## REVISION NOTICE TABLE

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| DATE | DESCRIPTION OF REVISION |
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## PROCESSING NOTES

Cruise: 2023-064

Agency: IOS, Ocean Sciences Division, Sidney BC

Chief Scientist: Bokvist J. Platform: Nita Maria

Location: WCVI / Barkley Sound Project: Follow the Fish Barkley Sound Purse Seine

Date: 24 May 2023 –19 September 2023

Processed by: Germaine Gatien

Date of Processing: 23 July 2024 – 1 August 2024

Number of original HEX files: 92 Number of CTD files: 81

# INSTRUMENT SUMMARY

A SeaBird Model SBE-19 CTD (s/n 8241) was mounted with a Wetlabs ECO Fluorometer #FLRT-7495 and dissolved oxygen sensor SBE43 #4354.

# SUMMARY OF QUALITY AND CONCERNS

This program involved repeat trips over 5 months. The same CTD was used throughout.

The first cast in the program was given event #12. Event numbers were assigned sequentially through the various legs of the program until September when casts were given event numbers 1 to 9. Since they were the last casts in the time-series, they were renamed as 106 to 114 so that event number order reflects time of collection order.

The log provided was a table with some information missing. There were some discrepancies between times in the log and the times in the CTD files. Since the same CTD was used for another 2023 time-series, 2023-010, which included a digital log, it was established that the CTD times are correct. They were in PST so were converted to UTC by adding 8 hours.

The deployment scheme included a 10m soak of about 2 minutes length followed by a return to the surface where there was a soak for about 30s for most casts. In May the surface soak was very short, but a test file was sent and the wait was increased thereafter.

There was no calibration sampling, but the same CTD was used during an overlapping time-series, 2023-010, that did include salinity and extracted chlorophyll sampling. The CTD salinity at the bottom was reasonably close to samples, so calibration errors in temperature and conductivity are likely very small. The comparison of CTD fluorescence and extracted chlorophyll indicates that the fluorometer read too high when CHL was low, dropped to about the same as CHL at about 2ug/L and steadily fell to about 50% of CHL when CHL was >10ug/L. This is typical performance for these sensors.

There was no dissolved oxygen sampling from either time-series, so values in these files are likely low by a few %, since calibration almost always drifts towards lower values.

No data could be retrieved from the last 5 events in July (Events #56-#60). In the first case, data were recorded but could not be plotted in SeaBird software or converted to IOS Header format. For the others only soak data were found in the files.

There were some other cases where only surface data were recorded but, with the exception of event #16, a second cast was run immediately afterwards at the same site and did contain a full profile.

# PROCESSING SUMMARY

##### Seasave

This step was completed at sea.

##### Preliminary Steps

The cruise summary sheet was completed.

##### Conversion of Raw Data

The configuration file used at sea was correct. It was saved as 2023-064-ctd.xmlcon.

All casts were converted using that file.

Examination of the hex file for 2023-064-0056 showed many problems, empty entries, split entries, an extra initial or final digit. The file could be converted but when attempting to plot it there was an error messages:.

Required header “END” line not found.

There is the same \*END\* line in the hex file as in all other files, so that message did not help.

A number of routines run that have been useful in the past at repairing HEX files, but no change resulted.

An attempt was made to edit the hex file and that file could be converted, but still could not be plotted.

A sample of casts were plotted and all channels were present and profiles looked ok for most. But some casts contained very little data. All the smallest files were examined and 10 casts had only data from the 10m soak (57-60) or surface data only (16, 18, 30, 51, 81, 90).

Of those, 5 casts were the 1st or 2nd of 2 casts, so data are available (18, 30, 51, 81, 90).

So there are 5 cases with no useful data and no 2nd cast to choose (16, 57, 58, 59, 60).

As noted above, cast #56 could not be plotted or be converted to IOS Header format. Presumably whatever went wrong for that cast is related to the failure to get anything other than surface data from casts #57-60).

Test plots were made of a few casts and the deployment scheme was found to include a 10m soak of about 2 minutes length followed by a return to the surface where there was a soak for about 30s for most casts. In May the surface soak was very short, but a test file was sent and the wait was increased thereafter.

All expected variables are present. Pressure looks quite smooth.

Temperature, conductivity and fluorescence profiles look normal.

The minimum fluorescence was reasonable, ~+0.04ug/L except for a spike to negative values in one upcast.

##### 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.

##### FILTER

The resolution of this instrument appears to be good, so the pressure does not obviously need filtering. However, a test showed some improvement in salinity and dissolved oxygen if a low-pass filter, size 1s, was run on pressure, so that was done for all casts.

After this step the 10 casts with no useful data were removed from the processing stream as was cast #56 which could not be plotted and could not be run through FILTER or Conversion to IOS Header format.

The temperature and conductivity were examined and the usual approach of applying a cosine filter size 8 in routine WFILTER did a good job of removing small reversals.

This step had little effect on Dissolved oxygen data.

##### ALIGNCTD

ALIGNCTD is usually run on all casts to advance the DO channel by 2.5s. For this cruise and for 2023-010 such an advance was much too high. Tests were run and the best choice found was 0.5s.

ALIGNCTD was run on all casts to advance the DO voltage by 0.5s.

##### CELLTM

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

##### DERIVE

Program DERIVE was run to calculate salinity and dissolved oxygen concentration (tau correction included).

Plots were examined to see if steps 5, 6 and 7 had worked well.

It was found that the CELLTM step seemed to have worked poorly in some places, well in others but the tests are hard to interpret in shallow casts where variability is high. No obvious explanation emerged and the odd values may be real.

##### Conversion to IOS Headers

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

The log provided was a table with times and positions of most casts. The times are said to be PST. A quick comparison was made between the times in the files and those in the spreadsheet, and the differences were highly variable. The spreadsheet times are often later than the file times by roughly an hour, but in 6 files that were checked the difference ranged from 24 minutes to 72 minutes. All of the casts were done at a time when PDT was in use locally. If the CTD clock was set properly, then the file times would normally be considered the most reliable.

Fortunately, the 2023-010 casts were also run from March until November and used the same CTD. There is a digital log for that cruise with GPS downloads. So those times were studied to find whether the times in the files were reliable and they corresponded well with the log times except that from March until September they were in PST and for October and November they were in PDT.

So we can have confidence in the 2023-064 instrument and use the time stamps in the files.

Initial track plots turned up errors in positions, likely due to typos or repeating a previous entry from a different site. These were corrected in events 12, 54, 71 and 75. A plot was made of sites of events 38-49 since that group included all sites occupied during the cruise. It was added to the end of this report. The sites vary slightly from one leg to another, but are reasonable close.

ADD TIME CHANNEL was run to add 8 hours to all files to make then UTC.

##### Checking Headers

A header check was run and no problems were found.

A cross-reference list was produced and no problems were found

Surface Check was run and the average was -0.01dbdb with a range from -0.01 to 0 to +0.08db, with very low salinity, so right at the surface. No recalibration will be applied to pressure.

##### CLIP

CLIP was run to remove the first 500 records from all casts except for #12 and #49 for which 1000 records were removed. This will enable DELETE to pick only data from after the deep soak.

This leaves some of the surface soak data but given the consistent stop around 1db, doing a second CLIP to 1.2db after running DELETE will remove noise from the surface soak time for most casts. Graphical editing will deal with any other features that look suspicious.

##### SHIFT

Conductivity

Tests were run on 2023-064 data using shifts of -16 to -2.8 records to see what shift to conductivity made the best improvement to stability in T-S space. A shift of -2.2 records looked best overall. That setting was applied to all casts and the results look good. Similar results were found for 2023-010.

Fluorescence

The fluorometer was not pumped, so a shift in alignment is expected to be small or unnecessary. Profile plots of temperature and fluorescence were examined and confirm that the alignment is ok.

Dissolved Oxygen

This channel was aligned earlier, but checks were made by examining plots of temperature and dissolved oxygen. The alignment looks good.

##### DELETE

DELETE was run on all casts using the following parameters:

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

Swells deleted. Warning message if pressure difference of 2.00

Drop rates < 0.3m/s (calculated over 5 points) was deleted from 10db to 10db above the maximum pressure.

COMMENTS ON WARNINGS: There were no warnings.

The output files were given extensions DELPRE because a further step is needed before submitting the files to the CTD QC model and that requires extension DEL.

CLIP was then run with output extension DEL, removing the top 1.2db to reduce the amount of editing required. The CTD soaked at roughly 1db for all casts so this will not remove much useful data.

(This step was accidentally missed for cast #75 but the cast was put through CTDEDIT, so this is not a problem.)

The DEL files were zipped and submitted to the CTD QC model.

##### DETAILED EDITING

All DEL files were copied to \*.EDT so there will be a complete set of files even if some need no editing.

Most files do not appear to need editing, but 16 were opened in CTDEDIT.

CTDEDIT was used to edit 16 files; this was limited to removal of a few records near the top and/or bottom corrupted by shed wakes and to clean salinity, mostly due to poor response to temperature gradients.

Cast #75 had a very unstable feature at the bottom with salinity values much lower than a short distance above. The low salinity as well as odd temperature and dissolved oxygen values continued through part of the upcast, then resumed normal values. Fluorescence also spiked at the bottom. This suggests that the CTD hit bottom. No other casts at that site, or nearby casts from the same trip, showed low salinity at the bottom. The affected bottom records were removed.

65 files required no editing.

Notes of editing details were made in the headers.

At this point the event numbers 1 to 9 were changed to 106 to 114 to reflect the order of collection.

CLEAN was run on all files (output CLN2) to ensure the event number in the header matches that in the file name. This will not affect events #12-105 as they already have the right event number.

##### Calibration checks

Sensor History – This cruise and 2023-010 are the first known uses of this CTD. Salinity samples were taken during 2023-010 which overlapped this cruise. CHL and Salinity comparisons showed both the fluorometer and salinity sensor were performing within expectations, but data were insufficient to state salinity accuracy.

Historic Ranges – There was no local climatology available, but all temperatures fell within a climatology for a large area around Barkley Inlet except that surface temperature were sometimes high and salinity often low at the surface, as expected nearshore. The climatology in use covered the whole year, so is not very informative.

Post-cruise calibrations – None were available.

##### CALIBRATE

Pressure does not require recalibration.

Salinity calibration sampling was available from cruise 2023-010, but the limited numbers and depth of samples mean the results are only useful in judging whether the sensor worked properly. They do show that the CTD values from near the bottom are generally close to the bottle samples.

No recalibration was applied to these files.

##### Fluorescence Filter

The fluorescence data do not require filtering.

##### Bin Average, Remove, Derive DO in mass units, Reorder

The CLN2 files were bin averaged using 1db bins.

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

Dissolved Oxygen was derived in mass units.

Oxygen saturation was calculated. Plots of near-surface saturation show a range of 90% to 165%. The highest values (>140%) were seen at Lyall Point in July to September and at Hand Island in August and Turtle Island and Chup Point in September. The values at Sproat Narrows were consistently between 95% and 100%. The lowest surface value was 90% found at Kirby Point in September. The DO profile looks reasonable there. Given the range of time and locations the wide spread in DO saturation is expected.

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

Header Edit was used to fix headers, fix formats and to add comments about processing.

A cross-reference listing was produced.

A header check and standards check were run on the CTD files.

The only problem noted is that cast #75 had missed a step; CTDEDIT was run on the DELPRE file rather than the DELPRED, so the CLIP of the top few records was missed. The data looks fine, so this was not corrected as this extra step was only run to make editing more efficient. No other errors were found.

The sensor history was updated.

Plots of CTD casts were examined; there a few slightly unstable surface features but these may be real, so no further editing was applied..

Particulars

16. Surface data only.

18. Surface data only, but cast 17 at same site is ok.

30. Surface data only, but cast 31 at same site is ok.

47. Dissolved oxygen odd on upcast; DO downcast ok but salinity bad. Temp bit odd but mostly ok.

51. Surface data only, but cast 52 at same site is ok.

56. Hex file corrupted. Could be converted but not plotted or run through any other routines.

57. Surface data only.

58. Surface data only.

59. Surface data only.

60. Surface data only.

81. Surface data only, but cast 82 at same site is ok.

90. Surface data only, but cast 91 at same site is ok.

**CRUISE SUMMARY**

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| --- | --- | --- | --- | --- | --- |
| Cruise ID#: 2023-084 | | | | | |
| Dates: Start: 24 May 2023 End: 19 September 2023 | | | | | |
| Location: Barkley Sound | | | | | |
| Chief Scientist: Bokvist J. | | | | | |
| **CTD#** | **Make** | **Model** | **Serial#** | **Used with Rosette?** | **CTD Calibration Sheet Competed?** | |
| 1 | SEABIRD | 19+ | 8241 | No | Yes | |

**CTD CALIBRATION INFORMATION**

**Make/Model/Serial#: SEABIRD/SBE19+/8241 Cruise ID#: 2023-064**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Calibration Information** | | | | | |
| **Sensor** | | **Pre-Cruise** | | **Post Cruise** | |
| **Name** | **S/N** | **Date** | **Location** | **Date** | **Location** |
| **Temperature** | **8241** | **9Dec2022** | **Factory** |  |  |
| **Conductivity** | **4345** | **9Dec2022** | **Factory** |  |  |
| **ECO Fluorometer** | **4185** | **4Dec2022** | **Factory** |  |  |
| **SBE43 Oxygen** | **3234** | **20Dec2022** | **Factory** |  |  |
| **Press** | **4345** | **3Dec2022** | **Factory** |  |  |

Station positions are approximate as they varied among different legs of the program.

