**SUPPLEMENTARY MATERIAL**

**PHYTOPLANKTON BIOMASS INCREASES IN THE SILT-IMPACTED AREA OF AN AMAZONIAN FLOOD-PLAIN LAKE OVER A 15-YEAR TIME SERIES**

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Table S1 – Summary of linear mixed-effect regressions (LMER) testing differences in the Total phytoplankton biomass (mm3 L-1) and abiotic variables (fixed factors) (Residual light attenuation m-1; Turbidity, NTU; Total nitrogen, mg L-1; NTU; Total phosphorus, mg L-1; Air temperature, oC; site depth, m) between impacted and non-impacted areas and among years (2005–2019), controlled for sites (random factor) and their interactions in Batata Lake. The table shows the degrees of freedom from the numerator (numDF) and denominator (denDF) after the Satterthwaite correction and the F and p-value associated with it. Marginal r2 describes the proportion of variance explained by the fixed factors alone, and Conditional r2 represents the proportion of variance explained by fixed and random factors. Significant p-values are in bold.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variables** | **numDF** | **denDF** | **F-value** | **p-value** |
| Total phytoplankton biomass (Marginal r² = 0.17; Conditional r² = 0.29) |
| (Intercept) | 1 | 340 | 0.2903 | 0.5904 |
| year | 1 | 340 | 7.8243 | **0.0054** |
| impact | 1 | 6 | 8.5724 | **0.0264** |
| year:impact | 1 | 340 | 1.1501 | 0.2843 |
| Residual light attenuation (Marginal r² = 0; Conditional r² = 0.02) |
| (Intercept) | 1 | 340 | 0.0228 | 0.8802 |
| year | 1 | 340 | 0.1027 | 0.7488 |
| impact | 1 | 6 | 0.0243 | 0.8811 |
| year:impact | 1 | 340 | 0.3297 | 0.5662 |
| Turbidity (Marginal r² = 0.06; Conditional r² = 0.07) |
| (Intercept) | 1 | 358 | 0.0025 | 0.9599 |
| year | 1 | 358 | 5.3509 | **0.0213** |
| impact | 1 | 6 | 10.4771 | **0.0178** |
| year:impact | 1 | 358 | 1.0143 | 0.3146 |
| Total nitrogen (Marginal r² = 0.01; Conditional r² = 0.05) |
| (Intercept) | 1 | 346 | 0.0236 | 0.8780 |
| year | 1 | 346 | 0.0872 | 0.7680 |
| impact | 1 | 6 | 0.3984 | 0.5512 |
| year:impact | 1 | 346 | 2.1760 | 0.1411 |
| Total phosphorus (Marginal r² = 0.15; Conditional r² = 0.17) |
| (Intercept) | 1 | 351 | 0.0017 | 0.9673 |
| year | 1 | 351 | 57.8517 | **0.0000** |
| impact | 1 | 6 | 3.3490 | 0.1170 |
| year:impact | 1 | 351 | 0.2884 | 0.5916 |
| Air temperature (Marginal r² = 0.04; Conditional r² = 0.05) |
| (Intercept) | 1 | 358 | 0.0038 | 0.9509 |
| year | 1 | 358 | 11.5948 | **0.0007** |
| impact | 1 | 6 | 3.6021 | 0.1065 |
| year:impact | 1 | 358 | 0.9902 | 0.3204 |
| Site depth (Marginal r² = 0.06; Conditional r² = 0.16) |
| (Intercept) | 1 | 358 | 0.2629 | 0.6084 |
| year | 1 | 358 | 0.4918 | 0.4836 |
| impact | 1 | 6 | 4.0581 | 0.0906 |
| year:impact | 1 | 358 | 0.8968 | 0.3443 |

**Table S2.** Annual mean, standard deviation (SD), and number of samples (n) per year of the variables selected in the models. AirT = Air temperature, zsite = Site depth, Turb = Turbidity, TN = Total nitrogen, TP = Total phosphorus, PhyBM = Total phytoplankton biomass, IA = impacted area, NIA = non-impacted area.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|   | **AirT (°C)** | **zsite (m)** | **Turb (NTU)** | **Kres (m–1)** | **TN (mg L–1)** | **TP (µg L–1)** | **PhyBM (mm3 L–1)** |
| **Year** | **Mean** | **SD** | **N** | **Mean** | **SD** | **N** | **Mean** | **SD** | **N** | **Mean** | **SD** | **N** | **Mean** | **SD** | **N** | **Mean** | **SD** | **N** | **Mean** | **SD** | **N** |
| **Impacted** |
| 2005 | 27.1 | 0.5 | 12 | 3.3 | 1.8 | 12 | 14.4 | 10.9 | 12 | 1.7 | 0.7 | 12 | 0.15 | 0.05 | 11 | 19.11 | 9.32 | 12 | 1.5 | 1.3 | 10 |
| 2006 | 26.7 | 1.0 | 14 | 4.0 | 2.4 | 14 | 11.6 | 14.6 | 14 | 1.9 | 0.6 | 12 | 0.30 | 0.11 | 14 | 19.90 | 14.39 | 14 | 1.3 | 1.5 | 11 |
| 2007 | 27.1 | 0.9 | 15 | 3.2 | 1.9 | 15 | 24.1 | 24.2 | 15 | 1.2 | 0.7 | 14 | 0.24 | 0.11 | 15 | 39.12 | 24.13 | 15 | 0.5 | 0.6 | 15 |
| 2008 | 26.7 | 1.1 | 15 | 3.5 | 2.2 | 15 | 23.3 | 23.5 | 15 | 1.4 | 0.8 | 13 | 0.24 | 0.06 | 15 | 12.62 | 5.93 | 14 | 1.4 | 1.9 | 15 |
| 2009 | 27.3 | 1.4 | 16 | 3.9 | 2.6 | 16 | 19.4 | 23.1 | 16 | 1.5 | 0.8 | 16 | 0.50 | 0.13 | 14 | 29.66 | 22.76 | 15 | 1.3 | 1.9 | 16 |
| 2010 | 27.2 | 0.5 | 12 | 3.3 | 1.6 | 12 | 15.2 | 20.2 | 12 | 2.0 | 0.4 | 11 | 0.25 | 0.05 | 10 | 33.45 | 15.01 | 12 | 0.9 | 1.1 | 12 |
| 2011 | 27.4 | 0.8 | 16 | 3.5 | 1.9 | 16 | 11.2 | 17.2 | 16 | 1.7 | 0.6 | 16 | 0.47 | 0.16 | 15 | 17.93 | 9.34 | 16 | 3.1 | 3.3 | 14 |
| 2012 | 27.3 | 0.8 | 16 | 4.3 | 2.0 | 16 | 6.8 | 8.9 | 16 | 1.9 | 0.7 | 15 | 0.40 | 0.21 | 16 | 15.63 | 12.66 | 14 | 2.2 | 3.3 | 16 |
| 2013 | 27.5 | 0.6 | 18 | 3.1 | 1.9 | 18 | 12.5 | 18.6 | 18 | 1.5 | 0.8 | 18 | 0.80 | 0.97 | 17 | 22.95 | 31.15 | 18 | 2.6 | 4.1 | 18 |
| 2014 | 28.0 | 1.1 | 15 | 3.5 | 1.8 | 10 | 12.8 | 14.9 | 10 | 1.2 | 0.9 | 10 | 0.30 | 0.15 | 10 | 17.34 | 8.75 | 10 | 1.9 | 1.7 | 9 |
| 2015 | 27.8 | 1.3 | 20 | 4.0 | 1.9 | 16 | 13.9 | 36.2 | 16 | 2.1 | 0.7 | 16 | 0.28 | 0.22 | 16 | 20.78 | 18.21 | 16 | 4.0 | 4.6 | 16 |
| 2016 | 27.7 | 0.9 | 15 | 2.4 | 1.4 | 14 | 31.4 | 42.8 | 14 | 1.5 | 0.8 | 14 | 0.16 | 0.09 | 10 | 2.85 | 1.99 | 12 | 2.8 | 3.8 | 14 |
| 2017 | 27.6 | 1.1 | 20 | 3.8 | 2.1 | 16 | 11.3 | 9.1 | 16 | 1.6 | 0.7 | 16 | 0.26 | 0.19 | 16 | 9.34 | 5.44 | 16 | 1.8 | 3.3 | 16 |
| 2018 | 27.3 | 0.8 | 20 | 3.1 | 1.6 | 16 | 7.7 | 6.9 | 15 | 1.6 | 0.8 | 16 | 0.29 | 0.11 | 16 | 4.47 | 4.06 | 16 | 4.2 | 5.8 | 16 |
| 2019 | 26.7 | 0.7 | 20 | 4.1 | 1.9 | 14 | 5.9 | 5.9 | 14 | 1.8 | 0.7 | 14 | 0.39 | 0.19 | 14 | 14.91 | 11.30 | 14 | 1.9 | 2.2 | 14 |
| **All years** | **27.3** | **0.9** | **244** | **3.5** | **1.9** | **220** | **15.4** | **19.4** | **219** | **1.6** | **0.7** | **213** | **0.30** | **0.19** | **209** | **18.9** | **13.1** | **214** | **2.1** | **2.7** | **212** |
| **Non-impacted** |
| 2005 | 27.3 | 0.7 | 10 | 3.9 | 2.5 | 10 | 8.4 | 9.9 | 10 | 1.3 | 0.8 | 7 | 0.54 | 0.18 | 9 | 25.78 | 17.94 | 9 | 4.2 | 3.2 | 8 |
| 2006 | 27.2 | 1.1 | 9 | 5.1 | 2.8 | 9 | 5.1 | 4.4 | 9 | 2.0 | 0.6 | 9 | 0.31 | 0.08 | 9 | 15.30 | 12.30 | 9 | 1.8 | 1.6 | 4 |
| 2007 | 27.4 | 0.9 | 10 | 4.7 | 2.3 | 10 | 7.7 | 4.8 | 10 | 1.9 | 0.7 | 10 | 0.28 | 0.12 | 10 | 44.92 | 26.57 | 10 | 2.2 | 2.4 | 8 |
| 2008 | 26.9 | 1.0 | 10 | 5.0 | 2.4 | 10 | 7.4 | 2.9 | 10 | 1.3 | 0.7 | 10 | 0.29 | 0.09 | 10 | 18.88 | 6.81 | 10 | 4.2 | 3.8 | 10 |
| 2009 | 27.7 | 1.3 | 10 | 4.8 | 3.5 | 10 | 21.5 | 28.7 | 10 | 1.7 | 1.0 | 9 | 0.53 | 0.18 | 10 | 47.86 | 35.95 | 10 | 4.3 | 4.3 | 10 |
| 2010 | 27.6 | 0.7 | 10 | 3.7 | 2.6 | 10 | 14.2 | 26.9 | 10 | 1.6 | 0.9 | 9 | 0.30 | 0.15 | 10 | 40.77 | 42.39 | 10 | 3.3 | 2.2 | 10 |
| 2011 | 27.7 | 0.7 | 10 | 5.0 | 2.8 | 10 | 6.5 | 6.6 | 10 | 1.8 | 0.6 | 10 | 0.46 | 0.18 | 10 | 31.27 | 18.03 | 10 | 9.0 | 8.0 | 10 |
| 2012 | 27.4 | 0.7 | 10 | 5.3 | 3.4 | 10 | 8.6 | 9.4 | 10 | 1.7 | 1.1 | 10 | 0.41 | 0.21 | 10 | 14.99 | 13.97 | 10 | 4.9 | 6.2 | 10 |
| 2013 | 27.6 | 0.6 | 10 | 5.6 | 2.0 | 10 | 4.1 | 2.7 | 10 | 1.6 | 1.0 | 10 | 0.76 | 1.27 | 10 | 13.75 | 5.74 | 10 | 10.8 | 8.6 | 10 |
| 2014 | 28.2 | 1.0 | 8 | 4.9 | 1.8 | 8 | 4.9 | 2.4 | 8 | 1.3 | 0.6 | 8 | 0.73 | 1.12 | 8 | 20.46 | 12.49 | 8 | 6.9 | 5.3 | 7 |
| 2015 | 28.0 | 1.3 | 10 | 5.4 | 3.2 | 10 | 31.1 | 48.6 | 10 | 1.7 | 1.2 | 10 | 0.40 | 0.31 | 10 | 40.47 | 39.38 | 10 | 5.7 | 5.6 | 10 |
| 2016 | 27.4 | 0.9 | 9 | 4.1 | 1.7 | 10 | 8.1 | 10.2 | 10 | 1.7 | 0.8 | 10 | 0.17 | 0.14 | 10 | 6.32 | 5.63 | 10 | 6.7 | 3.8 | 10 |
| 2017 | 27.7 | 1.1 | 10 | 5.2 | 2.4 | 10 | 7.7 | 4.5 | 10 | 1.6 | 0.7 | 8 | 0.29 | 0.26 | 10 | 18.62 | 30.27 | 10 | 4.2 | 4.5 | 10 |
| 2018 | 27.3 | 0.9 | 10 | 4.8 | 2.1 | 10 | 10.0 | 12.6 | 10 | 1.6 | 1.0 | 8 | 0.28 | 0.12 | 10 | 9.13 | 8.87 | 10 | 7.0 | 7.0 | 10 |
| 2019 | 26.8 | 0.7 | 10 | 5.4 | 2.3 | 10 | 4.8 | 4.0 | 10 | 1.6 | 0.8 | 8 | 0.35 | 0.09 | 10 | 18.76 | 21.74 | 10 | 4.7 | 4.6 | 10 |
| **All years** | 27.4 | 0.9 | 146 | 4.8 | 2.5 | 147 | 9.7 | 11.5 | 147 | 1.6 | 0.8 | 136 | 0.4 | 0.3 | 146 | 23.9 | 19.3 | 146 | 5.1 | 4.6 | 137 |
| **IA and NIA** | 27.4 | 1.0 | 390 | 4.1 | 2.3 | 367 | 12.9 | 20.4 | 366 | 1.6 | 0.8 | 349 | 0.37 | 0.40 | 355 | 21.10 | 21.72 | 360 | 3.47 | 4.60 | 349 |