



Sediment distribution pattern and environmental implications of physico-chemical characteristics of the Akkulam-Veli Lake, South India

Rayees Ahmad Shah¹ · Hema Achyuthan² · Razi-Sadath Puthan-Veetil¹ · Usamah Derwaish³ · Mohammdd Rafiq⁴

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Abstract

This study reports the spatial distributions of diatom assemblages and potential relationships between diatom diversity and environmental variables (C/N ratio, $\text{CaCO}_3\%$, clay mineralogy) using multivariate analyses in surface sediments of the Akkulam-Veli Lake. Surface sediment samples were collected at 19 sites throughout the lake to analyse diatom distribution, TOC, N, $\text{CaCO}_3\%$, clay mineralogy and sediment texture. The results suggest that the clay fraction is predominant in the eastern flank, whereas sand fraction is more in the western flank. TOC% and $\text{CaCO}_3\%$ in the lake floor sediments are attributed to high organic activity within the lake and contributions from the vegetation around the lake margins. The results suggest that N is being added to the lake from secondary sources from catchment area leading to eutrophication of the lake. Further, clay mineralogy of the sediment samples reveals that kaolinite mineralogy dominates in clay fractions. Diatom studies show rich diversity of freshwater, marine and brackish diatoms and abundance of pollution-reflecting species such as *Cyclotella* sp. and *Navicula* sp.

Keywords Diatoms · Total organic carbon · Eutrophication · Limnology · Clay mineralogy

Introduction

Fluvial transport of sediments incorporates both internal and external materials into lake basins, and such transported material could preserve important environmental information about lakes and their catchments (Liu et al. 2017; Meyers 2003). Physical and chemical compositions of sediment being deposited in lake basins are cumulatively influenced

by catchment lithology, climate, weathering and erosion processes, and thus, lake sediments provide an imperative archive to study the past and present environmental changes (Lone et al. 2018a). Sedimentation in lake basins forms a distinct depositional pattern resulted due to differential hydrological regimes, physical and chemical weathering of catchment rocks and sediment transportation and deposition through multiple waterways (Vijayaraj and Achyuthan 2015). Lake sediments play a significant role in controlling the organic matter (OM) concentrations in aquatic environments, as they are one of the major repositories of OM (Hou et al. 2014; Lone et al. 2018b). Lake surface sediments also contribute nutrients to the water column above them and thus lead to benthic–pelagic coupling and influence primary productivity in aquatic systems. The lake sediments can also store large amounts of OM and affect the oxygen content of bottom water (Anderson et al. 2013; Meyers and Ishiwatari 1993). OM and organic carbon in lake basins are mainly derived from the particulate detritus of plants, and only a small per cent is contributed from the animal tissue (Meyers and Lallier-Verges 1999). Within aquatic ecosystems, surface sediments have an important function as an efficient natural trap for diverse substances (including contaminants)

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✉ Rayees Ahmad Shah
shahrayees04@gmail.com

¹ Department of Geology, Anna University, Chennai 600025, India

² Institute for Ocean Management, Anna University, Chennai 600025, India

³ Sathyabama Institute of Science and Technology, Chennai 600119, India

⁴ National Centre for sustainable coastal management, Chennai 600025, India

Shah
Rayees