GEOMORPHOLOGICAL STUDY OF FLUVIAL FEATURES, FARAH VALLIS, MARS

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala, University of Calicut in partial fulfillment of the degree of

Master of Science in Applied Geology

By,

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Reg. No: CCAVMAG001

2021-2023

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SEPTEMBER 2023

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I hereby declare that this dissertation work – **"GEOMORPHOLOGICAL STUDY OF FLUVIAL FEATURES, FARAH VALLIS, MARS"** is a work done by me. No part of the report is reproduced from other resources. All information included from other sources has been duly acknowledged. I maintain that if any part of the report is found to be plagiarized, I shall take the full responsibility for it.

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ACKNOWLEDGEMENT

I take this opportunity to thank everyone who made this a meaningful exercise. First and foremost, I would like to express my sincere gratitude to my guide **Mr. Asif Iqbal Kakkassery**, Assistant Professor Department of Geology, Government College Kasaragod, for his enthusiastic guidance, valuable suggestions, and inexhaustible encouragement which inspired me to complete this work.

I express my heartfelt gratitude to **Mr. Gopakumar. P.G**, Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda for his guidance, cooperation and valuable support throughout the course of work.

Dr. Linto Alappat, Dean of Reasearch and Development of TLC (Former Head, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda), **Tharun. R,** Head, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda, for rendering all the help and facilities available in the department.

I am deeply thankful to **Dr. Anto Francis K**, the Co-Ordinator of M.Sc. Applied Geology, and other faculty members of Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda, for their support, guidance.

I would like to extend my thanks to **Mr. Ayyappadas C.S**. for the continuous support provided for the completion of the dissertation.

I'd like to take this opportunity to thank all of my classmates and friends who supported me in completing this dissertation work, whether directly or indirectly. I am grateful to the entire Christ College family for their love, support, and guidance. I also express my gratitude to my parents and family members for their unwavering support and prayers throughout my life.

Above all, I express my gratitude to God, the Almighty, for his divine generosity and blessings showered upon me.

Aathira P Santhosh

ABSTRACT

Fluvial activities are dominant in the Martian surface which has extensively modified the planet from early times. Farah vallis is a small valley. Studies provide observations of the topography and geomorphology of this paleolake outflow valley and connected tributary valleys in order to determine when the Farah Vallis system was incised. It's critical to quantify the lake levels in Gale Crater in order to describe the hydrologic and climatic history of the sedimentary layers that Curiosity has discovered. We suggest that there were at least three significant lake stands in Gale, each of which lasted for more than a thousand years, and all of which appeared after Mount Sharp reached close to the topographic form it currently has. The highest lake level, which had a mean depth of 700 m, is defined by deltaic deposits off the southern rim of Gale, resulting from the incision of Farah Vallis, and comparable deposits off the southern flank of Mount Sharp. Near Gale, canyons with a shape resembling Farah Vallis enter craters and/or the crustal dichotomy from the south, indicating that the largest lake was fed by a massive flow system.

The main objective of the study is to identify geomorphological features of Farah Vallis by digitizing the features using ArcGIS 10.8. The MRO context camera (CTX) images of Farah Vallis were downloaded from The Geosciences Node of NASA's Planetary Data System (PDS) archives which distributes digital data related to the study of the surfaces and interiors of terrestrial planetary bodies.

From the geomorphological mapping of the Farah Vallis, the prominent geological features identified are main Vallis, Tributary Vallis, delta etc. The features are formed in the south west region of the Gale Crater. The various feature seen in the Farah Vallis tells us about the fluvial activity that is ongoing on its surface.

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QUALITATIVE ANALYSIS OF GROUNDWATER IN AND AROUND SOUTHERN CLAY MINES AT MANGALAPURAM, TRIVANDRUM DISTRICT

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala, University of Calicut in partial fulfilment of the degree of

Master of Science in Applied Geology

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DECLARATION

I, AKSHAYA PRAKASH hereby declare that entitled **'QUALITATIVE ANALYSIS OF GROUNDWATER IN AND AROUND SOUTHERN CLAY MINES AT MANGALAPURAM, TRIVANDRUM DISTRICT'** submitted to Christ College (Autonomous), Irinjalakuda is an original research work done by me, and has not been submitted to any other university for the award of any degree, diploma, associateship and fellowship or any other similar title or recognition. It is a bonafide record carried out by me under the guidance of Dr.Vidhya.G.S, Junior Hydrogeologist, Thiruvananthapuram, Kerala, during April 2023 to August 2023.

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ACKNOWLEDGEMENT

First of all, I express my sincere gratitude and heartfelt thanks to the persons from whom I have received guidance, help, and encouragement in fulfilling the completion of this project work.

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I would like to take this opportunity to express my deepest gratitude to **Dr.Anto Francis K, Co-ordinator**, Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda.

I record my deep sense of gratitude to **Gopakumar. P. G, Assistant Professor**, Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda, for all the help, suggestions and support throughout the course and dissertation. I also thank other faculty members of the for their continuous support and encouragement.

I am also thankful to **Ms. Rajalakshmi, Ms. Anju** and other staffs (technical and non-technical) of **National Centre for Earth Science Studies (Ministry of Earth Science, Government of India), Thiruvananthapuram, Kerala**, for helping me in the analysis of water samples.

Last but not the least, I express my sincere gratitude to my parents, friends and family for other support.

Above all, I want to thank the Almighty God for the blessings and generosity he's shown me.

AKSHAYA PRAKASH

ABSTRACT

This study aims to investigate the qualitative analysis of groundwater in and around clay mines in Mangalapuram. Groundwater is a vital resource for various purposes, and its contamination can pose significant risks to human health and the environment. The presence of clay mines in the vicinity raises concerns about potential groundwater pollution due to mining activities. The qualitative analysis will assess the physical and chemical, and parameters of the groundwater samples collected from different locations around the clay mines.

From the areas around the Mangalapuram clay mines, 17 open well samples were taken for the current investigation. The investigation focused on determining the concentration of anions, cations and trace metals. Additionally, the study will assess the impact of clay mining on groundwater quality by comparing the results with the existing water quality standards and guidelines. The study area shows abnormal pH values, which indicate a trend toward acidity. The water quality parameters such as pH, Total Dissolved Solids (TDS), Sodium (Na), Calcium (Ca), Iron (Fe) etc. were used for evaluating Water Quality Index. The Water Quality Index decline as a result of the impact of clay mining. The investigation indicate that the region is unsuitable for the production of drinking water.

The findings of this study are expected to provide valuable insights into the potential contamination of groundwater in and around clay mines. This information will be beneficial for mining industry to develop appropriate measures for protecting and managing groundwater resources effectively. Furthermore, the study will contribute to the existing knowledge in the field of environmental science and advance our understanding of the impact of clay mining on groundwater quality.

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SEDIMENT TEXTURE AND MICROFOSSIL ASSEMBLAGES OF THE SUBSURFACE SEDIMENTS OF CENTRAL KERALA: IMPLICATIONS OF HOLOCENE LAND-SEA INTERACTIONS

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala, University of Calicut in partial fulfillment of the degree of

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DECLARATION

I thus certify that this dissertation – "**SEDIMENT TEXTURE AND MICROFOSSIL ASSEMBLAGES OF THE SUBSURFACE SEDIMENTS OF CENTRAL KERALA: IMPLICATIONS OF HOLOCENE LAND-SEA INTERACTIONS**"- is my own work. The report contains no quotations from external sources. All information derived from external sources has been properly credited. I maintain that if any element of the report is discovered to be plagiarised, I will accept full responsibility. Dr. Linto Alappat, Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda, Kerala, has provided necessary supervision for the completion of the work. I followed best practises and scientific study ethics. This work is presented to Christ College (Autonomous), Irinjalakuda, University of Calicut, Kerala, in partial satisfaction of the Master of Sciences in Applied Geology degree requirements.

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ACKNOWLEDGEMENT

This report is official documentation of dissertation work carried out in the Vallarpadam Island, Kerala. It is a privilege for me to convey my gratitude and respect to those who guided and inspired the project's completion.

I would like to express my heartfelt thanks to my mentor, **Dr. Linto Alappat, Dean of Research and Development of TLC, Assistant Professor, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda**, for including me, making timely comments, and guiding me through the completion of my research.

Tarun R, Head, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda, for rendering all the help and facilities available in the department.

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Above all, I thank God, the Almighty, for his wonderful kindness and the benefits that have been bestowed upon me.

ANJANA AJITH

ABSTRACT

Vallarpadam Island is located in the Vembanad Lake of Ernamkulam District of Central Kerala. The area possess a unique opportunity to study the palaeogeography and land sea interactions due to its geographic location in the coastal plain. A 15m deep sediment core was raised using mechanically operated auger to sample the sub-surface sediments of the area. The core sediment from Vallarpadam Island was subjected to textural and micropaleontological analysis. Wet sieving is used for textural analysis. Paleontological analysis was carried out by making a fossil slide. These pieces of evidence revealed the Island's diverse depositional history, which included marine- marginal marine, intertidal, littoral, and supratidal environments.

Presence of the fossil foraminifera indicate that the depositional environment of the sediment occurs under marginal marine to marine condition due to marine transgression and regression during the Holocene. The majority of the fossil foraminifera discovered in the research area were benthic in nature; however, planktic forms were also discovered. Ammonia beccarii was the most frequent species found here. The presence of spores in a specific sequence suggests the presence of vegetation in the past.

Presence of peat layers, leaf impressions and fossil shells in the Holocene sediments indicating the geomorphic history of the region that was initiated by transgression which is followed by a regression. All of these indicating that the shoreline is initially migrated towards the east and was later towards the west at the stage of deposition

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DECLARATION

I hereby **Aparna Rajan** declare that this dissertation work — **DISTRIBUTION OF MICROPLASTICS FROM SURFACE SEDIMENTS IN BRAHMAPURAM AREA, ERNAKULAM DISTRICT,** is a work done by me. No part of the report is reproduced from other resources. All information included from other sources has been duly acknowledged. I maintain that if any part of the report is found to be plagiarized, I shall take the full responsibility for it.

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ACKNOWLEDGEMENT

In the first place, I thank God Almighty greatly, by whose grace I'm able to complete this work.

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Last, but not the least, I would like to show my sincere gratitude to my parents for their sustained prayer, financial and moral support in the completion of my work.

I take this opportunity to thank my friends and classmates and all those who have directly and indirectly contributed their time, material and encouraged me during the course of my investigation.

APARNA RAJAN

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ABSTRACT

The present study is a distribution pattern of microplastic, percentage of organic carbon and a textural characteristics of river bank sediments in Brahmapuram area, Ernakulam district. This is focused on the quantity of microplastic present in the soil, presence of organic carbon relation with microplastic, and the related textural classification. Sediments were collected from Brahmapuram waste plant and nearby areas. Brahmapuram has led to a concern about the contamination of waste. By using trilinear plot, percentage of the texture of sample were identified and classified into different types. Maximum organic matter and microplastic is identified in sample number 10. The study is an integrated approach showing the relationship between organic matter, microplastic, and soil texture.

CHAPTER 1

INTRODUCTION

1.1 GENERAL

The presence of microplastic, which was defined as small piece of plastic less than 5 mm in size. Aquatic environment has become global concern there days. The microplastic accumulate in basin sediments either directly by sinking through the water column or indirectly by current or sediment transport by water. Main source of microplastic in soil sludge and waste water irrigation. Microplastic can have ecological impact on soil biota and even threaten human health. Microplastic came from a variety of source including larger particles piece that have broken synthetic textiles are the single greatest contributors of microplastic.

One in aquatic environment microplastic might float in the water column or sink in to the bottom, depend up on the particle density. Microplastic could sink in bottom as result of biofouling which can increase its density [Biofouling – undesirable accumulation of microorganisms, plants, algae and animals are submerged structure]. Sediments have considered to be major sink of microplastic and accumulation in sediments can bring harm to marine and human life. The morphological characteristics of microplastic is shape, colour, and size. Microplastic were identified in all sediment. Microplastics can come in many different forms, such as bigger plastic pieces that have broken up, resin pellets used in the production of plastic, or microbeads, which are tiny, produced plastic beads used in cosmetic and health products. Microplastics and their impact on human health are still an early stage of research, thus little is known about them. The research on this subject is being spearheaded by the NOAA Marine Debris Programme. There are now standardised field techniques that are being tested for the collection of sediment, sand, and surface-water microplastic samples. The first step in understanding the ultimate distribution, effects, and fate of this debris is to compare the amount of microplastics discharged into the ecosystem on a worldwide scale using field and laboratory techniques. Microplastics are considered to be carbon and hydrogen atoms bound together in polymer chains and others are phthalates, polybrominated diphenyl ethers and Tetra bromo bisphenol A are present. These chemicals are lech out of the plastic and entering into the environment. Primary and secondary microplastics are the two types of microplastic. Primary

HYDROCHEMICAL AND TRACE METAL ANALYSIS IN MINOR WATERSHED OF MAMAM RIVER BASIN- UPPER REACHES OF KADINAMKULAM LAKE, KERALA

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala,

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Place : Thiruvananthapuram APARNA. G

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ACKNOWLEDGEMENT

While bringing this project to its final form, I came across a number of people whose contributions in various ways helped my field of research and they deserve special thanks. It is a pleasure to convey my gratitude to all of them.

For the successful completion of this project work, I would like to extend my thanks and cordial sense of gratitude to **Mr. John Samuel IAS, Director, State Ground Water Department** for giving permission to do the project work under State Ground Water Department. I extend my gratitude to **Mr. Sudheer AS, District Officer, Trivandrum** for giving an opportunity to do my project work under District office and for the suggestion, support given from an early stage of this project work.

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I also express my sincere thanks to **Ms. Anju, Ms. Rajalekshmi** and other technical and Non-technical staff of **National Centre for Earth Science Studies (Ministry of Earth Science, Government of India), Thiruvananthapuram, Kerala**, for helping the hydrochemical analysis of water samples.

I would like to take this opportunity to express my deepest gratitude to **Dr. Anto Francis K, Co-ordinator**, **Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda**.

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Last but not the least, I express my sincere gratitude to my family and friends for their support.

Above all, I want to thank the Almighty God for his divine blessings showed upon me.

APARNA.G

ABSTRACT

Study on hydrochemical and trace metal analysis of groundwater provide very useful information about its quality for domestic and irrigational purposes. Water quality is defined as the characteristic of water that influences its suitability for specific use. Most important parameters for the quality analysis of groundwater are its physical and chemical parameters such as pH, EC, TDS , Cations and Anions. Trace metal analysis is also important because the contamination of groundwater is one of the critical environmental problems, among which trace metal contamination of groundwater cause significant pollution. In the present study 19 open well samples were collected from minor watershed of Mamam river basin and upper reaches of Kadinamkulam Lake. Physical, chemical and trace element analysis was carried out at NCESS, Thiruvananthapuram.

The study showed that the area is not suitable for drinking water purpose. Anomalous pH values were observed in the study area which shows an acidic trend. The interaction of Fe in laterite with Cl producing ferric chloride which is acidic, use of fertilizers for paddy and rubber , the presence of clay mine and concrete industry may be a reason for this. The iron content is higher in the areas near Kadinamkulam lake which may be due to the leaching of effluents from the retting of coconut husk or may due to the leaching of sewage from the houses. Cadmium and zinc are above highest desirable limit which makes the water toxic. This may be due to the industrial and domestic waste water entering in to the waterbody. Source of these trace metals are due to the anthropogenic activities. The sandy aquifer enhances the interaction between groundwater and surface water resources. The suitability of irrigation was studied by Wilcox and USSL diagram which shows that most of the areas are suitable for irrigation.

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IDENTIFICATION AND CHARACTERIZATION OF MICROPLASTICS IN THE SEDIMENTS IN THE BHARATHAPUZHA RIVER FROM ITS SOURCE TO SINK

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Certified that the dissertation work entitled "IDENTIFICATION AND CHARACTERIZATION OF MICROPLASTICS IN THE SEDIMENTS IN THE BHARATHAPUZHA RIVER FROM ITS SOURCE TO SINK" is a bonafide record of work done by Mr. ARJUN PRADEEP M of fourth semester M.Sc. Applied Geology in this college during 2022-23.

Dr. Anto Francis K

Co-Ordinator (Geology Self-financing)

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Place: Irinjalakuda

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DECLARATION

I hereby declare that this dissertation work – **IDENTIFICATION OF CHARACTERIZATION OF MICROPLASTICS IN THE SEDIMENTS IN THE BHARATHAPUZHA RIVER FROM ITS SOURCE TO SINK** is a work done by me. No part of the report is reproduced from other resources. All information included from other sources has been duly acknowledged. I maintain that if any part of the report is found to be plagiarized, I shall take the full responsibility for it.

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ACKNOWLEDGEMENT

This report is an official documentation of dissertation work carried out in Bharathapuzha River basin, Kerala. This report would not have been possible without guidance, encouragement and support of many well-wishers and my colleagues who helped me in many ways.

Firstly, I record my deep sense of gratitude and indebtedness to my guide **Dr. Linto Alappat, Dean of Research and Development of TLC (former HOD), Christ College (Autonomous) Irinjalakuda**, for developing the project's framework and providing regular support and supervision throughout the duration of the course of the study.

Next, I would like to thank **Tharun R, Head, Department of Geology and Environmental science, Christ College (Autonomous) Irinjalakuda**, for providing all the facilities and help available from the department.

I would like to express my gratitude to **Dr. V. Neetha, Assistant Professor, Department of Zoology, Sacred Heart College, Chalakudy,** for the guidance and supervision in the completion of the dissertation.

Next, I would like to thank **Dr. Sijinkumar and Dr. Sandeep. K, Assistant Professors at Central university of Kerala**, for giving me permission to carry out my work in this institution.

I am deeply thankful to **Dr. Anto Francis.K, the Co-ordinator of M.Sc. Applied Geology**, and other faculty members of Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda, for their support, guidance and love.

I would like to extend my thanks to Mr. **Ayyappadas C.S.** for the continuous support provided for the completion of the dissertation. Also, I'd like to take this opportunity to thank all of my classmates and friends who supported me in completing this dissertation work, whether directly or indirectly. I am grateful to the entire Christ College family for their love, support, and guidance. I also express my gratitude to my parents and family members for their unwavering support and prayers throughout my life. Above all, I express my gratitude to God, the Almighty, for his divine generosity and blessings showered upon me.

ARJUN PRADEEP M

ABSTRACT

This investigation mainly focused on the identification and quantification of microplastics in the surface sediments of Bharathapuzha river, Kerala. Various chemical procedures were done in the methodology of the work. Microplastics were detected in all the samples taken from the study area from the source to the sink of the river. The abundance of microplastics was increasing and decreasing from the sink and it was not in a definite order. The maximum number of microplastics was obtained from sample BP S13 and BP S22, which were taken from Ottappalam and Ponnani beach respectively and the least amount of microplastics was from the sample BP S1 and BP S2, which where taken from the source of the river. Microscopic examination showed that a type of microplastic called fibres was found in abundance in total microplastic count obtained. The black coloured microplastics was the abundant coloured microplastics. The increase in the percentage of coloured microplastics in the river increases the probability of damage to the aquatic life. Microplastics can cause serious effect to aquatic organism when they ingest it. The abundance of microplastics in the study area point towards different sources of contaminations like anthropogenic activities like fishing and waste disposal, and due to the hydrogeomorphology of the river like sediment type, flow velocity and discharge of the river.

CONTENT

REGIONAL STUDY OF MICROPLASTICS IN SURFACE WATER OF BRAHMAPURAM AREA, ERNAKULAM DISTRICT

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala,

Under University of Calicut in partial fulfilment of the degree of

MASTER OF SCIENCE IN APPLIED GEOLOGY

By,

CHANDINI S

REG NO: CCAVMAG007

2021-2023

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This is to certify that the dissertation entitled- '**Regional study of microplastics in surface water of Brahmapuram area, Ernakulam district**' is a bonafide record of work done by**. Ms. Chandini S** (Reg. No. CCAVMAG007), M.Sc. Applied Geology, (Christ College (Autonomous), Irinjalakuda) under the guidance of **Mrs. Roshini P.P**, Assistant professor, (Dept. of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda) in partial fulfilment of requirements for the degree of Master of Science in Applied Geology during the academic year 2021-2023.

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Christ College (Autonomous),Irinjalakuda

Place: ……

Date: …….

External Examiners;

1. ……

2. ……

DECLARATION

I **CHANDINI S**, hereby declare that the work incorporated in this dissertation report entitled '**Regional study of microplastics in surface water of Brahmapuram area, Ernakulam district**' has been composed solely by me and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where stated by reference, the work presented here is entirely my own. It was carried out under the guidance and supervision of **Mrs. Roshini P.P,** Assistant Professor, Dept. of Geology and Environmental Science, Christ college (Autonomous) Irinjalakuda, Kerala. I have followed best practice and ethics of scientific study. This work is submitted to Christ College (Autonomous), Irinjalakuda, Kerala in partial fulfilment for the award of degree of Master of Sciences in Applied Geology.

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ACKNOWLEDGEMENT

This work would not have been possible without guidance, encouragement and support of other people. I would like to extend my sincere gratitude to all those who helped me in this project. First and foremost, I thank my project guide **Mrs. Roshini P.P**. (Assistant professor, Dept. of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda for designing framework of the project, support and supervision throughout the work. I am deeply grateful to **Dr. Linto Alappat**(Deen of Research and Development of TLC and former HoD), **Mr. Tharun R** (Head of the Department), and **Dr. Anto Francis K** (Co-ordinator, Geology Self-financing) of Department of Geology and Environmental Science for their constant motivation throughout the course and in giving guidance in all possible ways to carry out the analysis.

I would like to extend my gratitude to **Dr. Anso M. A**, and **Ms. Ivine Joseph** (Assistant Professors, Dept. Of Geology and Environmental Science) for their constant guidance and support throughout the work and all other faculty members of Dept. of Geology and Environmental Science, Christ College, for their guidance during the academics. I would like to thank **Mr. Ayyappadas C S** (Research Fellow Christ (College Autonomous) Irinjalakuda) who gave technical support for my project and Christ college family for their support, guidance and love.

I also acknowledge with reverence, my warm regards towards my parents and my family members for their moral support and guidance. Last but not the least I extend my thanks to all of my friends who directly or indirectly helped me to complete this dissertation report.

Above all I would like to express my gratitude to God almighty for showering His blessings on me to complete my project in efficient manner.

ABSTRACT

Since surface water is easily accessible than ground water, it is relied on for many human uses. Brahmapuram is one of the prominent industrial areas in Ernakulam district, so assessment of surface water quality and microplastic contamination is of high demand.17 samples were collected as part of this investigation. Analysis of physico-chemical parameters of samples was carried out. In case of most parameters sample 2 recorded lowest value and samples 15, 16 &17 show highest values. Samples were analyzed using filtration unit for the determination of microplastics. This research provides the first step in understanding microplastic contamination in the river and its proximity to the water cycle.

CONTENTS

QUALITATIVE ANALYSIS OF GROUNDWATER ON WATERSHED OF KARAMANA RIVER BASIN: A CASE STUDY IN AND AROUND VILAPILSALA SOLID WASTE TREATMENT PLANT, KERALA

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala, University of Calicut in Partial fulfillment of the degree of

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AUGUST 2023

QUALITATIVE ANALYSIS OF GROUNDWATER ON WATERSHED OF KARAMANA RIVER BASIN: A CASE STUDY IN AND AROUND VILAPPILSALA SOLID WASTE TREATMENT PLANT, KERALA

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala,

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ACKNOWLEDGEMENT

This report is an official documentation of dissertation work carried out in and around Vilapilsala solid waste treatment plant, Kerala. This report would not have been possible without guidance, encouragement and support of many well-wishers and my colleagues who helped me in many ways.

Firstly, I record my deep sense of gratitude and indebtedness to my guide **Dr. Vidhya G.S, Junior Hydrogeologist, District office of Ground Water Department, Thiruvananthapuram**, for developing the project's framework and providing regular support and supervision throughout the duration of the course of study.

I extend my gratitude to **Sudheer A.S,** District officer of Ground Water Department, Thiruvananthapuram, for granting me permission to conduct my dissertation work in the department.

I thank National Hydrology Project Assistance , SGWB, for their support in the field studies and sampling.

I am deeply thankful to **Dr. Anto Francis K,** Co-ordinator, Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda, for the support and guidance.

I would like to extend my thanks to **Ms. Roshini P.P.**, for the continuous support and guidance.

I extend my sincere gratitude to **Ms. Rajalakshmi and Ms. Anju**, **National Centre for Earth Science Studies (NCESS), Thiruvananthapuram,** for helping me in my analysis of water samples.

I'd like to take this opportunity to thank all of my classmates and friends, who supported me in completing this dissertation work, whether directly or indirectly. I am grateful to the entire Christ College family for their love , support, and guidance. I also express my gratitude to my parents and family members for their support and prayers throughout my life.

Above all, I express my gratitude to God, the Almighty, for his divine generosity and blessings showered upon me.

GREESHMA GANESH

ABSTRACT

This study seeks to explore and analyze the qualitative characteristics of groundwater, especially around the Vilapilsala solid waste treatment plant. The plant has been shut down since past 11 years. Vilapilsala is a densely populated area where groundwater is a crucial source of drinking water for the local community. The aim of this study is to assess the quality of the groundwater in this region and identify any potential risks or contaminants that may affect its suitability for consumption or other uses.

The research will employ a qualitative research design, including both primary and secondary data sources. Primary data will be collected through the sampling and analysis of groundwater samples, 18 open wells and 2 bore wells were taken from different locations within Vilapilsala for this investigation. The samples will be analyzed for various physicochemical properties such as pH, electrical conductivity, total dissolved solids and levels of specific ions. This analysis will provide insights into the overall quality and suitability of the groundwater for various purposes.

Secondary data sources will include official reports, previous research studies, and historical data on water quality in the region. These sources will provide valuable context and allow for comparisons to be made over time.

The findings of this study will help in understanding the current state of groundwater quality in Vilapilsala and the potential risks associated with its use. The study will also identify any potential sources of contamination and recommend measures to address these issues. The results will be beneficial to local authorities, water management agencies, and the community in implementing appropriate measures to protect and preserve the groundwater resources in this region.

CONTENTS

DISTRIBUTION OF OSTRACODA IN THE VANCHIPURA BEACH: IMPLICATION ON RATE OF SEDIMENTATION

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala,

University of Calicut in partial fulfilment of the degree of

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SEPTEMBER 2023

DISTRIBUTION OF OSTRACODA IN THE VANCHIPURA BEACH: IMPLICATION ON RATE OF SEDIMENTATION

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala,

University of Calicut in partial fulfilment of the degree of

Master of Science in Applied Geology

By,

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Co-ordinator

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This is to certify that the dissertation entitled- 'Distribution of Ostracoda in Vanchipura Beach: Implication on rate of sedimentation' is a bonafied record of work done by Ms. Indusree B Raj (Reg.No. CCAVMAG009), M.Sc. Applied Geology, Christ College (Autonomous), Irinjalakuda under my guidance in partial fulfilment of requirements for the degree of Master of Science in Applied Geology during the academic year 2021-2023.

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Internal Supervisor

Dr. Anto Francis. K
Co-ordinator

DECLARATION

I, Indusree B Raj, declare that the work included in my dissertation report named "DISTRIBUTION OF OSTRACODA IN THE VANCHIPURA BEACH: IMPLICATION ON RATE OF SEDIMENTATION" was composed entirely by me and that it has not previously been presented, in whole or in part, in any previous application for a degree. Except where otherwise noted, the work presented here is entirely my own. This work is presented to Christ College (Autonomous), Irinjalakuda, Kerala, in a partial fulfilment of the Master of Science in Applied Geology degree requirements.

ACKNOWLEDGEMENT

First, I want to express my gratitude to God Almighty, by whose mercy I am able to do this work. I wish to express my heartfelt gratitude and heartfelt thanks to, Dr.Linto Alappat, Dean of Research and Development of TLC (former HOD) Department of Geology and Environmental Science, Christ College(Autonomous) Irinjalakuda, Dr. Anto Francis. K, Co- Ordinator, Department of Geology and Environmental science, Christ College (Autonomous) Irinjalakuda,and Mr. Tharun R. Head of Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda, for developing the project's framework and providing regular support and supervision throughout the duration of the course study. A successful and ultimate conclusion of this project necessitated a great deal of advice and assistance, and I consider myself very grateful to have received this during all stages of my project work. Whatever I've accomplished is entirely due to such guidance and assistance, for which I am grateful. I would like to thank my project guide, Dr Sunitha, D (Assistant Professor, Department of Geology & Environmental Science) Christ College (Autonomous) Irinjalakuda, for creating the project guidelines and providing support and supervision throughout the project. I would prefer to take this opportunity to thank all of my classmates and friends who helped me finish my dissertation, whether directly or indirectly. I'm also thankful to the entire ChristCollege family for their love and support. I also express my gratitude to my parents and family members for their unwavering support and prayers throughout my life.

Indusree B Raj

ABSTRACT

In order to study the distribution of Ostracoda, the calcareous microfauna, occurring in the Vanchipura Beach samples, a total of 25 surface samples and one core sample were collected. Distribution pattern of individual taxon was examined and their sediment relationship was determined for ecologic/environmental interpretation. Sand-silt clay ratio estimation was carried out using the procedure of Krumbein and Pettijohn (1938). Estimation of CaCO3 was made by adopting the procedure proposed by Piper (1947) has been incorporated in this dissertation. Previous research work on Ostracoda has been reviewed and included in the separate chapter.

The main aim of the present study is to find the abundance and distribution of Ostracoda in Vanchipura Beach region. Individual taxon, distribution trends were studied, and their sediment relationships have been identified for ecologic/environmental assessmen and to discuss on carapace and open valve ratio, to know the rate of sedimentation. 4 Osracoda species were identified from the surface samples and 6 Osracoda species were identified from the core sample. The species belonging to Loxoconcha gruendeli and Xestoleberis antillea were abundant in the surface samples. The species belonging to Hemicytheridea paiki is comparatively less in number in the surface samples. On the other hand, in the core sample. Hemicytheridea paiki and Xestoleberis antillea found dominant, Ambocythere sp and Loxoconcha gruendeli found rare. The species were observed in shallow water condition.

Sedimentological characteristics were discussed by analysing the sand silt clay and the calcium carbonate percentage and the carapace and open valve ratio have also studied.

CHAPTER I

INTRODUCTION

1.1 GENERAL INTRODUCTION

Microfossils, which can be anywhere between one centimeter and one micron in size, are the subject of the relatively recent area of micropaleontology. A tiny sample of sedimentary rock or silt can yield hundreds of well-preserved specimens due to their small size, making them a useful tool for researching ecosystems and environmental changes. Foraminifera,Ostracoda, Nanoplankton, dinoflagellates, acritarchs, diatoms, and radiolarians are only a few of the different kinds of microfossils that are frequently utilized in biostratigraphic correlation, paleoenvironmental reconstruction, and paleoceanography. Micropaleontology has significantly advanced in the areas of taxonomy, biostratigraphy, and paleoecology during the course of the past century, attributed in large part to the petroleum industry's use of the field for subsurface correlation of geologic layers.

The 1970s saw a shift in emphasis towards the interpretation of deep-sea core sequences, which improved our understanding of the geologic time scale and elevated paleoceanography to the forefront of modern science. More recently, radioactive isotope ratios in microfossils have been found to vary through space and time, revealing changes in plate tectonics and paleoclimatology as well as other physical, chemical, and biological components of the global ecosystem

Microfossils are helpful for studying ecology and evolution in addition to these new fields, as well as for environmental monitoring of aquatic ecosystems that are impacted by urban and industrial pollutants. Using micropaleontology in forensic investigations is prevalent.

1.2. INTRODUCTION TO OSTRACODA

Organisms that offer a proxy record of changes are especially important in light of the growing focus on environmental and climatic change in the scientific literature. It is widely used as a palaeoenvironmental, palaeoclimatic, and biostratigraphic indicator because one group of tiny

crustaceans, the ostracods, has a good fossil record and is one of the few that can be equally (palaeo)environmentally informative in both the marine and non-marine realms. Ostracod applications span a variety of fields, including evolutionary biology, zoology, molecular biology, (palaeo-)ecology, (palaeo-)limnology, and (palaeo-)oceanography, in addition to geological and palaeontological ones, such as basin analysis. Palaeoclimatic applications of ostracods frequently combine and integrate several of these fields.

Only estimations of the overall number of species in the ostracoda have been reported; the richness of this group has not yet been thoroughly characterized. Although this includes subspecies and synonymies, more than 65,000 living and fossil ostracod taxa at or below the species level have been reported based on the database compilations of Kempf 1996 and Kempf 1997 (Ikeya et al., 2005). Only half of the 20,000 living species that are thought to exist have been formally described, with the bulk coming from marine and transitional waters; 2000 fictitious species are known from non-marine environments (Martens et al., 2008).

The longest fossil record of any arthropod, dating from the Ordovician to the present, belongs to the ostracods and spans roughly 450 million years (Ma). A Silurian planktonic ostracod represents the earliest known instance of a male metazoan (Siveter et al., 2003), and a non-marine family with a lengthy history of obligate parthenogenesis (probably more than 200 Ma) is exceptional as a "ancient asexual" lineage with a rich fossil record (Martens 1998, Martens et al., 2003, Martens 2008).

Ostracods were first mentioned between 1000 and 1150 A.D. by the Mogollon people of New Mexico, who depicted certain specimens (perhaps Chlamydotheca or Megalocypris) on some Pueblo pottery (Neale, 1988). The first ostracod was described by Linné in 1746, and Baker illustrated one in 1753, likely depicting a Cypris (Oertli, 1982). However, O.F. Müller made the most significant contribution to early ostracod studies by proposing the first linnean taxonomic assignment of an ostracod (Müller, 1776, in: Oertli 1982, Neale 1988; both are also useful for historical references).

The French scientist Pierre André Latreille gave the name of the Class Ostracoda; he first used the spelling "Ostracoda" in 1802 and then modified it to "Ostracoda" in 1806 (Oertli, 1982). Early descriptive studies were published in the nineteenth century, such as those by Baird (1850), and a higher taxonomy of the major groups was established by Sars (1866). These were followed by the first comprehensive investigation of British Pleistocene ostracods (Brady et al., 1874), as

SPATIAL DISTRIBUTION OF MICROPLASTIC CONCENTRATION IN AND AROUND BRAHMAPURAM LANDFILL SITE AND ITS POTENTIAL RISK ON GROUNDWATER

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala, University of Calicut in partial fulfillment of the degree of

Master of Science in Applied Geology

By,

J KRISHNANUNNI

Reg Number: CCAVMAG010

2021-2023

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SEPTEMBER 2023

CERTIFICATE

This is to certify that the dissertation entitled – **SPATIAL DISTRIBUTION OF MICROPLASTIC CONCENTRATION IN AND AROUND BRAHMAPURAM LANDFILL SITE AND ITS POTENTIAL RISK ON GROUNDWATER**, is a bonafide record of work done by Mr. J Krishnanunni (Reg. No. CCAVMAG010), MSc Applied Geology, Christ College (Autonomous) Irinjalakuda, under my guidance in partial fulfilment of requirements for the degree of Master of Science in Applied Geology during the year 2021-2023.

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DECLARATION

I hereby declare that this dissertation work – **SPATIAL DISTRIBUTION OF MICROPLASTIC CONCENTRATION IN AND AROUND BRAHMAPURAM LANDFILL SITE AND ITS POTENTIAL RISK ON GROUNDWATER** is a work done by me. No part of the report is reproduced from other resources. All information included from other sources has been duly acknowledged. I maintain that if any part of the report is found to be plagiarized, I shall take the full responsibility for it.

Place: Irinjalakuda

Date:

J KRISHNANUNNI

Reg.No. CCAVMAG010

ACKNOWLEDGEMENT

This report is an official documentation of dissertation work carried out in Ambalamukal Industrial Area, Kerala. This report would not have been possible without guidance, encouragement and support of many well-wishers and my colleagues who helped me in many ways.

I would like to express my sincere gratitude and appreciation to **Dr. Anso M A**, Assistant Professor in the Department of Geology and Environmental Science at Christ College (Autonomous) Irinjalakuda. He played a pivotal role in shaping the framework of this thesis and provided unwavering support and guidance throughout the entire duration of the study.

Dr. Linto Alappat, Dean of Research and Development of TLC (Former Head, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda), **Mr Tharun R**, Head of the Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda, for rendering all the help and facilities available in the department.

I express my utmost gratitude to **Mr. Ayyappadas C.S**, a Research Scholar at Christ College (Autonomous) Irinjalakuda, for his invaluable assistance in the technical aspects of my study and his unwavering support during the completion of my dissertation.

I am grateful to **Dr. Anto Francis K**, Coordinator (Geology Self-financing), and the other faculty members of the Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda, for their encouragement, direction, and affection.

I'd like to take this opportunity to thank all of my teachers, classmates and friends who supported me in completing this dissertation work, whether directly or indirectly.

I am grateful to the entire Christ College family for their love, support, and guidance. I also express my gratitude to my parents and my sister for their unwavering support and prayers throughout my life. Above all, I express my gratitude to God, the Almighty, for His divine generosity and blessings showered upon me.

J KRISHNANUNNI

ABSTRACT

Although plastic is already a vital part of modern life and plays a significant role in human activity, it poses a serious threat to freshwater ecosystems. The aim of this study is to analyse the quality of ground water and to find the presence of microplastics in Ambalamugal area of Eranakulam District. Ambalamugal is one of the largest industrial areas in Eranakulam District. Total of 40 samples were taken before South West monsoon. The microplastic contamination in the groundwater samples ranged from 1 to 23 microplastics/L and included coloured microplastic particles in shades of white, black, green, pink, purple and blue. The quantification of the Physical parameters such as pH, electrical conductivity (EC) and total dissolved solids (TDS) also accounts for the severe ecological impacts over this area. Among the forty samples analysed, it was found that eight samples from the region exhibited pH levels within the allowed limit. Additionally, twelve samples met the acceptable standard for electrical conductivity (EC), while thirty-eight samples adhered to the allowable total dissolved solids (TDS) limit as specified by the Bureau of Indian Standards (BIS). All collected groundwater samples contained microplastics of various colours and morphologies, predominantly fibres. Among the 261 microplastics identified, black-coloured particles were most prevalent, with sizes ranging from 2 to 401 micrometres. The average microplastic concentration was 6 to 7 particles per litre, peaking at the Brahmapuram waste plant and decreasing with distance from this reference point. The investigation reveals that the water within the study region does not meet the permitted threshold, as evidenced by the presence of microplastics in the samples. This finding suggests that the water is unsuitable for consumption as drinking water.

CONTENTS

DATING PRE-AND POST-OCEAN DISAPPEARANCE EVENTS ON MARS USING CRATERSTAT

A dissertation submitted in partial fulfilment for the award of Degree of

MASTER OF SCIENCE

In

APPLIED GEOLOGY

By

KARTHIKA J.H.

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Pursued in

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DEPARTMENT OF GEOLOGY AND ENVIRONMENTAL SCIENCE

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(Affiliated to Calicut University and re-accredited by NAAC with A++ grade) 2021-2023

CERTIFICATE

This is to certify that the dissertation entitled- **'Dating Pre-and Post Ocean disappearance events on Mars using Craterstat'** is a bonafied record of work done by Ms. Karthika J.H. (Reg.No. CCAVMAG011), M.Sc. Applied Geology, Christ College (Autonomous), Irinjalakuda under my guidance in partial fulfilment of requirements for the degree of Master of Science in Applied Geology during the academic year 2021-2023.

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DECLARATION

I, Karthika J.H., hereby declare that the dissertation entitled "**Dating Pre-and-Post Ocean Disappearance Events on Mars using Craterstat"** is an authentic record of study and research work carried out by me, under the supervision and guidance of Dr. Sajin Kumar K.S., Assistant Professor, Department of Geology, University of Kerala, Thiruvananthapuram, in partial fulfilment of requirement for the award of the degree of Master of Science (M.Sc.) in Applied Geology of Calicut University, and that no part of this project work has been presented earlier for any degree or diploma in this or any other universities.

KARTHIKA J.H.

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I place my earnest thanks to **Dr. Sajin Kumar K.S, Assistant Professor**, **Department of Geology, University of Kerala, Trivandrum**, who guided and encouraged me with his constant support, guidance and suggestions throughout the programme to make it a great success.

I have the honour to extend my deep sense of gratitude to **Dr. E. Shaji, Associate Professor and Head, Department of Geology**, **University of Kerala**, for allowing me to do my dissertation work in this esteemed institute.

I would like to take this opportunity to express my deepest gratitude to, **Dr.Linto Alappat**, Dean of Research and Development of TLC (former HOD) Department of Geology and Environmental Science, Christ College(Autonomous) Irinjalakuda, **Dr. Anto Francis. K**, **Co-Ordinator**, Department of Geology and Environmental science, Christ College (Autonomous) Irinjalakuda,and **Mr. Tharun R.** Head of Department of Geology and Environmental Science, Christ College (Autonomous).

I express my sincere gratitude to **Ms. Ivine Joseph, Assistant Professor**, Dept. of Geology, Christ College (Autonomous), Irinjalakuda, who guided me internally for completion of my work. I also thank other faculty members of the department for their continuous support and encouragement.

I would like to acknowledge the Research Scholars, **Ms. Sadeeda Marjan.T, Ms. Devika Padmakumar and Mr. Rajaneesh. A**, Department of Geology, University of Kerala, for their advice and valuable guidance.

Last, but not the least, I would like to show my sincere gratitude to my parents for their sustained prayer, financial and moral support in the completion of my work.

I take this opportunity to thank my friends and classmates and all those who have directly and indirectly contributed their time, material and encouraged me during the course of my investigation.

KARTHIKA. J.H.

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PETROGRAPHY AND FLUID INCLUSION STUDIES IN METAPELITES OF COORG AND MERCARA, SOUTHERN GRANULITE TERRAIN, SOUTHERN INDIA

Project report submitted to the Christ College (Autonomous), Irinjalakuda, affiliated to University of Calicut, in partial fulfilment of the degree of

Master of Science in Applied Geology

Submitted By

Rahul Raj R

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2021-2023

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AUGUST 2023

DECLARATION

I, Rahul Raj R., student of MSc. Applied Geology, Department of Geology and Environmental science, Christ College (Autonomous) Irinjalakuda, Kerala, have completed my dissertation work entitled "Petrography and Fluid Inclusion Studies in Metapelites of Coorg and Mercara, Southern Granulite Terrain, Southern India". This work is solely based on the research work carried out by me from 9th May 2023 to August 10th, 2023, under the guidance of Dr. Amaldev T., Assistant Professor, Department of Marine Geology and Geophysics, Cochin University of Science and Technology, Lakeside Campus, Kochi-16. No part of the report is reproduced from other resources. All information included from other sources has been duly acknowledged. I maintain that if any part of the report is found to be plagiarized, I shall take full responsibility for it.

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This is to certify that the thesis entitled ***"Petrography and Fluid Inclusion Studies in Metapelites of Coorg and Mercara, Southern Granulite Terrain, Southern India"*** *was the work done by Mr. Rahul Raj R (Reg No. CCAVMAG012), MSc. Applied Geology, Department of Geology and Environmental science, Christ college (Autonomous) Irinjalakuda during the period 9th May 2023 to August 10th, 2023, at School of Marine Science, Cochin University of Science and Technology, Kochi-16, Kerala. The work was carried under my supervision in partial fulfillment of requirement for the award of degree of Master of Science in Applied Geology during the academic year 2021-2023 of Christ college (Autonomous) Irinjalakuda, Kerala.*

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ACKNOWLEDGEMENT

I am grateful to my supervisor Dr. Amaldev T, Assistant Professor, Department of Marine Geology and Geophysics, Cochin University of Science and Technology, Kochi-16, for the guidance, constant encouragement and for providing invaluable time, data and facilities that enable me to successfully complete my project.

I convey my sincere sense of gratitude to the Head, Department of Marine Geology and Geophysics, Cochin University of Science and Technology, Kochi-16, for providing necessary facilities required for the research work. I express my sincere gratitude to Dr. Resmy K.J Assistant professor Christ College (Autonomous) Irinjalakuda, Kerala, for her guidance and support. I express my heartfelt gratitude to Dr. Linto Alappat, Head of the Department, Department of Geology and Environmental science, Christ College (Autonomous) Irinjalakuda, for his guidance and valuable support throughout the work.

My heartfelt thanks to Mr. Rajkumar P.B, Research scholar, Department of Marine Geology and Geophysics, School of Marine Science, CUSAT, Kochi-16 for his technical help and necessary supports throughout my work. I would like to thank all the staff members of CUSAT for their support during the project. My sincere gratitude to all my teachers and staff members of the Department of Geology and Environmental science, Christ College (Autonomous) Irinjalakuda for their encouragement and help throughout the course of work.

I acknowledge my sincere gratitude to DST-SERB, Govt of India for financially supporting the work through the Scientific Social Responsibility Scheme of the funded project (File No.EEQ/2021/000992) "High-pressure granulites in the Archean crustal blocks of Southern Granulite Terrain, southern India" implementing in the Department of Marine Geology and Geophysics, Cochin University of Science and Technology.

Last but not the least, I would like to thank my family and friends for supporting me and for being by side in all ups and downs. I ascribe millions of gratitude to the Almighty for the abundant blessing poured upon me.

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GEOCHEMICAL ASSESSMENT OF GROUNDWATER QUALITY IN AND AROUND OF BHRAMAPURAM WASTE PROCESSING PLANT ERNAMKULAM DISTRICT, KERALA

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala, University of Calicut in partial fulfillment of the degree of

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SEPTEMBER 2023

CERTIFICATE

This is to certify that the dissertation entitled – **GEOCHEMICAL ASSESSMENT OF GROUNDWATER QUALITY IN AND AROUND OF BHRAMAPURAM WASTE PROCESSING PLANT ERNAMKULAM DISTRICT, KERALA**, is a bonafide record of work done by Ms. Sreelakshmi N S (Reg. No. CCAVMAG013), MSc Applied Geology, Christ College (Autonomous) Irinjalakuda, under my guidance in partial fulfilment of requirements for the degree of Master of Science in Applied Geology during the year 2021- 2023.

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DECLARATION

I hereby declare that this dissertation work – **GEOCHEMICAL ASSESSMENT OF GROUNDWATER QUALITY IN AND AROUND OF BHRAMAPURAM WASTE PROCESSING PLANT ERNAMKULAM DISTRICT, KERALA**, is a work done by me. No part of the report is reproduced from other resources. All information included from other sources has been duly acknowledged. I maintain that if any part of the report is found to be plagiarized, I shall take the full responsibility for it.

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ACKNOWLEDGEMENT

This report is an official documentation of dissertation work carried out in Ambalamukal Industrial Area, Kerala. This report would not have been possible without guidance, encouragement and support of many well-wishers and my colleagues who helped me in many ways.

I would like to express my sincere gratitude and appreciation to **Dr. Anso M A**, Assistant Professor in the Department of Geology and Environmental Science at Christ College (Autonomous) Irinjalakuda. He played a pivotal role in shaping the framework of this thesis and provided unwavering support and guidance throughout the entire duration of the study.

Dr. Linto Alappat, Dean of Research and Development of TLC (Former Head, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda), Mr **Tharun R**, Head of the Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda, for rendering all the help and facilities available in the department. I express my utmost gratitude to **Mr. Ayyappadas C.S**, a Research Scholar at Christ College (Autonomous) Irinjalakuda, for his invaluable assistance in the technical aspects of my study and his unwavering support during the completion of my dissertation.

I am grateful to **Dr. Anto Francis K**, Coordinator (Geology Self-financing), and the other faculty members of the Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda, for their encouragement, direction, and affection.

I'd like to take this opportunity to thank all of my teachers, classmates and friends who supported me in completing this dissertation work, whether directly or indirectly.

I am grateful to the entire Christ College family for their love, support, and guidance. I also express my gratitude to my parents and my sister for their unwavering support and prayers throughout my life. Above all, I express my gratitude to God, the Almighty, for His divine generosity and blessings showered upon me.

SREELAKSHMI N S

ABSTRACT

Water is an essential element for the life of all living beings. Water has special qualities that make it an important part of the Earth's biosphere. As a result, determining water quality is critical to understanding the ecosystem's equilibrium status. In this regard, the current investigation was carried out in and around the Brahmapuram waste processing plant in Ernakulam to assess the quality of the groundwater. The landfills, pollutions from nearby industries, unattended environmental issues may have detiorated the quality of groundwater around Brahmapuram. Laterites, sandstone, shale, and clay dominate the lithology of the Brahmapuram area, with charnokite as the basement rock. The aim of the study is to quantify the physcio-chemical parameters of the study area and thereby to check the groundwater quality in around Bhramapuram area. Forty water samples were collected for observations. The groundwater in the study area is mostly acidic in nature. According to the EC spatial distribution map, the eastern section of the research area has the lowest EC and TDS values. The surface water influence from Kadambrayar river is evident in the groundwater quality of the area. The content of bicarbonate, sodium values range from 2.4–64.66 mg/l and 115.73 to 2.06 mg/l respectively. The correlation table shows that alkalinity has a positive correlation with pH. The low concentration of calcium and magnesium accounts for the least total hardness in the study area. The Piper diagram, Wilcox diagram, Gibbs plot, correlation analysis and factor analysis details chemometrics of the current study which in-turn help to understand hydrogeochemical setting in and around the Brahmapuram waste processing plant.

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DISTRIBUTION OF FORAMINIFERA IN THE VANCHIPURA BEACH: IMPLICATION ON PALEOENVIRONMENT

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala, University of Calicut in partial fulfilment of the degree of

Master of Science in Applied Geology

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DISTRIBUTION OF FORAMINIFERA IN THE VANCHIPURA BEACH: IMPLICATION ON PALEOENVIRONMENT

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This is to certify that the dissertation entitled- '**Distribution of Foraminifera in Vanchipura Beach: Implication Of Paleoenvironment'** is a bonafied record of work done by Ms. Sukrutha Antony (Reg.No. CCAVMAG014), M.Sc. Applied Geology, Christ College (Autonomous), Irinjalakuda under my guidance in partial fulfilment of requirements for the degree of Master of Science in Applied Geology during the academic year 2021-2023.

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DECLARATION

I, **Sukrutha Antony**, declare that the work included in my dissertation report named **"DISTRIBUTION OF FORAMINIFERA IN THE VANCHIPURA BEACH: IMPLICATION ON PALEO ENVIRONMENT"** was composed entirely by me and that it has not previously been presented, in whole or in part, in any previous application for a degree. Except where otherwise noted, the work presented here is entirely my own. This work is presented to Christ College (Autonomous), Irinjalakuda, Kerala, in a partial fulfilment of the Master of Science in Applied Geology degree requirements.

SUKRUTHA ANTONY

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First and foremost, I want to express my gratitude to God Almighty, by whose mercy I am able to do this work. I wish to express my heartfelt gratitude and heartfelt thanks to, **Dr.Linto Alappat**, Dean of Research and Development of TLC (former HOD) Department of Geology and Environmental Science, Christ College(Autonomous) Irinjalakuda, **Dr. Anto Francis. K**, **Co- Ordinator**, Department of Geology and Environmental science, Christ College (Autonomous) Irinjalakuda,and **Mr. Tharun R.** Head of Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda, for developing the project's framework and providing regular support and supervision throughout the duration of the course study. A successful and ultimate conclusion of this project necessitated a great deal of advice and assistance, and I consider myself very grateful to have received this during all stages of my project work. Whatever I've accomplished is entirely due to such guidance and assistance, for which I am grateful. I would like to thank my project guide, **Dr Sunitha, D (Assistant Professor,** Department of Geology & Environmental Science) Christ College (Autonomous) Irinjalakuda, for creating the project guidelines and providing support and supervision throughout the project.

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I would prefer to take this opportunity to thank all of my classmates and friends who helped me finish my dissertation, whether directly or indirectly. I'm also thankful to the entire Christ College family for their love and support.

I also express my gratitude to my parents and family members for their unwavering support and prayers throughout my life.

Sukrutha Antony

CONTENTS

GEOCHEMICAL STUDIES ON SILICICLASTIC FORMATIONS OF THE PROTEROZOIC KALADGI SUPERGROUP, KARNATAKA

Dissertation submitted to Christ College (Autonomous), Irinjalakuda, Kerala,
University of Calicut in partial fulfillment of the degree of
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GEOCHEMICAL STUDIES ON SILICICLASTIC FORMATIONS OF THE PROTEROZOIC KALADGI SUPERGROUP, KARNATAKA

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DECLARATION

I **Varsha Krishnan** hereby declare that this dissertation titled "**GEOCHEMICAL STUDIES ON SILICICLASTIC FORMATIONS OF THE PROTEROZOIC KALADGI SUPERGROUP, KARNATAKA**" is an original and authentic work carried out by me under the guidance of Dr. Linto Alappat, Christ College Irinjalakuda and Dr. Bivin G. George, NCESS, Thiruvananthapuram. The research was conducted as a partial fulfillment of the requirements for the degree of Msc. Applied Geology. It has not formed the basis for the award of any other degree or diploma, in this or any other Institution or University. I further declare that the sources of information, data, and materials used in this project have been duly acknowledged and referenced. Any contributions from other researchers or authors have been properly cited. I maintain that if any part of the report is found to be plagiarized, I shall take the full responsibility for it.

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ACKNOWLEDGEMENTS

I would like to express my heartfelt gratitude to all those who have contributed to the succession completion of my dissertation.

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Last but not the least, I would like to thank my family and friends for supporting me and for being by my side in all ups and downs. I ascribe millions of gratitude to the almighty for the abundant blessing which is poured up on me.

VARSHA KRISHNAN

ABSTRACT

The Kaladgi Basin which is situated in Karnataka stands a notable geological landmark distinguished by its diverse assortment of sediment configuration, rock classification and mineral reserves. Over millions of years the basin underwent a series of tectonic activity and environmental conditions that played an important role to mold the basin into its present form. The Proterozoic Kaladgi Supergroup in Karnataka, India, put forward a significant geological setting to elucidate Earth's ancient sedimentary processes. This study presents a comprehensive geochemical investigation focused on the siliciclastic formations within the Kaladgi Supergroup. The objective of the study was to classify the Kaladgi siliciclastic rocks using their major oxide, understand the weathering intensity of the source area and to decode the provenance of the sediments.Through the laboratory analysis this study go through the detailing of siliciclastic rocks, by techniques such as X-ray diffraction (XRD) and X-ray fluorescence (XRF) spectroscopy. The findings of the geochemical analysis and interpretation reveals environmental conditions during deposition, as well as the tectonic setting and climatic influence that mold the formation of the Kaladgi Supergroup. Geochemical Indices including Chemical Index Alteration(CIA) and Chemical Index of Weathering (CIW), suggest the degree of alteration and weathering throughout deposition. These help to contribute to the palaeoenvironmental conditions during the sedimentation process.

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RADIOLARIAN DIVERSITY AND ITS CLIMATIC REPERCUSSIONS OF THE SOUTHERN BAY OF BENGAL

Dissertation submitted in partial fulfilment of the degree of

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This is to certify that the dissertation report entitled "**Radiolarian diversity and its climatic repercussions of the Southern Bay of Bengal**" is a bonafide record of project work done by Ms Haifa Abdul Kareem Valassery (Reg.No.CCAVMAG016), M.Sc. Applied Geology, Department of Applied Geology and Environmental Science, Christ (Autonomous) College, Irinjalakuda 680125. The work was carried out under my supervision and guidance at the Micropaleontology Laboratory, Department of Marine Geology and Geophysics, School of Marine Sciences, Cochin University of Science and Technology, Kochi-16, from April 2023 to August 2023, for the partial fulfilment of the requirements for the award of the degree of Master of Science in Applied Geology during the academic year 2021-2023 of Christ (Autonomous) College, Irinjalakuda, Kerala.

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DECLARATION

I hereby declare that this project report entitled "**Radiolarian diversity and its climatic repercussions of the Southern Bay of Bengal** " is an authentic work carried out by me from April 2023 to August 2023, under the supervision of **Dr N. R. Nisha**, Assistant Professor, Micropaleontology Laboratory, Department of Marine Geology and Geophysics, School of Marine Science, Cochin University of Science and Technology, Kochi-16, Kerala, in partial fulfilment of the requirements for the award of the degree of Master of Science in Applied Geology of Christ (Autonomous) College, Irinjalakuda, Kerala. No part of the report is reproduced from other resources. All information included from other sources has been duly acknowledged. I maintain that if any part of the report is found to be plagiarized, I shall take full responsibility for it.

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ACKNOWLEDGEMENT

I would like to express my sincere gratitude to my supervisor **Dr N. R. Nisha**, **Assistant Professor, Department of Marine Geology and Geophysics, School of Marine Science, Cochin University of Science and Technology, Kochi-16**, for the supervision, cooperation, support, and valuable guidance throughout the completion of this work. I convey my sincere sense of gratitude to **the Head, Department of Marine Geology and Geophysics, School of Marine Sciences, Cochin University of Science and Technology, Kochi-16** for permitting me to do my dissertation work and use the facilities of the institution. I am also thankful to the **Inter-University Accelerator Centre, New Delhi for extending the AMS facility for 14 C funded by the Ministry of Earth Science (MoES), Govt. of India** with reference numbers **MoES/16/07/11(i)-RDEAS and MoES/P. O (Seismic)8(09)-Geochron/2012**. I am also grateful to **the Director, National Centre for Polar and Ocean Research NCPOR, Goa** for providing the gravity core for this study. I sincerely acknowledge **the Director, Geological Survey of India, Mangalore for extending the SEM facilities.**

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My sincere gratitude to all my teachers and staff members of the Department of Geology and Environmental Science, Christ College Autonomous, Irnjalakuda for their encouragement and help. I express my gratitude to **Dr Sunitha D, Assistant Professor, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda, for her support**. I express my heartfelt gratitude **to Dr Linto Alappat, Dean of Research and Development of TLC (**Former HOD)**, Department of Applied Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda** for his valuable support throughout the course of work. I would extend my deepest gratitude to **Dr Anto Francis K, Co-ordinator, Department of Applied Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda.**

Last, but not least, I would like to thank my family and friends for supporting me and for being by my side in all ups and downs. I ascribe millions of gratitude to the Almighty for the abundant blessing which is poured upon me.

HAIFA ABDUL KAREEM VALASSERY.

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ABSTRACT

The southern Bay of Bengal (BoB) is famous for its biodiversity. The present study is the first report of radiolarians of the southern BoB. The present investigation mainly focuses on the taxonomic identification and temporal distribution pattern of these siliceous organisms. We recorded 18 radiolarian species belonging to 12 genera and 5 families. Based on the available radiolarian dates the average sedimentation ratio of the study are 625 cm/Kyr and the examined core spans up to 44 Kyr BP.

The temporal distribution pattern records the overall dominance of spummellarians over nassellarians. The dominant species recorded from the study area are *Acanthosphaera actinota*, *Acrosphaera spinosa*, *Dictyocoryne truncatum*, *Dictyocoryne euclidis* and *Spongaster tetras tetra* (Hollis and Neil, 2005; Rogers, 2016). We could also mark the Younger Dryas (YD, Bolling, Allerged (B/A), Henrinch events (H1, H2, H3 and H4) and the Last Glacial Maximum during 4A layer from the southern Bay of Bengal.