**REVISION NOTICE TABLE**

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| **DATE** | **DESCRIPTION OF REVISION** |
| 27-Sep-2017 | Corrected MISSION metadata field in header. R.H. |
| 11-Jan-2006 | Surface loop data was added to the archive. The data was acquired from John Morris at PBS. The data archived in August 2005 was replaced with this new set since chlorophyll was included. The original spreadsheet file from John and more detailed processing notes can be found in the “Cruise\_Data\Documents” directory.. Any questions regarding this data should be directed to John Morris. J.L. |
| Aug 2, 2005 | Added loop data to the archive. J.L. |

**PROCESSING NOTES**

Cruise: 2002-15

Agency: PBS, Ocean Science and Productivity, Nanaimo, B.C.

Project: High Seas Salmon

Chief Scientist: Morris J.

Platform: Ocean Selector

Date: 15 June 2002 – 30 June 2002

Processed by: Germaine Gatien

Date of Processing: 5 September 2002 –18 September 2002

Number of original CTD casts: 71 hex files, 61 CTD casts listed in Daily Log Book

Number of casts processed: 45

**INSTRUMENT SUMMARY**

A Sea Bird Model SBE 19 SEACAT CTD (S/N#1294) was used.

**SUMMARY OF QUALITY AND CONCERNS**

The file names were non-standard and very confusing. There remains some doubt that the data is from the cast indicated; times did not match the log exactly and there were no positions in the headers so uncertainties exist.

SeaCat salinity is prone to error due to mismatch of conductivity and temperature response times especially when the descent rate is non-uniform. These errors are likely to be much larger than calibration errors. Salinity for this cruise has been edited extensively, but errors as high as 0.05units of salinity are likely in areas of high gradient and unsteady descent rate.

**PROCESSING SUMMARY**

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

**2. Preliminary Steps**

The Daily Log Book was obtained.

The salinity data was obtained. The Niskin bottle was placed approximately 5m above the CTD and the plan was that surface samples be taken when the CTD was at 15db. Variations may have occurred.

The data files have non-standard names and do not contain positions; the times in the files are inconsistent and do not agree closely with the log.

Con file 2002-15.con contains the most up-to-date calibration coefficients for this instrument.

1. **Conversion of Raw Data**

The raw data was converted using conversion file 2002-15.con.

After conversion the file names were changed to standard format. This was not a straightforward job since the file names did not clearly relate to casts as described in the Daily Log Book. A first guess was made of which files pertained to which casts. Some files were given dummy names (format 2002-15-99\*\*) and after conversion to IOS HEADERS all will be re-examined. Plotting the files suggests that many of the files were exactly alike. This proved to be true – there were small differences in the headers, but the data was exactly the same. No file could be found corresponding to 15 of the 61 casts.

The positions and station names will be added to the headers when the files have been converted to IOS Headers; maximum pressures and times will need to be carefully checked to make sure the new names are correct.

1. **FILTER**

The conductivity was low-pass filtered with a time constant of 0.5 seconds to force it to have the same response as the temperature.

The pressure was filtered with a time constant of 2 seconds to increase the pressure resolution.

**5. ALIGNCTD**

Temperature needs to be advanced relative to pressure using ALIGNCTD. Tests were done on cast #7 using advancements of 0.5, 0.6, 0.65, 0.7, 0.75, 0.8, 0.9, 1.0, 1.2, 1.4 and 1.6s. The resulting files were put through DERIVE to calculate salinity and then converted to IOS Headers. DELETE was run and the results examined by making T-S plots. An area with sharp gradients in T and C was chosen for study; the best choice was deemed to be one that minimized salinity spikes and made T and C look alike with respect to pressure. The best results were found in the range 0.7-0.8s. Since 0.7s was found best for 2001-27 it was used again for this mission.

Temperature was advanced relative to pressure by 0.7s using ALIGNCTD.

**6. DERIVE**

Program DERIVE was run to calculate salinity.

**7. Conversion to IOS Headers**

To enable conversion it was necessary to enter a space between SBE and 19 in the first line of the headers of the CNV files.

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

A summary report was produced and files examined to determine which files corresponded to which casts as described in the Daily Log Book. As expected many files corresponded to the same casts. Repeats were deleted and new names were assigned to some of the files that had earlier been given dummy names.

HEADER EDIT was used to add a line for station, latitude and longitude in the headers.

The headers were edited to add positions and to fix the times. Most of the times in the files differed from those in the log by about 1 hour; it is believed that the log times are correct, so the headers were edited to agree with them. One exception was cast #180 for which the file time was an hour later than the log. Based on a speed check between casts the file time was found more likely and was chosen rather than the log time.

CLEAN was run to fix headers, ensure the event number matched the last 4 digits of the file names and to remove PAD values in pressure by linear interpolation based on scan\_number.

**8. Checking Headers**

A Cruise Track Plot was produced and a Header Check and Header Summary were run and details compared with the log book.

The surface check was run. The average surface pressure is –0.4db but the CTD was turned on in air. Examining files closely suggests that the conductivity went to non-zero values at about –0.1db. No adjustment will be made.

**9. Test Plots**

Profiles were plotted for all casts and up and down traces compared. There were no differences so great as to suggest errors in processing.

**10. DELETE**

The following DELETE parameters were used:

Surface Record Removal: Last Press Min

Maximum Surface Pressure (relative): 10.00

Surface Swell Pressure Tolerance: 1.0

Pressure filtered over width: 5

Swells deleted. Warning message if pressure difference of 2.00

Drop rates <3.0m/s (calculated over 5 points) was deleted.

Sample interval was taken from the header.

There were no warnings.

The maximum pressures before and after running DELETE were compared to ensure that no large chunks of data were lost from the bottom; the largest change for any cast was 1db. (See 2215\_Delete\_Study.xls)

**11. CTDEDIT**

Page plots were produced and were examined for spikes and instabilities to guide the use of CTDEDIT.

There were many unstable features in areas where the temperature changed smoothly but the salinity did not. An attempt was made to fix this by using SHIFT to realign conductivity relative to pressure and recalculate salinity. However, no significant improvement was achieved presumably because the alignment is correct, on average. Most of the instabilities appear to be due to the mismatch of temperature and conductivity time response; Sea-Bird advise that this problem is most serious when the descent rate is uneven. The resulting errors are seen as salinity spikes particularly in areas of high T and C gradients. CTDEDIT was used to clean salinity in such cases.

A few records were removed from the surface of all casts since 4 to 6 records were regularly logged followed by a stop near the surface before the rest of the cast was run. A few records were removed at mid-depths where spiking in temperature was not matched by spikes in conductivity and were presumed to be bad data points and where shed wakes had clearly corrupted the data.

Unstable features near the bottom and near the coast were considered real and left unedited unless a clear source of error was found.

CTDEDIT was used to remove a few surface records only for casts: 1, 8, 66, 109, 120, 162, 165, 183 & 186.

CTDEDIT was used to remove a few surface records and to clean salinity for all other casts.

Note was made of the editing details in the relevant files

**12. BIN AVERAGE**

The following Bin Average values were used:

Bin channel = pressure

Averaging interval = 1.000 Minimum bin value = .000

Average value will be used

Interpolated values are NOT used for empty bins

1. **Intercomparisons**

COMPARE - There was no rosette for this cruise but Niskin bottle samples were taken at 10db for all casts and at ~135db for one cast.

A spreadsheet was prepared in which a comparison was made of bottle salinities and salinity from the CTD. It is not obvious whether the bottles, which were collected on the upcast, should be compared with upcast or downcast CTD data. The downcast data is “cleaner” since the CTD has not passed through corrupting the data with shed wakes. On the other hand there can be significant changes between up and downcasts near the surface. There is also some doubt about what depth the bottle was at when it was closed. Looking at pressure versus record number suggest that the bottle was generally closer to 5db than 10db. Tests were done comparing bottles with CTD data from different depths and upcast and downcasts. The upcast data does not seem suitable because deeper water is dragged up by the CTD. The only reasonable comparison is based on downcast CTD data for casts with such small gradients in salinity near the surface that the CTD cannot cause significant changes as it passes through. Using this method the depths of the CTD and bottles are not critical.

Using the downcast 10db data and all surface samples the CTD was found to be high by 0.14units of salinity. When all differences greater than 0.01units were ignored the CTD was found to be low by 0.001 and when only values from the very well-mixed surface layer were included, the CTD was found to be high by 0.0009units. (When CTD downcast data from 5db was used the CTD was found to be high by 0.0005units. When upcast data from 10db and 5db was used the CTD was found to be low by 0.008 and 0.003units)

The only sample from below 10db is from about 134db at a station in Rivers Inlet. The downcast CTD salinity is higher than the bottle by about 0.07units. The upcast was at least 0.03units fresher at the depth from which the bottle was likely collected. This is probably due to shed wakes bringing fresher water down and the bottles may have sampled even fresher water than the CTD saw on the way up, since the wake effects might have partly dissipated by then. Moreover, the gradient is fairly steep so that a small error in depth would lead to significant error and local mixing is likely to be significant. Hence, the deep sample is not reliable enough to be considered for calibration purposes.

Previous Use of CTD – Since its latest calibration this instrument was used for 2000-11 and 2001-27. There were no useful bottles from 2000-11. During 2001-27 the CTD salinity was found to be low by about 0.001units which was within the noise level.

Historic ranges – A few casts had T and/or S data that fell outside of the historic ranges:

• For a few casts in Queen Charlotte Sound and Dixon Entrance, the temperature was low from about 50 to 80db. This matches other observations in the North-East Pacific through the spring and summer of 2002 so is not indicative of calibration problems.

• For a few casts in inlets for which there is only climatology averaged over 1° x 1° Marsden squares, the data fell outside the ranges; it is unlikely that the ranges contain any observations for these near-shore sites.

No recalibration will be applied to the salinity; the surface samples suggest that it is good to +/- 0.001 and there is no useful deep sample.

Comparison of nearby casts

Plots were made of T-S curves for nearby casts to check that no casts were mislabeled. An error was found; cast #51 had gotten copied into the file named #48 at an intermediate step in processing. Cast #48 was reprocessed. No other errors were detected. Particular attention was given to cast #180; the data is consistent with the assumed location in Rivers Inlet.

**14. Final Plots**

THIN and DERIVED QUANTITIES routines were used to produce information for tables. Page plots were prepared using the edited data and tables.

**15. REORDER AND REMOVE**

The following channels were removed from all casts: Scan\_Number, Conductivity and Flag. The pressure format was corrected.

**16. Producing final files**

a.) The final files were renamed \*.ctd.

b.) A cross-reference listing was produced.

**Particulars**

16,19,22,27,30,33,36,39,42,45,72,76,82,103,115,150 – data files missing

10, 123, 135-159 – Descent rate noisy but generally high

138 – Descent rate very noisy and occasionally low enough to cause shed wakes

180 - Time in log 1 hour earlier than in file whereas all other casts are later in files by approx. 1 hour. Based on speed between casts the file time was used rather than the log time.

**Institute of Ocean Sciences**

**CRUISE SUMMARY**

Cruise ID#: 2002-15

Dates: Start: 15 June 2002 End: 30 June 2002

Location: NW Pacific

Vessel: Ocean Selector

Party Chief: Morris J.

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| --- | --- | --- | --- | --- | --- |
| **CTD#** | **Make** | **Model** | **Serial #** | **Used with Rosette?** | **CTD Calibration Sheet Competed?** |
| 1 | SEABIRD | SBE19 SEACAT | 1294 | No | Yes |

**Institute of Ocean Sciences**

**CTD Calibration Information**

**Make/Model/Serial#: SEABIRD/19 SEACAT / 1294**

**Cruise ID#: 2002-15**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Calibration Information** | | | | | |
| **Sensor** | | **Pre-Cruise** | | **Post Cruise** | |
| **Name** | **S/N** | **Date** | **Location** | **Date** | **Location** |
| **Temperature** | **1294** | **17 June 1999** | **Factory** |  |  |
| **Conductivity** | **1294** | **17 June 1999** | **Factory** |  |  |
| **Pressure Sensor** | **163223** | **17 June 1999** | **Factory** |  |  |

**Sensor Calibration Notes:**

The configuration file used is attached; this includes the sensor calibrations.