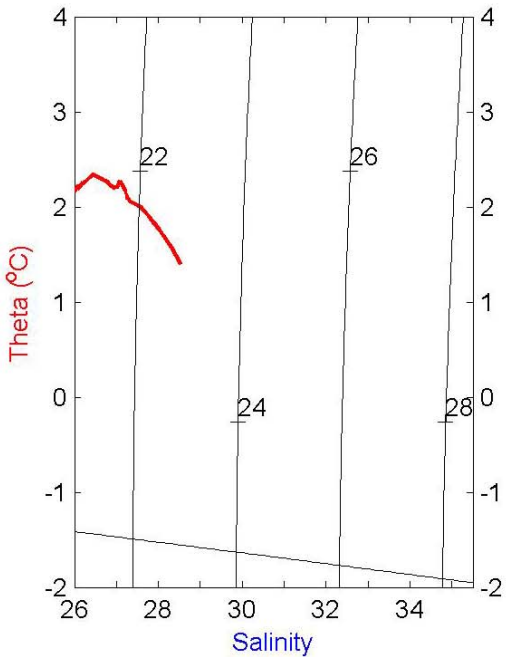
2000-22: Cast 141 Station CK3

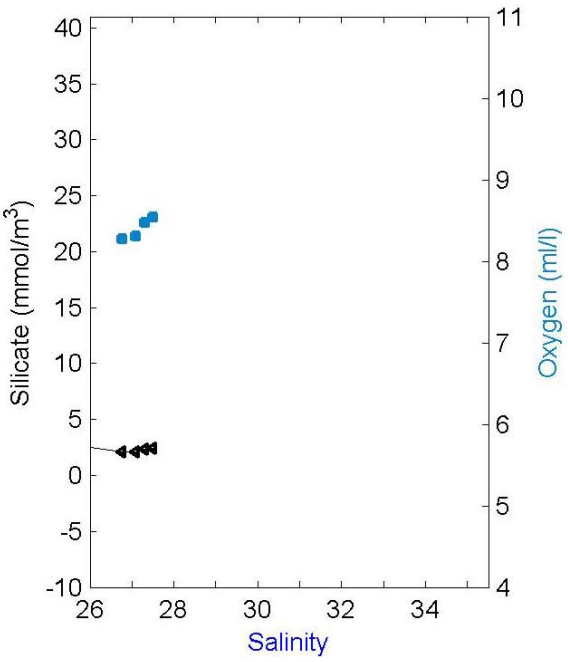


2000-22: Cast 143 Station CK1

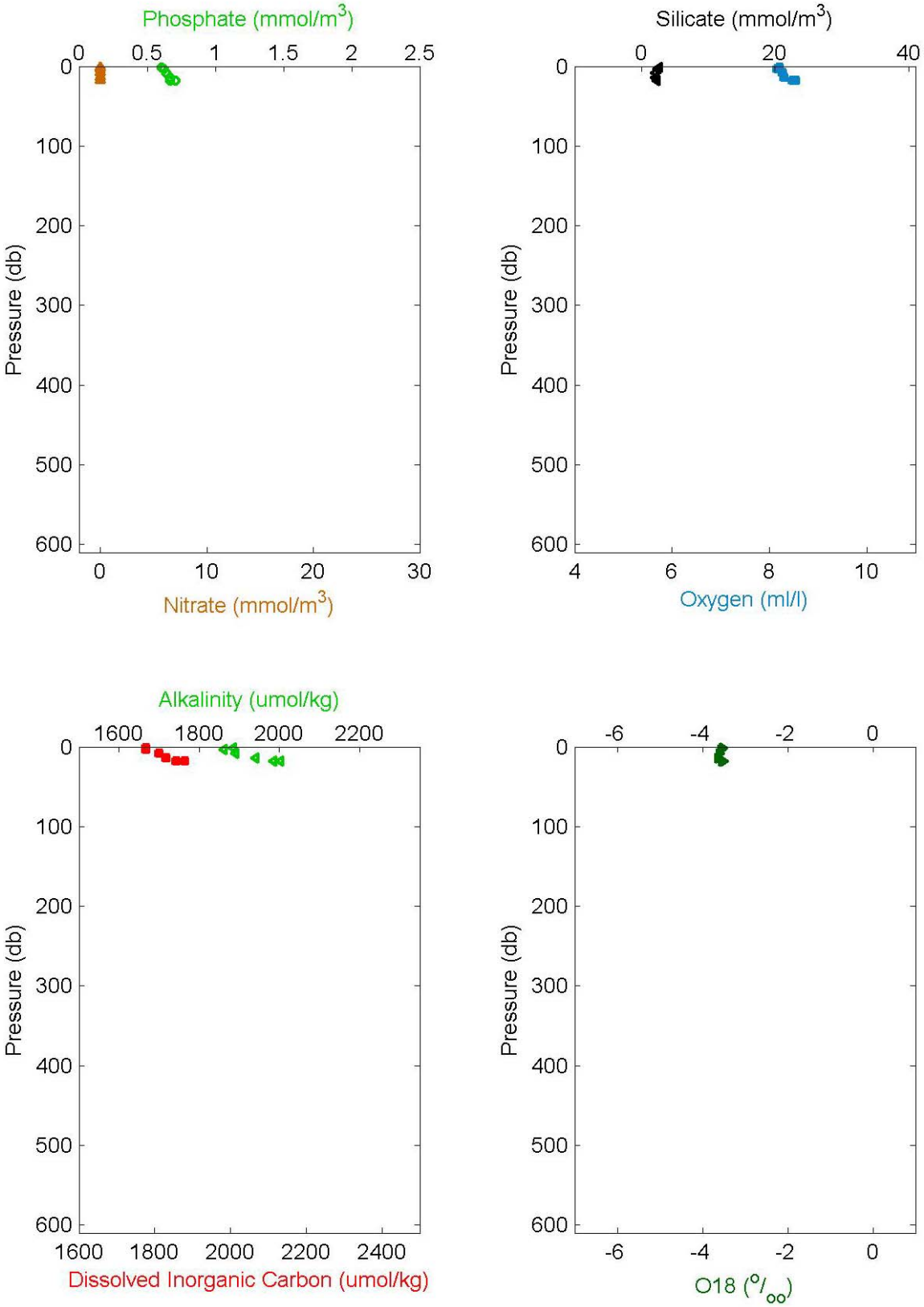




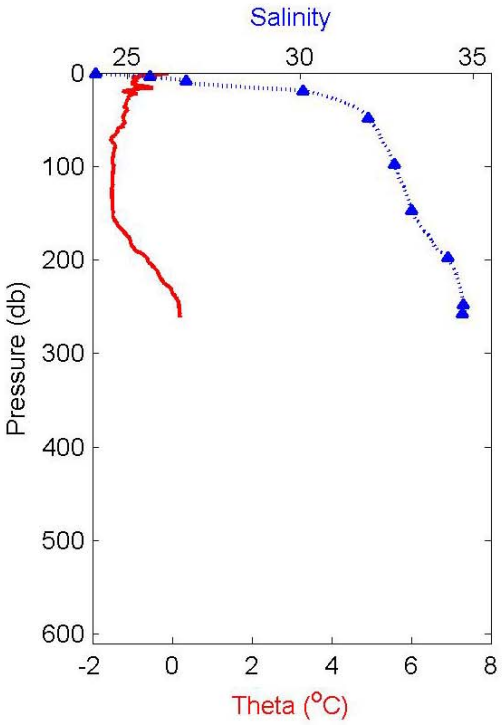


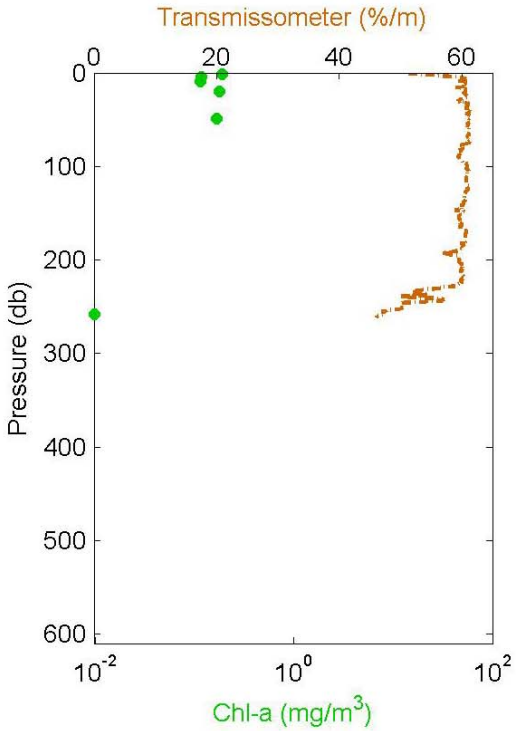


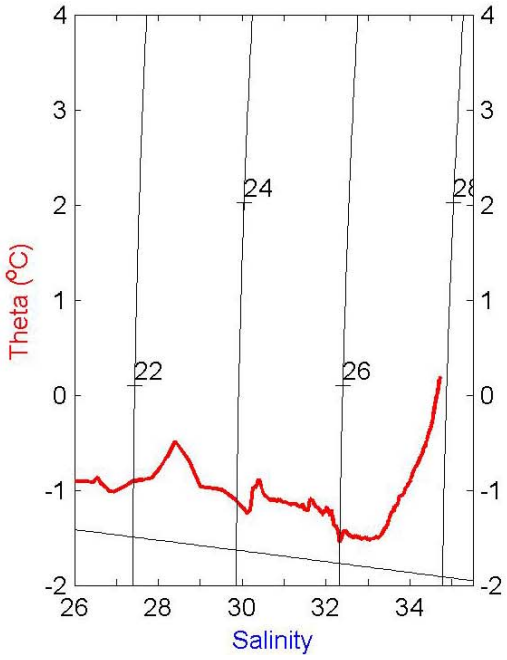
2000-22: Cast 143 Station CK1

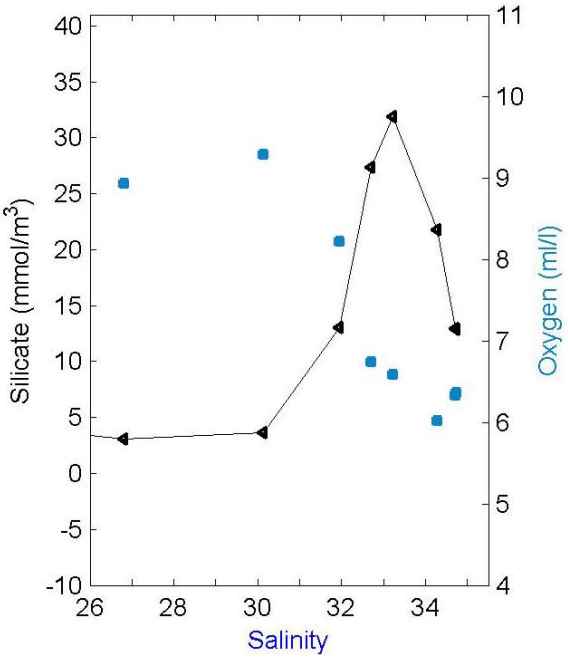


2000-22: Cast 144 Station AGT2

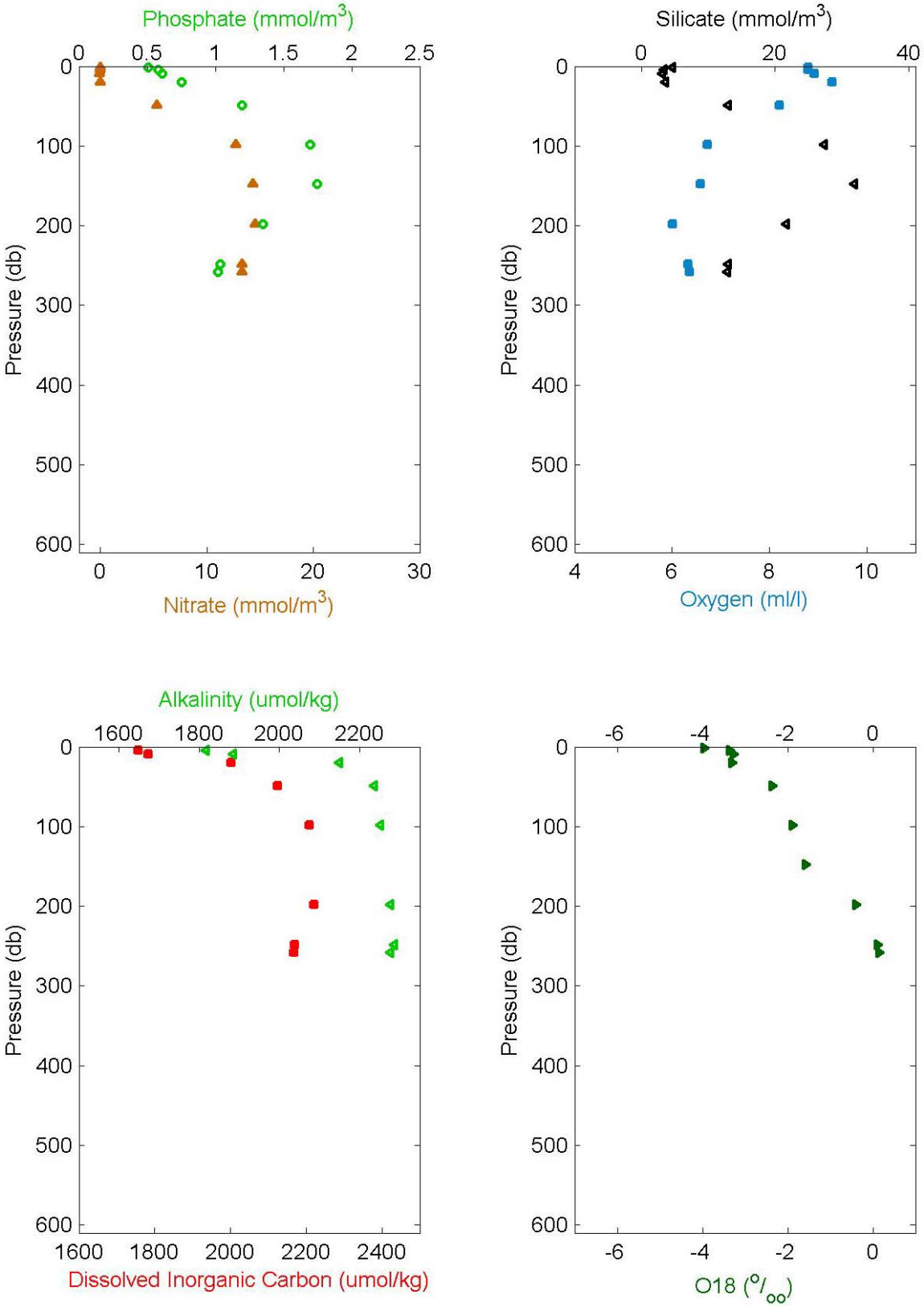




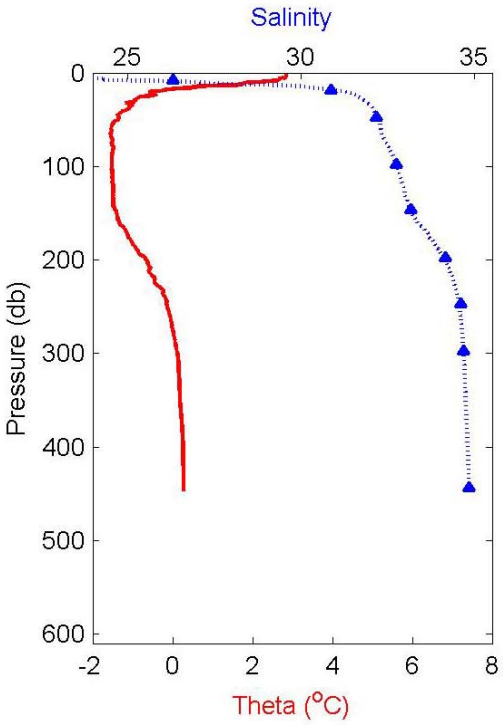


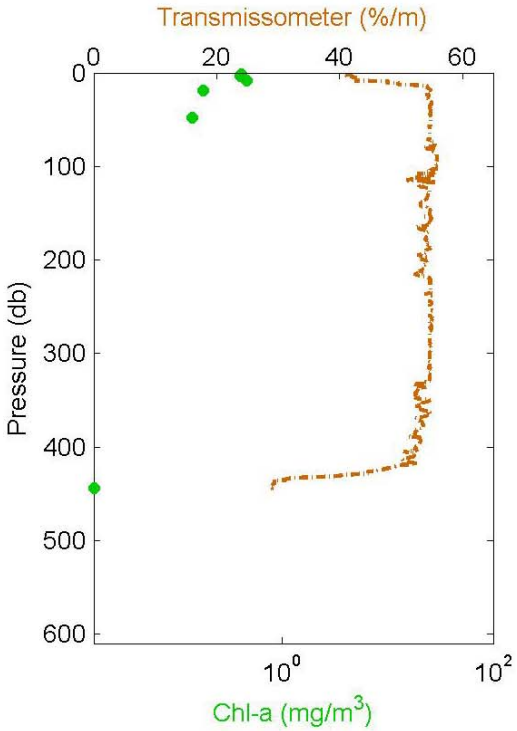


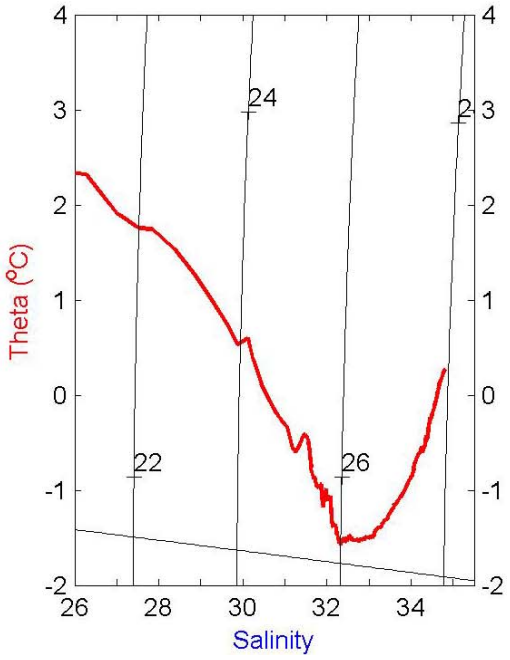
2000-22: Cast 144 Station AGT2

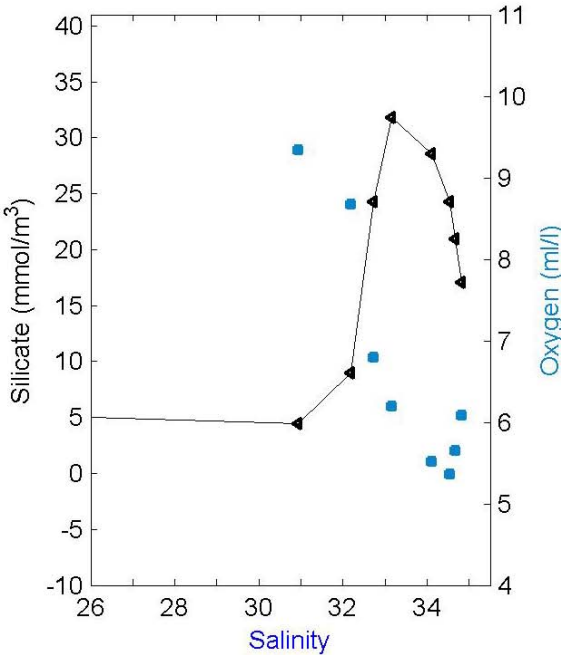


2000-22: Cast 146 Station AGT3

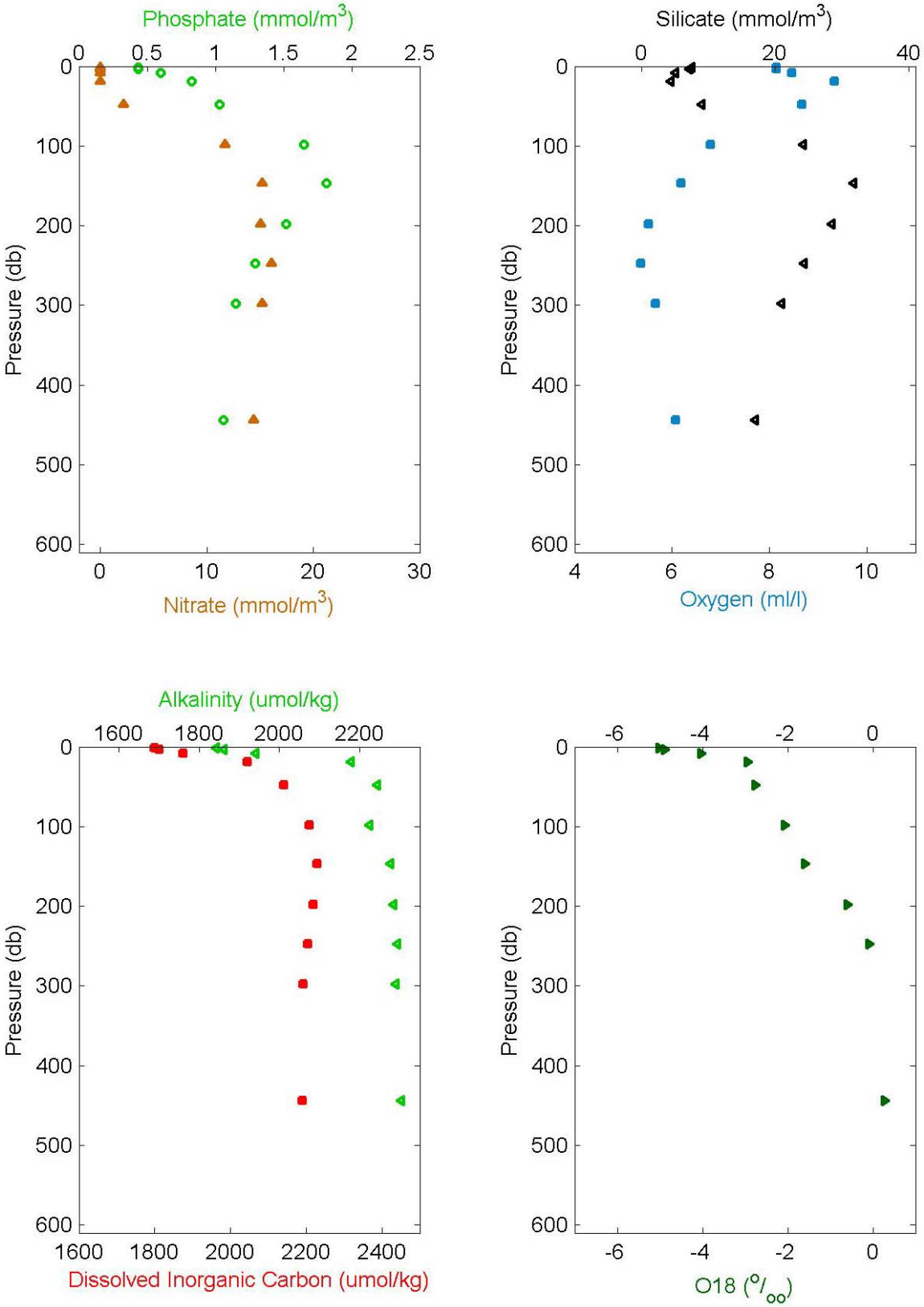




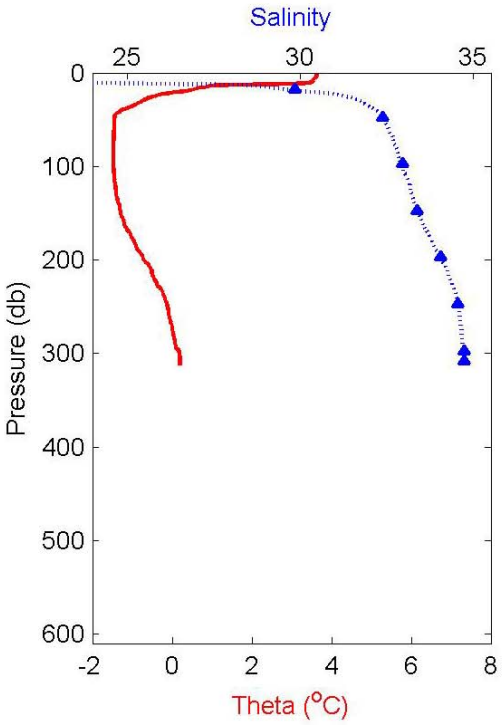


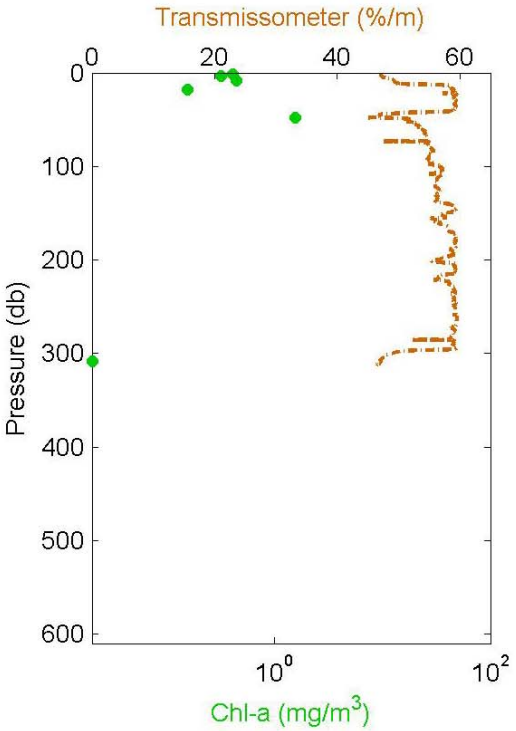


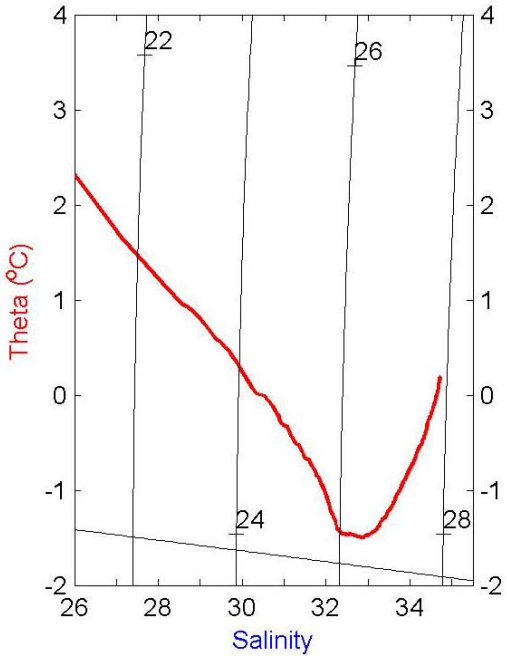
2000-22: Cast 146 Station AGT3

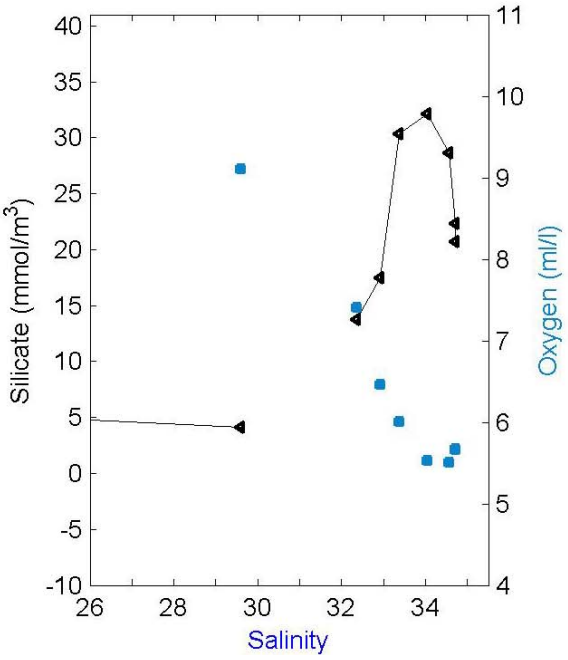


2000-22: Cast 147 Station WB1

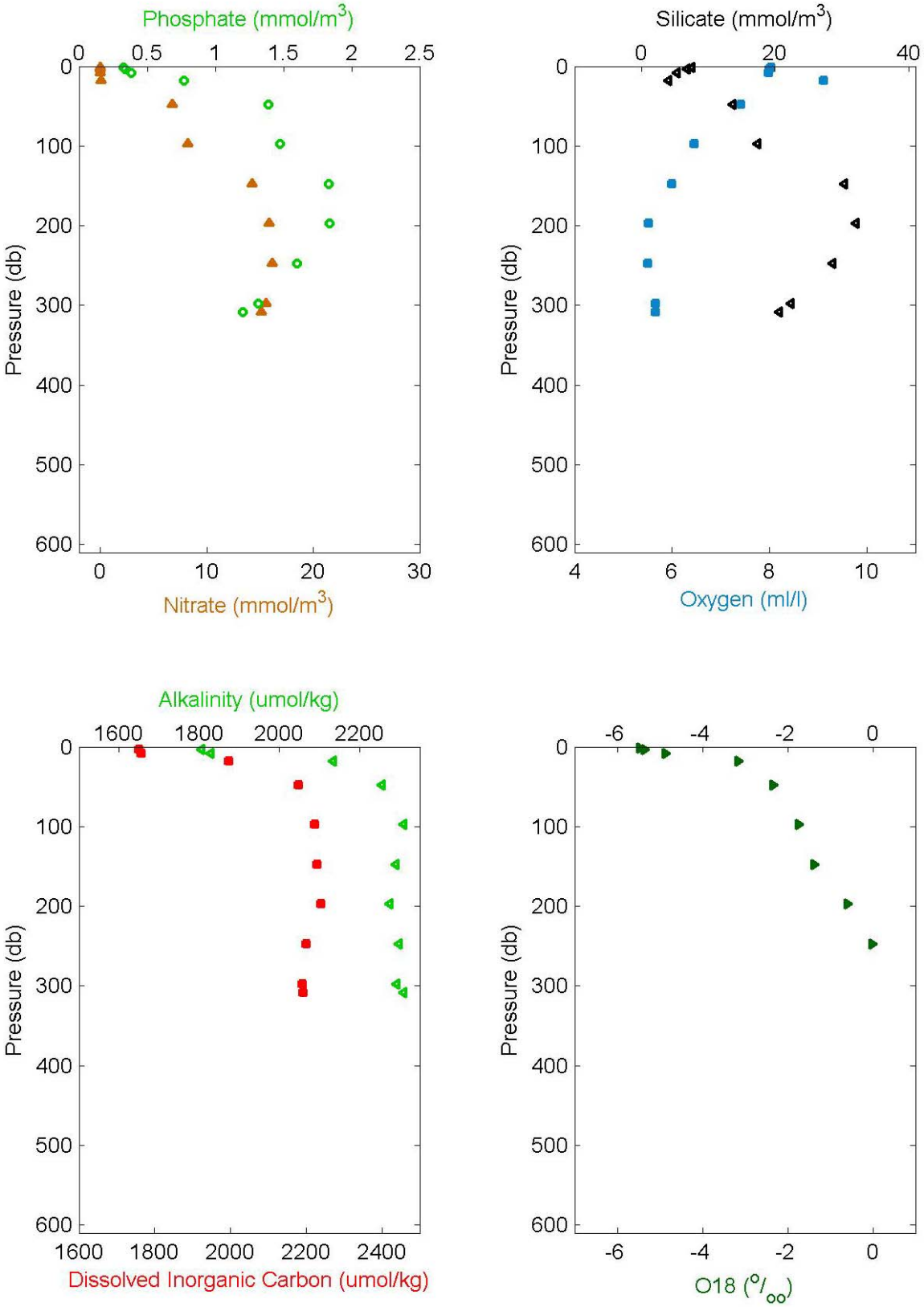




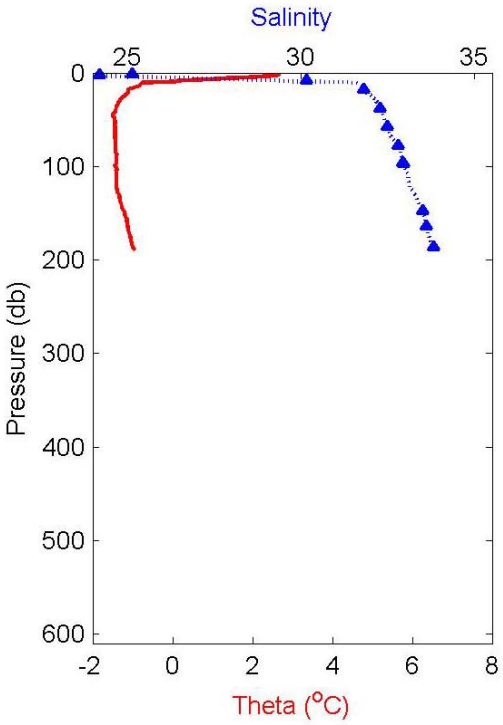


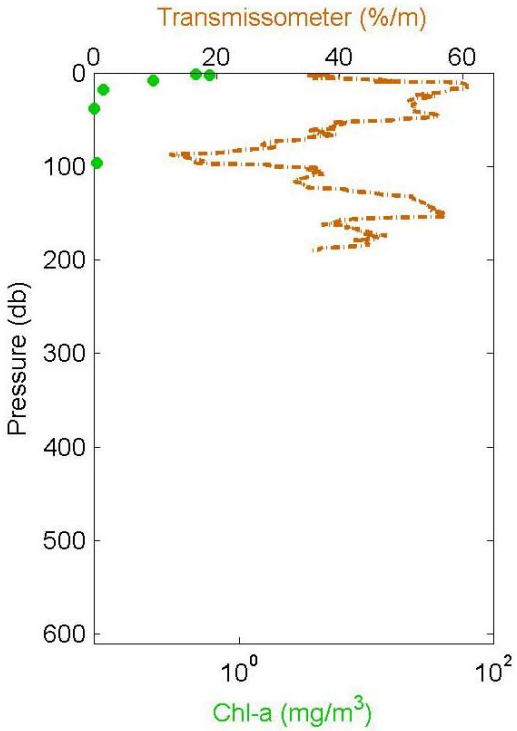


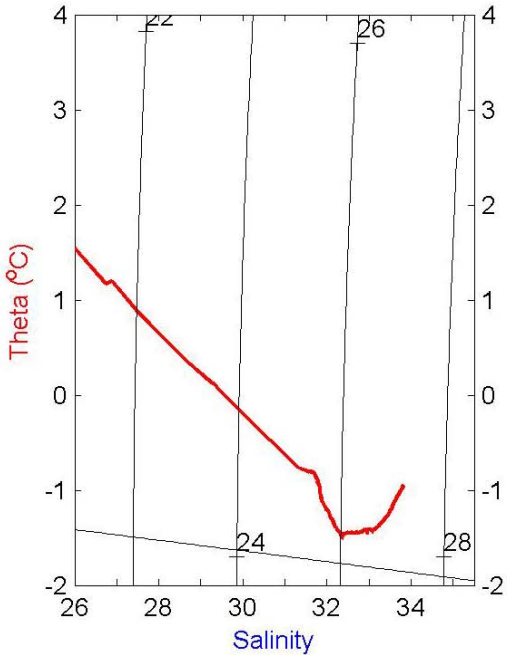
2000-22: Cast 147 Station WB1

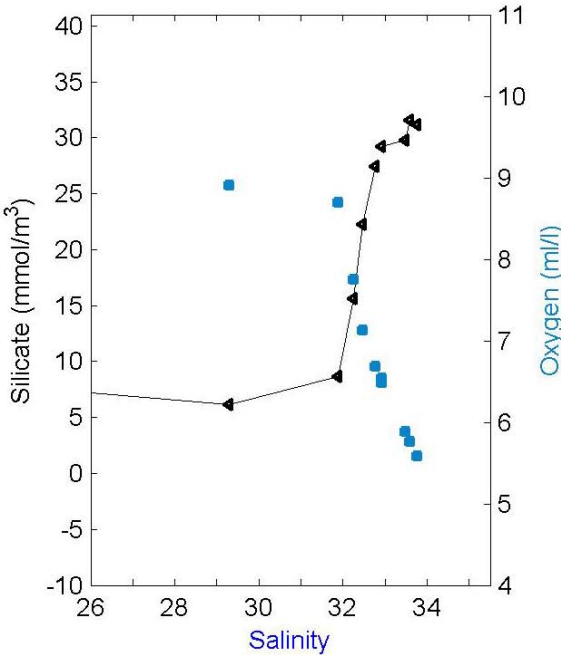


2000-22: Cast 150 Station WB3

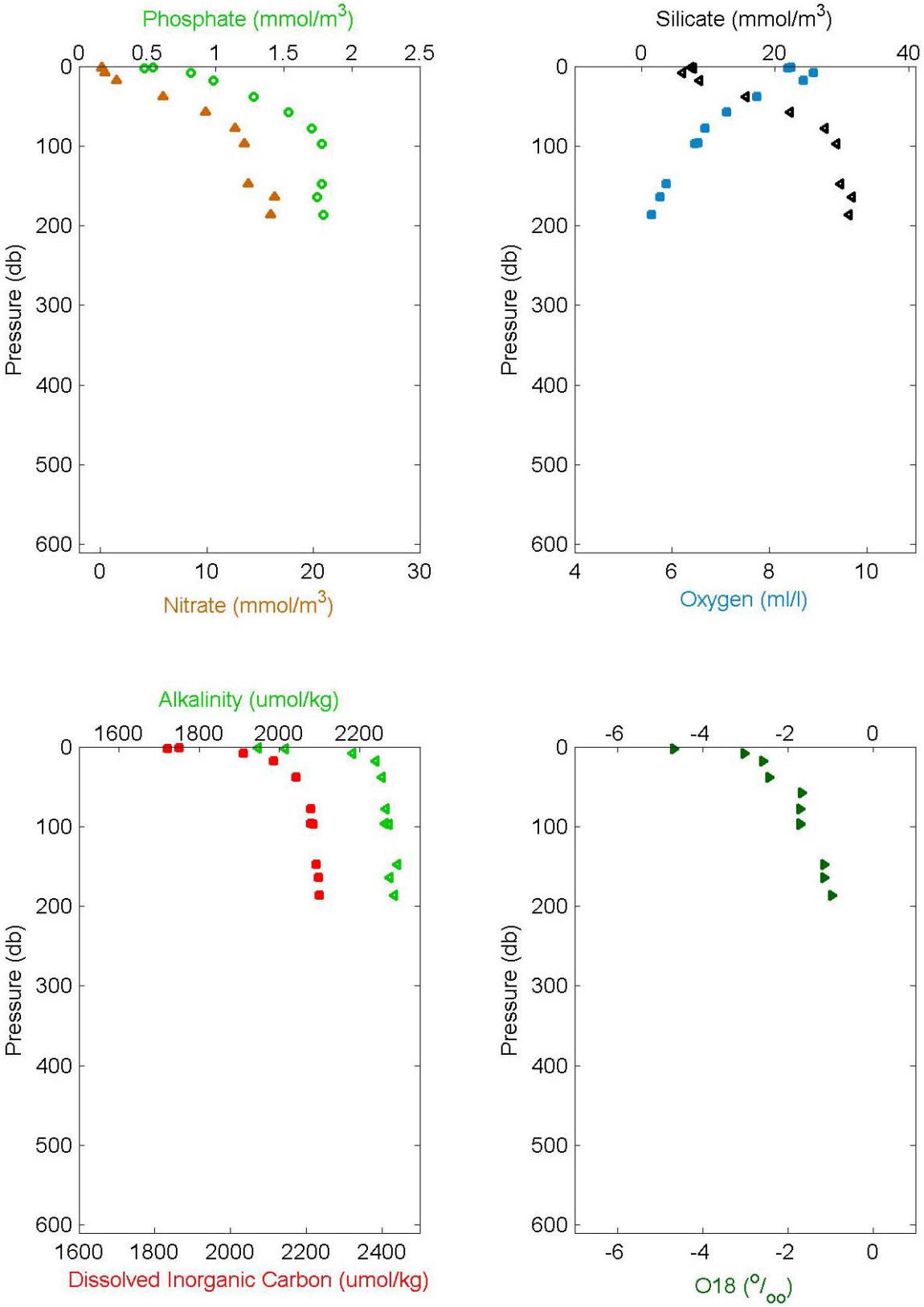




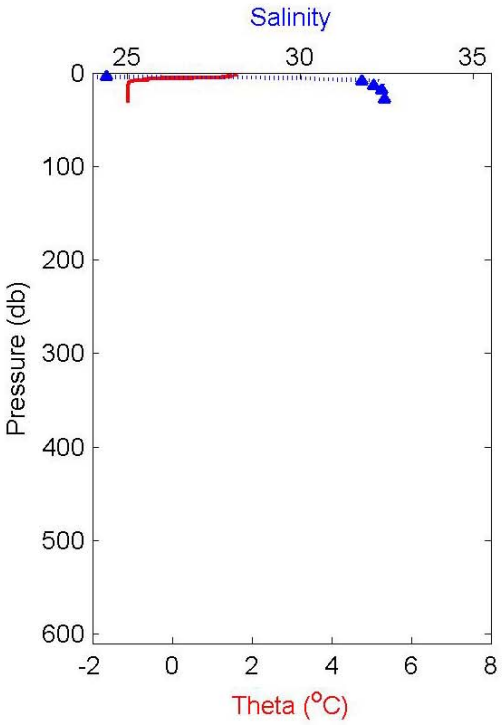


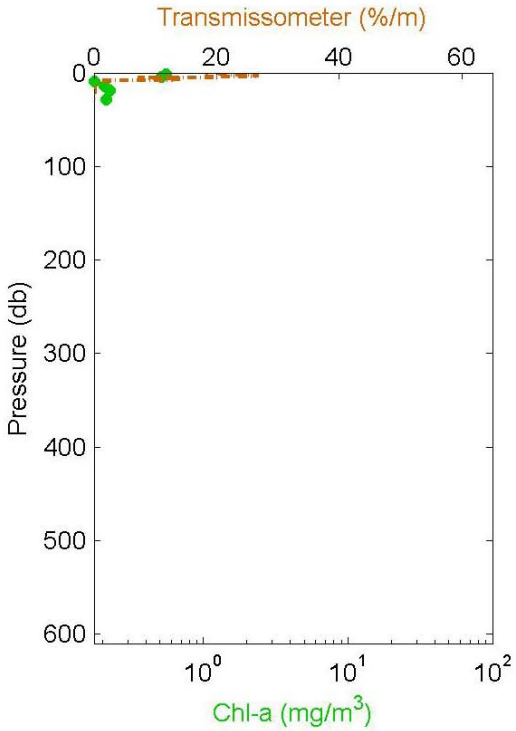


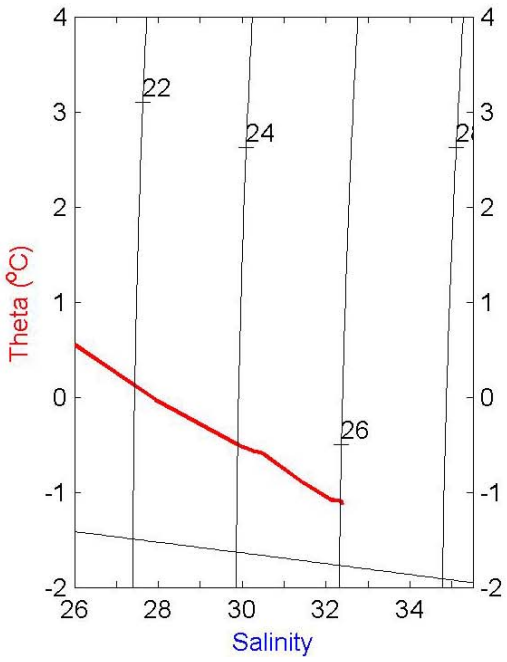
2000-22: Cast 150 Station WB3

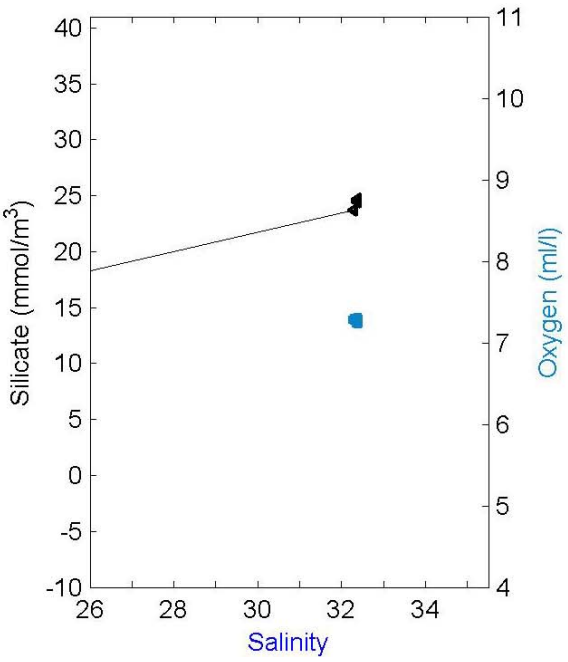


2000-22: Cast 152 Station WB5

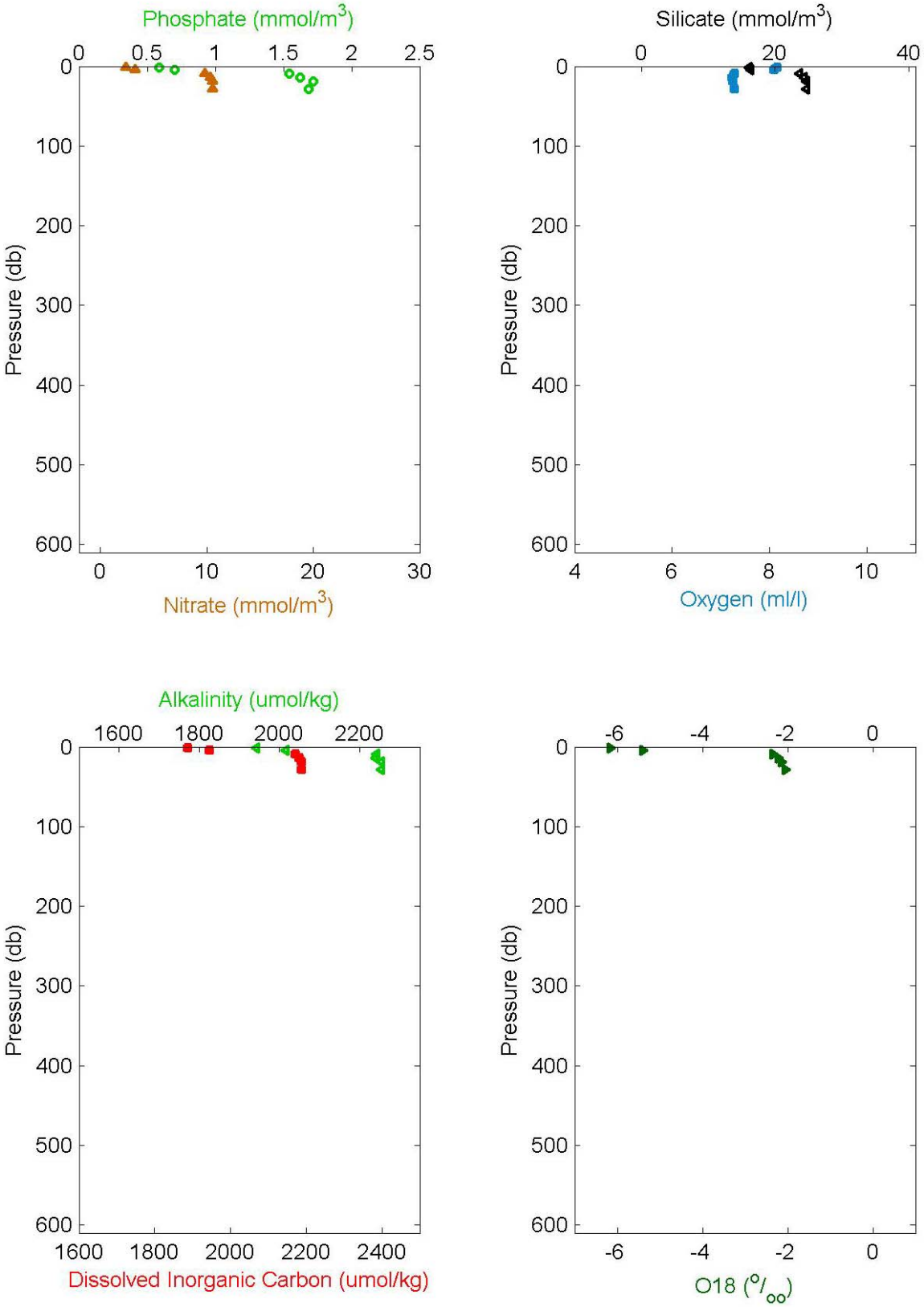




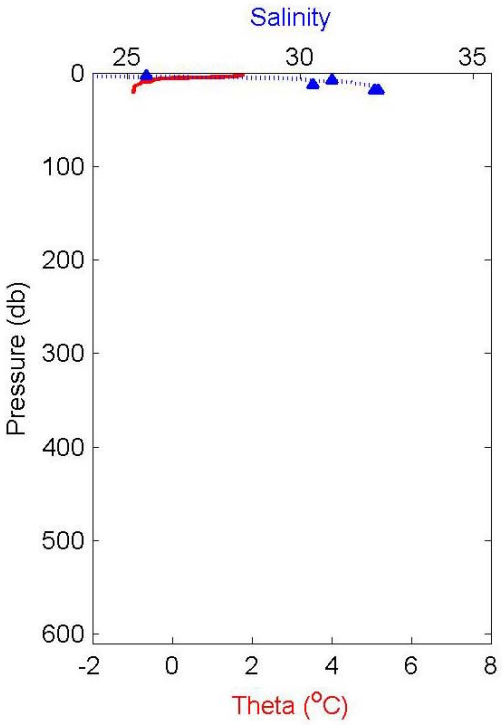


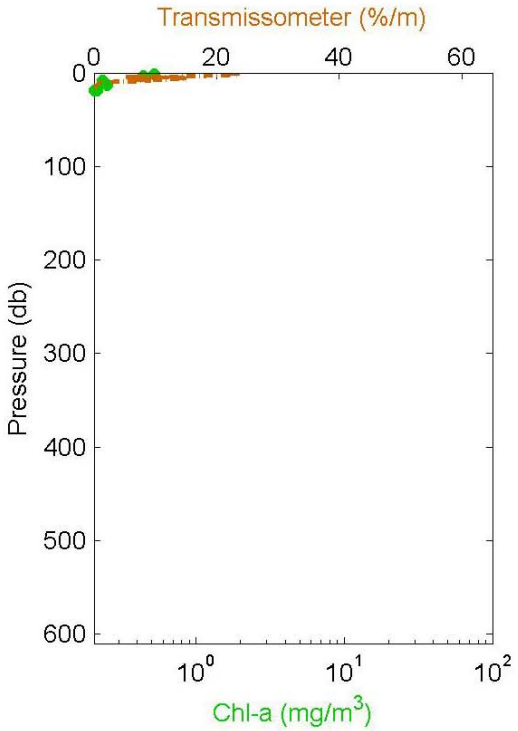


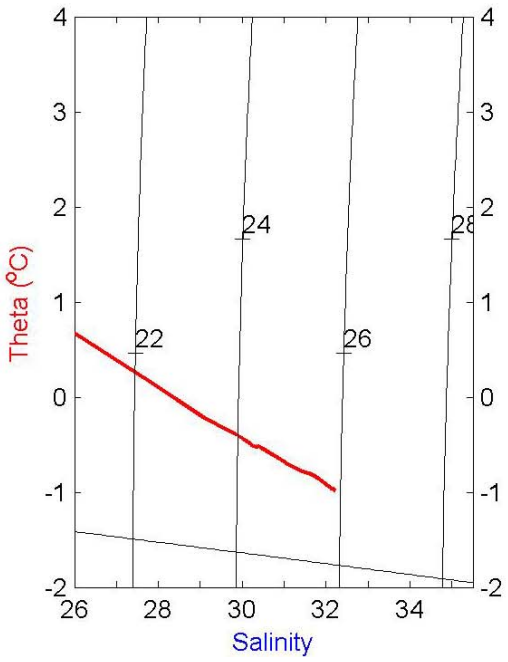
2000-22: Cast 152 Station WB5

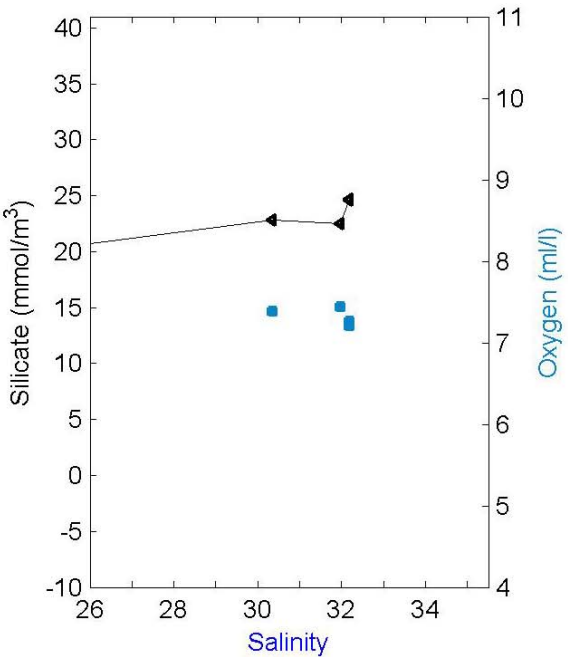


2000-22: Cast 153 Station WB6

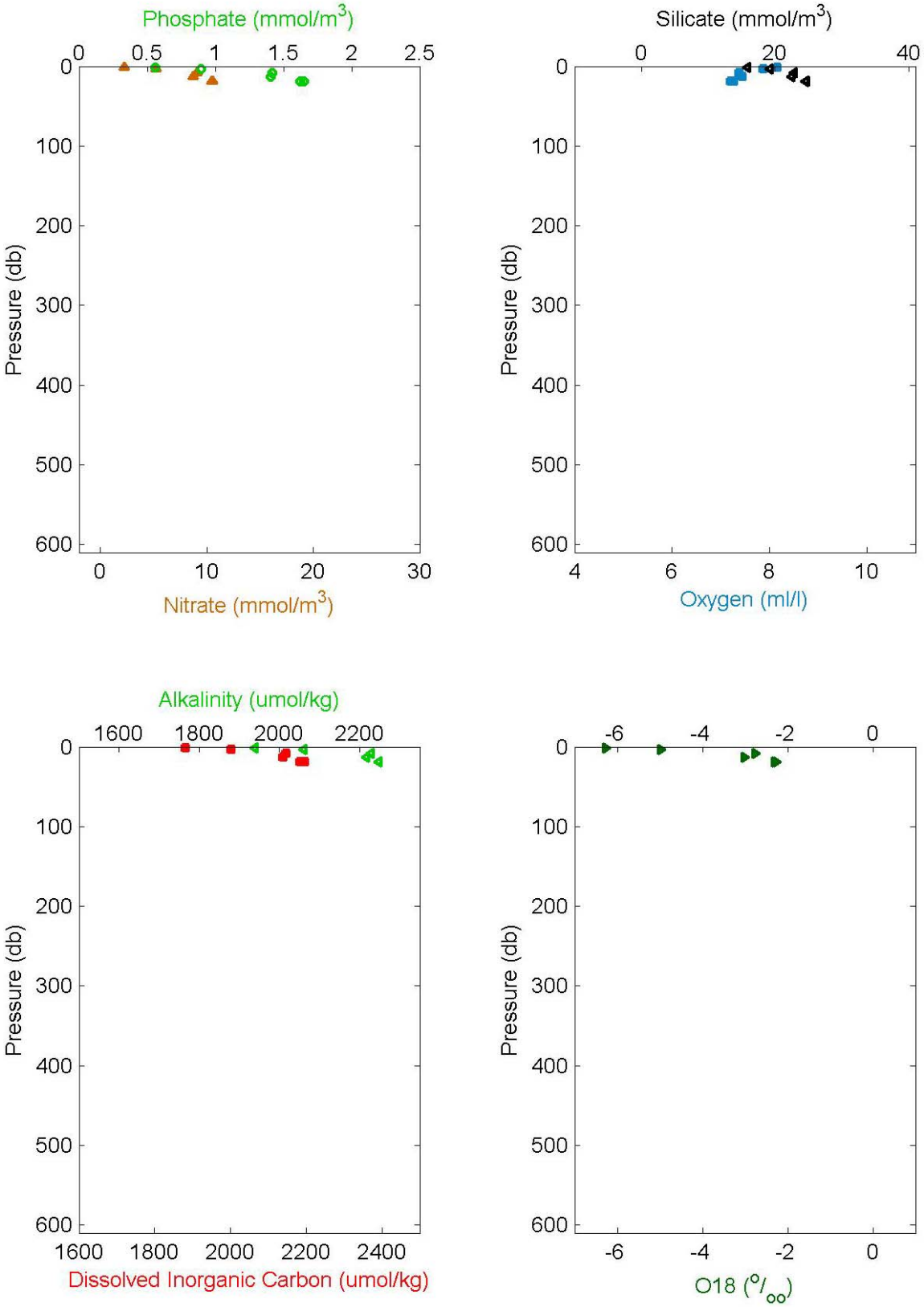




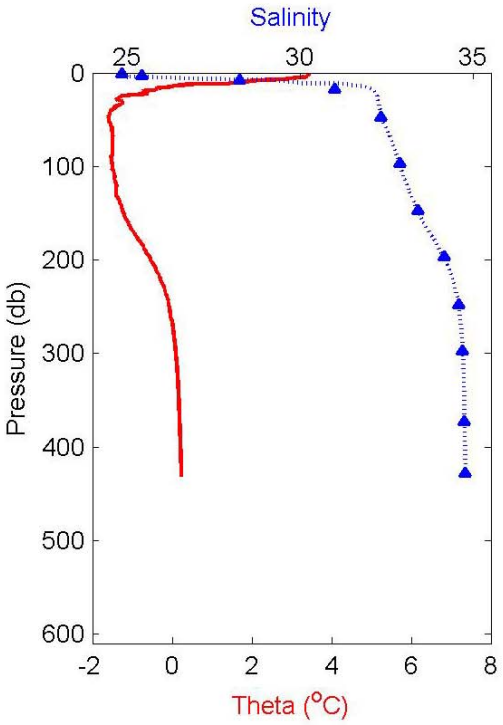


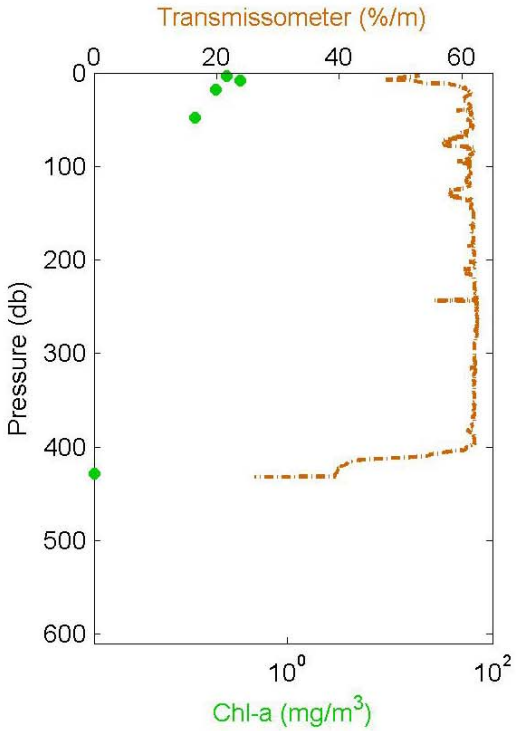


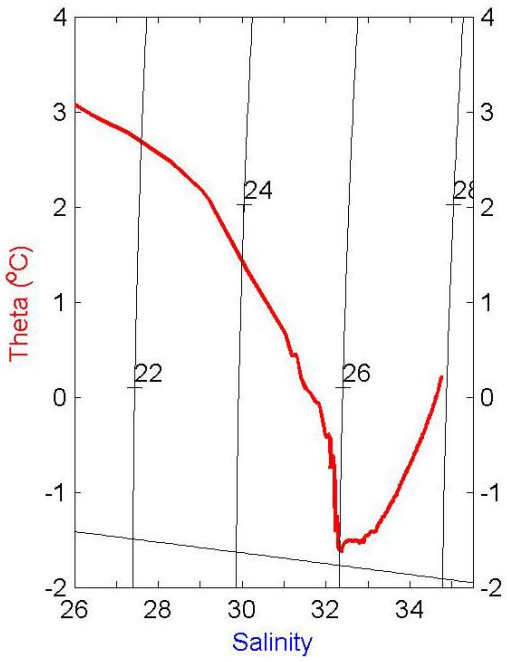
2000-22: Cast 153 Station WB6

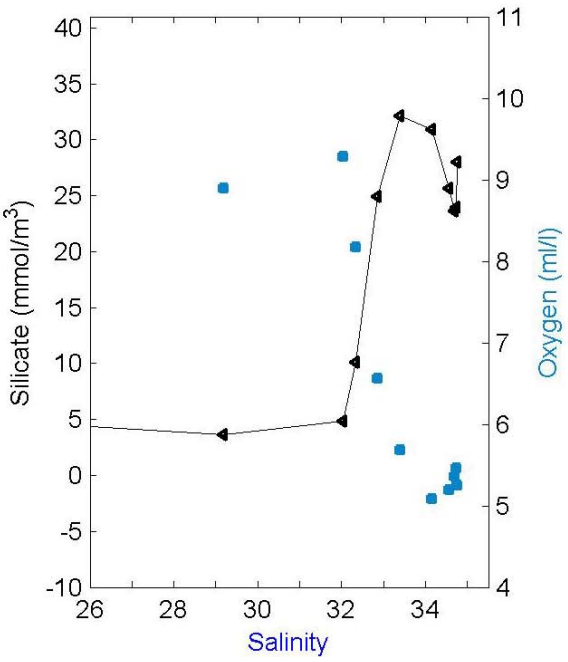


2000-22: Cast 154 Station AGT4

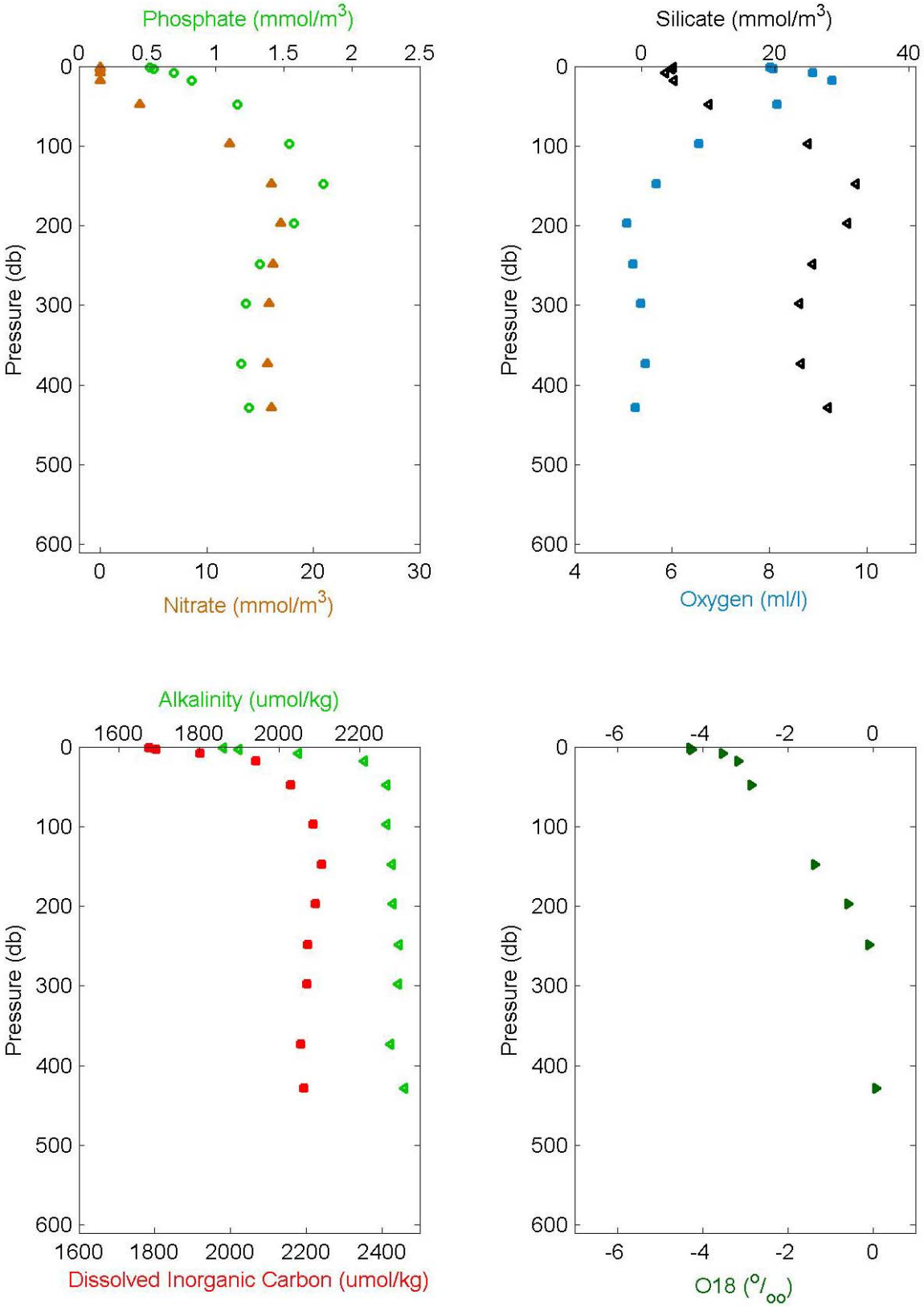




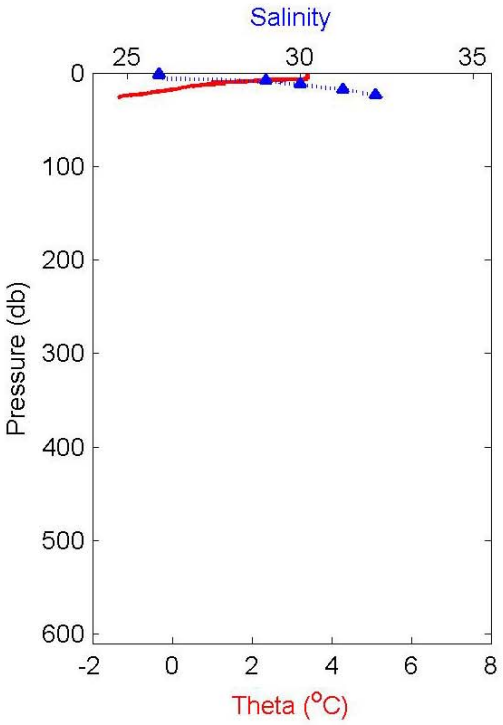


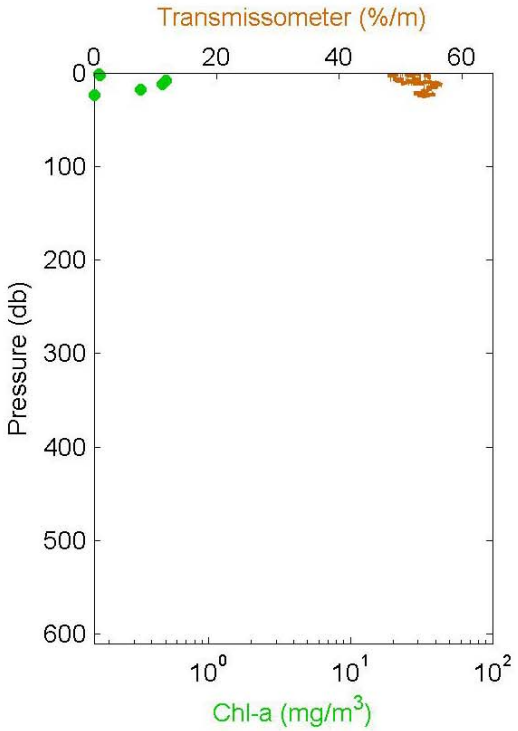


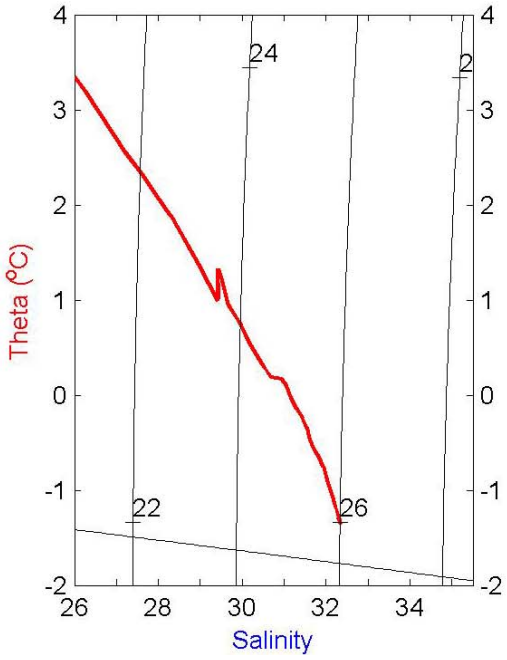
2000-22: Cast 154 Station AGT4

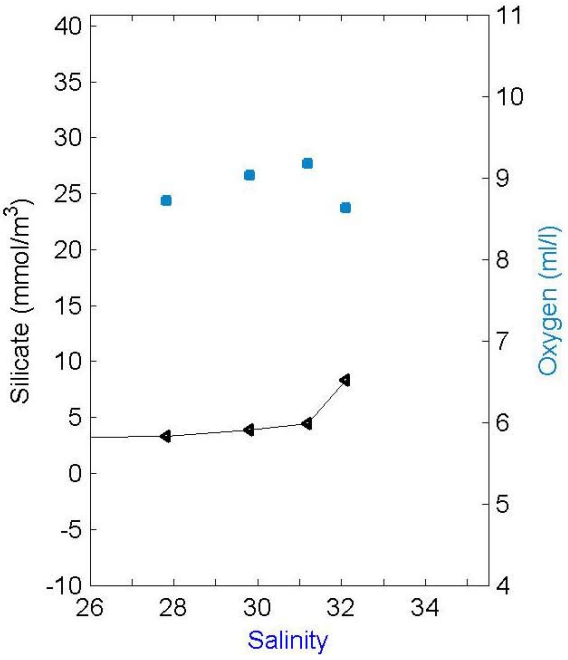


2000-22: Cast 155 Station DT1

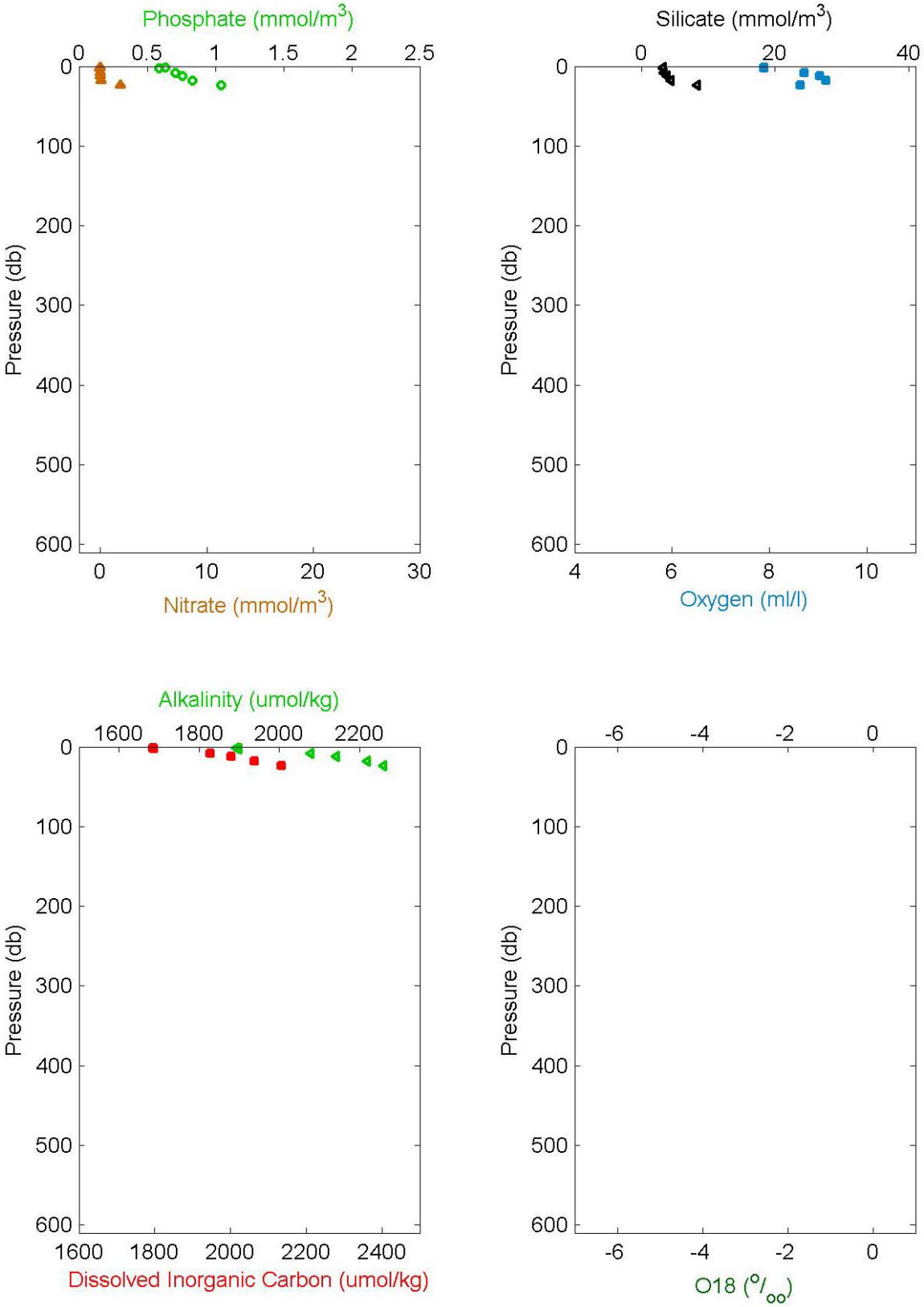




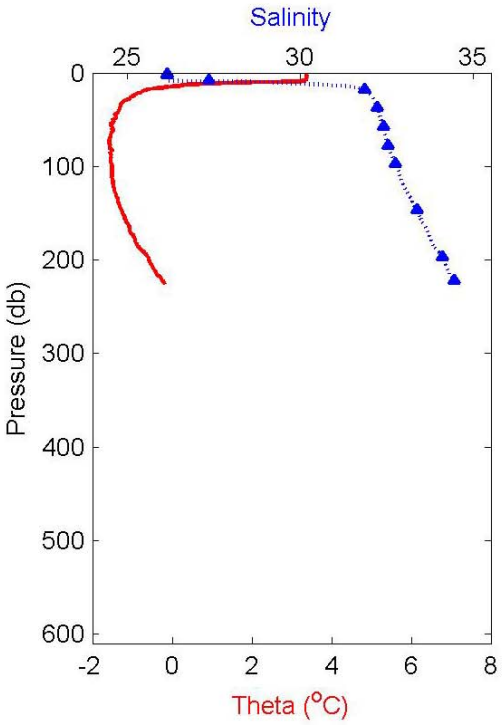


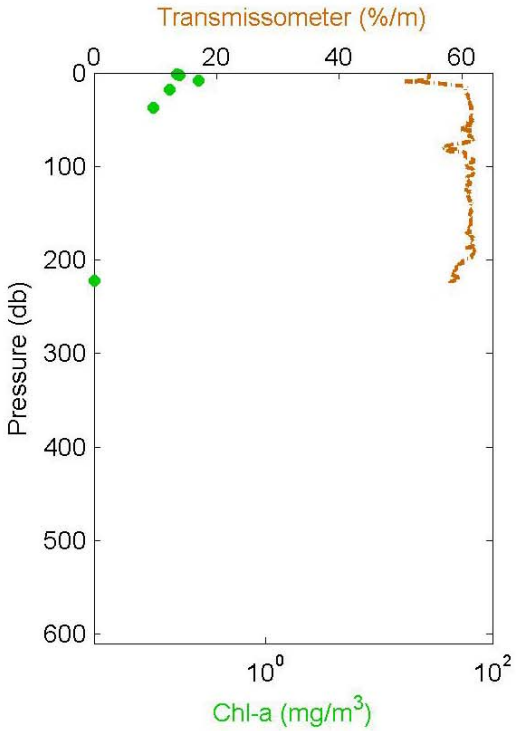


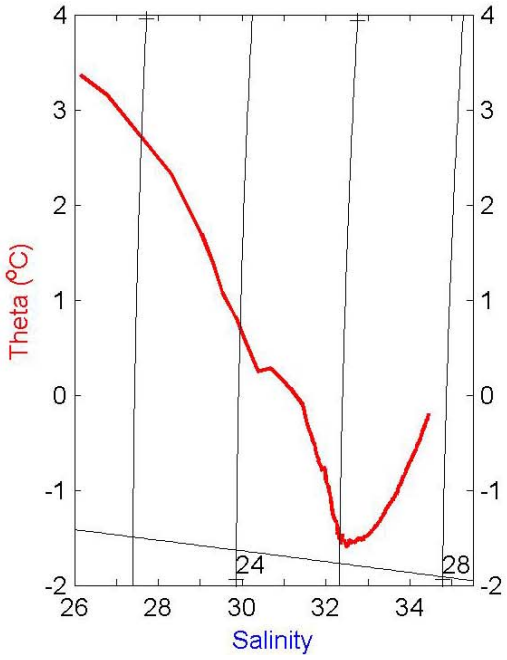
2000-22: Cast 155 Station DT1

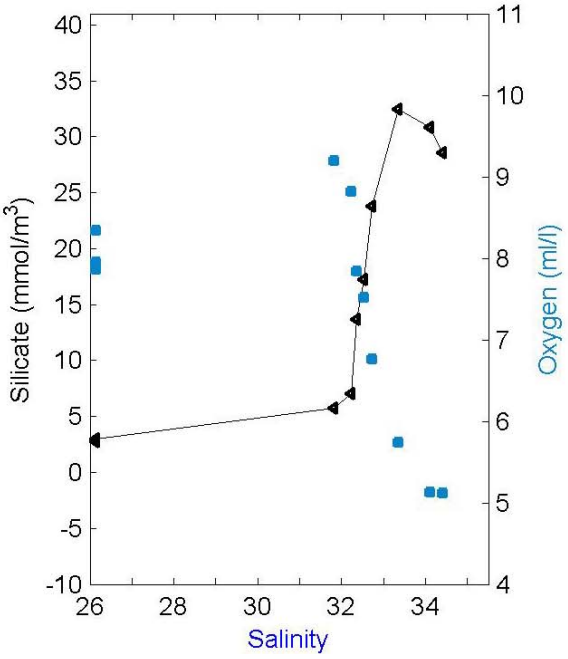


2000-22: Cast 157 Station DT3

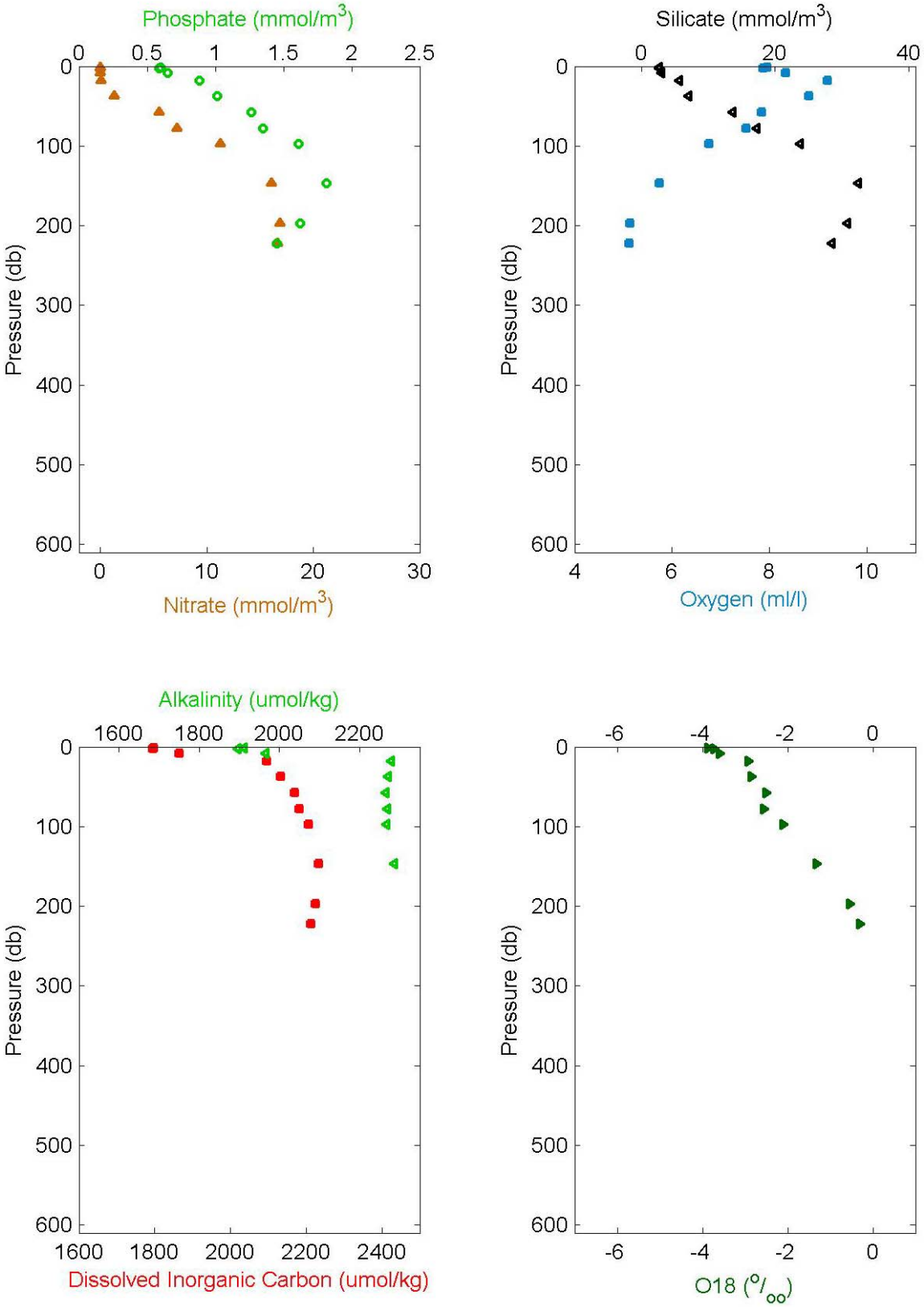




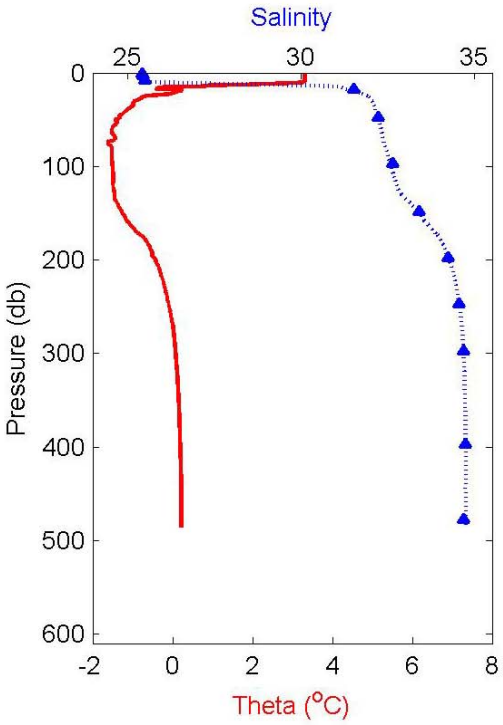


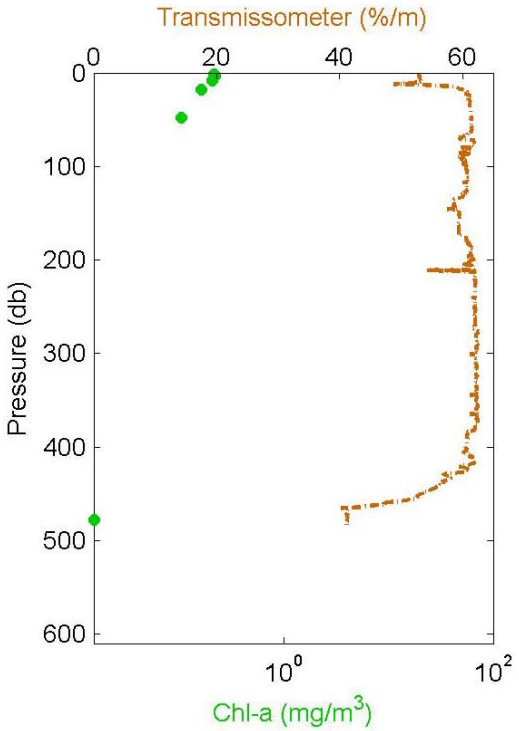


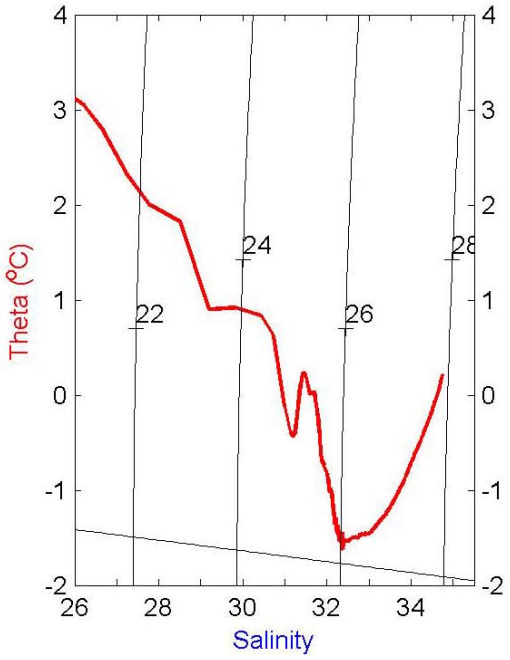
2000-22: Cast 157 Station DT3

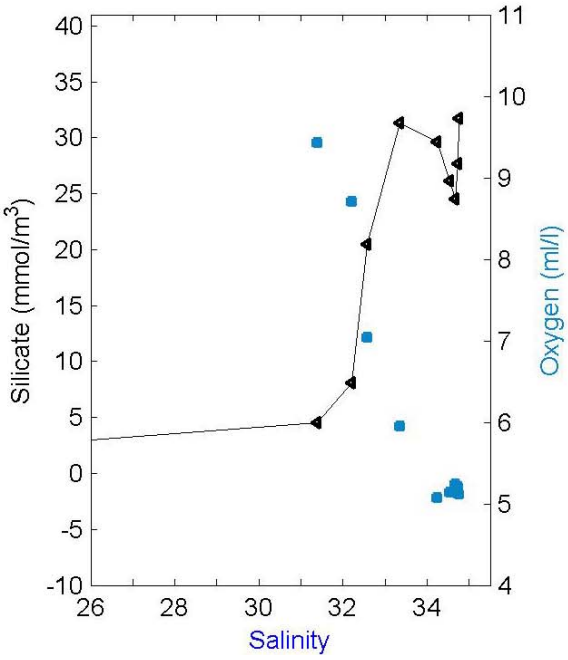


2000-22: Cast 159 Station DT5

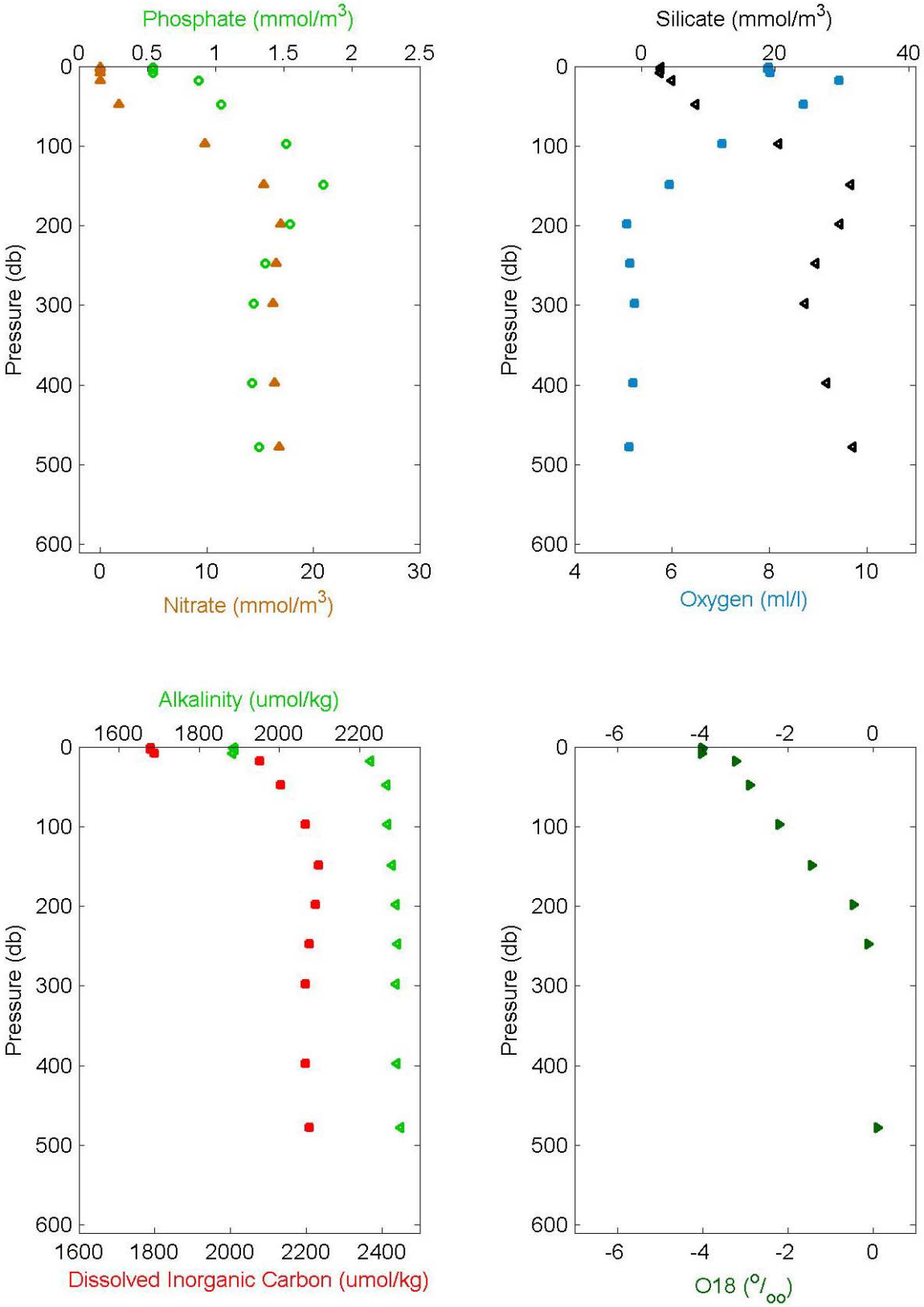






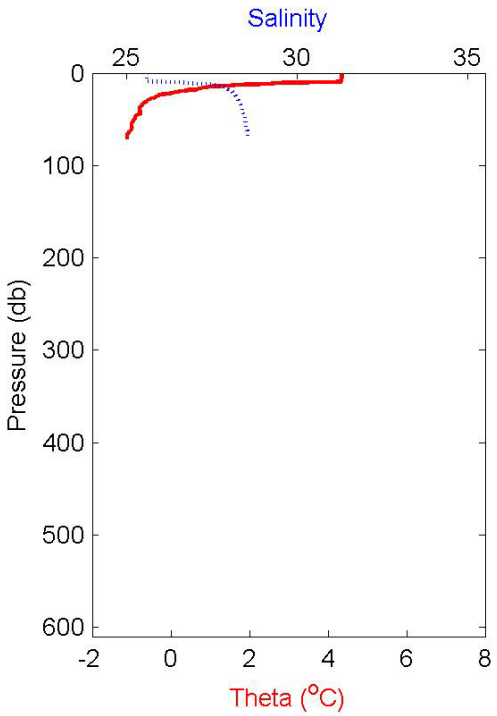


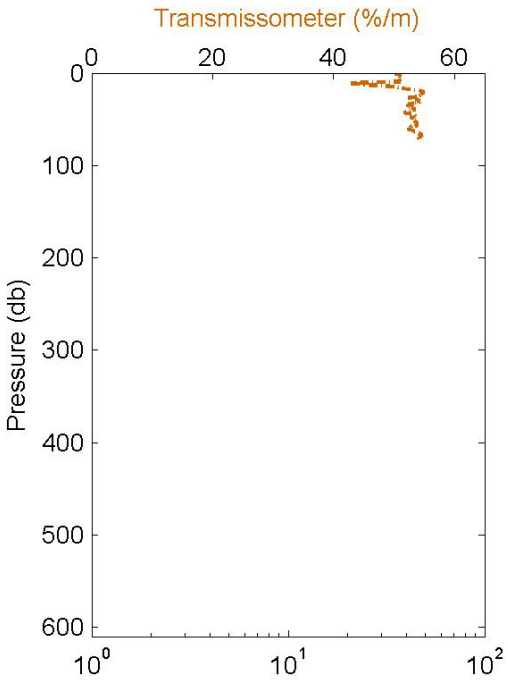
2000-22: Cast 159 Station DT5

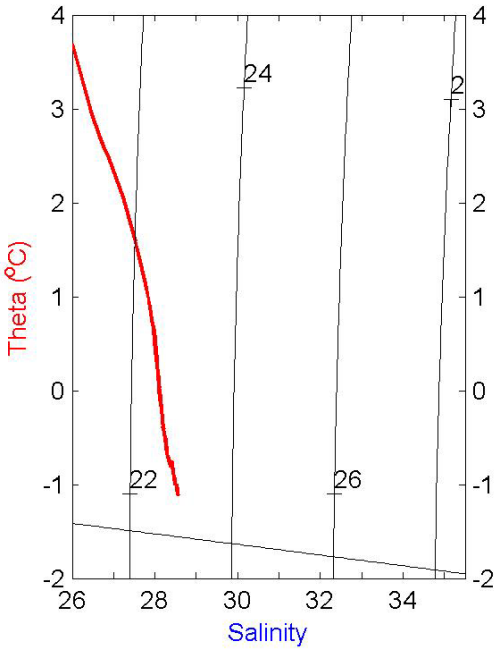


4.4.2 CTD Only

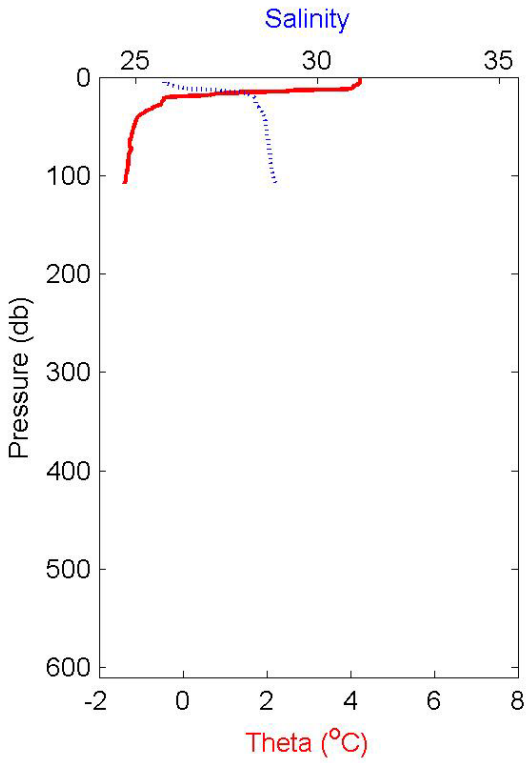
2000-22: Cast 96 Station TP-5

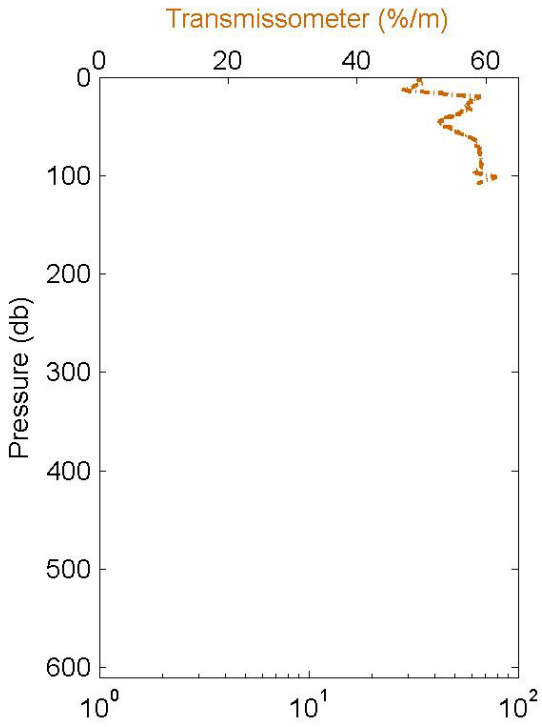


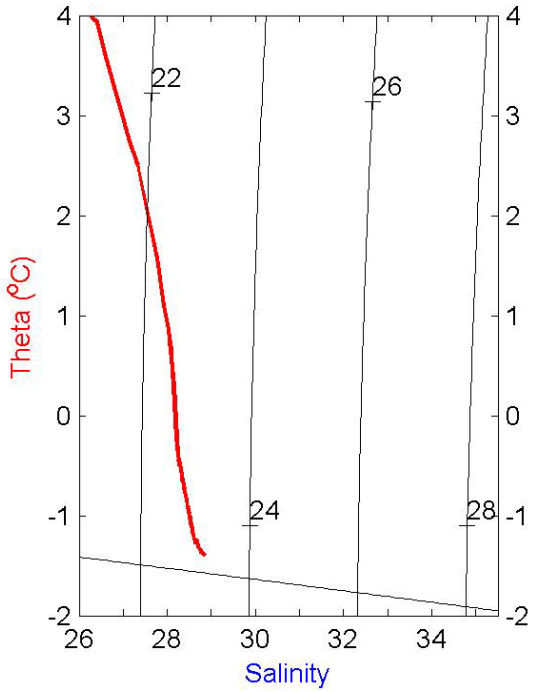




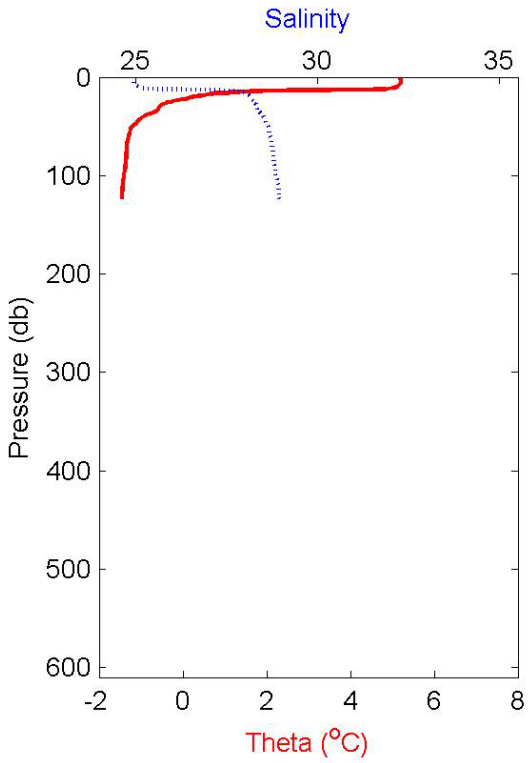
2000-22: Cast 97 Station TP-4

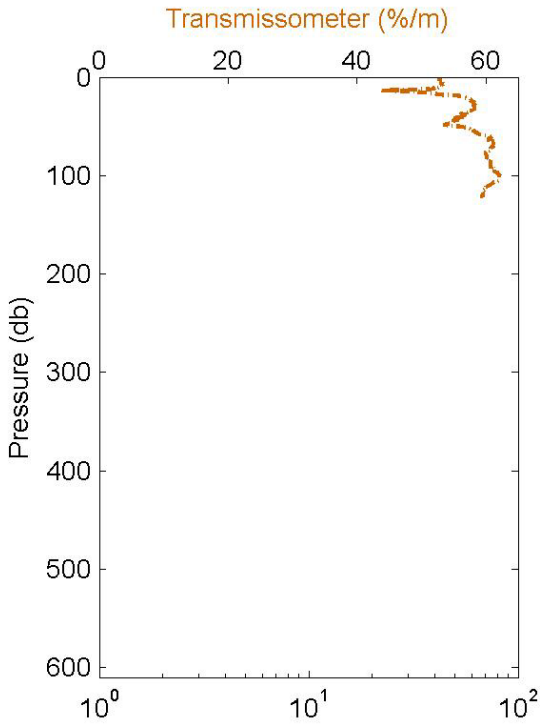


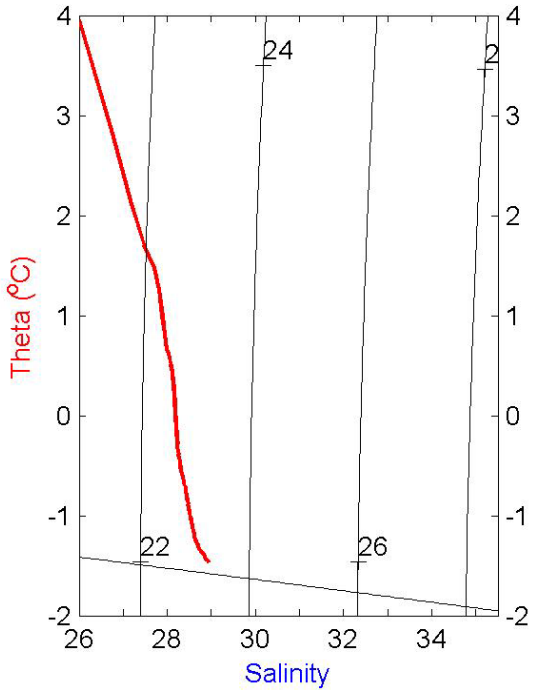




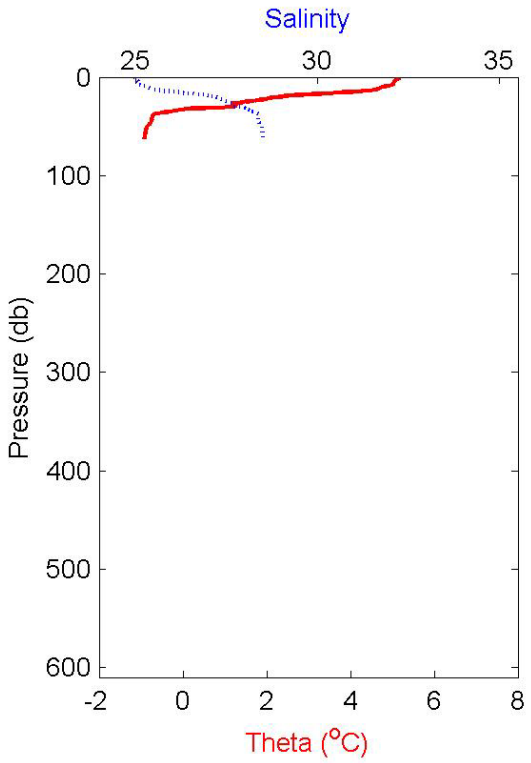
2000-22: Cast 98 Station TP-3

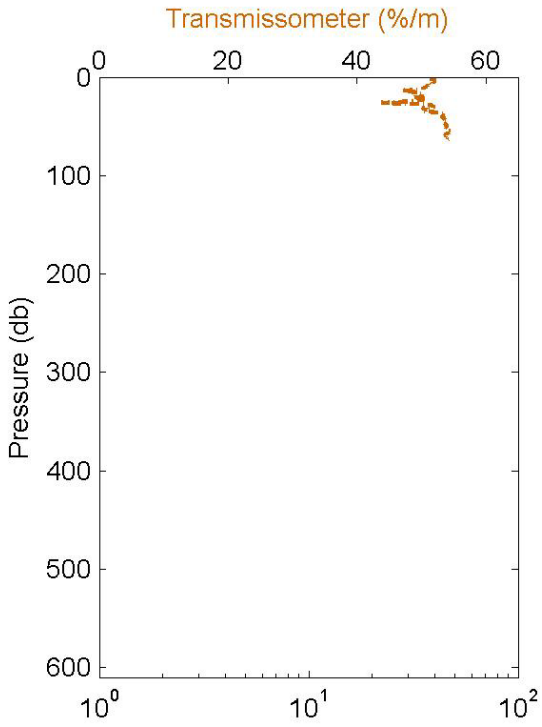


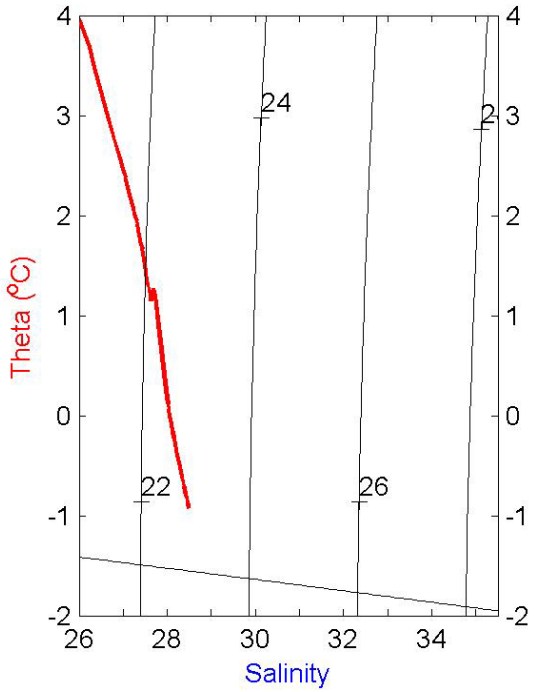




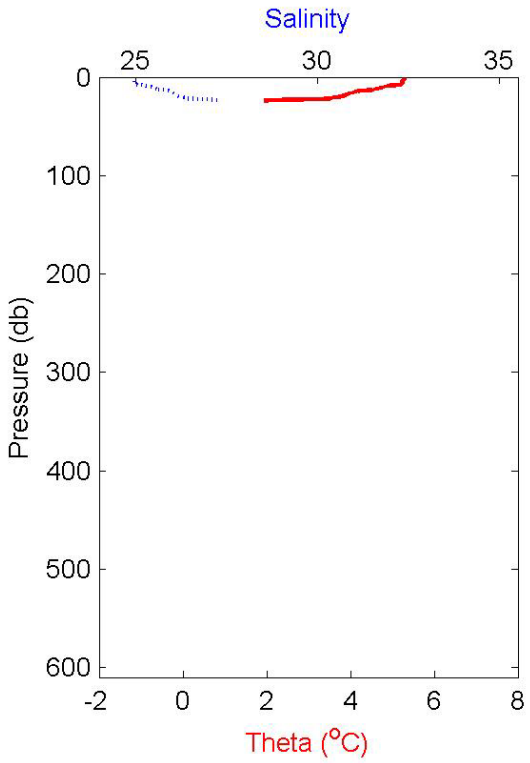
2000-22: Cast 99 Station TP-2

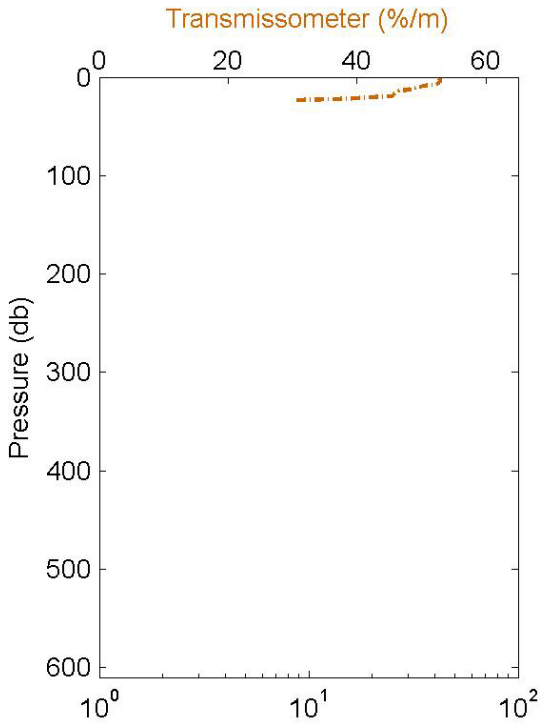


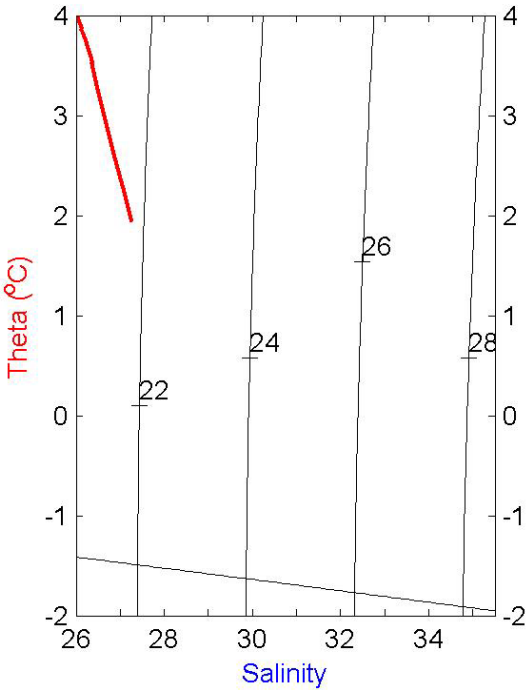




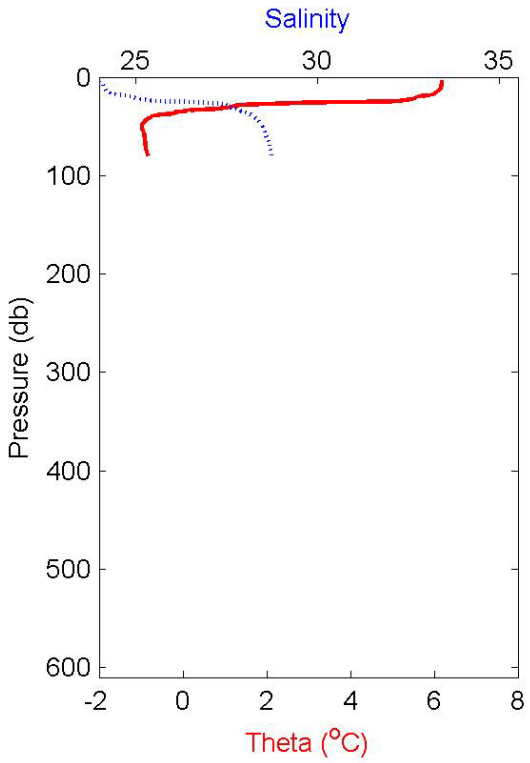
2000-22: Cast 100 Station TP-1

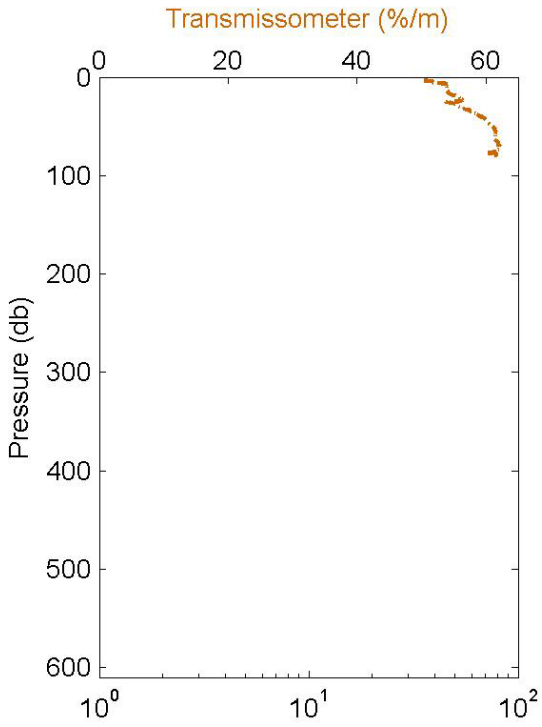


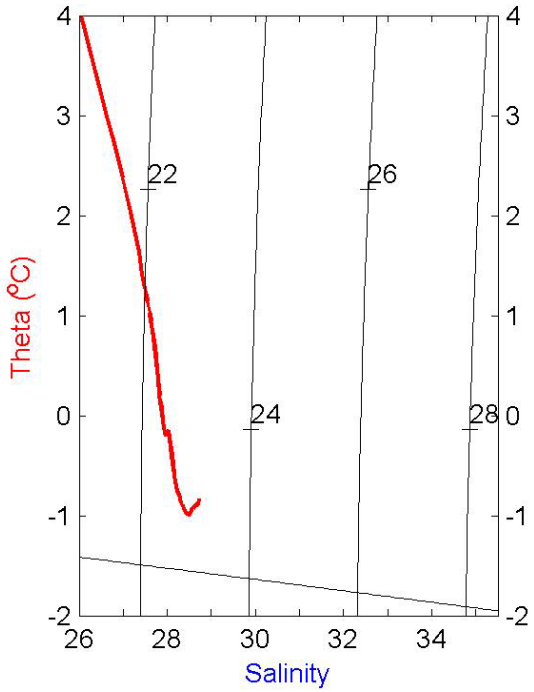




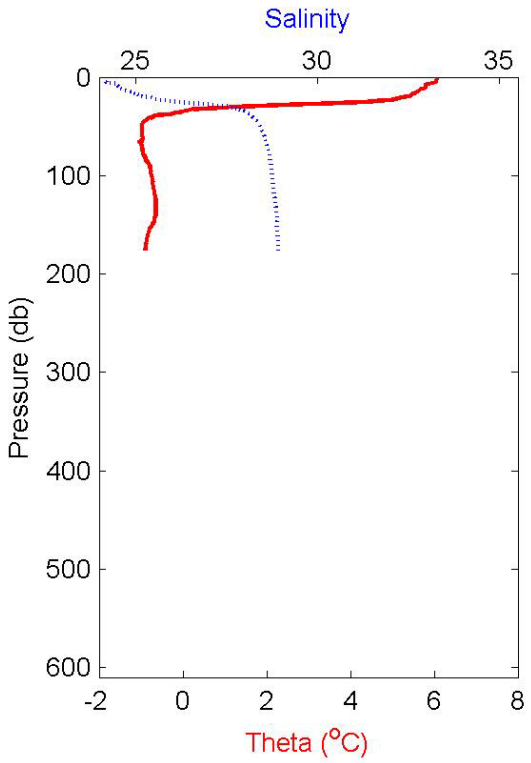
2000-22: Cast 102 Station EI11

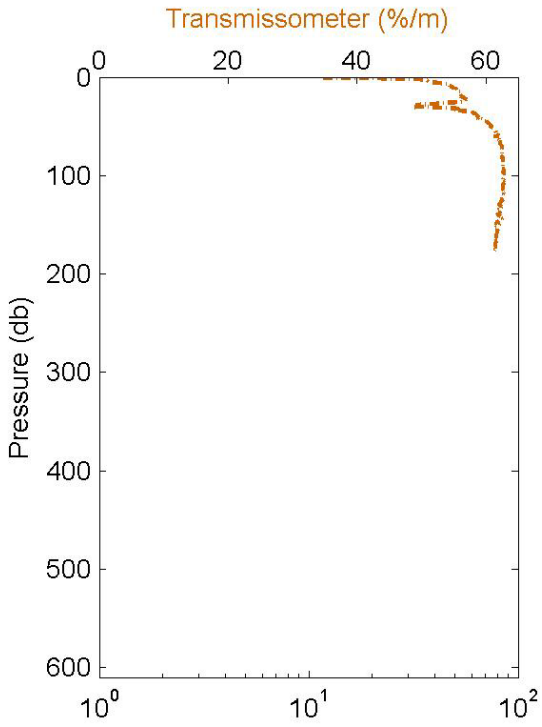


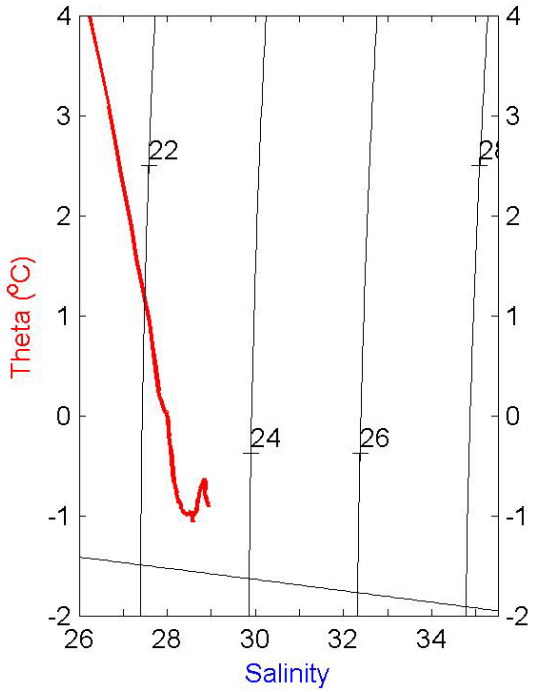




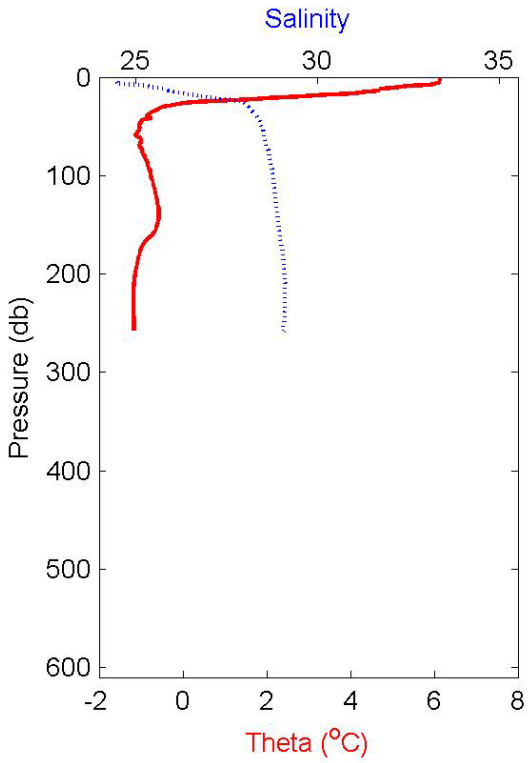
2000-22: Cast 104 Station EI10

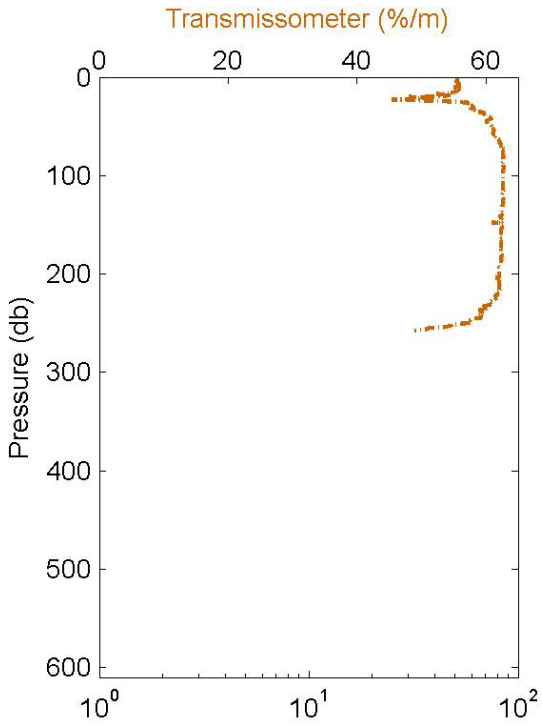


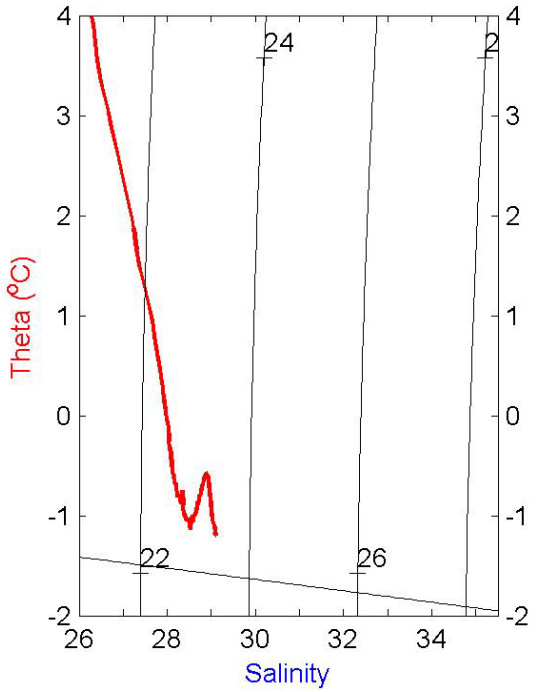




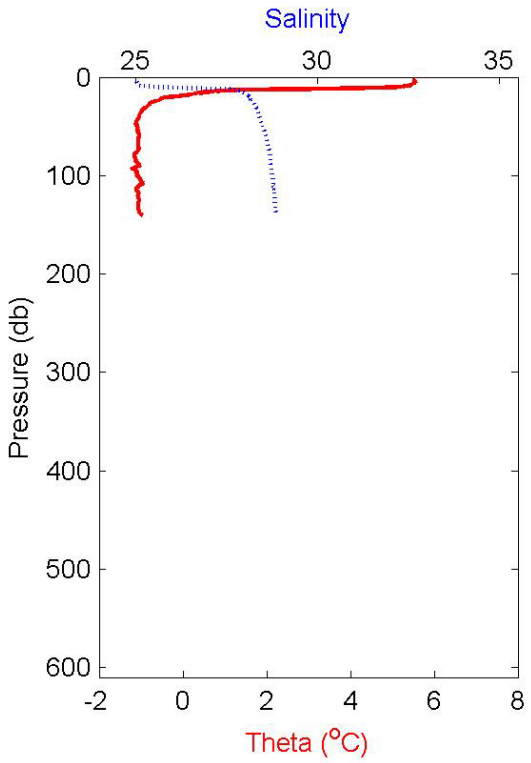
2000-22: Cast 106 Station EI08

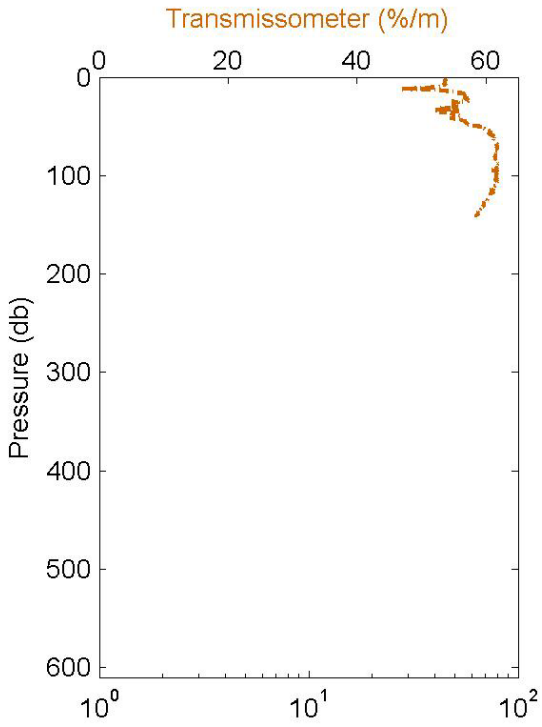


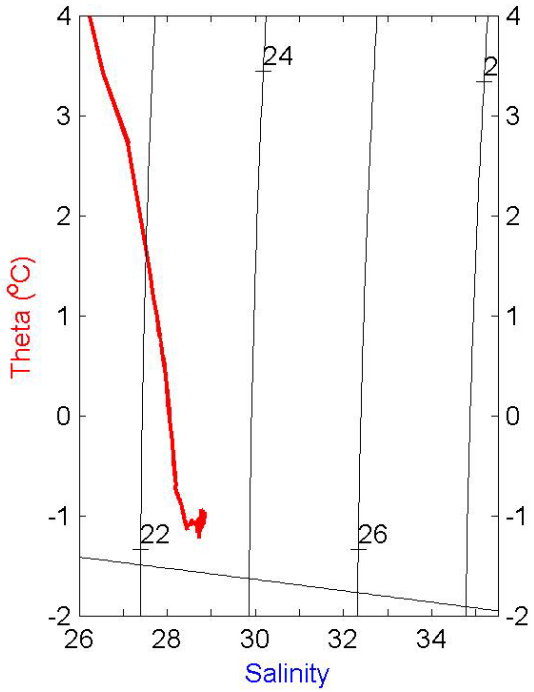




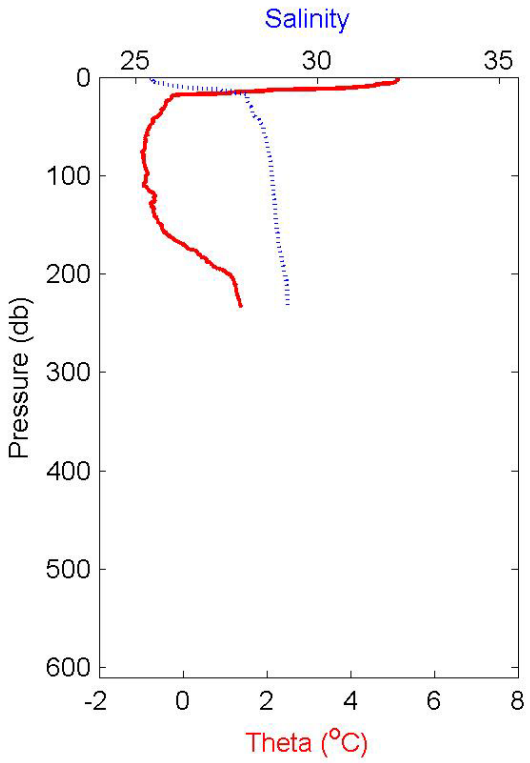
2000-22: Cast 109 Station EI06

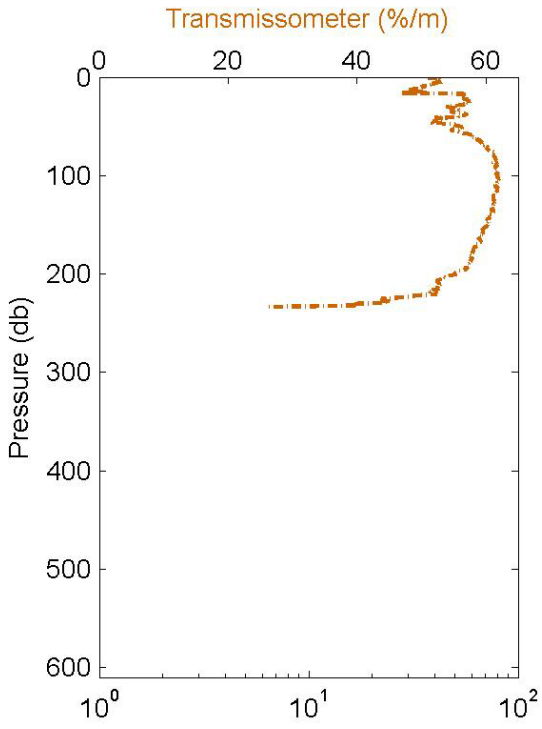


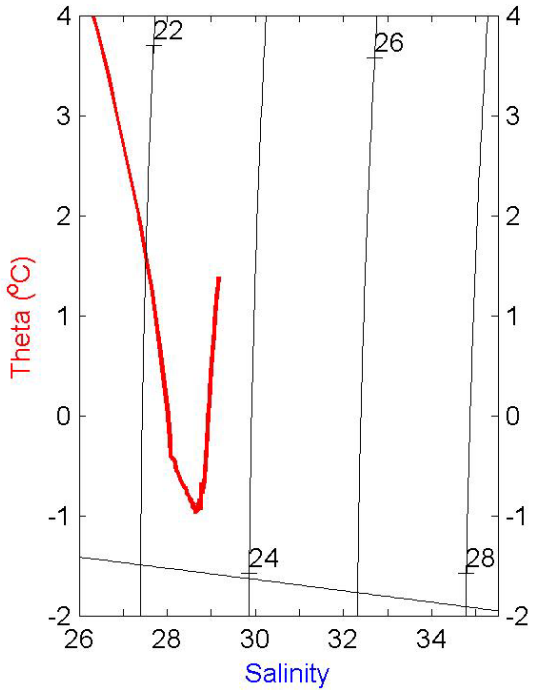




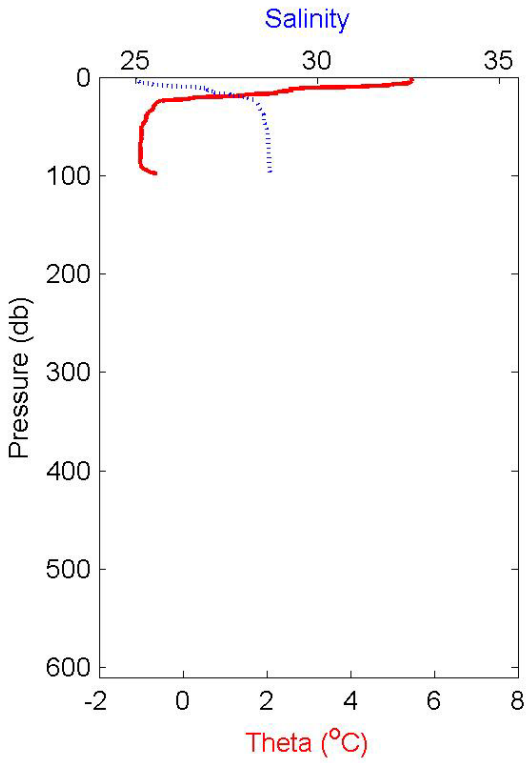
2000-22: Cast 111 Station EI04

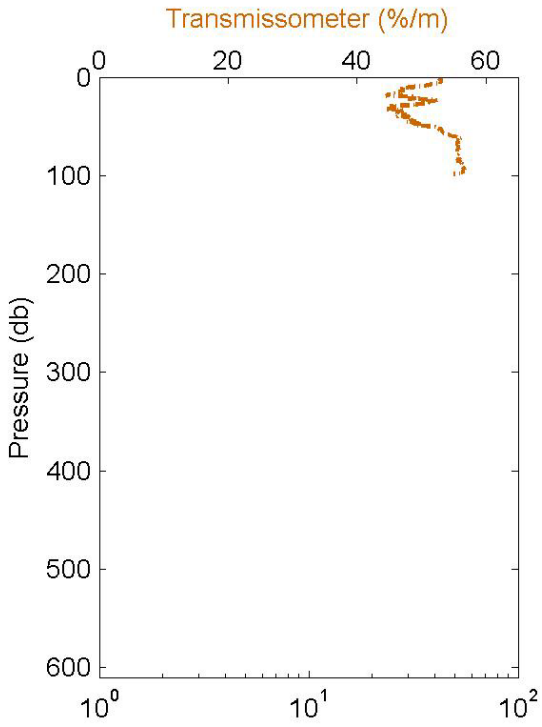


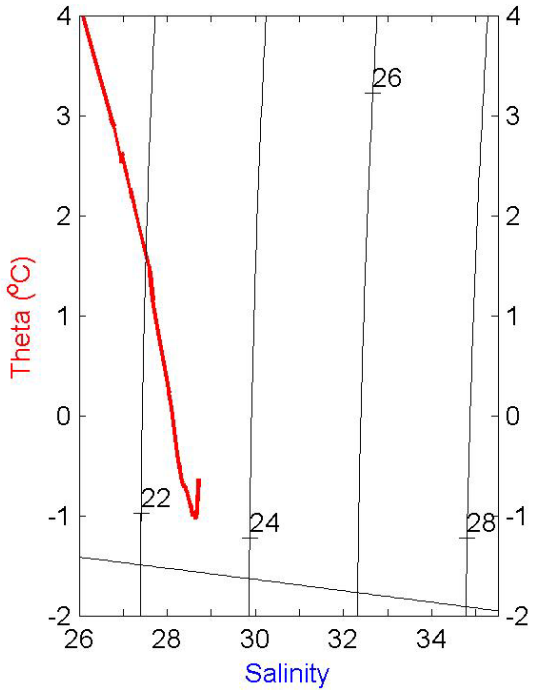




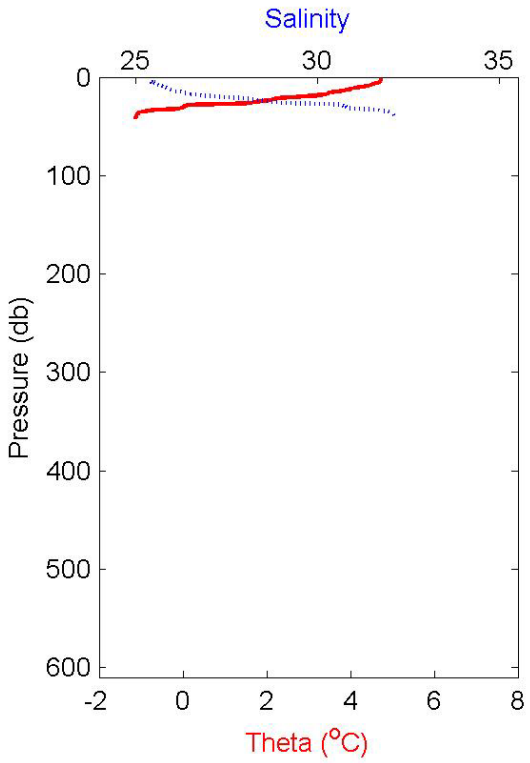
2000-22: Cast 113 Station EI02

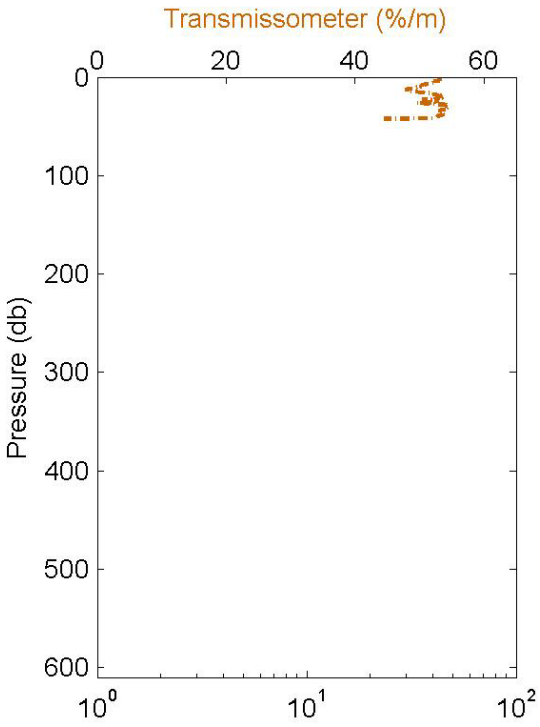


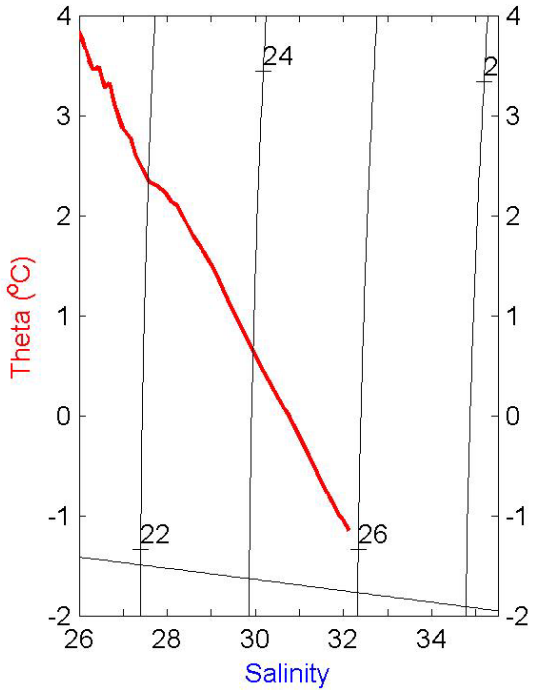




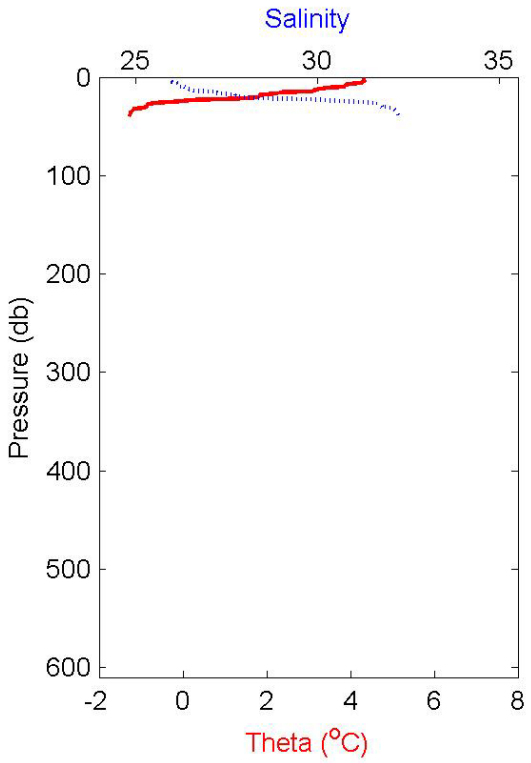
2000-22: Cast 116 Station DU2

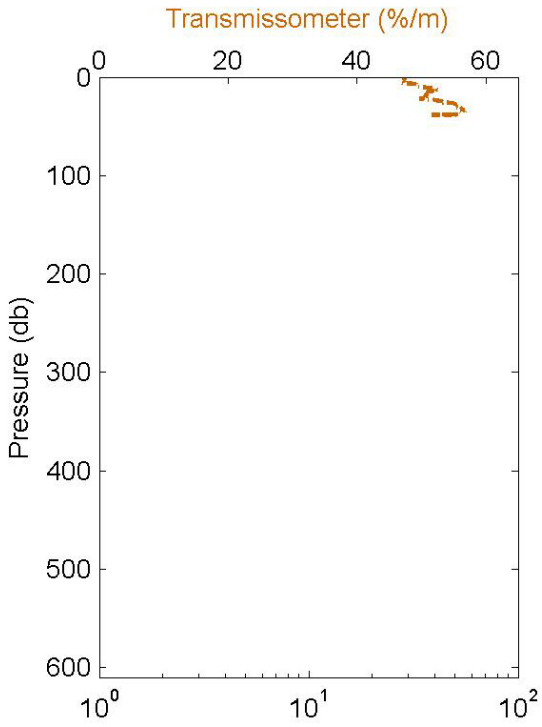


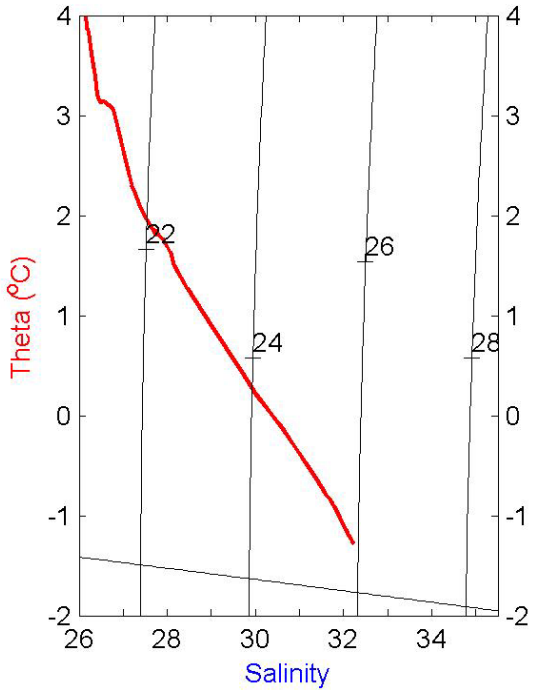




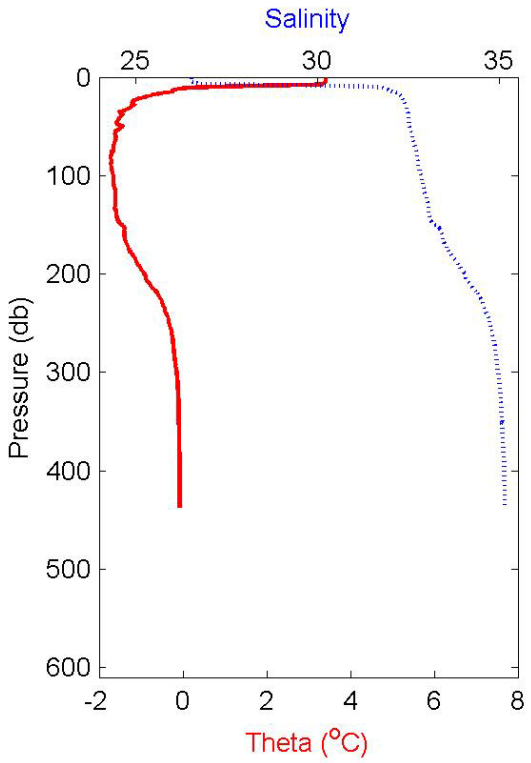
2000-22: Cast 118 Station DU4

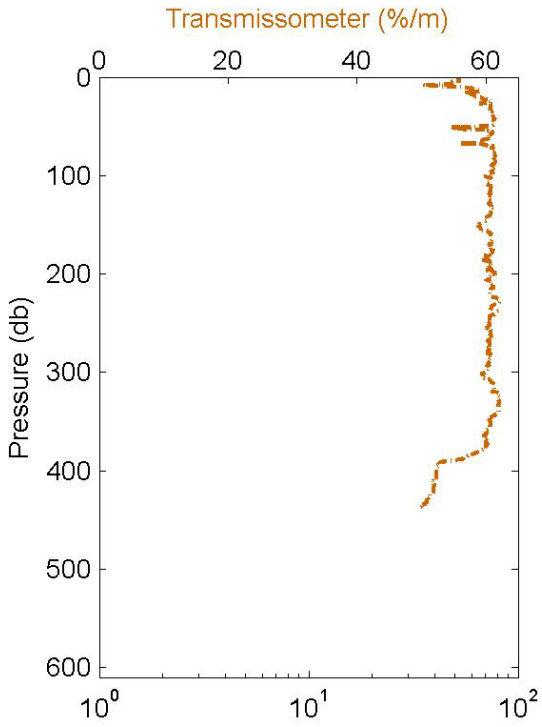


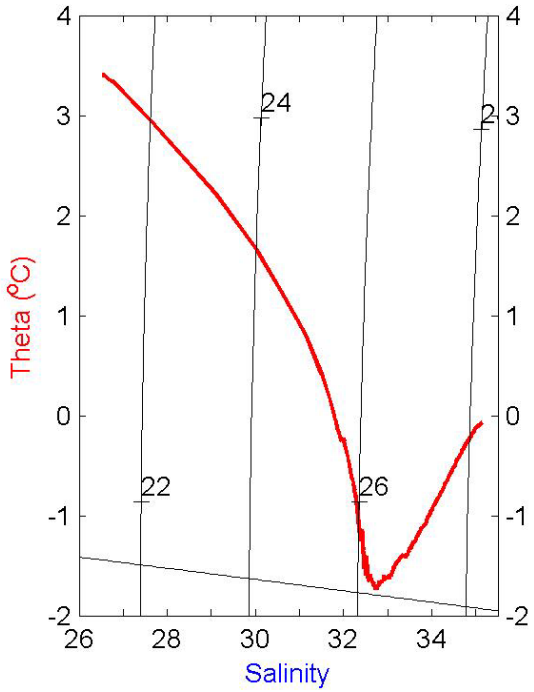




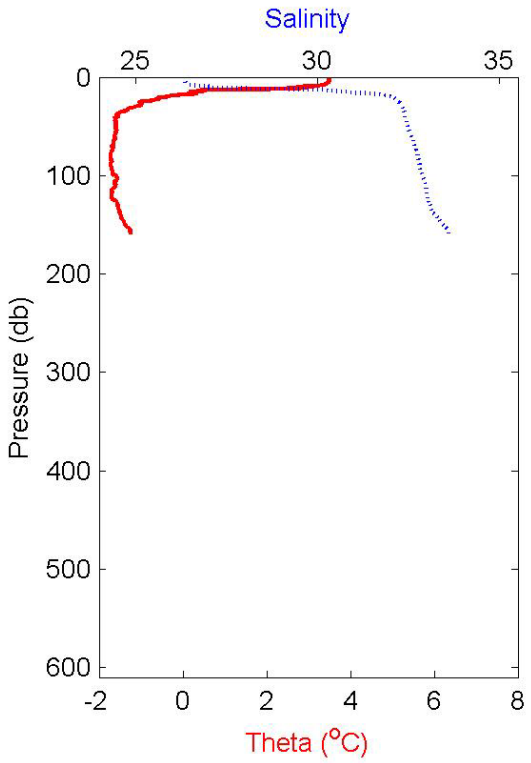
2000-22: Cast 122 Station CP4

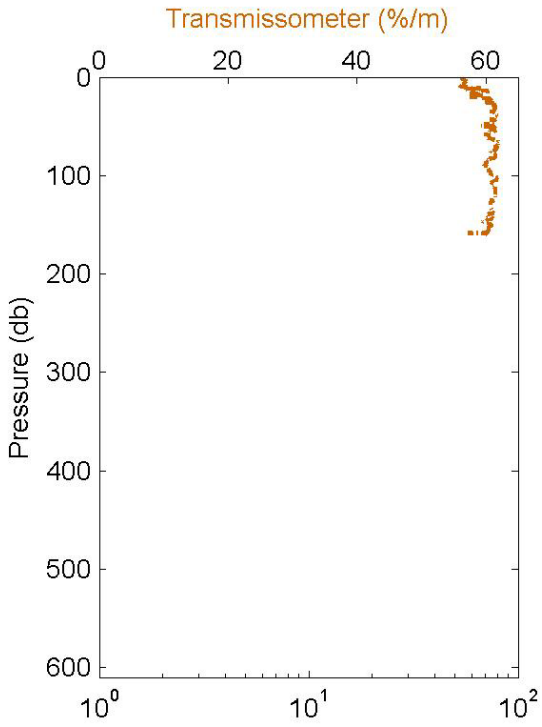


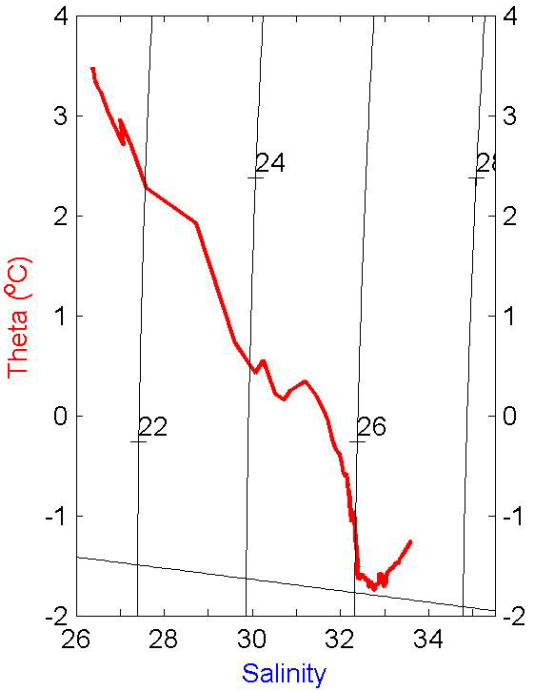




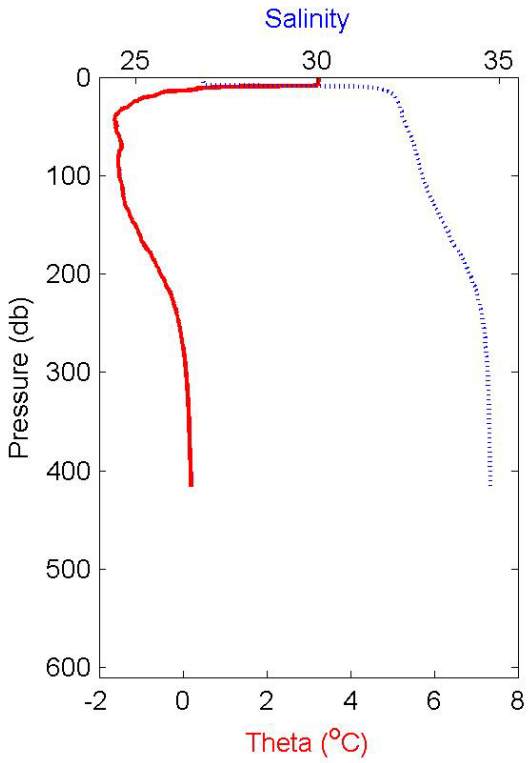
2000-22: Cast 124 Station CP2

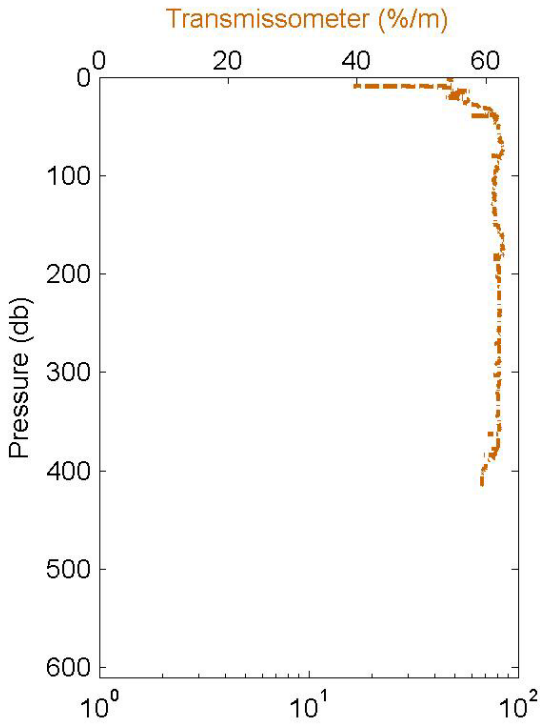


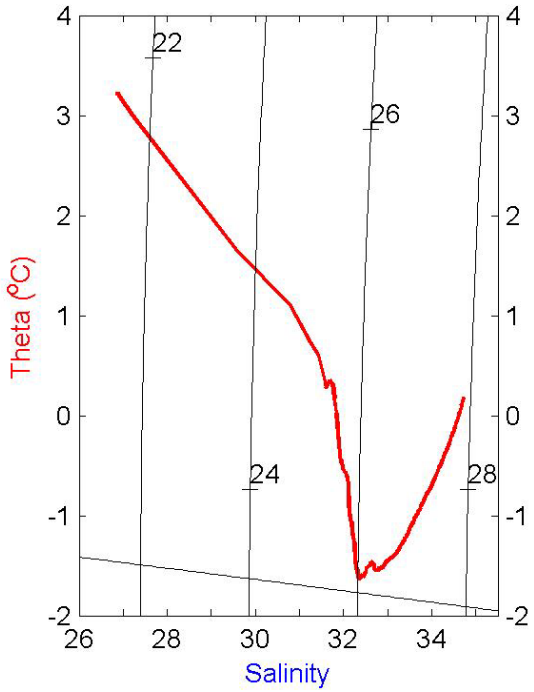




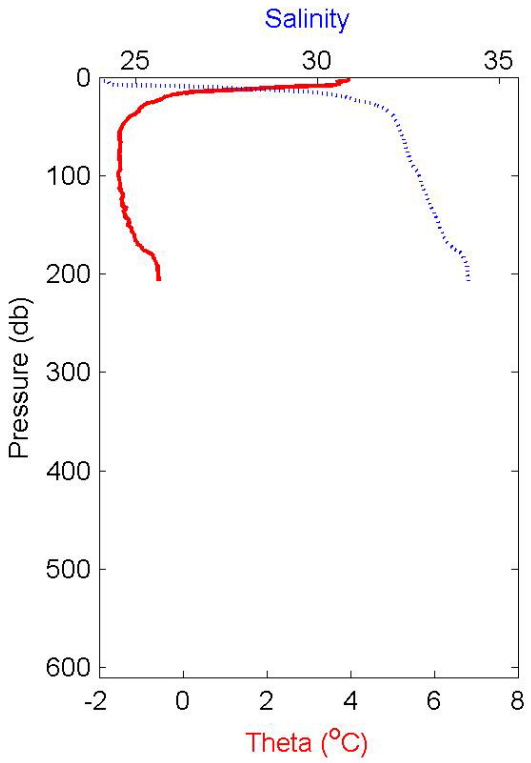
2000-22: Cast 127 Station AG5

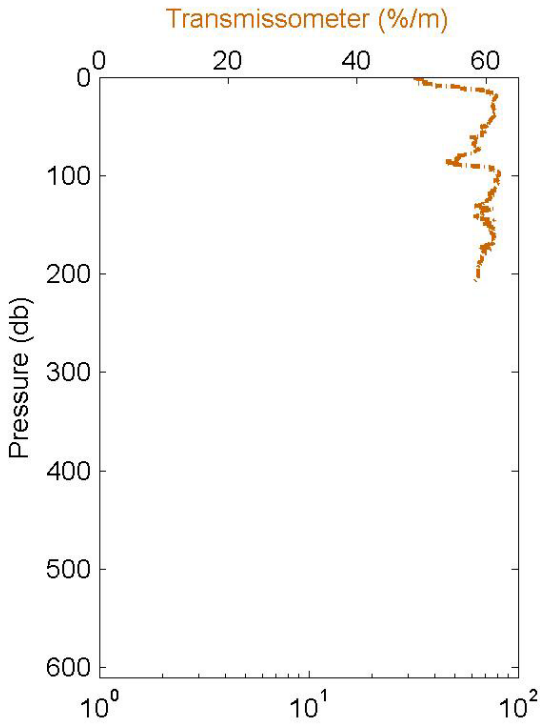


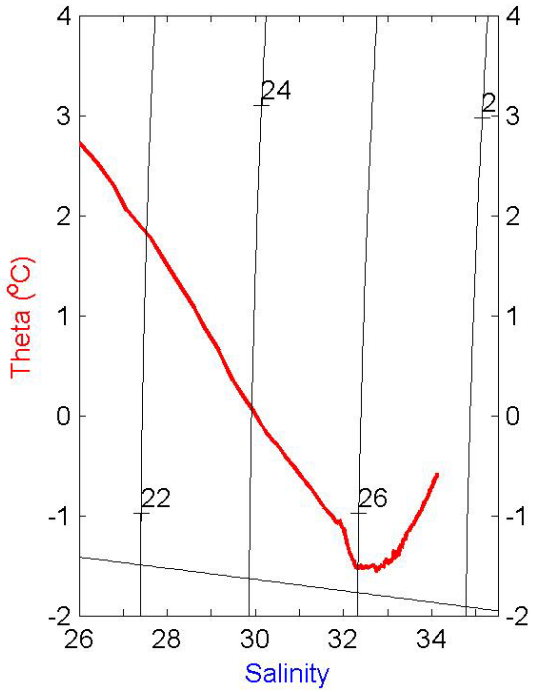




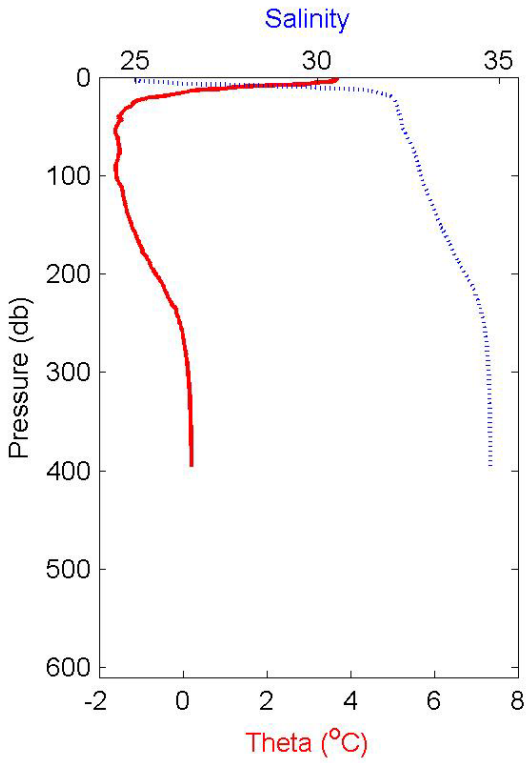
2000-22: Cast 130 Station AG2

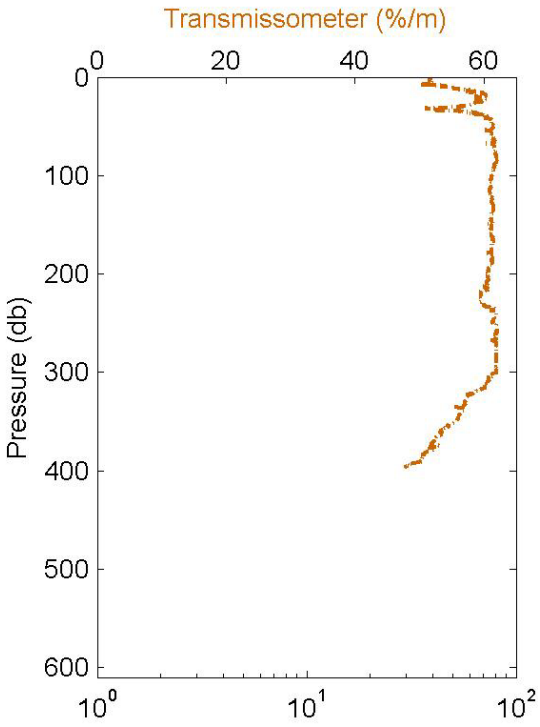


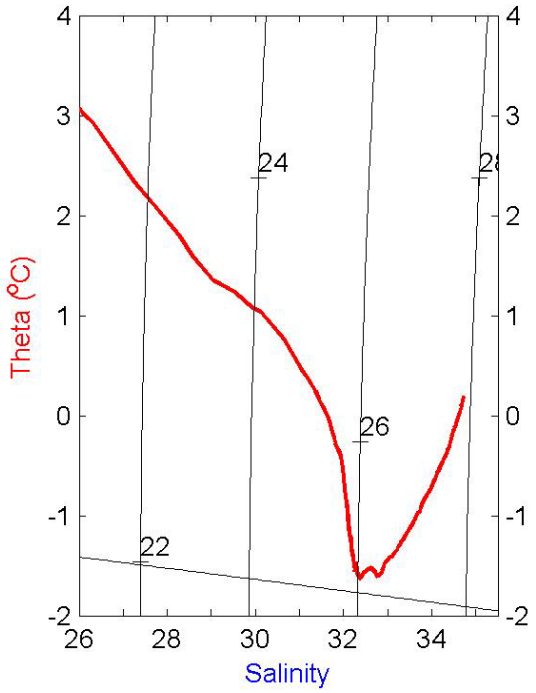




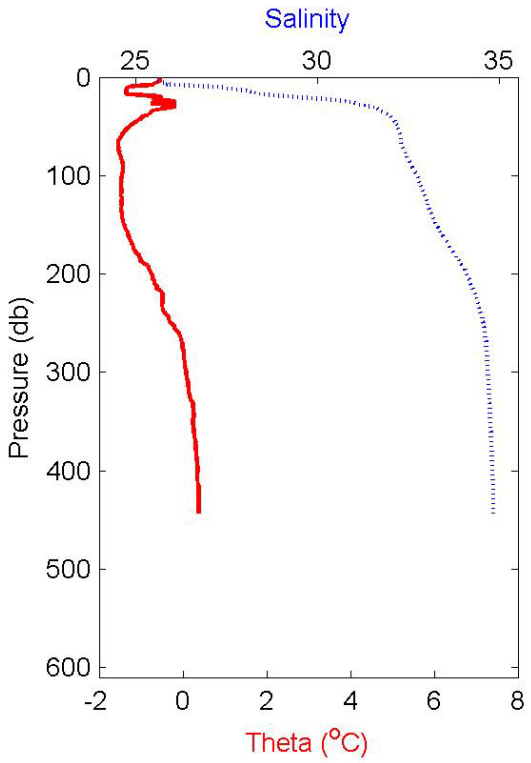
2000-22: Cast 132 Station AG4

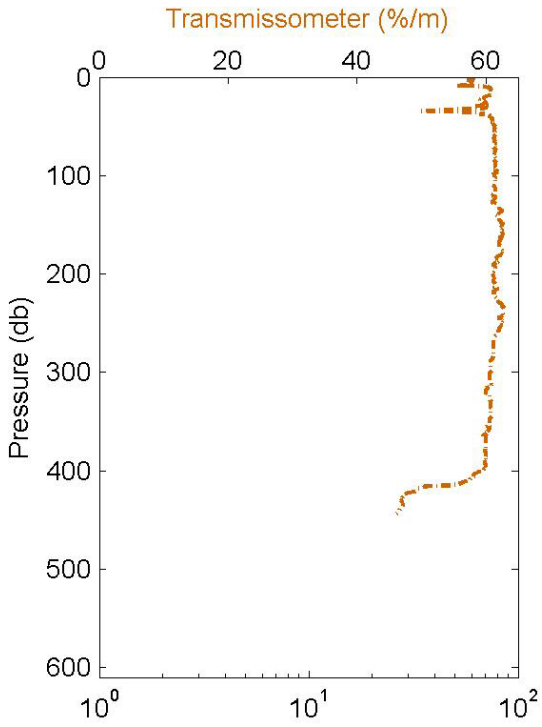


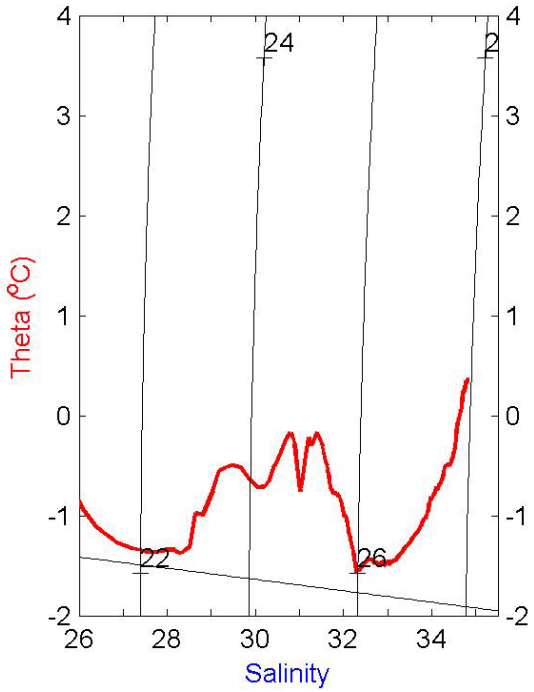




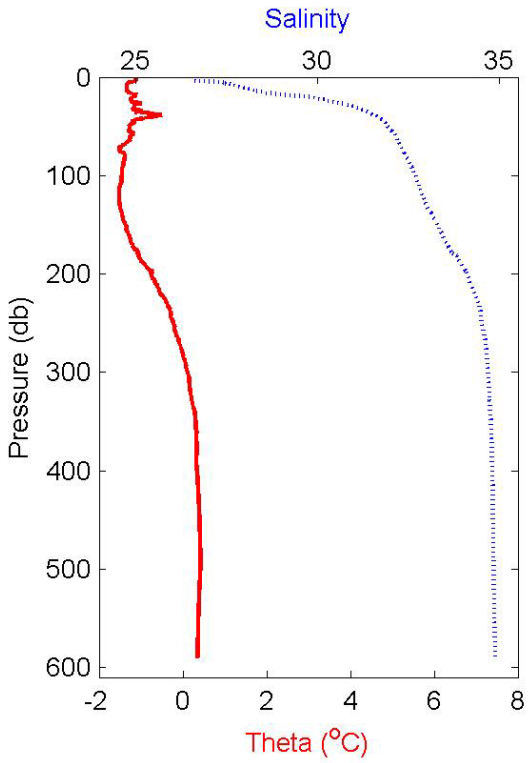
2000-22: Cast 135 Station LW1

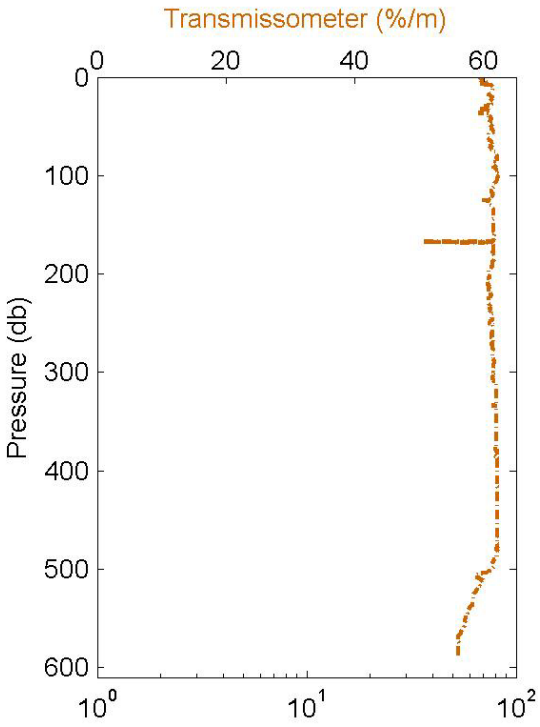


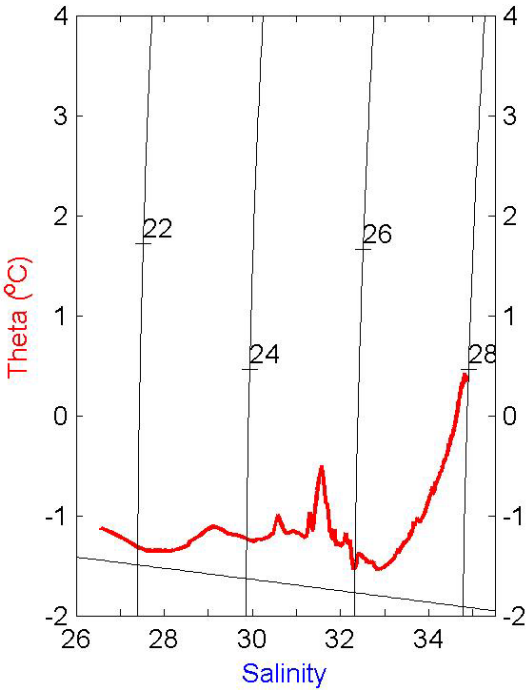




2000-22: Cast 136 Station LW2







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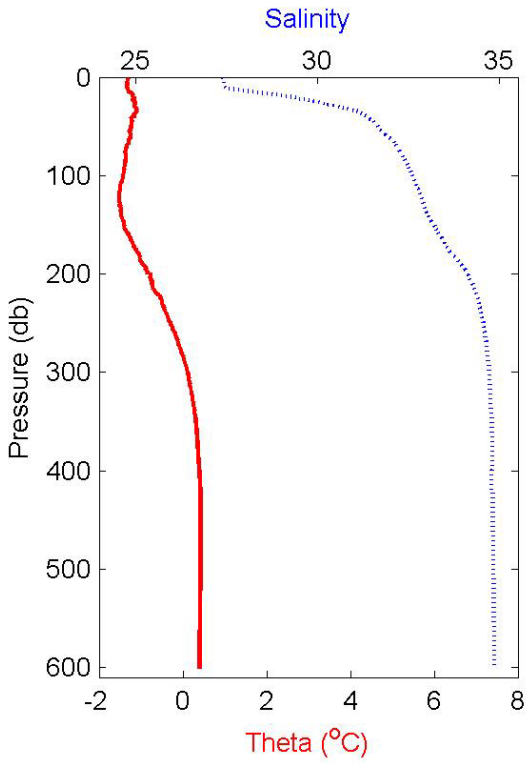
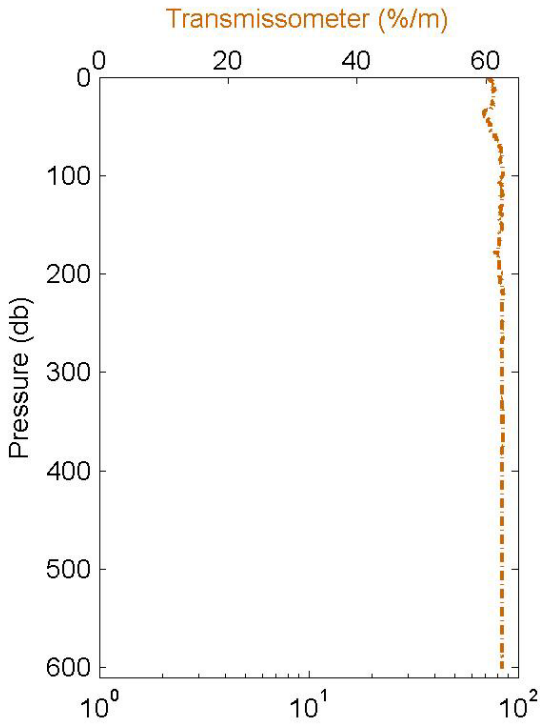
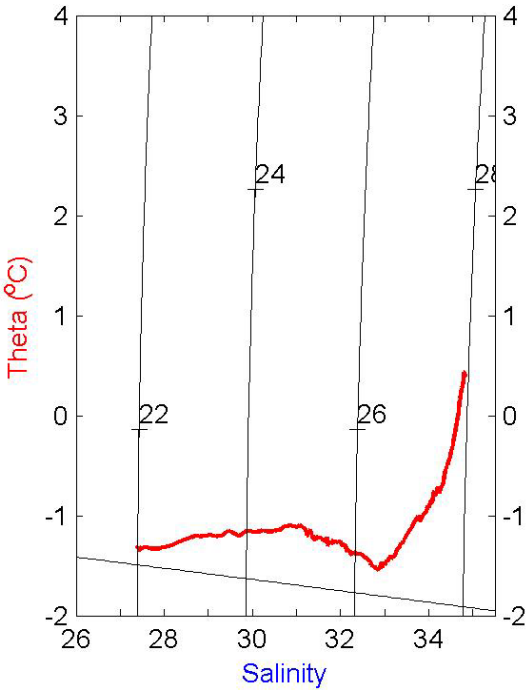
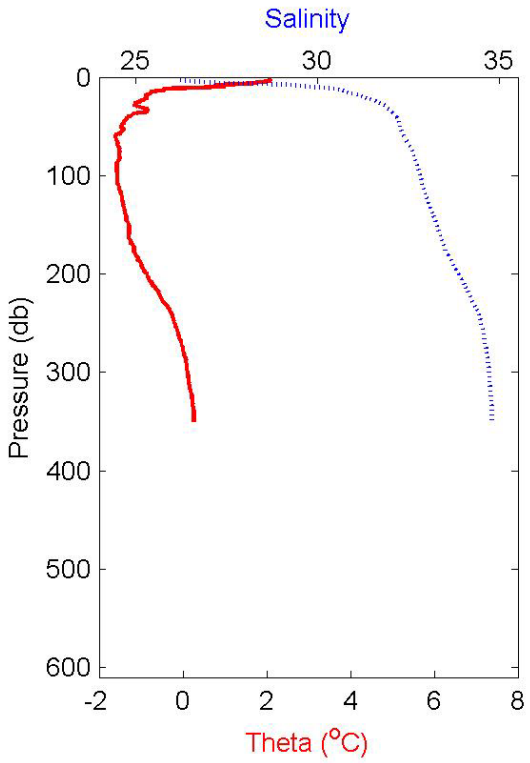
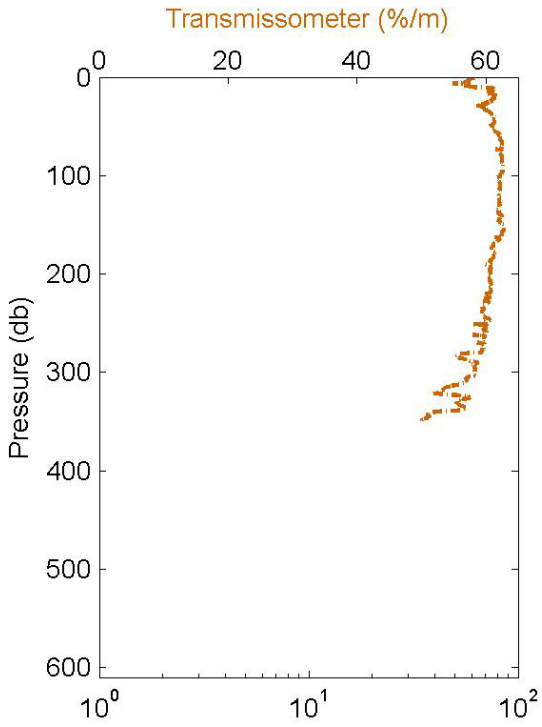


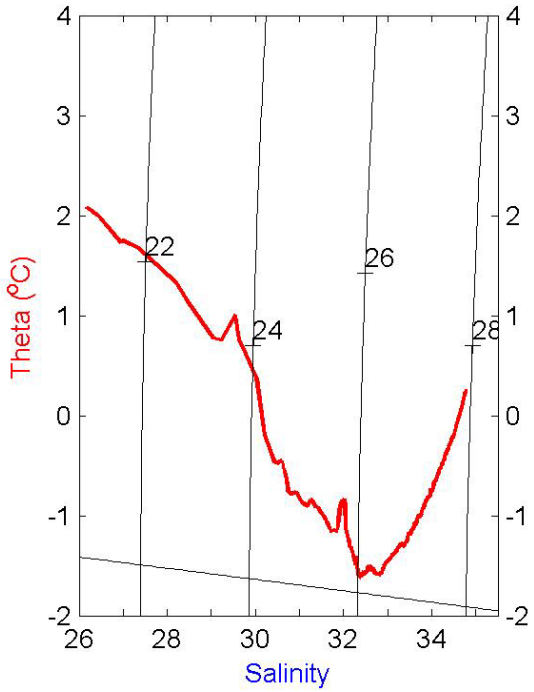




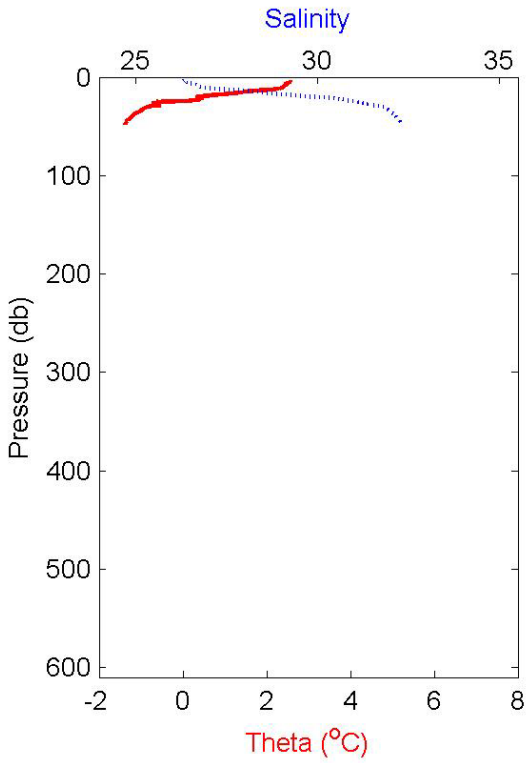
2000-22: Cast 140 Station CK4

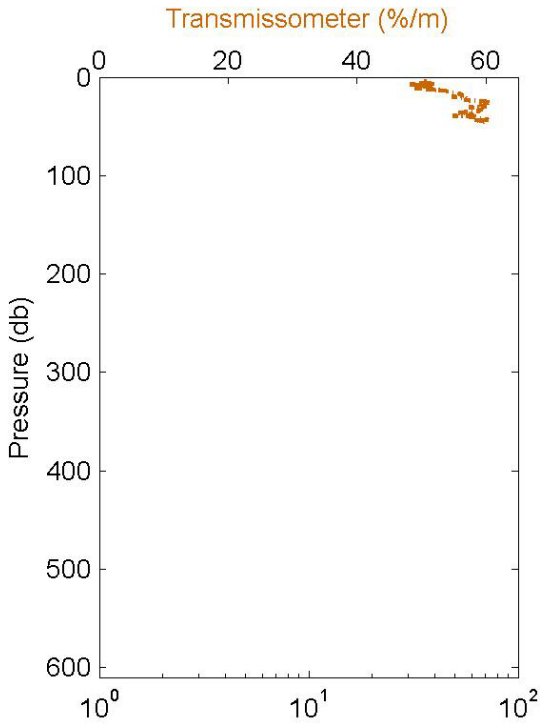


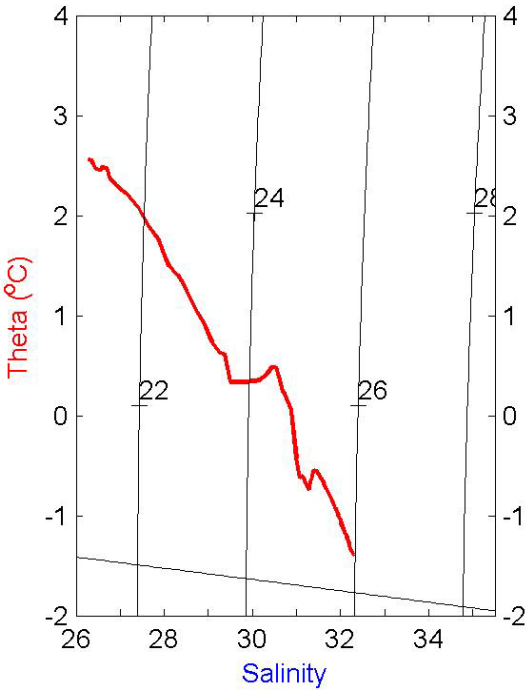




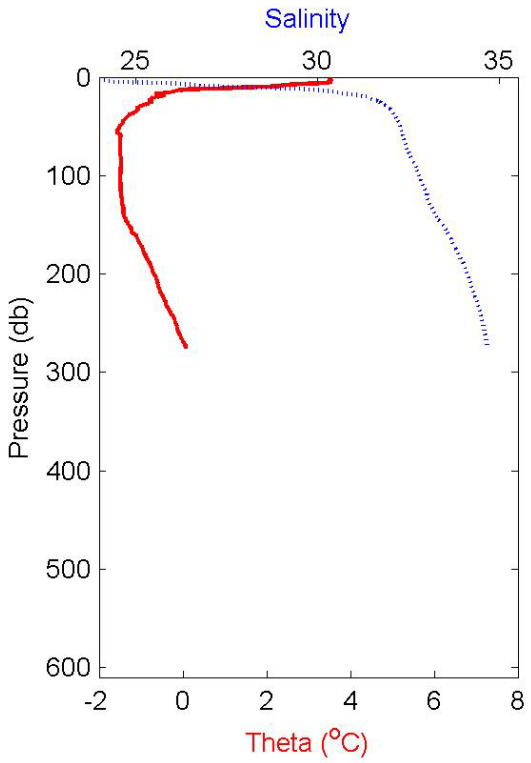
2000-22: Cast 142 Station CK2

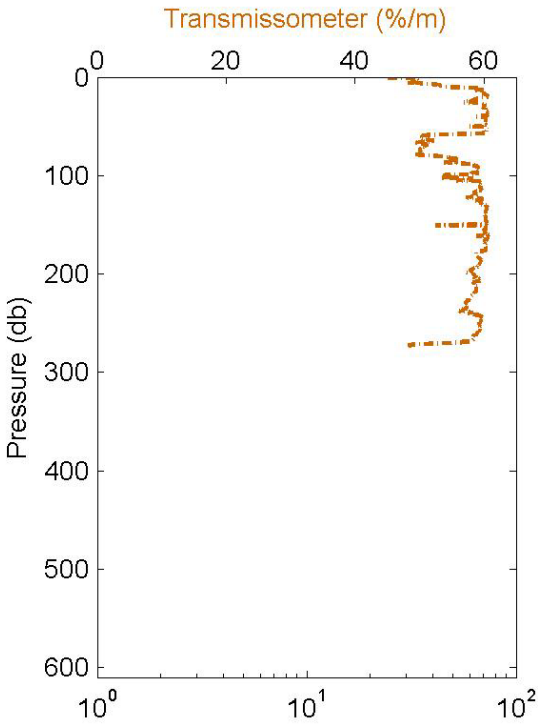


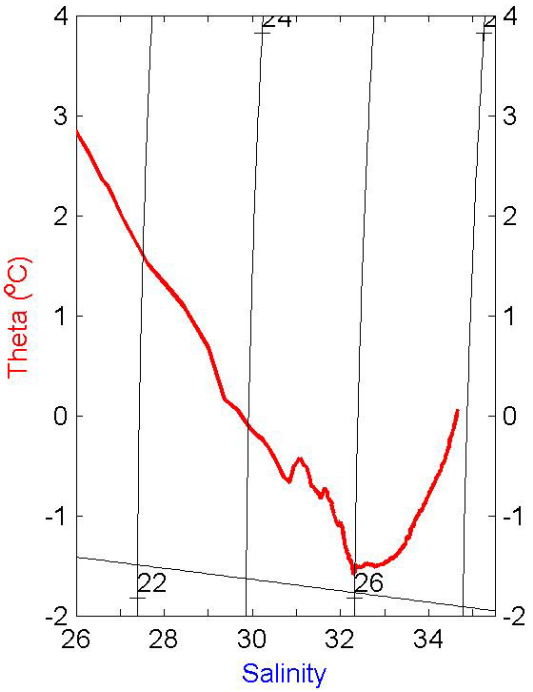




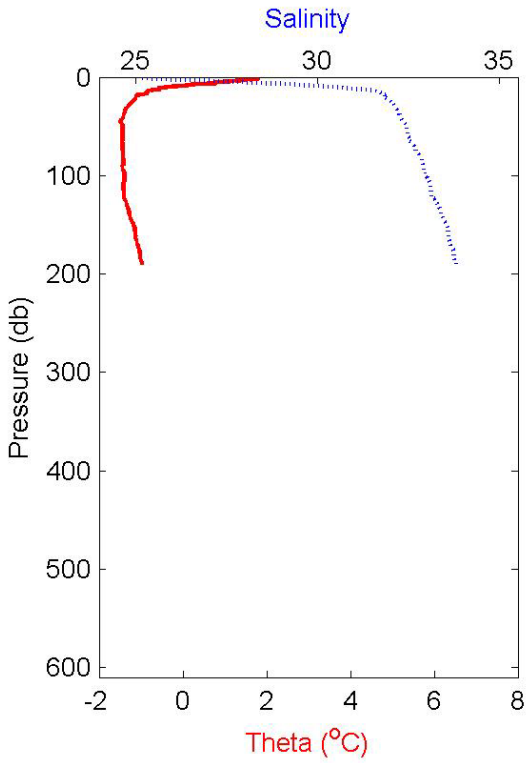
2000-22: Cast 148 Station WB2

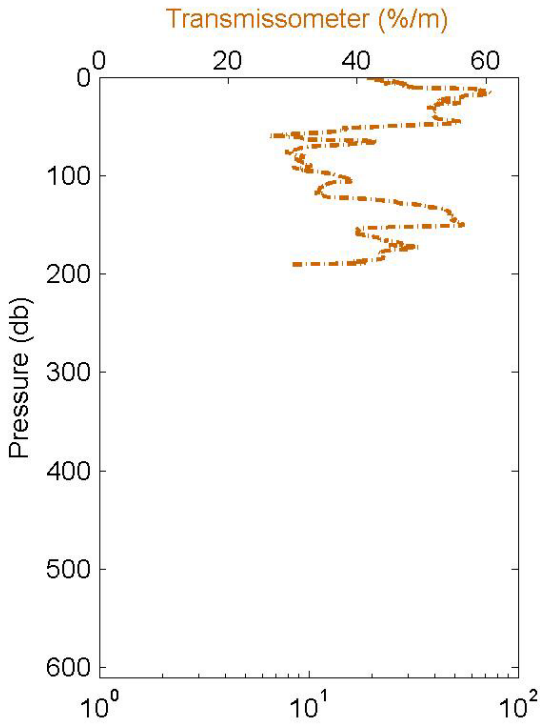


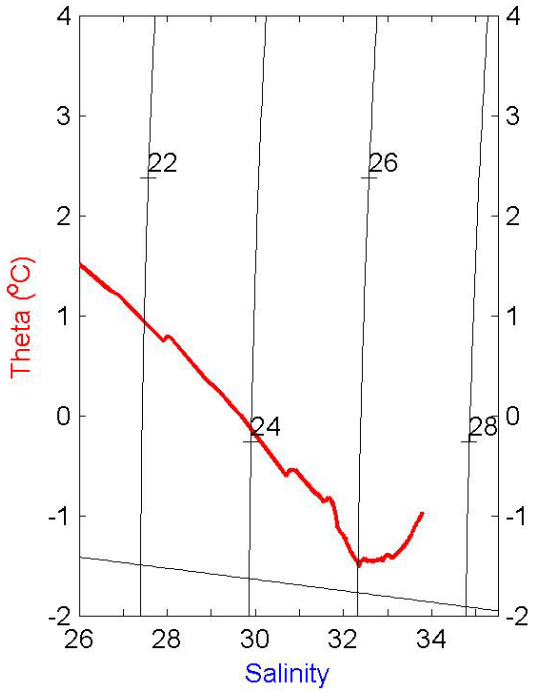




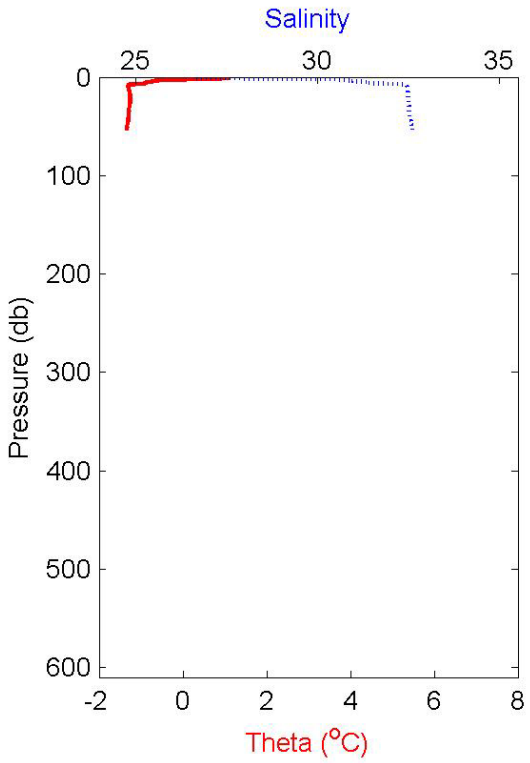
2000-22: Cast 149 Station WB3

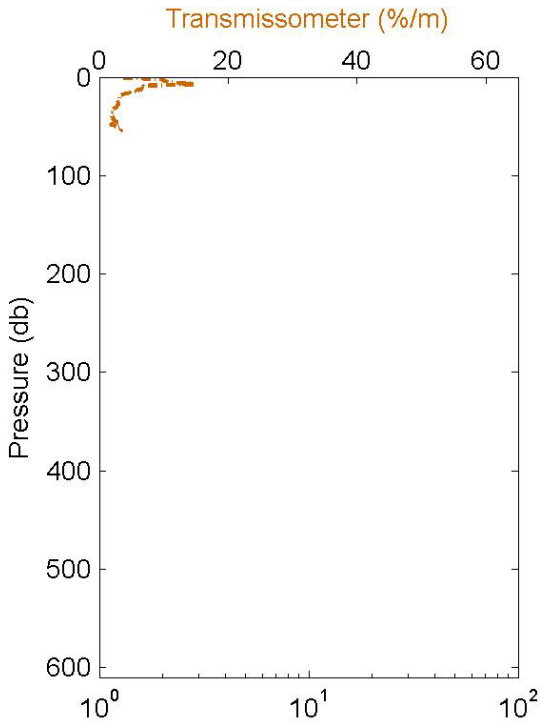


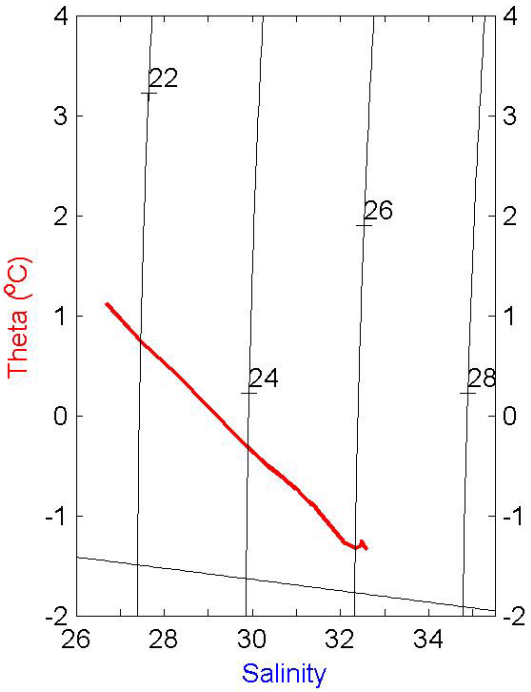




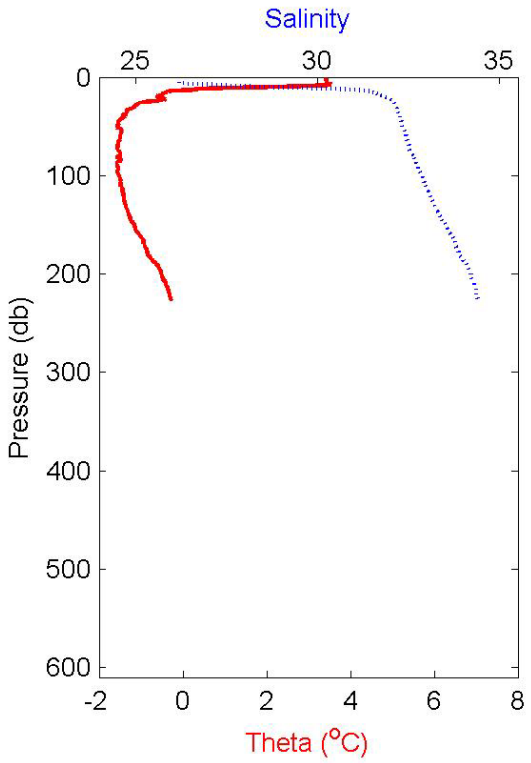
2000-22: Cast 151 Station WB4

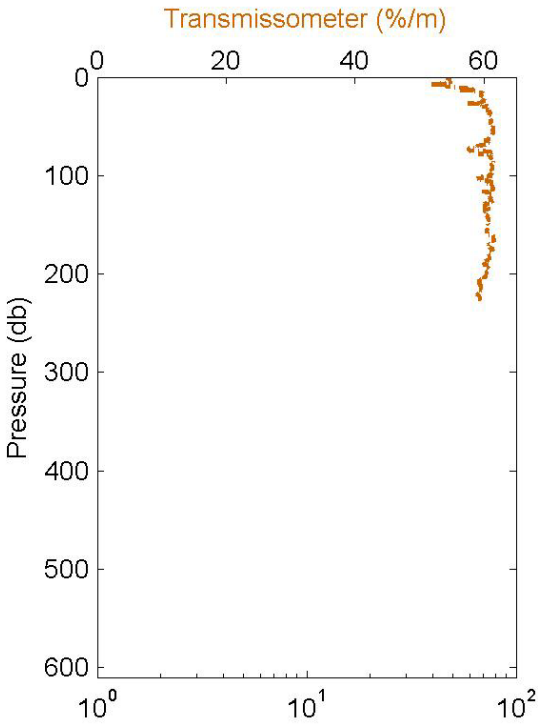


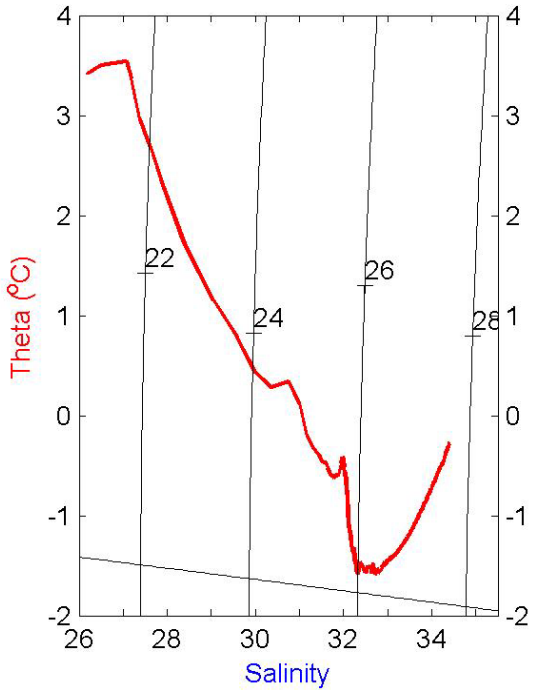




2000-22: Cast 156 Station DT2







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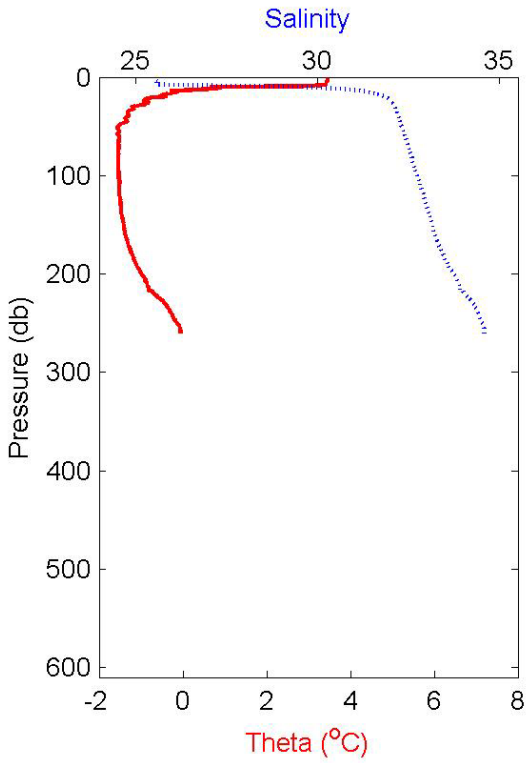

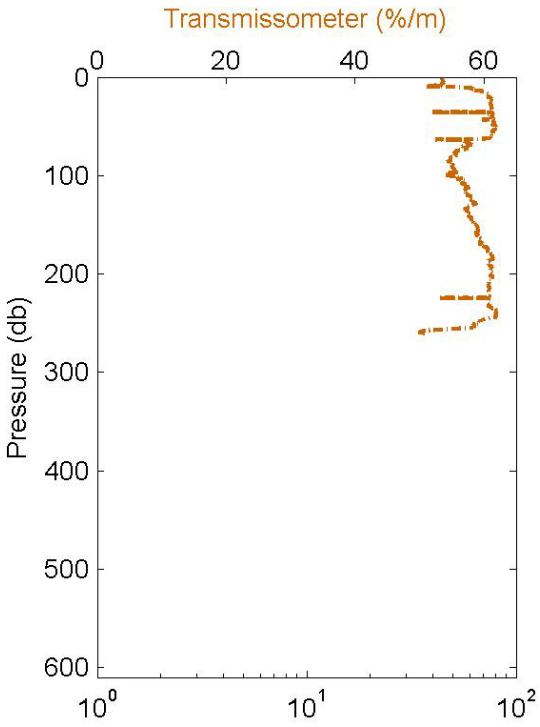

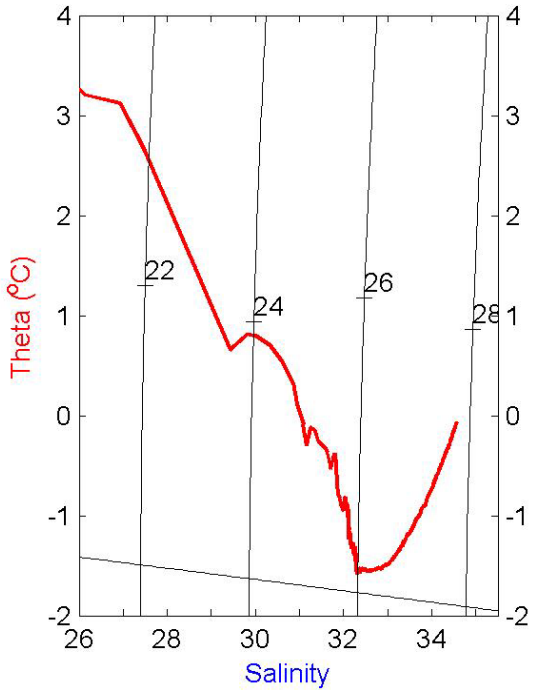

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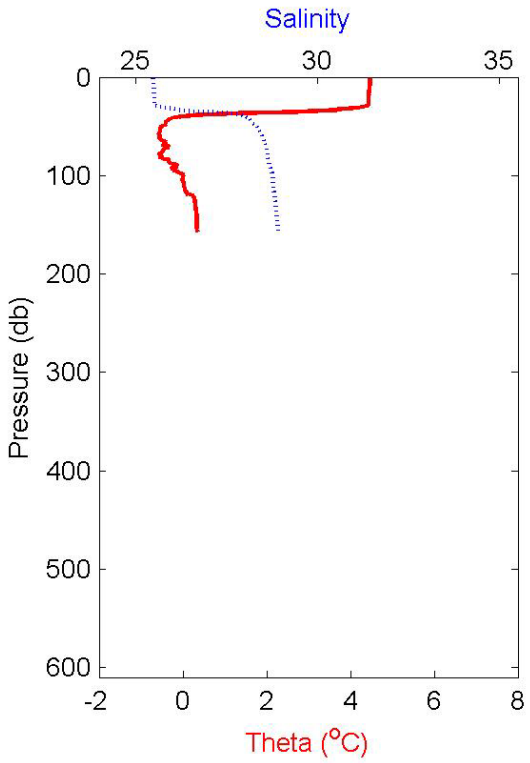

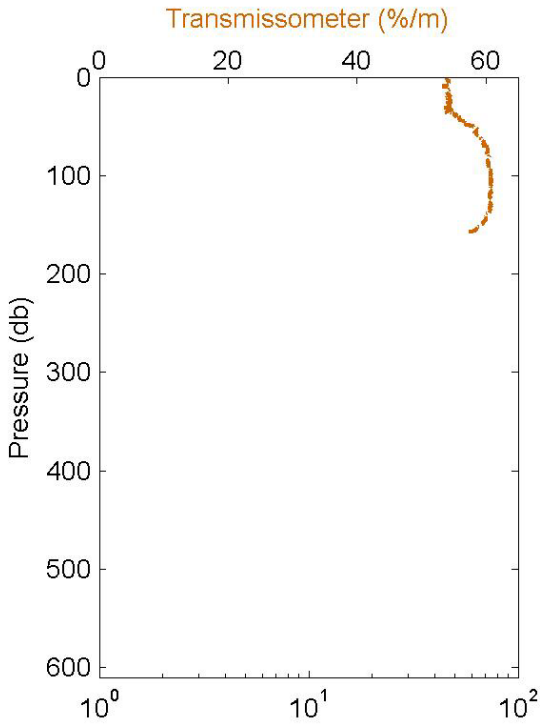

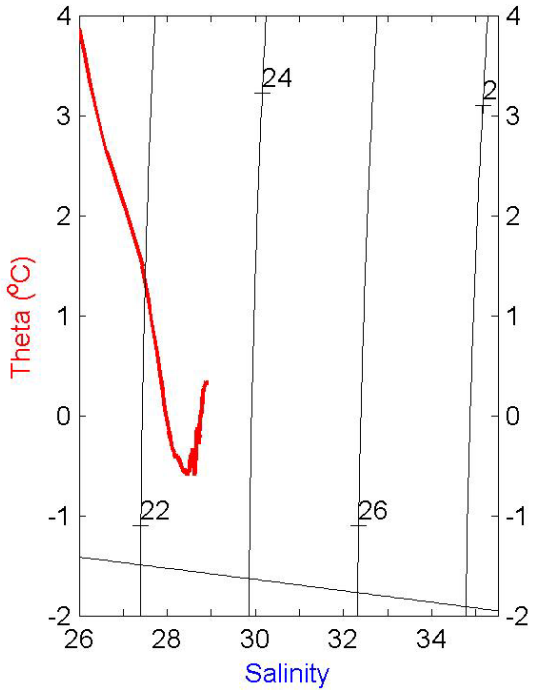

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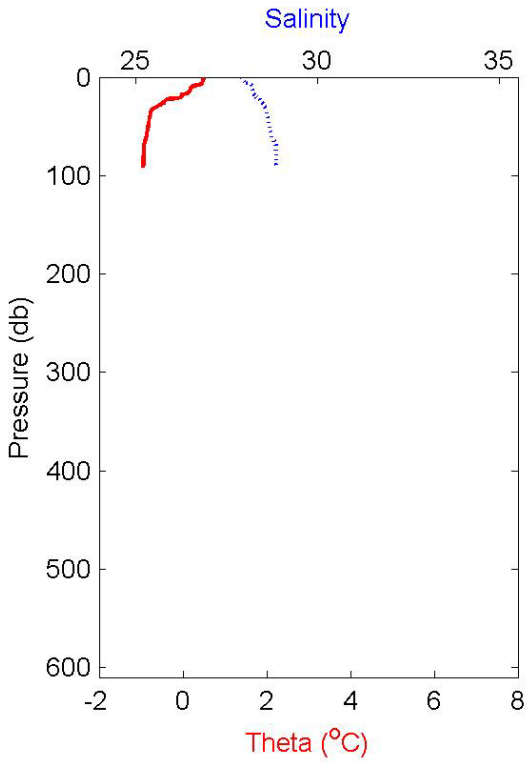
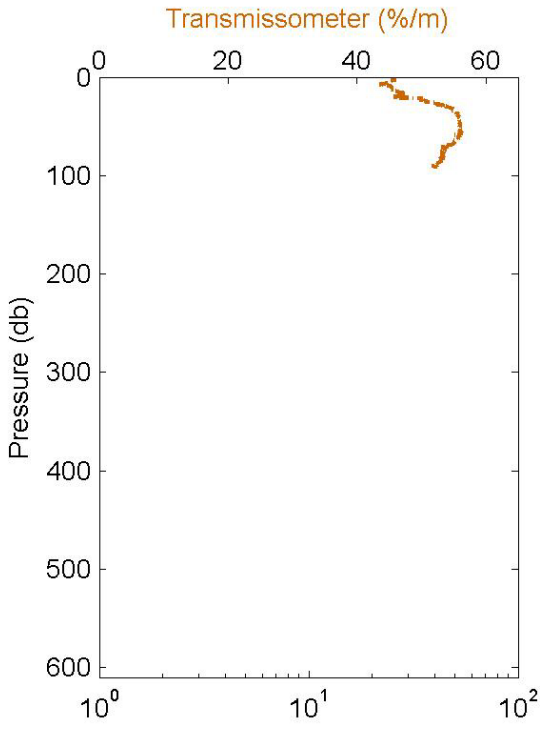
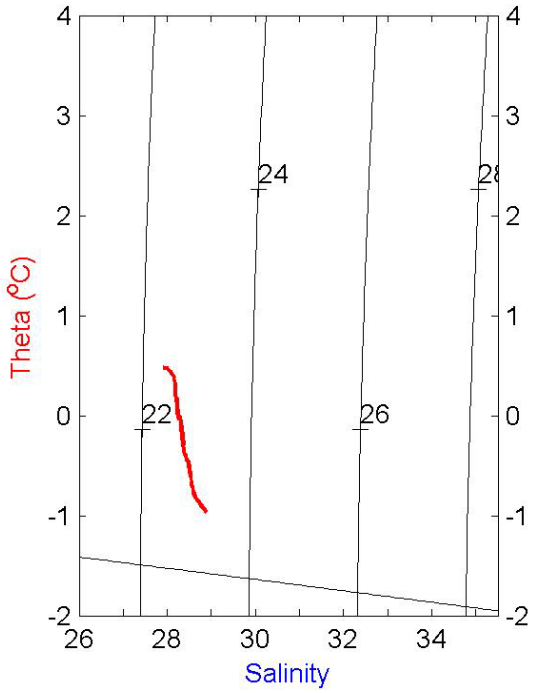


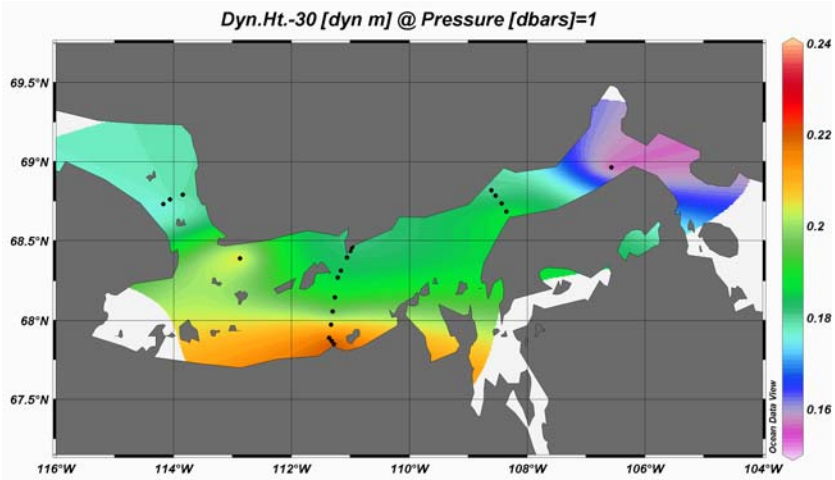




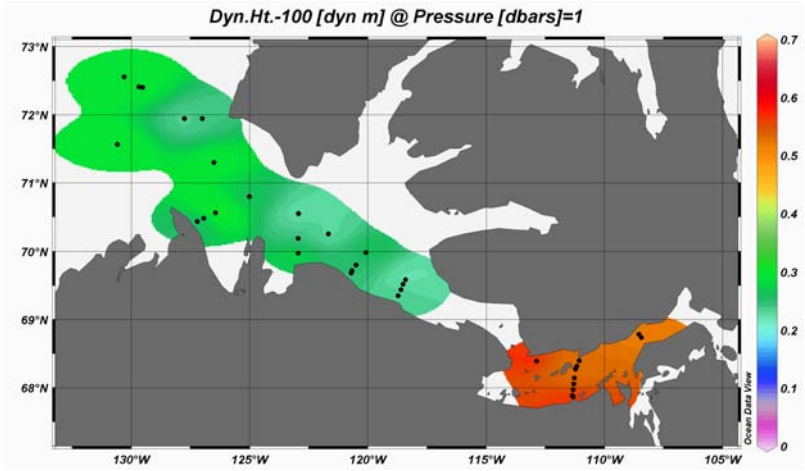
4.5 DYNAMIC HEIGHT AND SECTION PLOTS

Dynamic height (m) at all stations in Coronation Gulf, Amundsen Gulf and the Beaufort Sea calculated with respect to (a) 30 m; (b) 100 m; and (c) 300 m as the depth of no motion.

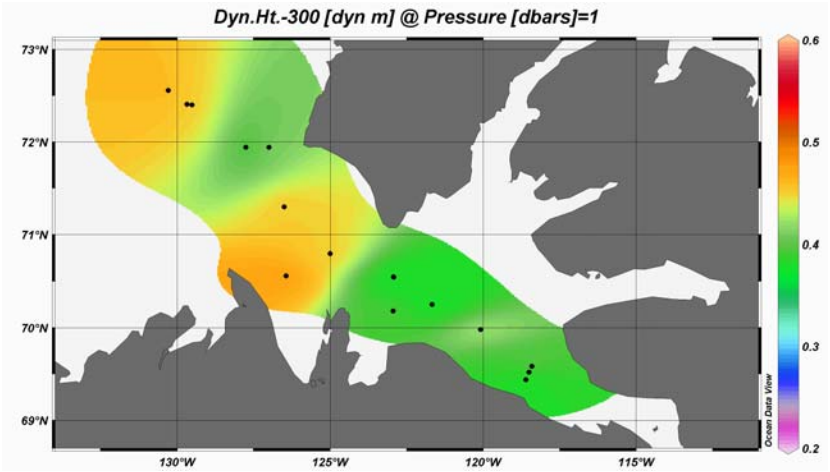
(a)



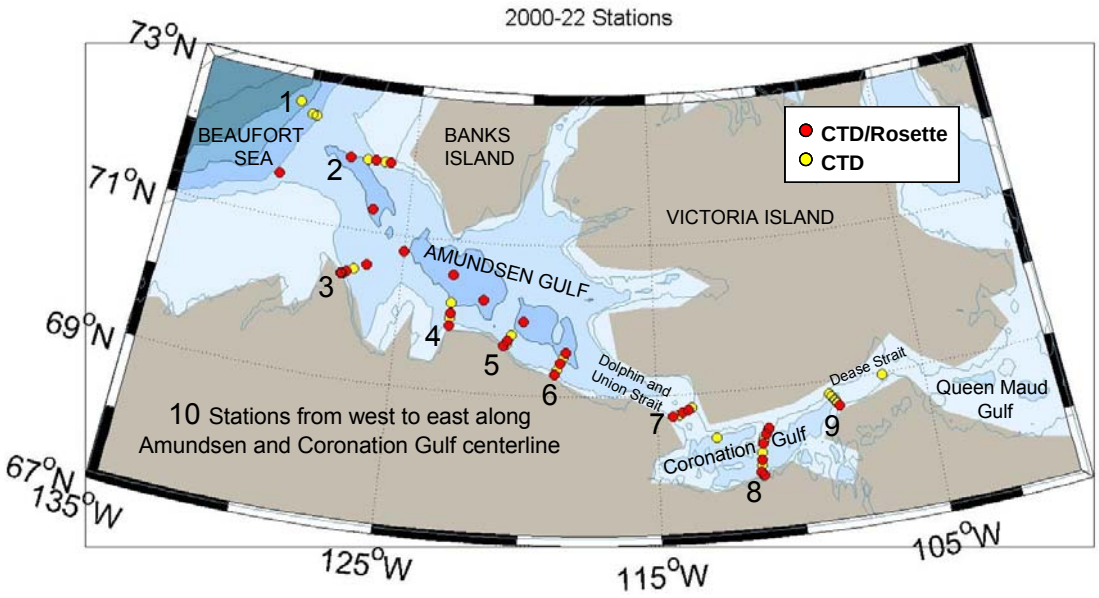
(b)



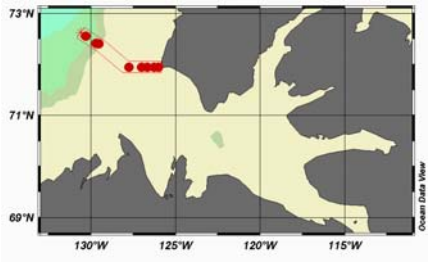
(c)

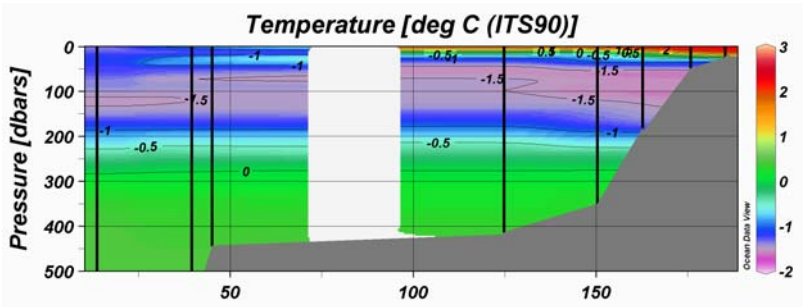


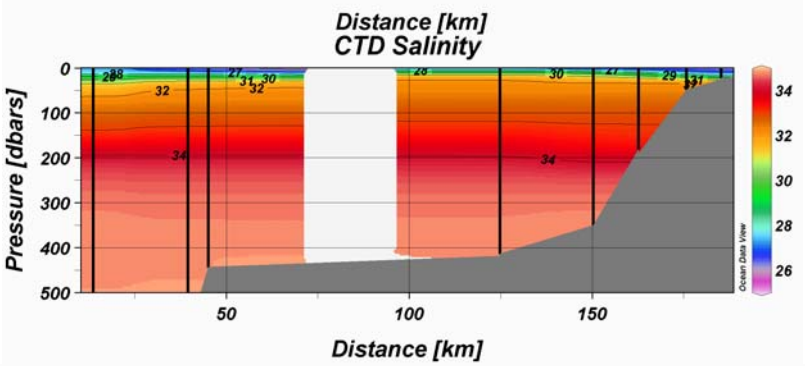
Mission 2000- 22 ODV Sections

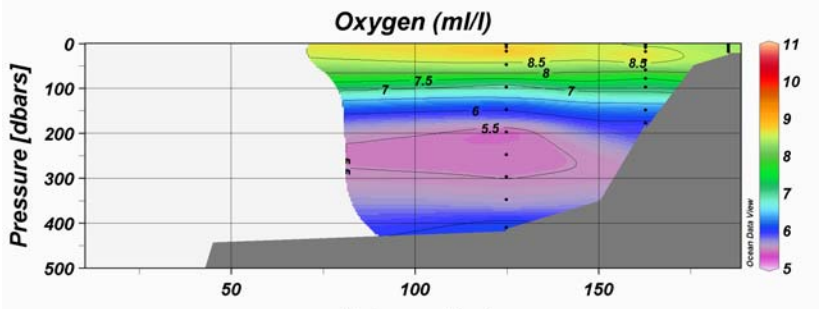


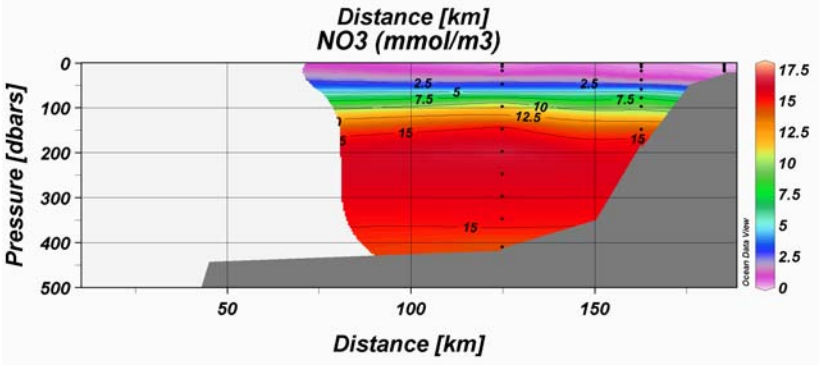
Beaufort Sea Sections 1 and 2:
Temperature; CTD Salinity; Oxygen; Nitrate



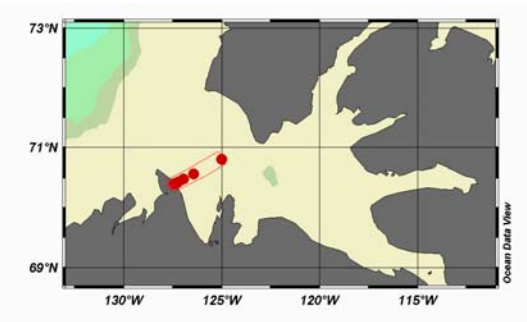


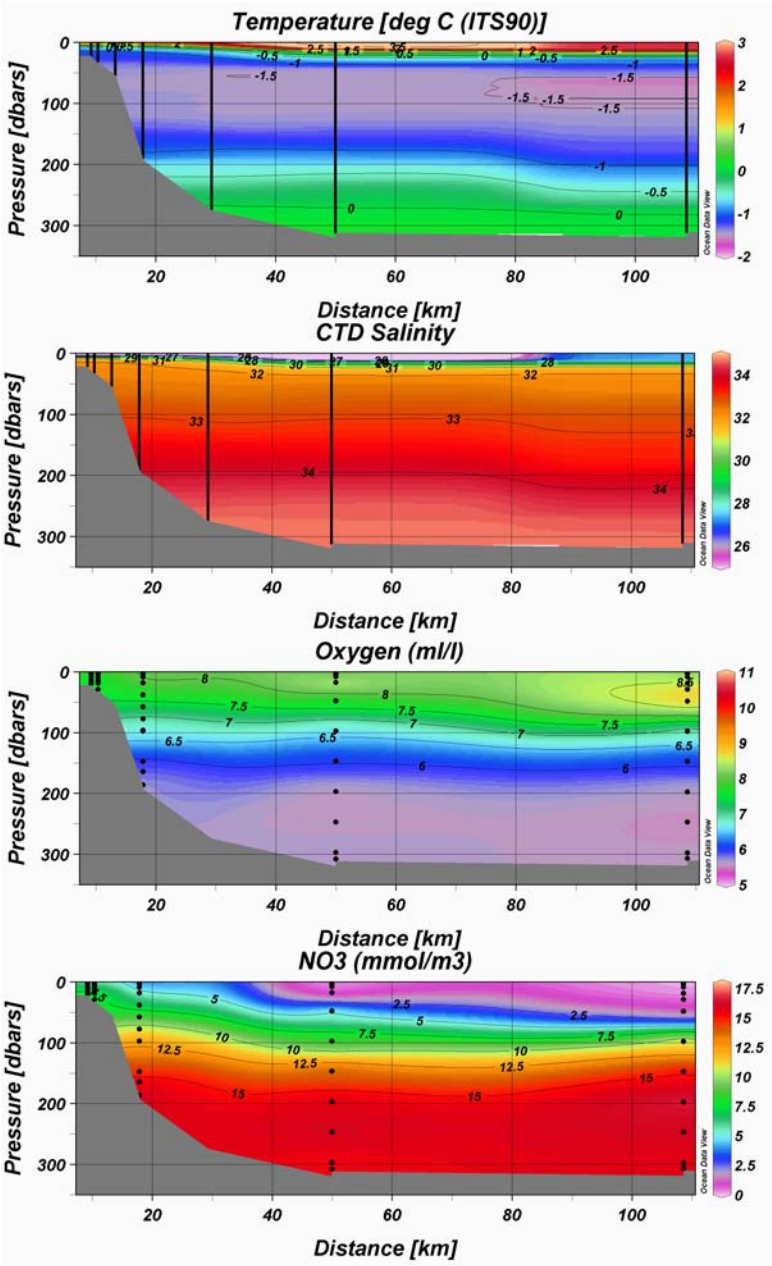




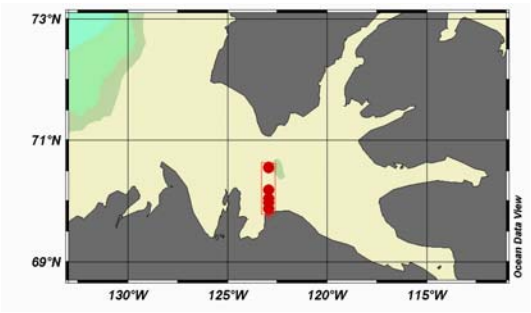


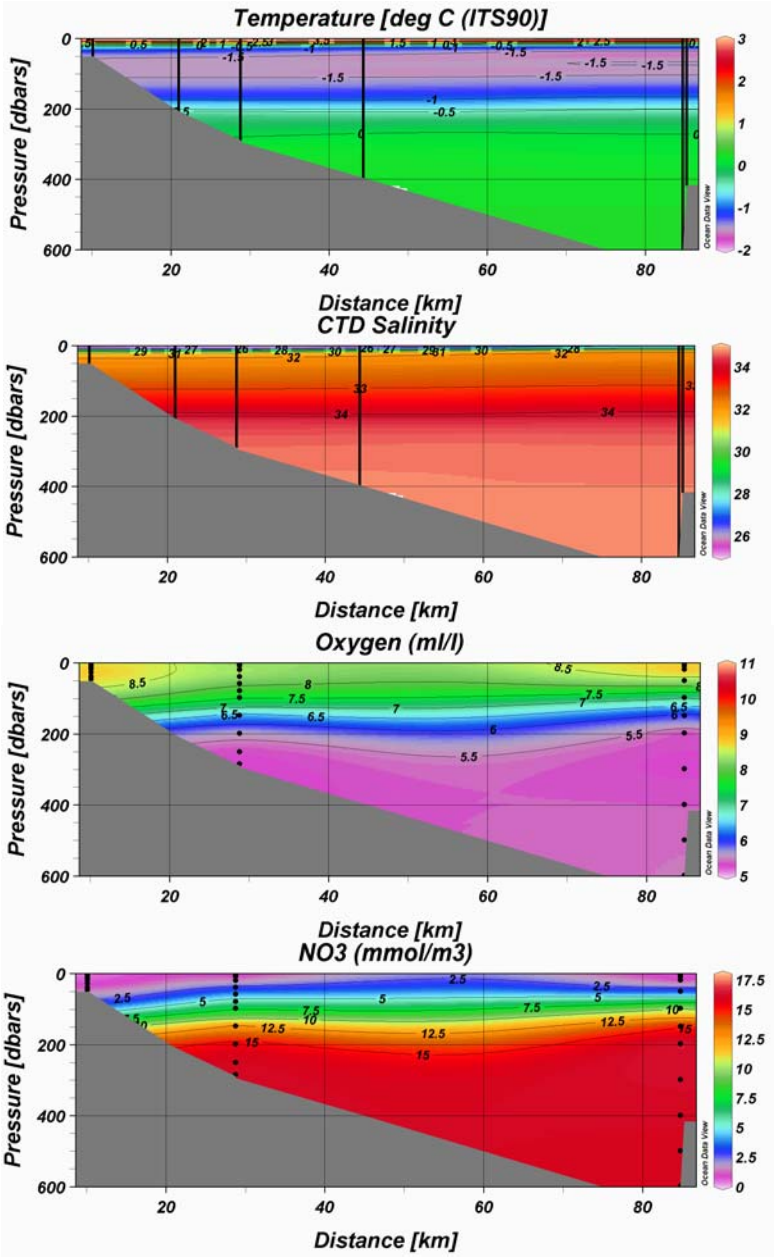
Amundsen Gulf Section 3:
Temperature; CTD Salinity; Oxygen; Nitrate



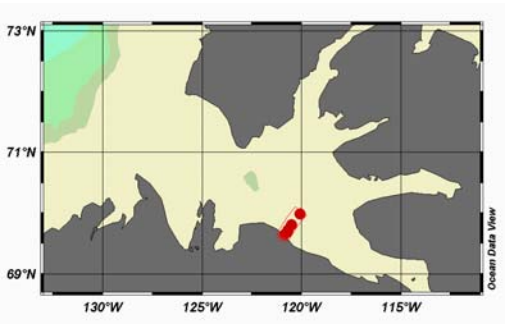


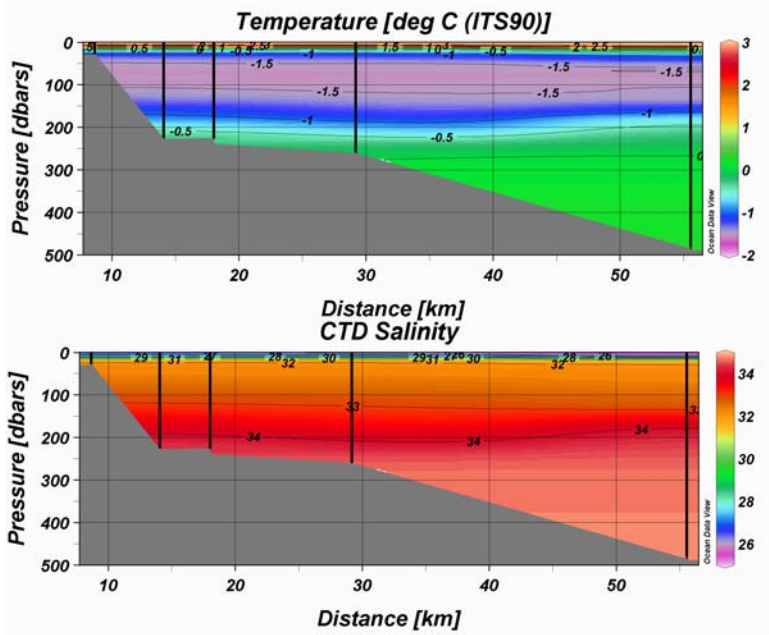
Amundsen Gulf Section 4:
Temperature; CTD Salinity; Oxygen; Nitrate

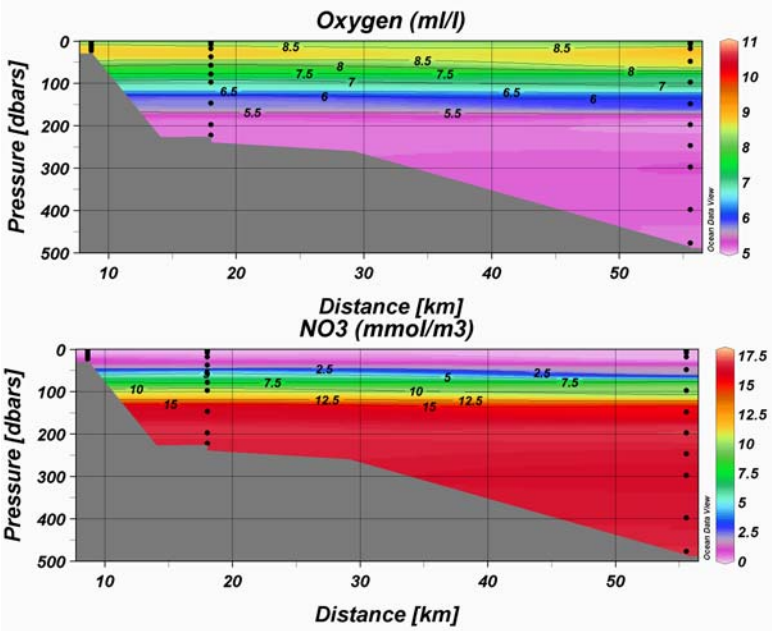




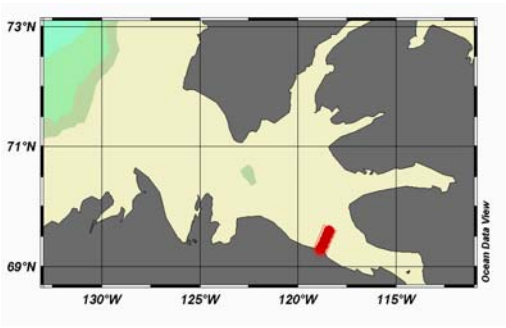
Amundsen Gulf Section 5:
Temperature; CTD Salinity; Oxygen; Nitrate

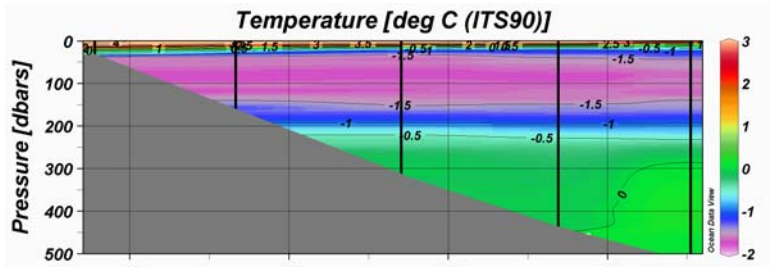


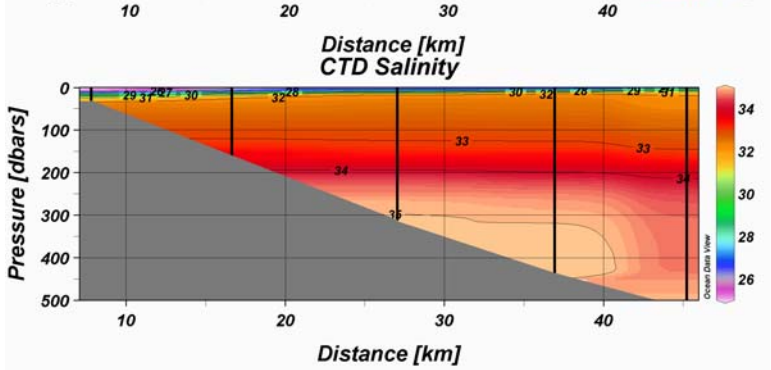


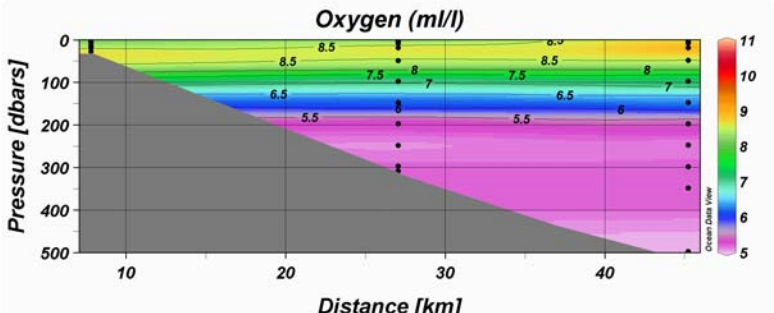


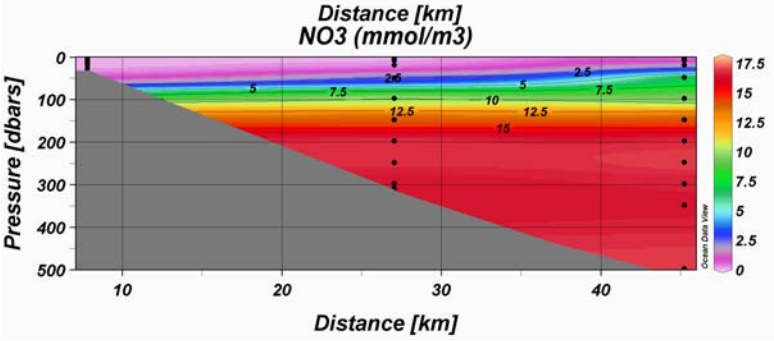
Amundsen Gulf Section 6:
Temperature; CTD Salinity; Oxygen; Nitrate



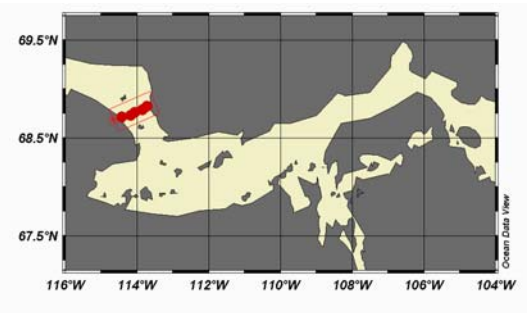


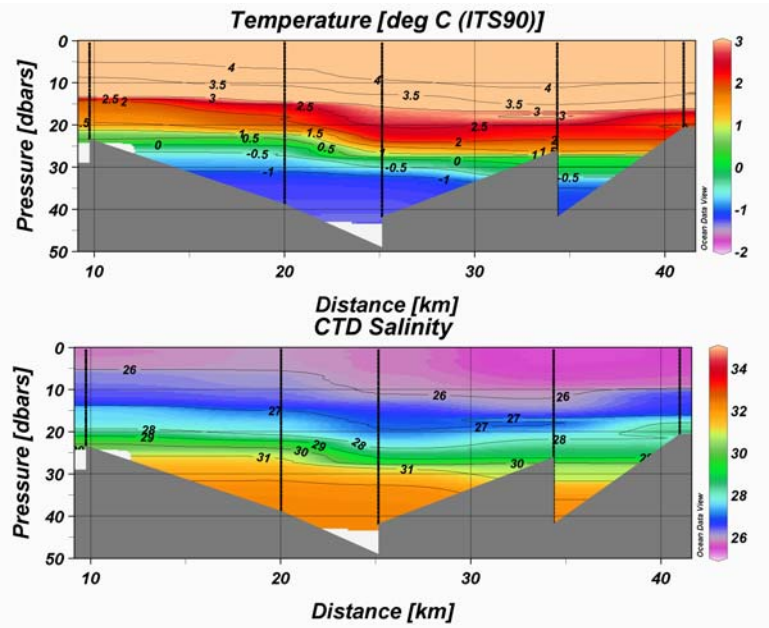


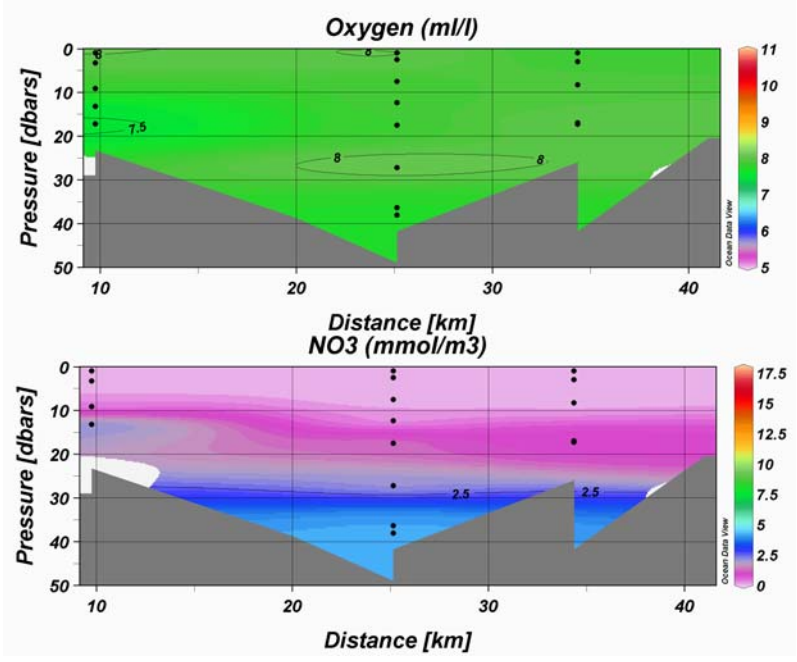




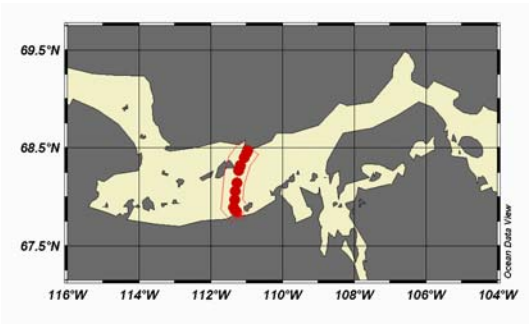
Dolphin and Union Strait Section 7:
Temperature; CTD Salinity; Oxygen; Nitrate

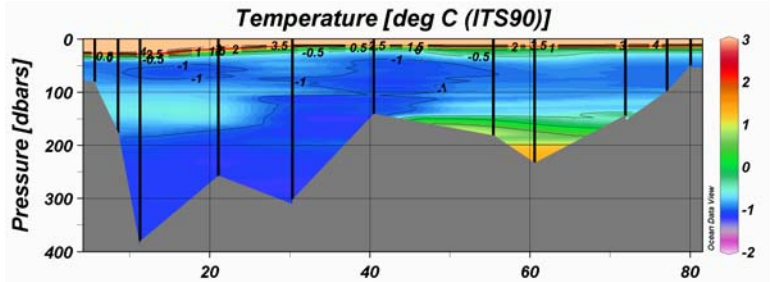


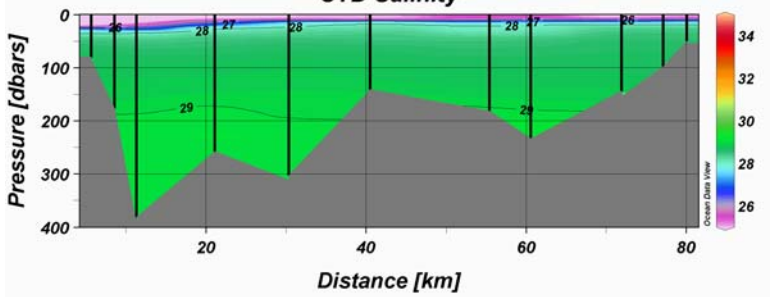


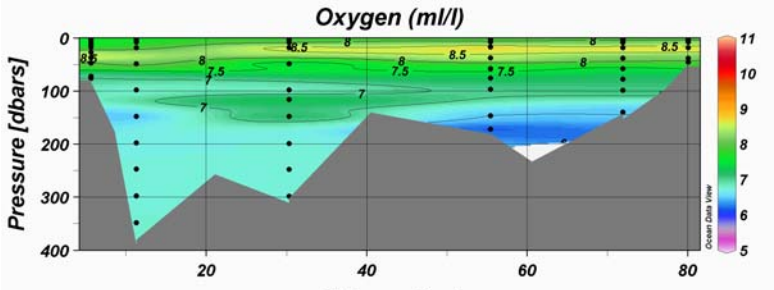


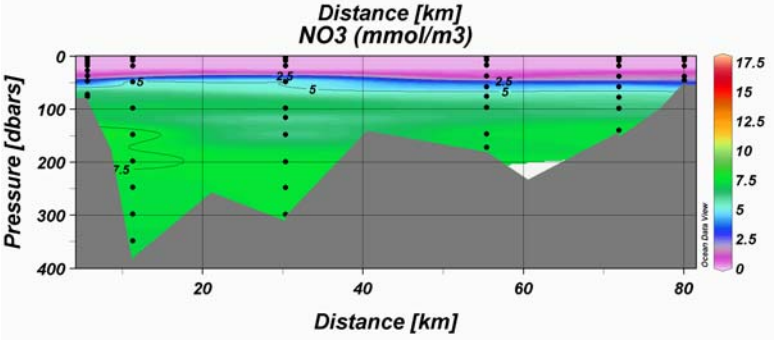
Coronation Gulf Section 8:
Temperature; CTD Salinity; Oxygen; Nitrate



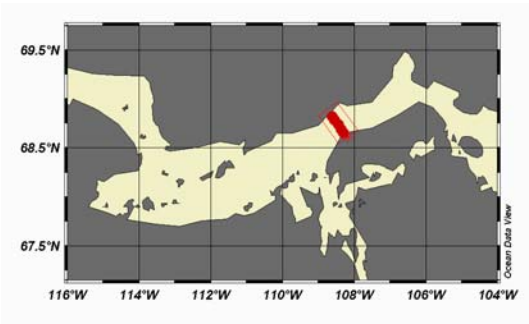


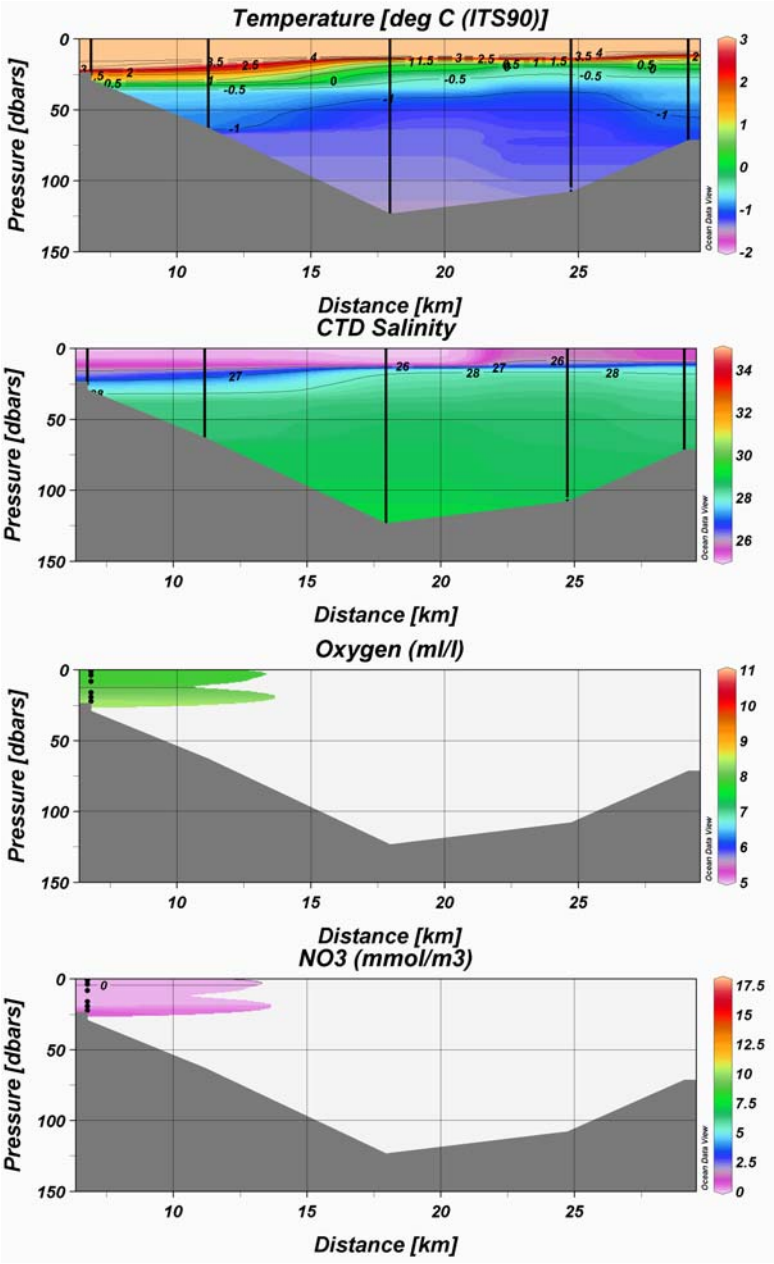




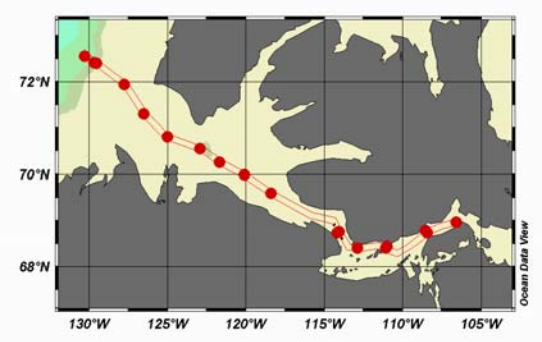


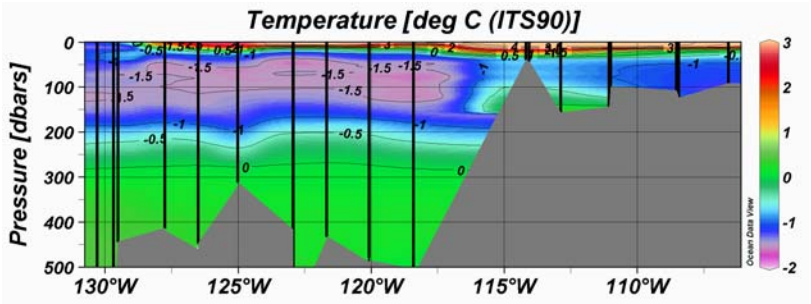
Dease Strait Section 9:
Temperature; CTD Salinity; Oxygen; Nitrate

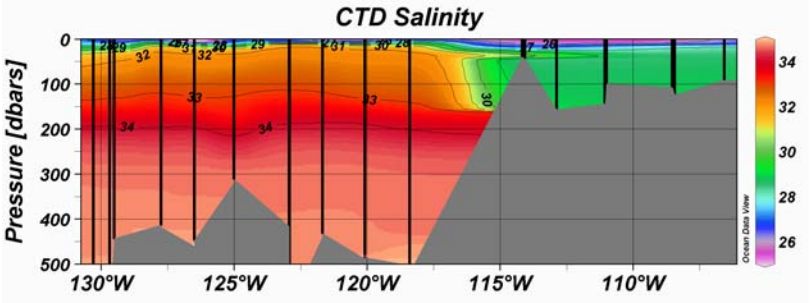


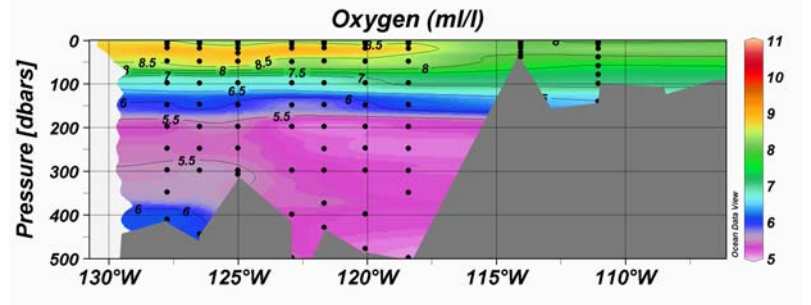


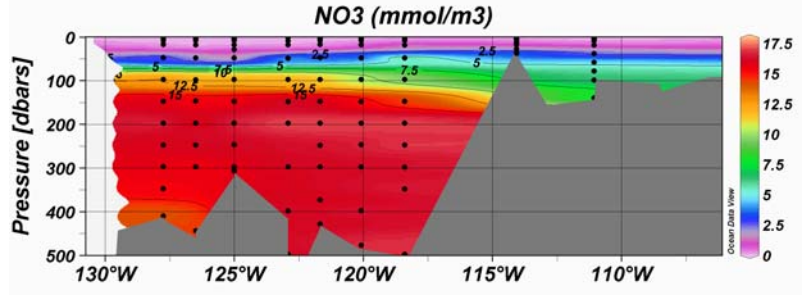
Connecting west to east along Amundsen and Coronation Gulf centerline
Section 10: Temperature; CTD Salinity; Oxygen; Nitrate



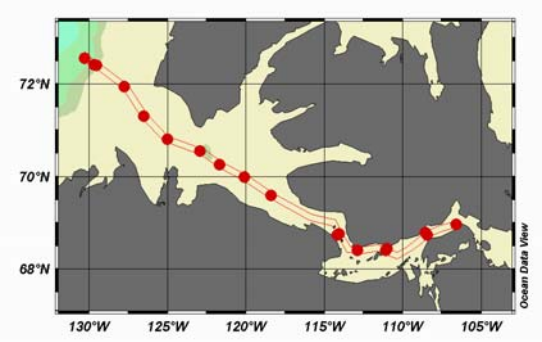


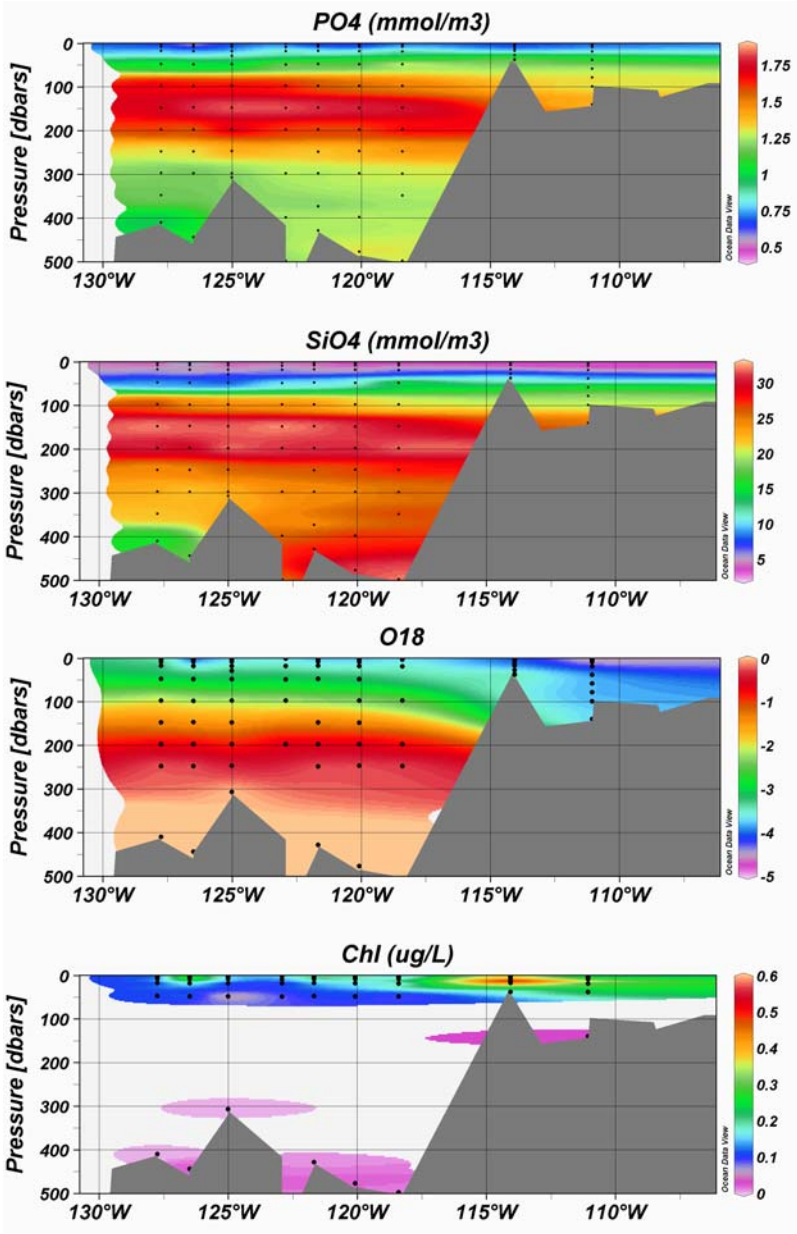






Connecting west to east along Amundsen and Coronation Gulf centerline
Section10: Phosphate; Silicate; $\delta^{18}O$; Chlorophyll-a





4.6 RIVER SAMPLES: NUTRIENTS, OXYGEN ISOTOPE RATIO AND BARIUM DATA

Table 20. River sample data: nitrate (plus nitrite), silicate, phosphate, oxygen isotope ratio and barium.

Station	Cast #	YYYY/MM/DD	Latitude (°N)	Longitude (°W)	Nitrate + Nitrite ($mmol/m^3$)	Silicate ($mmol/m^3$)	Phosphate ($mmol/m^3$)	δO^{18}	Label on vial	Sample names	Ba ($\mu mol/m^3$)
Wentzel River 1	Heli	2000/09/03	67.84	110.56	0.01	13.3	-0.05	-16.29	Wentzel River 2022 3/9 R	M13	19.8
Wentzel River 2								-18.79	Wentzel River 2022 3/9 R	M14	22.3
Horton River 1	Heli	2000/09/14	69.90	127.06	3.53	52.0	0.09	-19.77	Horton R 1	M10	330.8
Horton River 2	Heli	2000/09/14	70.00	127.13	0.01	33.0	-0.01		Horton R 2	M11	201.6
Horton River 3	Heli	2000/09/14	69.95	127.12	-0.03	46.2	0.03	-15.51	Horton R 3	M12	202.3

4.7 PHYTOPLANKTON TAXONOMY

4.7.1 Net Samples

Table 21. Phytoplankton taxonomy from net samples. All cells in fields were counted; results are good for comparative abundances.

Sample (net)	CP1	CP3	CP5	AG1	AG3	AG5	AGT	AG99	LW3	DT1	DT3	DT5	WB1	WB3	WB5
Station	CP1	CP3	CP5	AG1	AG3	AG5	AGT	AG99	LW3	DT1	DT3	DT5	WB1	WB3	WB5
Water column depth (m)	33	315	520	51	294	666	319	269	1212	30	239	489	320	195	34
Sample depth (m)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Date of sampling (2000)	9/5	9/5	9/5	9/7	9/8	9/8	9/9	9/13	9/10	9/15	9/15	9/16	9/14	9/14	9/14
Total # of cells counted	**724**	**1047**	**689**	**1054**	**1123**	**783**	**970**	**614**	**767**	**575**	**991**	**835**	**481**	**734**	**1193**
Centric Diatoms (a = apical axis; p = perivalvular axis)															
Hyalochaeotoceros															
valve view (a<20µm)	79	135	47	27	92	108	32	18	34	12	50	67	20	90	1
a=p (a<20µm)		10	5			2			3	2	34	1	2	12	2
a<p (a<20µm)	27	25	3	4		1			12	22	140		1	2	5
a>p (a<20µm)		11	3								18		2		8
valve view (a>20µm)	3	8		6	14	45	2	4	14	8	4	22	15	12	
a>p (a>20µm)	39					2					12				
Chaetoceros socialis								1		1					
Chaetoceros furcellatus			9				24						19		
Chaetoceros lorenzianus															15
Chaetoceros decipiens	4	14	9	12	9	12	7	11	28		13	4	13	8	21
Chaetoceros debilis (cf)											10				
Chaetoceros diadema	91	61	47	322	266	243	238	210	239	60	138	128	133	67	27
Chaetoceros contortus (cf)	139	337	226	245	509	124	396	132	99	156	160	465	161	203	7
Chaetoceros constrictus															3
Chaetoceros teres				14					2	22	14				2
Chaetoceros mitra				14											
Chaetoceros brevis														3	
Chaetoceros ingolfianus	8	14	44	18	52	47	87	38	48	40	65	29			
Chaetoceros laciniosus (cf)	127	33	38	142	2	9	56	1	180	60	84	44	30	31	7
Chaetoceros subtilis															4
Chaetoceros simplex										5					
Chaetoceros minimus														1	
C. convolutus f. trisetosa	2	1			2		2	2		12	12		1	1	
Chaetoceros danicus	seen	1		5	1	5			2	3	4	4			
Chaetoceros borealis		1	2		3	21	5	1	3	2	4	3	2		
C. convolutus f. convolutus	7	3	14	3			1		7		3	10			
Chaetoceros concavicornis										seen					
Chaetoceros atlanticus		4	3	3	4	5					seen	3		5	
Phaeoceros (a<20µm) (valvaire view)					11			3		9			3		
Phaeoceros (a>20µm) (valvaire v.)		2	2	1		15	4		2		7		4		
Chaetoceros sp. hypnospores (oval)			4						5						
Chaetoceros sp. hypnospores (symmetric)			1					3	5						
C. diadema hypnospores					1		1	2					3	seen	
C. mitra hypnospores				1											
C. furcellatus hypnosp.(oval)													1		
Attheya thin sp (pseudo-C.)			1												
Attheya septentrionalis	3	2	1		3		1	3		3	2	1		4	4
Thalassiosira sp (a>p)											seen				
Thalassiosira sp (>20 µm) (valvaire view)										1		1			
Thalassiosira pacifica						5						seen		3	
Thalassiosira nordenskioeldii		2							1	3					
Thalassiosira anguste-lineata													seen		

Sample (net)	CP1	CP3	CP5	AG1	AG3	AG5	AGT	AG99	LW3	DT1	DT3	DT5	WB1	WB3	WB5
Station	CP1	CP3	CP5	AG1	AG3	AG5	AGT	AG99	LW3	DT1	DT3	DT5	WB1	WB3	WB5
Water column depth (m)	33	315	520	51	294	666	319	269	1212	30	239	489	320	195	34
Sample depth (m)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Date of sampling (2000)	9/5	9/5	9/5	9/7	9/8	9/8	9/9	9/13	9/10	9/15	9/15	9/16	9/14	9/14	9/14
Total # of cells counted	**724**	**1047**	**689**	**1054**	**1123**	**783**	**970**	**614**	**767**	**575**	**991**	**835**	**481**	**734**	**1193**
Dinoflagellates															
Gymnodinium/Gyrodinium sp (5-10µm)					1	2									
Gymnodinium/Gyrodinium sp	5	1	1				2				1		1		
(10-20µm)															
Gymnodinium/Gyrodinium sp	1					1									
(20-50µm)															
Gymnodinium/Gyrodinium sp (50-70µm)			1								3				
Gymnodinium/Gyrodinium sp (70-100µm)						1									
Gyrodinium spirale	seen														
Gyrodinium guttula		seen							1	1					
Gyrodinium fusiforme			1												
Gyrodinium sp			2												
Polarella sp										seen					
Actiniscus sp									1						
Prorocentrum sp	1									2	2			2	
Prorocentrum minimum								1	2		1				
Prorocentrum compressum	1	seen	1	2	1	1	1	1	1	3	3	2	2	2	1
Prorocentrum gracile													1		
Dinophysis acuminata	7	3		2	3	2	13	2	4	10	10	1	7	13	10
Ceratium arcticum	1	1	1	2	1	2	2		1		1	1		1	1
Goniodomataceae	1										1				
Alexandrium sp	3			2	2	2	2		3	1	1			1	
Gonyaulax sp		1		1											
Peridiniella sp	seen														
Lingulodinium polyedrum (cf)	1									seen				4	
Corythodinium sp	1														
Scrippsiella (groupe)	1			seen	1	2								1	
Protoperidinium sp	1	2						1	2			1	2	4	
Protoperidinium mite (cf)	1	2		1			1		1		3		1		2
Protoperidinium conicoides (cf)	1										seen			1	
Protoperidinium pellucidum							2	3							
Protoperidinium pallidum			1												
Protoperidinium granii					1					1			1		
Protoperidinium bipes			1							3				1	1
Protoperidinium brevipes	2	1		seen	3				2		2	1	1		1
Protoperidinium cerasus			1	1	1	2		1		1	1	1		1	
Protoperidinium steneii (cf)	1														
kystes of *Polarella sp*										1					
spiny kystes of dinoflagellates						1									
oval kystes of dinoflagellates		1		seen					1						
round kystes of dinoflagellates		seen					2								3
unknown dinoflagellates	1							1	1	1	1				

Sample (net)	CP1	CP3	CP5	AG1	AG3	AG5	AGT	AG99	LW3	DT1	DT3	DT5	WB1	WB3	WB5
Station	CP1	CP3	CP5	AG1	AG3	AG5	AGT	AG99	LW3	DT1	DT3	DT5	WB1	WB3	WB5
Water column depth (m)	33	315	520	51	294	666	319	269	1212	30	239	489	320	195	34
Sample depth (m)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Date of sampling (2000)	9/5	9/5	9/5	9/7	9/8	9/8	9/9	9/13	9/10	9/15	9/15	9/16	9/14	9/14	9/14
Total # of cells counted	**724**	**1047**	**689**	**1054**	**1123**	**783**	**970**	**614**	**767**	**575**	**991**	**835**	**481**	**734**	**1193**
Flagellates															
Hillea marina							1								
Cryptophyceae (5-10µm)													1		
Heterosigma akashiwo			1		1					1	1				
Pseudopedinella pyriforme	2								1	3	3			1	
Dinobryon balticum	124	336	192	176	64	83	50	140	2	54	91	15	17	207	890
Dinobryon sp kyste														1	
Ciliophrys infusionum				6											
Imantonia rotunda/Dicrateria sp		3													
Eutreptiella gymnastica								1							
Eutreptiella eupharyngea															1
Dolichomastix aff. D.tenuilepis										1					
Pyramimonas orientalis	1									1					1
Pterosperma cristatum													1		
Pterosperma sp									1	1			1	2	
Chlamydomonas sp		1													
Monosiga marina								1			2			2	1
Parvicorbicula socialis					1										
Parvicorbicula pedunculata										3					
Choanoflagellates															1
Polytomella sp		1											1		
Paulinella ovalis	1		1		2					1			1	1	1
Ollicola sp															1
Syracolithus dalmaticus														2	
Syracosphaera sp													1		
unknown coccolithophores (>10µm)					1	1				3	1				
unknown coccolithophores (<10µm)					1	3	1			1	1			1	2
Ciliates															
Strombolidium sp				1											
Strombidium sp	1	1	2	1			1	1	1			1			1
Strombidium conicum	1	seen	1	seen	1	1	2	2	2	seen	seen	1		1	
Strombidium constrictum													1	seen	
Lohmaniella oviformis										seen				seen	
Didinium sp								1							2
Laboea strobila														seen	
Parafavella elegans	1	1	seen	seen	1	1	1	1	1	seen	seen	1			
Parafavella denticulata				1					1	seen					
Acanthostomella gracilis		seen		1		4						seen			
Ptychocyclis obtusa	1	3	seen	2	1	4	2	2		1	3	1			
Tontonia sp		4	1	1		2	1	1				2			
Tintinnopsis sp	2	seen	1	seen			1	2							2
kystes of ciliates		1	3			2	1		seen		1	1			
unknown ciliates (oligotrich)					1	1				1				2	seen
unknown ciliates (peritrich)	1		1	2	1	1		1		seen	seen	seen	1	seen	2
Unknown Cells	3	3	1	2	1	3	1		1	5	4	1	11	7	4
unknown colony cells				seen											

4.7.2 Water Samples

Table 22. Phytoplankton taxonomy from water samples.

Sample (water)	303	305	315	320	321	322	323	324	333	345	430	441	442	465	466	467	468	469	470
Station	CP03	CP03	CP01	AG05	AG05	AG05	AG05	AG05	AG03	AG01	WB03	WB05	WB05	DT01	DT01	DT01	DT01	DT01	DT01
Water column depth (m)	315	315	33	666	666	666	666	666	294	51	193	34	34	30	30	30	30	30	30
Sample depth (m)	6	21	6	2	11	21	52	100	5	6	5	2	7	2	5	10	15	20	26
Date of sampling (Year 2000)	9/5	9/5	9/5	9/7	9/7	9/7	9/7	9/7	9/7	9/7	9/14	9/14	9/14	9/15	9/15	9/15	9/15	9/15	9/15
Volume used for counting (mL)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	30	50	100	100
No. of fields read	19	38	14	26	27	17	40	47	23	47	36	25	21	34	21	29	43	28	32
Total number of cells counted	305	164	348	147	183	147	51	35	288	264	335	163	185	237	312	127	185	195	207
Thousand Cells/L	**474.5**	**126.8**	**732.1**	**165.9**	**200.5**	**252.0**	**37.9**	**21.5**	**371.3**	**164.6**	**276.9**	**191.6**	**258.6**	**207.4**	**437.8**	**434.3**	**251.9**	**205.1**	**190.6**
a = apical axis & p = perivalvular axis																			
Centric diatoms																			
Hyalochaeotoceros																			
valvaire view(a<20µm)	3132	10178	4250	2289	1102				3881							3420			
a=p (a<20µm)																	2768		
a<p (a<20µm)															1417		2768		1859
a>p (a<20µm)										1266					5667				
valvaire view (a>20µm)	1566		2125																
Chaetoceros furcellatus		1566															5535		
Chaetoceros decipiens					2204														
Chaetoceros diadema	9395	783	142384	13732	4408				33632	3798				4375	35419	27358	4151	5313	
Chaetoceros contortus (cf)	56372	12527	80755						9055	24688				3500	18418	34197	13838	4250	
Chaetoceros ingolfianus	6264	8612	17001						3881										
Chaetoceros laciniosus (cf)	9395	3915							2587										
C. convolutus f. trisetosa	1566																		
Chaetoceros danicus			4250																
Phaeoceros (a>20µm) (valvaire view)				1144	1102														
Chaetoceros sp. hypnospores (oval)		3132	4250			1750	744			1266				1750	1417	6839	5535	9563	4649
Chaetoceros sp. hypnospores (sym.)	15659	7046	10626	3433	2204	5250	5207	2532	2587	633	826	1190	2834	13126	15584	23938	13838	20189	25103
C. contortus hypnospores		1566																	
C. diadema hypnospores										1266							1384	1063	
C. furcellatus hypnospores (sym.)								633									2768	4250	
Attheya sp.	1566																		
Thalassiosira sp (<20 µm) (valvaire view)																6839			4649
Thalassiosira sp (>20 µm) (valvaire view)														3500	1417	10259	9687		
Thalassiosira sp (resting spores)														1750					
Thalassiosira pacifica											3306			3500	2834	23938		12751	14876
Thalassiosira nordenskioeldii														10501	21251	10259	11070	4250	4649
Bacterosira bathyomphala	3132																5535		

Sample (water) Cont'd	303	305	315	320	321	322	323	324	333	345	430	441	442	465	466	467	468	469	470
Station	CP03	CP03	CP01	AG05	AG05	AG05	AG05	AG05	AG03	AG01	WB03	WB05	WB05	DT01	DT01	DT01	DT01	DT01	DT01
Water column depth (m)	315	315	33	666	666	666	666	666	294	51	193	34	34	30	30	30	30	30	30
Sample depth (m)	6	21	6	2	11	21	52	100	5	6	5	2	7	2	5	10	15	20	26
Date of sampling (Year 2000)	9/5	9/5	9/5	9/7	9/7	9/7	9/7	9/7	9/7	9/7	9/14	9/14	9/14	9/15	9/15	9/15	9/15	9/15	9/15
Volume used for counting (mL)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	30	50	100	100
No. of fields read	19	38	14	26	27	17	40	47	23	47	36	25	21	34	21	29	43	28	32
Total number of cells counted	305	164	348	147	183	147	51	35	288	264	335	163	185	237	312	127	185	195	207
Thousand Cells/L	**474.5**	**126.8**	**732.1**	**165.9**	**200.5**	**252.0**	**37.9**	**21.5**	**371.3**	**164.6**	**276.9**	**191.6**	**258.6**	**207.4**	**437.8**	**434.3**	**251.9**	**205.1**	**190.6**
Centric diatoms Cont'd																			
Actinocyclus sp														875					
Rhizosolenia hebetata f. semispina (cf)	1566		9563						1294										
R. hebetata f. semispina (with parasites)																			
Eucampia groenlandica		3132																	
Hemiauloideae										633								3188	
Coscinodiscus sp															1417				
Licmophora sp										633									
Navicula transitans var. derasa																			930
Navicula transitans f. delicatula																			930
Navicula directa		783				1750					826					3420			930
Navicula sp																			930
Pinnularia sp																			930
Manguinea rigida														875					
Cylindrotheca closterium	1566	783	2125						1294	633				1750			1384	1063	
Cylindrotheca sp			2125									2380					1384	1063	
Nitzschia sp									1294									1063	
Pseudo-Nitzschia pseudodelicatissima	4698																		
Pseudo-Nitzschia turgidula				4577		1750	7438		5174	3798			2125		1417	23938	2768	2125	4649
Pseudo-Nitzschia seriata f seriata	3132	783																	
Dinoflagellates																			
Gymnodinium simplex										633						3420			
Gymnodinium arcticum		2349							1294										
Gymnodinium aff. G. parvum		783	2125	1144	2204														
Gymnodinium galeatum	1566		2125	1144		1750										3420			
Gymnodinium elongatum				1144	3306	1750	744							875				1063	
Gymnodinium dentatum						1750				633						6839	1384		930
Gymnodinium mikimotoi																			
Gymnodinium roseostigma					1102	7000				633	1653								
Gymnodinium valdecompressum				1144															
Gymnodinium sp					1102	7000	744												
Amphidoma acuminata				1144	9917	1750	744		1294					875	1417		1384	1063	
Amphidinium aff. A. kesslitzii		783																	

Sample (water) Cont'd	303	305	315	320	321	322	323	324	333	345	430	441	442	465	466	467	468	469	470
Station	CP03	CP03	CP01	AG05	AG05	AG05	AG05	AG05	AG03	AG01	WB03	WB05	WB05	DT01	DT01	DT01	DT01	DT01	DT01
Water column depth (m)	315	315	33	666	666	666	666	666	294	51	193	34	34	30	30	30	30	30	30
Sample depth (m)	6	21	6	2	11	21	52	100	5	6	5	2	7	2	5	10	15	20	26
Date of sampling (Year 2000)	9/5	9/5	9/5	9/7	9/7	9/7	9/7	9/7	9/7	9/7	9/14	9/14	9/14	9/15	9/15	9/15	9/15	9/15	9/15
Volume used for counting (mL)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	30	50	100	100
No. of fields read	19	38	14	26	27	17	40	47	23	47	36	25	21	34	21	29	43	28	32
Total number of cells counted	305	164	348	147	183	147	51	35	288	264	335	163	185	237	312	127	185	195	207
Thousand Cells/L	**474.5**	**126.8**	**732.1**	**165.9**	**200.5**	**252.0**	**37.9**	**21.5**	**371.3**	**164.6**	**276.9**	**191.6**	**258.6**	**207.4**	**437.8**	**434.3**	**251.9**	**205.1**	**190.6**
Dinoflagellates Cont'd																			
Amphidinium sphenoides		1566	4250	1144	1102					1266				875	1417				
Katodinium glaucum						1750			2587	633				1750				1063	
Katodinium rotundatum													1417			3420			
Gymnodinium/Gyrodinium sp (5-10µm)														875					
Gymnodinium/Gyrodinium sp (10-20µm)	6264	3132	2125	4577				1266	7761	3165	2479	1190		4375	9917	3420	6919	2125	930
Gymnodinium/Gyrodinium sp (20-50µm)	1566	783				3500				1899		1190	1417	875	2834				
Gymnodinium/Gyrodinium sp (50-70µm)														875					
Gyrodinium pingue					1102				2587	1899									
Gyrodinium flagellare				1144															
Gyrodinium sp			2125																
Torodinium robustum															1417				
Heterocapsa aff. H. niei (cf)										5697	826						5535	7438	
Prorocentrum sp					2204												1384		
Prorocentrum minimum	1566			1144	5510	1750			6468	5064		2380		875		6839		1063	
Prorocentrum balticum								633						875					
Prorocentrum compressum			2125	1144									1417		1417				930
Dinophysis acuminata										633	826	1190	2834						
Dinophysis rotundata								633											
Dinophysis sp															1417				
Ceratium fusus														875					
Alexandrium sp				2289							826					3420			
Gonyaulax sp			2125																
Gonyaulax spinifera (cf)	1566																		
Peridiniella sp	3132	783																	
Oxytoxum gracile					1102														
Scrippsiella (groupe)					2204	1750													
Protoperidinium pellucidum									1294										
Protoperidinium bipes				1144						633		1190							
Protoperidinium brevipes	1566			1144	1102														
Protoperidinium cerasus	1566													875	1417				
spiny kystes of dinoflagellates				2289						633						3420			
oval kystes of dinoflagellates						1750	744												
round kystes of dinoflagellates			2125										1417						
unknown dinoflagellates				1144					1294	633								2125	

Sample (water) Cont'd	303	305	315	320	321	322	323	324	333	345	430	441	442	465	466	467	468	469	470
Station	CP03	CP03	CP01	AG05	AG05	AG05	AG05	AG05	AG03	AG01	WB03	WB05	WB05	DT01	DT01	DT01	DT01	DT01	DT01
Water column depth (m)	315	315	33	666	666	666	666	666	294	51	193	34	34	30	30	30	30	30	30
Sample depth (m)	6	21	6	2	11	21	52	100	5	6	5	2	7	2	5	10	15	20	26
Date of sampling (Year 2000)	9/5	9/5	9/5	9/7	9/7	9/7	9/7	9/7	9/7	9/7	9/14	9/14	9/14	9/15	9/15	9/15	9/15	9/15	9/15
Volume used for counting (mL)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	30	50	100	100
No. of fields read	19	38	14	26	27	17	40	47	23	47	36	25	21	34	21	29	43	28	32
Total number of cells counted	305	164	348	147	183	147	51	35	288	264	335	163	185	237	312	127	185	195	207
Thousand Cells/L	**474.5**	**126.8**	**732.1**	**165.9**	**200.5**	**252.0**	**37.9**	**21.5**	**371.3**	**164.6**	**276.9**	**191.6**	**258.6**	**207.4**	**437.8**	**434.3**	**251.9**	**205.1**	**190.6**
Flagellates																			
Hemiselmis sp		3132				5250							1417		1417				930
Hemiselmis simplex (cf)						1750													
Plagioselmis sp	1566					1750			1294	633									
Rhinomonas sp			2125	2289		5250			1294		826	5950	5667						2789
Rhodomonas sp					1102														
Leucocryptos marina	1566			1144	6612	3500				2532							2768	2125	930
Goniomonas sp (cf)				1144		5250							1417						
Cryptophyceae (5-10µm)	3132	783	2125	1144							826		1417	2625		3420			930
Paraphysomonas sp (cf)			2125																
Chroomonas sp									1294					875					
Ochromonas sp						1750													
Chromulina aff. C. pleiades (cf)				1144								1190	1417						
Sphaleromantis marina (cf)			2125																
Pseudopedinella pyriforme	1566	1566	2125	3433	2204	5250	744		3881	1266	4959	1190		875		6839	5535	7438	2789
Pseudopedinella tricostata		783	2125										1417						930
Pseudopedinella sp (4 chloro.)																			930
Dinobryon balticum	7829	783	25502	1144	1102				5174			40462	8501						
Dinobryon faculiferum						1750													
Diplostauron pentagonium																6839		1063	
Diplostauron aff. D. elegans									1294										
Imantonia rotunda / Dicrateria sp	12527	7046	2125	6866	13223	19251				633	7438	2380	2834		1417		5535	4250	8368
Chrysochromulina sp				2289	2204	17501		633	2587	6330	12397	2380	5667	5250	2834	17099	4151	12751	7438
Pavlova gyrans (cf)									1294										930
Eutreptiella sp												1190							
Eutreptiella gymnastica	3132	783	2125													10259			930
Eutreptiella eupharyngea					5510	3500				1899									
Resultor mikron		1566				1750							1417						930
Mamiella gilva (cf)	1566	783												875					
Nephroselmis minuta				1144					1294	633		2380		875	2834	17099		3188	3719
Nephroselmis pyriformis (cf)				1144					3881	1266					1417		1384	1063	6508
Pseudoscourfieldia marina (cf)					1102					633	826	1190	2834		1417				
Dolichomastix aff. D.tenuilepis															1417				
Pyramimonas orientalis		783									5785		1417						

Sample (water) Cont'd	303	305	315	320	321	322	323	324	333	345	430	441	442	465	466	467	468	469	470
Station	CP03	CP03	CP01	AG05	AG05	AG05	AG05	AG05	AG03	AG01	WB03	WB05	WB05	DT01	DT01	DT01	DT01	DT01	DT01
Water column depth (m)	315	315	33	666	666	666	666	666	294	51	193	34	34	30	30	30	30	30	30
Sample depth (m)	6	21	6	2	11	21	52	100	5	6	5	2	7	2	5	10	15	20	26
Date of sampling (Year 2000)	9/5	9/5	9/5	9/7	9/7	9/7	9/7	9/7	9/7	9/7	9/14	9/14	9/14	9/15	9/15	9/15	9/15	9/15	9/15
Volume used for counting (mL)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	30	50	100	100
No. of fields read	19	38	14	26	27	17	40	47	23	47	36	25	21	34	21	29	43	28	32
Total number of cells counted	305	164	348	147	183	147	51	35	288	264	335	163	185	237	312	127	185	195	207
Thousand Cells/L	**474.5**	**126.8**	**732.1**	**165.9**	**200.5**	**252.0**	**37.9**	**21.5**	**371.3**	**164.6**	**276.9**	**191.6**	**258.6**	**207.4**	**437.8**	**434.3**	**251.9**	**205.1**	**190.6**
Flagellates Cont'd																			
Pyramimonas grossii				1144															
Pyramomonas virginica (<6µm) *(cf)*	15659		12751	22886	25344	31502	744		1294	633	6612			1750	2834				
Pyramomonas sp									1294		3306								
Pterosperma sp 1 (Lyse B-T)															1417				
Pterosperma sp		14093		1144		1750				633	1653			875		3420	1384		930
Chlamydomonas sp					1102														
Monosiga marina	1566		4250								826							1063	
Metromonas simplex (cf)										633									
Ryncomonas nasuta						5250													
Telenema subtilis	1566					1750								875		3420			
Telenoma sp					2204	1750			1294	633				1750					
Polytomella sp				1144															
Paulinella ovalis	3132	783	17001			1750			5174	2532	12397	9521	22668	2625	4250	3420			
Ollicola sp	106480		210388	1144				633	137117	23422	71074	23801	34002	60379	123258	3420	2768	1063	3719
Pseudopleurochloris antartica (cf)										1266									
Cryothecomonas inermis (cf)				6866		1750													
Quadricilia sp				6866	9917	1750		633	1294		1653	1190	1417		2834				
unknown flagellates (<3µm)	18791	7829	40377	13732	18733	22751	3719	1266	33632	15825	40496	19041	41086	5250	28335	30778	9687	13813	22314
unknown flagellates (>3µm)	20357	3915	12751	12587	15427	21001	744	633	6468	3165	5785	9521	22668	5250	5667	10259	5535	5313	2789
Coccolithophores																			
Emiliana huxleyi	62635	7829	53128	3433	16529	17501	2231	3798	34926	12027	32231	8331	29752	14001	39669	27358	29060	14876	17665
Helicosphaera carteri (cf)	3132																		
Zygosphaera sp				1144															
Syracolithus dalmaticus	4698														1417	3420			
Syracolithus quadriperforatus	4698	1566	4250		1102														
Syracosphaera prolongata							744												
Syracosphaera rotula						1750													
Gephyrocapsa oceanica		783																	
Sphaerocalyptra quadridentata	1566																		
unknown coccolithophores (>10µm)	12527		6375	6866	15427	7000		1899	2587	633	2479	7140	2834	7000	22668	27358	9687	9563	3719
unknown coccolithophores (<10µm)	43845	7046	27627	13732	11019	19251	10413	6330	31045	16458	51239	41653	51003	35877	59504	41037	69190	39315	31611

Sample (water) Cont'd	303	305	315	320	321	322	323	324	333	345	430	441	442	465	466	467	468	469	470
Station	CP03	CP03	CP01	AG05	AG05	AG05	AG05	AG05	AG03	AG01	WB03	WB05	WB05	DT01	DT01	DT01	DT01	DT01	DT01
Water column depth (m)	315	315	33	666	666	666	666	666	294	51	193	34	34	30	30	30	30	30	30
Sample depth (m)	6	21	6	2	11	21	52	100	5	6	5	2	7	2	5	10	15	20	26
Date of sampling (Year 2000)	9/5	9/5	9/5	9/7	9/7	9/7	9/7	9/7	9/7	9/7	9/14	9/14	9/14	9/15	9/15	9/15	9/15	9/15	9/15
Volume used for counting (mL)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	30	50	100	100
No. of fields read	19	38	14	26	27	17	40	47	23	47	36	25	21	34	21	29	43	28	32
Total number of cells counted	305	164	348	147	183	147	51	35	288	264	335	163	185	237	312	127	185	195	207
Thousand Cells/L	**474.5**	**126.8**	**732.1**	**165.9**	**200.5**	**252.0**	**37.9**	**21.5**	**371.3**	**164.6**	**276.9**	**191.6**	**258.6**	**207.4**	**437.8**	**434.3**	**251.9**	**205.1**	**190.6**
Ciliates																			
Strombidium sp					1102					1899	826				1417	3420			
Strombidium conicum	1566		2125				744			3165							1384		
Strombidium sulcatum				1144															
Lohmaniella oviformis					1102														
Didinium sp							744												
Mesodinium rubra					1102		744			2532	826	1190	1417			3420			
Laboea strobila											826						1384		
Acanthostomella gracilis					1102														
Ptychocyclis obtusa				1144	1102														
Tintinnopsis sp	1566									633					1417			1063	
kystes of ciliates												1190	1417						
unknown ciliates (oligotrich)					2204				2587				1417		2834		1384	1063	930
unknown ciliates (peritrich)																3420			
Unknown cells	3132	1566	6375	2289	1102	5250		633	1294	2532		2380	2834		4250		4151	2125	1859

4.8 ZOOPLANKTON TAXONOMY

Table 23. Zooplankton taxonomic analysis reported as abundance.

Order	Taxon	L (mm)	Wt (mg)	ABUNDANCE (#/m^3)														
				CP05	CP03	CP01	AG05	AG01	AG03	AGT	AG99	WB01	WB03	WB05	WB06	DT01	DT03	DT05
Anim:Anne:Poly:Acic:Polynoidae	Polynoidae *sp. larvae s1	2.5	0.080						1.99				0.29					0.33
Anim:Anne:Poly:Cana:Spionidae	Spionidae *sp. larvae s1	2.5	0.080		0.38	2.87		0.96	1.99			1.06	0.29		1.53	0.96	0.25	0.33
Anim:Arth:Bran:Dipl:Podonidae	*Evadne *sp. s1*	0.7	0.005												1.53			
Anim:Arth:Bran:Dipl:Podonidae	*Podon *sp. s1*	0.7	0.005												9.19			
Anim:Arth:Mala:Amph:	*Gammaridea *sp. s2*	6.5	0.604									0.03						
Anim:Arth:Mala:Amph:Hyperiidae	*Themisto abyssorum F*	12	3.500					0.12									0.06	
Anim:Arth:Mala:Amph:Hyperiidae	*Themisto abyssorum M*	10	2.900													0.24		
Anim:Arth:Mala:Amph:Hyperiidae	*Themisto abyssorum s2*	6	0.900	0.03					0.25	0.05	0.07		0.04					
Anim:Arth:Mala:Amph:Hyperiidae	*Themisto libellula F*	20.5	12.000							0.05		0.03						
Anim:Arth:Mala:Amph:Hyperiidae	*Themisto libellula M*	15	5.060							0.05		0.03						
Anim:Arth:Mala:Amph:Hyperiidae	*Themisto libellula s2*	6	0.900	0.03			0.02			0.05	0.07	0.03						
Anim:Arth:Mala:Cuma:	*Cumacea *sp. s2*	6	0.324											0.18				
Anim:Arth:Mala:Deca:Hippolytidae	*Spirontocaris *sp. s2*	9	1.310						0.06									
Anim:Arth:Mala:Deca:Hippolytidae	*Spirontocaris *sp. s3*	22	19.100		0.03		0.08						0.04					
Anim:Arth:Mala:Isop:	*Epicarid *sp. larvae s1*	1.5	0.025													0.96		
Anim:Arth:Maxi::	*Copepoda *sp. nauplii s1*	0.2	0.000	2.67	0.76	22.93		4.78	19.93	8.83	0.56	11.63	0.58	10.30	7.66	15.29	2.55	1.67
Anim:Arth:Maxi:Cala:	*Calanoida *sp. 1*	0.5	0.003	0.38										5.88	65.90		0.76	7.69
Anim:Arth:Maxi:Cala:	*Calanoida *sp. 2*	0.8	0.008	0.51		3.82						2.11		13.24	142.52	6.69	1.02	5.02
Anim:Arth:Maxi:Cala:	*Calanoida *sp. 3*	1.2	0.033	0.25		2.87						1.06			76.62	0.96		7.02
Anim:Arth:Maxi:Cala:	*Calanoida *sp. 4*	1.7	0.053												35.25			
Anim:Arth:Maxi:Cala:Acartiidae	*Acartia *sp. 2*	0.3	0.002			7.64							0.87		10.73	14.33		
Anim:Arth:Maxi:Cala:Acartiidae	*Acartia *sp. 3*	0.4	0.002			12.42		4.78						4.41	4.60	11.46		
Anim:Arth:Maxi:Cala:Acartiidae	*Acartia *sp. 4*	0.6	0.002					7.64						1.47				
Anim:Arth:Maxi:Cala:Acartiidae	*Acartia bifilosa 5*	0.8	0.003											7.36				
Anim:Arth:Maxi:Cala:Acartiidae	*Acartia bifilosa 6F*	1	0.005											4.41	3.06			
Anim:Arth:Maxi:Cala:Acartiidae	*Acartia bifilosa 6M*	0.9	0.004											1.47	3.06			
Anim:Arth:Maxi:Cala:Acartiidae	*Acartia hudsonica 6F*	0.8	0.007												3.06			
Anim:Arth:Maxi:Cala:Acartiidae	*Acartia hudsonica 6M*	0.7	0.004												1.53			

Cont'd: Zooplankton taxonomic analysis reported as abundance.

Order	Taxon	L (mm)	Wt (mg)	ABUNDANCE (#/m^3)														
				CP05	CP03	CP01	AG05	AG01	AG03	AGT	AG99	WB01	WB03	WB05	WB06	DT01	DT03	DT05
Anim:Arth:Maxi:Cala:Acartiidae	*Acartia longiremis 5*	0.9	0.004					3.82						1.47		1.91		
Anim:Arth:Maxi:Cala:Acartiidae	*Acartia longiremis 6F*	1	0.007		0.13			3.82					0.29	5.88	1.53	1.91		
Anim:Arth:Maxi:Cala:Acartiidae	*Acartia longiremis 6M*	0.95	0.004					1.91					0.29	4.41	3.06	2.87		
Anim:Arth:Maxi:Cala:Aetideidae	*Gaetanus tenuispinus 6F*	2.8	0.549						1.99	0.19								
Anim:Arth:Maxi:Cala:Aetideidae	*Jaschnovia tolli 4*	1.2	0.098						1.99					5.88	1.53			
Anim:Arth:Maxi:Cala:Aetideidae	*Jaschnovia tolli 5*	1.8	0.146											8.83				
Anim:Arth:Maxi:Cala:Aetideidae	*Jaschnovia tolli 6F*	2.3	0.312										0.29					
Anim:Arth:Maxi:Cala:Calanidae	*Calanus finmarchicus 6F*	2.4	0.387	0.13						0.19								
Anim:Arth:Maxi:Cala:Calanidae	*Calanus glacialis 3*	1.7	0.041													0.96		
Anim:Arth:Maxi:Cala:Calanidae	*Calanus glacialis 4*	2.6	0.130	0.38	0.51		0.32		13.95	0.19	0.56			1.47	1.53	7.64	0.51	0.33
Anim:Arth:Maxi:Cala:Calanidae	*Calanus glacialis 5*	3.5	0.320	0.89	0.89		5.82	11.46	3.99	0.77	3.63	2.64	0.29	1.47			3.82	2.67
Anim:Arth:Maxi:Cala:Calanidae	*Calanus glacialis 6F*	4.2	0.474	0.76	0.73		5.82	4.54	2.99	1.68	1.01	1.06	0.72	0.92	0.38	1.43	1.53	1.59
Anim:Arth:Maxi:Cala:Calanidae	*Calanus glacialis 6M*	4	0.350						0.12			0.07	0.07					
Anim:Arth:Maxi:Cala:Calanidae	*Calanus hyperboreus 1*	0.9	0.008					2.87							3.06			
Anim:Arth:Maxi:Cala:Calanidae	*Calanus hyperboreus 2*	1.6	0.041											2.94				
Anim:Arth:Maxi:Cala:Calanidae	*Calanus hyperboreus 3*	2.6	0.165						1.99		0.28			1.47		0.96		
Anim:Arth:Maxi:Cala:Calanidae	*Calanus hyperboreus 4*	4.1	0.690	0.51	0.89			5.73	29.89	0.19	0.84	1.06	2.31	8.83	1.53	1.91	1.53	1.00
Anim:Arth:Maxi:Cala:Calanidae	*Calanus hyperboreus 5*	5.5	1.620	0.16	0.35		1.29	0.72	1.99	0.38	1.15	1.52	1.30	2.02	0.38	0.72	0.25	0.25
Anim:Arth:Maxi:Cala:Calanidae	*Calanus hyperboreus 6F*	6.8	2.730	0.57	0.61	0.48	5.90	3.82	1.74	2.16	1.12	4.03	1.69	0.74		0.96	0.25	0.25
Anim:Arth:Maxi:Cala:Centropagidae	*Limnocalanus grimaldii 6F*	2.6	0.105													0.96		
Anim:Arth:Maxi:Cala:Clausocalanidae	*Microcalanus pusillus 4*	0.5	0.001								2.51							
Anim:Arth:Maxi:Cala:Clausocalanidae	*Microcalanus pusillus 5*	0.6	0.002	0.38	0.64		1.94		17.93	0.38	22.35	1.59	1.73	4.41	4.60		1.78	0.67
Anim:Arth:Maxi:Cala:Clausocalanidae	*Microcalanus pusillus 6F*	0.7	0.004		0.13				7.97			0.53		1.47				
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus *sp. 2*	0.3	0.002	0.89			0.97	13.37				19.03	16.73	167.72	6.13		0.76	
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus *sp. 3*	0.5	0.002	0.25			0.32	4.78				33.30	14.42	160.36	19.92		0.51	
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus *sp. 4*	0.7	0.002									1.06	1.73	8.83				
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus major 4*	0.7	0.002						17.93			12.69	3.75	69.15				
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus major 5F*	0.9	0.008	0.51					29.89			3.17	0.58	10.30				0.33
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus major 5M*	0.9	0.006		0.38				3.99			9.51	1.15	4.41				0.33
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus major 6F*	1.4	0.021		0.13				31.88			8.99	2.02	19.13	1.53			0.33
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus major 6M*	1.1	0.018									1.59		4.41				

Cont'd: Zooplankton taxonomic analysis reported as abundance.

Order	Taxon	L (mm)	Wt (mg)	ABUNDANCE (#/m^3)													
				CP05	CP03	CP01	AG05	AG01	AG03	AGT	AG99	WB01	WB03	WB05	WB06	DT01	DT03	DT05
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus minutus 5F*	0.9	0.008	1.15	2.42		0.97	4.78	25.90	0.77	0.84	8.46	1.44		3.06	1.91		1.67
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus minutus 5M*	0.9	0.006	0.38	0.38	0.96	0.65	2.87	5.98	0.38		17.97	1.15		1.53			
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus minutus 6F*	1.4	0.021		0.13		1.62		25.90		1.12	1.59		2.94	1.53			0.67
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus minutus 6M*	1.1	0.018										0.29	1.47				
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus newmani 5F*	0.7	0.008													0.96		
Anim:Arth:Maxi:Cala:Clausocalanidae	*Pseudocalanus newmani 6F*	0.9	0.012							0.19					3.06	0.96		
Anim:Arth:Maxi:Cala:Euchaetidae	Euchaetidae **sp.* 2	1.2	0.029						1.99									
Anim:Arth:Maxi:Cala:Euchaetidae	Euchaetidae **sp.* 3	1.7	0.084		0.13		0.65										0.25	
Anim:Arth:Maxi:Cala:Euchaetidae	Euchaetidae **sp.* 4	2.8	0.373		0.25						0.28		0.29				0.25	
Anim:Arth:Maxi:Cala:Euchaetidae	*Paraeuchaeta elongata 5M*	3.5	0.710				0.08											
Anim:Arth:Maxi:Cala:Euchaetidae	*Paraeuchaeta elongata 6F*	4.3	1.670				0.16											
Anim:Arth:Maxi:Cala:Euchaetidae	*Paraeuchaeta glacialis 5*	5.8	0.933		0.03			0.36	0.37	0.14	0.07		0.07					0.08
Anim:Arth:Maxi:Cala:Euchaetidae	*Paraeuchaeta glacialis 6F*	7.35	5.956		0.03			0.12	0.12	0.24	0.03	0.20	0.04				0.06	0.08
Anim:Arth:Maxi:Cala:Heterorhabdidae	*Heterorhabdus *sp. 3*	0.8	0.015								0.28							
Anim:Arth:Maxi:Cala:Metridinidae	*Metridia *sp. 2*	0.4	0.011									1.06						
Anim:Arth:Maxi:Cala:Metridinidae	*Metridia *sp. 3*	0.7	0.016									1.06						
Anim:Arth:Maxi:Cala:Metridinidae	*Metridia longa 4*	2.1	0.200		0.13					0.19							0.51	
Anim:Arth:Maxi:Cala:Metridinidae	*Metridia longa 5*	3.5	0.334	0.89	2.29		4.20	2.87	13.95	1.54	1.68	1.06					1.27	
Anim:Arth:Maxi:Cala:Metridinidae	*Metridia longa 6F*	4.5	0.592	5.35	4.97		16.81	16.24	13.95	7.87	18.44	4.76	0.87	2.94	1.53	0.96	3.82	0.67
Anim:Arth:Maxi:Cala:Metridinidae	*Metridia longa 6M*	3.5	0.334		0.13													
Anim:Arth:Maxi:Cala:Phaennidae	*Xanthocalanus *sp. 5*	2.2	0.149															0.33
Anim:Arth:Maxi:Cala:Scolecitrichidae	*Scolecithricella minor 4*	0.7	0.004	0.25			0.65								3.06			
Anim:Arth:Maxi:Cala:Scolecitrichidae	*Scolecithricella minor 5*	0.8	0.005	0.13			1.62	0.96		0.19	0.28	1.06		1.47	1.53		0.25	
Anim:Arth:Maxi:Cala:Scolecitrichidae	*Scolecithricella minor 6F*	1.1	0.011				2.26	0.96	3.99	0.38		0.53		1.47			0.51	0.33
Anim:Arth:Maxi:Cala:Scolecitrichidae	*Scolecithricella minor 6M*	0.9	0.007						1.99									
Anim:Arth:Maxi:Cala:Temoridae	*Eurytemora *sp. 2*		0.001											10.30				
Anim:Arth:Maxi:Cala:Temoridae	*Eurytemora *sp. 3*		0.001										0.58	16.18	4.60			
Anim:Arth:Maxi:Cala:Temoridae	*Eurytemora *sp. 4*		0.001											4.41				
Anim:Arth:Maxi:Cala:Temoridae	*Eurytemora americana 6M*	0.8	0.004											1.47				
Anim:Arth:Maxi:Cala:Temoridae	*Eurytemora herdmani 5*	0.8	0.004												1.53			
Anim:Arth:Maxi:Cala:Temoridae	*Eurytemora herdmani 6F*	0.9	0.004												1.53			
Anim:Arth:Maxi:Cala:Temoridae	*Eurytemora herdmani 6M*	0.8	0.004												9.19			

Cont'd: Zooplankton taxonomic analysis reported as abundance.

Order	Taxon	L (mm)	Wt (mg)	ABUNDANCE (#/m^3)													
				CP05	CP03	CP01	AG05	AG01	AG03	AGT	AG99	WB01	WB03	WB05	WB06	DT01	DT03	DT05
Anim:Arth:Maxi:Cycl:Oithonidae	*Oithona *sp. 2*	0.3	0.001			27.70	1.29						2.02			5.73		
Anim:Arth:Maxi:Cycl:Oithonidae	*Oithona *sp. 3*	0.4	0.001			30.57	2.59						3.46			32.48		
Anim:Arth:Maxi:Cycl:Oithonidae	*Oithona *sp. 4*	0.5	0.001													4.78		
Anim:Arth:Maxi:Cycl:Oithonidae	*Oithona similis 5*	0.6	0.001	2.80	3.18		11.32	38.21	53.80		8.38	17.44			4.60			
Anim:Arth:Maxi:Cycl:Oithonidae	*Oithona similis 6F*	0.9	0.002	12.48	14.27	7.64	24.57	47.77	205.24	15.16	35.20	24.84	15.29	66.20	45.97	0.96	48.15	40.46
Anim:Arth:Maxi:Cycl:Oithonidae	*Oithona similis 6M*	0.7	0.001	0.64	0.38													0.67
Anim:Arth:Maxi:Poec:Corycaeidae	*Corycaeus anglicus 6F*	0.6	0.003		0.13													
Anim:Arth:Maxi:Poec:Oncaeidae	*Oncaea borealis 6F*	0.7	0.000	1.02	5.10		0.32	3.82	17.93	0.58	0.84	8.99	1.15	32.37	1.53	0.96	1.27	1.34
Anim:Arth:Maxi:Poec:Oncaeidae	*Oncaea borealis 6M*	0.4	0.000	0.51	2.29					0.19	0.28	1.06		4.41			0.25	0.67
Anim:Arth:Maxi:Thec:	*Cirripedia *sp. cyprids s1*	1.2	0.350		0.38			6.69	3.99					1.47			0.76	0.67
Anim:Arth:Maxi:Thec:	*Cirripedia *sp. nauplii s1*	0.6	0.040						1.99									
Anim:Arth:Ostr:Halo:Halocyprididae	*Discoconchoecia elegans s1*	2.4	0.100		0.13				1.99									
Anim:Chae:Sagi:Aphr:Sagittidae	*Parasagitta elegans s1*	3.5	0.010			0.96										0.96		
Anim:Chae:Sagi:Aphr:Sagittidae	*Parasagitta elegans s2*	7.5	0.088	0.06		1.19	0.08	2.63	1.49	0.10		0.20				1.91	0.13	0.08
Anim:Chae:Sagi:Aphr:Sagittidae	*Parasagitta elegans s3*	20	1.050	0.13	0.03		0.16	0.84	0.50	0.14		0.13	0.07	0.37			0.25	
Anim:Chae:Sagi:Phra:Eukrohniidae	*Eukrohnia hamata s2*	7.5	0.180								0.21			0.55				
Anim:Chae:Sagi:Phra:Eukrohniidae	*Eukrohnia hamata s3*	18	1.400	0.06	0.06	0.24	0.40	0.12	0.75	0.38	0.63		0.11	0.55	1.53		0.32	0.33
Anim:Chor:Acti:Osme:Osmeridae	Osmeridae *sp.* s2	9.5	1.600													0.24		
Anim:Chor:Appe:Cope:Fritillaridae	*Fritillaria borealis s1*	1	0.010		0.13	24.84				0.38						0.96	1.78	1.00
Anim:Chor:Appe:Cope:Oikopleuridae	*Oikopleura dioica s1*	4.6	0.070	6.24	5.35	178.65	3.88	30.57	25.90	2.11	5.59	3.70	1.15		1.53	101.27	23.18	14.38
Anim:Chor:Appe:Cope:Oikopleuridae	*Oikopleura vanhoeffeni s2*	9.2	0.216	0.70	1.05	12.42	0.73	6.33	7.47	2.93	2.44	0.86	0.29	0.55		13.14	2.23	3.18
Anim:Chor:Appe:Cope:Oikopleuridae	*Oikopleura vanhoeffeni s3*	20	0.700	1.46	1.53	8.60	1.05	9.20	3.99	2.64	2.20	1.06	0.79	0.55		8.36	1.08	1.00
Anim:Cnid:Hydr:Hydr:Melicertidae	*Melicertum octocostatum s2*	8	0.450					0.12										
Anim:Cnid:Hydr:Hydr:Pandeidae	*Leuckartiara *sp. s2*	6.5	1.370									0.03						
Anim:Cnid:Hydr:Hydr:Pandeidae	*Leuckartiara *sp. s3*	13	5.020					0.12	0.06				0.04					
Anim:Cnid:Hydr:Hydr:Rathkeidae	*Rathkea octopunctata s1*	3.5	0.880					1.91					0.29					
Anim:Cnid:Hydr:Siph:Diphyidae	*Dimophyes arctica nectophores s1*	4.7	0.600	0.13			0.32		1.99									
Anim:Cnid:Hydr:Siph:Diphyidae	*Dimophyes arctica nectophores s2*	7.5	0.590		0.13		0.08		0.25		0.10	0.20	0.14				0.06	0.08
Anim:Cnid:Hydr:Siph:Diphyidae	*Diphyes *sp. nectophores s1*	3.5	0.069		0.25				1.99									
Anim:Cnid:Hydr:Siph:Diphyidae	*Diphyes *sp. nectophores s2*	6.5	0.450						0.37		0.03		0.18					

Cont'd: Zooplankton taxonomic analysis reported as abundance.

Order	Taxon	L (mm)	Wt (mg)	ABUNDANCE (#/m^3)													
				CP05	CP03	CP01	AG05	AG01	AG03	AGT	AG99	WB01	WB03	WB05	WB06	DT01	DT03	DT05
Anim:Cnid:Hydr:Trac:Aeginidae	*Aegina *sp. s2*	7.5	3.500	0.03	0.03		0.08		0.06		0.07		0.04				0.06	0.08
Anim:Cnid:Hydr:Trac:Aeginidae	*Aegina *sp. s3*	14	13.720	0.03						0.05								
Anim:Cnid:Hydr:Trac:Rhopalonematidae	*Aglantha digitalis s1*	4	0.250			12.42		6.69								4.78		1.34
Anim:Cnid:Hydr:Trac:Rhopalonematidae	*Aglantha digitalis s2*	7.5	1.900		0.41	0.48	0.97	0.24	8.22	0.24	0.59	1.39	0.29	0.37	0.38	0.72	0.64	1.76
Anim:Cnid:Hydr:Trac:Rhopalonematidae	*Aglantha digitalis s3*	13.2	3.220		0.03		0.24	0.12	4.23	0.05	0.14		0.14					
Anim:Cten:Nuda:Bero:Beroidae	*Beroe *sp. s2*	7.5	1.700						0.06									
Anim:Cten:Nuda:Bero:Beroidae	*Beroe *sp. s3*	22	3.500		0.03													
Anim:Cten:Tent:Cydi:Pleurobrachiidae	*Hormiphora *sp. s3*	17.9	6.300				0.08	0.12										0.08
Anim:Echi:Aste::	*Asteroidea *sp. juveniles s1*	1.2	0.009	0.13	0.13				3.99								0.25	0.33
Anim:Echi:Ophi:Ophi:	*Ophiuroid *sp. pluteus s1*	1.5	0.017		0.13	0.96												1.00
Anim:Moll:Biva:Phol:	*Bivalvia *sp. veligers s1*	0.5	0.001											4.41				
Anim:Moll:Gast:Gymn:Clionidae	*Clione limacina s1*	4	0.500		0.38	0.96		1.91	5.98							0.96		
Anim:Moll:Gast:Thec:Limacinidae	*Limacina helicina s0*	1	0.085	1.02	2.93	1.91	1.62	3.82	63.76	0.58	3.91	4.23	0.29	2.94		1.91	1.27	0.67
Anim:Moll:Gast:Thec:Limacinidae	*Limacina helicina s2*	6	1.830			0.24	0.16	0.12		0.05		0.07						
Prot:Prot:Gran:Fora:Globigerinidae	Globigerininae **sp.* s1	0.4	0.006	1.53	2.80		0.97	1.91					0.29				0.76	1.00

Table 24. Zooplankton taxonomic analysis summary reported as biomass: biomass was calculated using a net diameter of 0.56 m.

Taxon	BIOMASS (mg/m^3)														
	CP05	CP03	CP01	AG05	AG01	AG03	AGT	AG99	WB01	WB03	WB05	WB06	DT01	DT03	DT05
Polychaeta *sp.		0.031	0.229		0.076	0.319			0.085	0.046		0.123	0.076	0.020	0.053
Podonidae *sp.												0.054			
*Gammaridea *sp. s2*									0.020						
Themisto abyssorum spp.	0.029				0.418	0.224	0.043	0.063		0.032			0.693	0.223	
Themisto libellula spp.	0.029			0.018			0.862	0.063	0.593						
*Cumacea *sp. s2*											0.060				
*Spirontocaris *sp.*		0.608		1.544		0.082				0.689					
*Epicarid *sp. larvae s1*													0.024		
*Copepoda *sp. nauplii s1*	0.001	0.0002	0.007		0.001	0.006	0.003	0.0002	0.003	0.0002	0.003	0.002	0.005	0.001	0.001
*Calanoida *sp.*	0.013		0.123						0.051		0.114	5.630	0.082	0.010	0.289
*Acartia *sp.*			0.034		0.024					0.001	0.011	0.024	0.042		
Acartia bifilosa spp.											0.049	0.026			
Acartia hudsonica spp.												0.028			
Acartia longiremis spp.		0.001			0.048					0.003	0.064	0.023	0.032		
Gaetanus tenuispinus 6F						1.094	0.105								
Jaschnovia tolli spp.						0.195				0.090	1.864	0.150			
Calanus finmarchicus 6F	0.049						0.074								
Calanus glacialis spp.	0.697	0.699		4.663	5.819	4.549	1.066	1.715	1.370	0.459	1.098	0.381	1.712	2.014	1.652
Calanus hyperboreus spp.	2.174	2.834	1.304	18.205	15.571	28.940	6.648	5.541	14.194	8.322	11.739	1.703	5.245	2.163	1.783
Limnocalanus grimaldii 6F													0.100		
Microcalanus pusillus spp.	0.001	0.002		0.004		0.064	0.001	0.048	0.005	0.003	0.014	0.009		0.004	0.001
*Pseudocalanus *sp.*	0.002			0.002	0.033				0.096	0.059	0.606	0.047		0.002	
Pseudocalanus major spp.	0.004	0.005				0.965			0.323	0.061	0.714	0.032			0.012
Pseudocalanus minutus spp.	0.011	0.024	0.006	0.046	0.055	0.787	0.008	0.030	0.209	0.024	0.088	0.066	0.015		0.027
Pseudocalanus newmani spp.							0.002					0.037	0.019		
Euchaetidae *sp.		0.106		0.054		0.058		0.104		0.108				0.116	
Paraeuchaeta elongata spp.				0.327											
Paraeuchaeta glacialis spp.		0.219			1.046	1.090	1.563	0.273	1.181	0.282				0.379	0.576
*Heterorhabdus *sp. 3*								0.004							
*Metridia *sp.*									0.029						
Metridia longa spp.	3.465	3.775		11.358	10.572	12.916	5.209	11.474	3.169	0.512	1.742	0.907	0.566	2.790	0.396
*Xanthocalanus *sp. 5*															0.050
Scolecithricella minor spp.	0.002			0.035	0.015	0.058	0.005	0.001	0.011		0.024	0.018		0.007	0.004
Eurytemora herdmani spp.										0.001	0.036	0.051			
Oithona similis spp.	0.0206	0.0233	0.0406	0.0445	0.0908	0.3348	0.0227	0.0570	0.0460	0.0257	0.0993	0.0713	0.0229	0.0722	0.0612
Corycaeus anglicus 6F		0.0004													
Oncaea borealis spp.	0.0004	0.0018		0.0001	0.0011	0.0054	0.0002	0.0003	0.0028	0.0003	0.0102	0.0005	0.0003	0.0004	0.0005
*Cirripedia *sp.*		0.134			2.341	1.475					0.515			0.267	0.234
Discoconchoecia elegans s1		0.013				0.199									
Chaetognath *sp.	0.229	0.123	0.449	0.743	1.276	1.701	0.697	0.918	0.156	0.227	1.258	2.145	0.178	0.725	0.475
Osmeridae *sp. s2													0.382		
Copelata *sp.	1.614	1.673	21.455	1.164	9.944	6.217	2.631	2.459	1.185	0.698	0.505	0.107	15.787	2.880	2.405
Hydromedusae *sp.					2.335	0.313			0.045	0.435					
Siphonophorae *sp.	0.076	0.093		0.242		1.647		0.078	0.117	0.166				0.038	0.049
Trachylina *sp.	0.548	1.001	4.012	2.907	2.510	29.469	1.268	1.822	2.636	1.139	0.699	0.728	2.556	1.433	3.962
Ctenophora *sp.		0.111		0.509	0.752	0.106									0.527
Echinoderm *sp.	0.001	0.003	0.016			0.034								0.002	0.020
*Bivalvia *sp. veligers s1*											0.003				
Clione limacina s1		0.191	0.478		0.955	2.989							0.478		
Limacina helicina spp.	0.087	0.249	0.599	0.433	0.543	5.420	0.137	0.332	0.480	0.025	0.250		0.162	0.108	0.057
Globigerininae *sp . s1	0.010	0.018		0.006	0.012					0.002				0.005	0.006
TOTALS	**9.1**	**11.9**	**28.8**	**42.3**	**54.4**	**101.3**	**20.3**	**25.0**	**26.0**	**13.4**	**21.6**	**12.4**	**28.2**	**13.3**	**12.6**

5. RELATED DATA REPORTS IN THE CANADIAN DATA REPORT OF HYDROGRAPHY AND OCEAN SCIENCES SERIES

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