BROADSCALE ENVIRONMENTAL

MONITORING PROGRAM

D'Entrecasteaux Channel and Huon Marine Farming

Development Plan Sites

APPENDICES - 2017/2018 Annual Report

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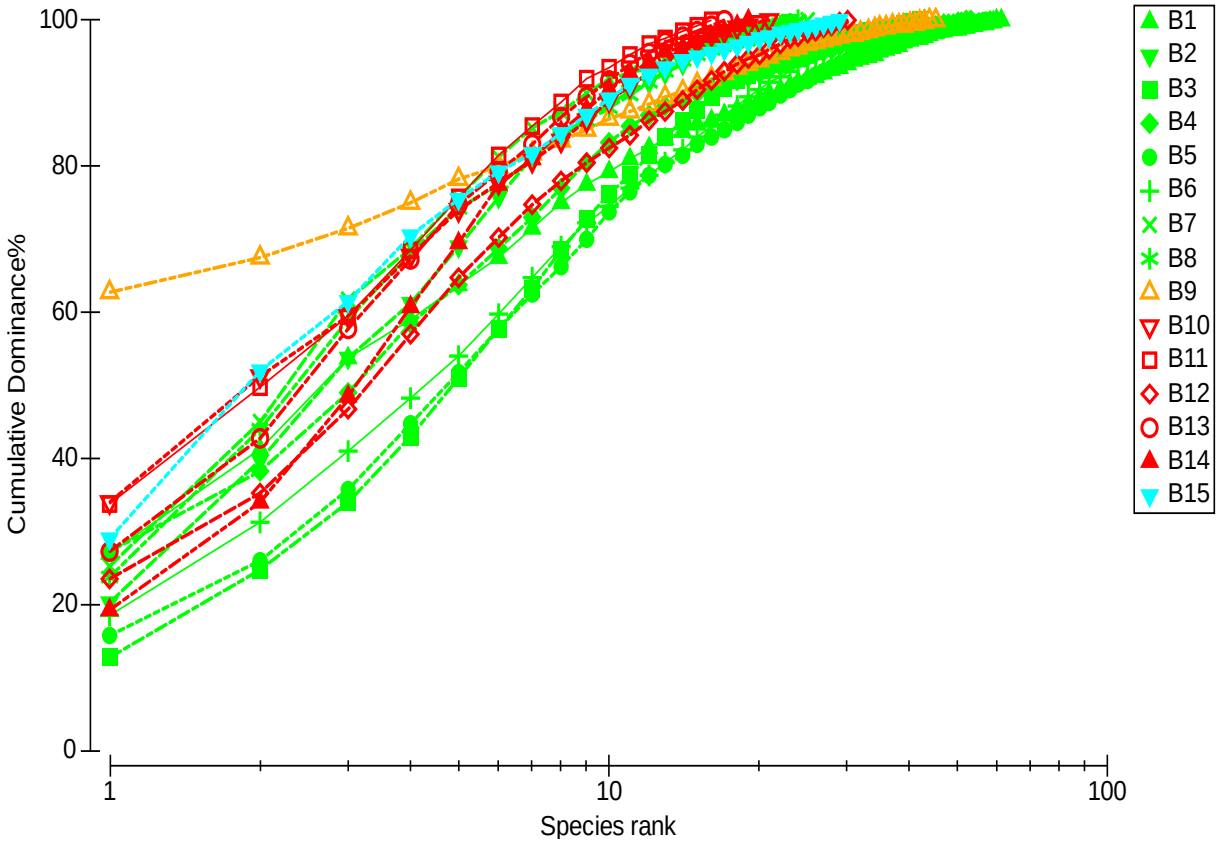
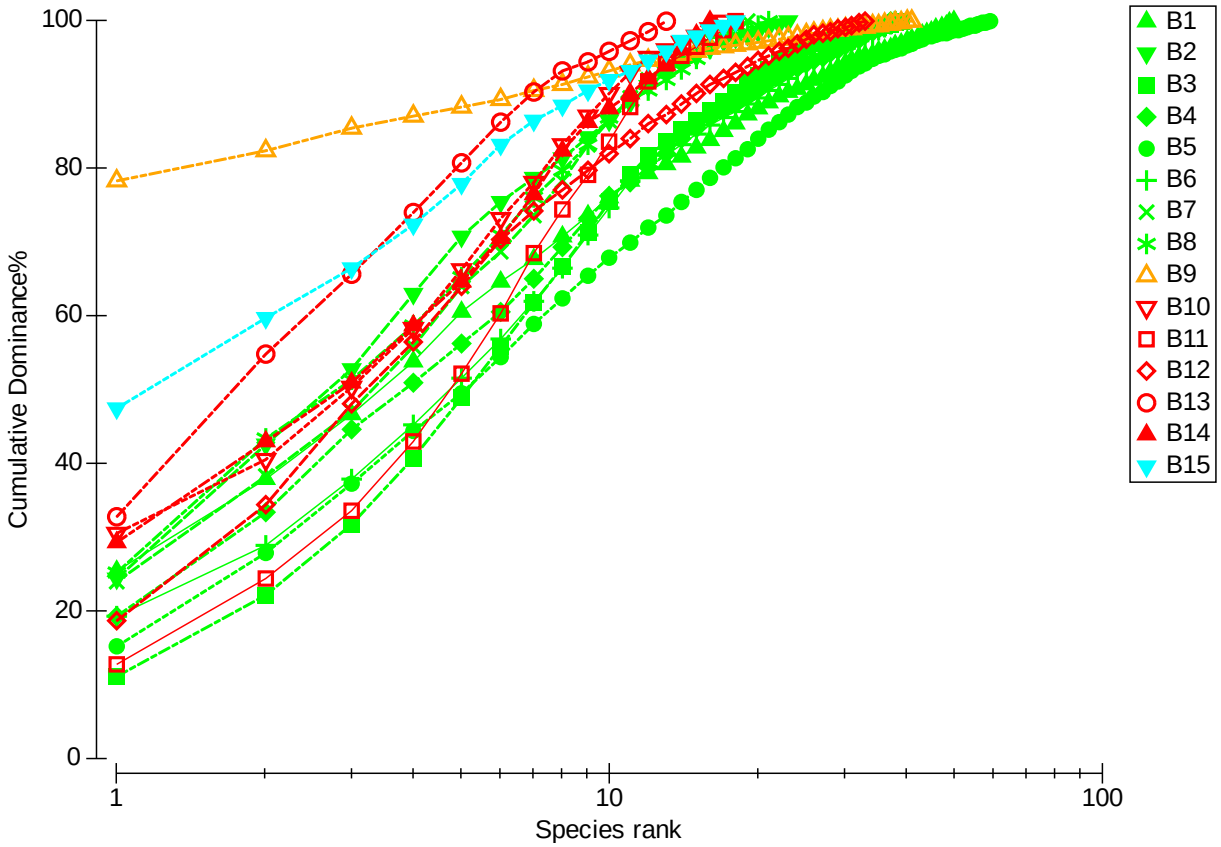
List of Appendices

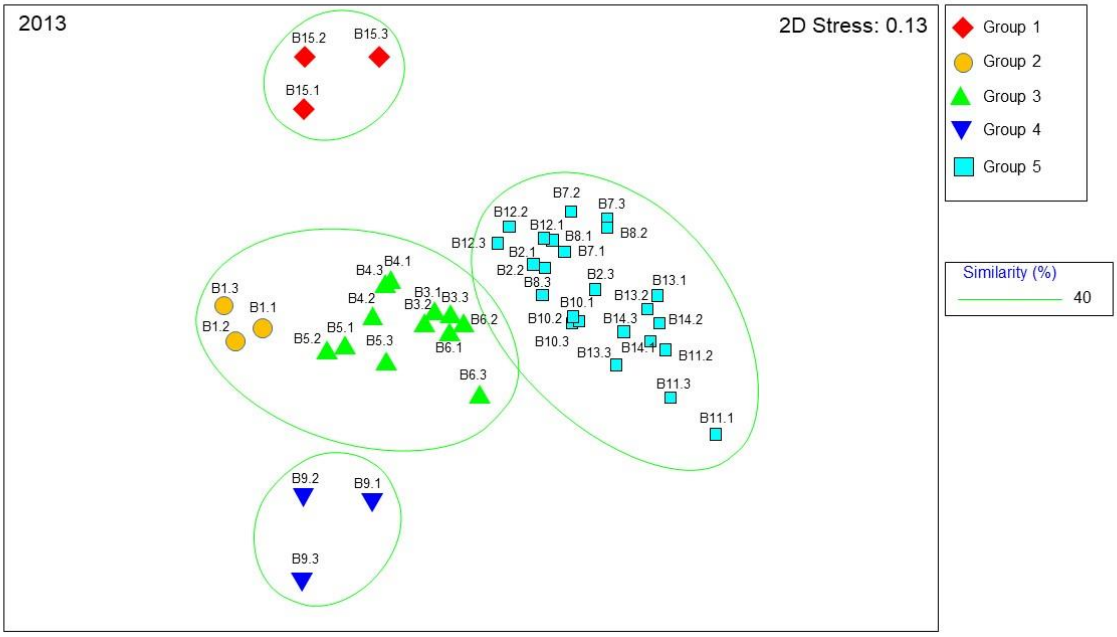
Appendix 1 Benthic infauna community analysis (2009 and 2013)



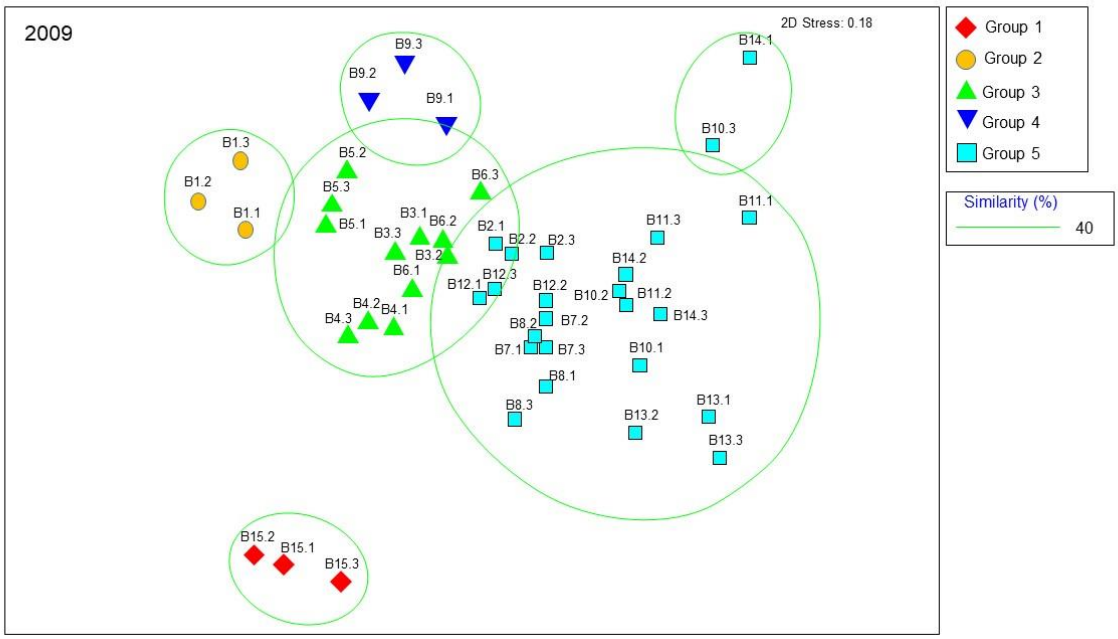
Appendix 1a K-dominance plot based on pooled 2013 survey (family level data)



Appendix 1b K-dominance plot based on pooled 2009 survey (family level data)



Appendix 1c Results of MDS analysis using benthic faunal data collected from replicate grabs at each site in 2013. Ellipses indicate community similarity (%), based on cluster analysis. Group 1 = Recherche Bay control site; group 2 = northern channel site; group 3 = mid-channel sites; group 4 = east Lippies; group 5 = muddy D'Entrecasteaux Channel and Huon sites.



Appendix 1d Results of MDS analysis using benthic faunal data collected from replicate grabs at each site in 2009. Ellipses indicate community similarity (%), based on cluster analysis. Group 1 = Recherche Bay control site; group 2 = northern channel site; group 3 = mid-channel sites; group 4 = east Lippies; group 5 = muddy D'Entrecasteaux Channel and Huon sites.

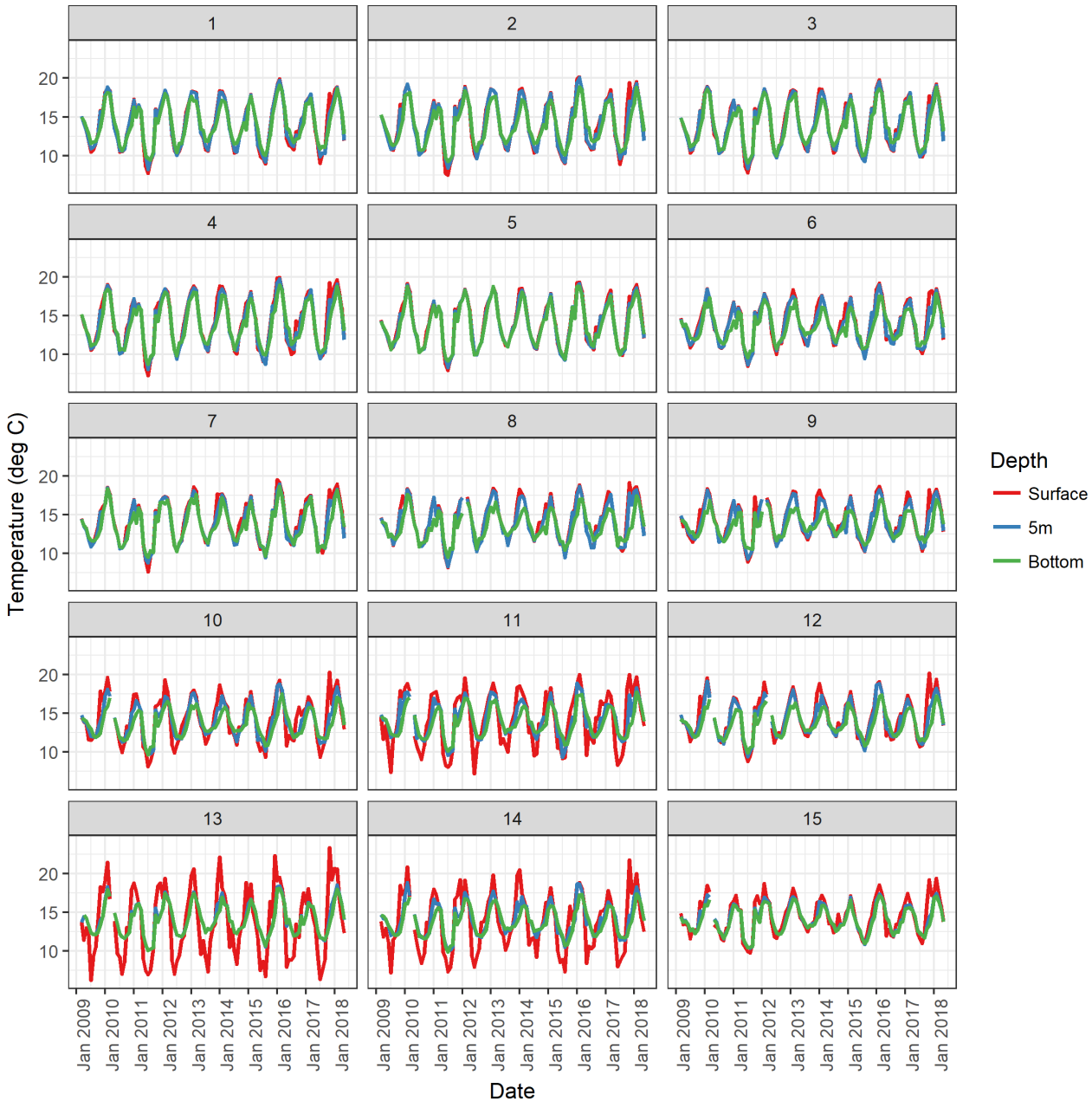
Appendix 2 Stable isotope raw data

	d^{15}N ‰ AIR			d^{13}C ‰ VPDB			N wgt %			C wgt %			C/N molar		
Sample No.	**2009**	**2013**	**2017**	**2009**	**2013**	**2017**	**2009**	**2013**	**2017**	**2009**	**2013**	**2017**	**2009**	**2013**	**2017**
IM1-1 sediment	8.29	8.73	8.43	-22.09	-22.09	-21.7	0.43	0.34	0.54	3.75	2.80	2.72	10.17	9.61	5.88
IM1-2 sediment	8.52	6.93	8.09	-22.09	-22.06	-19.8	0.53	0.15	1.25	4.76	1.21	8.81	10.48	9.41	8.22
IM1-3 sediment	10.88	7.03	6.01	-21.42	-22.24	-21.4	1.20	0.34	0.28	7.47	2.82	1.41	7.26	9.68	5.88
IM2-1 sediment	7.77	6.96	6.11	-22.60	-22.74	-21.9	0.43	0.21	0.51	4.20	2.18	3.03	11.40	12.11	6.93
IM2-2 sediment	7.39	6.32	5.17	-22.67	-22.61	-21.9	0.43	0.21	0.50	4.15	2.70	3.00	11.26	15.00	7.00
IM2-3 sediment	7.65	7.19	6.74	-22.71	-22.58	-21.8	0.39	0.20	0.50	3.79	2.16	2.94	11.34	12.60	6.86
IM3-1 sediment	7.48	10.20	6.79	-23.01	-22.28	-21.7	0.22	0.10	0.57	2.06	1.02	3.39	10.92	11.90	6.94
IM3-2 sediment	7.96	8.91	8.47	-22.45	-20.37	-22.0	0.16	0.08	0.13	1.47	0.87	1.15	10.72	12.69	10.32
IM3-3 sediment	7.84	7.44	7.20	-22.74	-22.97	-22.4	0.22	0.13	0.10	1.99	1.23	0.53	10.55	11.04	6.18
IM4-1 sediment	7.29	10.16	5.12	-22.76	-19.40	-22.6	0.14	0.06	0.10	1.28	0.68	0.61	10.67	13.22	7.12
IM4-2 sediment	6.85	8.74	5.54	-22.77	-22.20	-23.1	0.09	0.05	0.05	0.89	0.46	0.31	11.54	10.73	7.23
IM4-3 sediment	7.27	9.47	9.35	-22.77	-22.06	-22.7	0.06	0.05	0.06	0.56	0.46	0.35	10.89	10.73	6.81
IM5-1 sediment	8.24	7.41	5.89	-22.67	-21.00	-22.1	0.26	0.16	0.20	2.71	1.87	1.24	12.16	13.64	7.23
IM5-2 sediment	8.15	6.31	8.79	-22.66	-23.51	-22.3	0.36	0.14	0.13	3.68	1.54	1.20	11.93	12.83	10.77
IM5-3 sediment	7.63	7.11	7.78	-22.49	-22.46	-22.5	0.38	0.23	0.41	2.78	2.38	3.53	8.54	12.07	10.04
IM6-1 sediment	7.63	7.24	8.48	-23.18	-22.13	-23.4	0.09	0.11	0.04	0.80	1.18	0.25	10.37	12.52	7.29
IM6-2 sediment	7.21	8.72	8.94	-23.26	-22.91	-22.7	0.08	0.04	0.05	0.73	0.48	0.52	10.65	14.00	12.13
IM6-3 sediment	6.78	7.15	7.17	-23.18	-22.97	-22.8	0.07	0.05	0.09	0.63	0.57	0.55	10.50	13.30	7.13
IM7-1 sediment	8.47	8.49	7.87	-22.80	-23.12	-22.0	0.39	0.34	0.52	3.76	3.54	3.08	11.25	12.15	6.91
IM7-2 sediment	8.72	7.69	6.48	-22.60	-22.89	-22.5	0.42	0.32	0.57	4.47	3.22	3.04	12.42	11.74	6.22
IM7-3 sediment	8.84	8.27	6.59	-22.66	-22.93	-23.3	0.38	0.31	0.57	3.76	3.24	3.17	11.54	12.19	6.49

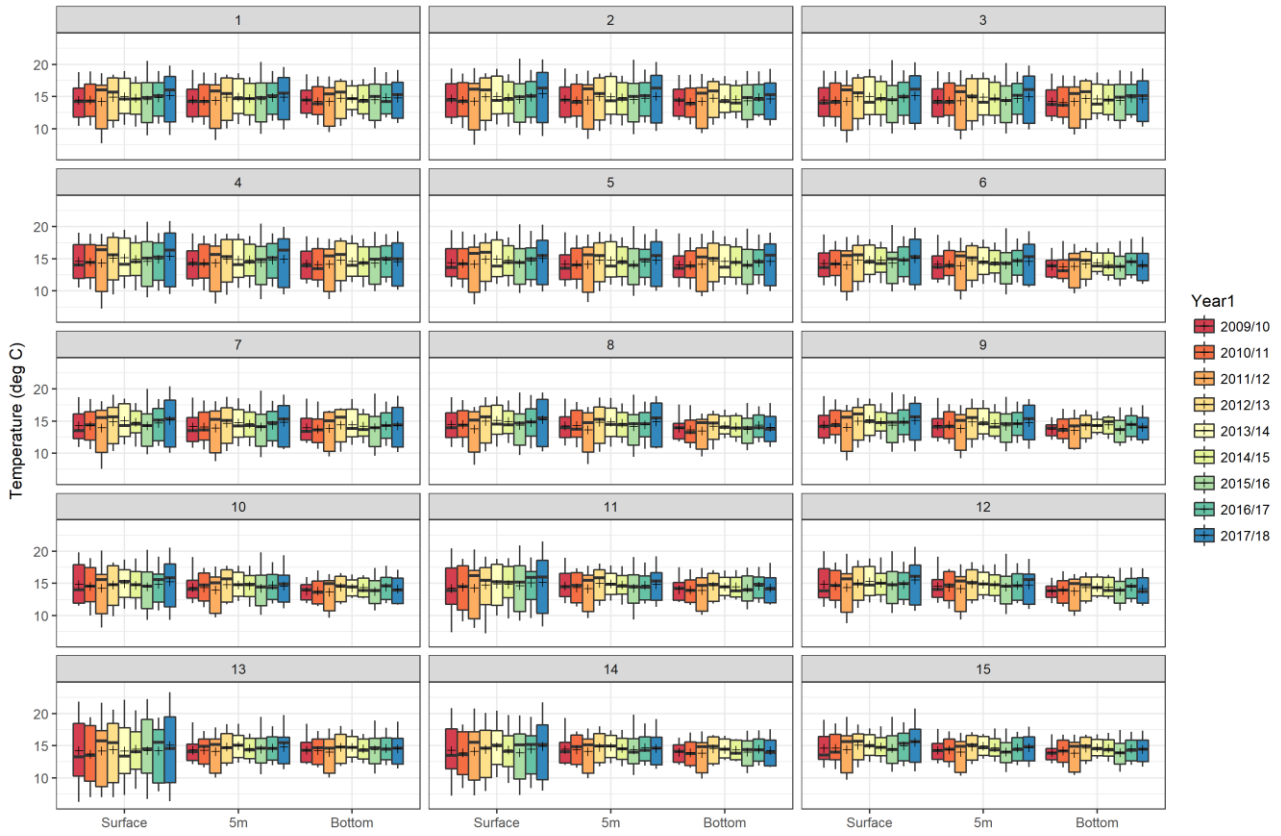
Sample No.	d^{15}N ‰ AIR			d^{13}C ‰ VPDB			N wgt %			C wgt %			C/N molar		
	2009	2013	2017	2009	2013	2017	2009	2013	2017	2009	2013	2017	2009	2013	2017
IM8-1 sediment	9.19	8.02	8.60	-22.69	-22.69	-21.9	0.23	0.26	0.39	2.22	2.68	2.33	11.26	12.03	6.97
IM8-2 sediment	8.13	7.77	6.45	-22.82	-22.79	-22.3	0.12	0.27	0.31	1.15	2.69	1.78	11.18	11.62	6.70
IM8-3 sediment	8.24	7.23	6.13	-22.68	-22.96	-22.2	0.18	0.22	0.36	1.69	2.33	2.04	10.95	12.36	6.61
IM9-1 sediment	6.88	2.76	7.82	-23.01	-23.57	-21.8	0.07	0.04	0.06	0.40	0.36	0.38	6.62	9.85	7.39
IM9-2 sediment	7.96	8.35	9.29	-22.90	-23.31	-21.9	0.08	0.07	0.08	0.62	0.80	0.48	9.10	9.58	7.00
IM9-3 sediment	8.18	5.52	5.71	-22.77	-24.33	-22.9	0.07	0.04	0.08	0.22	0.47	0.75	3.67	9.17	10.94
IM10-1 sediment	8.47	7.65	6.90	-23.55	-23.59	-23.1	0.51	0.28	0.55	5.65	3.19	6.01	12.92	13.29	12.75
IM10-2 sediment	8.17	7.38	6.21	-23.47	-23.53	-23.2	0.49	0.36	0.56	5.36	3.89	6.02	12.76	12.61	12.54
IM10-3 sediment	8.00	7.59	6.33	-23.51	-24.01	-23.1	0.51	0.28	0.58	5.71	3.23	5.95	13.06	13.46	11.97
IM11-1 sediment	7.19	6.62	4.91	-24.32	-24.44	-24.0	0.45	0.28	0.50	6.22	3.40	5.51	16.13	14.17	12.86
IM11-2 sediment	6.79	5.99	3.43	-24.45	-24.22	-25.1	0.42	0.21	0.53	6.27	2.85	5.90	17.42	15.83	12.99
IM11-3 sediment	7.64	7.16	6.91	-24.22	-24.20	-24.8	0.46	0.29	0.53	6.03	3.57	5.90	15.29	14.36	12.99
IM12-1 sediment	8.00	8.48	5.85	-23.16	-23.20	-23.9	0.55	0.41	0.57	6.16	4.03	5.31	13.07	11.47	10.87
IM12-2 sediment	7.93	7.28	6.72	-23.14	-22.89	-23.9	0.52	0.40	0.56	5.77	4.08	4.78	12.95	11.90	9.96
IM12-3 sediment	7.98	7.60	5.51	-23.00	-23.09	-23.7	0.54	0.38	0.65	5.77	3.81	6.33	12.47	11.70	11.36
IM13-1 sediment	3.67	3.75	1.42	-26.17	-27.78	-27.7	0.47	0.20	0.53	11.18	5.32	8.00	27.75	31.03	17.61
IM13-2 sediment	3.69	3.60	0.93	-26.14	-27.40	-27.7	0.44	0.38	0.52	10.78	8.25	8.09	28.58	25.33	18.15
IM13-3 sediment	3.39	0.77	0.44	-26.08	-27.83	-27.8	0.46	0.18	0.52	10.96	4.58	8.43	27.80	29.69	18.91
IM14-1 sediment	6.23	5.42	6.05	-25.52	-26.86	-25.7	0.45	0.28	0.49	7.25	4.55	6.90	18.80	18.96	16.43
IM14-2 sediment	5.49	6.18	7.39	-25.36	-24.59	-25.4	0.47	0.36	0.55	8.05	5.61	5.66	19.98	18.18	12.01
IM14-3 sediment	6.18	5.61	3.98	-25.47	-26.26	-25.7	0.49	0.19	0.48	7.88	3.68	7.24	18.76	22.60	17.60
IM15-1 sediment	6.93	7.50	9.30	-23.80	-22.68	-23.3	0.07	0.05	0.03	0.60	0.43	0.22	10.00	10.03	8.56
IM15-2 sediment	7.94	7.87	6.69	-23.79	-23.61	-23.9	0.12	0.04	0.08	1.01	0.37	0.67	9.82	10.79	9.77
IM15-3 sediment	7.69	7.98	9.92	-23.90	-22.29	-24.4	0.08	0.06	0.03	0.74	0.64	0.30	10.79	12.44	11.67

Appendix 3 Temporal variation in temperature (°C) at three depths (Surface, 5 m, Bottom) for each site including: (a) Monthly plots March 2009-May 2018; (b) Boxplots for 2009/10 – 2017/18 reporting years, based on March-February annual period; and (c) Boxplots for each site across all sampling years. Boxplots are defined by minimum, median and maximum values (lines); 20th and 80th percentiles (boxes); and means (crosshairs).

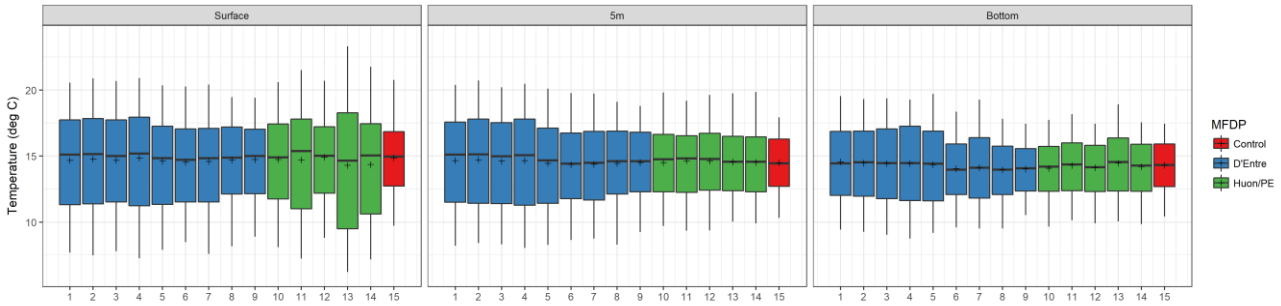
(a)



(b)


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Temperature (deg C)
Surface
5m
Bottom
Year1
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18

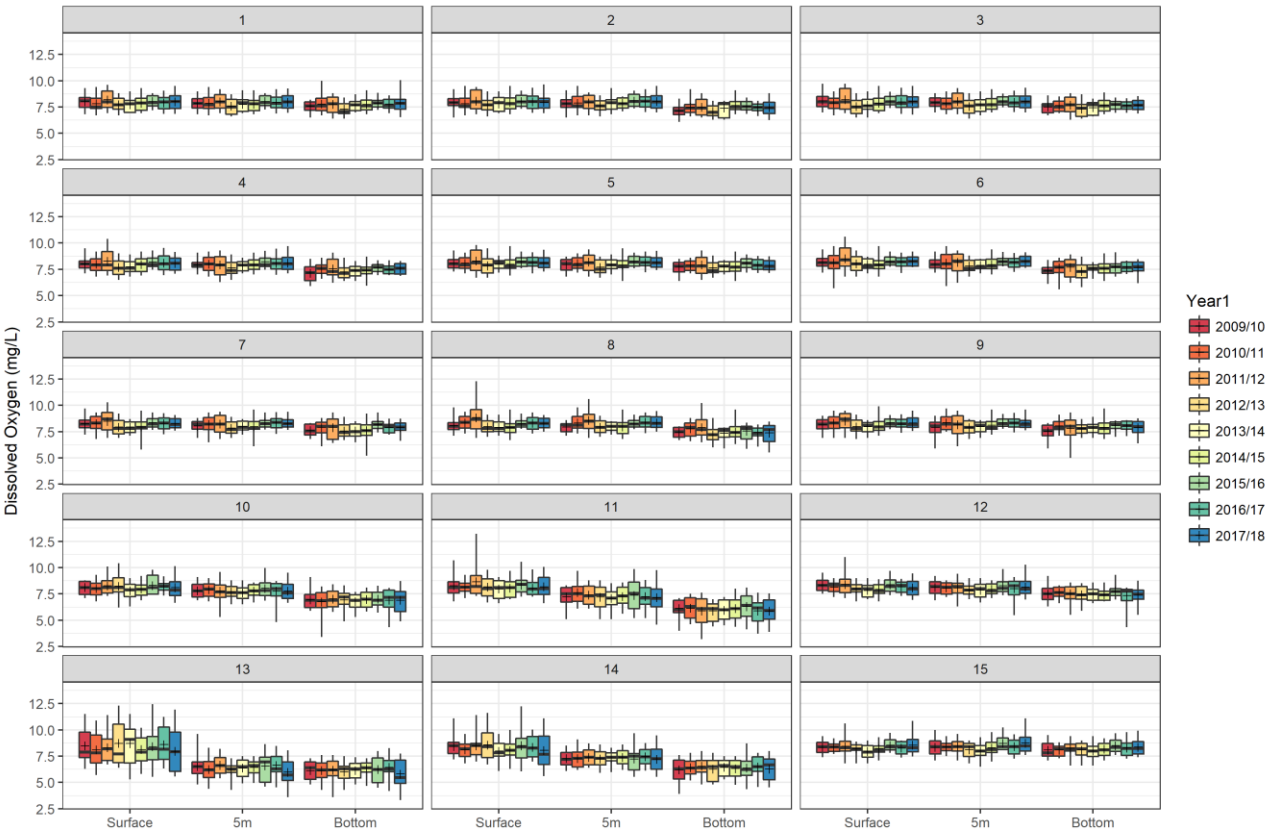
(c)


Surface
5m
Bottom
Temperature (deg C)
MFDP
Control
D'Entre
Huon/PE

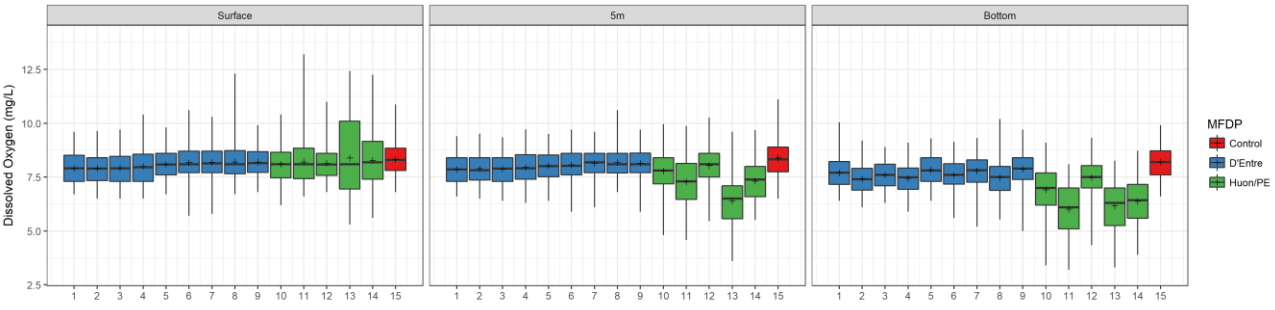
Appendix 4 Temporal variation in dissolved oxygen (mg/L) at three depths (Surface, 5 m, Bottom) for each site including: (a) Monthly plots March 2009-May 2018; (b) Boxplots for 2009/10 – 2017/18 reporting years, based on March-February annual period; and (c) Boxplots for each site across all sampling years. Boxplots are defined by minimum, median and maximum values (lines); 20th and 80th percentiles (boxes); and means (crosshairs).

(a)

(b)

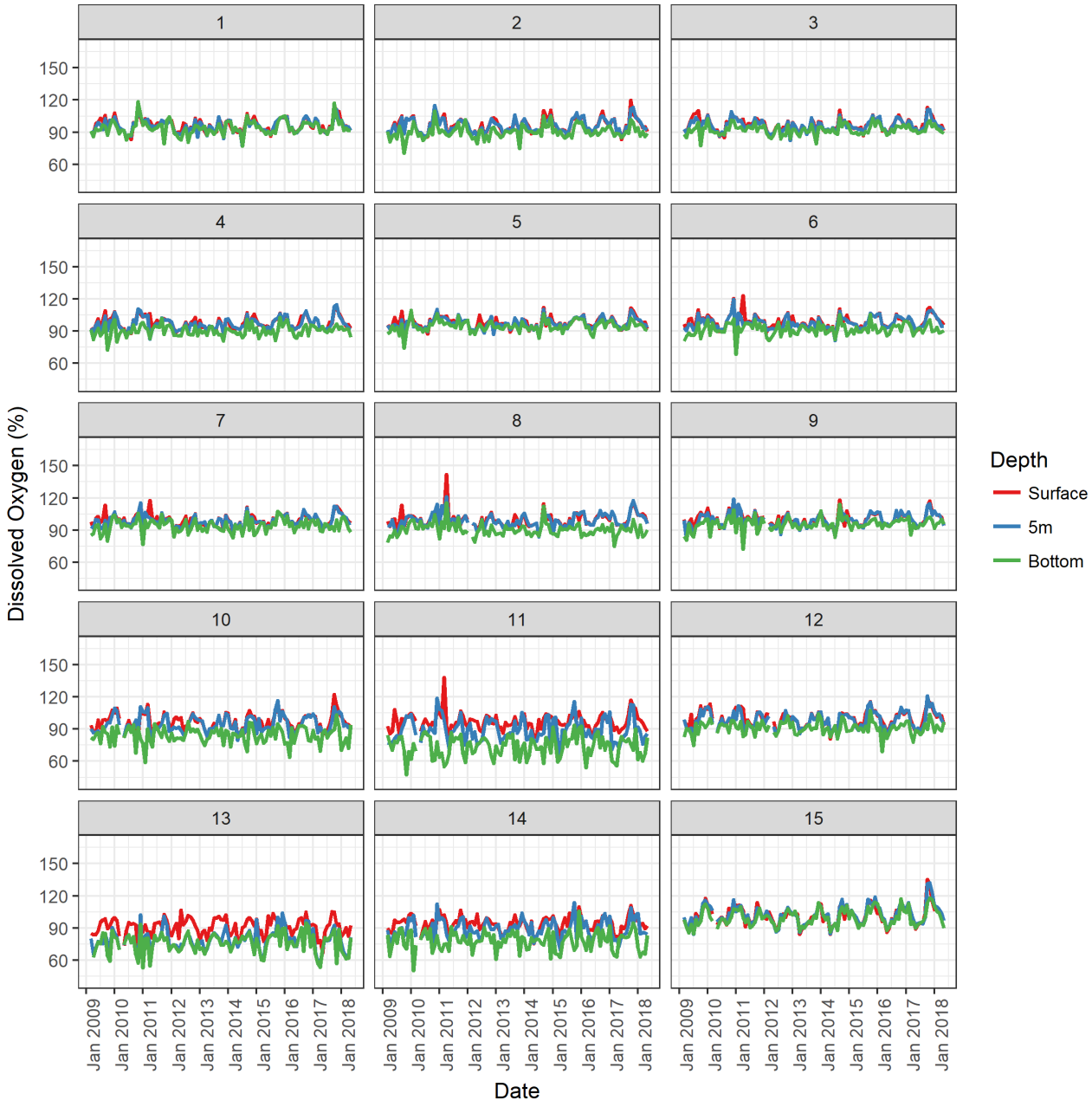

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Dissolved Oxygen (mg/L)
12.5
10.0
7.5
5.0
2.5
Surface
5m
Bottom
Year1
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18

(c)

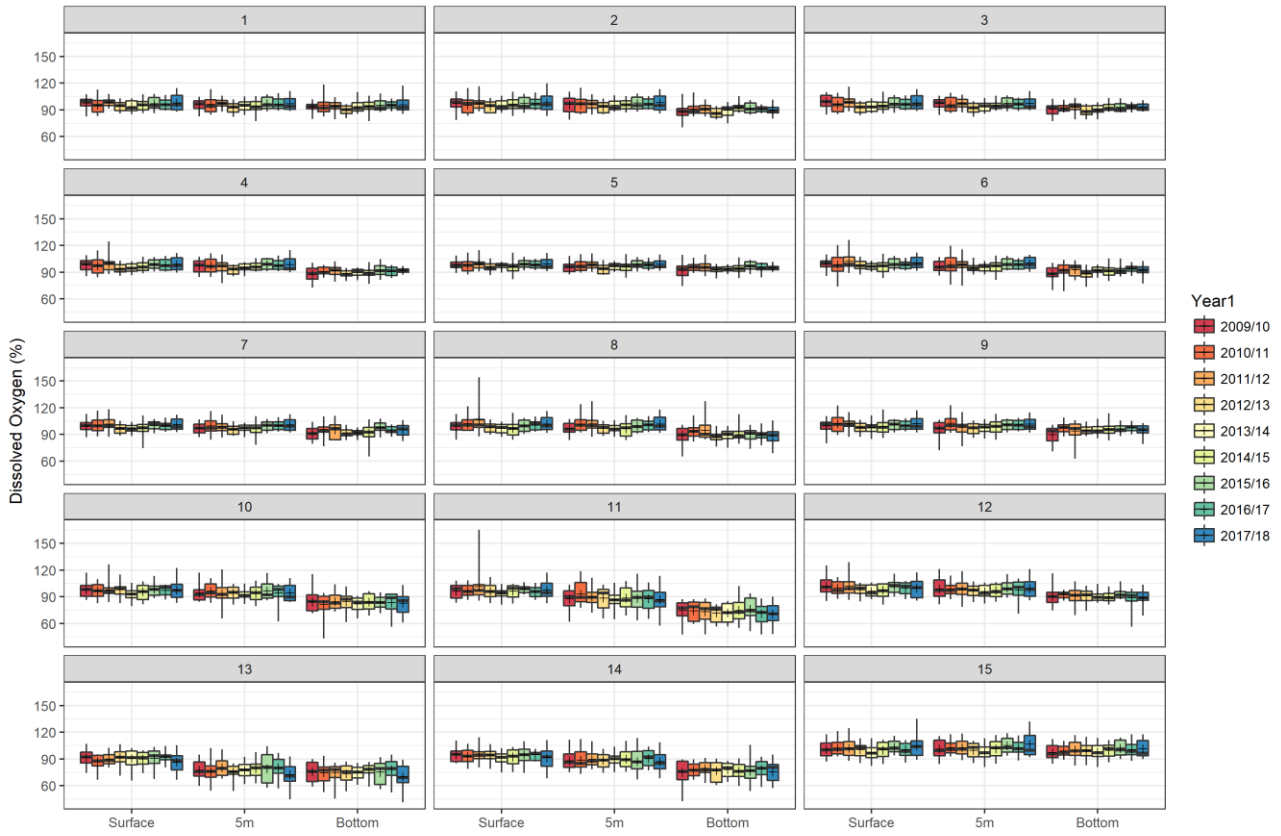

Surface
5m
Bottom
Dissolved Oxygen (mg/L)
12.5
10.0
7.5
5.0
2.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
MFDP
Control
D'Entre
Huon/PE

Appendix 5 Temporal variation in dissolved oxygen (% saturation) at three depths (Surface, 5m, Bottom) for each site including: (a) Monthly plots March 2009-May 2018; (b) Boxplots for 2009/10 – 2017/18 reporting years, based on March-February annual period; and (c) Boxplots for each site across all sampling years. Boxplots are defined by minimum, median and maximum values (lines); 20th and 80th percentiles (boxes); and means (crosshairs).

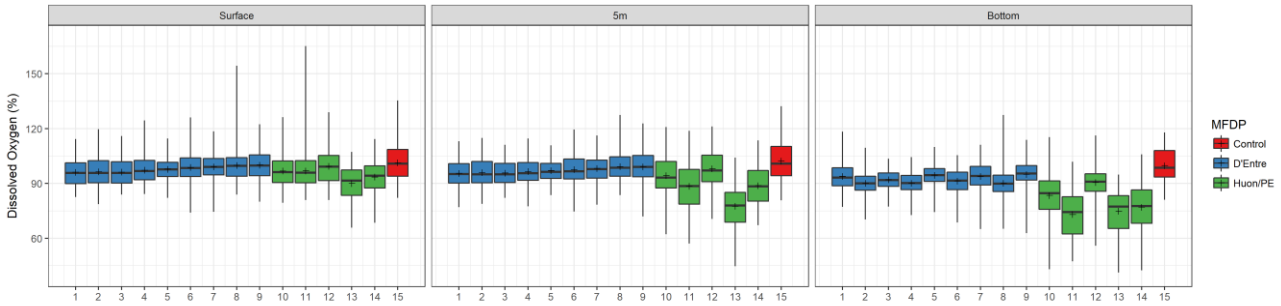
(a)



(b)

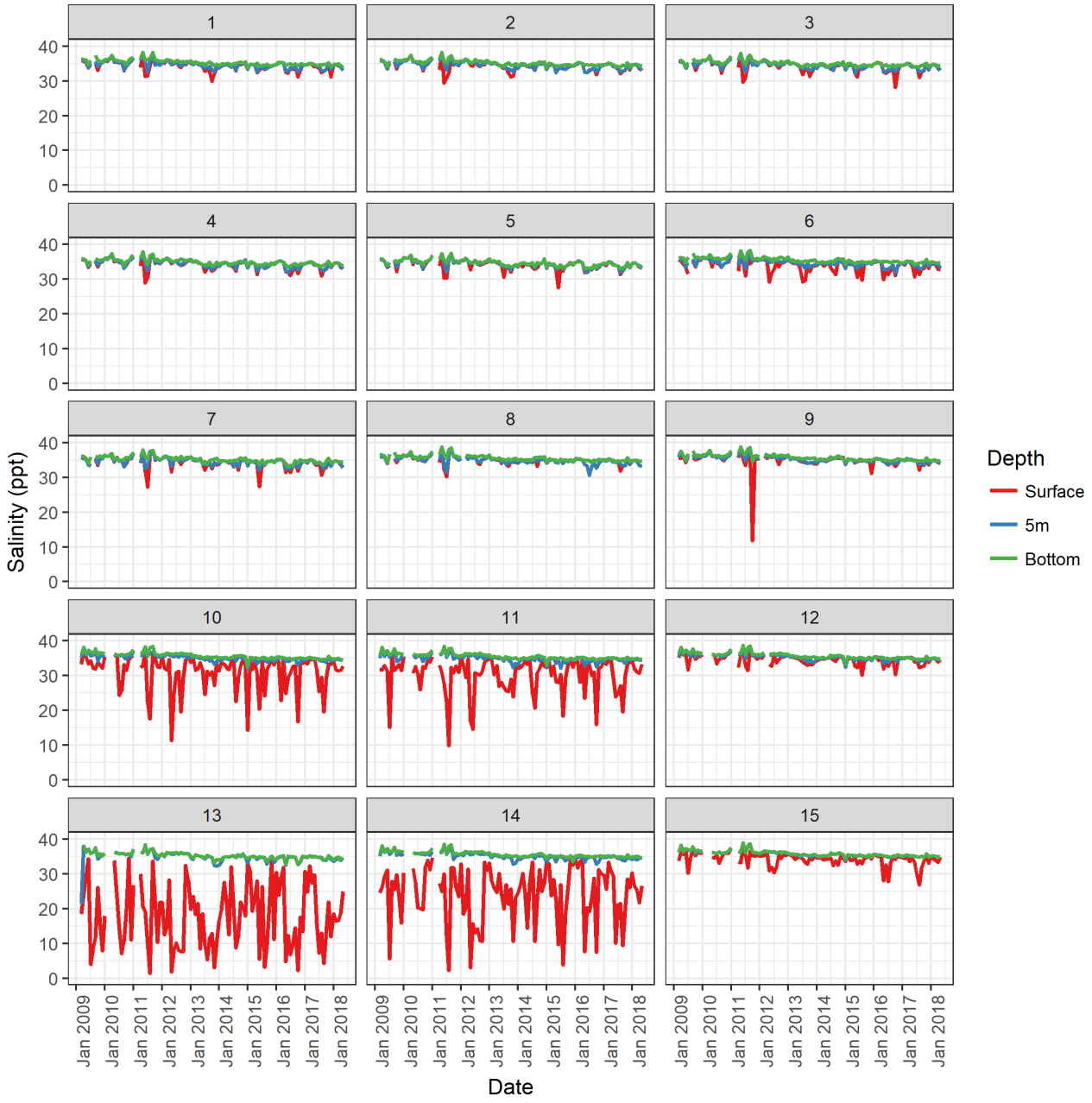

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
150
120
90
60
Dissolved Oxygen (%)
Surface
5m
Bottom
Year1
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18

(c)

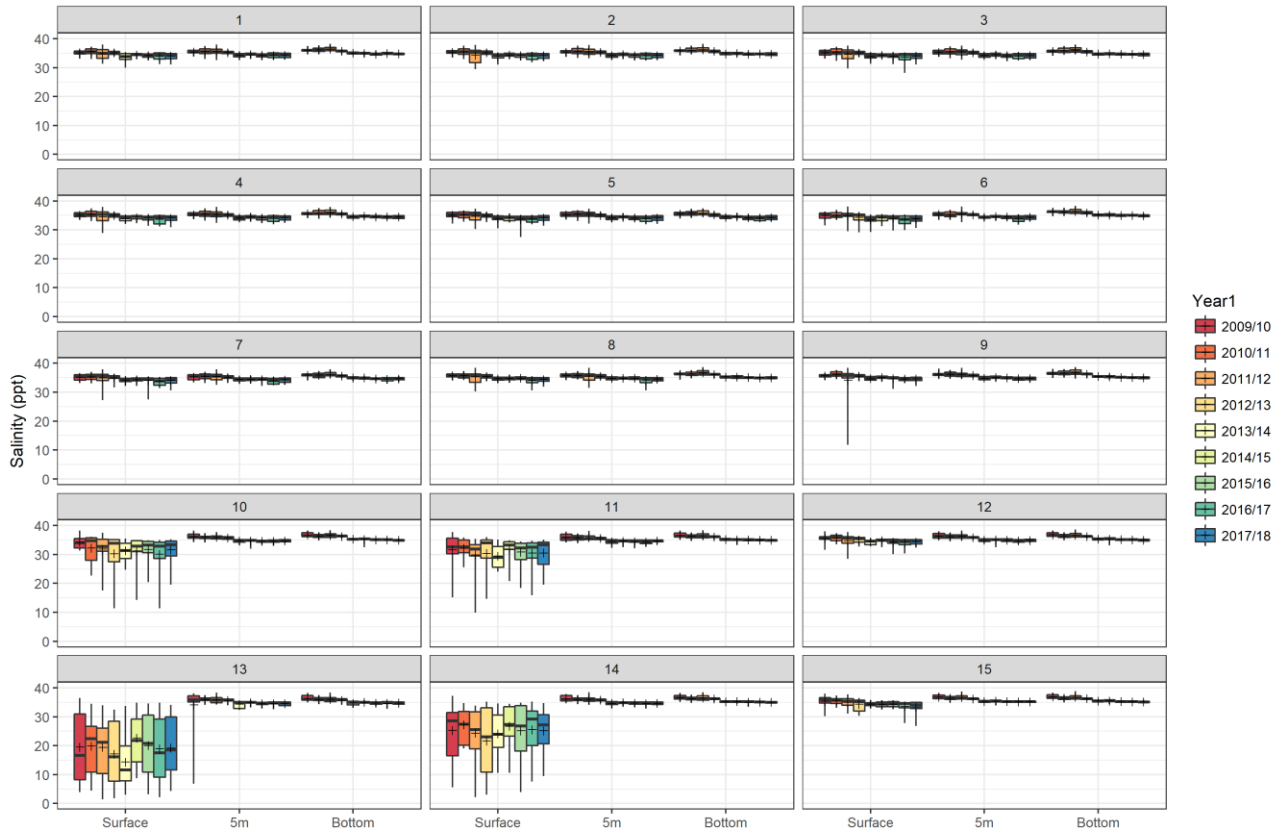

Surface
5m
Bottom
Dissolved Oxygen (%)
150
120
90
60
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
MFDP
Control
D'Entre
Huon/PE

Appendix 6 Temporal variation in salinity (ppt) at three depths (Surface, 5 m, Bottom) for each site including: (a) Monthly plots March 2009-May 2018; (b) Boxplots for 2009/10 – 2017/18 reporting years, based on March-February annual period; and (c) Boxplots for each site across all sampling years. Boxplots are defined by minimum, median and maximum values (lines); 20th and 80th percentiles (boxes); and means (crosshairs).

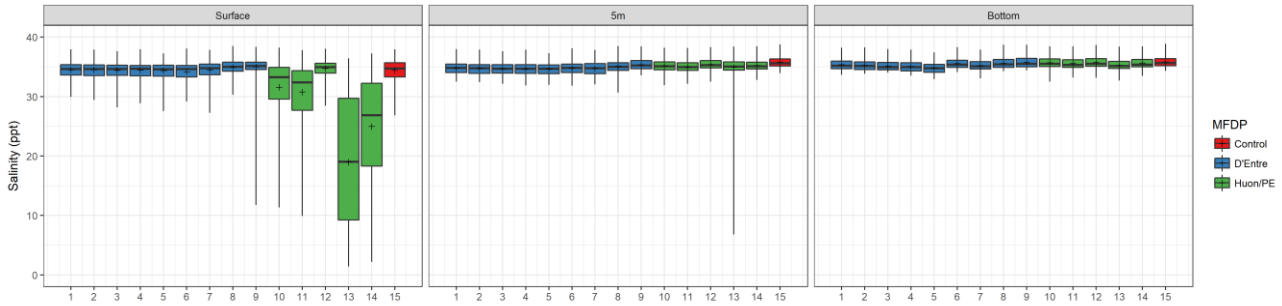
(a)



(b)

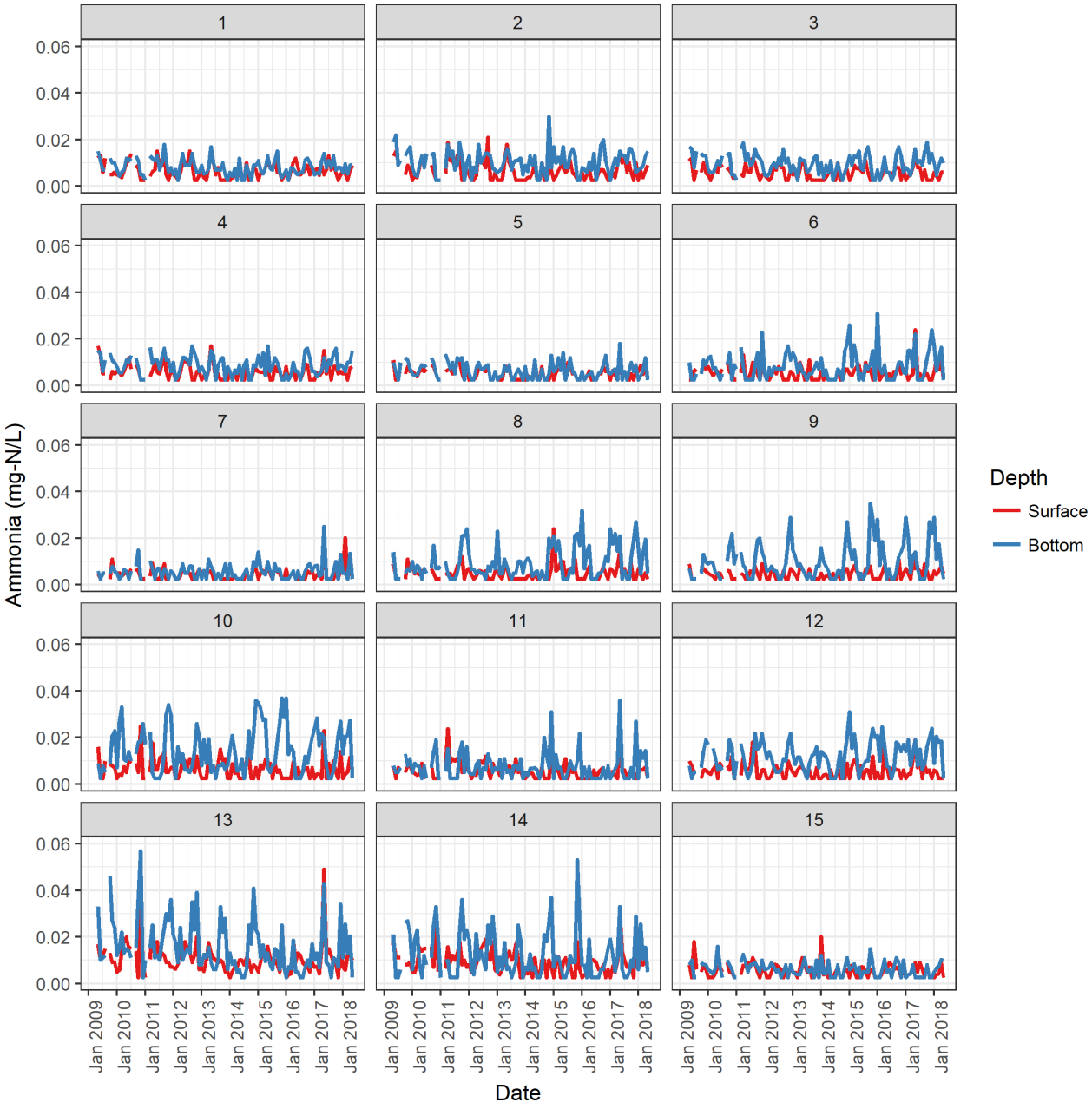

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Salinity (ppt)
0
10
20
30
40
Surface
5m
Bottom
Year1
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18

(c)

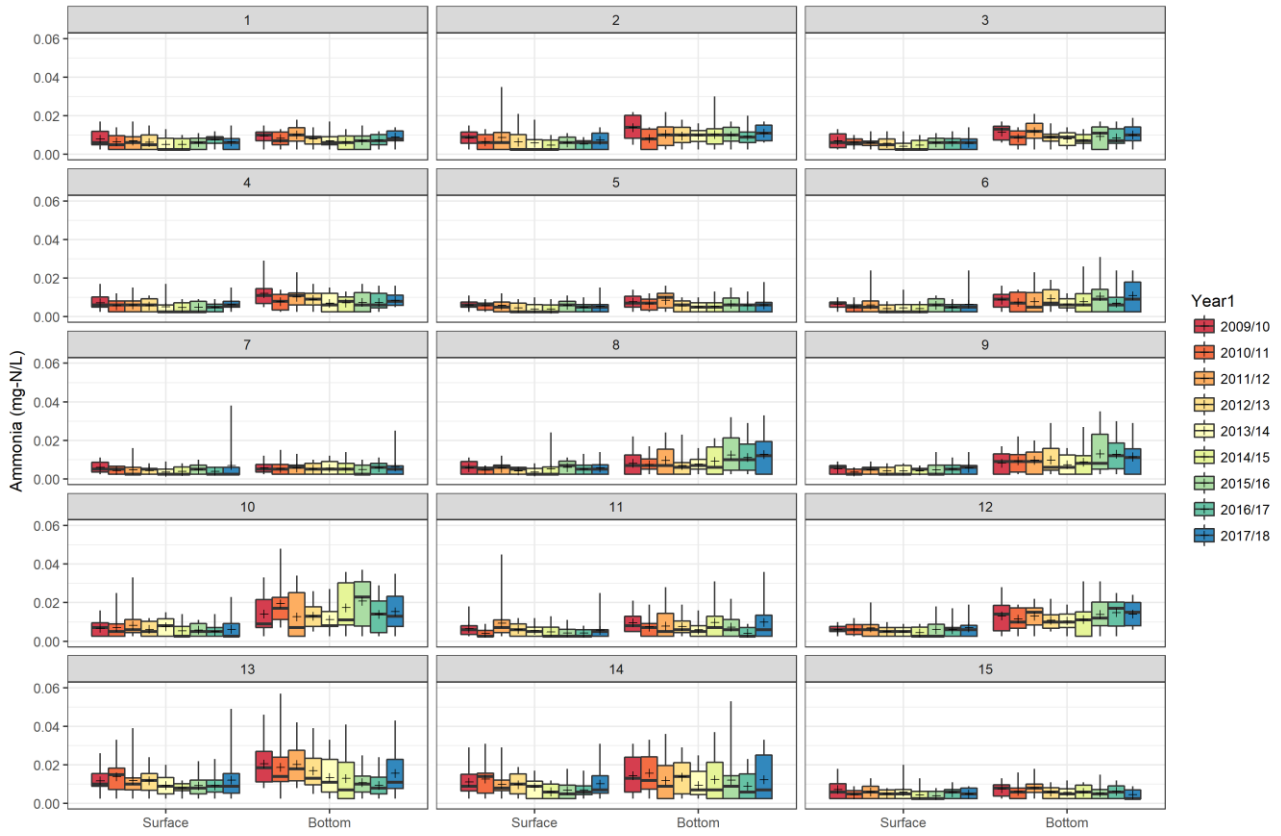

Surface
5m
Bottom
Salinity (ppt)
0
10
20
30
40
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
MFDP
Control
D'Entre
Huon/PE

Appendix 7 Temporal variation in ammonia (mg-N/L) at two depths (Surface, Bottom) for each site including: (a) Monthly plots March 2009-May 2018; (b) Boxplots for 2009/10 – 2017/18 reporting years, based on March-February annual period; and (c) Boxplots for each site across all sampling years. Boxplots are defined by minimum, median and maximum values (lines); 20th and 80th percentiles (boxes); and means (crosshairs).

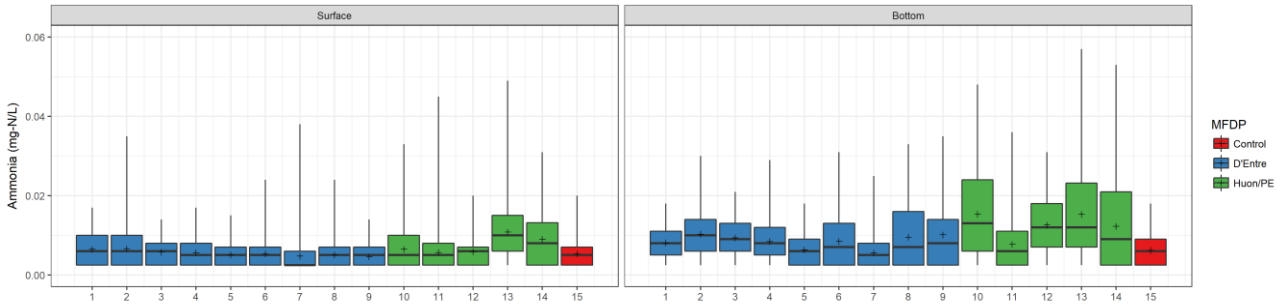
(a)



(b)

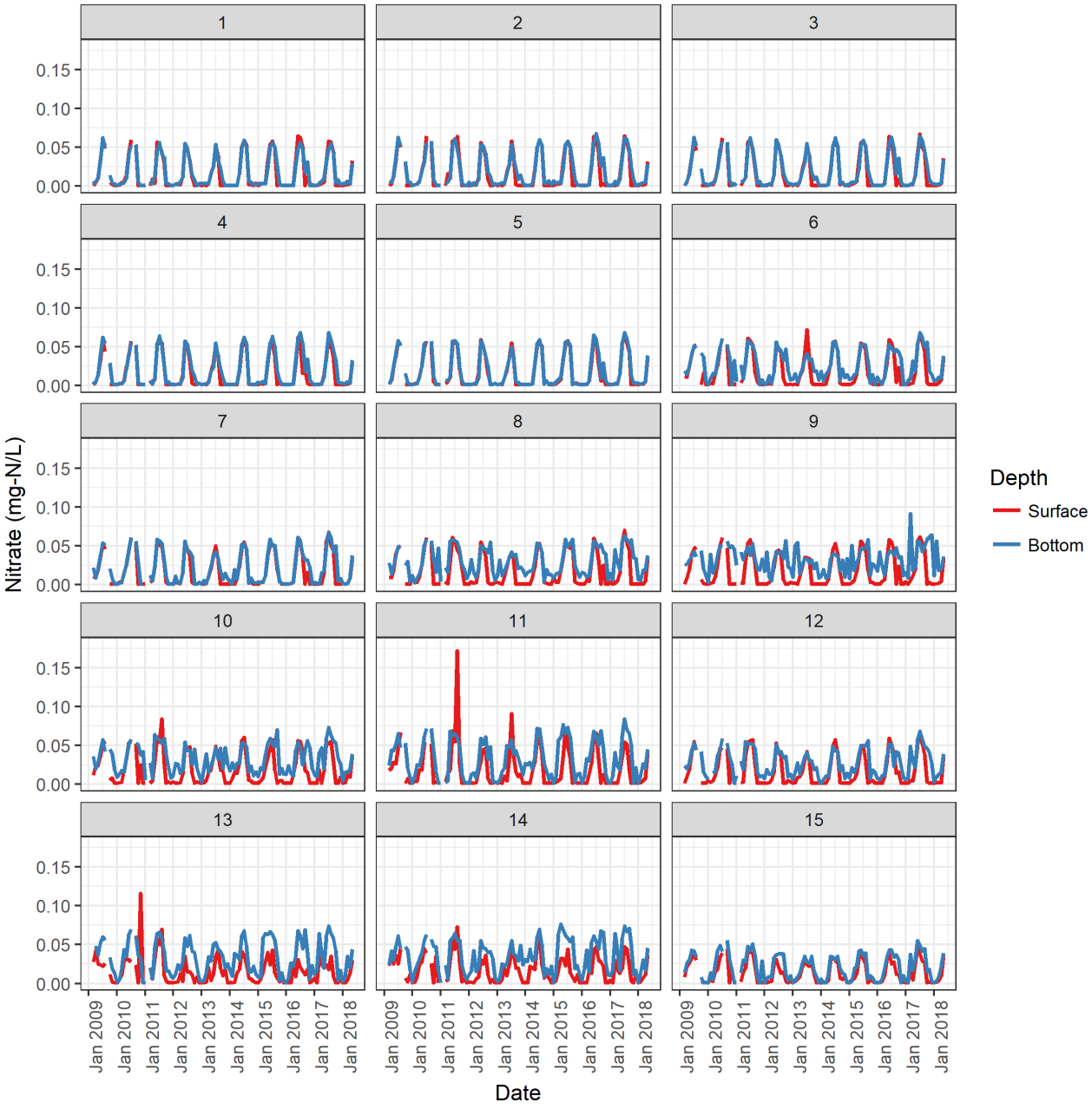

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Ammonia (mg-N/L)
0.00
0.02
0.04
0.06
Surface
Bottom
Year1
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18

(c)

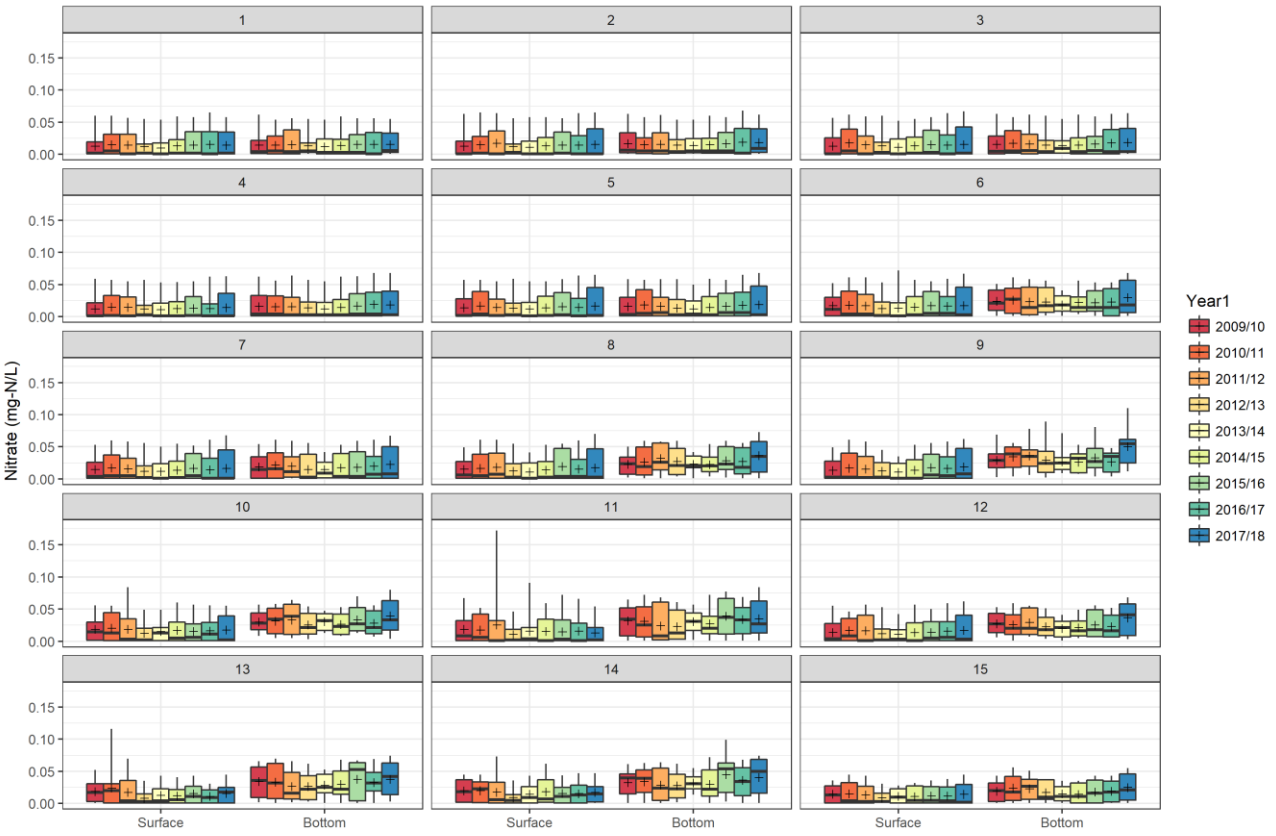

Surface
Bottom
Ammonia (mg-N/L)
0.00
0.02
0.04
0.06
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
MFDP
Control
D'Entre
Huon/PE

Appendix 8 Temporal variation in nitrate (mg-N/L) at two depths (Surface, Bottom) for each site including: (a) Monthly plots March 2009-May 2018; (b) Boxplots for 2009/10 – 2017/18 reporting years, based on March-February annual period; and (c) Boxplots for each site across all sampling years. Boxplots are defined by minimum, median and maximum values (lines); 20th and 80th percentiles (boxes); and means (crosshairs).

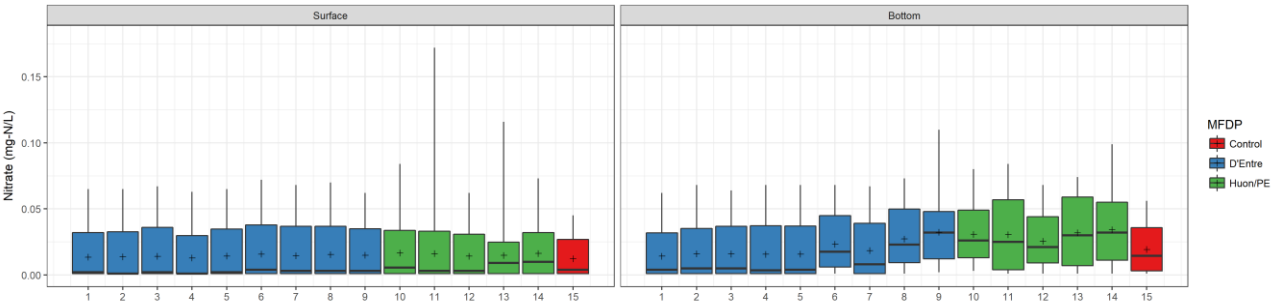
(a)



(b)


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Nitrate (mg-N/L)
0.15
0.10
0.05
0.00
Surface
Bottom
Year1
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18

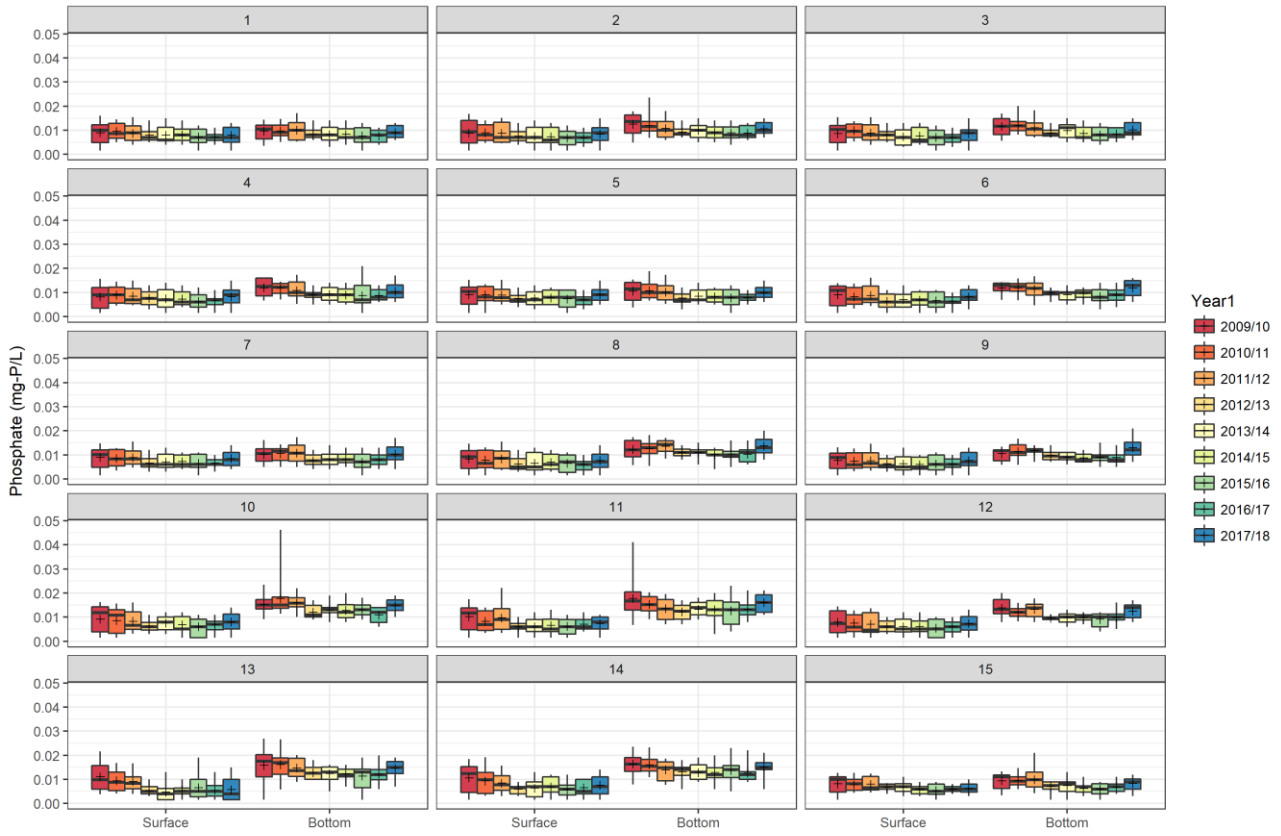
(c)


Surface
Bottom
Nitrate (mg-N/L)
0.15
0.10
0.05
0.00
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
MFDP
Control
D'Entre
Huon/PE

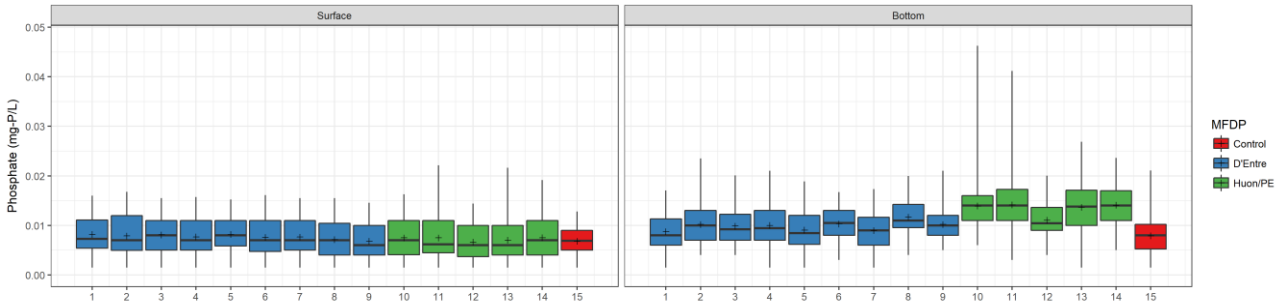
Appendix 9 Temporal variation in phosphate (mg-P/L) at two depths (Surface, Bottom) for each site including: (a) Monthly plots March 2009-May 2018; (b) Boxplots for 2009/10 – 2017/18 reporting years, based on March-February annual period; and (c) Boxplots for each site across all sampling years. Boxplots are defined by minimum, median and maximum values (lines); 20th and 80th percentiles (boxes); and means (crosshairs).

(a)

(b)

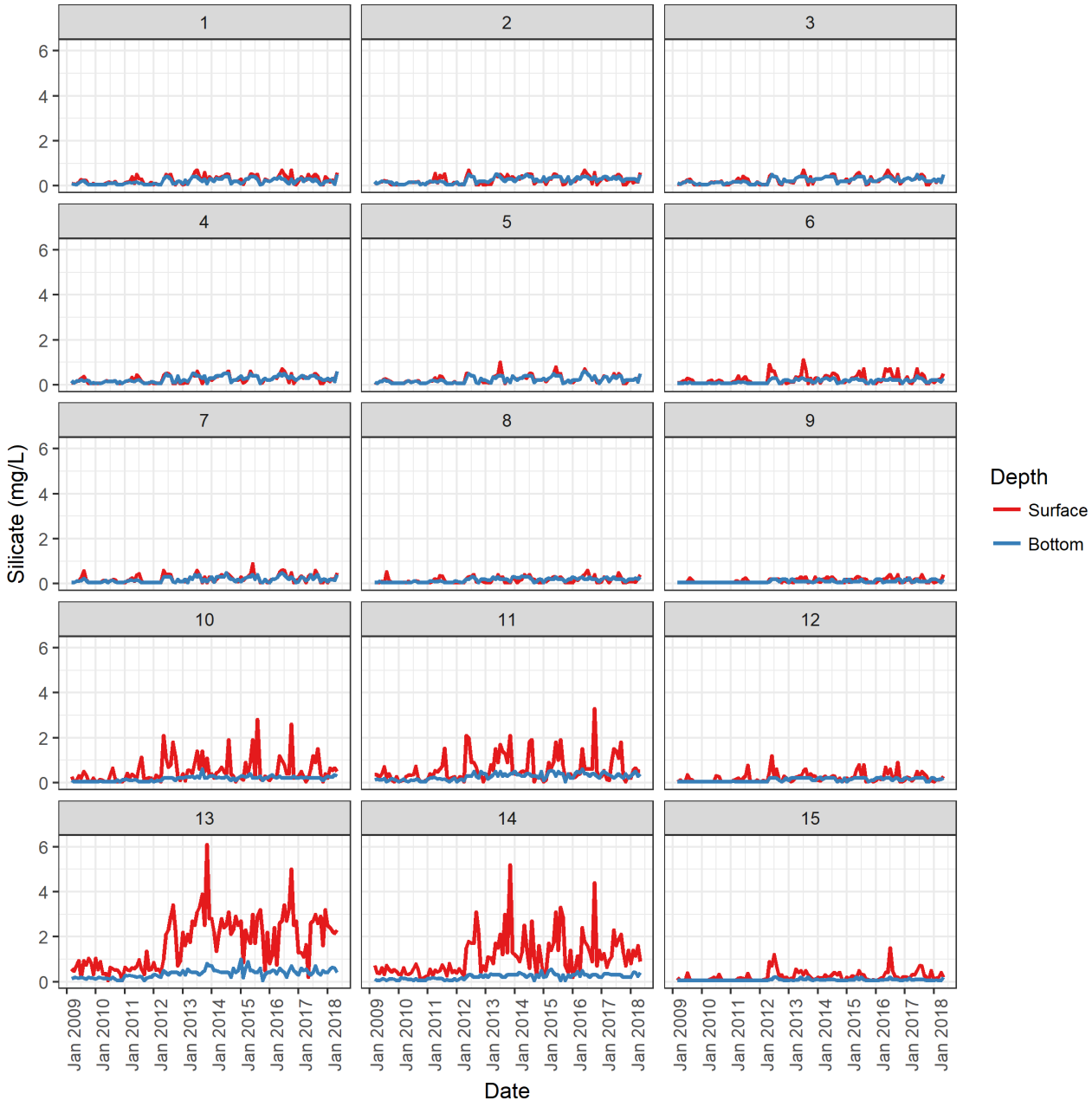

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Phosphate (mg-P/L)
0.05
0.04
0.03
0.02
0.01
0.00
Surface
Bottom
Year1
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18

(c)

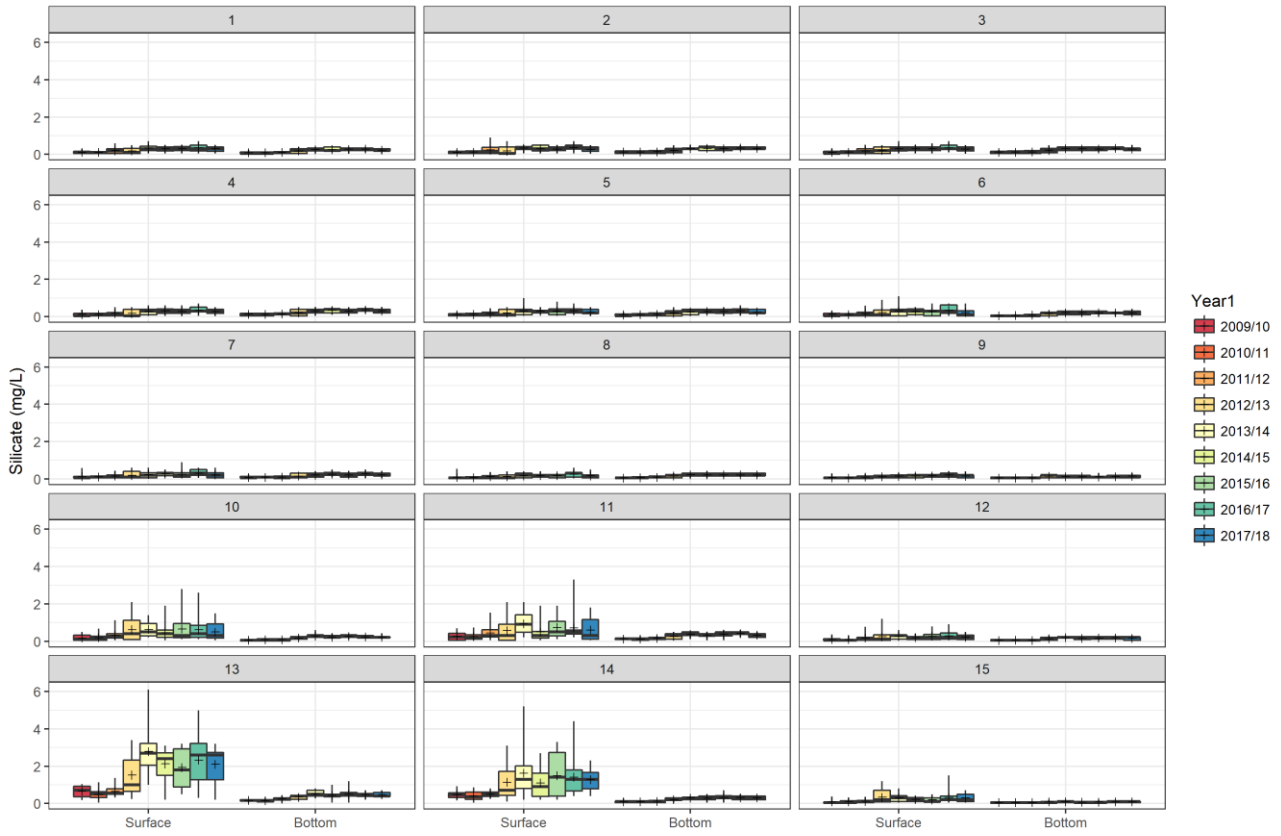

Surface
Bottom
Phosphate (mg-P/L)
0.05
0.04
0.03
0.02
0.01
0.00
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
MFDP
Control
D'Entre
Huon/PE

Appendix 10 Temporal variation in silicate (mg/L) at two depths (Surface, Bottom) for each site including: (a) Monthly plots March 2009-May 2018; (b) Boxplots for 2009/10 – 2017/18 reporting years, based on March-February annual period; and (c) Boxplots for each site across all sampling years. Boxplots are defined by minimum, median and maximum values (lines); 20th and 80th percentiles (boxes); and means (crosshairs).

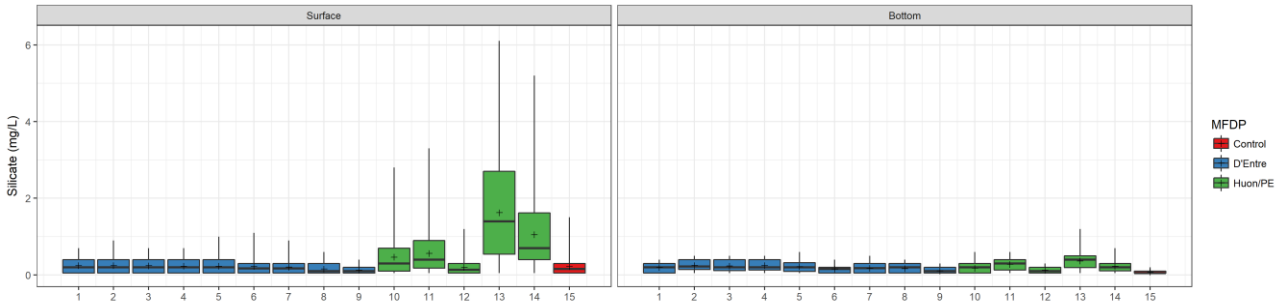
(a)



(b)

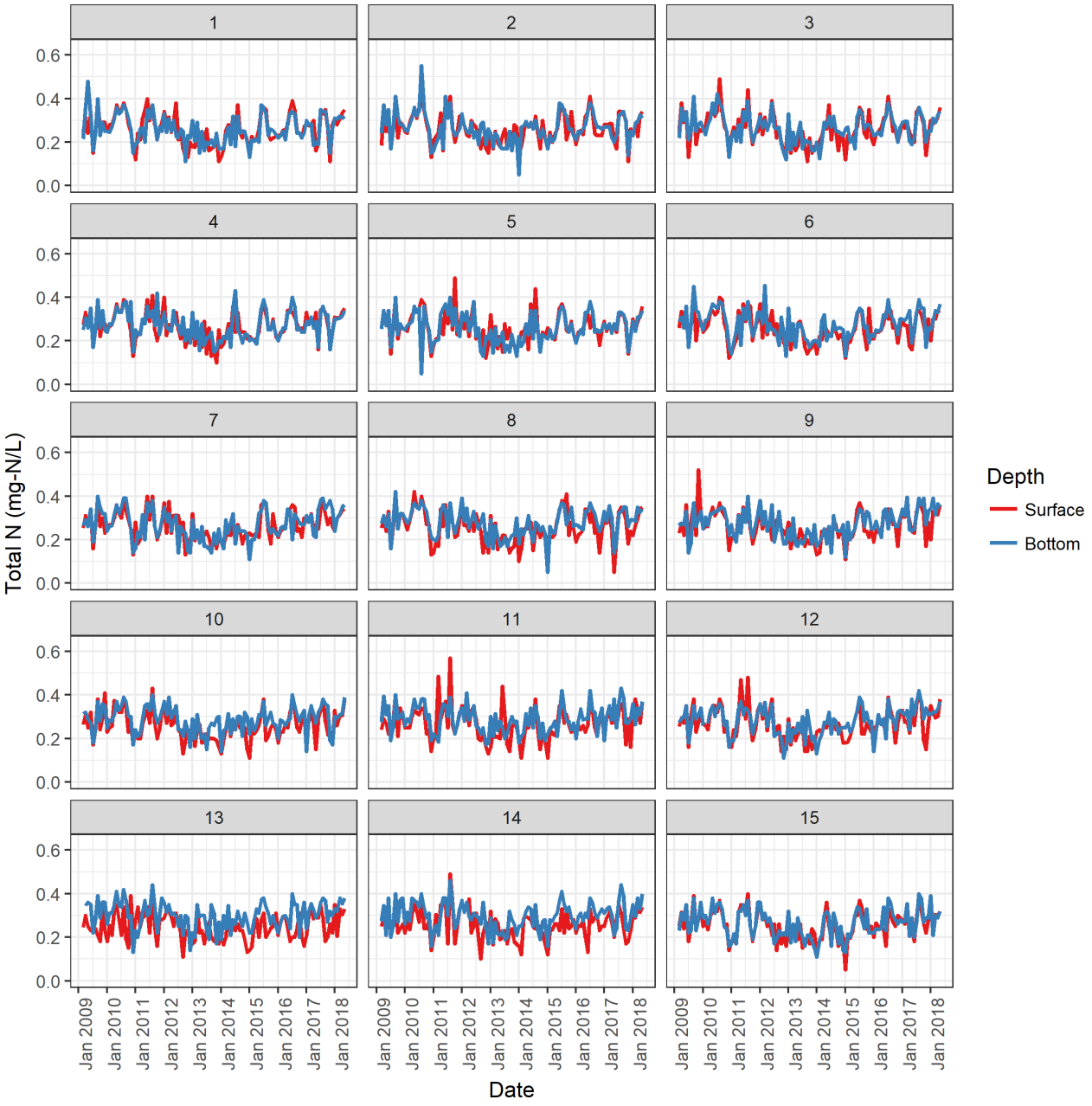

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Silicate (mg/L)
Surface
Bottom
Year1
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18

(c)

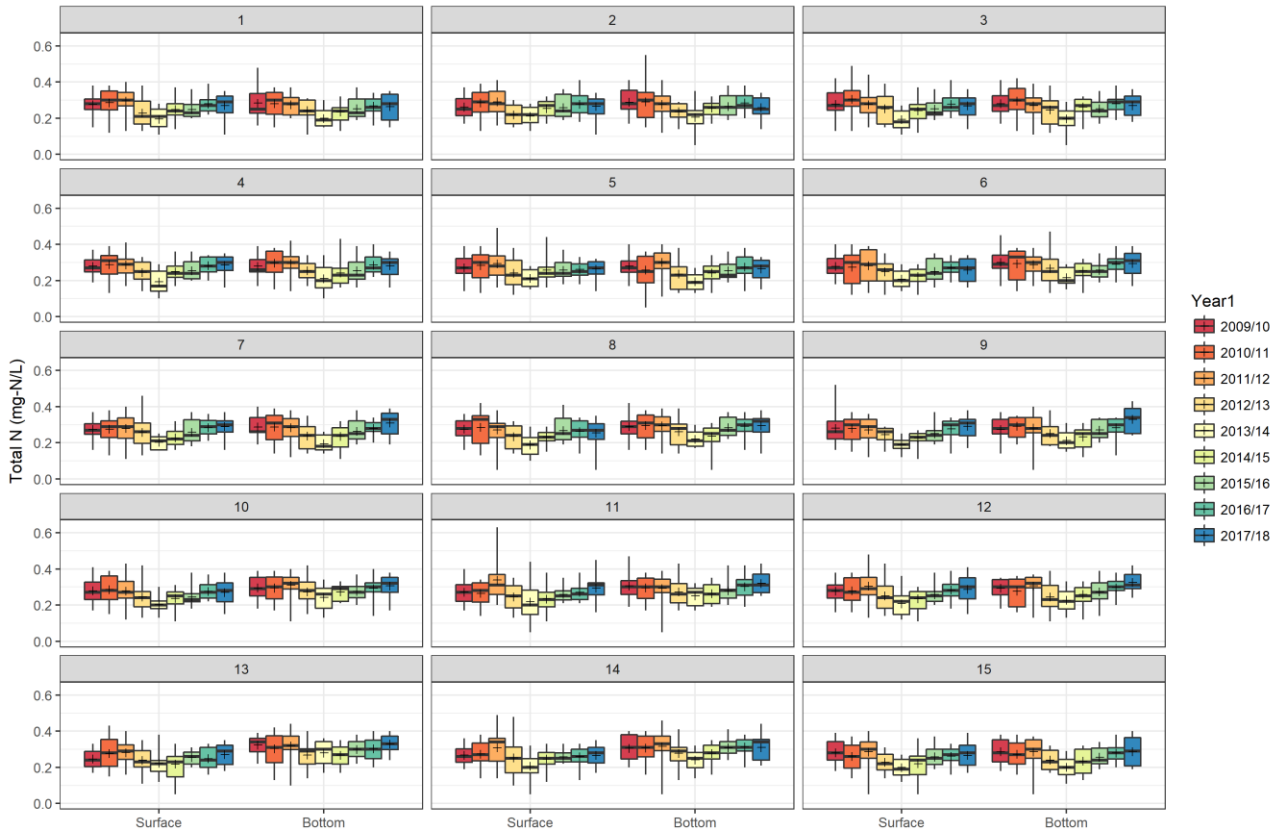

Surface
Bottom
Silicate (mg/L)
MFDP
Control
D'Entre
Huon/PE

Appendix 11 Temporal variation in total nitrogen (mg-N/L) at two depths (Surface, Bottom) for each site including: (a) Monthly plots March 2009-May 2018; (b) Boxplots for 2009/10 – 2017/18 reporting years, based on March-February annual period; and (c) Boxplots for each site across all sampling years. Boxplots are defined by minimum, median and maximum values (lines); 20th and 80th percentiles (boxes); and means (crosshairs).

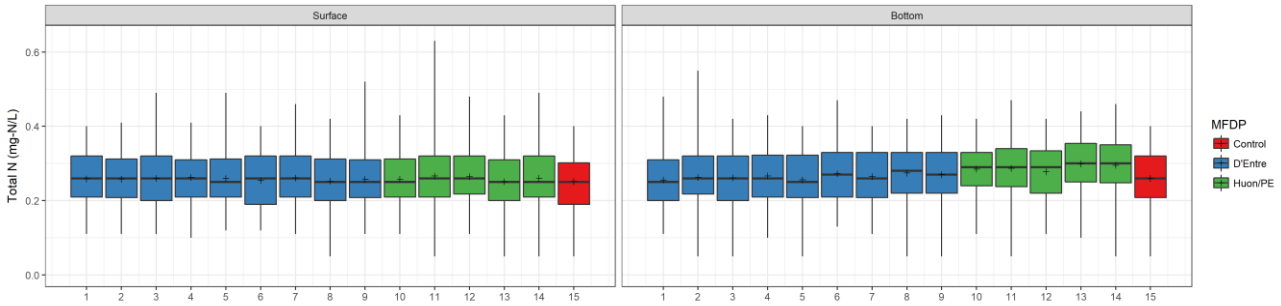
(a)



(b)

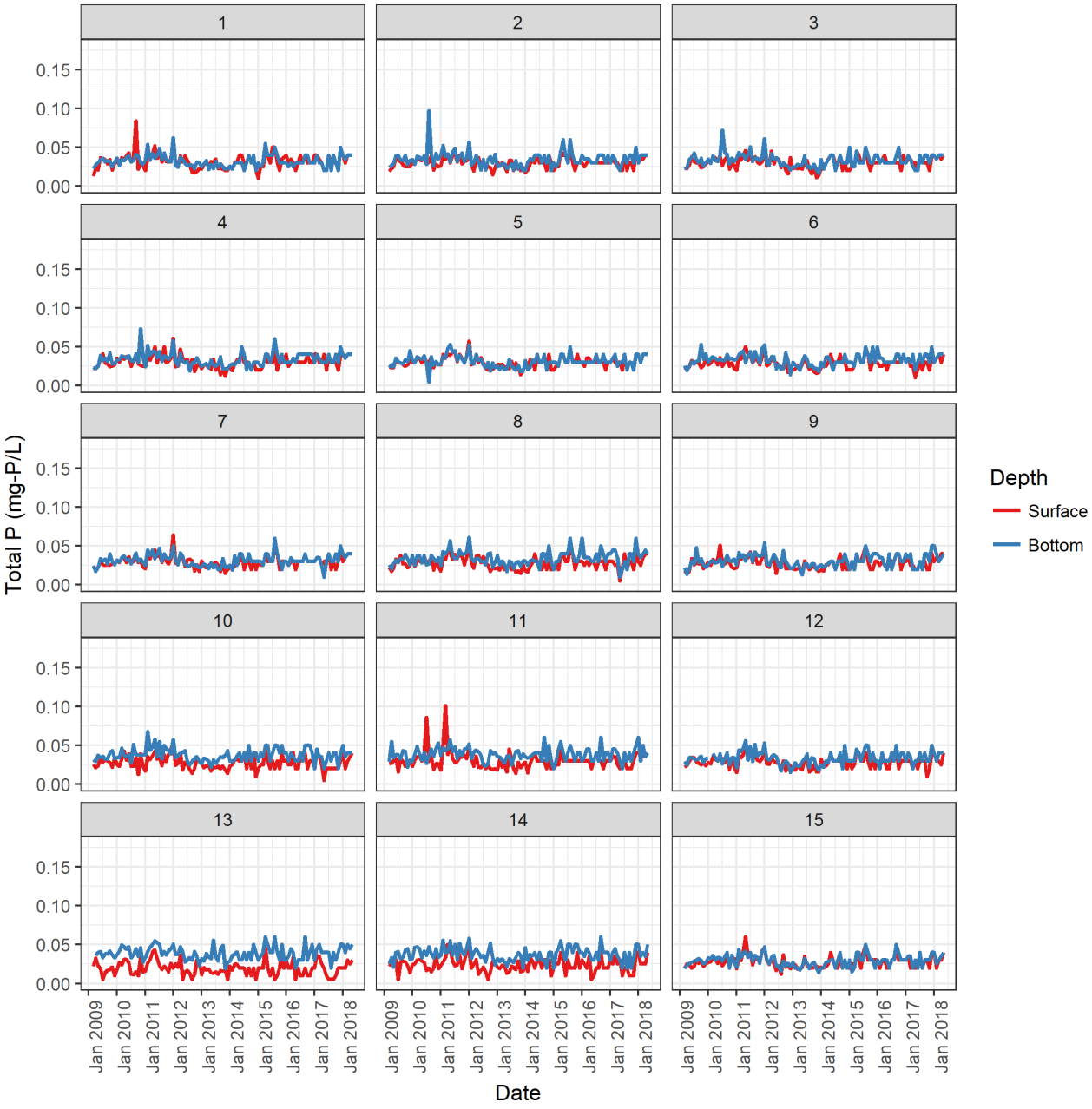

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Total N (mg-N/L)
0.0
0.2
0.4
0.6
Surface
Bottom
Year1
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18

(c)

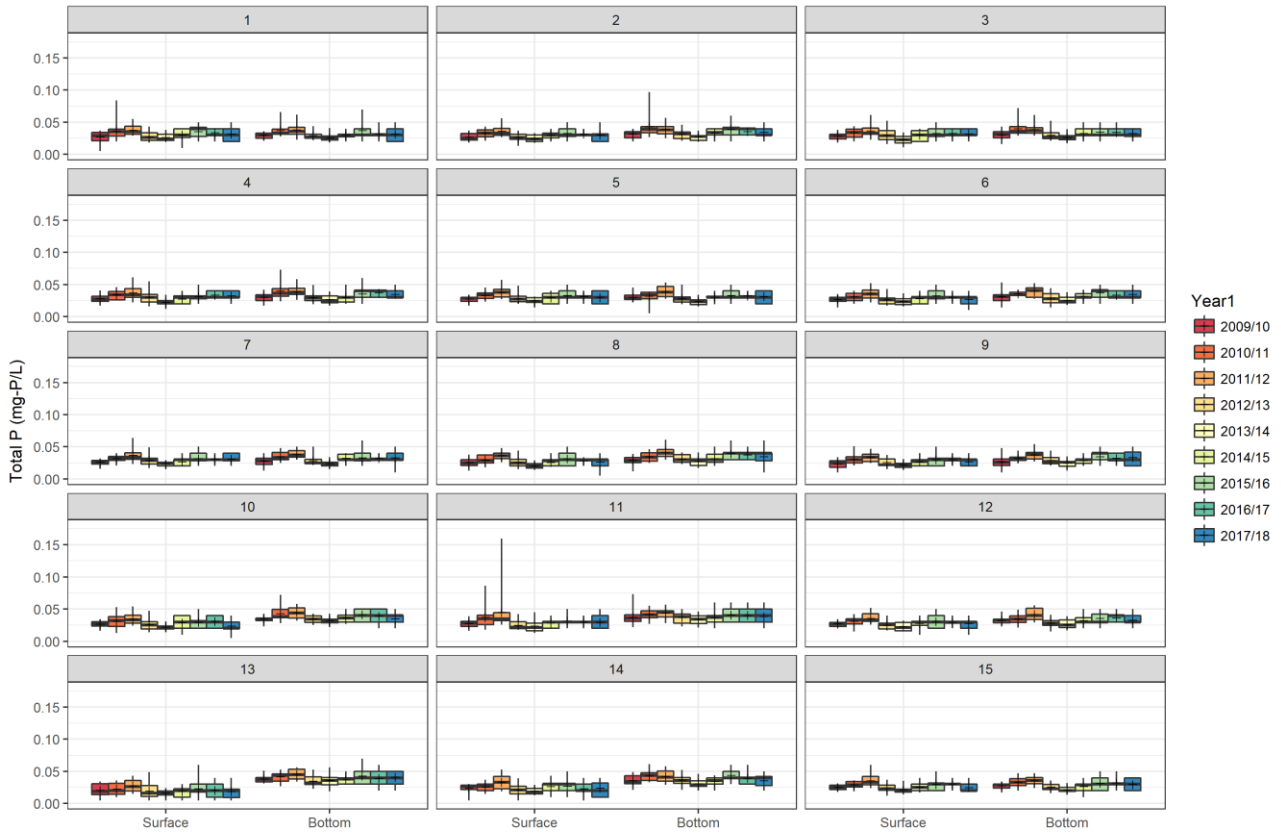

Surface
Bottom
Total N (mg-N/L)
0.0
0.2
0.4
0.6
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
MFDP
Control
D'Entre
Huon/PE

Appendix 12 Temporal variation in total phosphorous (mg-P/L) at two depths (Surface, Bottom) for each site including: (a) Monthly plots March 2009-May 2018; (b) Boxplots for 2009/10 – 2017/18 reporting years, based on March-February annual period; and (c) Boxplots for each site across all sampling years. Boxplots are defined by minimum, median and maximum values (lines); 20th and 80th percentiles (boxes); and means (crosshairs).

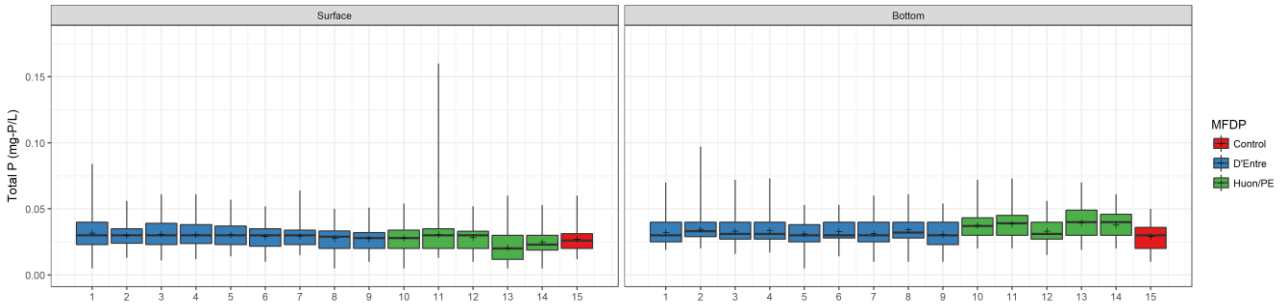
(a)



(b)

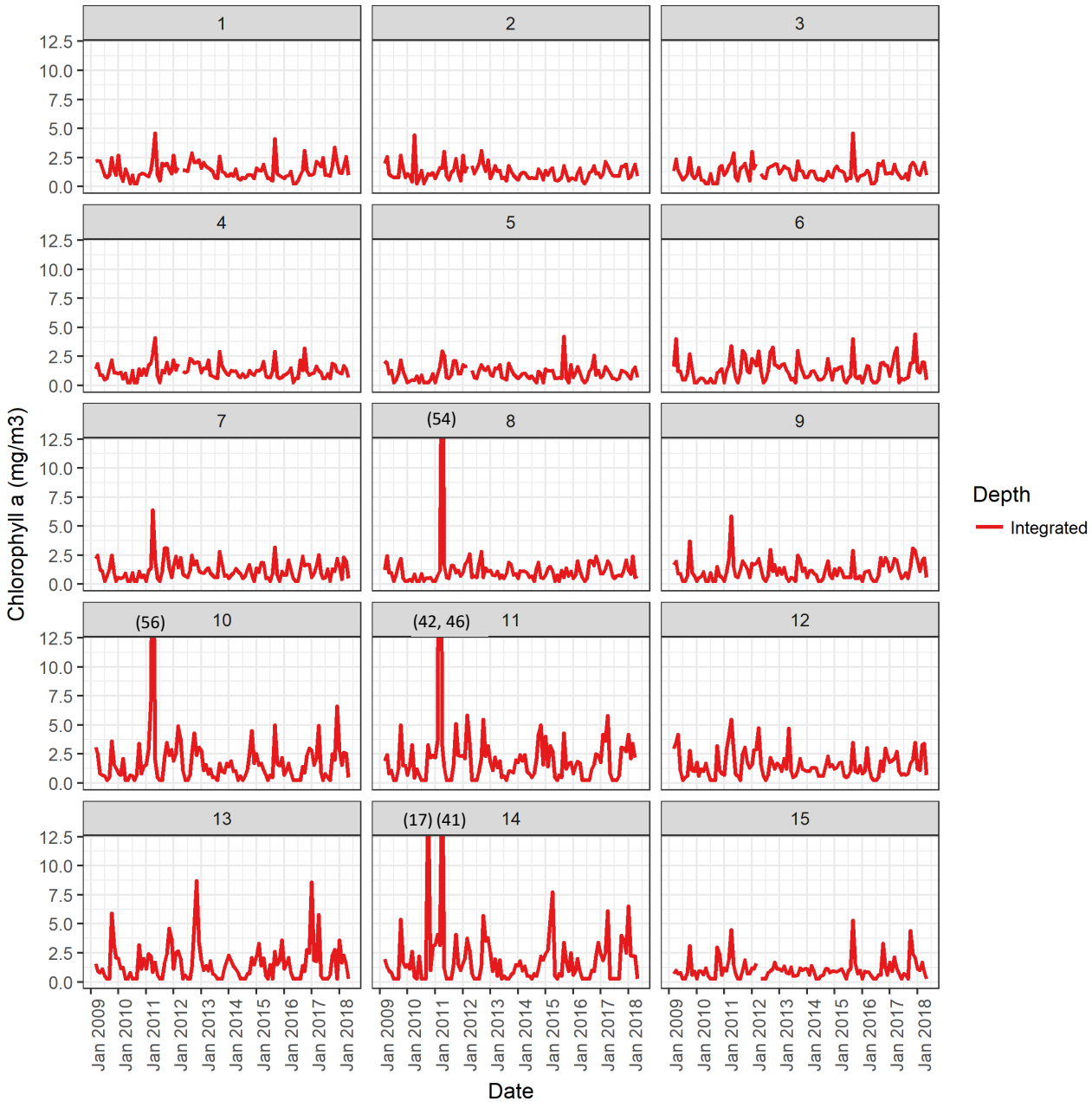

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Total P (mg-P/L)
0.15
0.10
0.05
0.00
Surface
Bottom
Year1
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18

(c)

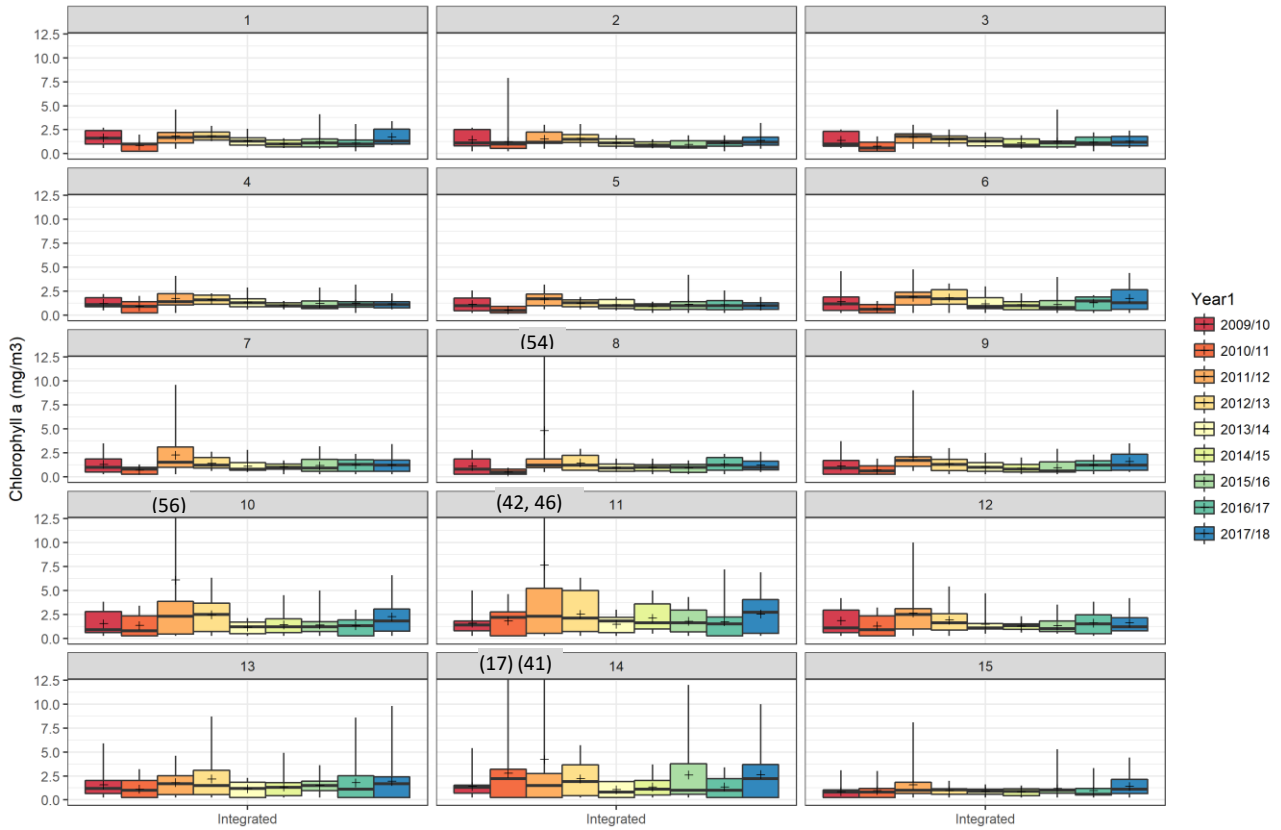

Surface
Bottom
Total P (mg-P/L)
0.15
0.10
0.05
0.00
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
MFDP
Control
D'Entre
Huon/PE

Appendix 13 Temporal variation in chlorophyll *a* (mg/m^3) based on 12 m depth integrated sample, including: (a) Monthly plots March 2009-May 2018; (b) Boxplots for 2009/10 – 2017/18 reporting years, based on March-February annual period; and (c) Boxplots for each site across all sampling years. Boxplots are defined by minimum, median and maximum values (lines); 20th and 80th percentiles (boxes); and means (crosshairs). Figures for chlorophyll a have been scaled from 0 to 12 mg/m^3 to highlight temporal trends and to facilitate comparisons with the 2017/18 period. Outliers exceeding 12.5 mg/m^3 are included in parentheses at the top of each relevant panel.

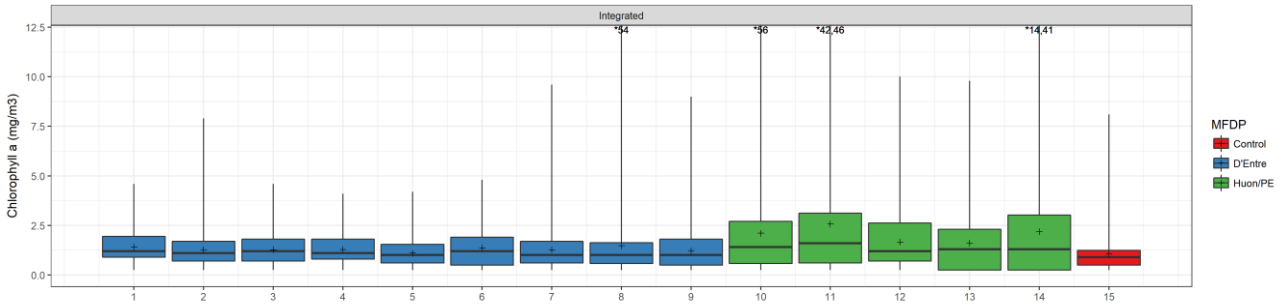
(a)



(b)


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
(54)
(56)
(42, 46)
(17) (41)
Chlorophyll a (mg/m3)
Integrated
Year1
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18

(c)


Integrated
Chlorophyll a (mg/m3)
*54
*56
*42,46
*14,41
MFDP
Control
D'Entre
Huon/PE

Appendix 14 Harmful phytoplankton species

List of harmful phytoplankton species. Harmful algal species included those with demonstrated impacts on aquaculture, human health and the environment. The harmful species considered in the analysis species included species identified from the literature (Hallegraeff 2002), along with input from recognised phytoplankton experts.

Species		
Alexandrium minutum	*Gymnodinium spp.*	*Prorocentrum lima*
Alexandrium ostenfeldii	*Heterosigma akashiwo*	*Prorocentrum minimum*
Alexandrium tamarense	*Heterosigma carterae*	*Prorocentrum rathymum*
Alexandrium pseudogonyaulax	*Karenia brevis*	*Prorocentrum spp.*
Alexandrium spp.	*Karenia umbella*	*Protoceratium reticulatum*
Chaetoceros convolutus	*Karenia cf*	*Prymnesium parvuum*
Chaetoceros concavicorne	*Karenia mikimotoi*	*Pseudo-nitzschia australis*
Chatonella antiqua	*Karenia spp.*	*Pseudo-nitzschia multiseries*
Chatonella globosa	*Karlodinium micrum*	*Pseudo-nitzschia pseudode*
Chatonella marina	*Noctiluca scintillans*	*Pseudo-nitzschia pungens*
Chatonella spp.	*Ostreopsis lenticularis*	*Pyrodinium bahamese*
Chrysochromulina polylepis	*Ostreopsis siamensis*	*Rhizosolenia spp.*
Chrysochromulina spp.	*Phaeocystis spp.*	*Scrippsiella trochoidea*
Cochlodinium spp.	*Phaeocystis pouchetii*	*Thalassiosira spp.*
Dictyocha speculum	*Phalacroma rotundatum*	
Dinophysis acuminata		
Dinophysis fortii		
Gambierdiscus toxicus		
Gymnodinium catenatum		

Appendix 15 Conversion of ammonia baseline levels from CSIRO to AST data. Details below provided by IMAS.

Rationale

The initial analysis of dissolved nutrients for the BEMP was undertaken by CSIRO, and the draft baselines and performance indicators were based on CSIRO measurements. Since June 2012 AST has been contracted to analyse the dissolved nutrients. It is known from an interlaboratory comparisons that there is some discrepancy in the measurement of ammonia concentration between the laboratories. Fortunately, AST were contracted to measure total N and total P for the entire BEMP monitoring period and, when measuring total N, also measured ammonia concentration and provisioned this data for the current study. As such, ammonia data were available from both AST and CSIRO for the first 51 BEMP surveys (June 2010 – May 2012). Using these data, a linear model was developed to convert the baseline ammonia estimates proposed by Volkman *et al.* (2009) (i.e. based on CSIRO measured ammonia) to values that align with AST measured ammonia.

Correction for inter-laboratory variation in ammonia measurement

As AST were able to provide ammonia concentrations for the first 51 BEMP campaigns, when technically CSIRO were contracted to do so, it was not necessary to correct for inter-laboratory variation in ammonia concentration reported by Eriksen (2009). It was, however, necessary to correct for this difference to allow ammonia to be compared against the baselines and triggers that were proposed by CSIRO using ammonia measurements undertaken in their laboratories (Thompson *et al.*, 2008).

Firstly, units were converted from µM-N to mg/l-N (hereafter abbreviated to mg/l) using its molecular weight (14.0067 µ). To confirm the mean difference of 0.21 µM-N between CSIRO and AST determined by Eriksen (2009), data from surveys 1– 51 when the laboratories were measuring ammonia/ammonium concurrently, were compared. A linear relationship between the data sets was identified and modelled (Figure A; Table A). The model provided a relatively good fit (R^2 = 0.73). This indicates that the difference between the two laboratories is dependent on concentration, and that using the modelled relationship would be more accurate method for conversion than the offset of 0.21 µM-N determined by Eriksen (2009); this likely reflects the much larger data set now available for the inter-laboratory comparison.

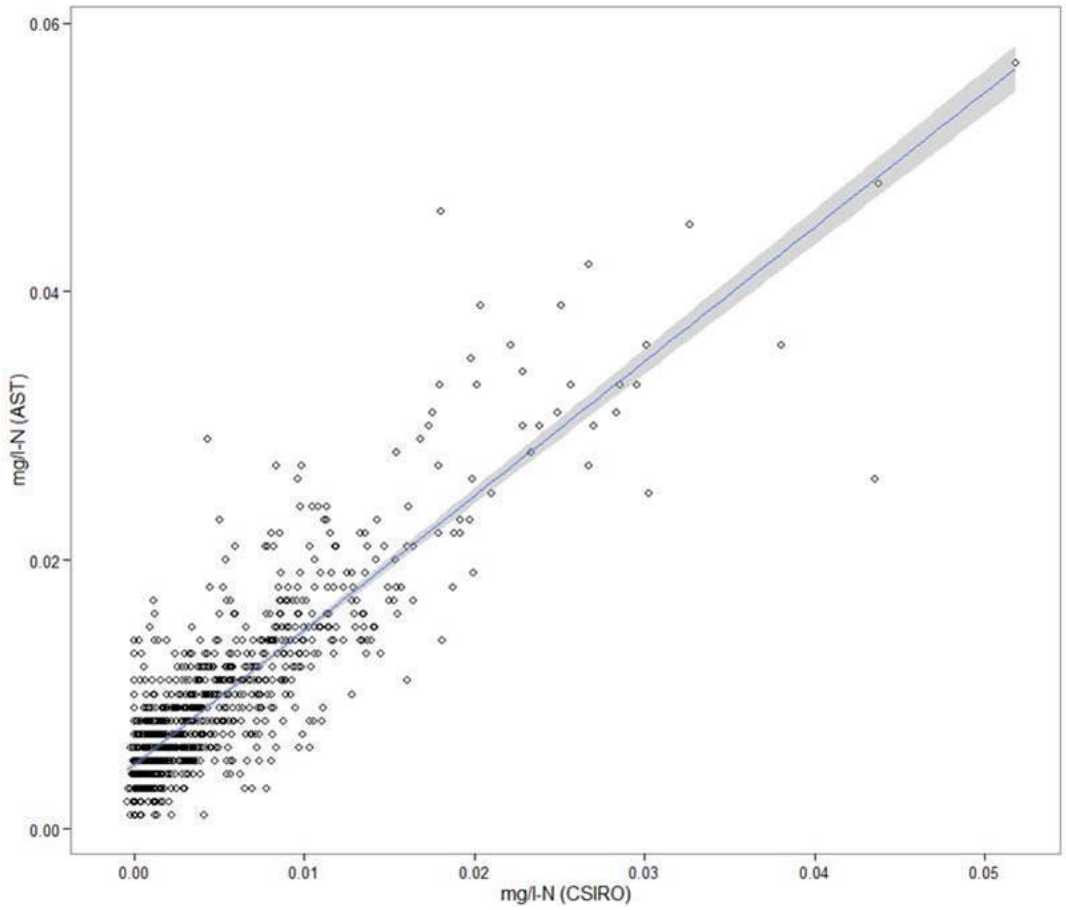


Figure A: Linear relationship between CSIRO and AST ammonia/ammonium N concentration. Blue line indicates the linear relationship; shaded area represents 95% confidence intervals of the model.

Table A: Linear model of CSIRO and AST ammonia/ammonium concentration to facilitate the conversion of CSIRO data to align with the latter AST data.

Summary statistics are as follows: residual standard error = 0.003428 on 1086 degrees of freedom, multiple R-squared = 0.7343, adjusted R-squared = 0.7373, F-statistic = 3004 on 1 and 1086 DF, p-value = <0.001.

Coefficient	Estimate	Std. error	t-value	*p*
(Intercept)	0.0047481	0.0001298	36.57	<0.001
AST ammonia	1.0017627	0.0182764	54.81	<0.001

Appendix 16 Quality Assurance: Nutrients.

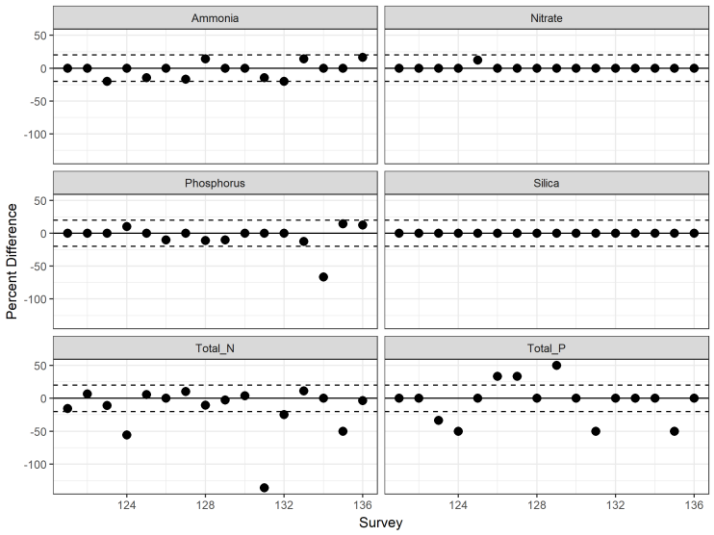


Figure A16.1: Percent difference between duplicate samples and field samples from <u>surface</u> waters for six analytes measured between March 2017 (Survey 121) and March 2018 (Survey 136). The dashed line represents a 20% difference. Calculated as *100 – ((Field Result / Duplicate) * 100).*

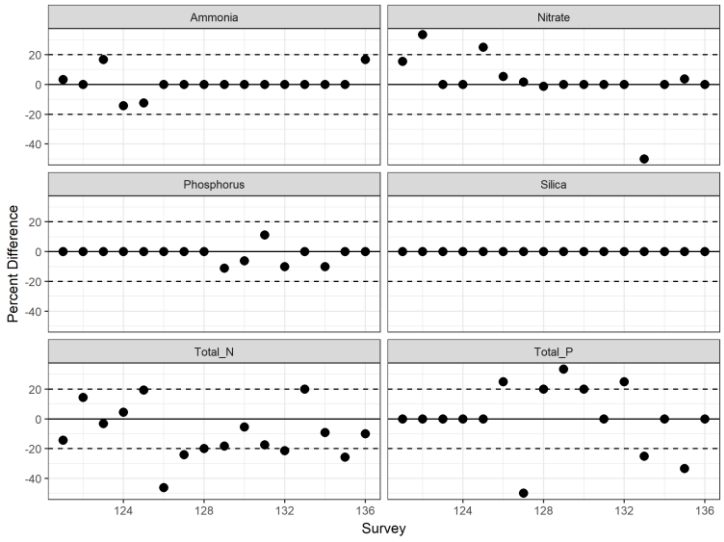


Figure A16.2: Percent difference between duplicate samples and field samples from <u>bottom</u> waters for six analytes measured between March 2017 (Survey 121) and March 2018 (Survey 136). The dashed line represents a 20% difference. Calculated as *100 – ((Field Result / Duplicate) * 100).*

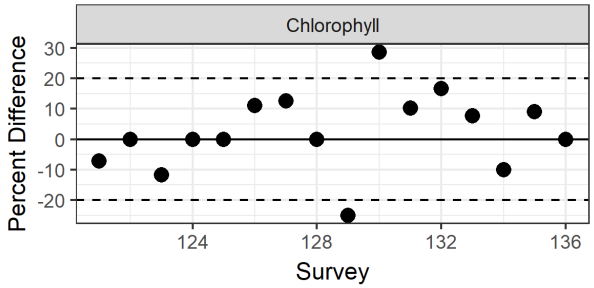


Figure A16.3: Percent difference between duplicate samples and field samples from integrated waters for chlorophyll *a* measured between March 2017 (Survey 121) and March 2018 (Survey 136). The dashed line represents a 20% difference. Calculated as *100 – ((Field Result / Duplicate) * 100).*

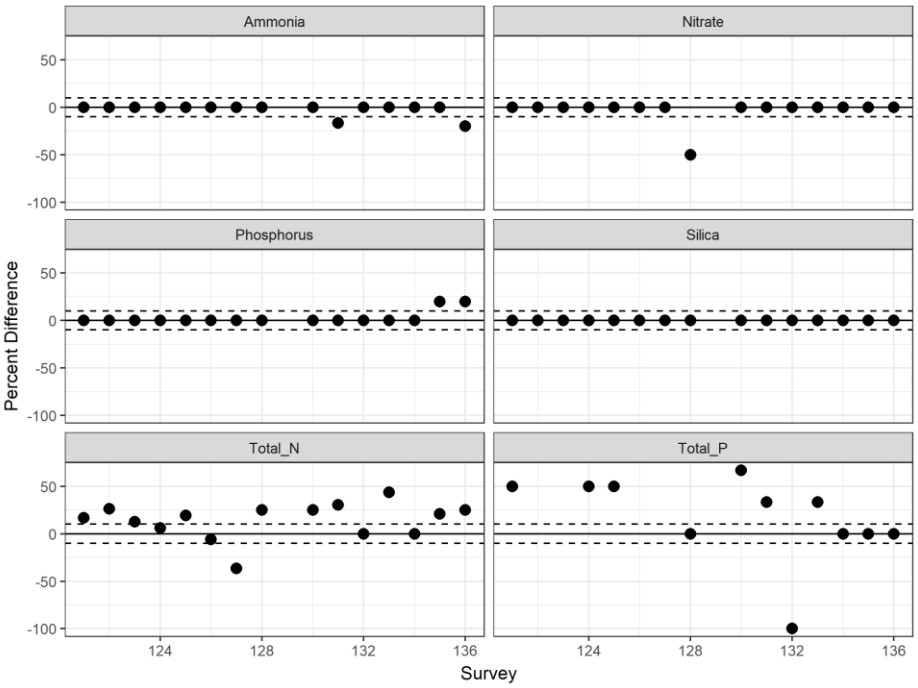


Figure A16.4: Percent difference between trip blanks and field blanks for six analytes measured between March 2017 (Survey 121) and March 2018 (Survey 136). The dashed line represents a 10% difference. Calculated as *100 – ((Field Result / Duplicate) * 100).*