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Supporting Information for

Low biodegradability of Dissolved organic matter from South East Asian peat draining rivers

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Introduction

The data enclosed include reaction kinetics from phenol oxidase enzyme assays using the substrate L-DOPA, which increases in absorbance at 460nm wavelength as it is oxidized either by enzymatic or abiotic activity. Samples shown are from various locations in Sarawak, including the Maludam and Sematan rivers and coastal waters off the Rajang River, and samples from the Johor Strait and Singapore Strait in Singapore. Samples were collected from 2017 to 2019. Mixing ratios of biodegradation incubation experiments of water from the tropical peat draining river Maludam, Sarawak and seawater from coastal Singapore. Finally, significant regression results from changes in dissolved organic carbon and optical properties of these Biodegradation incubations.

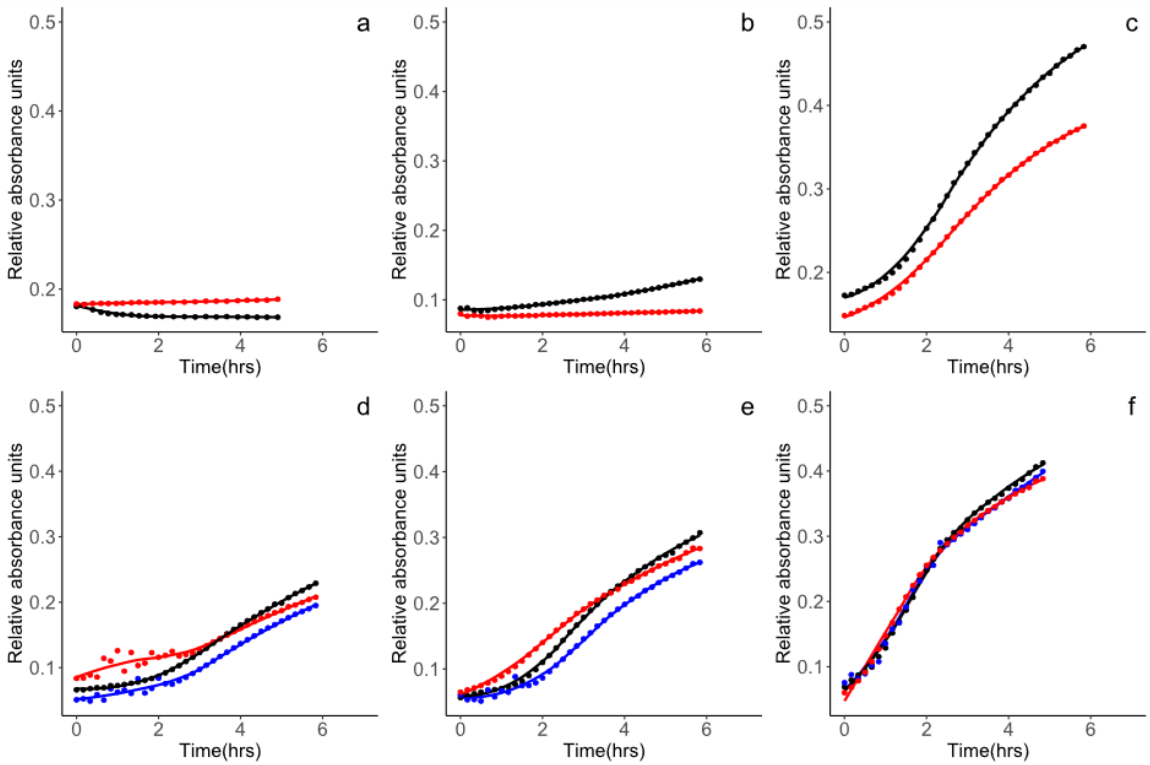

Figure S1. Reaction kinetics of Phenol oxidase assays (increase in absorbance at 460nM, due to the oxidation of the assay subsrate L-DOPA). Panels (a–c) show data from Sarawak; (d–f) show data from Singapore. (a) Maludam River, (b) Sematan River, (c) coastal marine waters off the Rajang River, (d,e) Johor Strait (d,e), and (f) Singapore Strait. Unaltered samples (black), autoclaved controls (red) and 3 kDa filtered samples (blue) are shown. Lines are LOESS (locally estimated scatterplot smoothing), points shown are raw spectrophotometer outputs. Increasing absorbance results from the oxidation of the substrate L-DOPA, through biotic or abiotic means. POx activity rates used in analysis are taken from the steepest linear portion of the absorbance graphs from three replicate microwells.

Table S1. Mixing ratios of waters used for biodegradation incubation experiments.

Incubation for Maludam river tDOC biodegradability with/without nutrient addition			
	mixture as % of total volume		
Treatment	**Unfiltered Maludam river water**	**Filtered Maludam river water**	
Maludam river water	**100%**	**0%**	
Maludam river water + nutrients	**100%**	**0%**	
Filtered Maludam river water (control)	**0%**	**100%**	
Incubation for Maludam river tDOC biodegradability in seawater			
	mixture as % of total volume		
Treatment	**Unfiltered seawater**	**Filtered seawater**	**Filtered Maludam river water**
Seawater	**5%**	**95%**	**0%**
Filtered seawater control	**0%**	**100%**	**0%**
Seawater + filtered Maludam river water	**5%**	**93.75%**	**1.25%**
Filtered seawater + filtered Maludam seawater control	**0%**	**98.75%**	**1.25%**

Table S2. Statistically significant linear and exponential regressions for dissolved organic carbon (DOC) and coloured dissolved organic matter (CDOM) parameters measured during 56 day biodegradation incubations. Regressions were performed on mean values of 3 replicate incubations per time point (see Figure 4).

Treatment	**Parameter ~ time (days)**	**Equation: linear** $y = a + bx$ **or exponential decay** $Y_t \sim y_f + (y_0 - y_f)e^{-\exp(\log \alpha)t}$	**R^2 & p value**	**Sample size**
Incubation 1 – Maludam river water with/without added nutrients				
Unfiltered Maludam river water	DOC	Linear a = 3049 b = -1.2	$R^2 = 0.86$ P = 0.01	5
Unfiltered Maludam river water + nutrients	DOC	Linear a = 3041 b = -2.0	$R^2 = 0.81$ P = 0.02	5
	a_{350}	Linear a = 145.4 b = -0.097	$R^2 = 0.82$ P = 0.02	5

Incubation 2 – Seawater with/without added Maludam river water				
Unfiltered seawater	a_{350}	Linear a = 0.49 b = -8.9e-4	R^2 = 0.75 P = 0.04	5
	Slope ratio	Linear a = 1.2 b = 0.0025	R^2 = 0.90 P < 0.01	5
Filtered seawater (control)	DOC	Linear a = 86.3 b = -0.24	R^2 = 0.90 P < 0.01	5
Unfiltered seawater + Maludam river water	a_{350}	Linear a = 3.6 b = -6.3e-3	R^2 = 0.81 P = 0.02	5
		Exponential decay Y_f = 3.2 Y_0 = 3.6 Log α = -3.0	P = 0.02	5
	$S_{350-400}$	Exponential decay Y_f = 1.30e-2 Y_0 = 1.25e-2 Log α = -2.3	P < 0.01	5
Filtered seawater + Maludam river water (control)	a_{350}	Linear a = 3.5 b = -3.8e-3	R^2 = 0.72 P = 0.04	5
		Exponential decay Y_f = 3.3 Y_0 = 3.6 Log α = -2.7	P = 0.02	5
	$S_{275-295}$	Linear a = 0.012 b = 7.2e-6	R^2 = 0.90 P < 0.01	5
	$S_{350-400}$	Linear a = 0.013 b = 1.37e-05	R^2 = 0.88 P = 0.01	5
		Exponential decay Y_f = 0.014 Y_0 = 0.013 Log α = -3.5	P = 0.02	5