



Supplement of

Calibration of Mg / Ca and Sr / Ca in coastal marine ostracods as a proxy for temperature

Maximiliano Rodríguez and Christelle Not

Correspondence to: Maximiliano Rodríguez (xamrodri@connect.hku.hk)

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Supplementary materials

Table S1: Annual mean values of ocean parameters measured by the Environmental Protection Department of Hong Kong (EPD) at three characteristic sampling locations; one close to the Pearl River Estuary (NM6), Hong Kong Island (SM1) and east coast of Hong Kong Island (MM13).

Variable	Units	Annual value		
		NM6	SM1	MM13
Volatile Suspended Solids	mg/L	1.947	0.997	1.004
Unionised Ammonia	mg/L	0.003	0.001	0.001
Turbidity	NTU	14.209	6.905	8.338
Total Phosphorus	mg/L	0.048	0.029	0.032
Total Nitrogen	mg/L	0.652	0.239	0.2
Total Kjeldahl Nitrogen	mg/L	0.264	0.174	0.147
Total Inorganic Nitrogen	mg/L	0.458	0.086	0.065
Temperature	°C	23.453	22.361	21.89
Suspended Solids	mg/L	12.818	4.737	5.318
Silica	mg/L	1.793	0.695	0.604
Secchi Disc Depth	M	1.573	2.713	4.288
Salinity	psu	28.373	33.063	33.741
Phaeo-pigments	ug/L	1.149	0.565	0.382
pH		7.992	8.108	8.102
Orthophosphate Phosphorus	mg/L	0.021	0.011	0.011
Nitrite Nitrogen	mg/L	0.056	0.012	0.008
Nitrate Nitrogen	mg/L	0.313	0.045	0.035
Faecal Coliforms	cfu/100mL	109.361	7.156	1.272
E. coli	cfu/100mL	54.913	3.783	1.032
Dissolved Oxygen	mg/L	6.321	6.174	6.199
Dissolved Oxygen	% saturation	86.291	85.472	83.401
Chlorophyll-a	ug/L	2.853	1.582	1.118
Ammonia Nitrogen	mg/L	0.079	0.027	0.022
5-day Biochemical Oxygen Demand	mg/L	0.726	0.572	0.398

Table S2: Error estimated in the validation of OCEAN-HK cruise samples

Site	Latitude	Longitude	Species	n	Mg/Ca (mmol/mol)	Estimated temp (°C)	Satellite temp (°C)	Error (°C)
A9	22.15	113.84	<i>S. impressa</i>	1	15.4	19.3	21.1	-8.5
F101	21.82	113.12	<i>S. impressa</i>	10	22.5	21.9	22.1	-0.8
F301	21.99	113.54	<i>S. impressa</i>	5	22.4	21.8	21.8	0.1
F303	21.91	113.59	<i>S. impressa</i>	3	18.2	20.3	20.7	-2.1
F403	22.08	113.74	<i>S. impressa</i>	2	24.6	22.7	21.9	3.5
F603	22.03	114.09	<i>S. impressa</i>	9	17.4	20	20.3	-1.3
F605	21.95	114.12	<i>S. impressa</i>	6	19.8	20.9	20.3	3.1
M202	22.31	114.51	<i>S. impressa</i>	10	19.7	20.9	20.2	3.3
F101	21.82	113.12	<i>N. delicata</i>	3	20.0	22.1	22.1	0.2
F403	22.08	113.74	<i>N. delicata</i>	2	15.9	19.6	21.9	-10.6
M202	22.31	114.51	<i>N. delicata</i>	25	19.2	21.6	20.2	6.8

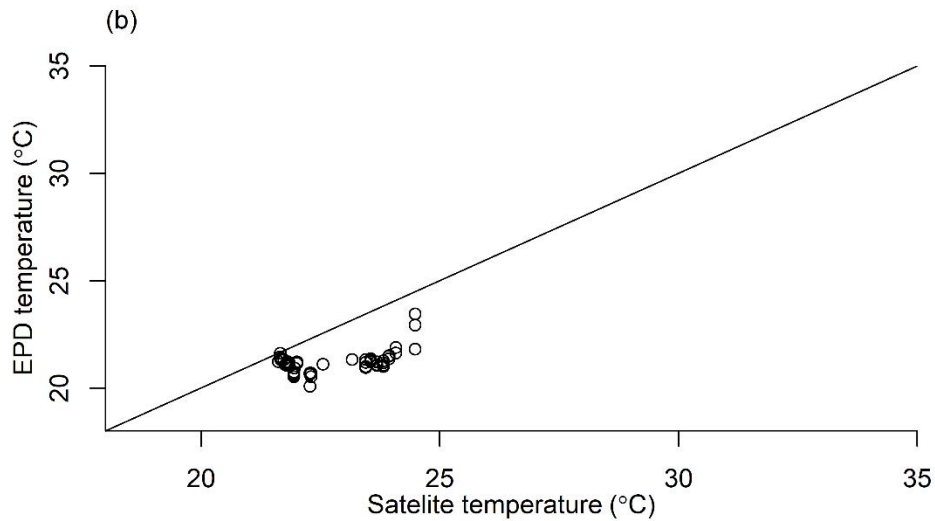
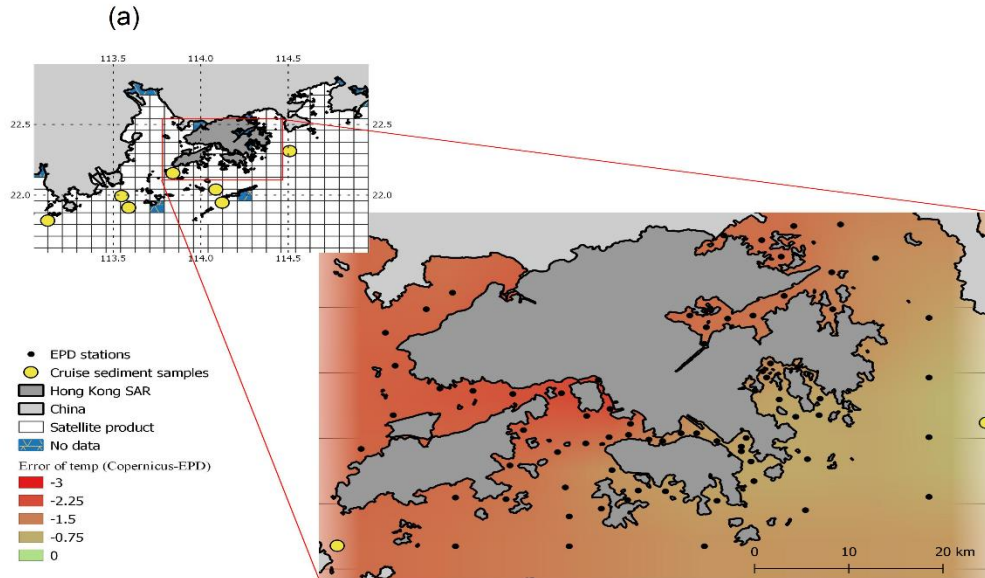


Figure S1: a) Interpolation map of bottom water temperature errors between the satellite record and EPD data by pixel (white squares). b) The correlation of April temperatures (°C) from satellite and EPD data in each Hong Kong station.

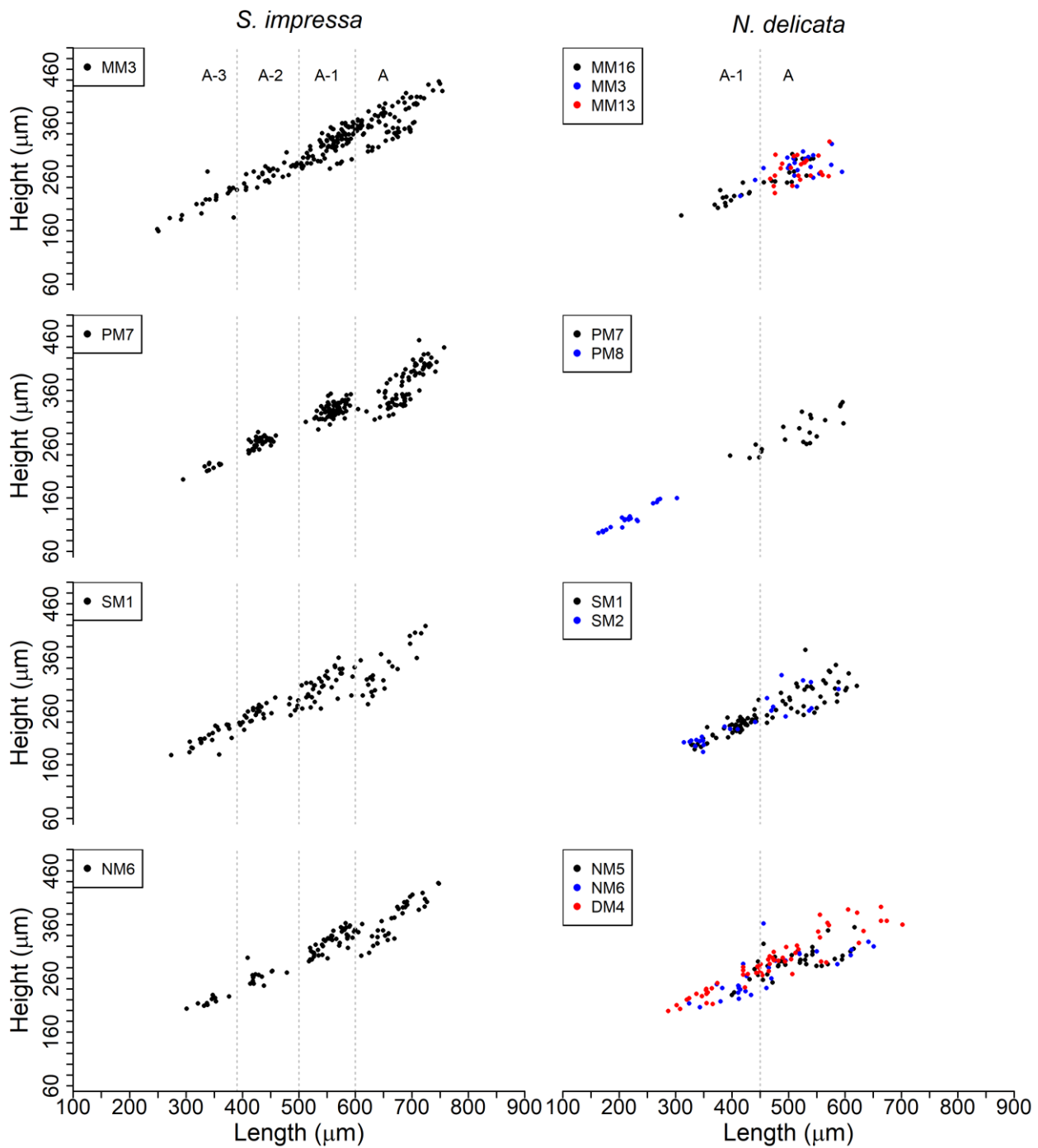


Figure S2: Classification of adult and juvenile ostracods *S. impressa* and *N. delicata*. Dotted lines show the different ostracod stages.

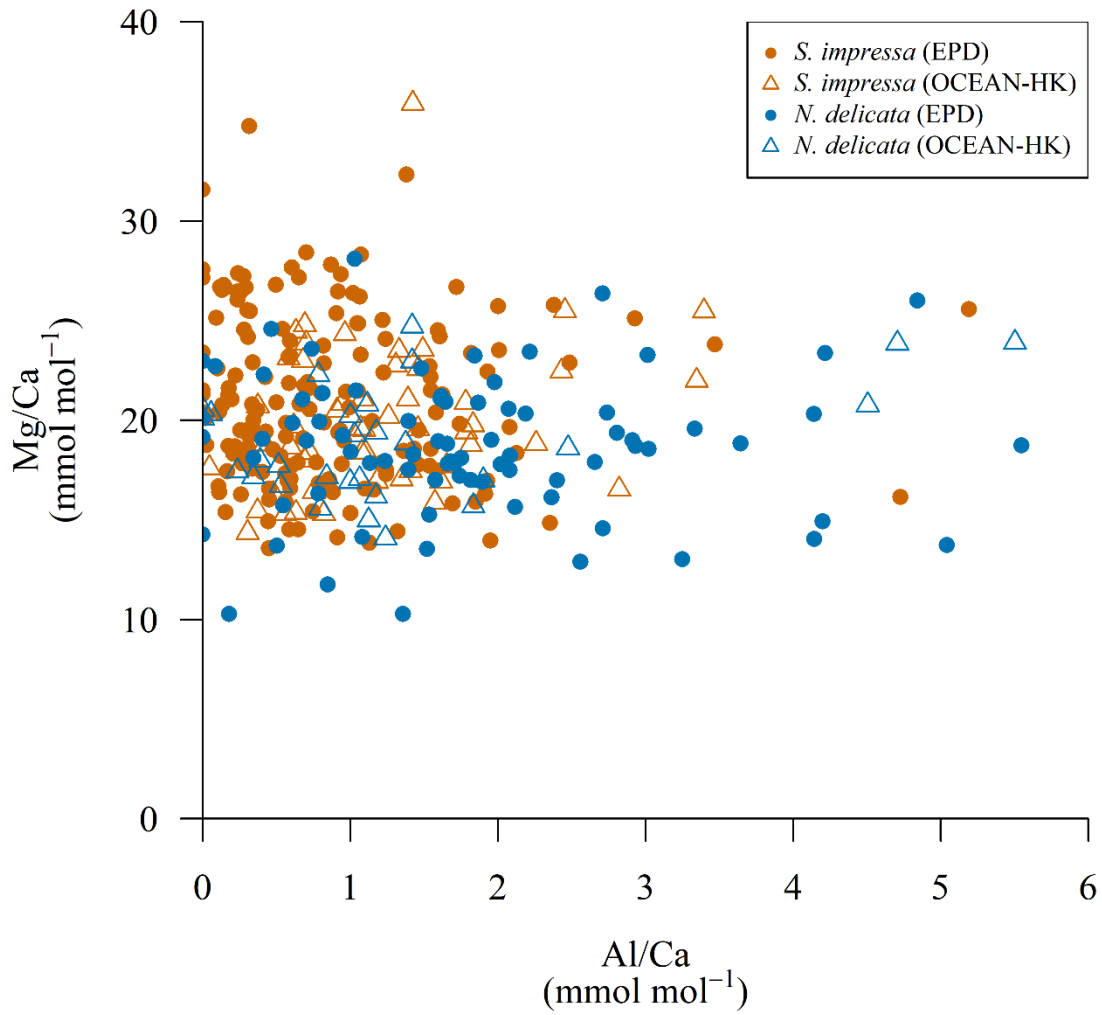


Figure S3: Mg/Ca versus Al/Ca of adult specimens of *S. impressa* and *N. delicata* from samples obtained from EPD and OCEAN-HK.

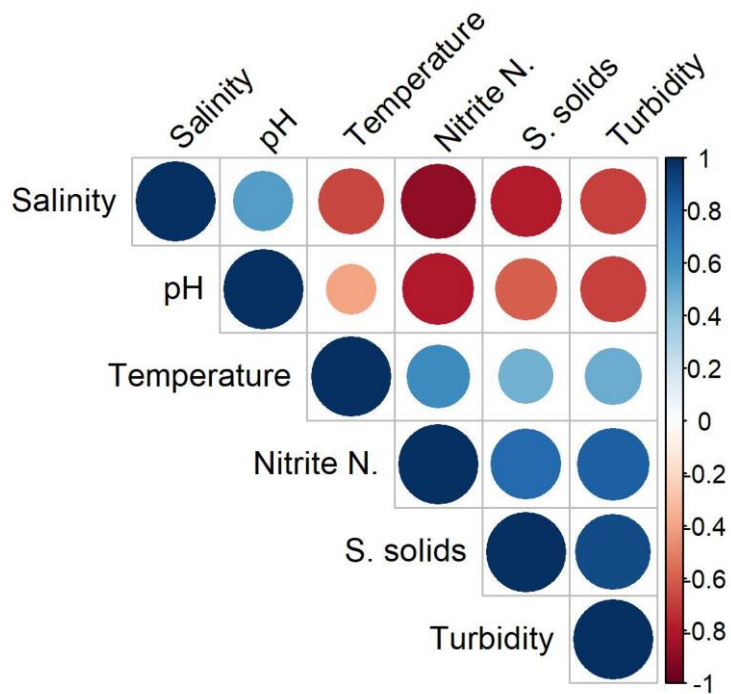


Figure S4: Diagram of the correlation matrix for temperature, salinity, pH, nitrite, suspended solids and turbidity.

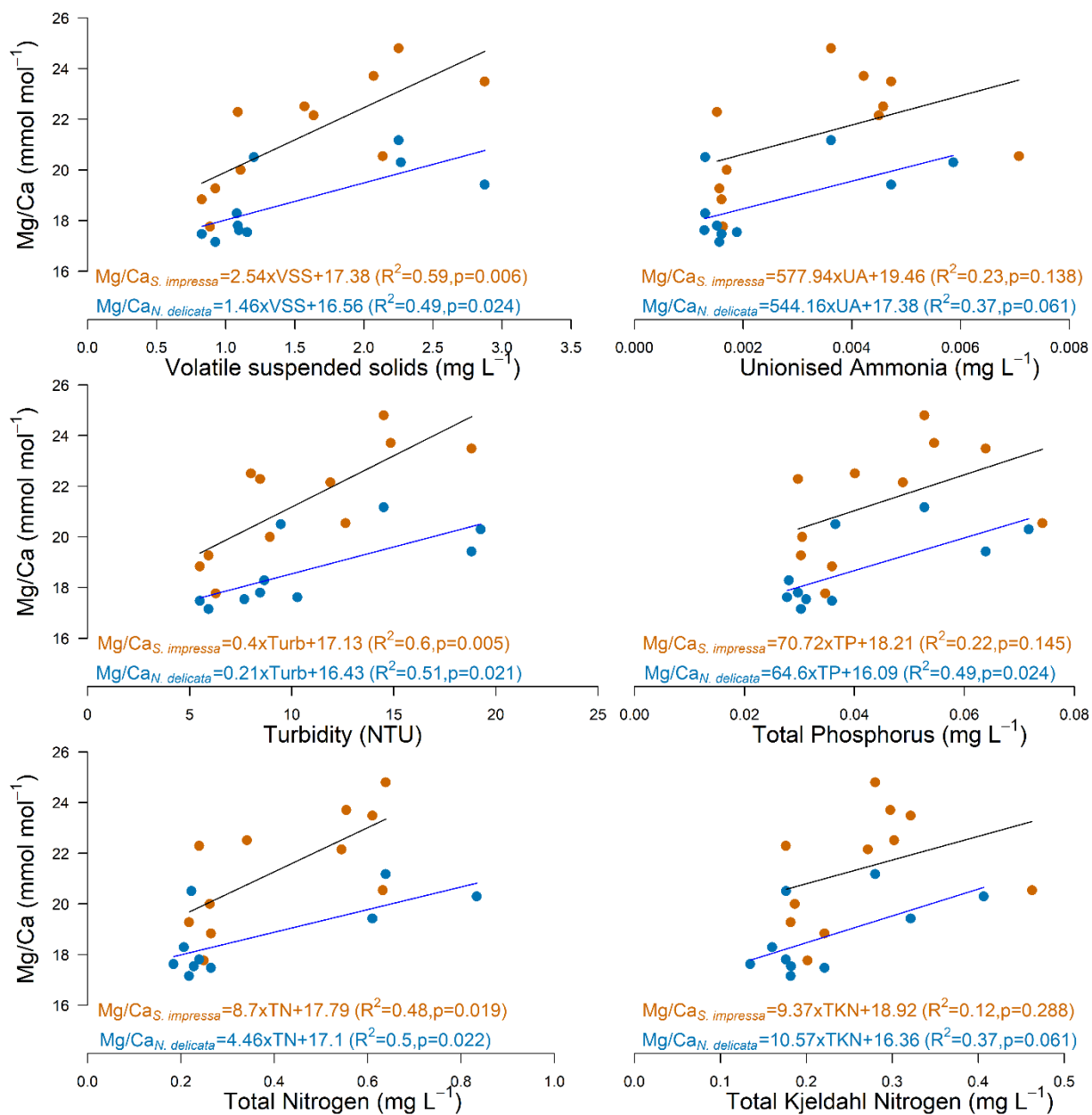


Figure S5: Linear correlations of Mg/Ca mean values in *S. impressa* ($\eta=7$) and *N. delicata* ($\eta=3$) with volatile suspended solids, unionised ammonia, turbidity, total phosphorus, total nitrogen and total (kjeldahl) nitrogen in Hong Kong waters.

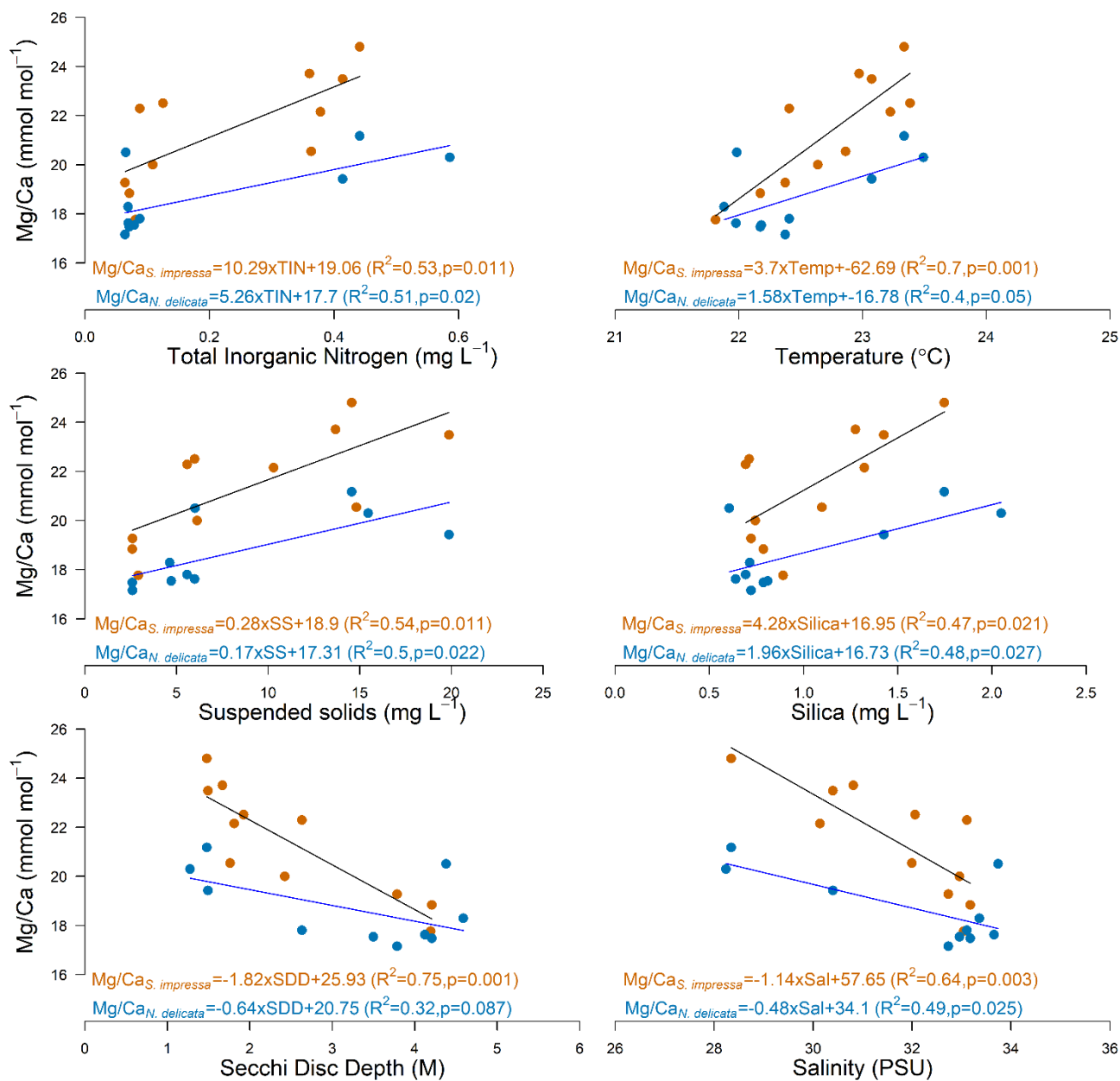


Figure S6: Linear correlations of Mg/Ca mean values in *S. impressa* ($\eta=7$) and *N. delicata* ($\eta=3$) with total inorganic nitrogen, temperature, suspended solids, silica, secchi disc depth and salinity in Hong Kong waters

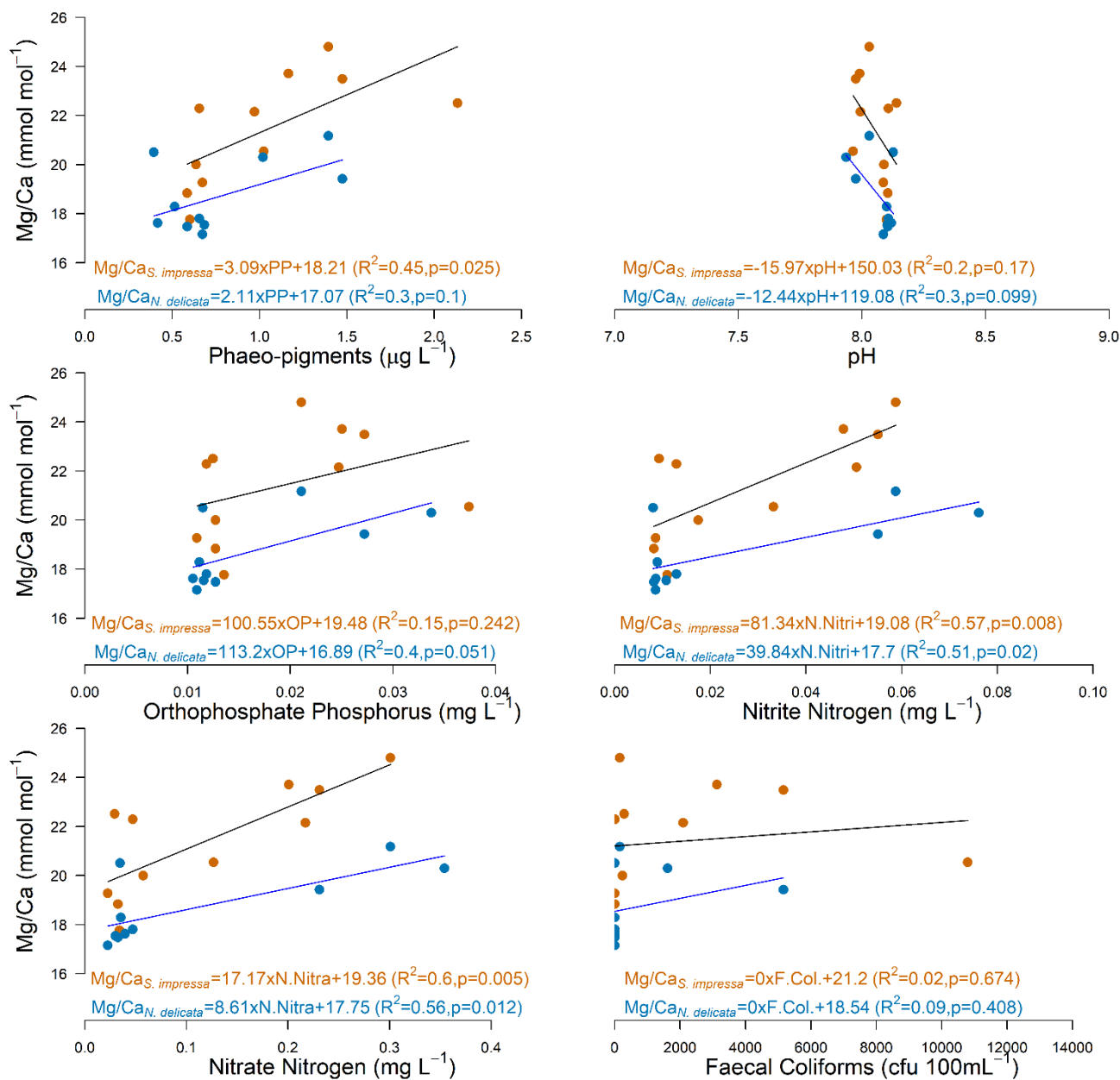


Figure S7: Linear correlations of Mg/Ca mean values in *S. impressa* ($\eta=7$) and *N. delicata* ($\eta=3$) with phaeo-pigments, pH, orthophosphate phosphorus, nitrite nitrogen, nitrate nitrogen and faecal coliforms in Hong Kong waters

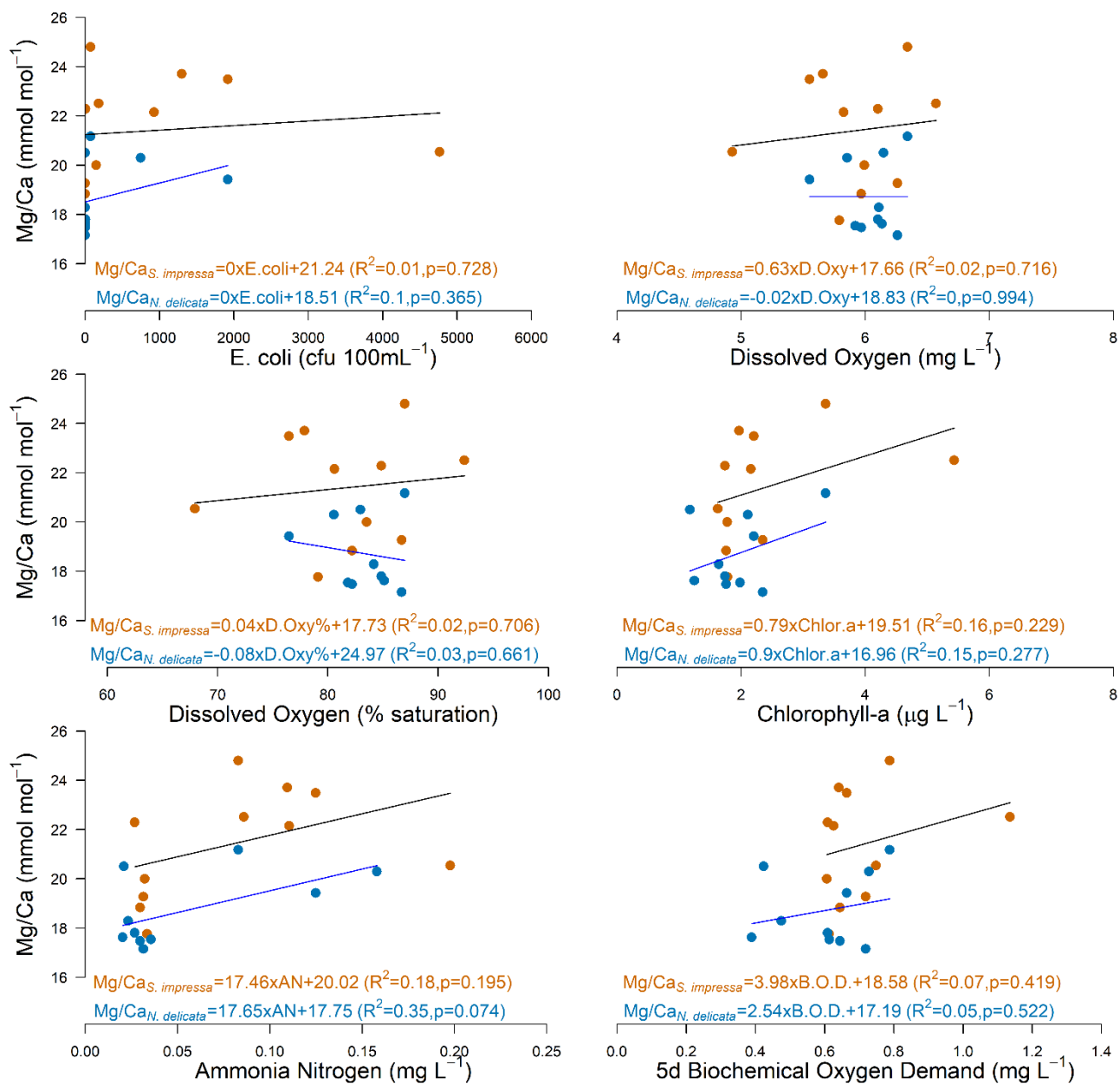


Figure S8: Linear correlations of Mg/Ca mean values in *S. impressa* ($\eta=7$) and *N. delicata* ($\eta=3$) with Escherichia coli, dissolved oxygen, dissolved oxygen (%), chlorophyll-a, ammonia nitrogen and 5-days biochemical oxygen demand in Hong Kong waters

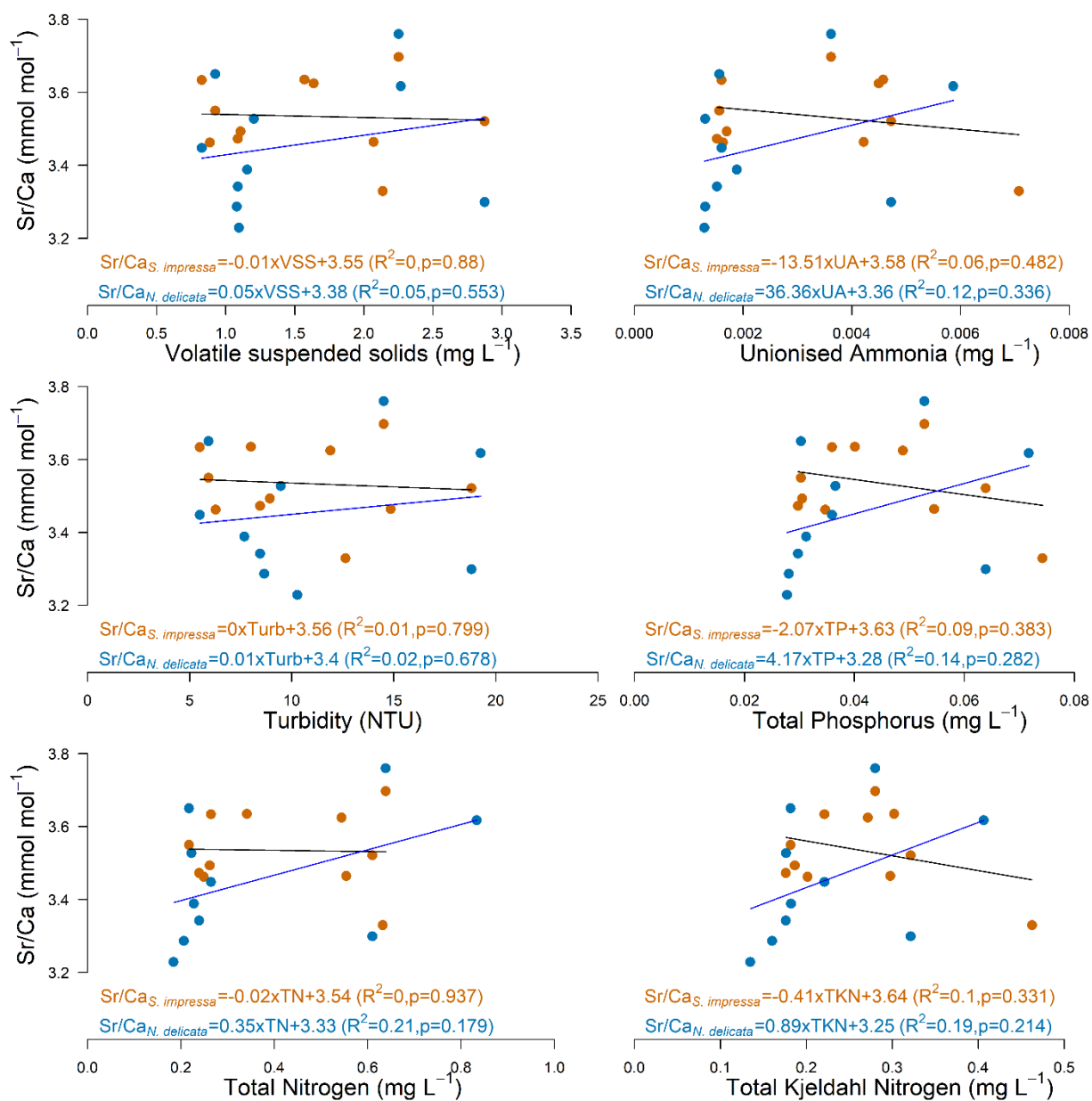


Figure S9: Linear correlations of Sr/Ca mean values in *S. impressa* ($\eta=7$) and *N. delicata* ($\eta=3$) with volatile suspended solids, unionised ammonia, turbidity, total phosphorus, total nitrogen and total (kjeldahl) nitrogen in Hong Kong waters.

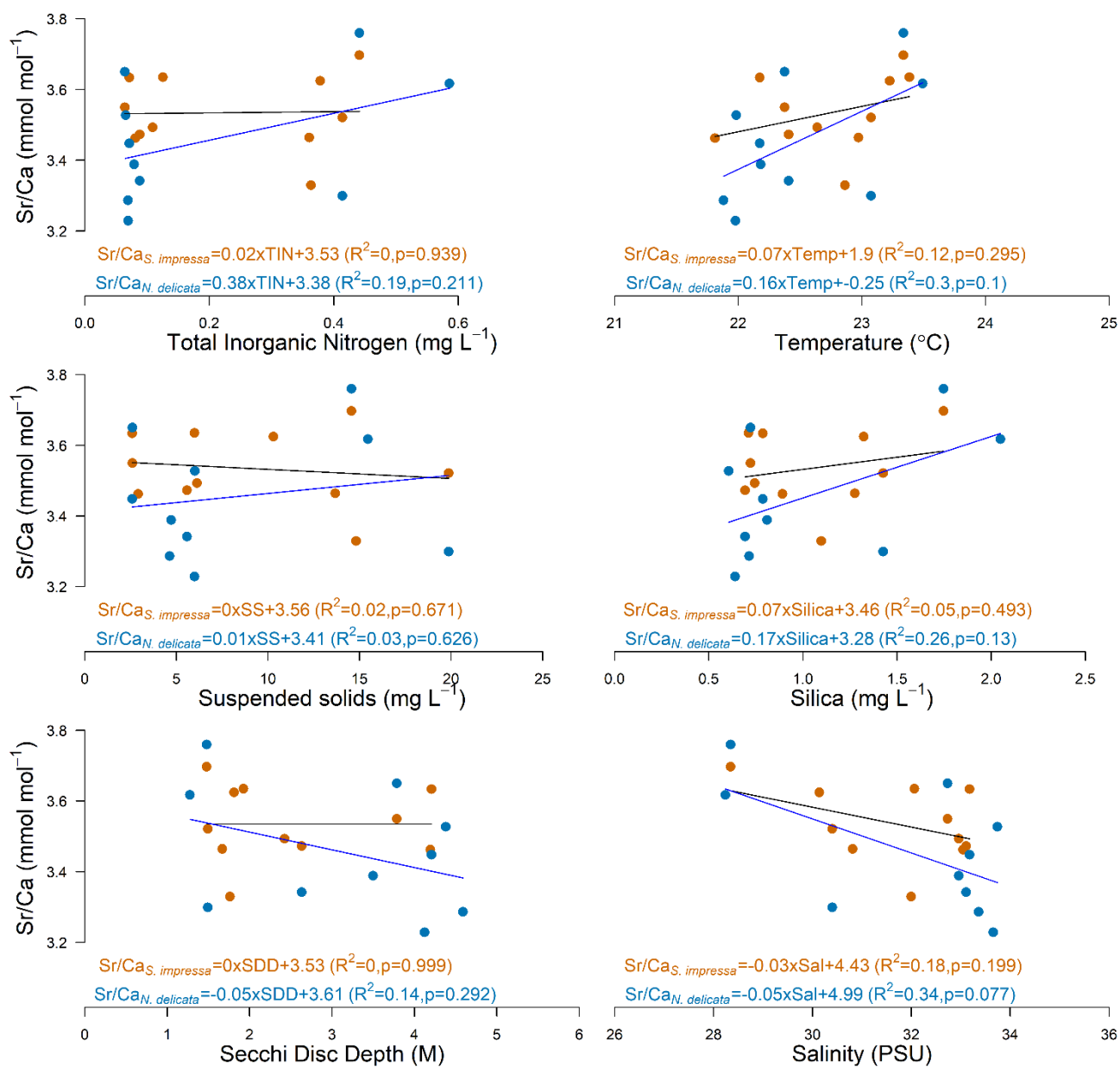


Figure S10: Linear correlations of Sr/Ca mean values in *S. impressa* ($\eta=7$) and *N. delicata* ($\eta=3$) with total inorganic nitrogen, temperature, suspended solids, silica, secchi disc depth and salinity in Hong Kong waters.

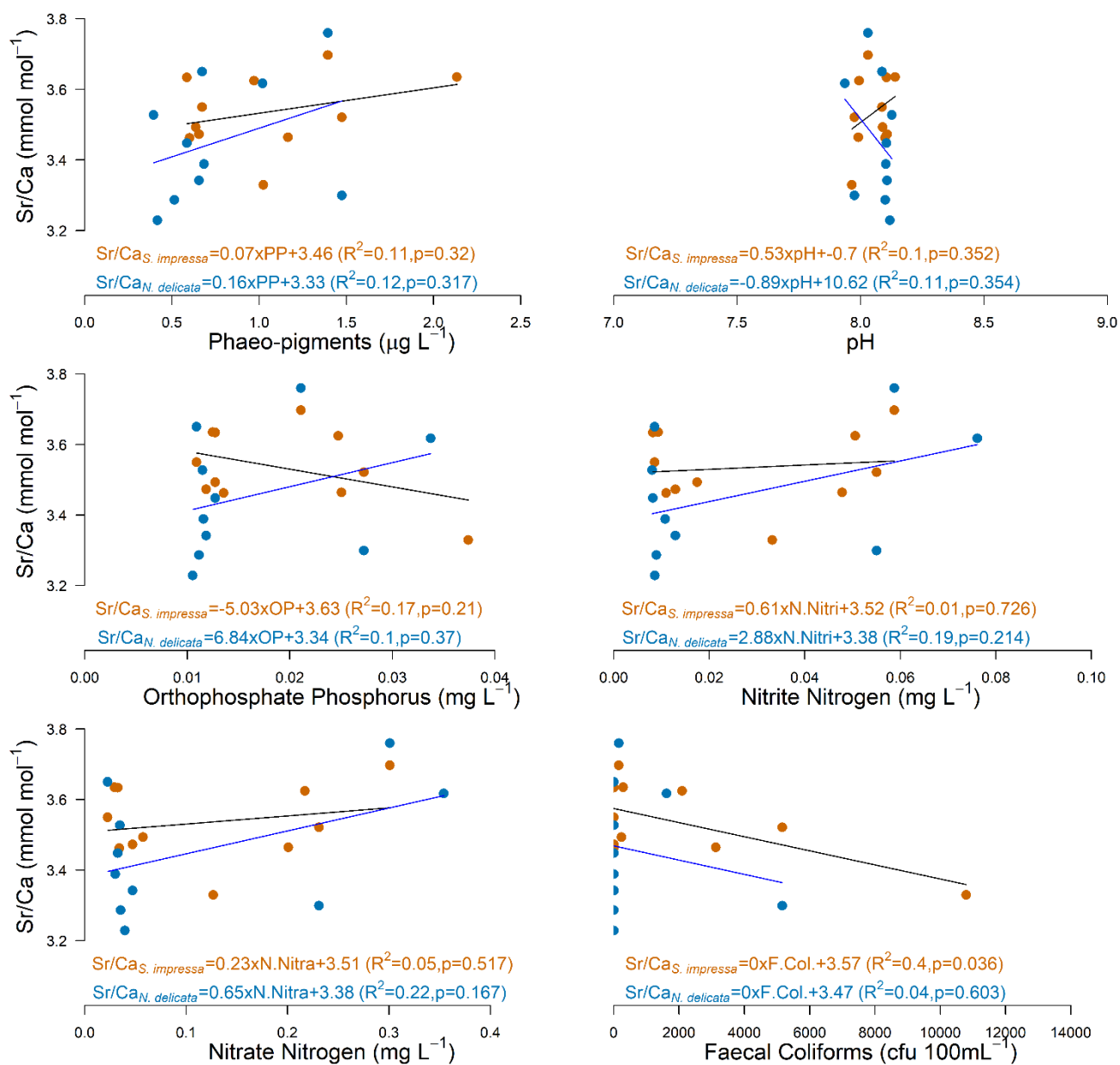


Figure S11: Linear correlations of Sr/Ca mean values in *S. impressa* ($\eta=7$) and *N. delicata* ($\eta=3$) with phaeo-pigments, pH, orthophosphate phosphorus, nitrite nitrogen, nitrate nitrogen and faecal coliforms in Hong Kong waters.

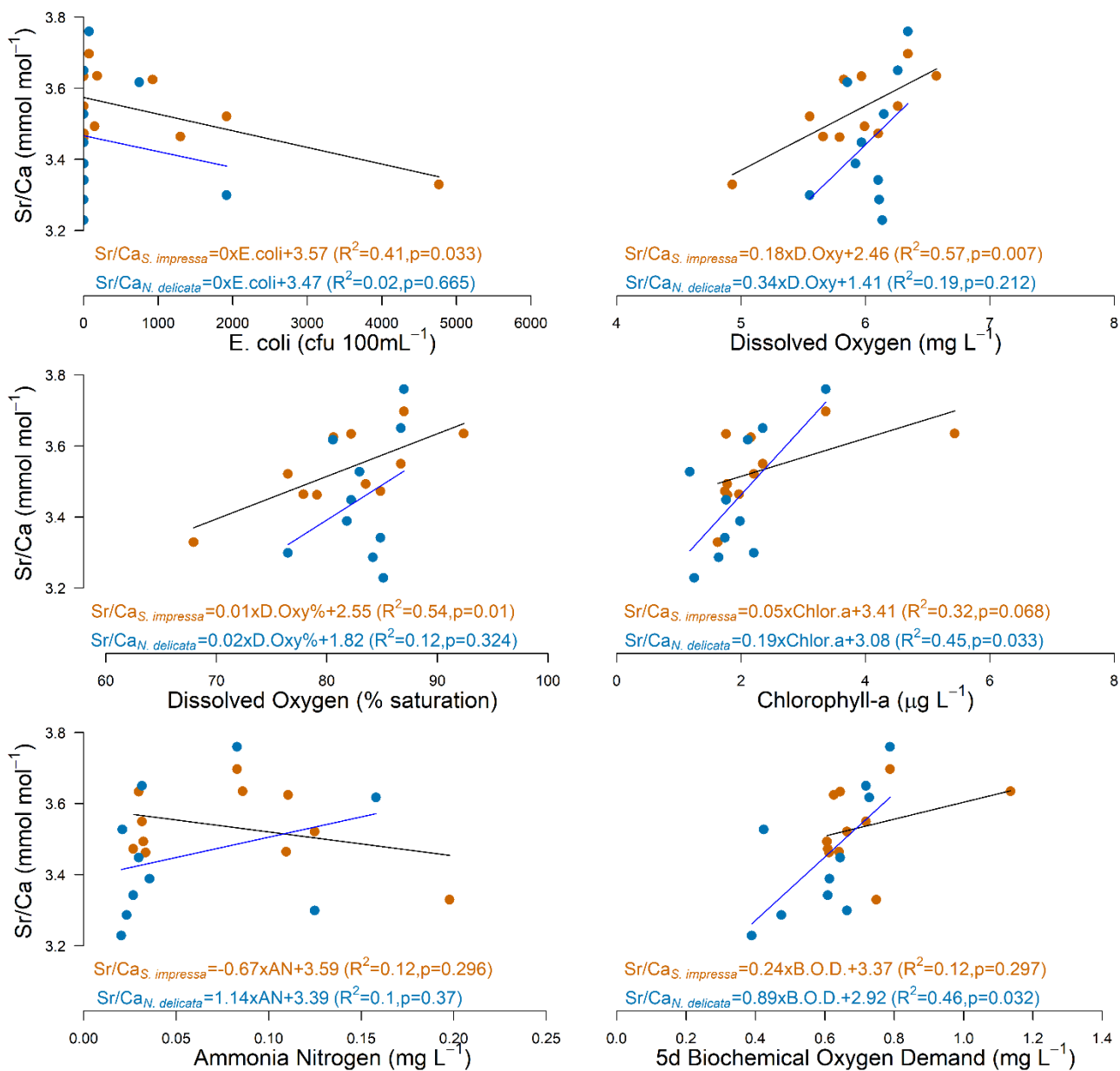


Figure S12: Linear correlations of Sr/Ca mean values in *S. impressa* ($\eta=7$) and *N. delicata* ($\eta=3$) with Escherichia coli, dissolved oxygen, dissolved oxygen (%), chlorophyll-a, ammonia nitrogen and 5-days biochemical oxygen demand in Hong Kong waters.

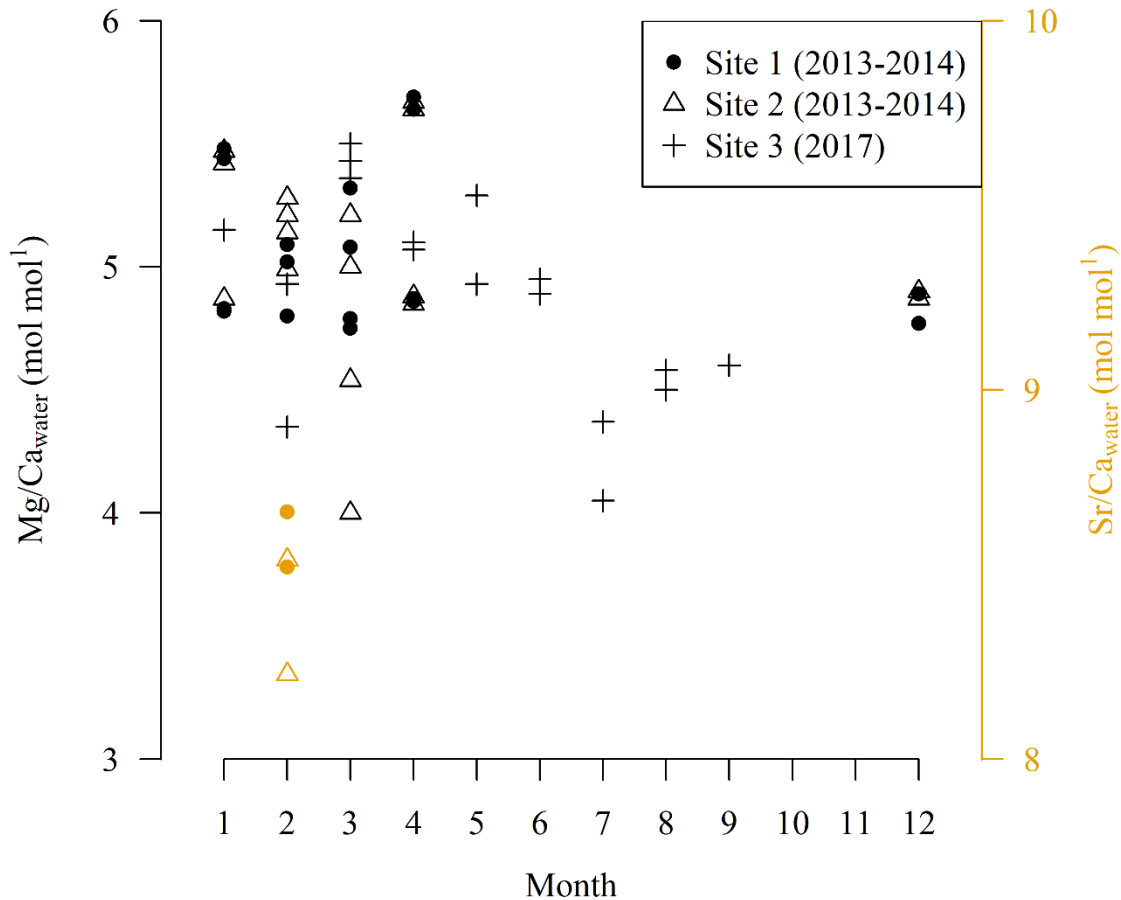


Figure S13: Mg/Ca and Sr/Ca ratios of seawater in Kwun Tsai, close to the Hong Kong desalination plant at Tseung Kwan O, obtained during the feasibility study performed by the EPD (Agreement No. CE 21/20212 (WS)). Water depths for Site 1, 2 and 3 are 4 m, 12 m and 12 m respectively. Measurements for Site 1 and 3 were performed at the middle water depth, while in Site 2 measurements were performed at the seafloor.