

Behaviour of Dissolved Phosphorus with the associated nutrients in relation to phytoplankton biomass of the Rajang River-South China Sea continuum

Edwin Sien Aun Sia¹, Jing Zhang², Shan Jiang², Zhuoyi Zhu², Gonzalo Carrasco³, Faddrine Holt Jang¹, Aazani Mujahid⁴, Moritz Müller¹

¹Faculty of Computing, Engineering and Science, Swinburne University of Technology, Sarawak Campus, Jalan Simpang Tiga, 93350, Kuching, Sarawak, Malaysia.

²State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Zhongshan N. Road 3663, Shanghai, 200062, China.

³Tropical Marine Science Institute, National University of Singapore, 119223, Singapore.

⁴Department of Aquatic Science, Faculty of Resource, Science and Technology, University Malaysia Sarawak, 93400 Kota Samarahan, Sarawak, Malaysia.

Correspondence: Moritz Müller, email: mmueller@swinburne.edu.my

Supp. Table 1: Average values of measured parameter along the four source types (geographical distribution) of the Rajang River (mean \pm SE)

Parameters	Season	Source Type (Mean \pm SE)			
		Marine	Brackish Peat	Freshwater Peat	Mineral Soil
Temperature ($^{\circ}$ C)	Dry	31.10 \pm 0.41 (n=3)	30.40 \pm 0.21 (n=13)	30.00 \pm 0.18 (n=4)	26.00 \pm 0.17 (n=9)
	Wet	30.25 \pm 0.15 (n=2)	28.84 \pm 0.31 (n=8)	27.76 \pm 0.25 (n=5)	26.60* (n=1)
Salinity (PSU)	Dry	31.50 \pm 0.32 (n=3)	15.40 \pm (n=13)	0.28 \pm (n=4)	0.00*(n=9)
	Wet	30.01 \pm 0.01 (n=2)	14.52 \pm 2.46 (n=8)	0.00 (n=5)	0.00* (n=1)
Dissolved oxygen, DO (mg L ⁻¹)	Dry	4.03 \pm 0.08 (n=3)	3.51 \pm 0.16 (n=13)	3.68 \pm 0.19 (n=4)	4.33 \pm 0.13 (n=9)
	Wet	6.52 \pm 0.02(n=2)	6.01 \pm 0.27 (n=8)	5.88 \pm 0.36 (n=5)	5.96*(n=1)
DIP(μ M)	Dry	0.17 \pm 0.05 (n=3)	0.11 \pm 0.04 (n=13)	0.04 \pm 0.01 (n=4)	0.04 \pm 0.01(n=8)
	Wet	0.13* (n=1)	0.10 \pm 0.01 (n=8)	0.08 \pm 0.03 (n=5)	0.06 * (n=1)
DOP(μ M)	Dry	0.25 \pm 0.01 (n=3)	0.25 \pm 0.01 (n=13)	0.22 \pm 0.02 (n=4)	0.20 \pm 0.01 (n=9)
	Wet	0.33 \pm 0.04 (n=2)	0.19 \pm 0.03(n=8)	0.10 \pm 0.02 (n=5)	0.09 * (n=1)
TDP(μ M)	Dry	0.42 \pm 0.04 (n=3)	0.36 \pm 0.02 (n=13)	0.25 \pm 0.02 (n=4)	0.23 \pm 0.01(n=9)
	Wet	0.42* (n=1)	0.29 \pm 0.03 (n=8)	0.18 \pm 0.02 (n=5)	0.16 * (n=1)
Dissolved Inorganic Nitrogen, DIN (μ M)	Dry	11.36 \pm 1.69 (n=3)	21.86 \pm 1.59 (n=13)	13.33 \pm 1.14 (n=4)	10.90 \pm 1.76 (n=9)
	Wet	10.57 \pm 0.46 (n=2)	13.41 \pm 0.93 (n=8)	13.44 \pm 1.95 (n=5)	10.34 * (n=1)
dSi (μ M)	Dry	4.63 \pm 0.32 (n=3)	80.50 \pm 12.96 (n=13)	152.00 \pm 3.13 (n=4)	143.00 \pm 3.21(n=9)
	Wet	10.77 \pm 4.78 (n=2)	76.50 \pm 12.01 (n=8)	146.94 \pm 2.98 (n=5)	157.00* (n=1)
Suspended Particulate Matter, SPM (mg L ⁻¹)	Dry	49.30 \pm 20.51 (n=3)	86.10 \pm 11.06 (n=13)	56.00 \pm 12.76 (n=4)	74.00 \pm 14.85(n=9)
	Wet	55.47 \pm 8.32 (n=2)	52.46 \pm 6.27 (n=8)	264.09 \pm 58.58 (n=5)	226.73* (n=1)
Dissolved Organic Carbon (DOC) (mM)	Dry	0.1833 \pm 0.0189 (n=3)	0.2678 \pm 0.0151 (n=13)	0.2355 \pm 0.0119 (n=4)	0.2281 \pm 0.0214 (n=9)
	Wet	0.0896 \pm 0.0066 (n=2)	0.1452 \pm 0.0066 (n=8)	0.1839 \pm 0.0094 (n=5)	0.1253* (n=1)

*Indicate only one (1) sample was available for calculations

The reaction factor was calculated for both DIP and DOP with both seasons combined to obtain the average reaction factor. The reaction factors were as calculated below in **Table 3.2**:

Supp. Table 2: The calculated reaction factor and percentage addition or removal of DIP and DOP along the salinity gradient towards the South China Sea

	DIP	DOP
Reaction Factor	0.58	2.27
Percentage Addition or Removal (%)	57.78% Removal	44.07% Addition

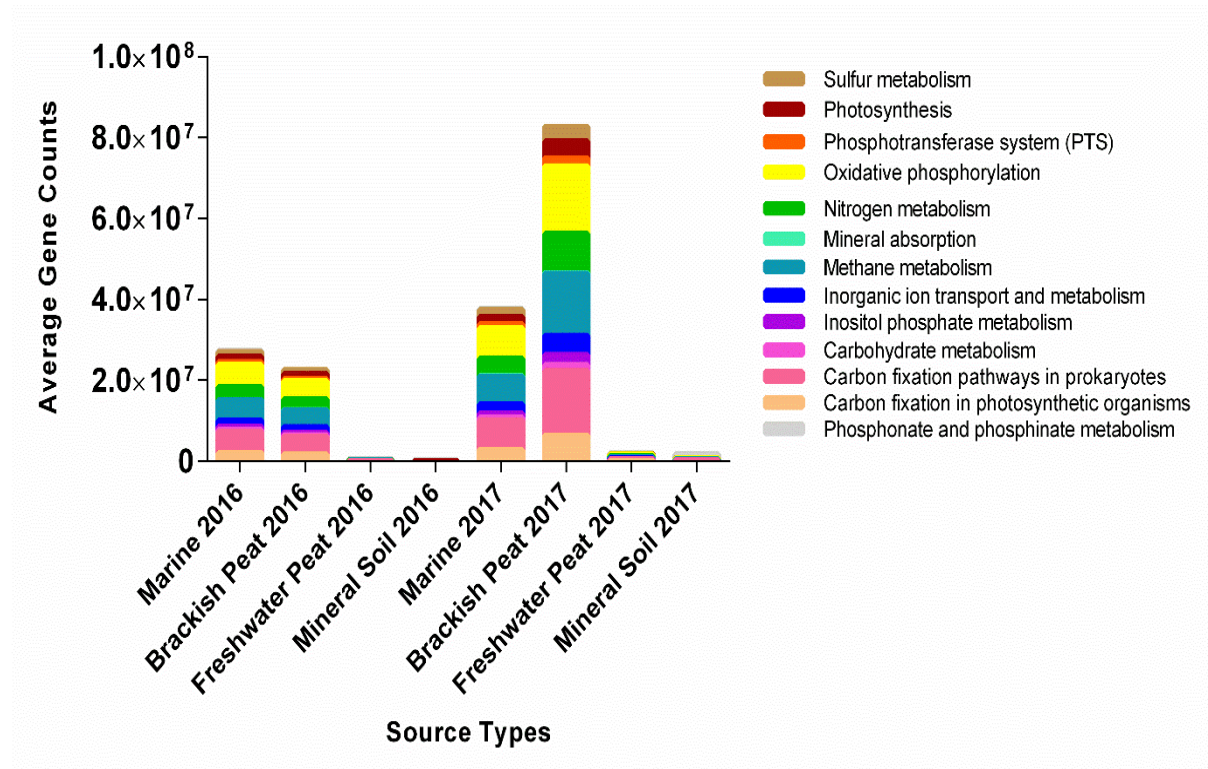
Calculation of Rajang River Discharge

Supp. Table 3: Average precipitation calculations over the month of the sampling campaigns (Dry and wet) and the calculations for discharge

Season	Average precipitation (mm)	Average precipitation (m)	Days per month	Area of Basin (m ²)	Total Precipitation (m ³)	Precipitation m ³ s ⁻¹	Discharge, after consideration with surface runoff) (m ³ s ⁻¹)
Dry	209.79	0.20979	31	5.20E+10	1.09E+10	4073.74	2444.24
Wet	338.68	0.33868		5.20E+10	1.76E+10	6576.49	3945.89

Discharge during the dry season (2444.24 m³ s⁻¹) as shown in **Table 4** was below the annual average of (3780.57 m³ s⁻¹ based on own calculation) 3355 m³ s⁻¹ as described by Müller-Dum et al. (2019) whereas for the wet season, the discharge rate (3945.89 m³ s⁻¹) was below the annual estimated average of 4197.39 m³ s⁻¹ (own calculation) .

Functional Profile of Bacterial Communities



Supp. Fig. 1: The relative abundance of predicted bacterial functional profiles in the four source types across two seasons based on KEGG Pathways (taken from Sia et al. 2019)