



DIFFUSIVE METHANE AND NITROUS OXIDE FLUXES FROM AQUACULTURE PONDS IN THE BRAZILIAN CERRADO

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Aquaculture expansion can generate environmental impacts, including greenhouse gas (GHG) emissions or removal. Brazil has experienced rapid growth in this sector, yet regions such as the Cerrado remain poorly characterized in terms of direct GHG fluxes. This study aimed to quantify diffusive methane (CH₄) and nitrous oxide (N₂O) fluxes in aquaculture ponds located in the Brazilian Cerrado, a region lacking empirical data on GHG emissions. Gas fluxes were measured in 25 ponds across 10 semi-intensive fish farms in Tocantins state, northern Brazil. All systems were dominated by tambaqui (*Colossoma macropomum*) or its hybrid with *Piaractus brachipomus*, pirapitinga. Diffusive fluxes were quantified during daytime using floating chambers coupled to portable gas analyzers (LI-7820 for N₂O and LI-7810 for CH₄), with measurements conducted in triplicate per pond. Atmospheric and limnological parameters were also recorded to support flux calculations based on linear concentration changes over short incubation periods. Fluxes ranged from 0.3 to 63 mg m⁻² d⁻¹ for CH₄ and from -0.5 to 2 mg m⁻² d⁻¹ for N₂O. Median CH₄ and N₂O fluxes were 8 mg m⁻² d⁻¹ and 0.49 mg m⁻² d⁻¹, respectively. Compared to the Intergovernmental Panel on Climate Change (IPCC) default value for diffusive, CH₄ emissions from freshwater and brackish ponds (50 mg m⁻² d⁻¹), 92% of observations were below this estimate. Additionally, N₂O fluxes were consistent with values reported in the literature for aquaculture systems. These findings indicate that ponds in the Brazilian Cerrado may exhibit relatively low GHG diffusive emissions, potentially associated with regional management practices and system functioning. Measures of ebullitive emissions are essential to obtain a more realistic assessment of the total emissions. This study helps reduce geographic gaps in GHG estimates for aquaculture and suggests that tambaqui-based systems may be associated with lower diffusive emissions.

Palavras-chave: *Climate change; Colossoma macropomum; greenhouse gas*