

Commentary on our big day out May 7th 2016.

YSI 85 doing well, we borrowed a YSI 2030 from Julie/Geography Dept.

MAIN MESSAGES when compared with March 12th data.

- 1 Water temperature cooler**
- 2 Chloro a concentrations much higher than previous day March 12th at some sites.**
- 3 NNN higher concentrations**
- 4 DRP similar**
- 5 Turbidity slightly higher**

What was the day like?

A very pleasant day to monitor, mild day (16-17°C) with variable cloud cover, 40-70%.
Wind direction was a light S/SW in direction.

Tide and harbour conditions.

All observations and sample collection occurred between 0935 and 1209. All observations carried out close to low tide (at 10.00) in Dunedin. on a possible flooding tide.
This has been a dry month.

Is there anything unusual ?

Nothing significant

Seaweeds.

See the data sheets

Animals

See the data sheets.

Conditions of the surface water and does the water have any real or apparent colour?

Surface conditions were reasonably calm at most sites. There was a slight ripple or chop at most sites... There was nothing unusual about the colour at the surface of the water.

WE make this observation to check for any unusual discharges, like oil on the surface. The good news is that seldom do we notice any sheens or unusual colours on the surface of the water.

Water temperature

The water temperature ranged from 9.8 °C (#88) – 14.3 °C. (#86) A limited number of readings, most around 12. The water temperatures are similar to March 12th

The water temperature will have an effect on the solubility of different substances in water, solubility of ions will decrease however the solubility of oxygen and gases will increase.

Freshwater flowing in from the Leith is colder than water entering the harbour mouth in winter.

[March 12th 10.8 °C (#88) – 14.1 °C. (#85)]

Salinity

Sites that are directly impacted on by the tidal flow showed a range of 30.7 (#89) -34.40 ppt (#87)
The salinities are similar to March 12th, salinity variable in the harbour, no obvious gradient. All measurements taken close to low tide and a flooding tide, samples may reflect water draining off the land, more freshwater mixing with the sample.

Some samples were tested in the lab.

[March 12th 28.28 (#86) -34.81 ppt (#81/2)]

Open sea salinity 34.998 ppt!!!

Salinity readings more accurate, both YSI instruments are checked each time against standard sea water. YSI 2030 measured 32.8 (standard 33.7ppt). YSI 85 measured 32.5 (vs 33.7). These differences are included in our adjusted calculations for salinity and conductivity.

pH

All sites tested. Range was 7.62 (#89) – 8.12(#85).

pH range is similar to March 12th data. Most readings around 8.0 . Many of the readings were quite consistent around 8.

What about buffers in the water???

[March 12th 8.06 (#89) – 8.73(#88).]

Turbidity

All sites tested. Range was 1.52 NTU (#84) – 6.64 (#87) /18.2 NTU (#89).

The water was relatively clear at some open water sites. One discharge sites quite turbid..

Discharge sites higher than the open water sites

Some turbidity could be explained by the extra phytoplankton in the water, #81/2 had noticeably higher chloro a levels.

The samplers have to be careful collecting their samples at low tide and avoid including sediment in their samples. It was difficult to collect a sample from #89 as the water was very shallow.

[March 12th 0.89 NTU (#84) – 5.29 (#810) /20 NTU (#89).]

**** Why is turbidity important?? .**

Light is essential for photosynthesis, increased turbidity will inhibit PS deeper in the water column.

Increased surface area will increase the solubility of nutrients?especially phosphates/heavy metals.

Presence of significant amounts of fine particles in the water column will act against filter feeders!!, may block up their siphons/filters.

Guideline values 0.5-10 NTU ANZECC&ARMCANZ (2000)

All samples within these guidelines except for, #89. This a discharge sites.

New data:

From 2013 Coastal and estuarine water quality Median WQ values 2.63 NTU C/5.3 E NTU

Dissolved oxygen (DO) mg L⁻¹ and % saturation.

The range of DO readings shows a range from sites tested 5.26 mg L⁻¹ (#89)-10.94 mg L⁻¹ (#88)/11.35 mg L⁻¹(#83)
% saturation range 56.1% (#89) – 120% (#81/2) and 138.1 % (#83).

From 2013 Coastal and estuarine water quality Dissolved Oxygen; 99.5% C/95.9 E

The sites with supersaturated concentrations of DO generally had elevated concentrations of chlorophyll a

Chlorophyll a.

The range of values is 1.17 µg L⁻¹ (#84)/1.27 µg L⁻¹(#88) – 3.07 µg L⁻¹(#89)/ 2.97µg L⁻¹(#81)/3.49 µg L⁻¹(#82).

Range and values are greater than March 12th . Many flocks of birds were observed feeding close to some of our monitoring sites (#81/2) and (#86). This suggest strongly extra biological activity in the harbour at the time of monitoring.

There was no neat story correlating a high concentration of chlorophyll a with a very low concentration of NNN. If there has been a steady point and non point input of NNN from the land then this relationship may not show.

Values above 5.0 are classified in estuaries as a matter for concern, possible algal blooms???

[March 12th 1.06 µg L⁻¹ (#85)/1.04 µg L⁻¹(#810) – 2.64 µg L⁻¹(#89)/ 2.69µg L⁻¹(#88).)]

Four sites had low values, six sites have medium values

Medium ENVIRONMENTAL HEALTH CATEGORY for open water

0-2 (µg L⁻¹) low

>2-5 medium

>5-10 high

>10 very high

NNN (total dissolved nitrates and nitrites)

Variable readings from different sites.

2.79 µmol L⁻¹(#810) -10.76 µmol L⁻¹(#87) Open water sites. All sites exceed 2 µmol L⁻¹ , **greater than March 12th values.**

13.97 $\mu\text{mol L}^{-1}$ (#86) – 26.67 $\mu\text{mol L}^{-1}$ (#88)/ 27.47 $\mu\text{mol L}^{-1}$ (#89) Storm water /discharge sites **greater than March 12th values.**

Assume that more NNN being utilised by the phytoplankton. Chloro a levels are **higher** reflecting the **lower** concentration of nutrients. ?? From our last day, both the chloro a and NNN are higher.

Hypothesis.

A Brief algal bloom!!!!

The phytoplankton will draw down the NNN in the water, is there biological activity developing in the harbour??

[March 12th 0.7 $\mu\text{mol L}^{-1}$ (#85) -2.7 $\mu\text{mol L}^{-1}$ (#83) Open water sites. Most sites around 2 $\mu\text{mol L}^{-1}$

3.94 $\mu\text{mol L}^{-1}$ (#89) – 6.31 $\mu\text{mol L}^{-1}$ (#86)/ 20.85 $\mu\text{mol L}^{-1}$ (#88) Storm water /discharge sites]

ALL sites exceed guidelines.

GUIDELINE value 1.79 $\mu\text{mol L}^{-1}$ (=0.025 mg N-NO₃⁻¹ L⁻¹)

Medium ENVIRONMENTAL HEALTH CATEGORY !!!!!!

From 2013 Coastal and estuarine water quality

NNN: median values 0.01mg/L, (0.0714 $\mu\text{mol L}^{-1}$) C/ 0.02 mg/L (1.43 $\mu\text{mol L}^{-1}$)

DRP (dissolved reactive phosphate)

Range of 0.63 $\mu\text{mol L}^{-1}$ (#81) – 1.31 $\mu\text{mol L}^{-1}$ (#89).

The range of values is less to March 12th values.

[March 12th 0.40 $\mu\text{mol L}^{-1}$ (#81) – 1.49 $\mu\text{mol L}^{-1}$ (#86).]

All sites exceed the Guidelines.

GUIDELINE value 0.0322 $\mu\text{mol L}^{-1}$ (= 0.010 mg P- PO₄³⁻ L⁻¹)

HIGH ENVIRONMENTAL HEALTH CATEGORY

Enterococci

The enterococci data is always challenging to count, this time Dave reported back to say the colonies were quite distinct. All sites showed some indications except for #89, unusual! Strong indications from #86 (Waters of Leith) and #88 (Macbay stormwater) which exceeded the Alert value.

#88 Macandrew bay stormwater exceeded the guideline value.

Guideline value 140 cells per 100mL of sample indicated

***Enterococci* bacteria**

SUMMARY OF DATA.

DATE: **07/05/2016**

<p>What is the weather like?</p> <ul style="list-style-type: none"> • <i>Air temperature</i> • <i>Wind speed and direction</i> • <i>Cloud cover</i> 	<table border="0"> <tr> <td>#81 and 2</td> <td>16.4oC,S wind, 75% ccv</td> <td></td> </tr> <tr> <td>#82</td> <td></td> <td></td> </tr> <tr> <td>#83</td> <td>19.30oC, no wind, 8% ccv</td> <td></td> </tr> <tr> <td>#84</td> <td>18.1oC,Southerly,v slight,</td> <td></td> </tr> <tr> <td>#85</td> <td>light wind,17-18oC,75% ccv</td> <td></td> </tr> <tr> <td>#86</td> <td>light wind,17-18oC,75% ccv</td> <td></td> </tr> <tr> <td>#87</td> <td>13.1oC,calm, 45%ccv</td> <td></td> </tr> <tr> <td>#88</td> <td>12.2oC,Southerly, 5kph,45% ccv</td> <td></td> </tr> <tr> <td>#89</td> <td>light breeze,calm,40% ccv</td> <td></td> </tr> <tr> <td>#810</td> <td>—</td> <td></td> </tr> </table>	#81 and 2	16.4oC,S wind, 75% ccv		#82			#83	19.30oC, no wind, 8% ccv		#84	18.1oC,Southerly,v slight,		#85	light wind,17-18oC,75% ccv		#86	light wind,17-18oC,75% ccv		#87	13.1oC,calm, 45%ccv		#88	12.2oC,Southerly, 5kph,45% ccv		#89	light breeze,calm,40% ccv		#810	—	
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<p>What is the time, and what stage is the tide?</p> <p><i>What is the condition of the Leith ?</i></p> <p><i>Check websites (Met service and Port otago)</i></p>	<table border="0"> <tr> <td>#81 and 2</td> <td>0935, extremely low</td> <td></td> </tr> <tr> <td>#82</td> <td></td> <td></td> </tr> <tr> <td>#83</td> <td>1138, low tide</td> <td></td> </tr> <tr> <td>#84</td> <td>1052,very low tide</td> <td></td> </tr> <tr> <td>#85</td> <td></td> <td>11.46</td> </tr> <tr> <td>#86</td> <td>1209, low tide</td> <td></td> </tr> <tr> <td>#87</td> <td>0940, low tide</td> <td></td> </tr> <tr> <td>#88</td> <td>1010,low tide</td> <td></td> </tr> <tr> <td>#89</td> <td>1025,low tide</td> <td></td> </tr> <tr> <td>#810</td> <td>—</td> <td></td> </tr> </table>	#81 and 2	0935, extremely low		#82			#83	1138, low tide		#84	1052,very low tide		#85		11.46	#86	1209, low tide		#87	0940, low tide		#88	1010,low tide		#89	1025,low tide		#810	—	
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<p>Is there anything unusual to report (dead crabs, nasty smell, coloured sheen on the water)?</p> <ul style="list-style-type: none"> • Discharge pipes • Any star fish/other animals ?? • Rubbish or litter. 	<p>#81 and 2 all the intetidal visible</p> <p>#82</p> <p>#83 geese, bird poo,</p> <p>#84 all very exposed, glass,bricks,bottlecaps,tyres dead crabs and fish</p> <p>#85 Smell drfting from N,fine film,brown scum Flowing at a rate of 0.5m/s</p> <p>#86 film or brown scum, lots of litter</p> <p>#87 cans in the water</p> <p>#88 –</p> <p>#89 –</p> <p>#810 –</p>
<ul style="list-style-type: none"> • Special seaweeds <p>f=few</p> <p>s=some</p> <p>m=many</p>	<p>See data sheets</p>
<p>Animals</p>	<p>See data sheets</p>
<p>What condition is the surface of the water?</p>	<p>#81 and 2 calm, minor ripples</p> <p>#82</p> <p>#83 still</p> <p>#84 murky, sl constant ripples</p> <p>#85 v calm</p> <p>#86</p> <p>#87 clear</p> <p>#88 clear white bubbles</p> <p>#89 –</p> <p>#810 –</p>
<p>Does the water have any real, or apparent colour?</p>	<p>#81 and 2 no, very clear</p> <p>#82</p> <p>#83 murky/greenish blue</p> <p>#84 murky/clear</p>

	#85	green oily appearance
	#86	
	#87	no
	#88	no
	#89	-
	#810	-

Understanding Estuarine Processes

SITE: _____ DATE: _____

<p>What is the water temperature ?</p>	<table> <tr> <td>#81 and 2</td> <td>14.2</td> </tr> <tr> <td>#82</td> <td></td> </tr> <tr> <td>#83</td> <td>16.6</td> </tr> <tr> <td>#84</td> <td>16.4</td> </tr> <tr> <td>#85</td> <td>12.9</td> </tr> <tr> <td>#86</td> <td>14.3</td> </tr> <tr> <td>#87</td> <td>12.3</td> </tr> <tr> <td>#88</td> <td>9.8</td> </tr> <tr> <td>#89</td> <td>11.7</td> </tr> <tr> <td>#810</td> <td>12</td> </tr> </table> <p style="text-align: right;">°C</p>	#81 and 2	14.2	#82		#83	16.6	#84	16.4	#85	12.9	#86	14.3	#87	12.3	#88	9.8	#89	11.7	#810	12
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<p>What is the electrical conductivity of the sample ?</p>	<table> <tr> <td>#81 and 2</td> <td>_/52.350</td> </tr> <tr> <td>#82</td> <td></td> </tr> </table>	#81 and 2	_/52.350	#82																	
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<p>NOTE: record the first conductivity, this is the actual conductivity at this temperature, the next reading is the specific conductance, the conductivity adjusted by the instrument to 25 ° C</p>	#83	–	
	#84	–/–	
	#85	38.36/50.2	
	#86	37.54/46.50	
	#87	38.0/50.4	
	#88	.380/0.470	
	#89	24.10/31.39	
	#810	37.37/49.97	
			mS/cm

<p>What is the pH of the sample ?</p>	#81 and		
	2	7.71	
	#82	8.11	
	#83	8.02	
	#84	8.1	
	#85	8.12	
	#86	7.74	
	#87	7.91	
	#88	7.97	
	#89	7.62	
#810	8.04		

<p>What is the water turbidity?</p>	#81 and		
	2	4.75	
	#82	5.64	
	#83	1.76	
	#84	1.52	
	#85	2.44	
	#86	3.77	
	#87	6.64	
	#88	6.11	
	#89	18.2	
#810	4.02		
		NTU	

<p>What is the oxygen concentration of your sample ? Measure both methods mg/L and % saturation</p>	#81 and		
	2	10.1	
	#82		
	#83	11.35	
	#84	9.1	
	#85	8.02	
	#86	9.2	
	#87	7.23	
	#88	10.94	
#89	5.26		

	<table> <tr> <td>#810</td> <td>7.56</td> <td></td> </tr> <tr> <td></td> <td></td> <td>mg/L</td> </tr> <tr> <td>#81 and 2</td> <td>120</td> <td></td> </tr> <tr> <td>#82</td> <td></td> <td></td> </tr> <tr> <td>#83</td> <td>138.1</td> <td></td> </tr> <tr> <td>#84</td> <td>112</td> <td></td> </tr> <tr> <td>#85</td> <td>90.7</td> <td></td> </tr> <tr> <td>#86</td> <td>107.6</td> <td></td> </tr> <tr> <td>#87</td> <td>83.6</td> <td></td> </tr> <tr> <td>#88</td> <td>94.7</td> <td></td> </tr> <tr> <td>#89</td> <td>56.1</td> <td></td> </tr> <tr> <td>#810</td> <td>83.1</td> <td></td> </tr> <tr> <td></td> <td></td> <td>% saturation</td> </tr> </table>	#810	7.56				mg/L	#81 and 2	120		#82			#83	138.1		#84	112		#85	90.7		#86	107.6		#87	83.6		#88	94.7		#89	56.1		#810	83.1				% saturation				
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<p>What is the chlorophyll a concentration of the sample ?</p> <ul style="list-style-type: none"> <i>Record the volume of water filtered</i> 	<table> <tr> <td>#81 and 2</td> <td>3.49</td> <td></td> </tr> <tr> <td>#82</td> <td>2.97</td> <td></td> </tr> <tr> <td>#83</td> <td>2.15</td> <td></td> </tr> <tr> <td>#84</td> <td>1.17</td> <td></td> </tr> <tr> <td>#85</td> <td>2.37</td> <td></td> </tr> <tr> <td>#86</td> <td>2.25</td> <td></td> </tr> <tr> <td>#87</td> <td>1.36</td> <td></td> </tr> <tr> <td>#88</td> <td>1.27</td> <td></td> </tr> <tr> <td>#89</td> <td>3.07</td> <td></td> </tr> <tr> <td>#810</td> <td>1.60</td> <td></td> </tr> <tr> <td>0-2 low</td> <td></td> <td></td> </tr> <tr> <td>>2-5 medium</td> <td></td> <td></td> </tr> <tr> <td>>5-10 high</td> <td></td> <td></td> </tr> <tr> <td>>10 very high</td> <td></td> <td></td> </tr> </table>	#81 and 2	3.49		#82	2.97		#83	2.15		#84	1.17		#85	2.37		#86	2.25		#87	1.36		#88	1.27		#89	3.07		#810	1.60		0-2 low			>2-5 medium			>5-10 high			>10 very high			<p>µg/L</p>
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		μmol/L
****DRP	#81 and 2	0.63
	#82	0.63
	#83	1.21
	#84	0.66
	#85	0.75
	#86	0.94
	#87	1.08
	#88	–
	#89	1.31
	#810	0.86
		μmol/L
What is the enterococci count in the sample ?	#81 and 2	18
	#82	11
	#83	10
	#84	2
	#85	3
	#86	63
	#87	12
	#88	170
	#89	0
	#810	5
		colonies indicated /100mL