International Journal of Ecology and Environmental Sciences 50: 355-360, 2024
ISSN: 2320-5199 (Online); https://doi.org/10.55863/ijees.2024.3140

Diversity and Seasonal Variation of Phycofloral Hydrodictyaceae from Kothandaramar Temple Tank, West Mambalam, Chennai, Tamil Nadu, India

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ABSTRACT

This preliminary study explored the diversity and seasonal pattern of Hydrodictyaceae members found at Kothandaramar Temple Tank, Chennai, South India. It is one of the largest freshwater temple tanks of Chennai. The members of this family typically take on twisted, triangular, quadrangular, or polygonal forms. Cell angles, whether they have spines or not, are straightforward. The diversity of the 27 phycofloral species were identified and classified.

Key words: Microalgae, *Monactinus*, *Pseudopediastrum, Stauridium, Tetraedron*

INTRODUCTION

The study of microalgal biodiversity is gaining importance for its ecological benefits and biotechnological potential. Microalgal diversity study plays a vital role in today's world. In India, being a tropical nation is abounded blessed with species richness. Continuous phycofloral diversity study in tropical regions has led to discovery of new species (Eliáš et al. 2008, Zhang et al. 2008, Neustupa et al. 2007, 2009, Rindi and Lopez-Bautista 2008). Microalgae are very important taxa in the world and they provide solutions for major world complications. Microalgae provide solutions for many manmade disasters (Gouveia et al. 2011, Sweetman 2009). In recent times, modern techniques are more sought out method for identifying the species with precision. The quantity and quality of water has changed a lot which play a big role in the abundance of microalgae. Microbial ecosystems are now defined due to human influences (Omar 2010, Mallikarjuna et al. 2019).

In Tamil Nadu, temple tanks along with sacred trees and sacred groves have been vital for environment conservation. At present 2359 temple tanks are present in Tamil Nadu, Eastern Ghats, South India. In Chennai, there are plenty of temples with an adjacent pond. Water from the pond is used for all temple activities. It will recharge the groundwater of the area. Generally, they dry during summer and it gets backwater again during the monsoon (Amirthalingam and Muthukrishnan 2004, Desingurajan et al. 2015, 2021, Mallikarjuna et al. 2019). In this paper, we have reported for the first time the Hydrodictyaceae family from Chennai district, Tamil Nadu, South India.

MATERIALS AND METHODS

The study area

The Study area of Kothandaramar temple is located 13°02' N and 80°13' E in West Mambalam, Chennai, Tamil Nadu, South India (Fig. 1), which is more than 150 years old Hindu temple known as Kothandaramar Temple. The main deity of the temple is Pattabhirama and his spouse Sita Piratti. Within the temple's boundaries, a sizable temple tank has been constructed. The temple is conveniently located adjacent to Mambalam Veda Pada Shala in the Medley underground. One of Chennai's perpetual temple tanks, it provides a habitat for a variety of phytoplankton, zooplankton, and fauna (fish and birds). The tank is the only source of water since rainwater falls from the temple grounds through well-built pipeline network. People nearby do not use the water from the tank.

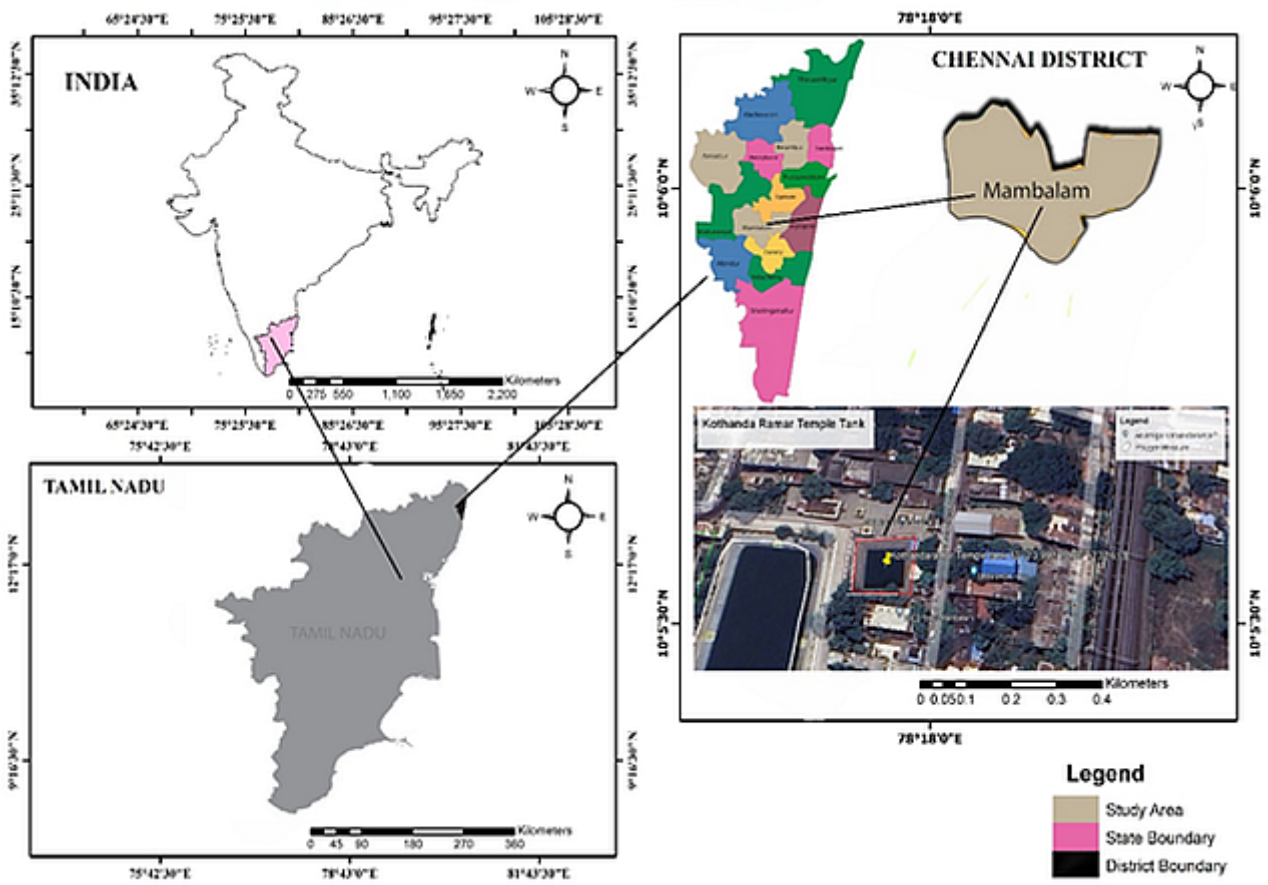


Figure 1. The study area

Sample collection and identification

Samples were collected periodically during the time of July 2021 to June 2022. The samples collected at various spots of Kothandaramar temple tank. Using a 0.2 mm mesh phytoplankton net, subsurface water samples was taken. Four distinct sterile sample vials used to collect the material, which has brought into the lab. The collected samples were centrifuged many times at 1,000 rpm for 15 minutes. After centrifugation, a few drops of the obtained pellet were placed in the middle of the micro slide and covered with 0.1 mm coverslips. The samples were viewed using Olympus microscope and photographed with Nikon digital camera (Coolpix E8400). Nikon software used to gauge the microalgae's dimensions. The collected samples Morphotaxonomy were identified using books, monographs and online resources. The pertinent flora books and monographs Prescott (1962), Philipose (1967) and Algaebase, an online resource for listing the World's Algae was used for species confirmation (Guiry and Guiry 2020). The identified algal data were analysed using Microsoft excel (Version 2013) (Table 1).

RESULTS

A total of 27 species belonging to 5 genera were isolated and identified. The genus *Tetraedron* (70%) was dominating in Kothandaramar temple tank during all the seasons with 18 species (70%), followed by *Pediastrum* (11%), *Monactinus* (8%), *Stauridium* (7%) and *Pseudopediastrum* (4%) (Table 1, Fig. 2). Most of the *Tetraedron* and only one species of *Monactinus* were found during all seasons (*Monactinus simplex, Tetraedron minimum* var. *tetralobulatum, Tetraedron caudatum, Tetraedron pentaedricum f. minimum, Tetraedron pentaedricum, Tetraedron trilobulatum, Tetraëdron proteiforme* var. *granulatum)* followed by *Pediastrum* and one *Tetraedron* species were observed during winter, summary and monsoon seasons (*Pediastrum tetras* var. *apiculatum*, *Stauridium tetras, Tetraedron*

Table 1. Ecological occurrence of phycoflora in KRT Tank

Name	Winter (Jan-Feb)	Summer (Mar - May)	Monsoon (June - Sep)	Post-monsoon (Oct - Dec)
Monactinus simplex	+	+	+	+
Monactinus simplex var. *biwaensis*				+
Pediastrum tetras var. *apiculatum*	+	+	+	
Pediastrum duplex	+			
Pediastrum ovatum	+			
Pseudopediastrum subgranulatum	+			
Stauridium tetras	+	+	+	
Stauridium tetras var. *tetraodon*	+	+		
Tetraedron regulare var. *granulatum*		+	+	
Tetraedron incus f. decolorata		+		
Tetraedron minimum	+			
Tetraedron hemisphaericum		+	+	
Tetraedron minimum var. *tetralobulatum*	+	+	+	+
Tetraedron caudatum	+	+	+	+
Tetraedron pentaedricum f. minimum	+	+	+	+
Tetraedron pentaedricum	+	+	+	+
Tetraedron trilobulatum	+	+	+	+
Tetraedron triangulare	+		+	
Tetraedron regulare var. *longispinum*	+	+	+	
Tetraedron acutum		+		+
Tetraëdron octaedricum var. *spinosum*	+	+		
Tetraëdron proteiforme var. *granulatum*	+	+	+	+
Tetraëdron tumidulum		+	+	
Tetraëdron quadratum f. minor	+			
Tetraedron gracile f. minus	+	+		+
Tetraëdron limneticum var. *gracile*	+			+
Tetraëdron pusillum			+	

+ represent four seasons; + represent three seasons; + represent two seasons; + represent one season

regulare var. *longispinum, Tetraedron gracile f. minus).*

Stauridium and *Tetraedron* were observed during winter and summer seasons. which are *Stauridium tetras* var. *tetraodon, Tetraedron regulare* var. *granulatum, Tetraedron hemisphaericum, Tetraedron triangulare, Tetraedron acutum, Tetraëdron octaedricum* var. *spinosum, Tetraëdron tumidulum, Tetraëdron limneticum* var. *gracile.*

Some of the *Monoactinus* and *Pediastrum* species were observed only during monsoon season (*Monactinus simplex* var. *biwaensis, Pediastrum duplex, Pediastrum ovatum, Pseudopediastrum subgranulatum; Tetraedron incus f. decolorata, Tetraedron minimum, Tetraëdron quadratum f. minor, Tetraëdron pusillum)*

DISCUSSION

Seventeen species of *Tetraedron* were identified from Beed district of Maharashtra, India. In the winter season and followed by summer season the diversity of *Tetraedron* was high (Yadav 2018). *Tetraedron* diversity was studied in Chandrapur district of Maharashtra and thirteen species were identified (Reddy 2020). Ten species of *Tetraeron* were identified in Andhra Pradesh from ditches, ponds, streams, reservoirs, waterfalls, etc. (Mallikarjun et

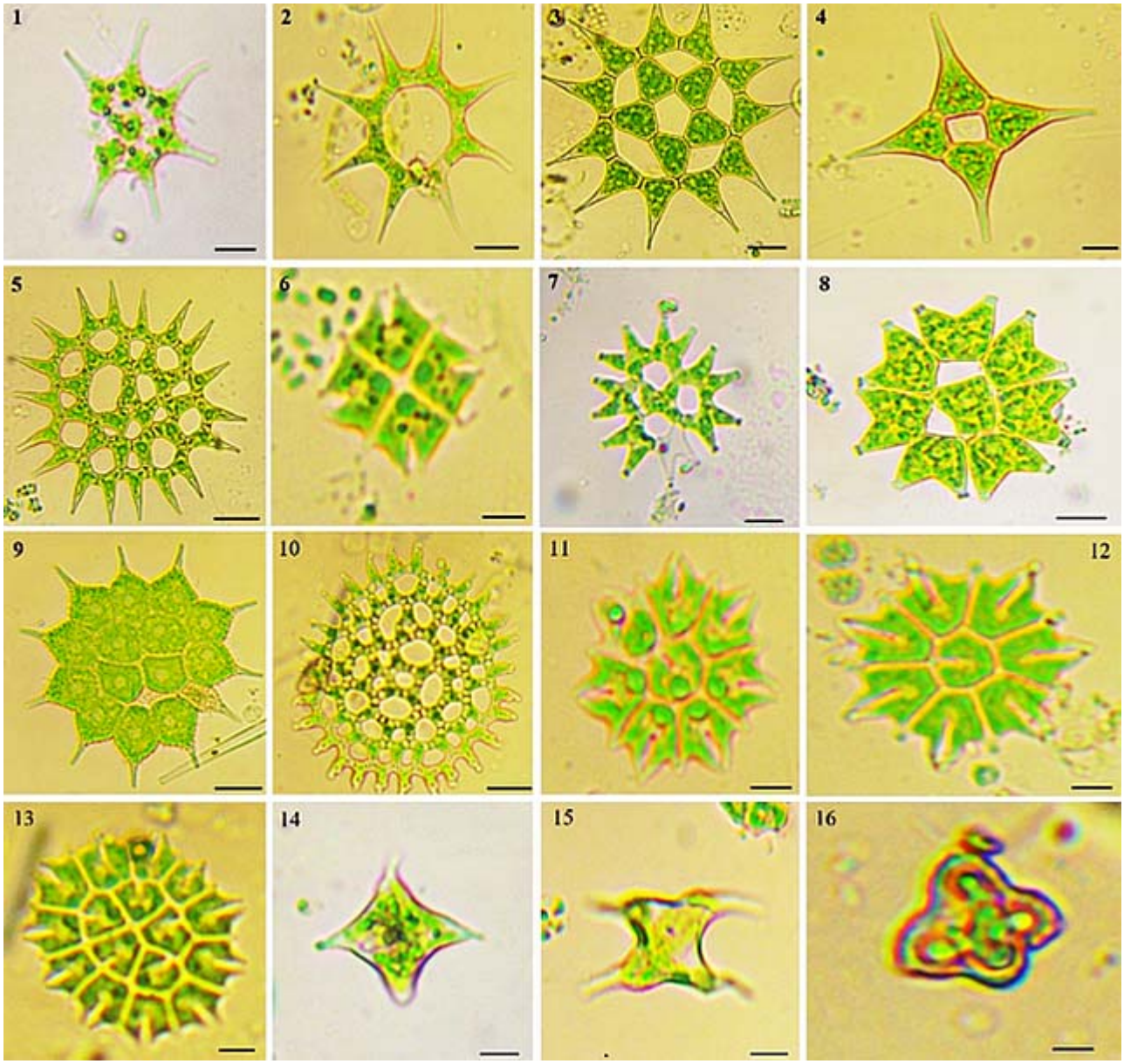
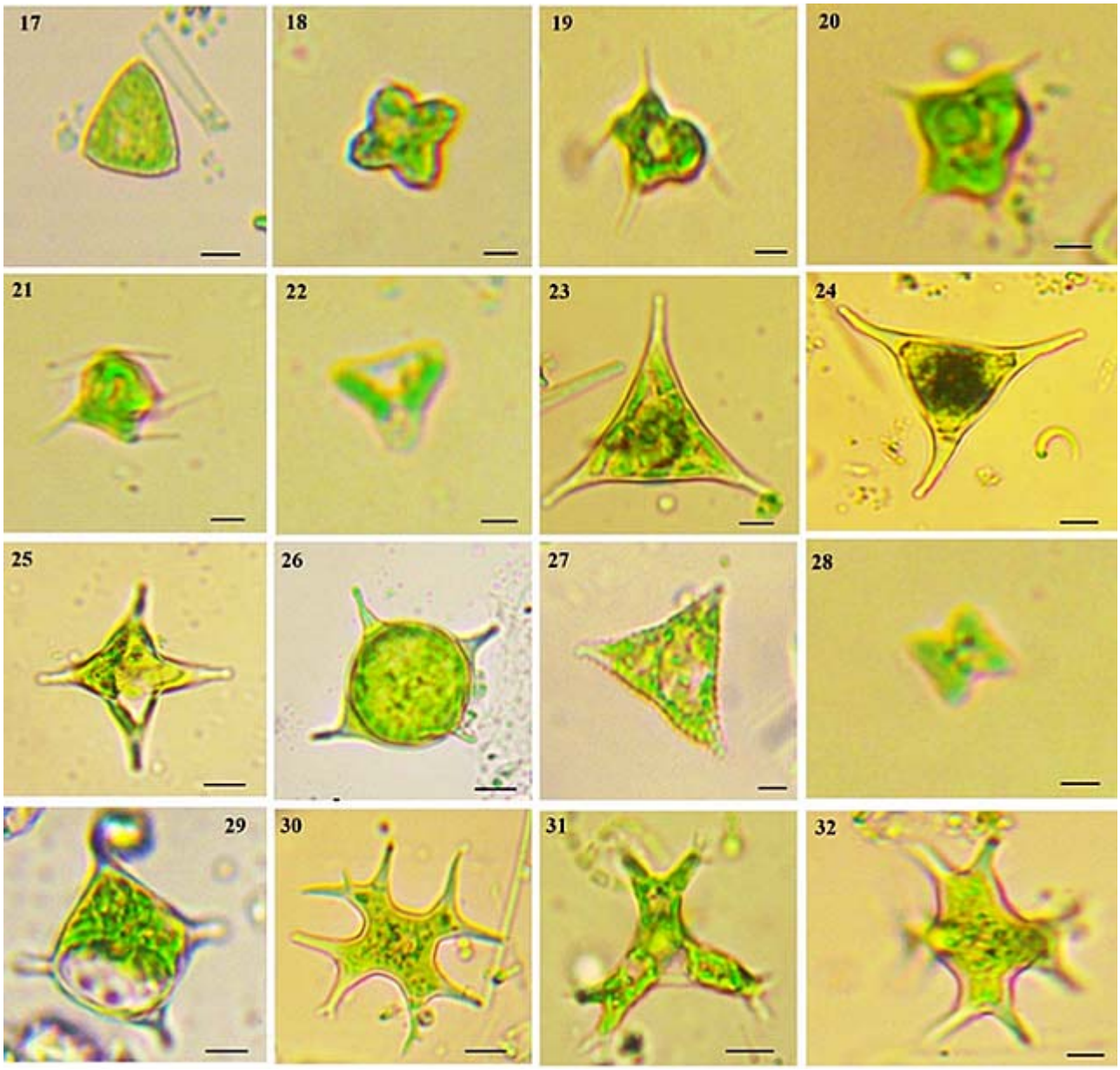


Figure 2. Phycofloral diversity of Hydrodictyaceae from Kothandaramar Temple Tank. 1-4. *Monactinus simplex,* 5. *Monactinus simplex* var. *biwaensis,* 6. *Pediastrum tetras* var. *apiculatum*, 7-8 *Pediastrum duplex,* 9. *Pediastrum ovatum,* 10. *Pseudopediastrum subgranulatum,* 11. *Stauridium tetras,* 12-13. *Stauridium tetras* var. *tetraodon,* 14 *Tetraëdron regulare* var. *granulatum,* 15. *Tetraëdron incus f. decolorata,* 16. *Tetraëdron minimum*

al. 2019a,b). Twenty species was collected by (Upadhyay et al. 2012). In Bangladesh, the occurrence of *Tetraedron* and *Pediastrum* were high in the month of October in the study carried out in Borobila beel, Rangpur district (Chowdhury et al. 2007).

Tetraedron minimum, terrestrial algae isolated from Iceland accumulated secondary carotenoids like astaxanthin and adonixanthin when provided with saline stress and nitrogen starvation (Doppler et al. 2021). The cell wall of the *Tetraedron minimum* possesses highly resistant, non-hydrolyzable aliphatic biopolymer (algaenan) which is highly resistant against chemicals and biodegradation (Blokker et al. 1998, Allard and Templier 2001).



17. *Tetraëdron hemisphaericum,* 18. *Tetraëdron minimum* var. *tetralobulatum,* 19. *Tetraëdron caudatum,* 20. *Tetraëdron pentaedricum f. minimum,* 21. *Tetraëdron pentaedricum,* 22. *Tetraedron trilobulatum,* 23. *Tetraëdron triangulare,* 24. *Tetraëdron regulare* var. *longispinum,* 25. *Tetraëdron acutum,* 26. *Tetraëdron octaedricum* var. *spinosum,* 27. *Tetraëdron proteiforme* var. *granulatum,* 28. *Tetraëdron tumidulum,* 29. *Tetraëdron quadratum f. minor,* 30. *Tetraedron gracile f. minus,* 31. *Tetraëdron limneticum* var. *gracile,* 32. *Tetraëdron pusillum.*

CONCLUSION

Total 19 species of genus *Tetraedron,* 3 species of *Pediastrum,* 2 species each of *Monactinus and Stauridium, and* 1 species of *Pseudopediastrum* has been reported during present investigation. As far as seasonal variation is concerned the species of *Tetraedron* were found dominant in the study area. *Monactinus simplex* var. *biwaensis, Pediastrum tetras* var. *apiculatum, Tetraëdron hemisphaericum, Tetraëdron minimum* var. *tetralobulatum*, *Tetraëdron triangulare, Tetraëdron acutum, Tetraëdron quadratum f. minor* are first reported in Chennai, Tamil Nadu.

Authors' contributions: All authors contributed equally

Conflict of interest: Authors declare no conflict of interest

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Received: 2nd October 2023
Accepted: 31st December 2023