## REVISION NOTICE TABLE

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| DATE | DESCRIPTION OF REVISION |
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## PROCESSING NOTES

Cruise: 2022-071

Agency: IOS, Ocean Sciences Division, Sidney BC

Chief Scientist: Young K. Platform: Strickland

Location: Strait of Georgia Project: Strait of Georgia Zooplankton

Date: 16 August 2022 –17 August 2022

Processed by: Germaine Gatien

Date of Processing: 26 January 2023 – 27 January 2023

Number of original HEX files: 9 (including 3 from Chito casts not to be processed)

Number of CTD files: 6 Number of BOT files: 4

##### INSTRUMENT SUMMARY

A SeaBird Model SBE-25 CTD+ (s/n 1123) was used with temperature sensor #2968, conductivity sensor #2173, Seapoint Fluorometer #3685, SeaBird dissolved oxygen sensor #0766 and strain gauge pressure sensor #1123.

# SUMMARY OF QUALITY AND CONCERNS

There was a digital log with positions and notes about sampling and rosette log sheets.

Header information was entered in the raw files in a format that enabled easy conversion into IOS Header format.

A Niskin bottle was attached immediately above the CTD which was closed at the bottom of the cast. Surface samples were taken immediately after the cast; in the log they were given separate event numbers from the CTD casts. In the BOT files all sample data are identified by the event number of the corresponding CTD cast in order to combine the samples in a single file.

Searchable bottle files were prepared by combining sample data with CTD data from as close to the sample depths as possible.

While salinity and extracted chlorophyll samples were available for comparison with CTD salinity and fluorescence, there were too few and the results too variable to offer useful information about sensor calibration. The pressure calibration looks excellent. The pressure, temperature, conductivity and dissolved oxygen sensors had been serviced recently.

# PROCESSING SUMMARY

##### 1. Seasave

This step was completed at sea.

##### 2. Preliminary Steps

A digital daily log was obtained as well as a sampling log.

The cruise summary sheet was completed.

CTD Deployment method: CTD was lowered to 10m for a soak of about 1 minute, then bought back to surface. There was sometimes a 10s to 20s stop at the surface before the full cast was run, but sometimes it was very brief, likely due to rough conditions.

BOTTLES:

1. For casts with bottom sampling a 1.7L Niskin bottle was mounted immediately above the CTD.

2. Surface sampling was done for each cast at the same time as the CTD cast.

##### 3. Conversion of Raw Data

All parameters in the configuration file used at sea were correct. It was saved as 2022-071-ctd.xmlcon and used to convert all XML files.

The pressure looks accurate at the surface with conductivity changing very rapidly between -0.02 and +0.01db at the beginning of the cast and between -0.07 and -0.02db at the end of the cast. These results are well within specifications for strain gauge sensors. During the last cruise when the sensor was used it also performed well.

Plots were made of all casts and all expected variables were present and produced reasonable values with spikes in temperature seen only at the top of casts. Conductivity had surface spikes and a few spikes at the bottom.

Fluorescence dark value is ~0.1ug/L with no values <0. There were no off-scale values. .

##### 4. WILDEDIT

The only spikes noted in the data occurred at the beginning or end of the casts or included many points, and will be removed in the normal course of editing. So WILDEDIT was not run.

##### 5. FILTER

Usually data from SBE25 CTDs are put through the FILTER routine at this stage, rather than leaving it until the DELETE stage as is done for SBE911 data. However, for the SBE25plus with a higher sampling rate (0.0625s), this step is not useful.

Tests were run to see if the usual approach of applying a cosine filter to temperature and conductivity using routine WFILTER did a good job of removing small reversals. A filter size roughly equal to the scan rate is recommended and when last used a size 19 filter worked best. So tests were run using filter sizes between 13 and 21. Size 19 removed most problems. This is a larger size than usual, but the sampling rate is 16Hz compared to 8Hz from most cruises. WFILTER was run on all casts using size 19.

##### 6. ALIGNCTD

Based on tests run for other cruises in this project using the same DO sensor, ALIGNCTD was run on all casts to advance the DO channel by 2.5s. Plots were examined after this step and the results look good.

##### 7. CELLTM

CELLTM was run on all casts using the SeaBird recommended parameters, (α, 1/β) = (0.04, 8).

##### 8. DERIVE

Program DERIVE was run to calculate salinity and dissolved oxygen concentration (tau correction included). Plots were examined and confirmed that steps 5, 6 and 7 had improved the data.

##### 9. Conversion to IOS Headers

The IOSSHELL routine was used to convert the CNV files to IOS Headers.

CLEAN was run to add event numbers and replace pad values in the pressure channel with interpolated values.

##### 10. Checking Headers

A cross-reference list was produced and all looked correct.

Track plots looked ok so were added to the end of this report.

Surface Check was run and the average was -0.005db with a range from -0.03 to +0.02db.

HEADER CHECK was run. No problems were found.

##### 11. CLIP

The next step is to remove the data collected during soaks at 10m. Plots were examined to see how many records should be removed from each cast. File clip.csv was prepared with 2 columns containing event # and # of records to removed. CLIP was run and output plots examined until all looked appropriate.

##### 12. SHIFT

Conductivity

SHIFT was run using a variety of settings followed by a pass through DELETE to see which made the most improvement to stability in T-S space. Profiles were also examined comparing differences between down and upcast temperature and salinity. On the previous use of these sensors settings the best choice found was +1.8. There was very little difference in the settings tested for this cruise, but +2.0 looks slightly better for these data.

Shift was run on all casts using +2.0 records..

Fluorescence

The fluorometer was pumped, so a shift in alignment is expected to be equivalent to about 1 seconds, which for these data would be 16 scans. Profile plots of temperature and fluorescence were examined and there is too much to noise to fine-tune the setting, but +16 definitely improved alignment, looking a bit too much in some cases and too little in others. Shift was run using +16 scans

Dissolved Oxygen

This channel was aligned earlier, but checks were made by examining plots of temperature and dissolved oxygen. No further adjustment was made.

##### 13. DELETE

DELETE was run on all casts using the following parameters:

Surface Record Removal: Last Press Min. Surface Swell Pressure Tolerance: 1.0

Pressure filtered over width: 11

Swells deleted. Warning message if pressure difference of 2.00

Drop rates < 0.3m/s (calculated over 9 points) was deleted from 10db to 10db above the maximum pressure.

COMMENTS ON WARNINGS: There were no warnings.

##### 14. DETAILED EDITING

Plots were examined and none appear to need editing.

##### 15. Initial Bottle Data Steps

There was no rosette available for this cruise. All samples come from the surface or bottom of casts.

The files were bin-averaged using 0.5db bins.

Dissolved oxygen was derived in mass units.

The files were then thinned to 1db and the bottom of casts. Those data were exported to a spreadsheet and combined with the sample data in a 6-line header file called 2022-071-bottles-ctd-6linehdr.csv.

Each of the analysis spreadsheets were examined to see what comments the analysts wanted included in the header file. These were used to create file 2022-071-bot-hdr.txt which will be updated as needed during processing.

* Chlorophyll analysis was obtained in spreadsheet QF 2022-071\_CHL\*.xlsx.
* Salinity analysis was obtained in spreadsheet QF 2022-071\_SAL\*.xlsx.
* Nutrient analysis was obtained in spreadsheet QF2022-071\_NUTS..xlsx.

HPLC data were not yet available.

File 2022-071-bottles-ctd-6linehdr.csv was converted to individual files.

File 2012-071-bottle-CTD-comparison.xlsx was prepared to do a comparison of CTD and bottle data for salinity and fluorescence.

##### 16. Compare

Fluorescence

The only extracted chlorophyll sampling was at the surface and was gathered shortly after the CTD cast.

The CHL samples are much higher than the SBE Fluorescence in all cases with cast #8 being the closest. These sensors do tend to read lower than CHL when CHL is >2ug/L, but with the exception of cast #8 these are reading lower than would be explained by that. However, they measure different things and are from slightly different depths. The overall shape and values in the files look reasonable.

Salinity Comparison

There were 6 salinity samples, 3 each from the surface and near the bottom.

From the surface the CTD salinity was higher than the sample by 0.0312psu, 3.9380psu and 0.1850psu. Since there are no reliable downcast data above 1m, a look was taken at upcast data, but the gradients are too high there to pick a reasonable value. We don’t expect reasonable matches at this level.

For the deep samples the CTD salinity was higher than samples by 0.1026psu, 0.0026psu and 0.0396psu. The bottle would have been a little higher in the water column and we expect incomplete flushing of bottles to lead to sample values being lower than ambient salinity. Looking at CTD salinity above the bottom we can find values equal to the bottle salinity at 10.5db, 11db and 2.5db higher than the CTD for the 3 cases. The last of those cases was from a cast with a very noisy descent rate so that flushing would have been better than from the other 2.

As expected, there is no useful evidence concerning salinity calibration.

##### 17. Other calibration checks

Sensor History –

* 2020-010: The pressure sensor had surface values in a range of -0.06 to +0.00db. There was very little salinity sample when this equipment was used and scatter in the comparison. Dissolved oxygen sampling was all from the surface so the comparison was not useful for recalibration. A different fluorometer was used.

Historic Ranges – Temperature and salinity data were all with the local climatology.

Post-cruise calibrations – None were available.

##### 18 CALIBRATE

No calibration was applied.

##### 19. Fluorescence Filter

The fluorescence data were filtered using a median filter, size 7.

https://statics.teams.cdn.office.net/evergreen-assets/safelinks/1/atp-safelinks.html

**20. Bin Average, Remove, Derive DO in mass units, Reorder**

The files were bin averaged using 1db bins.

REMOVE was run to remove Scan\_Number, Oxygen:Voltage, Descent Rate and Flag channels.

Dissolved Oxygen was derived in mass units and that was used to calculate DO saturation. Plots of near-surface saturation show a range of 77% to 150%, with the lowest value in Satellite Channel and the highest at Station 46. The other sites ranged from 102% to 121%. This region is noted for great variability. This type of check rarely offers calibration guidance except well offshore.

REORDER was used to get the 2 dissolved oxygen channels together.

##### 21. HEADER EDIT and final checks of CTD files.

Header Edit was used to fix headers (ship name), fix formats and to add comments about processing.

A cross-reference listing was produced; details are listed at the end of the report.

A header check and standards check were run on the CTD files and no errors were found.

The sensor history was updated.

Plots of CTD casts were examined. No problems were found.

##### 2. Final BOT file preparation

To enable searching of bottle data, BOT casts were created that contain sample data and CTD data from the downcast at the same site. The spreadsheet (2022-071-bottles-CTD-6linehdr.csv) prepared previously when doing comparison of CTD and bottle files was now converted to IOS Header files for each cast.

The time and date are present as channels as these cannot be converted directly into header entries.

CLEAN was run to add START and END time to the headers. The END TIME is identical so the START time so it will be removed later. CLEAN was also used to enter 0 flags where the flag channels are empty.

There are salinity values <25, so CALIBRATE was run to correct affected silicate values.

REMOVE was run to remove Date and Time channels.

The final CTD data include DO in mass units.

There was no DO sampling so there is no need to derive mass units for the sample data.

Header Edit was run to add comments and to remove END TIME since it is the same as START TIME and TIME ZERO.

The final files have extensions BOT.

The standards check was run and no errors were found.

A cross-reference list and header check were run on the BOT files and no problems were found.

Plots were made of all BOT casts. With just 1 or 2 levels these were not very useful but looked ok.

Finally all data from BOT files were extracted to a spreadsheet and compared to the event log; all expected data are present.

PARTICULARS – notes from log

4. Niskin mounted immediately above CTD, so <1m above.

7, 11, 21 – Chito casts

**Cross-reference List of CTD files**

Filename Event Station Latitude Longitude Date Time

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2022-071-0001.ctd 0001 SC-04 48 43.67 N 123 24.98 W UTC 2022/08/16 17:48

2022-071-0004.ctd 0004 46 48 51.42 N 123 10.98 W UTC 2022/08/16 20:25

2022-071-0008.ctd 0008 42 49 1.79 N 123 26.28 W UTC 2022/08/16 23:27

2022-071-0014.ctd 0014 38 49 11.99 N 123 26.39 W UTC 2022/08/17 14:25

2022-071-0017.ctd 0017 40 49 8.70 N 123 36.78 W UTC 2022/08/17 16:24

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2022-071-0018.ctd 0018 GEO1 49 14.87 N 123 45.01 W UTC 2022/08/17 18:08

**CRUISE SUMMARY**

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| --- | --- | --- | --- | --- | --- |
| Cruise ID#: 2022-071 | | | | | |
| Dates: Start: 16 August 2022 End: 17 August 2022 | | | | | |
| Location: Strait of Georgia Zooplankton | | | | | |
| Chief Scientist: Young K. | | | | | |
| **CTD#** | **Make** | **Model** | **Serial#** | **Used with Rosette?** | **CTD Calibration Sheet Competed?** | |
| 1 | SEABIRD | 25 | 1123 | No | Yes | |

**CTD CALIBRATION INFORMATION**

**Make/Model/Serial#: SEABIRD/SBE25/1123 Cruise ID#: 2022-071**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Calibration Information** | | | | | |
| **Sensor** | | **Pre-Cruise** | | **Post Cruise** | |
| **Name** | **S/N** | **Date** | **Location** | **Date** | **Location** |
| **Temperature** | **2968** | **11Jan2022** | **Factory** |  |  |
| **Conductivity** | **2176** | **19Jan2022** | **Factory** |  |  |
| **Seapoint Fluorometer** | **3685** |  | **Factory** |  |  |
| **SBE43 Oxygen** | **0766** | **30Mar2022** | **Factory** |  |  |
| **Press**    **D:\Telework\2022-0** **28\Processing\ios\** | **0573** | **7Mar2022** | **Factory** |  |  |



