



Primary production and dinitrogen fixation in a subtropical inland saline environment

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For over half a century, scientists have endeavoured to measure the rates of primary production (PP) and dinitrogen (N₂) fixation in a diverse range of inland waters, spanning from freshwater to saline. There is nearly an equivalent portion of the saline as well as fresh in the world's inland waters, emphasizing their significance within our continental landscapes. Lakes play crucial role in global biogeochemical processes and are fundamental for essential ecosystem functions and services. Nonetheless, swift alterations in lakes have been recognized (i.e., salinization of freshwater ecosystems) on a global scale due to shifts in climate and increasing human interventions, posing risks to the valuable services these habitats offer. While considerable research on saline lakes has occurred in the past years across Africa, Australia, and North America, there remains a substantial amount to explore in Asian lakes and beyond, necessitating investigation into these unique ecosystems worldwide.

The current study explores rates of PP and N₂ fixation within a subtropical saline lake (Sambhar, India) along with its neighbouring brine reservoir and salt pans. Incubation experiments were performed to estimate the PP and N₂ fixation rates using ¹³C and ¹⁵N tracer techniques. The study reveals that PP and N₂ fixation rates were higher in the lake than the adjacent brine reservoir. Concentrations of particulate and dissolved forms of carbon and nitrogen were also higher in the lake than the brine reservoir. However, salt pans showed huge variation in PP, but N₂ fixation rates were quite low. The highest concentration of particulate and dissolved forms of carbon and nitrogen were also found in the salt pans. The high uptake rates in the lake and salt pan may be attributed to high biomass and high nutrient concentrations than the brine reservoir. The difference in the rates is possibly due to variation in salinity, temperature, nutrient concentrations, and runoff to the lake, which can affect primary producers and potentially leading to shifts in community structure and biodiversity in different systems. This study provides insights into the complex interactions of PP and N₂ fixation rates with environmental parameters in a subtropical saline environment.