

Mitigação de Florações de Cianobactérias em Ecossistemas Aquáticos Tropicais

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CIANO-Control



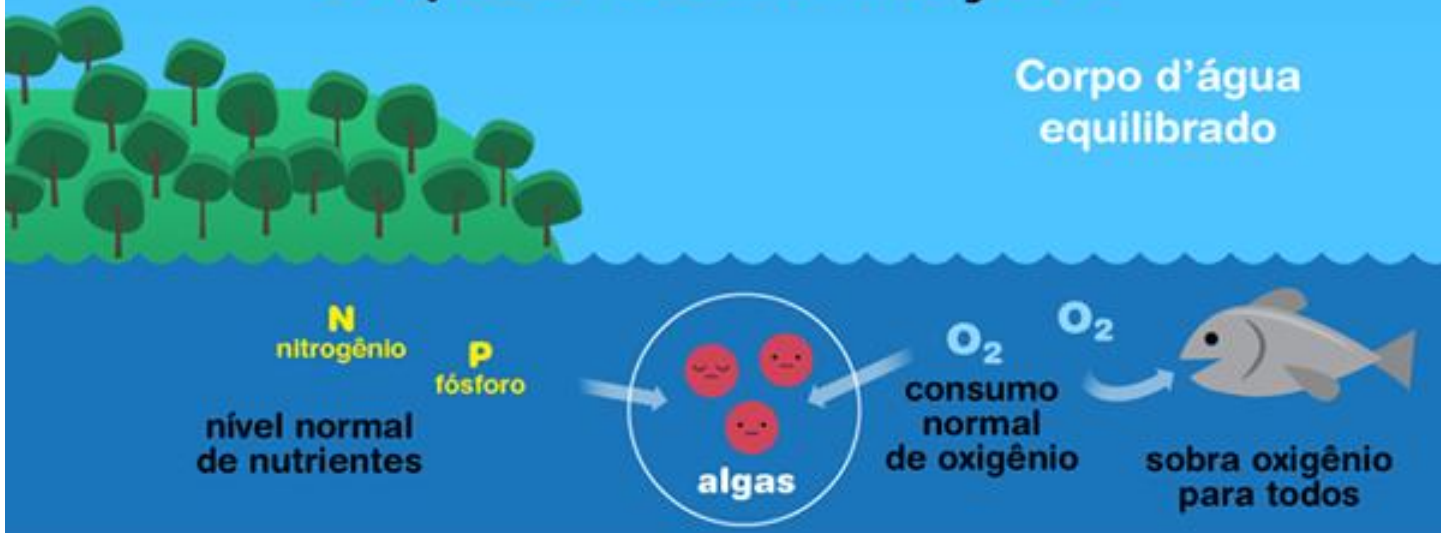
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O que é eutrofização?





Rio Sergipe (SE)

https://infonet.com.br/wp-infonet/img/cidade/grande-rio_sergipe_mancha_rede_social_16122015.jpg



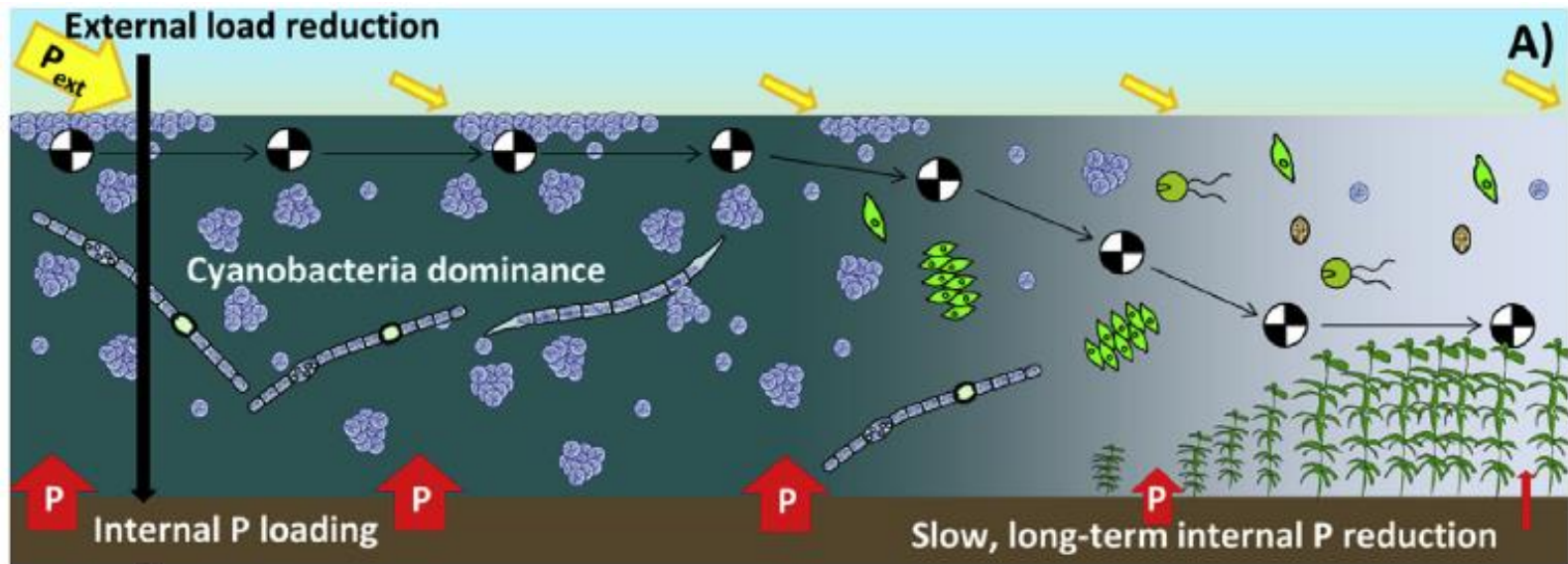
Lagoa de Jacarepaguá (RJ)

<https://oglobo.globo.com/economia/impacto-do-esgoto-jogado-em-rios-lagoas-do-rio->



Rio Potengi (RN)

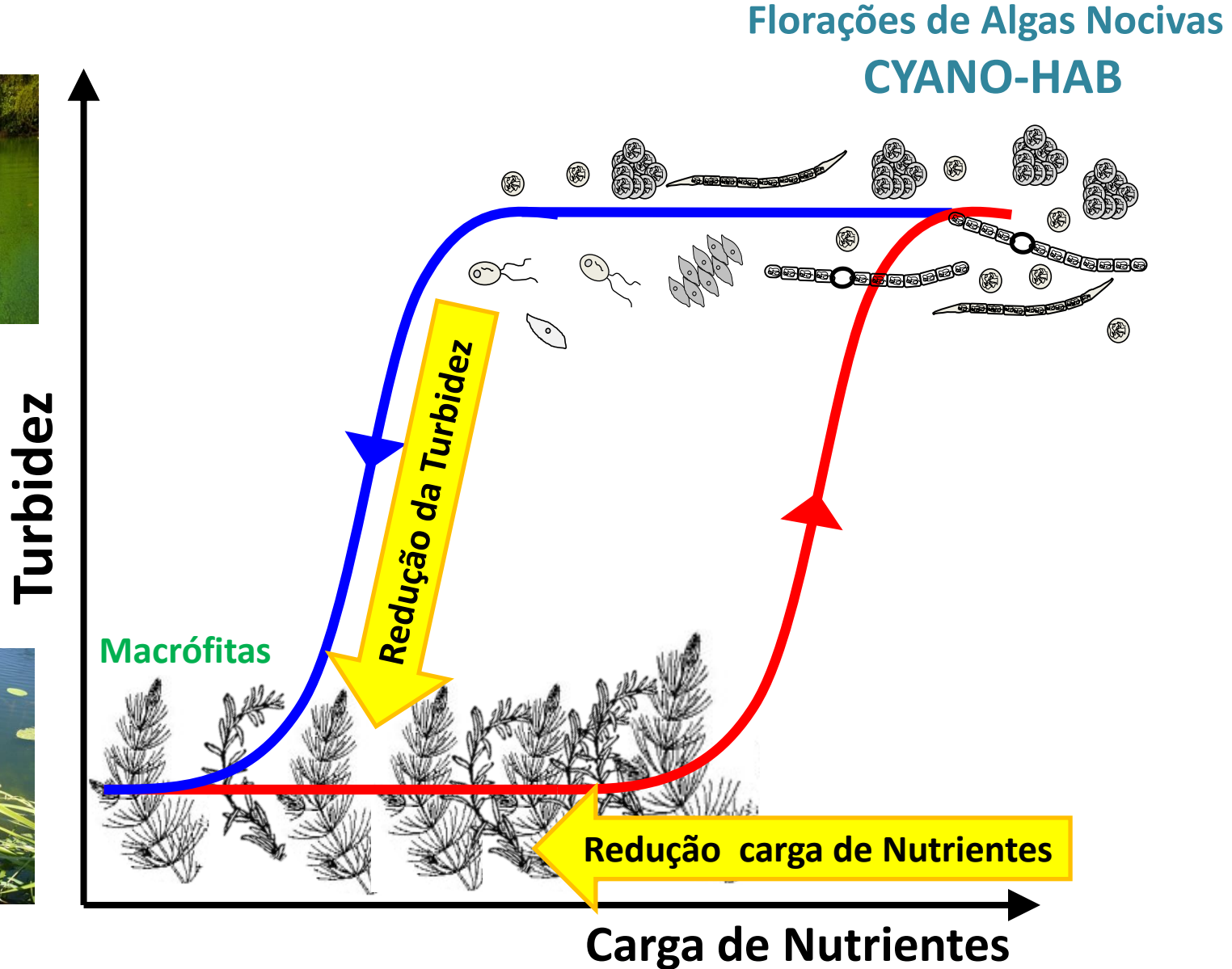
<http://www.tribunadonorte.com.br/noticia/potengi-ameaca-de-todos-os-lados/125782>



M. Lürling et al. / Water Research 97 (2016) 1–10

Somente a redução do aporte externo pode não ser suficiente ou a recuperação pode ser bem lenta

ESTADOS ALTERNATIVOS



**Problema
identificado**

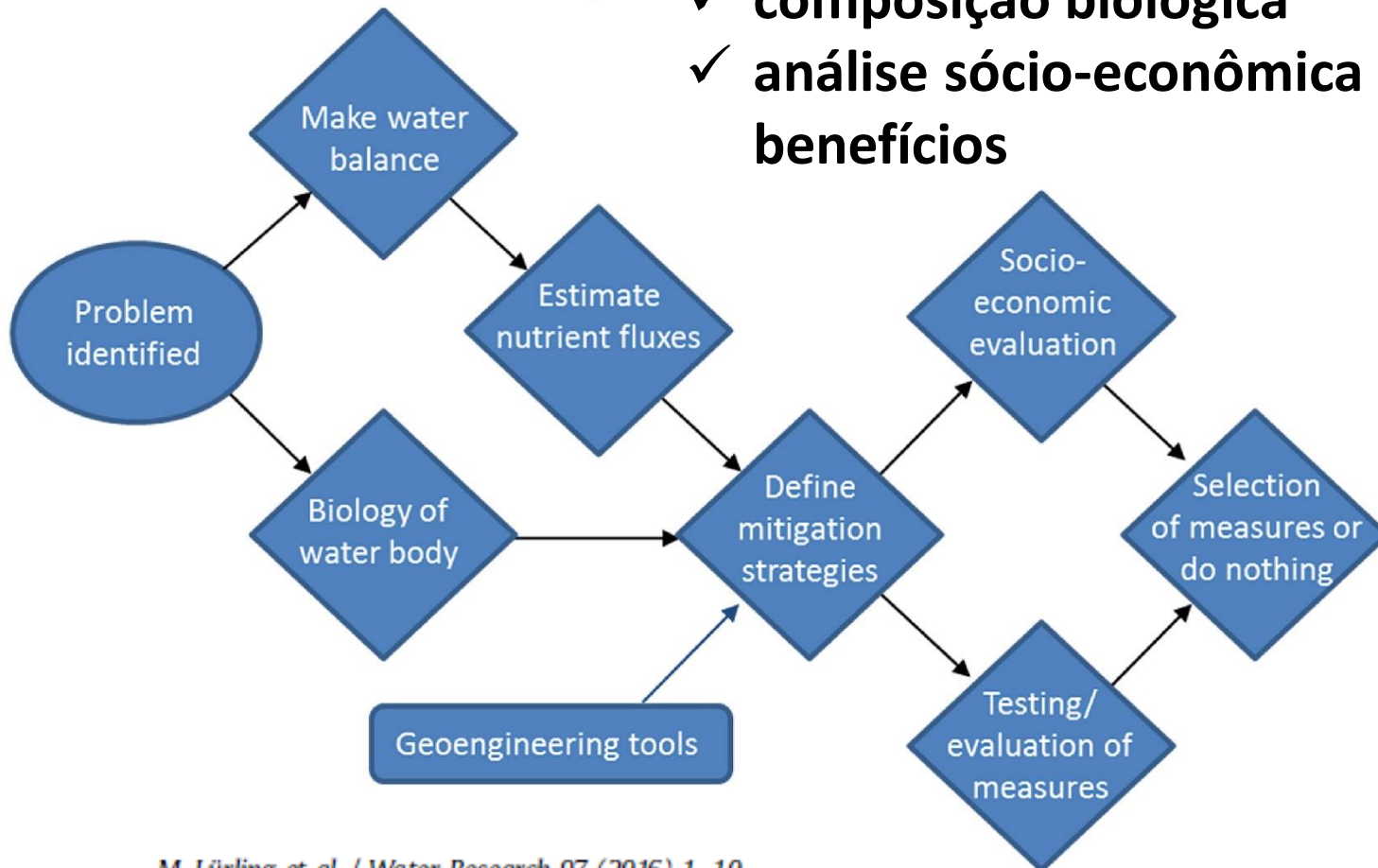
**Análise de
sistema**

Ações

**Melhoria nos
serviços
ecossistêmicos**



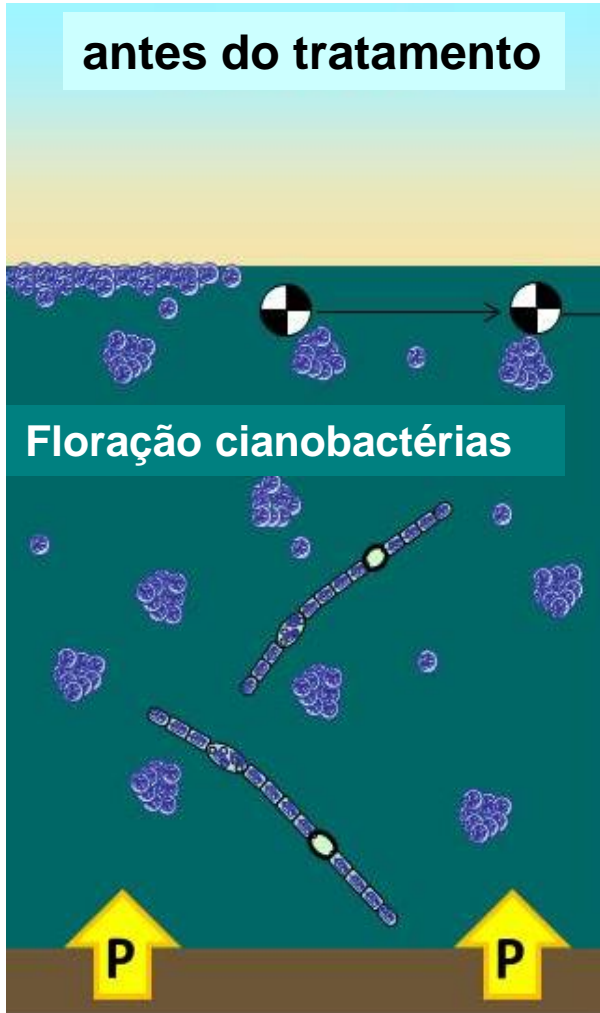
- ✓ **balanço hídrico e de nutrientes**
- ✓ **composição biológica**
- ✓ **análise sócio-econômica de custos e benefícios**





Controle do aporte externo

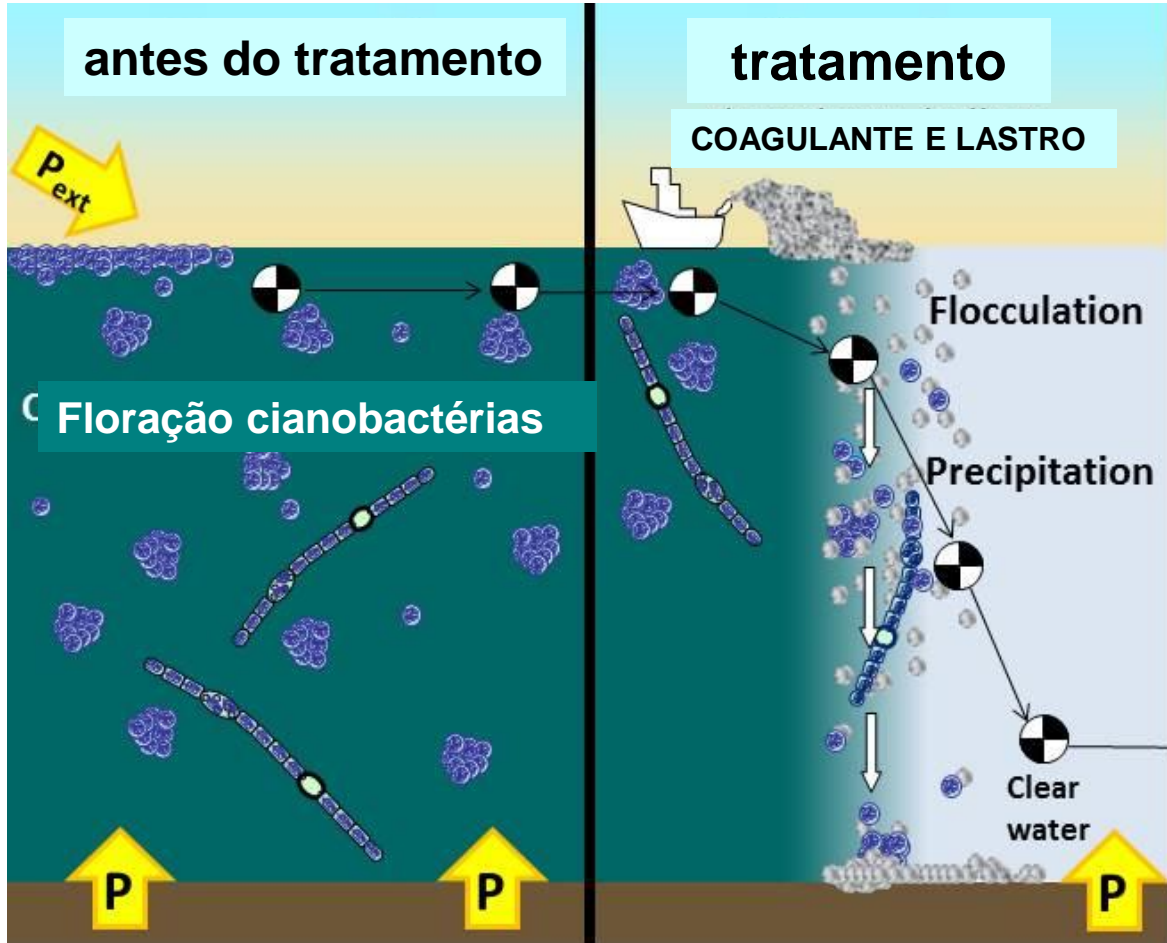
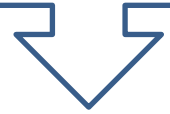
Saneamento da bacia



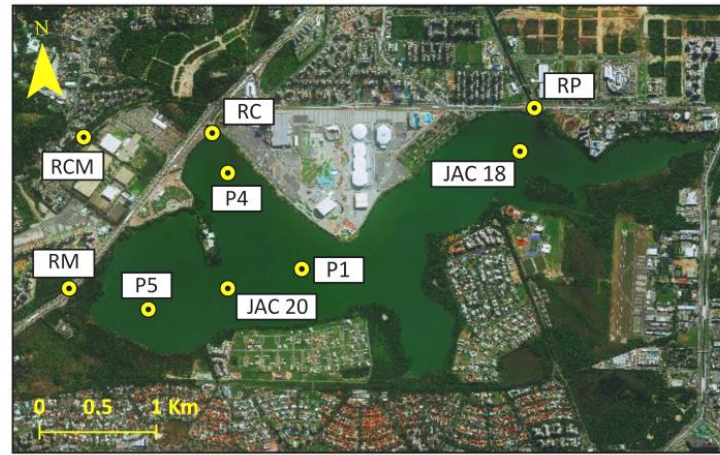


Sem saneamento ou parcial

Ação necessita
ser repetida

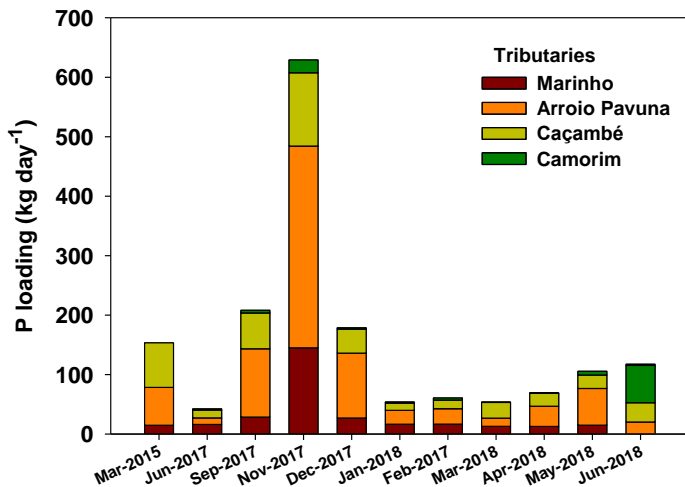
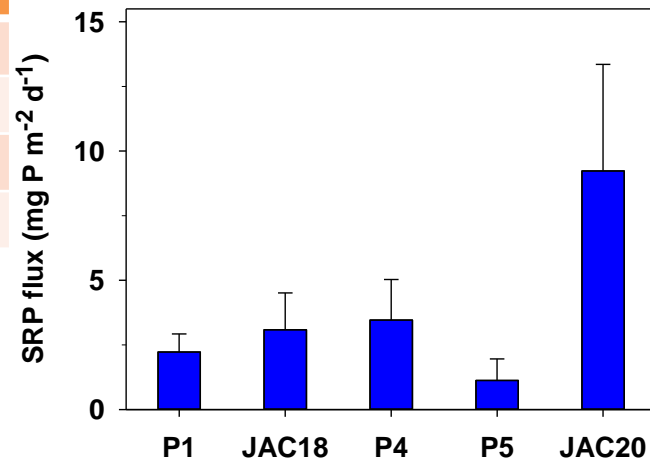


Mitigation of Cyanobacterial blooms in Lagoa de Jacarepaguá



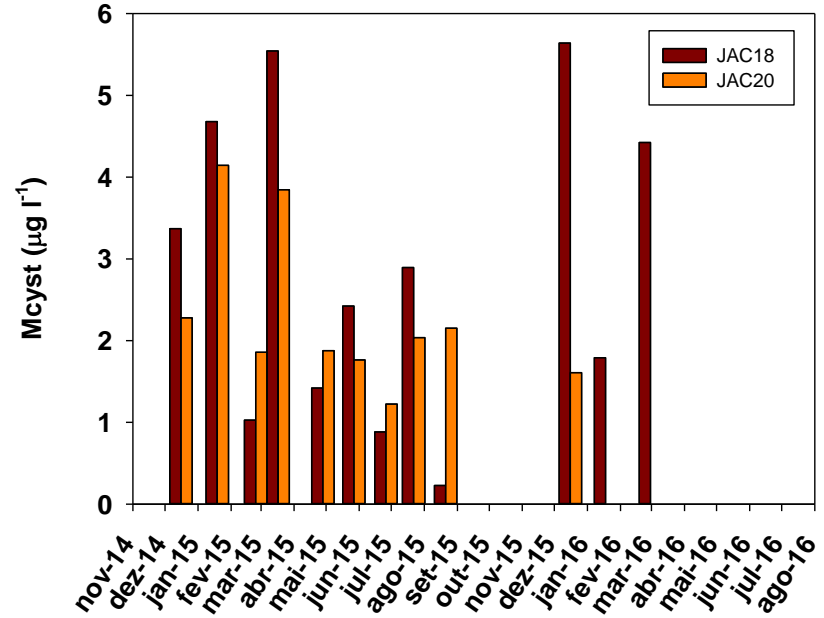
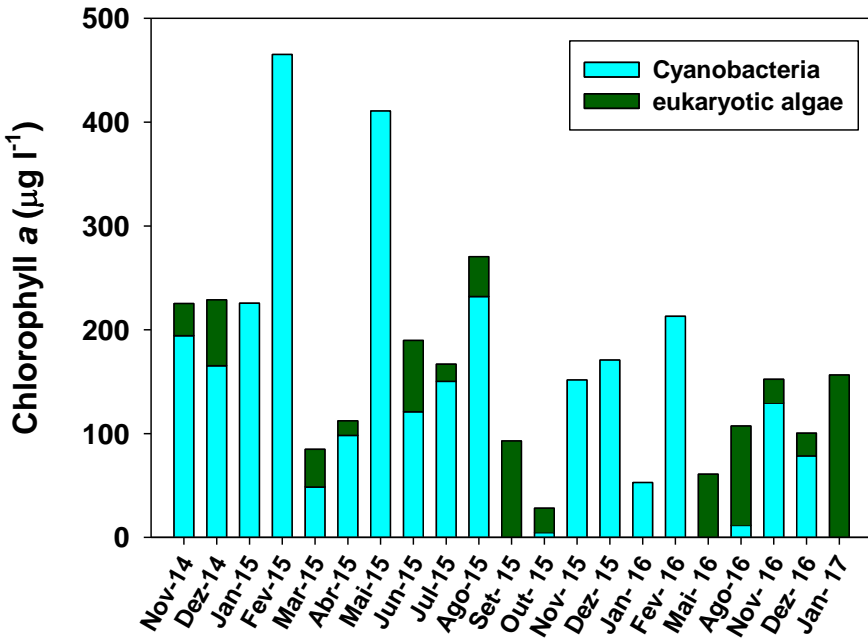
2014-2018	Lagoon (n= 66)
Total P (mg l ⁻¹)	1.3
SRP (mg l ⁻¹)	0.7
DIN (mg l ⁻¹)	3.9
	7.3

Annual internal load of 6.2 tons P yr⁻¹



External annual input of \cong 55 tons of P

Blooms of cyanobacteria



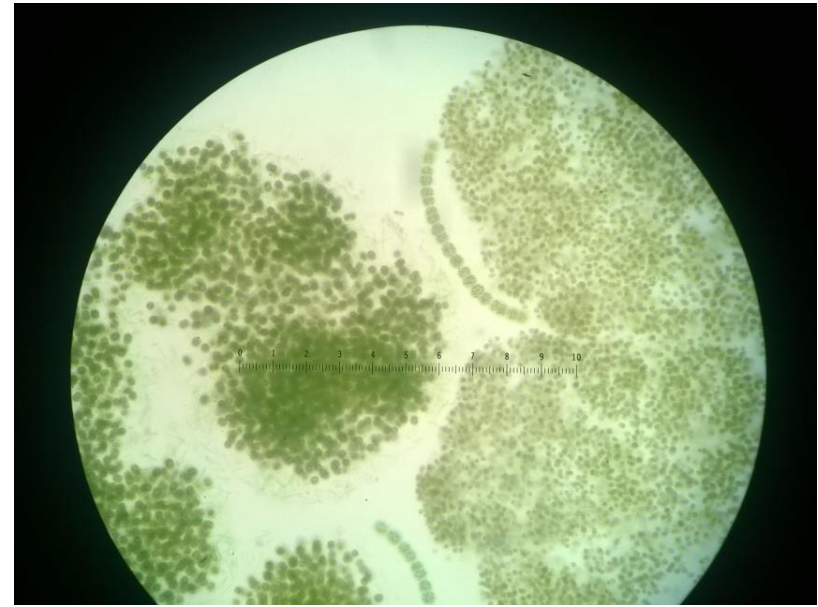
These blooms are toxic
not high values (2014 – 2016)

But other studies reported (ex.)

103.2 $\mu\text{g l}^{-1}$ March 2012

Cruz et al. (2013)

Freshwater Reservoir – Funil



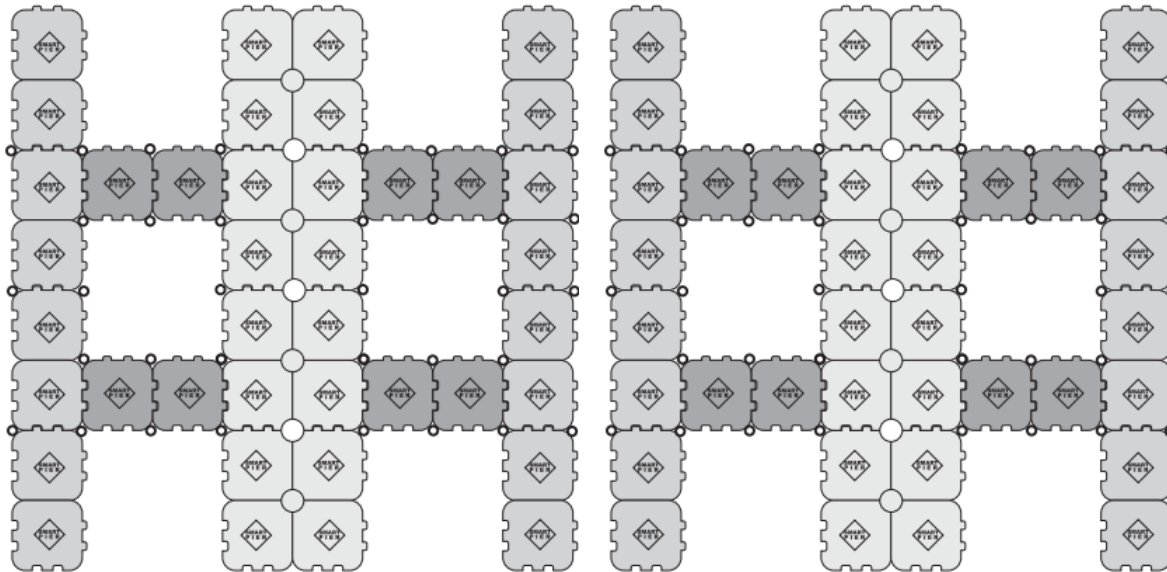
Represa do Funil

- Control
- PAC (4mg Al l^{-1}) + LMB (4.24 g l^{-1})
- PAC (4mg Al l^{-1}) + LMB (2.12 g l^{-1}) + Red soil (2.12 g L^{-1})

depth: 12m

Diameter: 0.9m

Sediment



Lagoa de Jacarepaguá

- Control
- PAC (8mg Al l^{-1}) + LMB (4.24 g l^{-1})
- PAC (8mg Al l^{-1}) + LMB (2.12 g l^{-1}) + ZEO (2.12 g L^{-1})

depth: 4m

Diameter: 0.9m

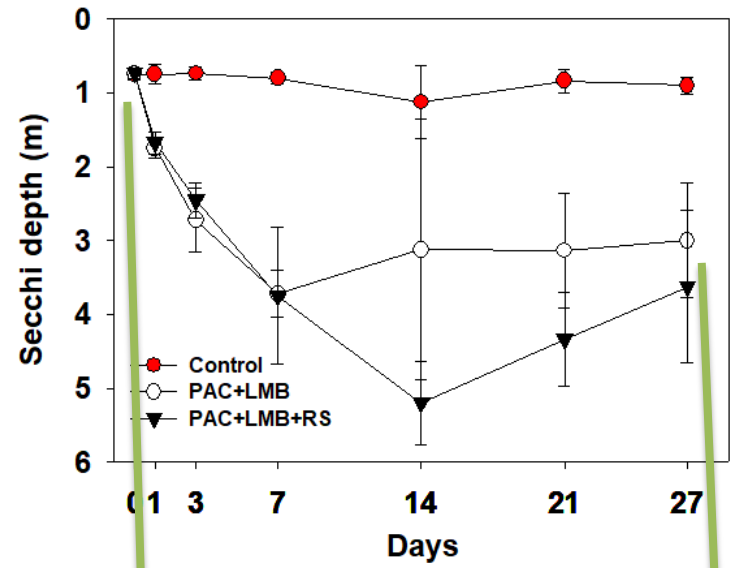
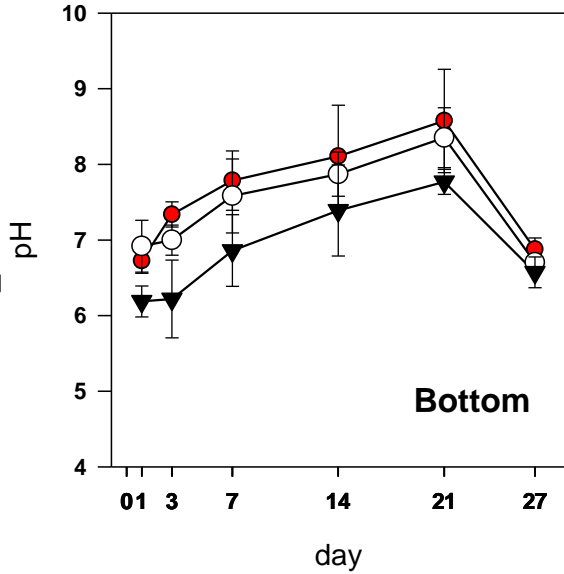
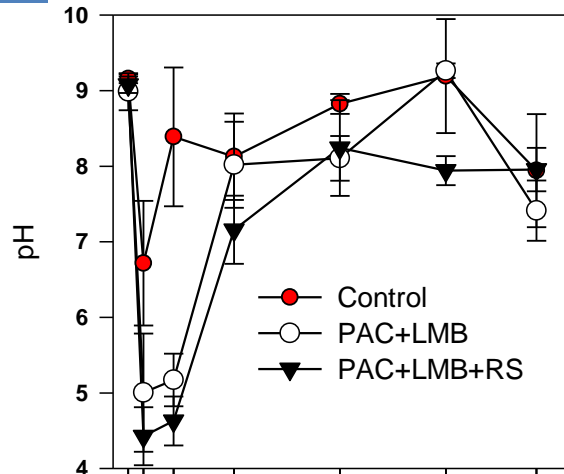
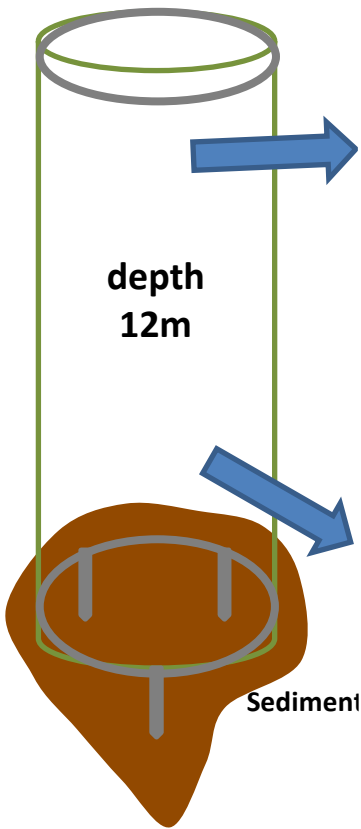
Sediment



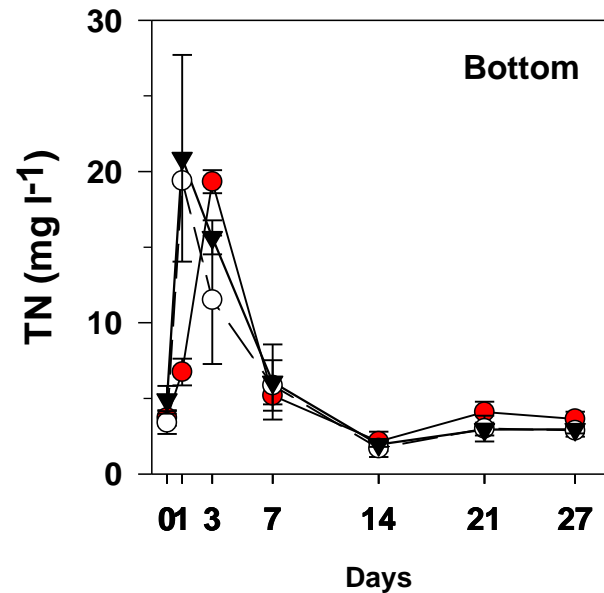
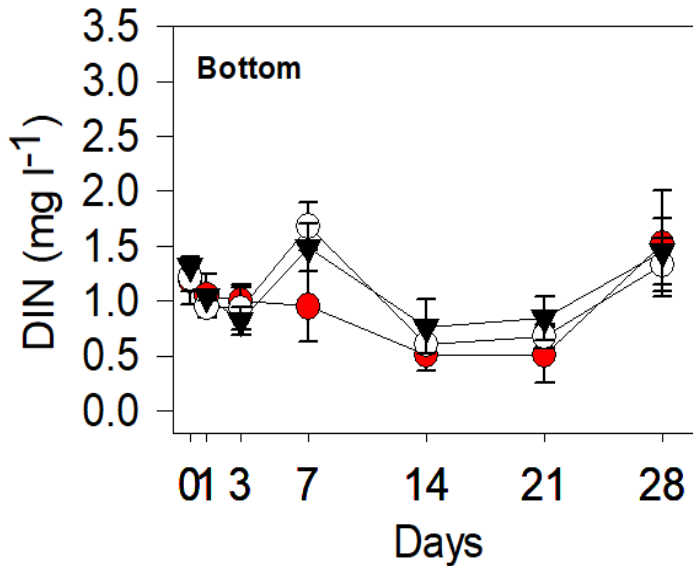
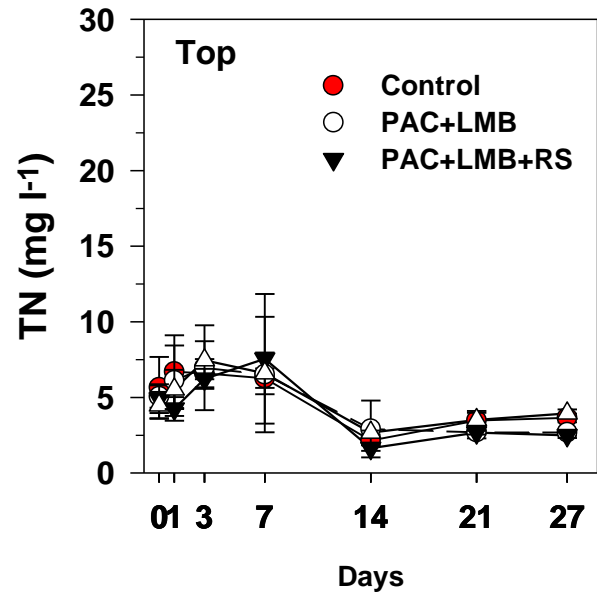
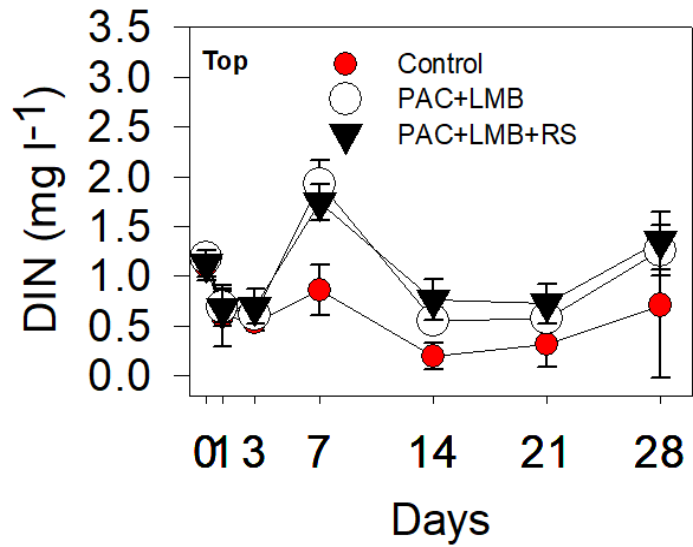
Represa do Funil



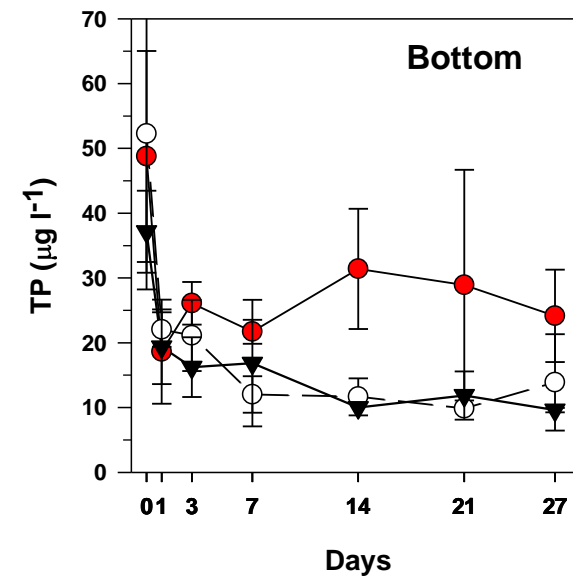
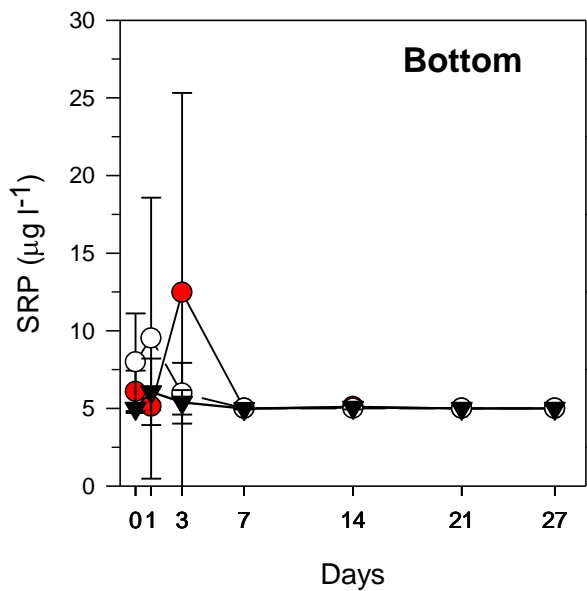
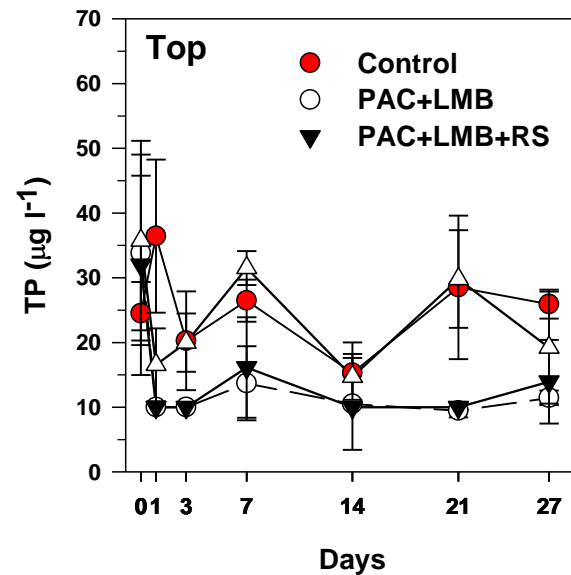
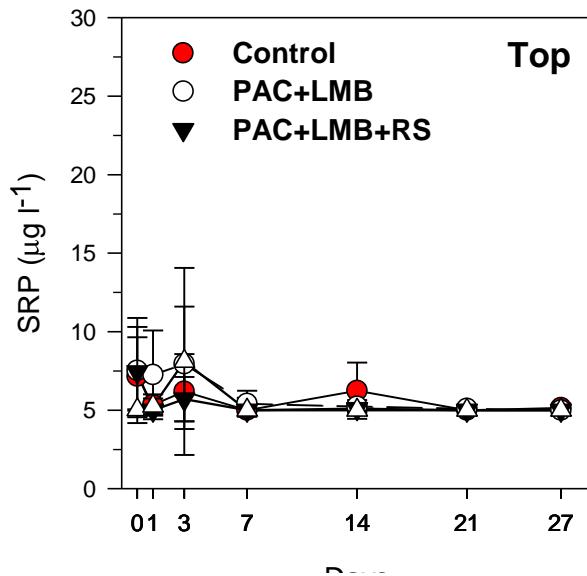
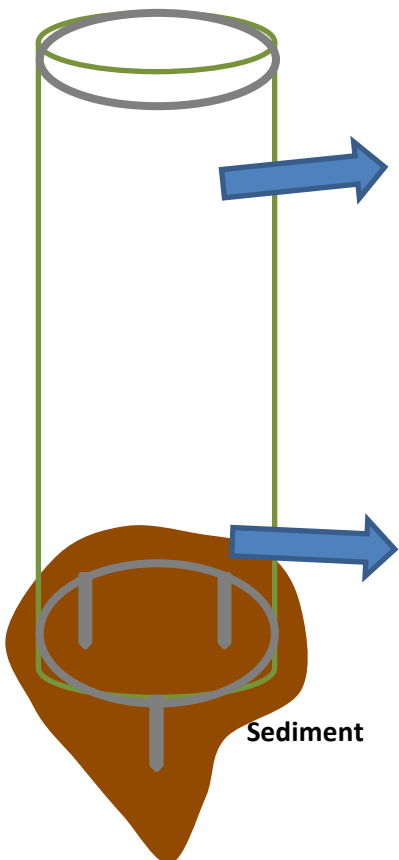
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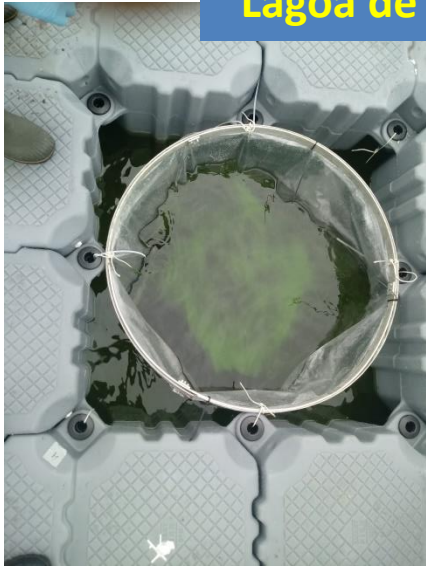
Represa do Funil



Represa do Funil



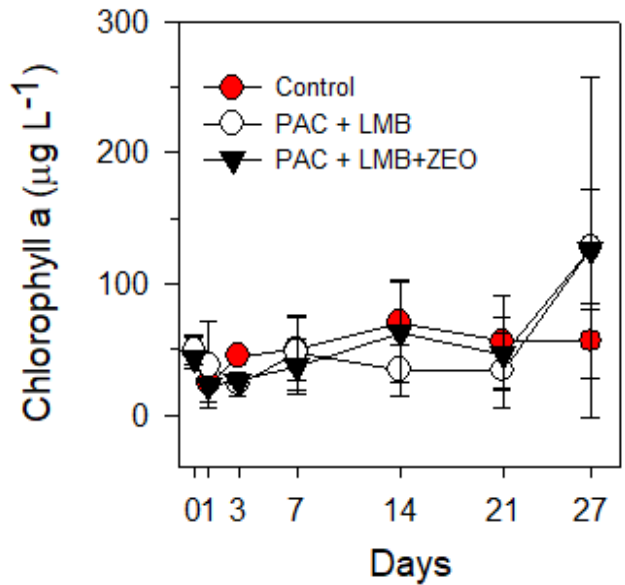
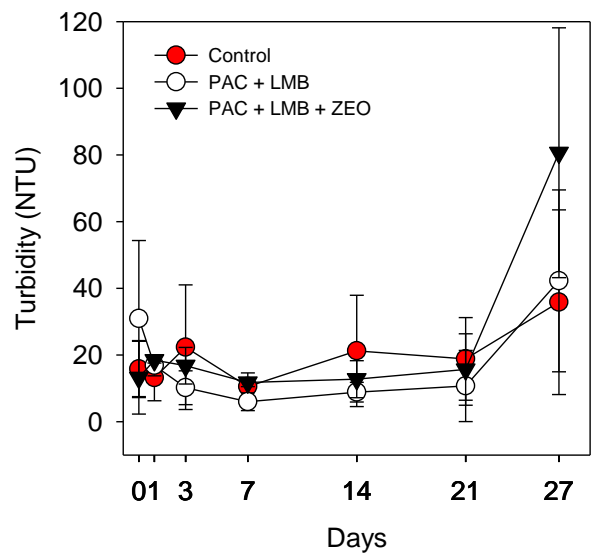
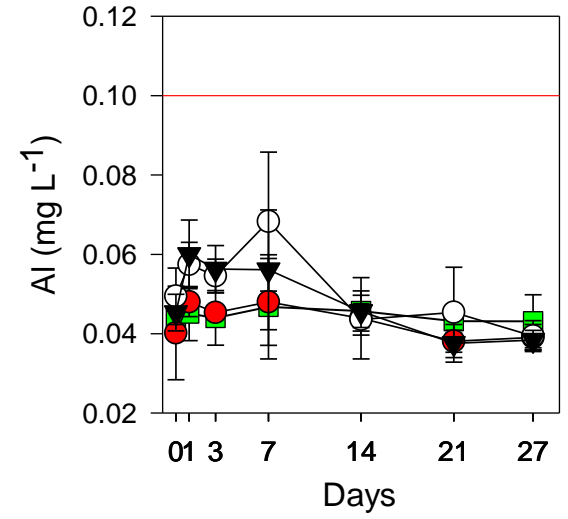
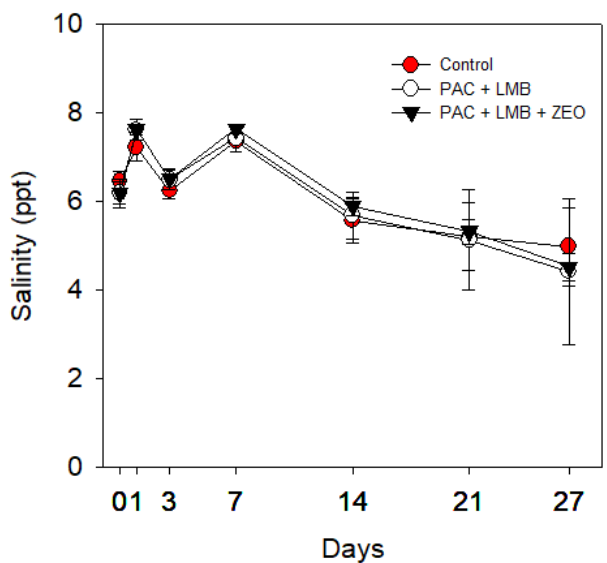
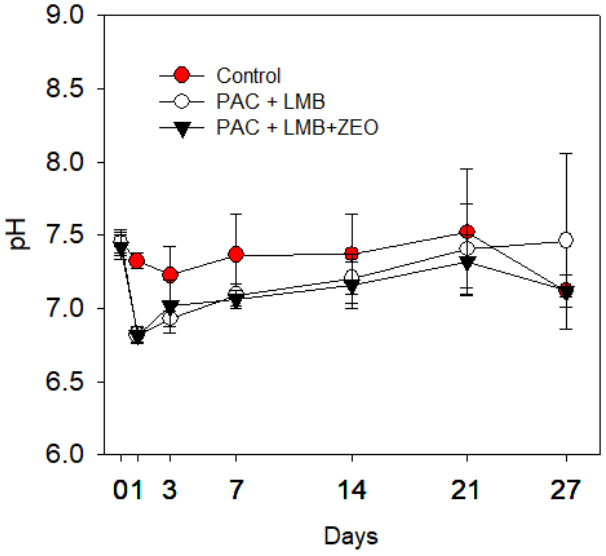
Lagoa de Jacarepaguá



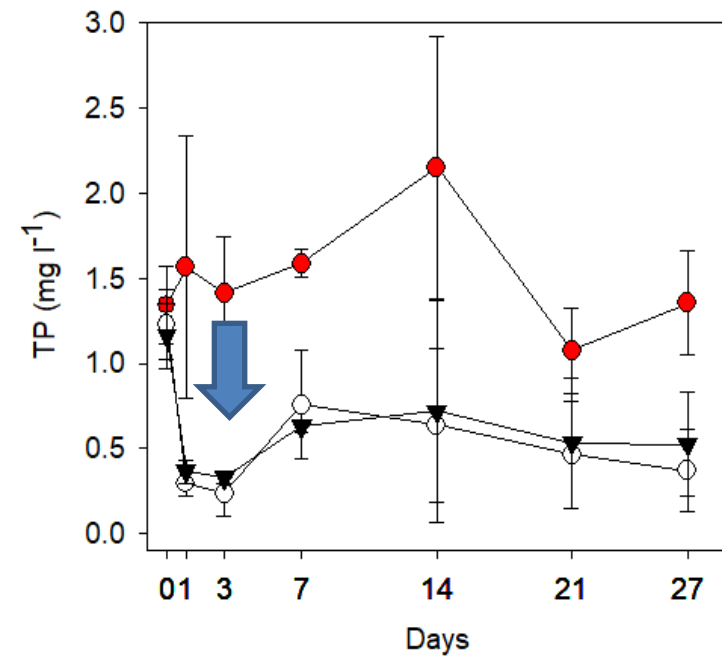
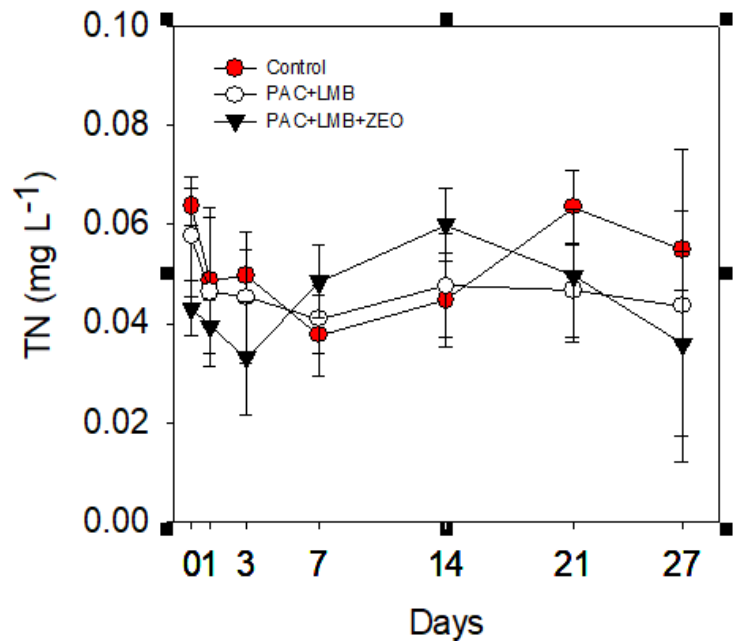
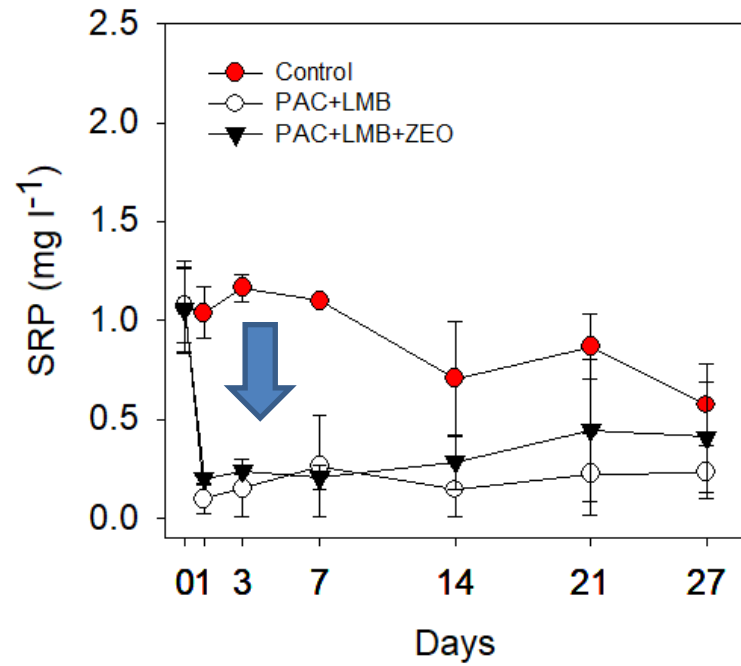
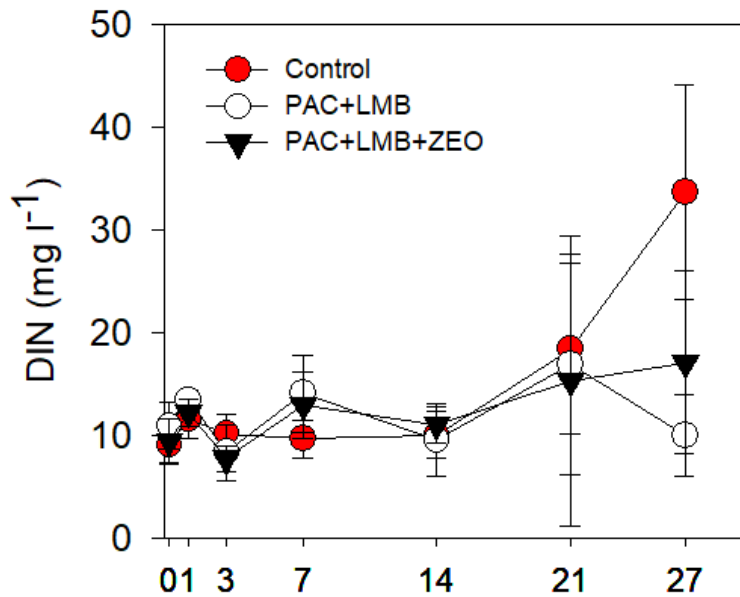
CONTROL PAC+LMB PAC+LMB+ZEO



Lagoa de Jacarepaguá



Lagoa de Jacarepaguá



Longevidade dos tratamentos

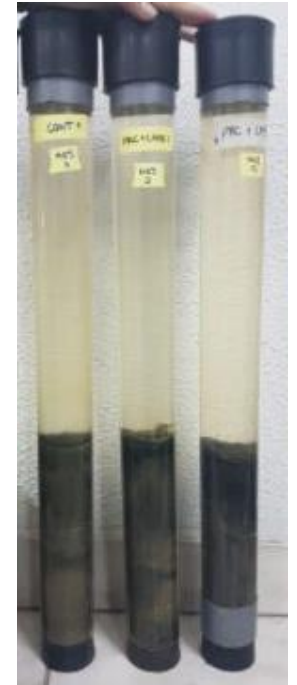
Amostragem ao final do experimento



Lagoa de Jacarepaguá



Funil reservoir



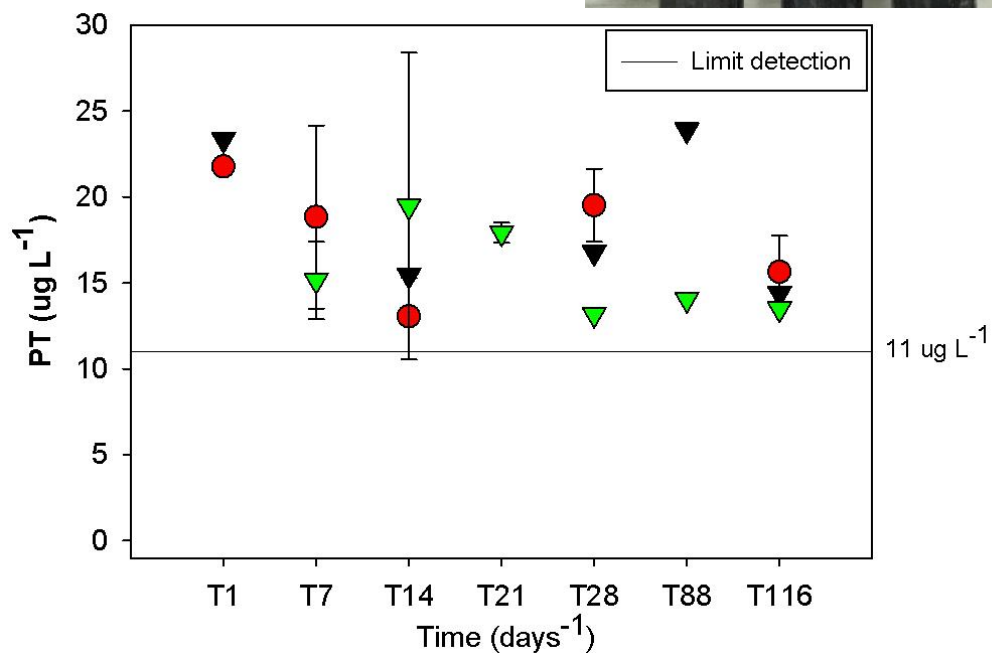
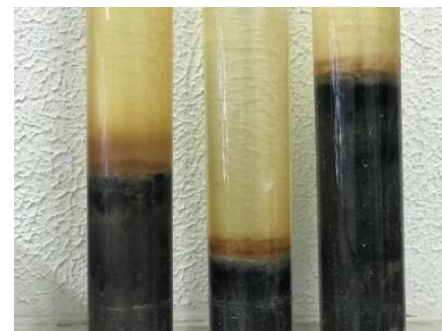
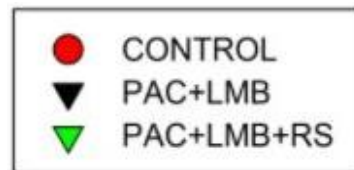
LONGEVIDADE DA REMOÇÃO DE FÓSFORO NA REPRESA DO FUNIL

P-DISSOLVIDO

- Limitante para o fitoplâncton
- Concentrações $< 5 \mu\text{g L}^{-1}$ 4 meses após o final do experimento.

P-T otal

- Baixas concentrações
- Em algumas réplicas abaixo do LD ($10 \mu\text{g L}^{-1}$)

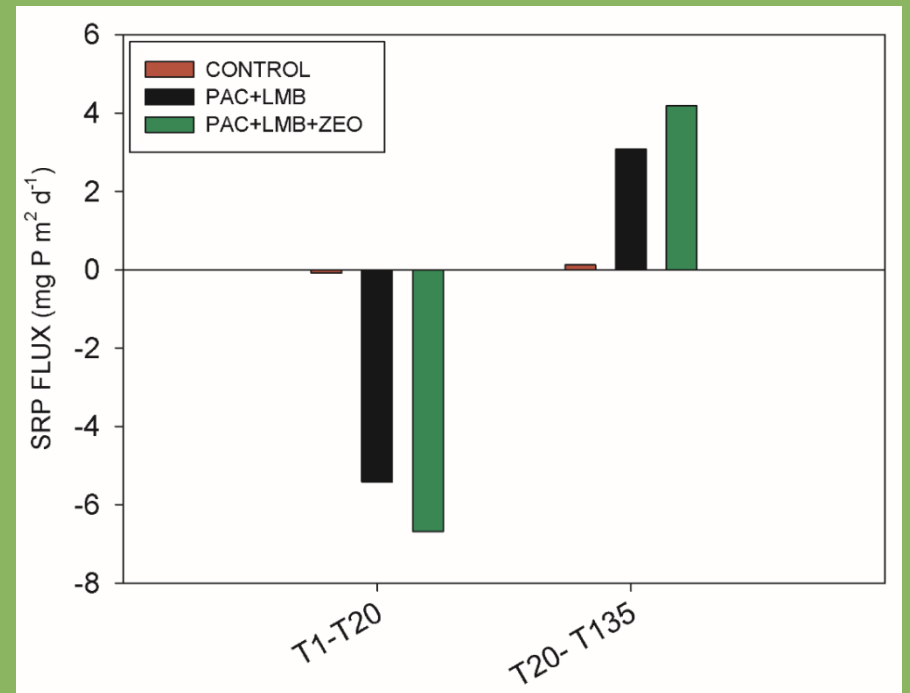
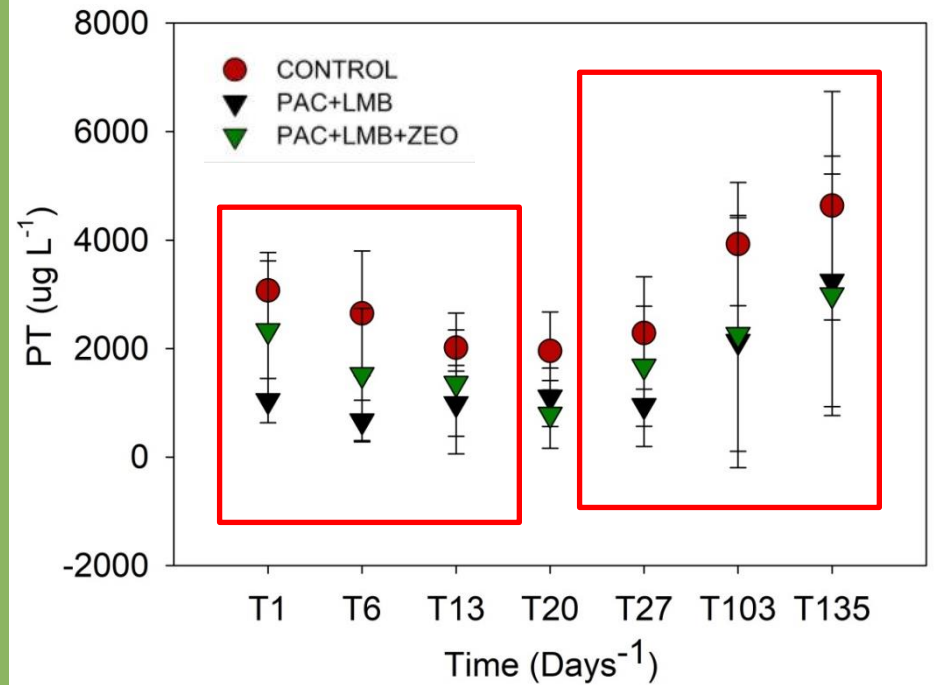
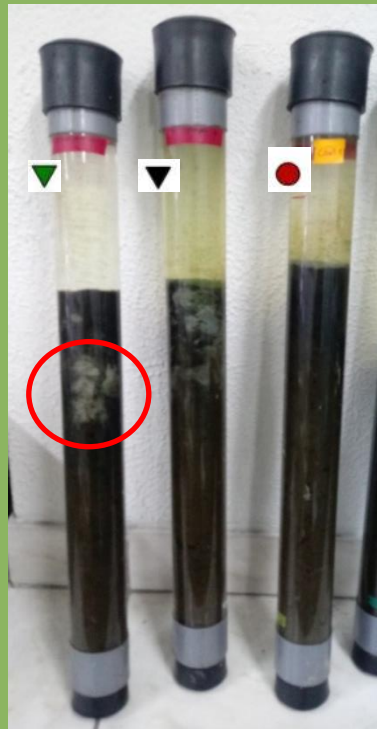


LONGEVIDADE DA REMOÇÃO DE P NA LAGOA DE JACAREPAGUÁ

Fluxo de P do sedimento

- Controle – saturado, sem liberação
- Os tratamentos evitaram liberação por 20 dias

- Sedimento “fofo”
- LMB penetra no sedimento (não cria uma camada bloqueadora do P)





Em síntese

REPRESA DO

FUNIL

“FLOCK & LOCK” foi eficiente em remover o fósforo e a biomassa de cianobactérias da coluna d’água

Efetivo em bloquear o P do sedimento prevenindo a recolonização de cianobactérias na coluna d’água

LAGOA DE JACAREPAGUÁ

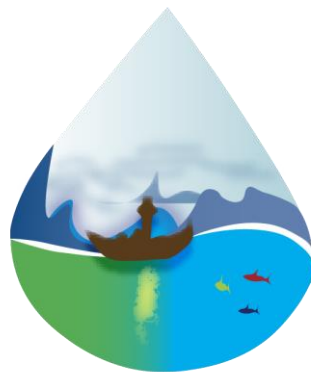
Removeu grande parte (90%) do P-dissolvido da coluna d’água

Os tratamentos não previniram o aparecimento de cianobactérias

Mudança de condição hipereutrófica para eutrófica

Longevidade dos tratamentos foi reduzida devido às características do sedimento

Reaplicação é necessária



Obrigado!

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