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Catchment characteristics and chemical limnology of small lakes, tarns and mire pools in New Zealand (South Island) and Tasmania

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Abstract. Small alpine water bodies can play a large role in defining patterns of biological and landscape diversity, and may be particularly sensitive to climate change. A large limnological dataset, consisting of 65 and 6 water bodies, respectively, on South Island and Stewart Island (New Zealand) and 76 and 12 water bodies, respectively, in the Tasmanian highlands and coastal areas (Australia), was constructed to assess patterns of variation in alpine and subalpine lakes in the Australasian region. With the exception of the coastal systems, most lakes were very dilute. In general, lake water chemistry resembled world average seawater cationic ratios (WASW). In addition, some New Zealand lakes fell close to the world average freshwater cationic ratios (WAFW), due to relatively high calcium concentrations, and some were dominated by magnesium due to the presence of serpentine bedrock in the catchment area. Multivariate analyses of the joint dataset revealed that the variation in chemical limnological variables was dominated by gradients in conductivity, pH and gilvin. The concurrent relationships between pH, calcium and gilvin, which enabled the differentiation of Tasmanian water bodies into limnological provinces, were absent in New Zealand. In the latter, pH and gilvin contents were not coincident, as clear-water acidic systems occurred in New Zealand. The higher diversity of freshwater bodies in New Zealand will enable independent assessment of the effects of pH and gilvin on the distribution and diversity of biota.

Accessory Table 1.

label	Region	Lake/River catchment	Waymark (geographical reference point)	Lake Order	Type	Coordinates		Soil	Lith.	Veg.	area	catch.	Lake depth	Altitude	MAR	january T	july T
						x	y				km²	km²	m	m	(mm.yr^{-1})		
NZ 1	W	Taramakau River	Lake Kaurapataka	2	lake	2403300	5823700	HCPYB	Gw	1	0.4000	5.5	-	405	4499	14.3	3.4
NZ 2	C	Waimakariri River	Williams Saddle,Edwards/Mingha	-3	tarn	2399000	5806000	HCYB	Gw	2	0.0003	0.1	-	1290	3137	11.9	0.2
NZ 3	C	Waimakariri River	Williams Saddle,Edwards/Mingha	-2	tarn	2398900	5806000	HCYB	Gw	2	0.0013	0.3	-	1300	3152	12.0	0.2
NZ 4	C	Waimakariri River	Williams Saddle,Edwards/Mingha	-2	tarn	2398900	5806000	HCYB	Gw	2	0.0003	0.3	-	1300	3152	12.0	0.2
NZ 5	C	Waimakariri River	Williams Saddle,Edwards/Mingha	0	tarn	2398800	5806000	HCYB	Gw	2	0.0010	0.3	-	1290	3166	12.0	0.3
NZ 6	C	Waimakariri River	Williams Saddle,Edwards/Mingha	-3	mire o.b.	2398800	5806000	HCYB	Gw	2	< 0.0001	0.1	-	1290	3166	12.0	0.3
NZ 7	C	Waimakariri River	Edwards Valley	-2	tarn	2399900	5806600	HCYB	Gw	2	0.0010	0.1	-	1090	3095	12.1	0.5
NZ 8	W	Maruia River	Lake Daniells	2	lake	2452200	5877700	HCPYB	St2	1	0.8000	5.6	-	575	2387	14.8	2.7
NZ 9	W	Grey River	LakeChristabel	4	lake	2445900	5866300	YB	Al	1	2.4000	45.8	90	640	3237	14.7	2.8
NZ 10	W	Maruia River	Rahu River right branch	0	tarn	2438400	5879800	HCPYB	Gn	3	0.0002	0.1	-	1280	2687	13.0	-0.1
NZ 11	W	Maruia River	Rahu River right branch	0	tarn	2438400	5879700	HCPYB	Gn	3	0.0002	0.1	-	1300	2680	13.0	-0.1
NZ 12	W	Maruia River	Rahu River right branch	1	lake	2438400	5879600	HCPYB	Gn	3	0.0150	0.3	-	1280	2672	13.0	-0.1
NZ 13	W	Maruia River	Rahu River right branch	2	lake	2438800	5879500	HCPYB	Gn	1	0.0002	0.5	-	1090	2573	13.1	0.0
NZ 14	W	Lake Mahinapua	Lake Mahinapua	3	lake	2338400	5821400	GPOD	Al	1	3.4000	31.3	10	20	2690	15.4	7.0
NZ 15	W	Lake Paringa	Lake Paringa	4	lake	2220900	5714500	YB	Al	1	4.8000	78.9	50	16	6040	14.8	5.8
NZ 16	W	Lake Moeraki	Lake Moeraki	5	lake	2209600	5714300	GPOD	Al	1	2.2000	98.3	40	93	3884	15.1	6.9
NZ 17	W	Waita River	dunelake direction Haast	0	lake	2195900	5704000	PYB	Al	1	0.0005	0.1	-	5	3918	15.1	7.2
NZ 18	W	Waiho River	Lake Wombat, Franz Joseph Glacier	0	lake	2280700	5752100	YB	Al	1	0.0008	1.0	-	260	4783	14.5	5.7
NZ 19	W	Waiho River	Peters Pool, Franz Joseph Glacier	-3	tarn	2281100	5750300	YB	Al	1	0.0001	0.1	-	230	5126	14.6	5.7
NZ 20	W	Lake Mapoerika	Lake Mapoerika	4	lake	2284800	5763800	HCPYB	Gw	1	8.3000	66.3	114	82	4144	14.6	5.9
NZ 21	W	Lake Brunner	Lake Brunner	5	lake	2387000	5842600	RE	Al	4	36.1000	380.0	109	86	3101	16.2	6.9
NZ 22	C	Waimakariri River	Bealy Tarn	-1	mire o.f.	2394800	5796400	HCYB	Gw	3	0.0030	0.3	<1	1030	2783	12.8	2.1
NZ 23	C	Waimakariri River	Bealy Tarn	-2	mire o.b.	2394800	5796400	HCYB	Gw	3	< 0.0001	0.3	<1	1030	2783	12.8	2.1
NZ 24	NM	Wairau River	Red Hills	-2	mire m.f.	2511500	5943400	BGC	Um	3	?	1.5	<1	1110	1535	14.4	2.0
NZ 25	NM	Wairau River	Red Hills	-2	mire m.f.	2511100	5943300	BGC	Um	3	0.0008	2.0	<1	1110	1548	14.3	1.8
NZ 26	NM	Wairau River	Red Hills	-2	mire m.f.	2510600	5942700	BGC	Um	3	?	0.5	<1	1120	1521	14.5	2.1
NZ 27	F	Long Burn	Saddle north of Staircase Saddle	0	lake	2038300	5470700	PYB	Gn	3	0.1000	1.5	<10	621	6400	12.7	1.4
NZ 28	F	Long Burn	Saddle north of Staircase Saddle	0	tarn	2038600	5470300	PYB	Gn	3	0.0001	0.4	<1	700	6402	12.8	1.5
NZ 29	F	Long Burn	Saddle north of Staircase Saddle	-2	tarn	2038700	5470200	PYB	Gn	3	0.0001	0.4	<1	700	6402	12.8	1.5
NZ 30	F	Long Burn	Saddle north of Staircase Saddle	0	lake	2038600	5470300	PYB	Gn	3	0.0001	0.4	<1	700	6402	12.8	1.5
NZ 31	F	Long Burn	Staircase Saddle	1	lake	2037500	5468800	PYB	Gs	3	0.0700	0.6	<10	840	6406	12.6	1.3
NZ 32	F	Long Burn	Staircase Saddle	0	tarn	2037400	5469200	PYB	Gs	3	0.0002	0.2	<1	854	6406	12.7	1.4
NZ 33	F	Eglington River	Key Summit Ridge	-1	tarn	2124900	5585000	BGC	Gw	3	0.0090	1.0	-	1000	4606	13.6	1.7
NZ 34	F	Eglington River	Key Summit Ridge	-3	tarn	2124800	5585600	BGC	Gw	3	0.0020	0.2	-	1020	4735	13.5	1.7
NZ 35	F	Greenstone/Caples	McKellar Saddle	-2	mire o.b.	2127200	5583900	HCYB	Gw	3	0.0003	0.3	-	1000	4171	12.8	0.3
NZ 36	F	Greenstone/Caples	McKellar Saddle	-2	mire o.b.	2127100	5584300	HCYB	Gw	3	0.0020	0.3	-	1030	4251	13.0	0.7
NZ 37	F	Greenstone/Caples	McKellar Saddle	-2	tarn	2127100	5584300	HCYB	Gw	3	0.0020	0.3	-	1030	4251	13.0	0.7
NZ 38	F	Greenstone River	Lake McKellar	3	lake	2126000	5584500	RE	Al	3	0.9000	15.0	-	610	4453	13.8	2.0
NZ 39	F	Greenstone River	Lake Howden	0	lake	2125600	5586900	RE	Al	2	0.1000	1.2	-	683	4913	13.5	1.5
NZ 40	F	Eglington River	Key Summit Ridge	-2	tarn	2124800	5584600	BGC	Gw	3	0.0004	0.1	-	1020	4522	13.5	1.7
NZ 41	F	Eglington River	Key Summit Ridge	-2	mire o.b.	2124800	5587300	BGC	Gw	1	0.0004	0.1	-	920	5166	13.5	1.6
NZ 42	F	Eglington River	Lake Lochie	0	lake	2123800	5586000	BGC	Gw	1	0.1400	1.0	-	520	4887	13.8	2.2
NZ 43	F	Eglington River	Lake Gunn	3	lake	2123000	5582800	BGC	Gw	1	2.5000	21.8	60	500	3744	13.7	2.1
NZ 44	F	Eglington River	Mirror Lake	-2	lake	2117100	5563500	RE	Al	1	0.0003	0.4	-	360	2400	14.0	3.3
NZ 45	F	Lake TeAnau	Lake Mistletoe	-2	lake	2103700	5543500	PYB	Al	2	0.1000	2.0	-	210	1174	14.1	4.7
NZ 46	O	Lake Ohau	Lake Ohau Rd	-2	tarn	2263900	5664500	HCPYB	St1	5	0.1000	0.5	<1	580	1107	12.9	-3.5
NZ 47	O	Lake Ohau	Lake Ohau Rd	-3	tarn	2263500	5664600	HCYB	Gw	3	0.0700	0.5	<1	580	1129	13.2	-3.0
NZ 48	O	Lake Ohau	Lake Middleton	-3	lake	2259700	5654500	HCYB	Al	3	0.1750	8.0	5.5	523	916	16.2	0.5
NZ 49	F	Hauroko River	Furkert Saddle	-3	tarn	2058600	5485300	HCPYB	St2	1	0.0001	0.7	-	800	9659	12.6	0.8
NZ 50	F	Hauroko River	Furkert Saddle	-3	tarn	2058600	5485300	HCPYB	St2	1	0.0001	0.7	-	800	9659	12.6	0.8
NZ 51	F	Hauroko River	Furkert Saddle	1	tarn	2054800	5484600	PYB	Gs+Gn	3	0.0080	0.5	-	980	9967	12.2	0.2
NZ 52	F	Hauroko River	Lake Roe, Furkert Saddle	0	lake	2054700	5484200	PYB	Gs+Gn	3	0.2000	1.2	-	975	9966	12.3	0.4
NZ 53	F	Hauroko River	Furkert Saddle	-3	tarn	2053300	5486700	PYB	Gs+Gn	3	0.0001	0.3	-	960	9707	12.6	0.8
NZ 54	F	Hauroko River	Furkert Saddle	0	lake	2053100	5484700	PYB	Gs+Gn	3	0.1300	1.0	-	1020	9733	12.3	0.3
NZ 55	F	Lake Manapouri	Amoeboid Mire (KeplerTrack)	-2	mire o.b.	2091200	5510300	OR	Pt	5	0.0050	1.0	-	200	1185	14.5	4.1
NZ 56	F	Hollyford River	Lake Adelaide	-3	lake	2117400	5598500	PYB	Al	3	2.4000	14.0	-	942	9719	12.6	0.4
NZ 57	F	Hollyford River	Lake Adelaide basin	-3	tarn	2116800	5598600	PYB	Al	3	0.0050	1.0	-	1000	9657	12.8	0.7
NZ 58	F	Hollyford River	Lake Adelaide basin	-1	tarn	2116500	5599300	PYB	Al	3	0.0003	1.0	-	1000	9672	12.5	0.3
NZ 59	F	Hollyford River	Lake Adelaide basin	-1	tarn	2117200	5600200	BRock	Gn	3	0.0080	0.3	-	1000	9802	12.7	0.6
NZ 60	F	Hollyford River	Moraine Creek	0	tarn	2120800	5599700	HCPYB	Gn	1	0.0048	0.5	-	600	9316	13.7	2.1
NZ 61	S	Rakeahua River	Mt Rakeahua	-2	tarn	2120200	5349100	PYB	Gn	2	0.0020	2.0	<10	400	2570	13.8	5.2
NZ 62	S	Rakeahua River	Table Hill	1	mire o.b.	2118000	5342900	HCPYB	Gn	6	< 0.0001	0.2	<1	400	2891	13.8	5.2
NZ 63	S	Rakeahua River	Table Hill	-2	mire o.b.	2117500	5342400	HCPYB	Gn	5	< 0.0001	0.3	<1	400	3047	13.8	5.2
NZ 64	S	Rakeahua River	Table Hill	-2	mire o.b.	2117500	5342400	HCPYB	Gn	2	0.0002	0.3	<1	400	3047	13.8	5.2
NZ 65	S	Rakeahua River	Table Hill	-2	mire o.b.	2118300	5343100	HCPYB	Gn	2	0.0002	0.2	<1	400	2784	13.8	5.2
NZ 66	S	Freshwater River	Freshwater swamp	-2	mire o.b.	2123000	5358400	OR	Gn	2	0.0001	2.0	<1	10	2687	13.8	5.2
NZ 67	N	Motueka River	Owen Plateau	-3	tarn	2472000	5963600	IRENYB	Ma	3	0.0007	0.1	-	1460	3230	12.6	-0.5
NZ 68	N	Motueka River	Owen Plateau	-3	mire o.b.	2472300	5964600	IRENYB	Ma	3	0.0008	0.4	-	1300	3144	12.8	-0.3
NZ 69	N	Motueka River	Owen Plateau	-2	mire o.b.	2472300	5962800	IRENYB	Ma	3	0.0009	0.3	-	1520	3193	12.5	-0.8
NZ 70	N	Motueka River	Owen Plateau	-2	mire o.b.	2472300	5962800	IRENYB	Ma	3	0.0004	0.3	-	1520	3193	12.5	-0.8
NZ 71	N	Motueka River	Owen Plateau	-2	mire o.b.	2472300	5962800	IRENYB	Ma	3	0.0040	0.3	-	1520	3193	12.5	-0.8
Mean				-							0.9625	11.5	-	788	4498	13.4	1.9
Median				-2							0.0012	0.5	-	854	3237	13.0	1.5
1SD				-							4.5187	48.1	-	420	2625	1.0	2.4

Minimum								-3						< 0.0001	0.1	<1	5	916	11.9	-3.5	
Maximum								5						36.1000	380.0	114.0	1520	9967	16.2	7.2	
N° Lakes								71						68	70	26	71	71	71	71	

label	pH	cond.	T	gilvin	DOC	Ca^{2+}	Mg^{2+}	Na^{+}	K^{+}	Cl^{-}	SO_4^{2-}	Al^{X+}	Cd^{X+}	Co^{X+}	Cr^{X+}	Fe^{X+}	Mn^{X+}	Ni^{X+}	TDP	TDN	Na/Cl
		($\mu S.cm^{-1}$)		($g_{440}.m^{-1}$)	ppm	($mg.L^{-1}$)	($mg.L^{-1}$)	($mg.L^{-1}$)	($mg.L^{-1}$)	($mg.L^{-1}$)	($mg.L^{-1}$)	($mg.L^{-1}$)	($mg.L^{-1}$)	($mg.L^{-1}$)	($mg.L^{-1}$)	($mg.L^{-1}$)	($mg.L^{-1}$)	($mg.L^{-1}$)	($mg.m3^{-1}$)	($mg.m3^{-1}$)	
NZ 1	7.3	29.8	21.0	1.54	10.11	2.17	0.34	1.26	0.31	0.82	0.44	-	-	-	-	-	-	-	-	-	1.54
NZ 2	5.4	7.9	23.5	1.91	11.90	0.14	0.07	0.66	0.05	0.50	0.06	0.058	<0.004	<0.020	<0.008	<0.016	<0.006	<0.021	2	270	1.32
NZ 3	7.3	23.5	24.5	0.71	11.90	2.08	0.25	0.79	0.09	0.56	0.12	0.065	<0.004	<0.020	<0.008	<0.016	<0.006	<0.021	1.3	270	1.42
NZ 4	5.3	6.8	25.6	0.97	11.90	< 0.01	0.06	0.59	0.04	0.46	0.06	-	-	-	-	-	-	-	-	-	1.30
NZ 5	6.6	29.3	24.0	0.62	11.90	2.64	0.33	1.00	0.24	0.72	0.18	-	-	-	-	-	-	-	-	-	1.40
NZ 6	5.2	9.8	27.7	4.68	11.90	0.14	0.08	0.67	0.17	0.60	0.06	-	-	-	-	-	-	-	-	-	1.12
NZ 7	5.8	7.1	27.9	1.22	11.90	0.25	0.10	0.89	0.43	1.10	0.17	-	-	-	-	-	-	-	-	-	0.81
NZ 8	8.9	82.3	20.3	0.64	5.75	9.87	0.63	1.21	0.49	0.80	0.64	-	-	-	-	-	-	-	-	-	1.52
NZ 9	6.8	48.3	20.9	0.69	4.37	6.59	0.37	1.93	0.63	0.43	0.83	-	-	-	-	-	-	-	-	-	4.44
NZ 10	9.3	31.5	16.2	0.64	6.26	3.02	0.35	1.16	0.50	0.46	0.23	-	-	-	-	-	-	-	-	-	2.53
NZ 11	4.8	11.5	22.7	6.79	13.37	0.13	0.12	1.16	0.32	0.48	< 0.01	-	-	-	-	-	-	-	-	-	2.43
NZ 12	7.4	21.5	17.7	1.34	4.97	1.81	0.32	1.52	0.53	0.38	0.11	0.063	<0.004	<0.020	<0.008	<0.016	<0.006	<0.021	2.2	243	3.99
NZ 13	9.4	55.2	19.2	1.08	6.35	5.39	0.67	1.73	0.51	0.36	0.33	0.037	<0.004	<0.020	<0.008	0.067	<0.006	<0.021	1.2	54	4.81
NZ 14	7.8	61.0	24.1	5.14	6.51	1.90	1.35	5.00	0.52	4.61	0.40	-	-	-	-	-	-	-	-	-	1.09
NZ 15	6.9	30.0	16.5	1.27	9.39	1.66	0.53	2.08	0.62	1.82	0.84	-	-	-	-	-	-	-	-	-	1.15
NZ 16	7.2	35.6	18.8	0.92	0.24	2.39	0.49	1.78	0.64	2.11	1.03	-	-	-	-	-	-	-	-	-	0.84
NZ 17	5.6	54.1	21.1	7.99	15.39	0.46	0.94	5.90	0.30	10.21	0.43	-	-	-	-	-	-	-	-	-	0.58
NZ 18	7.1	47.4	18.5	2.37	9.67	3.66	0.53	2.14	1.14	2.58	2.20	-	-	-	-	-	-	-	-	-	0.83
NZ 19	5.3	18.6	17.6	2.72	22.26	0.25	0.34	1.56	0.27	2.32	0.25	0.066	<0.004	<0.020	<0.008	0.043	0.01	<0.021	2.4	144	0.67
NZ 20	7.0	42.7	18.6	1.54	30.30	2.84	0.68	1.97	1.03	1.06	0.51	-	-	-	-	-	-	-	-	-	1.86
NZ 21	7.1	52.0	24.1	1.61	22.86	3.54	0.65	2.30	0.68	1.21	0.46	-	-	-	-	-	-	-	-	-	1.90
NZ 22	6.7	25.1	20.0	1.38	8.12	0.85	0.21	1.32	0.15	1.73	0.10	0.043	<0.004	<0.020	<0.008	0.017	<0.006	<0.021	2.2	311	0.76
NZ 23	5.3	9.7	19.2	1.31	17.26	0.32	0.14	0.66	0.08	0.99	0.09	<0.034	<0.004	<0.020	<0.008	0.031	<0.006	<0.021	0.7	162	0.67
NZ 24	6.7	17.4	11.7	10.66	34.58	0.19	1.51	1.52	0.16	1.02	0.09	0.091	<0.004	<0.020	0.013	0.553	<0.006	0.029	6.5	675	1.49
NZ 25	6.8	17.6	12.1	2.97	15.80	0.15	1.58	1.68	0.14	1.05	0.08	<0.034	<0.004	<0.020	<0.008	0.283	0.01	<0.021	4.5	594	1.60
NZ 26	7.8	71.5	15.4	6.86	33.21	0.45	8.72	2.50	0.37	0.83	0.15	-	-	-	-	-	-	-	-	-	3.01
NZ 27	5.9	17.4	9.5	1.13	6.41	0.34	0.26	2.14	0.13	0.96	0.19	<0.034	<0.004	<0.020	<0.008	0.023	<0.006	<0.021	0.6	45	2.23
NZ 28	5.0	20.1	9.2	1.11	6.33	0.12	0.25	2.25	0.17	1.59	0.26	-	-	-	-	-	-	-	-	-	1.42
NZ 29	4.9	23.5	11.3	1.01	3.89	0.15	0.29	2.30	0.11	4.58	0.63	<0.034	<0.004	<0.020	<0.008	0.027	<0.006	0.022	1.2	90	0.50
NZ 30	5.0	15.8	8.8	2.23	5.67	0.12	0.18	1.76	0.03	2.71	0.41	-	-	-	-	-	-	-	-	-	0.65
NZ 31	5.9	15.2	9.5	0.37	4.93	0.24	0.24	2.27	0.12	3.63	0.55	-	-	-	-	-	-	-	-	-	0.63
NZ 32	5.0	17.3	11.0	0.37	8.88	0.16	0.21	2.06	0.04	8.59	0.75	-	-	-	-	-	-	-	-	-	0.24
NZ 33	5.0	6.8	14.6	1.27	7.35	0.09	0.09	0.64	0.06	1.21	0.14	<0.034	<0.004	<0.020	<0.008	<0.016	<0.006	<0.021	1.7	126	0.53
NZ 34	5.0	7.4	19.4	2.53	10.19	0.09	0.12	0.77	0.07	1.59	0.18	-	-	-	-	-	-	-	-	-	0.48
NZ 35	4.6	14.7	16.5	5.44	11.11	0.13	0.08	0.48	0.18	1.01	0.06	-	-	-	-	-	-	-	-	-	0.47
NZ 36	4.9	6.4	21.1	3.11	14.92	0.25	0.11	0.81	0.12	1.01	0.12	-	-	-	-	-	-	-	-	-	0.80
NZ 37	5.2	5.9	18.4	0.41	6.62	0.08	0.07	0.57	0.04	1.02	0.12	-	-	-	-	-	-	-	-	-	0.56
NZ 38	7.8	69.0	15.2	1.13	6.64	9.11	0.24	0.95	0.14	0.93	0.39	-	-	-	-	-	-	-	-	-	1.02
NZ 39	8.5	162.0	15.9	0.99	7.58	23.48	0.33	1.59	0.45	0.42	0.55	-	-	-	-	-	-	-	-	-	3.77
NZ 40	5.7	9.1	15.0	1.68	12.01	0.08	0.07	0.59	0.07	0.52	0.08	-	-	-	-	-	-	-	-	-	1.13
NZ 41	4.4	15.7	14.9	7.05	16.67	0.07	0.08	0.47	< 0.01	0.62	0.07	-	-	-	-	-	-	-	-	-	0.76
NZ 42	7.5	30.0	16.0	0.55	5.78	3.22	0.31	1.11	0.10	0.73	0.63	-	-	-	-	-	-	-	-	-	1.52
NZ 43	7.4	39.8	14.0	0.23	5.67	4.19	0.55	1.02	0.09	0.54	1.07	-	-	-	-	-	-	-	-	-	1.89
NZ 44	8.1	148.0	10.8	0.12	6.82	13.40	3.76	2.06	0.17	0.59	2.93	-	-	-	-	-	-	-	-	-	3.51
NZ 45	7.8	62.8	20.1	1.70	6.36	4.05	2.51	1.86	0.24	0.79	0.52	-	-	-	-	-	-	-	-	-	2.36
NZ 46	6.6	34.4	17.9	6.49	19.53	2.19	0.72	1.48	1.28	0.63	0.06	-	-	-	-	-	-	-	-	-	2.35
NZ 47	6.7	35.6	17.0	5.78	35.94	2.48	0.85	1.73	1.44	0.57	0.06	<0.034	<0.004	<0.020	<0.008	0.132	0.012	<0.021	17	1688	3.02
NZ 48	9.0	37.4	19.2	0.62	6.53	3.00	0.76	1.58	0.16	0.18	0.19	-	-	-	-	-	-	-	-	-	8.83
NZ 49	4.9	10.0	6.6	0.58	4.59	0.27	0.16	1.00	0.02	1.35	0.24	-	-	-	-	-	-	-	-	-	0.74
NZ 50	5.5	12.0	6.6	0.85	10.40	0.76	0.20	1.23	0.07	1.30	0.24	-	-	-	-	-	-	-	-	-	0.94
NZ 51	5.9	16.0	8.0	1.15	5.69	1.50	0.24	1.33	0.10	0.99	0.23	-	-	-	-	-	-	-	-	-	1.35
NZ 52	5.0	11.0	13.0	0.69	4.14	0.68	0.17	1.12	0.08	1.09	0.32	<0.034	<0.004	<0.020	<0.008	<0.016	<0.006	<0.021	0.8	81	1.03
NZ 53	5.0	12.0	7.7	1.04	4.23	0.39	0.20	1.35	0.12	1.15	0.16	-	-	-	-	-	-	-	-	-	1.18
NZ 54	5.7	11.3	10.0	0.35	4.44	0.11	0.15	1.26	0.02	0.99	0.20	-	-	-	-	-	-	-	-	-	1.27
NZ 55	4.8	10.3	20.6	2.30	12.35	0.13	0.11	0.77	0.12	1.19	0.05	-	-	-	-	-	-	-	-	-	0.65
NZ 56	6.6	6.6	17.0	0.09	8.50	0.39	0.15	0.62	0.13	2.86	0.91	-	-	-	-	-	-	-	-	-	0.22
NZ 57	6.1	5.6	6.6	1.00	6.10	0.26	0.10	0.39	0.01	0.35	0.22	-	-	-	-	-	-	-	-	-	1.11
NZ 58	5.6	4.1	14.4	1.11	26.49	0.10	0.07	0.36	0.12	0.34	0.07	-	-	-	-	-	-	-	-	-	1.07
NZ 59	5.8	4.5	13.0	0.30	3.56	0.08	0.04	0.20	0.03	0.19	0.13	-	-	-	-	-	-	-	-	-	1.01
NZ 60	5.6	5.1	20.4	0.48	4.70	0.15	0.10	0.55	0.08	0.86	0.15	<0.034	<0.004	<0.020	<0.008	0.103	<0.006	<0.021	1.1	81	0.65
NZ 61	5.6	108.5	20.2	0.05	4.30	0.48	1.50	12.30	0.53	11.70	0.82	<0.034	<0.004	<0.020	<0.008	0.025	<0.006	<0.021	0.4	99	1.05
NZ 62	5.6	96.3	11.2	4.81	10.99	0.57	1.32	11.06	0.37	12.06	0.55	-	-	-	-	-	-	-	-	-	0.92
NZ 63	5.4	98.9	13.0	3.43	6.83	0.87	1.45	10.67	0.33	11.47	0.63	-	-	-	-	-	-	-	-	-	0.93
NZ 64	5.2	102.5	15.6	4.33	9.27	0.50	1.37	11.35	0.33	26.13	1.84	-	-	-	-	-	-	-	-	-	0.43
NZ 65	5.5	96.8	16.8	4.42	6.69	0.66	1.31	10.98	0.38	22.21	1.03	0.134	<0.004	<0.020	<0.008	0.589	<0.006	<0.021	0.8	99	0.49
NZ 66	4.8	136.8	15.8	11.42	22.79	0.67	1.82	16.24	0.68	28.74	0.70	-	-	-	-	-	-	-	-	-	0.57
NZ 67	5.7	6.3	11.6	1.17	12.22	0.49	0.16	0.39	0.01	0.63	0.11	-	-	-	-	-	-	-	-	-	0.62
NZ 68	5.8	14.8	11.1	10.34	18.55	1.55	0.14	0.90	0.12	0.95	0.09	-	-	-	-	-	-	-	-	-	0.95
NZ 69	4.9	7.2	16.8	1.38	7.41	0.17	0.13	0.65	0.04	1.03	0.15	<0.034	<0.004	<0.020	<0.008	0.044	<0.006	<0.021	2.2	225	0.63
NZ 70	6.1	13.8	16.0	4.42	18.85	1.47	0.33	0.66	0.09	0.94	0.23	<0.034	<0.004	<0.020	<0.008	0.150	0.030	<0.021	6.6	567	0.70
NZ 71	5.8	16.7	16.0	2.67	13.41	0.68	0.37	0.56	0.01	0.90	0.27	-	-	-	-	-	-	-	-	-	0.62
Mean	6.2	34.5	16.4	2.44	11.13	1.87	0.63	2.27	0.27	2.86	0.41	0.07	-	-	-	0.14	0.01	0.03	2.9	299	1.45
Median	5.8	17.6	16.5	1.27	8.88	0.49	0.26	1.26	0.14	0.99	0.23	0.06	-	-	-	0.04	0.01	0.03	1.9	162	1.05
1SD	1.2	36.2	5.1	2.63	7.65	3.56	1.17	3.19	0.30	5.54	0.50	0.03	-	-	-	0.19	0.01	0.00	3.8	375	1.33

Minimum	4.4	4.1	6.6	0.05	0.24	< 0.00	0.04	0.20	< 0.00	0.18	< 0.00	0.04	<0.004	<0.020	<0.008	<0.016	<0.006	<0.021	0.4	45	0.22
Maximum	9.4	162.0	27.9	11.42	35.94	23.48	8.72	16.24	1.44	28.74	2.93	0.13	-	-	-	0.59	0.03	0.03	17.0	1688	8.83
N° Lakes	71	71	71	71	71	71	71	71	71	71	71	7	0	0	0	14	5	2	19	19	71

Accessory Table 2.

	Lake Order		C		F		NM		N		O		S		W		BGC		BROCK		GPOD		HCPYB		HCYB		IRENYB		OR		PYB		RE		YB		AL		GN		GS		GS+GN	
Lake Order	1.00																																										
BGC	-		-		0.28	*	0.36	**	-		-		-		-		1.00																											
BROCK	-		-		-		-		-		-		-		-		-		1.00																								
GPOD	0.38	**	-		-		-		-		-		-		0.33	**	-		-		1.00																						
HCPYB	-		-		-0.26	*	-		-		-		0.34	**	0.32	**	-		-		-		1.00																				
HCYB	-0.31	**	0.75	***	-		-		-		0.26	*	-		-0.25	*	-		-		-		-0.25	*	1.00																		
IRENYB	-		-		-0.25	*	-		-		-		-		-		-		-		-		-		-		1.00																
OR	-		-		-		-		-		-		0.25	*	-		-		-		-		-		-		-		1.00														
PYB	-		-		0.47	***	-		-		-		-		-		-		-		-		-0.29	*	-0.26	*	-		-		1.00												
RE	0.25	*	-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		1.00										
YB	-		-		-		-		-		-		-		0.47	***	-		-		-		-		-		-		-		-		-		1.00								
AL	0.30	*	-		-		-		-		-		-		0.40	**	-		-		0.33	**	-0.28	*	-		-		-		-		0.47	***	0.47	***	1.00						
GN	-		-		-		-		-		-		0.54	***	-		-		-		-		0.43	***	-0.28	*	-		-		-		-		-		-0.30	*	1.00				
GS	-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		0.31	**	-		-		-		1.00		
GS+GN	-		-		0.27	*	-		-		-		-		-		-		-		-		-		-		-		-		0.45	***	-		-		-		-		1.00	
GW	-		0.57	***	-		-		-		-		-		-		0.42	***	-		-		-		0.67	***	-		-		-0.35	**	-		-		-0.34	**	-0.37	**	-	
MA	-		-		-0.25	*	-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		-	
PT	-		-		-		-		-		-		-		-		-		-		-		-		-		-		0.70	***	-		-		-		-		-		-	
ST1	-		-		-		-		-		0.57	***	-		-		-		-		-		-		-		-		-		-		-		-		-		-		-	
ST2	-		-		-		-		-		-		-		-		-		-		-		0.40	**	-		-		-		-		-		-		-		-		-	
UM	-		-		-		-		-		-		-		-		0.36	**	-		-		-		-		-		-		-		-		-		-		-		-	
Area	0.63	***	-0.25	*	-		-		-		-		-0.31	**	0.35	**	-		-		0.30	*	-		-		-		-		0.25	*	-		0.45	***	-0.37	**	-		-	
Catch	0.63	***	-0.32	**	-		-		-		-		-		0.26	*	-		-		0.34	**	-		-0.26	*	-		-		0.27	*	-		0.42	***	-		-		-	
Altitude	-0.41	***	0.24	*	-		-		-		-		-0.24	*	-0.47	***	-		-		-0.37	**	-		0.26	*	-		-0.37	**	-		-		-0.26	*	-0.50	***	-		-	
pH	0.45	***	-		-0.26	*	-		-		-		-		0.44	***	-		-		-		-		-		-		-		-		0.35	**	-		0.44	***	-		-	
Conductivity	0.37	**	-		-0.35	**	-		-		-		0.52	***	0.30	*	-		-		-		0.25	*	-		-		-		-		0.39	**	-		0.35	**	-		-	
T	-		0.37	**	-0.53	***	-		-		0.33	**	-		0.29	*	-		-		-		-		0.51	***	-		-		-0.44	***	-		-		-		-		-0.33	**
DOC	-0.27	*	-		-0.31	**	-		-		-		-		-		-		-		-0.37	**	-		0.24	*	-		-		-0.27	*	-		-		-		-		-0.26	*
GILVIN	-		-		-0.34	**	-		-		-		0.32	**	-		-		-		-		-		-		-		0.33	**	-		-		-		-		-		-	
Ca	0.47	***	-		-		-		-		-		-		0.36	**	-		-		-		-		-		-		-		-0.27	*	0.59	***	-		0.48	***	-		-	
Mg	-		-0.24	*	-0.30	*	-		-		-		0.53	***	-		-		-		-		-		-		-		-		-		-		-		0.31	*	-		-	
Na	-		-		-0.34	**	-		-		-		0.84	***	-		-		-		-		0.28	*	-0.26	*	-		-		-		-		-		-		0.47	***	-	
K	0.39	**	-		-0.54	***	-		-		0.42	***	-		0.56	***	-0.24	*	-		-		0.31	**	-		-		-		-		-0.25	*	-		0.33	**	0.26	*	-		-	
Cl	-		-		[22]		-		-		-		0.81	***	-		-		-		-		-		-0.24	*	-		0.26	*	-		-		-		-		0.39	**	-	
SO4	0.31	*	-0.28	*	-		-		-		-		0.37	**	-		-		-		-		-		-0.37	**	-		-		-		0.30	*	0.31	**	0.43	***	-		-	
MAR	-		-		0.59	***	-		-		-0.49	***	-		-		-		-		-		-		-0.29	*	-		-		0.46	***	-		-		-		-		0.40	**
January T	0.49	***	-0.40	**	-		-		-		-		-		0.59	***	-		-		0.34	**	-		-0.27	*	-		-		-		0.27	*	0.34	**	0.63	***	-		-	
July T	0.45	***	-		-		-		-0.32	**	-0.45	***	0.34	**	0.44	***	-		-		0.34	**	-		-0.31	*	-0.32	**	-		-		-		0.32	**	0.47	***	-		-	

	GW	MA	PT	ST1	ST2	UM	Area	Catch	Altitude	pH	Conductivity	T	DOC	GILVIN	Ca	Mg	Na	K	Cl	SO4	MAR	January T
Lake Order																						
BGC																						
BROCK																						
GPOD																						
HCPYB																						
HCYB																						
IRENYB																						
OR																						
PYB																						
RE																						
YB																						
AL																						
GN																						
GS																						
GS+GN																						
GW	1.00																					
MA	-	1.00																				
PT	-	-	1.00																			
ST1	-	-	-	1.00																		
ST2	-	-	-	-	1.00																	
UM	-	-	-	-	-	1.00																
Area	-	-	-	-	-	-	1.00															
Catch	-	-	-	-	-	-	0.78 ***	1.00														
Altitude	-	-	-	-	-	-	-0.30 *	-0.38 **	1.00													
pH	-	-	-	-	-	-	0.51 ***	0.40 **	-	1.00												
Conductivity	-0.27 *	-	-	-	-	-	-	0.32 **	-0.51 ***	0.50 ***	1.00											
T°C	0.45 ***	-	-	-	-0.27 *	-	-	-	-	-	-	1.00										
DOC	0.30 *	-	-	-	-	-	-	-	-	-	-	0.36 **	1.00									
GILVIN	-	-	-	-	-	-	-0.27 *	-0.24	-0.35 **	-0.29 *	-	-	0.52 ***	1.00								
Ca	-	-	-	-	-	-	0.49 ***	0.44 ***	-	0.83 ***	0.68 ***	-	-	-	1.00							
Mg	-0.31 **	-	-	-	-	-	-	-	-0.51 ***	0.36 **	0.79 ***	-	-	-	0.42 ***	1.00						
Na	-0.35 **	-	-	-	-	-	-	-	-0.57 ***	-	0.75 ***	-	-	0.35 **	-	0.72 ***	1.00					
K	-	-	-	0.36 **	-	-	0.32 **	0.31 **	-0.47 ***	0.41 **	0.58 ***	0.49 ***	-	0.27 *	0.47 ***	0.44 ***	0.44 ***	1.00				
Cl	-0.28 *	-	-	-	-	-	-0.26 *	-	-0.49 ***	-0.31 **	0.47 ***	-	-	0.37 **	-	0.48 ***	0.87 ***	-	1.00			
SO4	-0.30 *	-	-	-	-	-	-	0.36 **	-0.39 **	0.29 *	0.64 ***	-	-0.29 *	-	0.46 ***	0.60 ***	0.53 ***	0.31 **	0.48 ***	1.00		
MAR	-	-	-0.25 *	-0.27 *	-	-	-	-	-	-0.36 **	-0.43 ***	-0.59 ***	-0.31 *	-0.33 **	-0.31 **	-0.51 ***	-	-0.43 ***	-	-	1.00	
JANT°C	-	-	-	-	-	-	0.53 ***	0.56 ***	-0.66 ***	0.45 ***	0.43 ***	0.24 **	-	-	0.43 ***	0.39 **	-	0.41 ***	-	0.32 **	-0.32 **	1.00
JULT°C	-	-0.32 **	-	-0.37 **	-	-	-	0.38 **	-0.74 ***	-	0.48 ***	-	-	-	-	0.44 ***	0.54 ***	-	0.51 ***	0.55 ***	-	0.63 ***