SYNOPSIS

STUDIES ON THE ALGAL FLORA OF
KOLE LANDS IN THRISSUR DISTRICT, KERALA

The Kole lands of Thrissur are distributed in Mukundapuram, Chavakkad and Thrissur taluks of Thrissur district. The Kole lands of Thrissur are part of one of the largest wetland systems on the south – west coast of India, namely Vembanad–Kol. The Vembanad–Kol wetland was declared as Ramsar site in 2002 by the Ramsar Convention, 1971, and got international importance.

The Thrissur Kole lands form a unique aquatic ecosystem and are the rice granary of Thrissur district, Kerala. The term 'Kole' is a Malayalam word which denotes bumper yields under favorable conditions during summer from December to May in case floods did not damage the crop. During the monsoon season, the whole area is inundated. The Kole lands are different from other agro–ecosystems in many aspects. The periods of cultivation are well defined, the soils are comparatively fertile and productive and the microclimate is favorable.

The Thrissur Kole lands lie between Kecheri River in the north and Chalakudy River in the south. Karuvannur River divides the Thrissur Kole lands into two regions, an area of 8,072 ha. in the north is termed as North Kole, and an area of 2,115 ha. in the south is known as South Kole. This wetland area is exploited for products such as

rice, vegetables, livestock and fish and all these activities depend upon the annual rise and fall of the floods. Karuvannur and Kechery are the two major rivers in Thrissur Kole region. The Kole area functions as the flood basin for both these rivers.

The algae form an important component of aquatic flora and play a vital role in maintaining proper equilibrium of abiotic and biotic components of aquatic ecosystem. Micro–algae have vast industrial and economic potential as valuable sources for pharmaceuticals, health foods, carotenoids, restriction endonucleases and in bioremediation of industrial effluent. Algae are also used as biological indicators of water pollution.

The freshwater biodiversity of Kerala State is not well documented and the rate of possible biodiversity loss is not yet quantified in Kerala. The compilation of the bibliography on the Ramsar sites of Kerala shows that the knowledge of flora is meager. A perusal of the existing literature reveals that very few limnological investigations related to algal biodiversity had been done in Thrissur district. There was lack of comprehensive data on the biodiversity of the Thrissur district especially with regard to the data on the lower plant groups. In fact, there was no clear information available on the algal flora of the Thrissur district of Kerala, as the areas was not fully or partly surveyed and remains under explored for the algae.

Practically no work has been done on the taxonomy, distribution, species diversity and composition, seasonal and spatial variation of algae in the Kole lands of Kerala and hence the present work was undertaken. The species composition and distribution of algal flora would give more information regarding the species richness of Kerala.

The main objectives of the present investigation are:

1. To gather information regarding the diversity of freshwater algae in the Kole lands of Thrissur district up to the species level.

2. To evaluate the seasonal and spatial variation of algal flora and to evaluate the relative abundance of algae in the study area.

3. To compare the physico–chemical aspects of water in relation to the diversity of algae of the Kole lands of Thrissur.

4. To analyze the community structure, pigment composition and productivity of the area studied.

This thesis is mainly centered on the taxonomy, ecology and species diversity of phytoplankton in the Kole lands of Thrissur district, Kerala. The species composition, population density, spatial, temporal, qualitative and quantitative distribution of algae in relation to various physico–chemical parameters were investigated at 10 stations from February 2005 to January 2006. It also explains the pigments and the primary productivity in relation to the environmental characteristics during the period of study. This comprehensive study was planned since no such work is available in literature.

The thesis is presented in six chapters. The first chapter provides the general introduction, the review of literature on the freshwater phycological studies of India and Kerala and the objectives, relevance and scope of the research work undertaken. The other chapters are discussed with separate introduction, materials and methods, results, discussion and summary.

The second chapter deals with the geographic location of the study area and the physico–chemical parameters such as temperature, pH, dissolved oxygen (DO), free

carbon dioxide (CO_2), total alkalinity, total hardness, salinity, phosphate, nitrate and silicate. The surface water samples were collected monthly from ten stations in the Kole lands of Thrissur district namely Pullur, Muriyad, Nambiankavu, Mapranam, Chemmanda, Cherpu, Palakkal, Chettupuzha, Anthikkad and Enamavu. The range and the mean along with standard deviation of various physico–chemical characteristics of the different stations studied were analyzed for three seasons: pre–monsoon (February–May), monsoon (June–September) and post–monsoon (October–January) and their correlations were discussed.

The study area is subject to flooding, the frequency, duration, and magnitude of which were dictated by the Karuvannur River. The study revealed that the water quality of the study area fluctuated with seasons and locations. The amount and type of rainfall was found to play a significant role in the fluctuations of physico–chemical characteristics of water.

The third chapter deals with the systematic account of the phytoplankton in the Kole lands of Thrissur, Kerala. The identification of the algal taxa up to the species level was carried out with the help of keys and descriptions given by standard publications and monographs on algae. In the present study 120 water samples were collected and analyzed. The photomicrographs were taken and the Camera Lucida diagrams were prepared.

The algal flora of the Kole lands of Thrissur comprised of 591 taxa belonging to 105 genera and they belonged to six divisions namely Chlorophyta, Chrysophyta, Bacillariophyta, Euglenophyta, Pyrrhophyta and Cyanophyta. Chlorophyceae (green algae) was the major group comprised of 391 taxa belonging to 52

genera of which 292 taxa belonging to 23 genera were desmids. Bacillariophyceae (diatoms) was represented by 74 taxa belonging to 20 genera, Euglenophyceae represented by 61 taxa belonging to 5 genera and Cyanophyceae (blue green algae) represented by 59 taxa belonging to 23 genera. Dinophyceae with 2 genera and 3 taxa, Xanthophyceae with 2 genera and 2 taxa and Chrysophyceae with 1 taxa and 1 genus were also found in the study area. The descriptions of 591 taxa with the illustrations are given.

The Chapter four focuses on the seasonal and spatial variation of phytoplankton compositions in the Kole lands of Thrissur. The estimation of the phytoplankton abundance was done by the Sedgewick Rafter (S–R) cell method. The algal flora varies qualitatively with seasons and stations. Indices such as species diversity, dominance, species richness, evenness and similarity index were studied in order to measure the status of water quality in the Kole lands of Thrissur and the relationship that exists between the physico–chemical characteristics. The pollution aspects with respect to phytoplankton were also discussed.

The seasonal estimation of abundance of phytoplankton revealed that during pre-monsoon the Bacillariophyceae was more dominant followed by the Chlorophyceae and during monsoon and post-monsoon the Chlorophyceae were more abundant followed by the Bacillariophyceae. The present study showed the predominance of Desmidiaceae during monsoon seasons. The variations in physico–chemical parameters and rainfall are responsible for the fluctuations in the quality and quantity of phytoplankton.

The annual pooled quantitative data revealed that the Chlorophyceae were more abundant followed by the Bacillariophyceae. The abundance of phytoplankton

classes were in the order of Chlorophyceae > Bacillariophyceae > Euglenophyceae > Cyanophyceae > Dinophyceae > Chrysophyceae > Xanthophyceae.

More number of taxa was present during monsoon and there is a sharp decrease during November which is due to the conversion of the study area into paddy fields partially or completely. *Cosmarium*, *Staurastrum*, *Closterium*, *Pleurotaenium*, *Euastrum*, *Phacus*, *Trachelomonas*, *Scenedesmus*, *Micrasterias*, *Pediastrum*, *Navicula*, *Xanthidium*, *Euglena* and *Oscillatoria* were the diverse genera found in the study area.

Out of the 105 genera found in the study area, thirty eight were pollution tolerant. The analyses of algae in the study area showed thirty pollution tolerant algal species and are indicators of pollution in the Kole lands of Thrissur. The pollution tolerant algal taxa and genera found in the study area pointed out the environmental hazards of the area.

The Chapter five deals with the potential production of phytoplankton in the Kole lands of Thrissur. The trichromatic method was followed for quantitative estimation of algal pigments such as chlorophyll *a*, *b*, *c* and also carotenoids. The primary productivity measurements were determined by the light and dark bottle method. The seasonal and spatial variations of pigments and the productivity were also discussed. Studies on the pigments indicated that the chlorophyll pigments had direct relationship with the total abundance of phytoplankton. The total phytoplankton also indicated significant positive correlation with the gross primary productivity.

The summary and conclusions of the investigation were presented in the sixth chapter. These chapters are followed by the list of literature consulted and cited as the bibliography.

The diversity of the phytoplankton in the Kole lands of Thrissur was affected by the rainfall, salinity, hardness, magnitude of the flood dictated by the Karuvannur River and the conversion of the area into paddy fields during post-monsoon season. The physico-chemical and quantitative assessment of phytoplankton along with their seasonal variation established a baseline for future studies. The investigations will be useful for analyzing the biodiversity of algae of Kerala and Thrissur district.

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