Ocean Networks Canada

Ferry Maintenance Report – Queen of Alberni

Date: August 1, 2014

Arrival: 12:45PM sailing to Tsawassen. We signed in at terminal supervisor at Duke Point.

Reporter: Chris Sundstrom (Servicing), Akash Sastri (Science Analysis)

Attending Personnel: Chris Sundstrom (ONC-Operations), Jeremy Krogh (MEOPAR)

Reason for Visit

Regular instrument servicing

Observations

1. There were no signs of moisture or leaks In the Instrument Box.
2. The AADI optode had very little or no debris but had sediment/biofilm growth within the housing.
3. The BBFL2 had a partial layer of sediment in the housing and fouling on the sensing surface. Fouling was noticed on the “bottom” surface of the horizontal housing.
4. The Seabird 45 CT sensor very dirty, but no mussel growth was observed.
5. The flex tubing was did not need replacement. Replacement is estimated to be needed next servicing.
6. The sea chest showed no signs of leaks.
7. The inline filter (sea strainer) was checked and was found to be dirty and required cleaning.
8. The CT connector corrosion has grown slightly but no evidence for signal degradation yet.

Actions Taken

1. Opened both boxes and observed function. Both were working well, no leaks anywhere.
2. Powered down and disassembled instruments in lower assembly.
3. Cleaned and checked over instruments in Engineering room. Cleaned CT sensor connector to remove sediment and biofouling growth.
4. Ran pre- and post- calibration with standard solutions and with Orange test stick and blue test stick for CDOM fluorescence and Chl fluorescence. Post-deployment test on unit 786 (not in

service) failed; instrument did not respond. Additional tests with seawater pulled from system test tap included.

5. Re-assembled the instruments in the lower box.
6. Checked over Sea chest and valves, no leaks apparent.
7. Checked and cleaned the sea strainer.
8. Turned ON the system.
9. No leaks in instrument housing and checked flow output at sea strainer. Flow was good. Visually confirmed flow direction at the BBFL2 and confirmed the volume filled with water and began draining correctly.
10. Signed out at Engineering room.
11. Conducted inspection on MEET station and upper works. Corrosion noted on metallic connectors.

Future Actions

1. Potentially replace CT connector (shipboard connector will need to be re-soldered).
2. Monitor growth of Mussels within the system.
3. Purchase new #2 Philips Screwdriver (missing from toolkit). Purchase longer Slot screwdriver to make installation of panel screw for BBFL2 easier and less time consuming.
4. November refit, replace all metallic connectors on upper boxes with plastic glands.

Discussion of Test Procedures and Results

The test procedures used are documented in the supplemental report, which also provides preliminary analysis of the data and its consequences.

PICTURES

Figure 1: System upon arrival

Figure 2: Sediment and biofouling within CT sensor

Figure 3: Biofouling within CT sensor

Figure 4: Biofouling within BBFL2 sensor

Figure 5: Biofouling within Optode sensor

Figure 6: System upon reassembly

Figure 7: MET Station tower

Figure 8: Radiometer and Pyrometer, SAT and Cellular antennae

Figure 9: Connector view

Figure 10: Computer boxes

Figure 11: Corrosion on connectors (upper box)

Figure 12: Corrosion on connectors (lower box)

In situ CDOM and Chlorophyll fluorescence (BBFL2) corrections
August 1, 2014

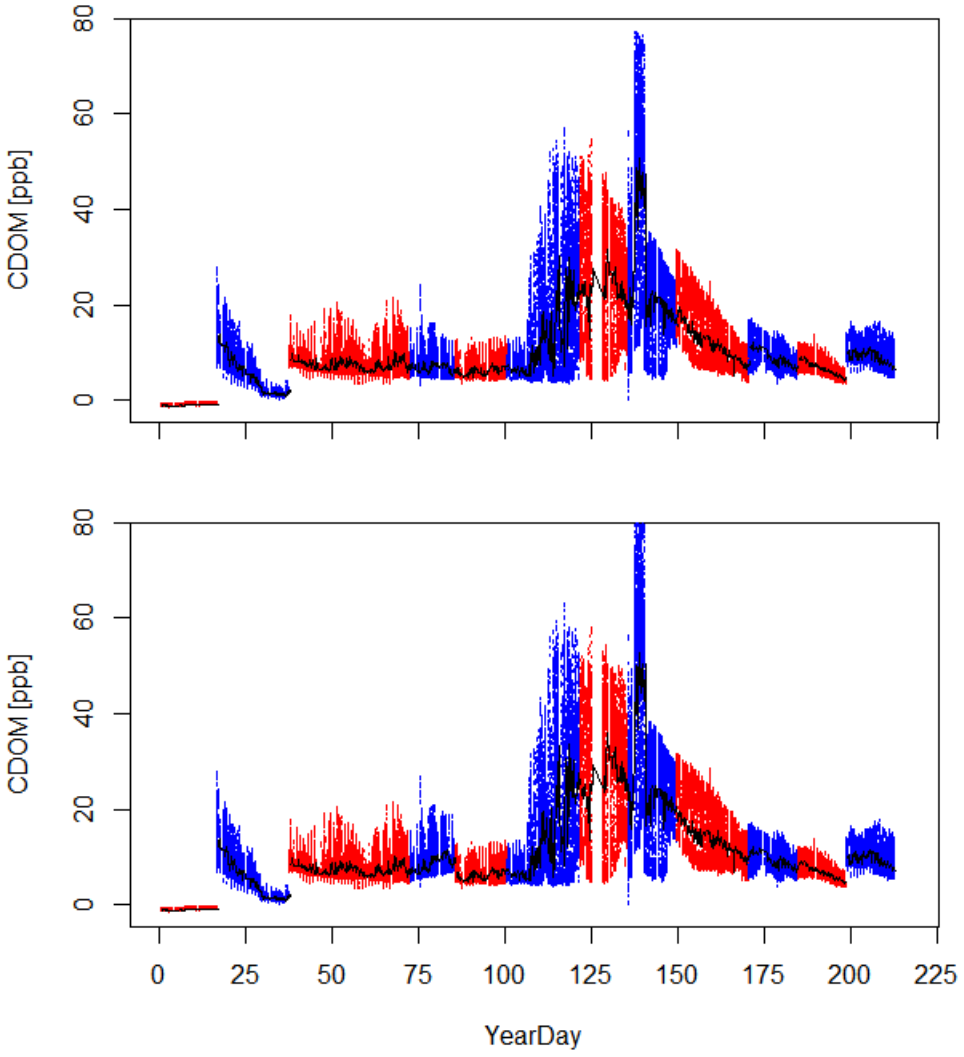

Figure 1. Time series of a) un-corrected; and b) corrected CDOM fluorescence measured en route between Duke Point (Vancouver Island) and Tsawwassen (Mainland, BC) by the BBFL2 unit of the SeaKeeper 1000 instrument suite on board the BC ferry, the Queen of Alberni. Red and blue symbols are used to distinguish between instrument cleaning dates. The difference between pre- and post-cleaning fluorescence of diluted tonic water was used to calculate a correction factor (%) which was applied as a linear correction retrospectively between cleaning dates. The most recent cleaning event took place on August 1, 2014. On this date, we failed to see a positive increase in CDOM fluorescence of diluted tonic water (see Table 1). Pre- and post- values for Sprite Zero were used instead. However, the derived correction factor appears to be too modest. Note: an instrument inter-calibration applied to all data following day 149 when BBFL2-786 was swapped out for BBFL2-787.

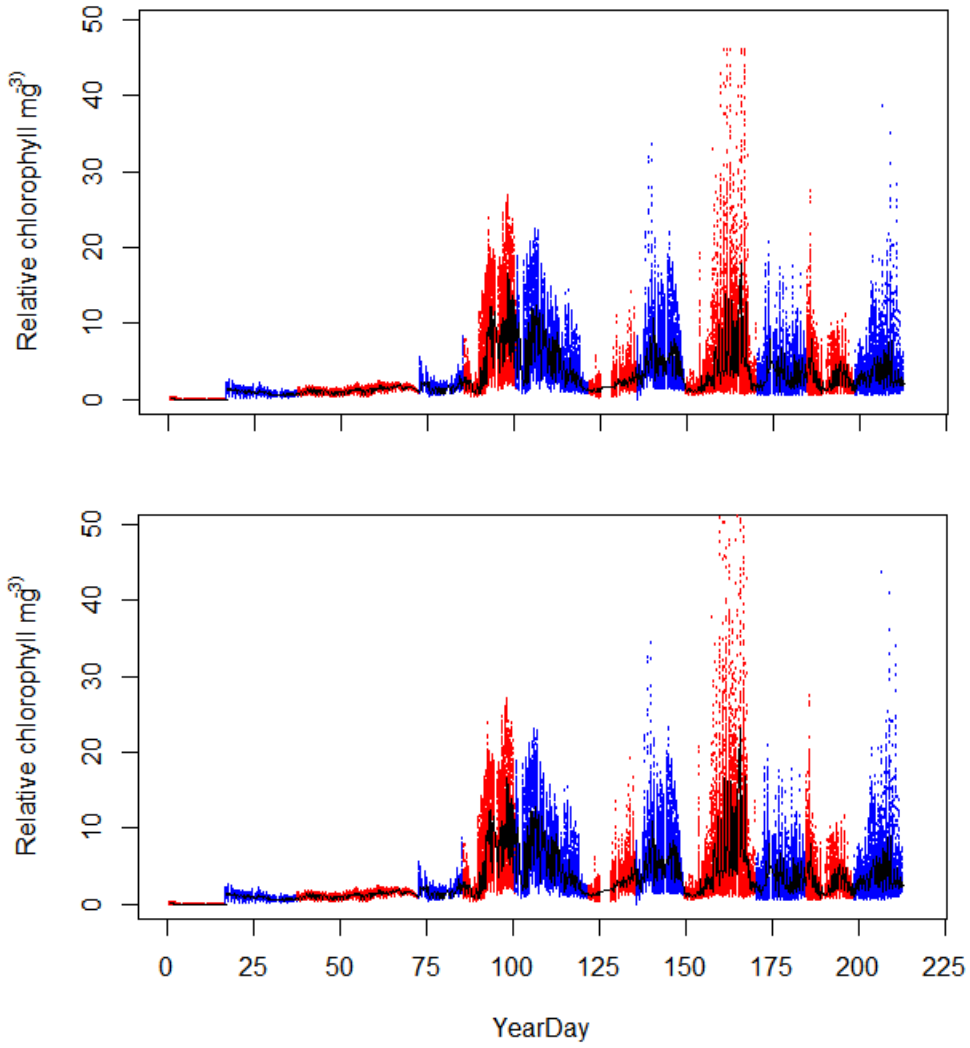

Figure 2. Time series of a) un-corrected; and b) corrected Chl fluorescence measured en route between Duke Point (Vancouver Island) and Tsawwassen (Mainland, BC) by the BBFL2 unit of the SeaKeeper 1000 instrument suite on board the BC ferry, the Queen of Alberni. Red and blue symbols are used to distinguish between instrument cleaning dates. The difference between pre- and post-cleaning fluorescence of diet coke was used to calculate a correction factor (%) which was applied as a linear correction retrospectively between cleaning dates. The most recent cleaning event took place on August 1, 2014. On this date, we measured a positive increase in Chl fluorescence of diet coke (see Table 1). Note: an instrument inter-calibration applied to all data following day 149 when BBFL2-786 was swapped out for BBFL2-787.

Table 1. Mean (±standard error) values of pre- and post-cleaning fluorescence for solutions/fluorescent sticks specific to CDOM and Chlorophyll fluorescence. 'Δ fluor' values for Diet Coke (Chl) and diluted tonic water (CDOM) have been used at every cleaning since March 14, 2014 to assess the degree of signal decay between cleanings. This most recent trip represents the first instance where we measured a negative response of diluted tonic water fluorescence to cleaning. In light of this negative response, we have applied the correction factor derived from Δ 'Δ fluor' for Sprite Zero to the "corrected" 2014 time series. However, comparison between uncorrected and corrected CDOM time series suggests little improvement with correction. As noted in the maintenance report (above); sedimentation was very high within the BBFL2 housing. Our method includes a gentle rinse of the housing with distilled water before pre-cleaning fluorescence measurements. It may be that by rinsing (necessary) we are effectively only assessing signal decay due to bio-fouling. This estimate will represent an underestimate of signal decay when sediment loading is high.

CDOM/Chl Fluorescence	Method	Pre- (mean± SEM)	Post- (mean± SEM)	Δ fluor (%)
CDOM	Diluted tonic water	33.220±0.025	31.671± 0.011	-0.049
CDOM	Sprite Zero	41.321± 0.097	45.695± 0.015	0.096
CDOM	Blue fluorescent stick	57.600± 0.022	41.566± 0.026	-0.386
Chl	Diet Coke	4.130± 0.005	5.362± 0.002	0.230
Chl	Pink fluorescent stick	1.040± 0.002	0.855± 0.002	-0.216