

## Preite and Pearson: Water quality in tropical waterholes

### Supplementary tables and figures

**Table S1.** ANOSIM results comparing overall water quality between seasons and rivers in surveys 1 and 2. The test statistics, Global R and R, and P values are shown, with significant values of P in boldface.

Survey	Grouping variable	Global R	P	Group Comparison	R	P
Survey 1	Season	0.376	<b>0.001</b>	July – Nov	0.455	<b>0.001</b>
				July – April	0.397	<b>0.001</b>
				Nov – April	0.316	<b>0.001</b>
	River	0.399	<b>0.001</b>	Basalt – Keelbottom	0.428	<b>0.001</b>
				Basalt – Suttor	0.581	<b>0.001</b>
				Keelbottom – Suttor	0.103	<b>0.013</b>
Survey 2	Season	0.213	<b>0.002</b>	Nov – April	0.213	<b>0.002</b>
	River	0.656	<b>0.001</b>	Basalt – Keelbottom	0.419	<b>0.001</b>
				Basalt – Suttor	0.675	<b>0.001</b>
				Keelbottom – Suttor	0.882	<b>0.001</b>

**Table S2.** Summary of PCA results for surveys 1 and 2 data, showing, for each of the first 3 principal components, the eigenvalues, % of the variance explained, cumulative % of the variance explained, and Pearson correlation coefficients, *r*, between water quality measures and PC scores, indicating the key drivers in the analysis. Values of  $P < 0.001$  are in boldface. Abbreviations: min, minimum; max, maximum

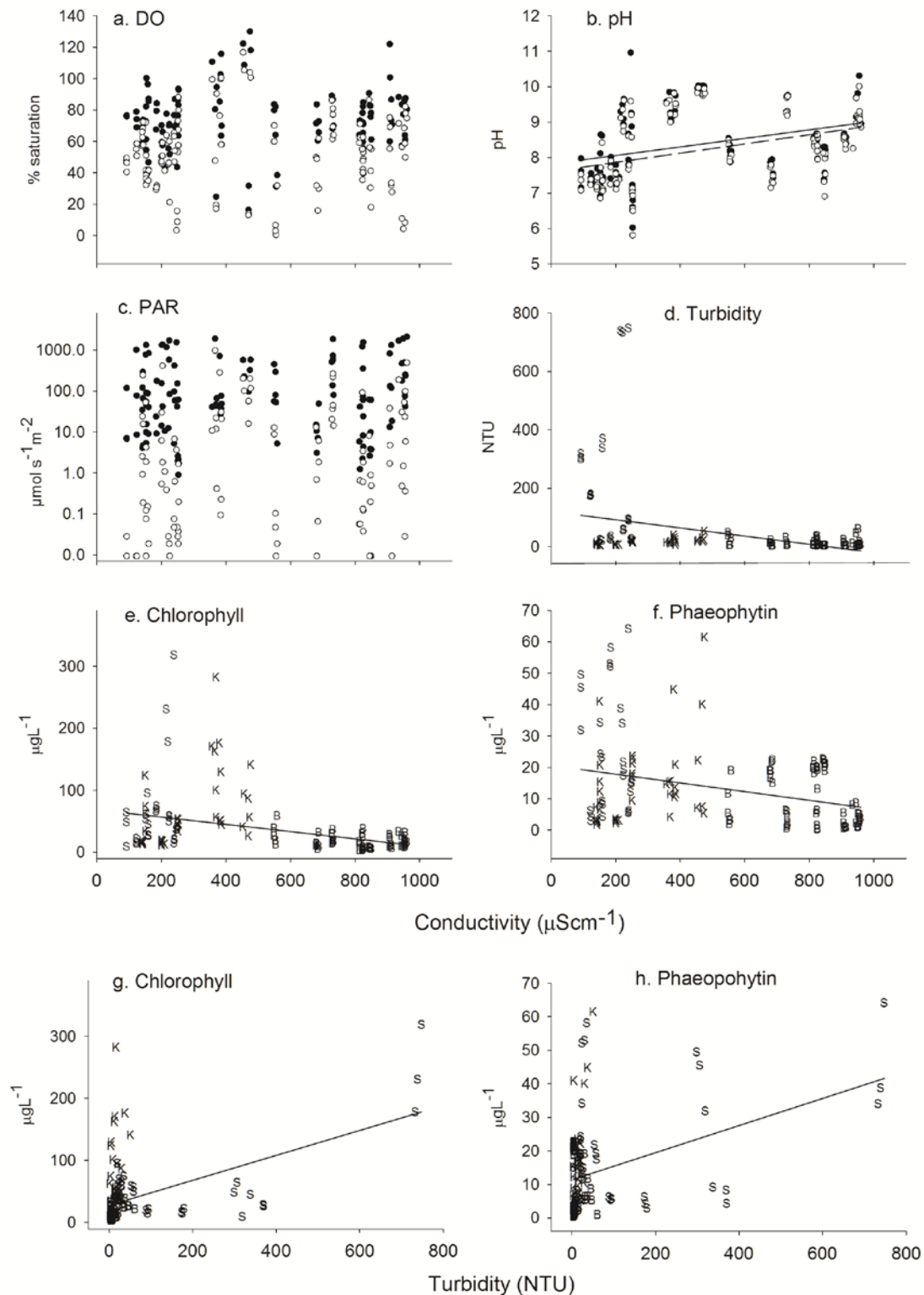
	Survey 1 (N = 120)			Survey 2 (N = 36)		
	PC1	PC2	PC3	PC1	PC2	PC3
	<u>PCA results</u>					
Eigenvalues	8.21	5.66	3.41	7.46	4.38	2.27
% Variance explained	27.4	18.9	11.4	41.4	24.3	12.6
Cumulative %	27.4	46.2	57.6	41.4	65.8	78.4
	<u>Pearson correlation coefficients, <i>r</i></u>					
Temperature min	<b>0.773</b>	-0.251	-0.123	0.506	0.132	<b>0.544</b>
Temperature max	<b>0.712</b>	<b>-0.406</b>	-0.132	<b>0.816</b>	0.364	0.345
Dissolved oxygen min	<b>0.408</b>	<b>-0.334</b>	<b>0.737</b>	<b>-0.672</b>	-0.245	<b>0.537</b>
Dissolved oxygen max	<b>0.461</b>	-0.206	<b>0.706</b>	0.179	0.357	<b>0.618</b>
pH min	-0.002	-0.073	-0.072	<b>0.853</b>	0.324	0.021
pH max	<b>0.687</b>	-0.100	-0.208	<b>0.896</b>	0.339	0.009
Conductivity min	<b>0.638</b>	<b>0.674</b>	0.027	<b>0.916</b>	0.335	-0.114
Conductivity max	<b>0.643</b>	<b>0.668</b>	0.029	<b>0.914</b>	0.337	-0.120
PAR min	<b>0.510</b>	<b>-0.371</b>	-0.266	0.127	-0.361	<b>0.769</b>
PAR max	<b>0.542</b>	-0.265	<b>-0.379</b>	<b>0.556</b>	-0.174	<b>0.535</b>
Turbidity	-0.229	<b>-0.524</b>	-0.023	<b>-0.748</b>	<b>0.632</b>	0.128
Chlorophyll	0.086	<b>-0.666</b>	-0.099	<b>0.599</b>	<b>0.605</b>	-0.164
Phaeophaetin	<b>-0.341</b>	<b>-0.416</b>	0.153	-0.187	<b>0.750</b>	-0.233
Particulate nitrogen				0.091	<b>0.840</b>	0.040
Nitrate nitrogen				<b>-0.694</b>	<b>0.687</b>	0.125
Particulate phosphorus				<b>-0.671</b>	<b>0.705</b>	0.125
Filterable reactive phosphorus				0.283	-0.160	-0.362

**Table S3.** Summary of results of nested PERMANOVA analyses of water quality data from surveys 1 and 2. P values for each comparison are shown for the main analyses of both surveys, with significant values in boldface; the % of pairwise comparisons in survey 2 with P < 0.05 are also shown.

n	Surveys 1 and 2 main analysis: P values						Survey 2: % of pairwise comparisons with P < 0.05			
	Season 3	River 3	Site 9	Habitat 2	Time 3	Depth 2-8	Season 2	Site 3	Time 2	Depth 2-8
All factors	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.040</b>	100	100	100	100
Temperature min	<b>0.001</b>	<b>0.001</b>	<b>0.003</b>	<b>0.001</b>	<b>0.001</b>					
Temperature max	<b>0.001</b>	<b>0.001</b>	<b>0.017</b>	0.812	<b>0.001</b>					
Temperature all						<b>0.007</b>	100	100	100	100
Dissolved oxygen min	<b>0.007</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>					
Dissolved oxygen max	<b>0.001</b>	<b>0.001</b>	<b>0.011</b>	0.584	<b>0.001</b>					
Dissolved oxygen all						<b>0.001</b>	100	67	100	100
pH min	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.007</b>	<b>0.001</b>					
pH max	<b>0.001</b>	<b>0.001</b>	<b>0.002</b>	0.381	<b>0.020</b>					
pH all						0.748	100	100	100	0
Conductivity min	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.015</b>	<b>0.001</b>					
Conductivity max	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.049</b>	<b>0.005</b>					
Conductivity all						0.095	100	100	0	50
PAR min	<b>0.004</b>	<b>0.040</b>	0.950	0.088	0.069					
PAR max	<b>0.001</b>	0.083	0.163	0.062	<b>0.001</b>					
PAR all						<b>0.001</b>	100	100	67	100
Turbidity <sup>1</sup>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	0.621		100	100	0	
Chlorophyll <sup>1</sup>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.004</b>	0.704		0	100	0	
Phaeophaetin <sup>1</sup>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.004</b>		0	33	0	
Particulate N <sup>2</sup>	<b>0.004</b>	<b>0.010</b>		1.000			100	50	0	
Nitrate N <sup>1,2</sup>	<b>0.001</b>	<b>0.001</b>		1.000			100	83	0	
Particulate P <sup>2</sup>	<b>0.001</b>	<b>0.001</b>		0.365			100	83	0	
Filterable reactive P <sup>1,2</sup>	<b>0.001</b>	<b>0.001</b>		0.760			100	83	0	

<sup>1</sup>Composite samples across strata. <sup>2</sup>Survey 2 only

**Fig. S1** Relationships between water quality variables and putative explanatory large-scale variables, conductivity and turbidity. Maximum and minimum values are represented by closed and open circles, respectively (a – c). Other symbols represent the three rivers: B, Basalt River; K, Keelbottom Creek; S, Suttor River (d – h). Regression lines are shown where  $P < 0.05$ . F, P and  $r^2$  values are provided in Table 6. For (b) regression lines for maximum (solid) and minimum (dashed) are shown.



**Fig. S2** Relationships between nutrient concentrations and putative explanatory large-scale variables, conductivity and turbidity. Symbols represent the three rivers: B, Basalt River; K, Keelbottom Creek; S, Suttor River. Regressions are shown where  $P < 0.05$ . F, P and  $r^2$  values are provided in Table 6.

